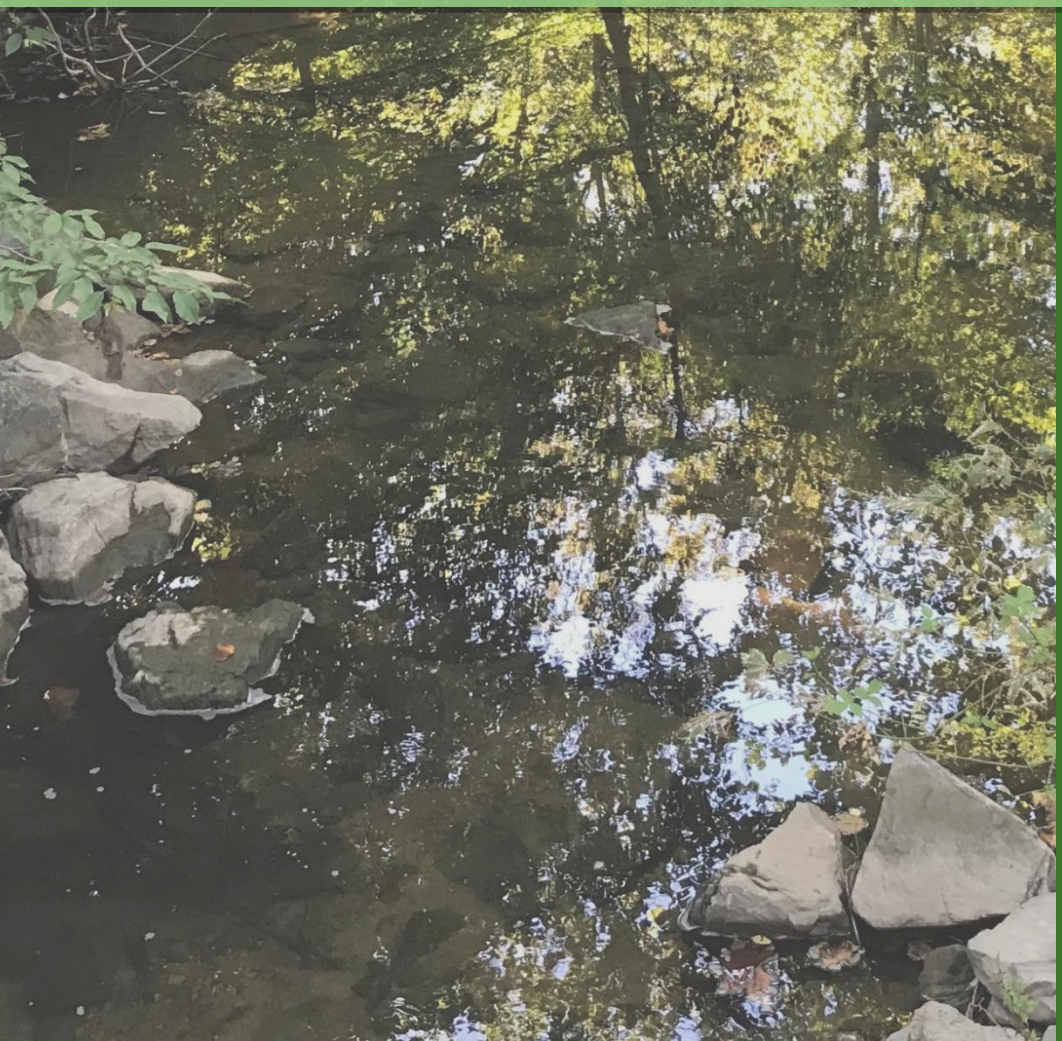
US Army Corps of Engineers

# ANACOSTIA WATERSHED RESTORATION
# MONTGOMERY COUNTY, MARYLAND
# CONTINUING AUTHORITIES PROGRAM SECTION 206
# AQUATIC ECOSYSTEM RESTORATION FEASIBILITY STUDY

## DRAFT INTEGRATED FEASIBILITY REPORT AND ENVIRONMENTAL ASSESSMENT



**MARCH 2025**

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# EXECUTIVE SUMMARY

This Draft Integrated Feasibility Report and Environmental Assessment (IFR/EA) documents the U.S. Army Corps of Engineers (USACE) feasibility study planning process for the Anacostia River watershed, Montgomery County, Maryland Continuing Authorities Program (CAP) Section 206 Aquatic Ecosystem Restoration project ("Montgomery County CAP 206") and compliance with the National Environmental Policy Act (NEPA) and other environmental laws as integrated into the planning process. The Montgomery County CAP 206 study is being completed by USACE Baltimore District in partnership with the Montgomery County Department of Environmental Protection (MCDEP), the non-Federal sponsor for this feasibility study, and the Maryland National Capital Park and Planning Commission (M-NCPPC) in Montgomery County, Maryland.

The Montgomery County CAP 206 study is being completed pursuant to Section 206 of the Water Resources Development Act (WRDA) of 1996, which allows USACE to develop aquatic ecosystem projects that improve the quality of the environment, are in the public interest, and are cost-effective solutions to the identified problems. The Montgomery County CAP 206 study is being completed to identify aquatic ecosystem restoration (AER) actions that would improve in-stream habitat and fish passage in degraded streams within the Anacostia River watershed in Montgomery County. The Anacostia River watershed has been degraded by human alteration of the natural landscape and is characterized by significant urban development due to the growth of the metropolitan area of Washington D.C.

This study was preceded by other USACE efforts in the Anacostia River watershed including the Anacostia River Watershed Restoration Plan (ARP) completed in 2010, which identified over 3,000 candidate projects for the restoration of the Anacostia River watershed. The ARP resulted in two specifically authorized studies that were initiated in 2012 to identify AER actions for USACE participation in the Anacostia River watershed in each of two counties in Maryland – Montgomery County and Prince George's County. The Anacostia River Watershed Montgomery County General Investigation Study was never completed, but instead, due to the magnitude of the likely recommendation, was transitioned to the CAP Section 206 program resulting in this study. The Anacostia River Watershed Prince George's County Study was completed in 2018 and has proceeded to project design and implementation.

The Anacostia River watershed encompasses approximately 176 square miles, located entirely within the metropolitan area of Washington, D.C. The drainage within Montgomery County is approximately 61 square miles, accounting for about one-third of the total Anacostia River watershed. The Anacostia River flows through Maryland and then the District of Columbia into the Potomac River; the river ultimately drains to the Chesapeake Bay. Anacostia River subwatersheds largely within Montgomery County

include Sligo Creek, Northwest Branch, Paint Branch, and Little Paint Branch (Figure ES-1).

In the Montgomery County portion of the Anacostia Watershed, the ARP identified 304 potential AER projects that represent possible USACE-led projects. The preceding Anacostia River Watershed Montgomery County General Investigation Study focused on seven headwater streams of the Anacostia River watershed in Montgomery County. These seven headwater streams were selected in coordination with MCDEP during scoping of the study as headwater streams were characterized by incision (when a stream cuts its channel into the bed through erosion) that was impacting downstream habitat conditions in the Potomac River. Furthermore, the Anacostia River Watershed Montgomery County General Investigation Study screened seven streams down to three streams (Lamberton Creek, Bel Pre Creek, and Sligo Creek/Colt Terrace) prior to recommending conversion of the feasibility study to the CAP Section 206 authority. Therefore, the scope of the Montgomery County CAP Section 206 study is limited to examination of AER measures to address degraded ecosystem health in the three selected streams - Lamberton Creek, Bel Pre Creek, and Sligo Creek/Colt Terrace - of the Anacostia River watershed in Montgomery County to include measures to improve in-stream habitat, floodplain wetlands, riparian areas, and enhance floodplain connectivity.

The alternative evaluation and comparison summarized in this draft IFR/EA resulted in identification of Alternative 2a Natural Channel Design for Bel Pre Creek and Lamberton Creek as the Tentatively Selected Plan (TSP). The TSP presented in this Draft IFR/EA is the National Ecosystem Restoration (NER) Plan, the plan that reasonably maximizes ecosystem restoration benefits to the nation when compared to costs, consistent with the Federal objective. Prior to release of this Draft Feasibility Report/EA, USACE, MCDEP and M-NCPPC had agreed to remove Sligo Creek from consideration in the USACE AER project as the segment will be part of a project to be implemented by M-NCPPC in coordination with the Washington Sanitary Sewer Commission (WSSC).

The recommended plan consists of restoring 2.5 miles of stream habitat in Bel Pre Creek extending from Bel Pre Neighborhood Park to 100 feet upstream of the confluence with the Northwest Branch of the Anacostia River (Figure ES-2) and restoring 0.7 miles of Lamberton Creek from the outfall at Yeatman Terrace to 1,000 feet upstream of the confluence with the Northwest Branch of the Anacostia River (Figure ES-3). Note that stream improvements in the downstream segment of Lamberton Creek are being planned for implementation by WSSC. The Bel Pre Creek and Lamberton Creek Plan is identified as both a cost-effective and best buy plan based on the cost effectiveness-incremental cost analysis (CEICA) completed for this study (see Appendix B). The total project cost for the recommended plan which includes Bel Pre Creek and Lamberton Creek is estimated at $18.9 million. The cost sharing requirement for the CAP Section 206 program is 65 percent federal and 35 percent non-Federal. The recommended plan has a total estimated cost of $18.9 million, which

would be cost shared $12.3 million federal and $6.6 million non-Federal. This plan will have the greatest impact on habitat improvement in the Anacostia Watershed in Montgomery County.

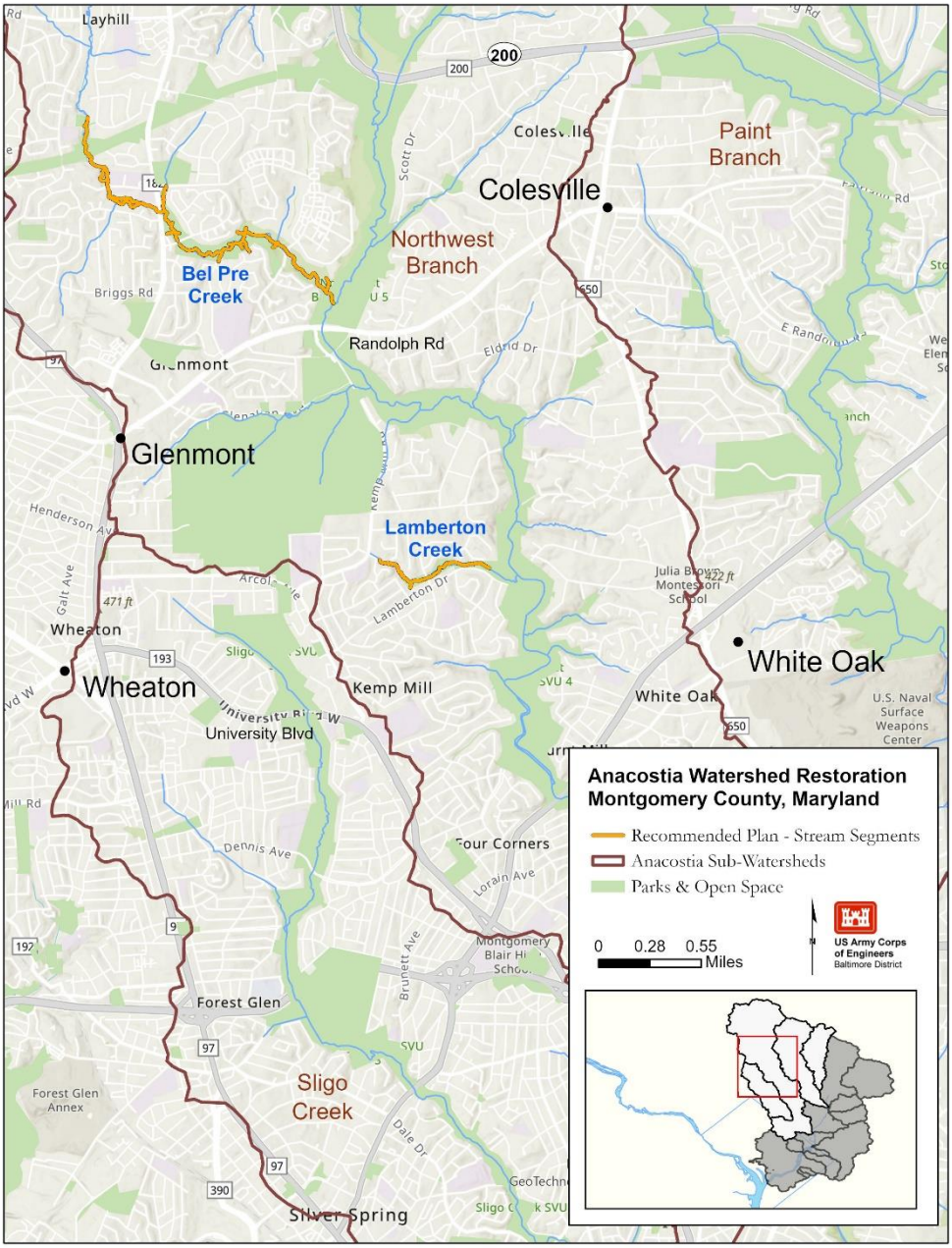


**Figure ES-1: Selected Streams in Anacostia Watershed in Montgomery County**

Concept designs for stream restoration have been developed for Bel Pre Creek and Lamberton Creek that consist of raising the stream bed using a series of grade control structures that include a mixture of riffle grade control (RGC) structures, j-hooks with

riffle aprons, and cross vanes with riffle aprons and a series of riffle pool habitat, a sequence of shallow, fast-moving sections of stream (riffles) and deeper pools that are naturally found in streams and rivers (typical details shown in Section 6). Structure placement and design will be determined upon completion of a survey during the design and implementation phase. The concept designs address undercutting of the channel and improve floodplain connectivity between the stream and adjacent wetlands and riparian habitat. Additionally, the recommended plan would provide significant floodplain enhancements using floodplain benches, grading, planting of native species, and removal of non-native invasive species. There are existing terrestrial resources around Bel Pre and Lamberton Creeks including mature forests, wetlands, seeps, and native vegetation that will be considered for protection as more detailed designs are developed during the design phase. MCDEP and M-NCPPC have expressed support for the recommended plan to move forward to design and implementation.

The recommended plan supports E.O. 13508 Chesapeake Bay Protection and Restoration and contributes to goals and objectives outlined in the 2014 Chesapeake Bay Watershed Agreement by restoring habitat, fish passage, and wetlands in the Bay's contributing subwatersheds. It also supports the Urban Waters Federal Partnership by reconnecting urban areas with their waterways and improving community health and cohesion.

In addition to the benefits provided for anadromous fish, riffles and pools support a diversity of aquatic habitats that provide the foundation for many of the biological and water quality functions that natural streams provide. Benthic (bottom dwelling) organisms find habitat around rocks and coarse substrate, filtering food from the water column, or gathering it from the bottom of the channel. Fish utilize pools and the overhead cover provided for protection and cooler water temperatures. The increased stability provided by restoration activities are expected to establish a dynamic equilibrium in the stream that maintains habitat complexity and results in increases in species abundance and diversity.

Although wetland benefits could not be quantified in this IFR/EA, the stream restoration project is expected to improve the flow of water from the stream to adjacent floodplain wetlands through the stabilization and grading of stream banks contributing to the reconnection of streams with their floodplains. This will increase saturation of hydric soils and potentially aid in the reestablishment of floodplain wetlands. Implementing this project in the near term will help to restore aquatic communities through nutrient cycling and water retention and will provide benefits to riparian wildlife including birds and amphibians.

Non-native/invasive species (NNI) are present in Bel Pre Creek including Garlic mustard, Japanese stiltgrass, Callery Pear (*Pyrus calleryana*), winter creeper (*Euonymus fortunei*), Japanese honeysuckle (*Lonicera Japonica*), and Vitis sp. (vines mainly in the vicinity of Layhill Road). NNI that are present in Lamberton Creek include

Bamboo spp., bush honeysuckle (*Lonicera tatarica*) Vitis sp., and Callery pear. NNI management would include treatment, monitoring, and adaptive management of NNI. The project would include grading of stream banks to restore the natural channel geometry and planting of native species along the riparian zone. More details on NNI management, grading and planting will be developed during the design and implementation phase.

The total costs for the recommended plan – stream restoration using natural channel design at Bel Pre Creek and Lamberton Creek are summarized in Table ES-1.

**Table ES-1: Project Cost Summary for the Recommended Plan**

| **Construction Item** | **Cost** |
|---|---|
| 01 Lands and Damages | $ 1,291,000 |
| 16 Bank Stabilization | $12,816,000 |
| 30 Planning Engineering and Design | $ 3,584,000 |
| 31 Construction Management | $ 1,207,000 |
| Total First Cost | $18,898,000 |

*Total Project Costs are in October 2025 (FY 2025) price levels and use a discount rate of 3.0%. Costs have been rounded and may not add up from the accounts breakdown as shown.*

An abbreviated risk analysis (ARA) was performed to estimate the effects associated with design uncertainties including for construction elements (e.g. numbers of structures), quantities of materials, level of analyses, schedule, etc. For construction elements in account 16 Bank Stabilization, an estimated project contingency of 47.7 percent is used based on the cost and schedule risks outlined in the ARA and summarized in Appendix D. Contingencies for other accounts include 20.0 percent for Bel Pre Creek and Lamberton Creek for 01 Lands and Damages, 15.6 percent for account 30 Planning Engineering and Design and 11.3 percent for account 31 Construction Management.

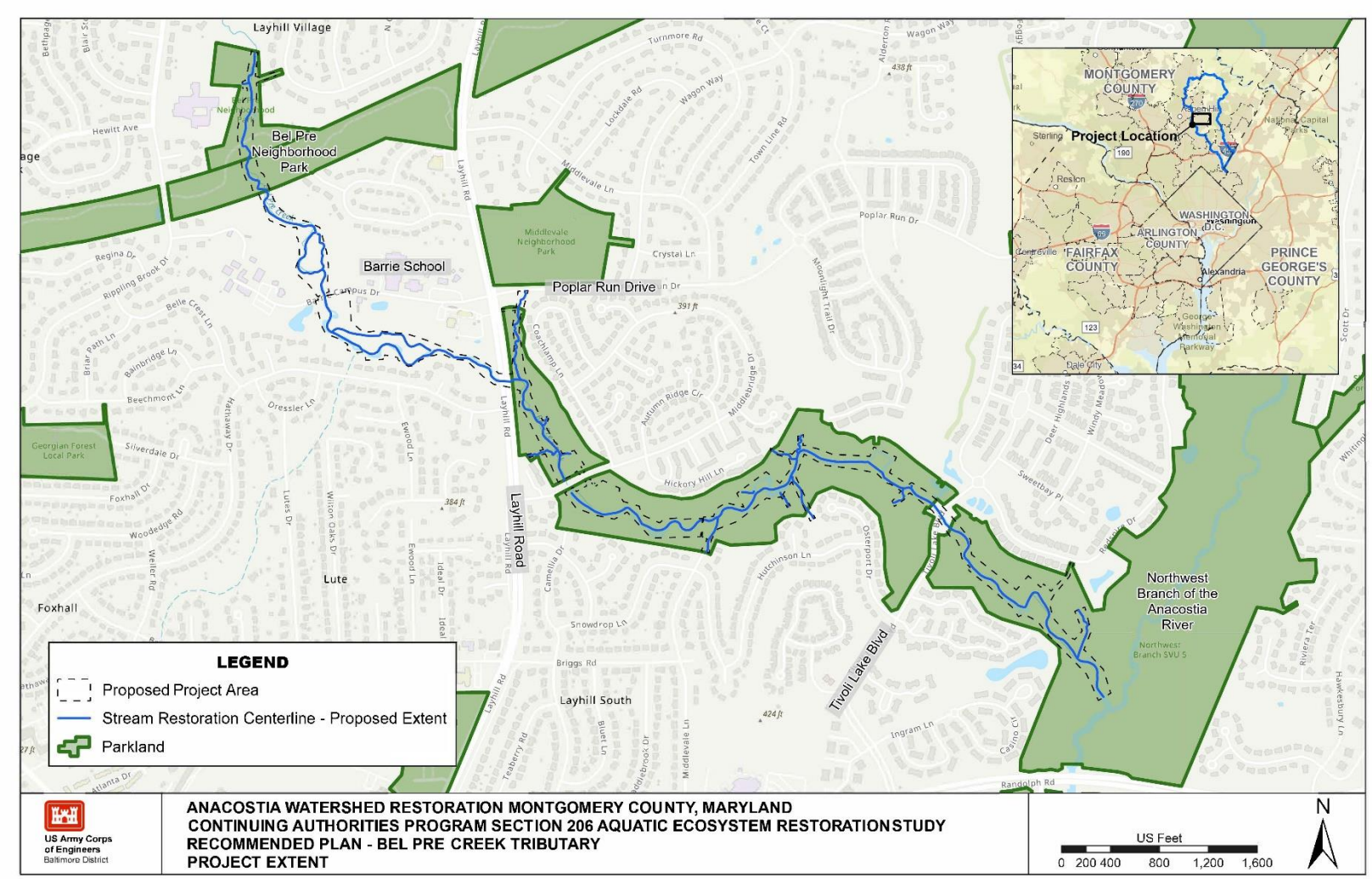


**Figure ES-2: Recommended Plan - Bel Pre Creek**

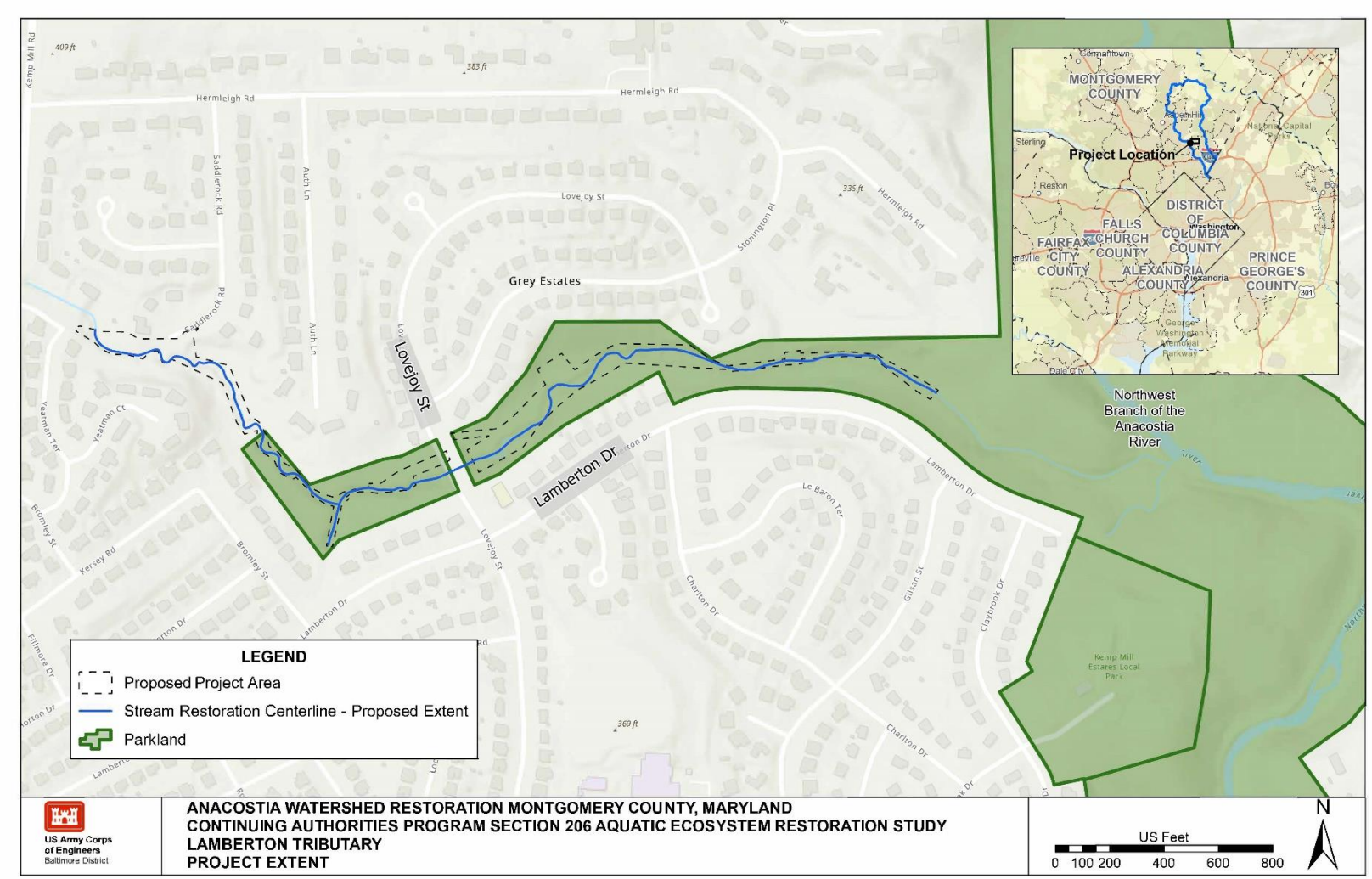


**Figure ES-3: Recommended Plan – Lamberton Creek**

Implementation would occur provided that sufficient funds are appropriated to design and construct the project. To initiate the design and implementation phase, USACE must enter into a Project Partnership Agreement with a non-Federal sponsor. MCDEP and M-NCPPC have identified that they will be co-sponsors for the design and implementation phase of this project. It is anticipated that MCDEP will be primarily responsible for funding the restoration effort whereas M-NCPPC will contribute real estate interests for implementation of this project. The design phase is cost shared 65 percent federal and 35 percent non-Federal. The design phase is estimated to take three years from October 2026 to October 2029. Construction of the project is estimated to take one and a half years from contract award from June 2030 to December 2031.

A preliminary Monitoring and Adaptive Management Plan (MAMP) was developed with this IFR/EA to identify monitoring requirements and adaptive management actions appropriate for the project's restoration goals and objectives and is included as Appendix H. Monitoring includes the systematic collection and analysis of data that provides information useful for assessing project performance, determining whether ecological success has been achieved, and whether adaptive management may be needed to attain project benefits. The plan also identifies and describes examples of adaptive management activities that may be proposed for the project and estimate their cost and duration. Note that adaptive management actions may vary based on the results of monitoring data and could vary from conditions projected in this MAMP. The plan will be further developed in the design phase as specific design details are made available.

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# 1 INTRODUCTION

## 1.1 Introduction

This Draft Integrated Feasibility Report and Environmental Assessment (IFR/EA) documents the U.S. Army Corps of Engineers (USACE) feasibility study planning process for the Anacostia River watershed, Montgomery County, Maryland Continuing Authorities Program (CAP) Section 206 Aquatic Ecosystem Restoration ("Montgomery County CAP 206") and compliance with the National Environmental Policy Act (NEPA) and other environmental laws as integrated into the planning process. The EA follows the Council on Environmental Quality (CEQ) NEPA implementing regulations in 40 CFR Sections 1500-1508 dated July 2020, and 40 CFR Sections 1502, 1507, and 1508 dated April 2022. The EA also follows USACE NEPA implementation regulations at 33 CFR part 230. The Montgomery County CAP 206 study is being completed by USACE Baltimore District in partnership with the Montgomery County Department of Environmental Protection (MCDEP), the non-Federal sponsor for this feasibility study, and the Maryland National Capital Park and Planning Commission (M-NCPPC) in Montgomery County, Maryland.

The Montgomery County CAP 206 study is being completed under the CAP Section 206 authority, which allows USACE to develop aquatic ecosystem projects that improve the quality of the environment, are in the public interest, and are cost-effective solutions to the identified problems. The Montgomery County CAP 206 study is being completed to identify aquatic ecosystem restoration (AER) actions that would improve in-stream habitat and fish passage in degraded streams within the Anacostia River watershed in Montgomery County. The Anacostia River watershed has been degraded by human alteration of the natural landscape and is characterized by significant urban development due to the growth of the metropolitan area of Washington D.C.

This study was preceded by other USACE efforts in the Anacostia River watershed including the Anacostia River Watershed Restoration Plan (ARP) completed in 2010, which identified over 3,000 candidate projects for the restoration of the Anacostia River watershed. The ARP resulted in two specifically authorized studies that were initiated in 2012 to identify AER actions for USACE participation in the Anacostia River watershed in each of two counties in Maryland – Montgomery County and Prince George's County. The Anacostia River Watershed Montgomery County General Investigation Study was never completed, but instead was transitioned to the CAP Section 206 program resulting in this study. The Anacostia River Watershed Prince George's County Study was completed in 2018 and has proceeded to project design and implementation.

## 1.2 USACE Planning Process

This IFR/EA was prepared in accordance with the Principles and Guidelines for Water and Land Related Resources Implementation Studies (P&G) and Engineer Regulation

(ER) 1105-2-103 Policy for Conducting Civil Works Planning Studies (November 7, 2023) and follows the Final Feasibility Report Format and Content Guide (October 26, 2021). This study was structured using the USACE six step planning process to ensure that sound decisions are made based on a rational approach. The IFR/EA presents the AER problem to be addressed by the study, summarizes information on existing and future with and without project conditions, lays out the plan formulation process for developing, evaluating, and comparing alternatives, and details the decisions leading to the selection of the Tentatively Selected Plan (TSP). This IFR/EA includes the environmental, engineering, and socioeconomic information utilized in formulating and evaluating the AER alternatives and provides the basis for recommending the preparation of final designs and construction of this project.

## 1.3 Study Authority

The CAP is a group of nine legislative authorities under which the Secretary of the Army, acting through the USACE Chief of Engineers, is authorized to plan, design, and implement certain types of water resources projects without additional project specific congressional authorization. The study will be conducted under Section 206 of the Water Resources Act of 1996, as amended, which provides authority for USACE to restore degraded ecosystems. Under this authority, proposed projects must demonstrate that they are in the public interest, increase aquatic ecosystem habitat, and provide a cost-effective solution to the identified problem.

## 1.4 Study Area

The Anacostia River watershed encompasses approximately 176 square miles, located entirely within the metropolitan area of Washington, D.C. The drainage within Montgomery County is approximately 61 square miles, accounting for about one-third of the total Anacostia River watershed. The Anacostia River flows through Maryland and then the District of Columbia into the Potomac River; the river ultimately drains to the Chesapeake Bay. Anacostia River subwatersheds largely within Montgomery County include Sligo Creek, Northwest Branch, Paint Branch, and Little Paint Branch (Figure 1). The watershed in Montgomery County falls primarily within the Piedmont physiographic province. However, along the county's border with Prince George's County, small sections of the streams lie within the Coastal Plain province.

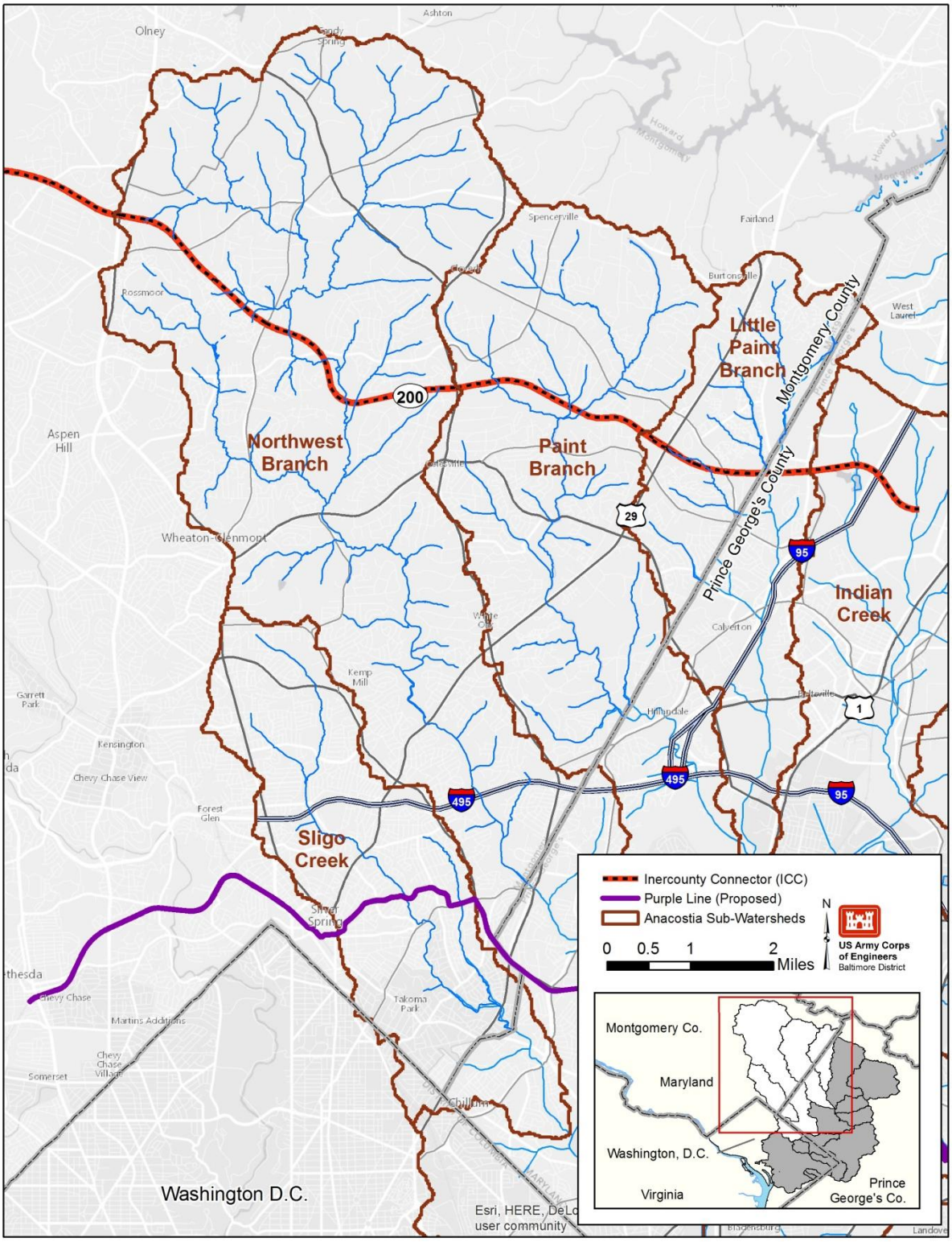


**Figure 1-1: Study Area**

## 1.5 Background and History

USACE has a long history in the Anacostia River watershed, dating back to the founding of Washington, D.C. Early USACE work included making the land habitable and suitable for construction of the city and navigation on the mainstem of the Anacostia River. Historically, the Anacostia River played a critical role in enabling significant economic development in the region, but as a result became engineered and industrialized. The Anacostia River flows through economically disadvantaged communities and has been called America's "Forgotten River" (Arnold et al., 2015).

Efforts to restore the Anacostia River watershed began nearly four decades ago. Since that time, local, state, and federal government agencies, as well as environmental non-governmental organizations and dedicated private citizens have contributed significant resources toward watershed restoration. Formal cooperation between government agencies came with the signing of the Anacostia Watershed Agreement in 1987 (of which USACE Baltimore District was an original signatory member) and the formation of the Anacostia Watershed Restoration Committee (AWRC). Due in large part to the Anacostia Watershed Agreement, numerous federal commitments and actions have been made within the past 30 years, culminating in current federal efforts to restore urban streams in the watershed.

A Comprehensive Watershed Plan, Anacostia River and Tributaries, Maryland and the District of Columbia, was completed in July 2005, under the authority of WRDA 1986 Section 905(b), which recommended that USACE conduct a comprehensive investigation of watershed problems. The resulting Anacostia River Watershed Restoration Plan (ARP) was completed in February 2010 and identified over 3,000 candidate projects for the restoration of the Anacostia River watershed, including projects that USACE could implement.

USACE initiated a general investigation study to further evaluate these candidate projects and other opportunities for watershed restoration in Montgomery County and recommend USACE actions within the watershed for congressional authorization. A Feasibility Cost Sharing Agreement (FCSA) was signed with Montgomery County and executed on October 8, 2013. The Alternatives Milestone Meeting was held on February 28, 2014. During the scoping phase of the general investigation study, seven stream reaches in four subwatersheds of the Anacostia River watershed were identified as degraded and as candidates for further screening (Figure 1-2) from a list of 14 initially identified project alternatives. Concept alternatives plans, estimated costs, and estimated ecological lift of project alternatives were developed. USACE requires that a Cost Effective/Incremental Cost Analysis (CEICA) be conducted, and that agency-approved benefit metrics be utilized.

In February 2015, USACE obtained approval from the National Ecosystem Restoration Planning Center of Expertise (EcoPCX) for use of an aquatic ecosystem restoration

benefits metric based on the MCDEP Rapid Habitat Assessment (RHA) procedure to estimate habitat quality and establish a baseline for habitat improvement through this project. CEICA was completed in 2015, and during a pre-TSP Milestone meeting (April 30, 2015) a TSP composed of restoration at Lamberton Creek, Bel Pre Creek, and Sligo Creek was identified. The streams largely flow through forested parkland but are incised and have degraded instream habitat. The streams have reduced stream/floodplain connection due to channel incision and undercutting, resulting in loss of ecosystem function and dewatering of floodplain wetlands. The total project costs at the time were projected to be under $12 million; therefore, USACE recommended that the project be transitioned to the CAP Section 206 authority. By memorandum dated December 9, 2016, the transition of the study to CAP was approved by North Atlantic Division, USACE. The FCSA for this study under the CAP Section 206 authority was signed with MCDEP as the non-Federal sponsor and executed on September 30, 2020.

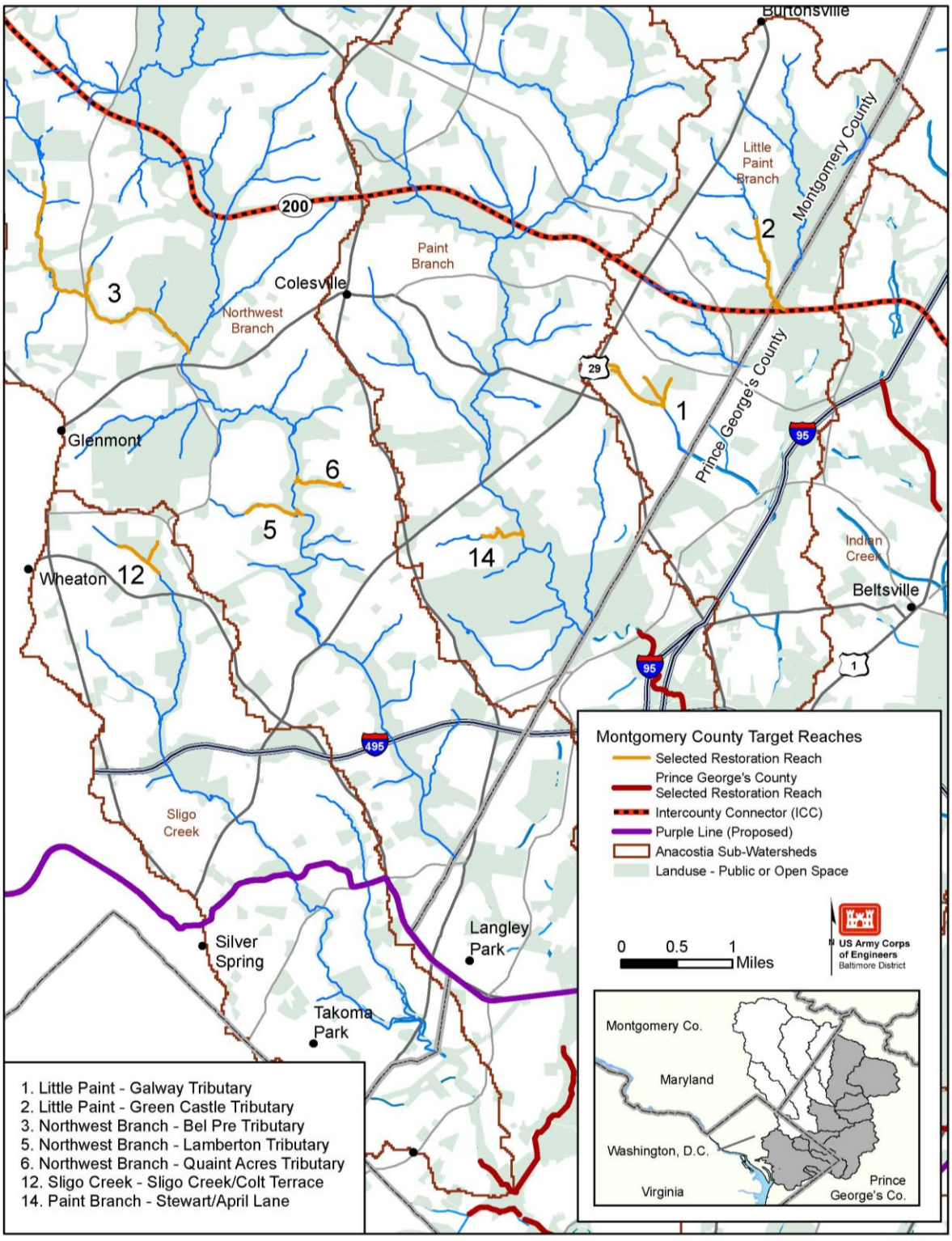


**Figure 1-2: Seven Stream Reaches identified for further evaluation in Anacostia Watershed Restoration: Montgomery County**

## 1.6 Purpose and Need

Human alteration of the Anacostia River watershed has resulted in significant degradation of aquatic ecosystems. While much has been accomplished over the past several decades to restore this important urban watershed in and around our nation's capital, the river and its tributaries remain ecologically stressed. The purpose of this study is to restore ecological function, structure, and health in selected stream reaches and riparian zones in the Anacostia River watershed in Montgomery County.

The Montgomery County CAP 206 study directly supports the need to improve habitat within the Anacostia watershed, achieve the goals of the ARP, and of Executive Order (E.O.) 13508 Chesapeake Bay Protection and Restoration. The Anacostia River drains into the Potomac River that feeds the Chesapeake Bay. The significance of the fish and wildlife resources of the Chesapeake Bay is widely recognized by the institutional, public, and technical sectors. As the largest estuary in the United States, the Chesapeake Bay watershed extends into six states (Delaware, Maryland, New York, Pennsylvania, Virginia, and West Virginia) and encompasses all of the District of Columbia. The Anacostia Watershed is one of the most urbanized watersheds in the United States. Ecological restoration of the Anacostia River and its floodplain wetlands reduces sediment loads and provides treatment of contaminants carried by stormwater runoff through natural processes, preventing further degradation in the Anacostia River watershed and downstream receiving waters in the Potomac River and the Chesapeake Bay.

WRDA 2007 established the federal objectives that water resource investments must reflect national priorities, encourage economic development, and protect the environment by seeking to maximize sustainable economic development while seeking to avoid the unwise use of floodplains and flood-prone areas, and protecting and restoring the functions of natural systems and mitigating any unavoidable damage to natural systems. The contributions will be in accordance with national environmental statutes, applicable executive orders, and other federal planning requirements. The USACE objective in ecosystem restoration planning is to contribute to National Ecosystem Restoration (NER). Contributions to NER outputs are increases in net quantity and/or quality of the desired ecosystem resources (USACE, 2000).

## 1.7 Study Scope

The ARP identified 304 potential AER projects in Montgomery County that represent possible USACE-led projects. The preceding Anacostia River Watershed Montgomery County general investigation study in 2015 focused on seven headwater streams of the Anacostia River watershed in Montgomery County. These seven headwater streams were selected in coordination with MCDEP during scoping of the study as headwater streams were characterized by incision that was impacting downstream habitat conditions in the Potomac River. Furthermore, the Anacostia River Watershed Montgomery County general investigation study screened down from seven streams to

three streams (Lamberton Creek, Bel Pre Creek, and Sligo Creek/Colt Terrace) prior to recommending conversion of the feasibility study to the CAP Section 206 authority. The scope of the Montgomery County CAP Section 206, therefore, is limited to examination of AER measures to address degraded ecosystem health in the three selected streams (Lamberton Creek, Bel Pre Creek, and Sligo Creek/Colt Terrace) of the Anacostia River watershed in Montgomery County to include measures to improve in-stream habitat, floodplain wetlands, riparian areas, and enhance floodplain connectivity. Prior to release of this IFR/EA, USACE, MCDEP and M-NCPPC had agreed to remove Sligo Creek from consideration in the USACE AER project as the segment will be part of a project to be implemented by M-NCPPC in coordination with WSSC. Therefore, the scope of this IFR/EA is limited to examining AER actions in Bel Pre Creek and Lamberton Creek. This IFR/EA details previous efforts completed in the Anacostia River Watershed Montgomery County general investigation study and builds upon those efforts in this CAP Section 206 study.

## 1.8 Problems and Opportunities

The USACE planning process requires identification of specific water and related land resources problems and opportunities in the study area. The problems and opportunities detailed below form the basis for formulation of the study's objectives and constraints. The problems and opportunities are focused on the two project areas of Bel Pre Creek and Lamberton Creek.

### 1.8.1 Problems

The Anacostia River watershed in Montgomery County is characterized by degraded ecosystem function and health of the river, its tributaries, and riparian zone, which has been historically caused by disruptions of the hydrologic cycle in the study area due to human alteration of the natural landscape.

Problems in the study area can be summarized as:

- Urbanization with substantial impervious surfaces within the watershed leads to flooding, high stormwater velocities, poor water quality, poor instream habitat, reduced groundwater recharge, invasive species introduction, and floodplain disconnection.
- Channel bank instability within the headwater streams leads to erosion, bypasses, exposed infrastructure, and sedimentation.
- Floodplain wetlands are dewatered as streams cut down into the floodplain, causing loss of water from below and reduced stream/floodplain interaction for floodplain wetlands.
- Human introduced fish blockages in the watershed prevent movement of resident fish.
- Degraded environmental conditions impair stream aquatic life, evidenced by poor index of biotic integrity scores.

- Substantial historic wetlands in the watershed have been lost to development on the landscape, and in stream valleys by sediment infill and excess erosion.

### 1.8.2 Opportunities

Opportunities exist in the study area to:

- Restore ecosystem function, quality, and connectivity in Bel Pre Creek and Lamberton Creek.
- Maintain and enhance existing native species habitats along Bel Pre Creek and Lamberton Creek.
- Re-establish native vegetation and manage against non-native invasive (NNI) plant species in areas identified for stream restoration, floodplain reconnection, and floodplain wetland restoration.
- Protecting existing riparian forests and minimize potential negative impacts to mature forest and trees from direct construction effects and induced hydrology changes.
- Enhance passive recreational opportunities along Bel Pre Creek and Lamberton Creek through improved stream geomorphology.
- Optimize aquatic ecosystem co-benefits in the study area by connecting planned ecosystem restoration actions in this study to existing stream stabilization projects, stormwater management, and other water quality improvements by WSSC, MCDEP, the M-NCPPC, and other stakeholders in the watershed.
- Provide educational opportunities coupled with stream restoration work through coordination with the Barrie School along Bel Pre Creek.

## 1.9 Objectives and Constraints

The goal of this project is to provide a solution in the Anacostia River watershed in Montgomery County that will restore ecological function, structure, and health in selected stream reaches and riparian zones and those areas downstream affected by restoration actions. Stream restoration will reduce sediment transport and combined nutrient loads improving overall water quality within the Anacostia River watershed. Additional goals were identified for each stream segment by MCDEP and M-NCPPC for the project as summarized below. These goals were used to inform the approach for stream restoration and contributed to objectives for the study.

**Goals for the Bel Pre Creek Tributary:**

- Restore in-stream habitat to provide a self-sustaining diversity of flow, depth, bedform and complex cover conditions that can support a wide range of fish and aquatic macroinvertebrate species.
- Protect the existing Park, school, transportation, and utility infrastructure in the floodplain to ensure that natural channel dynamics do not create future conflicts.

- Increase the hydrologic connection of the stream to the floodplain and improve groundwater connection to wetlands located in the floodplain.
- Stabilize outfalls and buffer mainstem channels from stormwater using sustainable techniques that extend flow paths, promote infiltration, dissipate water velocity, and add hydrologic capacity.
- Enhance riparian vegetation through native herbaceous, shrub, and tree plantings and NNI management.

**Goals for the Lamberton Creek Tributary:**

- Restore in-stream habitat to provide a self-sustaining diversity of flow, depth, bedform and complex cover conditions that can support a range of fish and aquatic macroinvertebrate species.
- Improve aquatic passage by addressing the fish blockage through the culvert at Lovejoy Street.
- Protect the existing utility infrastructure in the stream valley to ensure that natural channel dynamics do not create future conflicts.
- Improve downstream water quality with improved sinuosity, extended flow paths, stabilization of severely eroded banks, and increased channel roughness and heterogeneity to improve the natural buffering capacity of the system.
- Stabilize outfalls and buffer mainstem channels from stormwater using sustainable techniques that extend flow paths, promote infiltration, dissipate water velocity, and add hydrologic capacity.
- Enhance riparian vegetation through native herbaceous, shrub, and tree plantings and NNI management.

As discussed in the previous section, the objectives and constraints for this study are based on the areas within the watershed that were identified in the previous study effort.

### 1.9.1 Objectives

Planning objectives are summarized in statements that describe the desired results from solving or alleviating problems and/or realizing opportunities. The planning objectives apply to the planning horizon of this study which extends from 2030 to 2079. Planning objectives for this study include:

- Restore in-stream habitat and associated ecosystem function in Bel Pre Creek and Lamberton Creek.
- Restore the natural range of resident fish in Bel Pre Creek and Lamberton Creek.
- To the extent practicable, re-establish hydrologic connection of the streams to the floodplain along stream restoration reaches.

- To the extent practicable, restore floodplain wetlands. No wetland restoration opportunities were identified in this feasibility study. Further analysis will be completed in the design phase to identify opportunities for wetland restoration, where appropriate.
- Stabilize stream channels to reduce the supply and transport of sediment to downstream receiving waters.

### 1.9.2 Constraints and Considerations

Planning constraints are restrictions that limit the extent of the planning process; whereas planning considerations are factors that will help to guide decisions.

#### *1.9.2.1 Constraints*

The planning constraints for this study include the following:

- Minimize impacts to existing terrestrial areas with native species.
- Minimize adverse impacts to infrastructure and utilities, both instream and within the floodplain along Bel Pre Creek and Lamberton Creek.
- Avoid/minimize potential negative impacts of flooding to people.
- Avoid negative impacts to bedrock and features that provide aquatic habitat natural in character to the streams.

#### *1.9.2.2 Considerations*

The planning considerations include the following:

- Prioritize restoration activities on public lands.
- Focus restoration activities on headwater streams.
- Minimize impacts to forest during construction because of high value of mature native woody vegetation.
- Minimize impacts to actively used recreational space.

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# 2 EXISTING AND FUTURE WITHOUT PROJECT (FWOP) CONDITIONS

## 2.1 Period of Analysis

The period of analysis for this study is 50-years per ER 1105-2-100 Planning Guidance Notebook. The period of analysis represents the timeframe where benefits are expected to accrue for the project and serves as a performance baseline in ecological and economic modeling. The planning horizon for this study starts in baseline year 2030 and ends in year 2079. Existing conditions reflect the conditions in place at the time of completion of this IFR/EA through 2025.

## 2.2 General Setting

The study area is located on the Anacostia River watershed, which encompasses approximately 176 square miles, located entirely within the metropolitan area of Washington, D.C. The drainage within Montgomery County is approximately 61 square miles, accounting for about one-third of the total Anacostia River watershed. The Anacostia River flows through Maryland and then the District of Columbia into the Potomac River; the river ultimately drains to the Chesapeake Bay. Anacostia River subwatersheds largely within Montgomery County include Sligo Creek, Northwest Branch, Paint Branch, and Little Paint Branch. The watershed in Montgomery County falls primarily within the Piedmont physiographic province. However, along the county's border with Prince George's County, small sections of the streams lie within the Coastal Plain province.

Montgomery County is the most populous county in the State of Maryland. Rockville is the county seat and largest municipality. The study area is in a densely populated urban setting that is primarily residential, but also includes commercial districts, industrial facilities, major United States (U.S.) government offices, scientific research centers, and transportation infrastructure as well as natural areas and historic and cultural properties. The Anacostia River subwatersheds are heavily developed with primarily residential development located along the tributaries of the Anacostia River in Montgomery County. The Barrie School Campus is located along Bel Pre Creek and will be an important component of the stream restoration project.

### 2.2.1 Future-Without Project (FWOP) Conditions

This report evaluates the FWOP conditions (no-action alternative) and the alternatives and benefits of the project. The existing conditions are not expected to undergo significant change during the period of analysis. Within the watershed in Montgomery County, MCDEP and M-NCPPC are working on efforts to include improvements to water quality and stormwater flow through the use of best management practices (BMPs), retrofits, stream restoration, and capital improvements.

## 2.3 Natural Environment

### 2.3.1 Wetlands

USACE and the U.S. Environmental Protection Agency (EPA) define wetlands as areas inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions (LaBranche, et al., 2003). It is estimated that since European settlement more than 4,000 acres of non-tidal wetlands have been lost from the Anacostia River watershed, representing greater than 60 percent of the historical non-tidal wetland acreage. Existing forested wetlands are generally within parkland owned by M-NCPPC.

There are approximately 2,550 acres of remaining wetlands in the Anacostia River watershed (MWCOG, 2008). Wetlands are classified by two major systems: Cowardin and Others (1979) National Wetlands Inventory (NWI), and Hydrogeomorphic (HGM). The NWI system is utilized by the US Fish and Wildlife Service (USFWS) and other agencies nationally, as well as by Maryland state agencies such as Maryland Department of Environment (MDE) and Maryland Department of Natural Resources (MDNR) (Figure 2-1 and Table 2-1). The NWI classification scheme is the national standard typically used in natural resources management. USACE prepared initial reports on the HGM classification scheme in the 1990s, but use of this classification scheme of wetlands is largely limited to situations regarding management of wetlands functions. These two classification schemes are often partially combined. According to the Cowardin Classification, most wetlands within the project area consist of palustrine forested, palustrine emergent, and palustrine scrub-shrub wetlands and confirmed (but not officially delineated) by USACE biologists. Palustrine wetlands can be found inland on the side of a river, stream, or lakes, as long as they are covered by vegetation such as trees, shrubs, or emergent plants (Cowardin et al, 1979).

**Table 2-1: Mapped Wetlands within Bel Pre Creek Project Area**

| Wetland Acreage | | Classification | Location |
|---|---|---|---|
| Square Feet | Acres | | |
| 62,077 | 1.43 | Palustrine | Bel Pre Creek |

*The Lamberton Study Area does not contain any DNR mapped wetlands.
*Source: MD iMap, August 2019*

In 2014 and 2015, USACE biologists informally collected preliminary information on wetlands along a portion of Bel Pre Creek. Sources of hydrology were hypothesized as originating from seeps at the toe of valley walls, to intermittent surface flows from tributaries to overbank flooding. Additional and preliminary investigations occurred in 2022. USACE biologists informally identified parcels dominated by wetlands along Bel Pre Creek see Figure 2-1.

The Lamberton Creek is characterized by a steep stream valley with small, pocket wetlands located where small relief occurs, see Figure 2-2. Wetlands in the valleys of the stream segments of interest include wetlands in two HGM classes: riverine and slope. Two subclasses of riverine wetlands occur along the stream segments of interest: headwater and floodplain wetland complexes (Brooks and others, 2011). These wetlands differ in their water source, and thus in their capability to provide habitat for aquatic life and other functions.

#### *2.3.1.1 FWOP Condition*

A FWOP would continue to see degradation occurring along the two stream segments. Stream channel erosion, lack of wetland habitat, and invasive species would continue to impede Lamberton Creek and Bel Pre Creek. MCDEP, M-NCPPC and or other local, state, or federal entities would likely seek other outlets to restore in-stream habitat in these areas. The historical hydrologic regime that supported wetlands throughout Bel Pre Creek included a combination of groundwater and surface water from overbank flooding of the streams and connection through the hyporheic zone (zone within the streambed where surface water and groundwater mix). This hydrology has been altered by land conversion, first to agriculture and then to urban land use. Without restoration activities, this component of natural hydrology would not be restored. In many locations along the study stream reaches, the stream has become excessively incised, thereby losing the hydrologic connection with the floodplain.

### 2.3.2 Floodplains

E.O. 11988 requires federal agencies to consider the potential effects of their proposed actions to floodplains. To determine the potential floodplain impact, the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM) were reviewed for portions of the proposed project that would be located within the floodplain of Bel Pre Creek. FIRM maps reviewed include: 24031C0370D (Lamberton Creek) and 24031C0360D (Bel Pre Creek) (FEMA, Sept 2006).

Floodplains are typically flat or gently rolling lands adjacent to streams and rivers that receive floodwaters once the waterway has overtopped the bank of the main channel. Overtopping is usually a result of a higher-than-normal influx of precipitation caused by intense meteorological events, tropical storms, and hurricanes. Overtopping can also be a result of excessive water moving from higher elevations to lower elevations, normally seen during flash flood events. Floodplains can often become vulnerable due to development directly adjacent to or within a designated floodplain area and is most seen in densely populated cities. Due to increased development, floodplains lose their proper functions and values of flood storage, nutrient reduction, and wildlife habitat, among others. Bel Pre Creek and Lamberton Creek are located in the Anacostia River watershed where the main component of flooding is caused by excessive runoff from impervious surfaces and improper stormwater management. Lamberton Creek is the

only US Geological Survey (USGS) mapped waterway of the two stream segments that does not contain a FEMA 100-year floodplain.

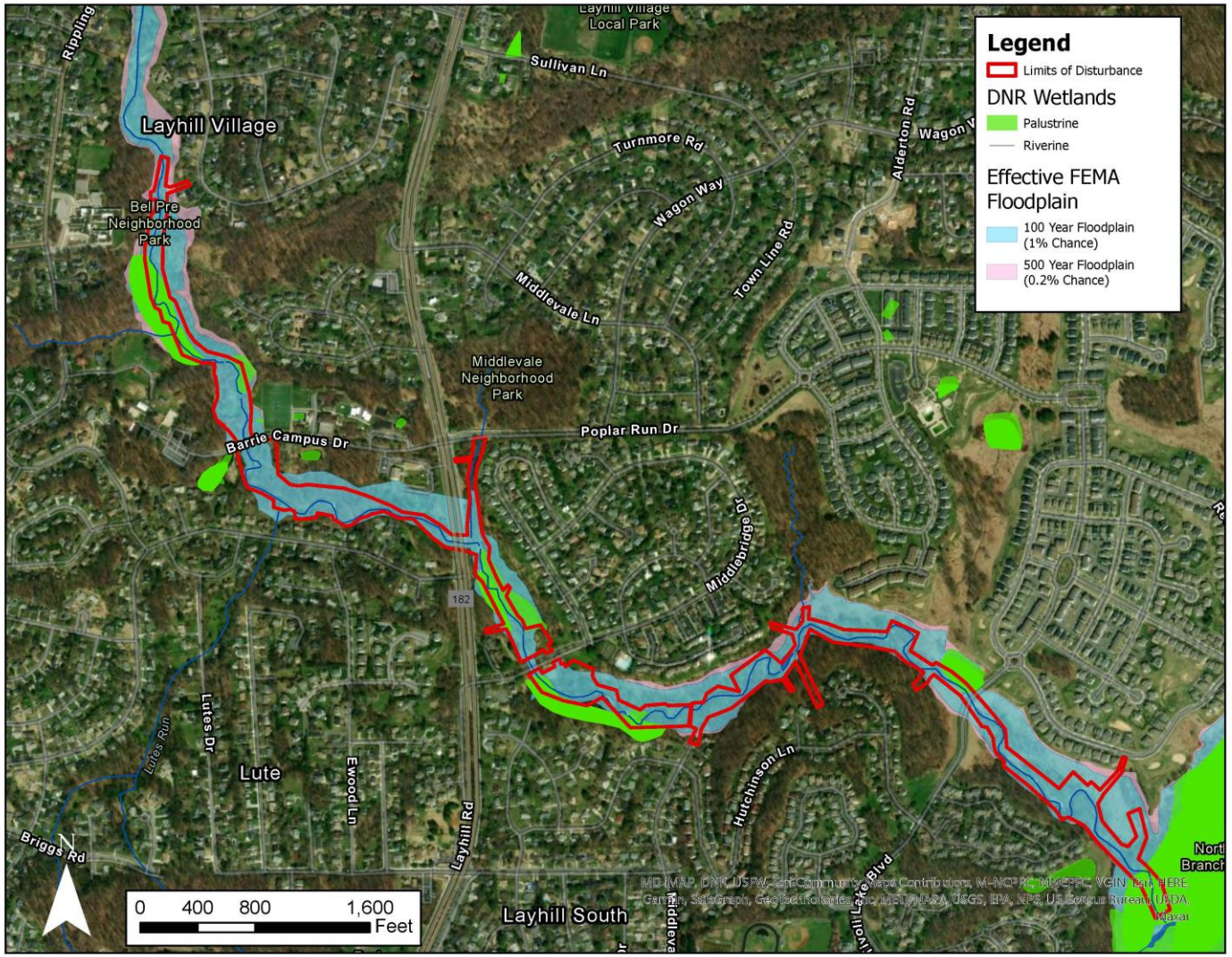


**Figure 2-1: Bel Pre Northwest Wetlands and Floodplain**

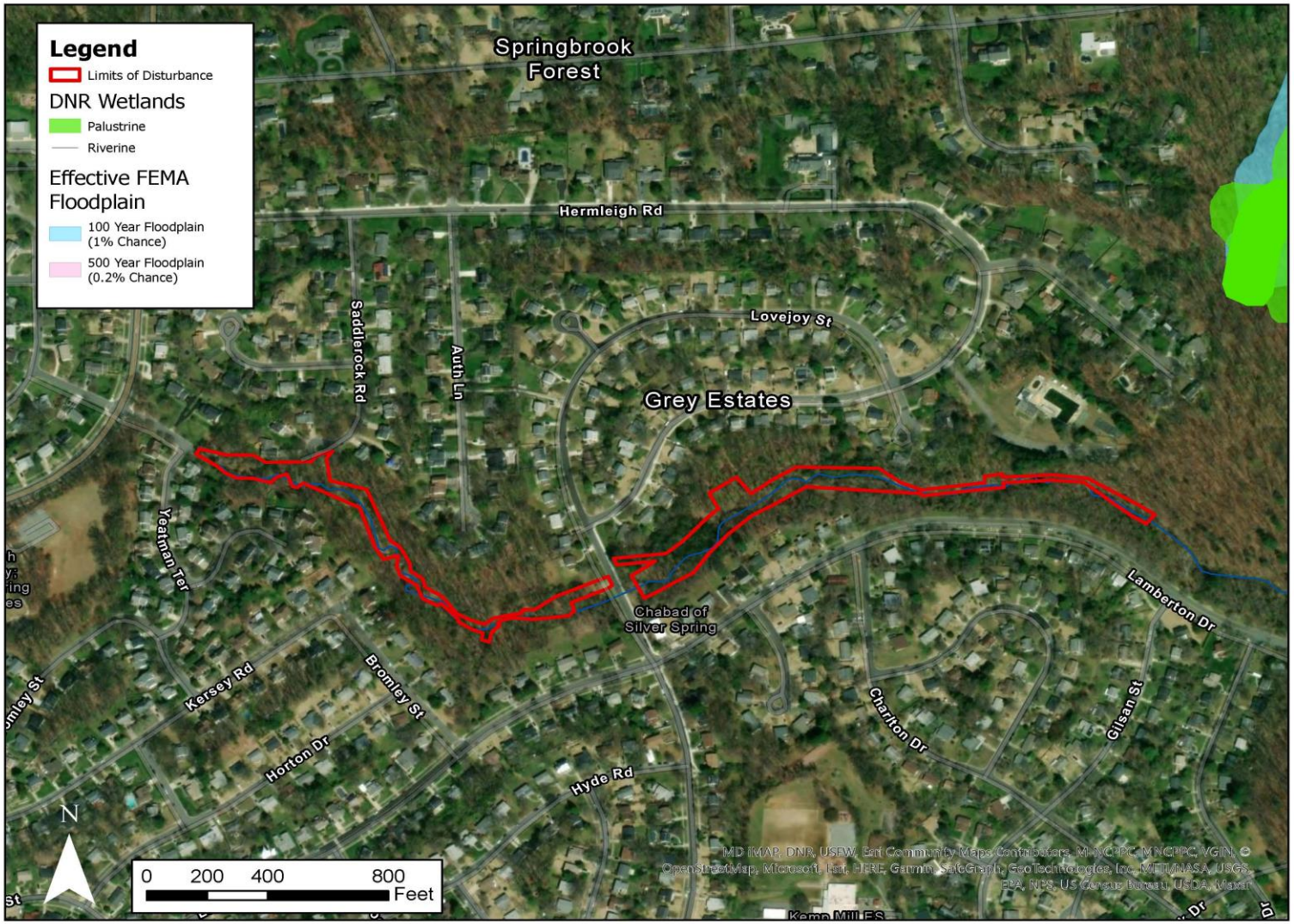


**Figure 2-2: Lamberton Wetland and Floodplain**

#### *2.3.2.1 FWOP Condition*

The 100-year floodplain along Bel Pre Creek would remain under a FWOP condition; however, characteristics of the floodplain may change as stream channels become more incised and cut-off from the floodplain. Changes may occur to the vegetation typically seen in a floodplain due to lack of hydrologic connections. Upland species or invasive species that prefer drier soils may begin to impede on the floodplain.

### 2.3.3 Rare, Threatened, and Endangered Species

In accordance with Section 2(b) of the Fish and Wildlife Coordination Act (16 U.S.C. 1513 et seq.) and Section 7 of the Endangered Species Act (16 U.S.C. 1513 et seq.), the USFWS provided a Fish and Wildlife Planning Aid Report (PAR) to USACE in March 2023. Through coordination efforts between USACE and USFWS, a request was submitted in February 2023 by USFWS, through the Information for Planning and Consultation (IPaC) online web service to determine the presence of protected resources and species (under jurisdiction of the USFWS) within the project's study areas. IPaC is a project planning tool that is used to streamline USFWS's environmental review process; it is used to identify migratory birds, endangered species, interjurisdictional fish, marine mammals, wetlands and refuge lands. As reported through the USFWS IPaC Resource List, there are no critical habitats, fish hatcheries or National Wildlife Refuge (NWR) lands within the study areas. In April 2023, USACE performed an additional IPaC analysis to capture the status change of the Northern Long-Eared Bat (*Myotis septentrionalis*), from 'threatened' to 'endangered', effective March 31, 2023. Two additional updates to the USFWS IPaC were executed in April 2024 and January 2025. The USFWS PAR, as well as the updated January 2025 IPaC analysis is included in Appendix C with species listed from both sources located in Table 2-2.

According to Maryland's Environmental Resource & Land Information Network (MERLIN), the southeastern portion of Bel Pre Creek is located within a Sensitive Species Project Review Area (Group 2 – State Listed Species). USACE Baltimore has coordinated with MD DNR's Wildlife and Heritage Program through an agency coordination meeting in March 2023. An official letter response from MD DNR was received on August 28, 2023 (see Appendix G). MD DNR has determined that there are no official state or federal records for listed plant or animal species within the project area of Lamberton Creek. For Bel Pre Creek, MD DNR determined that there are records of listed species that may exist in proximity to the site. USACE Baltimore will continuously work with MD DNR and the MCDEP to avoid areas of concern.

**Table 2-2: Federal Listing Status of Species within Project Areas**

| Common Name | Scientific Name | Federal Listing Status | Time of Year Restriction (TOYR) |
|---|---|---|---|
| Northern Long-eared Bat | *Myotis septentrionalis* | Endangered* | April 1 – November 14 |
| Cerulean Warbler | *Setophaga cerulea* | At-Risk** | April 29 – July 20 |
| Little Brown Bat | *Myotis lucifugus* | At-Risk | Not subject to TOYR in MD. |
| Monarch Butterfly | *Danaus plexippus plexippus* | Proposed Threatened | Not subject to TOYR in MD. |
| Spotted Turtle | *Clemmys gutatta* | At-Risk | Not subject to TOYR in MD. |
| Tricolored Bat | *Perimyotis subflavus* | Proposed Endangered | Not subject to TOYR in MD. |
| Wood Thrush | *Hyclocichla mustelina* | At-Risk | May 10 – August 31 |

*Source: USFWS PAR and IPaC (2023 and 2025)*
***** *Endangered species are any species which is in danger of extinction throughout all or a significant portion of its range.*
*** At-risk species are species that are declining but are not yet determined to be threatened or endangered.*

#### *2.3.3.1 FWOP Condition*

The MCDEP continues to design and build restoration projects within Montgomery County and the Anacostia River watershed. These restoration projects would continue to benefit wildlife habitat and harbor RTE and at-risk species throughout the watershed.

The Maryland State Wildlife Action Plan forms the blueprint for the conservation of priority species and habitats over a 10-year period. The plan identifies 610 animal species considered to be Species of Greatest Conservation Need (SGCN), including all state- and federally listed threatened or endangered species, rare species, endemic species, declining species, and responsibility species for which Maryland harbors a significant portion of the overall population. Because of the strong tie between species and habitats, it is critical to identify those habitats that support SGCN in order to conserve them (MDE, 2022).

### 2.3.4 Migratory Birds

Migratory birds are an important trust resource, and the USFWS works with partners to protect, restore and conserve bird populations and their habitats for the benefit of future generations. The following databases were used to gather information on migratory birds within the project area, including data from the USFWS IPaC. IPaC official species lists are valid for 90 days. After 90 days project proponents should reconfirm their results by requesting an updated species list for their project area to ensure an accurate and up-to-date list. USACE reconfirmed the species list for the project area on 14 January 2025.

A polygon of the project area was mapped in IPaC (Appendix C). From this data a list of migratory birds as well as Birds of Conservation Concern (BCC) was created (Table 2-3). IPaC identified 11 migratory bird species for the project areas. The relevant species of conservation concern are presented below and are the subset of birds identified in IPaC that relate to the 1988 Fish and Wildlife Coordination Act mandating the Service to, "identify species, subspecies, and populations of all migratory nongame birds that, without additional conservation actions, are likely to become candidates for listing under the Endangered Species Act (ESA) of 1973." There are also particular Time of Year (TOY) restrictions that need to be taken into account. TOY restrictions provide general guidance for the protection of wildlife; they focus on the time of year that species may be more sensitive to human activities such as during the breeding season (USFWS PAR, 2023).

**Table 2-3: Birds of Conservation Concern known to occur in the project area**

| Common Name | Scientific Name | Breeding Season |
|---|---|---|
| Bald Eagle* | *Haliaeetus leucocephalus* | Sept 1 to Jul 31 |
| Black-billed Cuckoo | *Coccyzus erythropthalmus* | May 15 to Oct 10 |
| Cerulean Warbler | *Dendroica cerulea* | Apr 28 to Jul 20 |
| Chimney Swift | *Chaetura pelagica* | Mar 15 to Aug 25 |
| Golden Eagle | *Aquila chrysaetos* | Breeds elsewhere |
| Kentucky Warbler | *Geothlypis formosa* | Apr 20 to Aug 20 |
| Prairie Warbler | *Dendroica discolor* | May 1 to Jul 31 |
| Prothonotary Warbler | *Protonotaria citrea* | Apr 1 to Jul 31 |
| Red-headed Woodpecker | *Melanerpes erythrocephalus* | May 10 to Sep 10 |
| Rusty Blackbird | *Euphagus carolinus* | Breeds elsewhere |
| Wood Thrush | *Hylocichla mustelina* | May 10 to Aug 31 |

*Source: USFWS PAR and IPaC (2022 and 2023)*
**Bald Eagle TOY restriction is December 15 – June 15. Time of year restrictions refer to construction, tree clearing, and breeding times for the species listed above, respectively.*

Another resource used to examine wildlife presence is the Rapid Avian Information Locator (RAIL) tool, which pulls graphics and information from multiple data sources. The results indicate that a species has been observed within 10 kilometers of the project areas within the last 10 years and therefore is a starting point for identifying birds that have potential to be found within the project area with the best available information from a several credible resources (RAIL - Rapid Avian Information Locator, n.d.). The RAIL results are included in Appendix C.

#### *2.3.4.1 FWOP*

Restoration efforts would continue throughout Montgomery County and the Anacostia Watershed to provide habitat to migratory bird species. Montgomery Parks provides several volunteer and group programs to ensure wildlife habitats are maintained as well as providing new habitat. Groups or individuals can adopt natural area parks through

Montgomery County and responsibilities would include monitoring nest boxes for birds, maintaining detailed records, conducting wildlife and plant surveys, and constructing and installing wildlife nesting boxes, clean-ups, and reporting park needs.

### 2.3.5 Anadromous and Catadromous Fish

The Anadromous Fish Conservation Act is a federal law enacted in 1965 to conserve, develop, and enhance the anadromous fish resources of the U.S. that are subject to depletion from water resources development and other causes, or with respect to which the U.S. has made conservation commitments by international agreements, and the fish in the Great Lakes and Lake Champlain that ascend streams to spawn. The provisions of the Act are found under 16 USCS §§ 757a-757f. Inter-jurisdictional, catadromous, and anadromous fish are a USFWS and NMFS trust resource. Anadromous fish spend most of their adult lives in saltier water but return each year to spawn in freshwater. Catadromous fish spend most of their adult lives in freshwater and return to salt water to spawn. Only one migratory fish species, American eel (*Anguilla rostrata*), a catadromous species, has been surveyed within the proposed project areas (Appendix C); they are the only catadromous eel native to Atlantic coastal waters. Its status has been reviewed by USFWS in 2007 and 2015 for listing under the ESA. Both times, the determination was that protection is not warranted.

Macroinvertebrates and fish are typically classified into categories of “tolerant,” “moderate,” or “intolerant” based on their tolerance to cumulative water quality and habitat alteration. Intolerant species are sensitive to water quality and or habitat alternation (Meador and Carlisle, 2007). Sligo Creek was sampled before it was formulated to be excluded from this study. The five fish species sampled in Lamberton Creek include four tolerant species and one moderately tolerant species (Rosyside dace, *Clinostomus funduloides*). Bel Pre Creek contains a mix of tolerant and moderately tolerant fish species, and one intolerant fish species (Northern hogsucker, *Hypentelium nigricans*). Additional fish surveys were performed by MCDEP in 2022. Table 2-4 below shows the species identified in the most recent survey performed by MCDEP. Additionally, several anthropogenic fish blockages exist within the stream segments. The blockages consist of culvert or causeways that cause substantial vertical drops or create intermittent flows within the channels.

**Table 2-4: Surveyed Fish Species in Selected Stream Segments**

| Common Name | Scientific Name | Location |
|---|---|---|
| **American Eel** | *Anguilla rostrata* | Sligo Creek |
| **Blacknose Dace** | *Rhinichthyus atratulus* | Sligo Creek, Bel Pre Creek |
| **Bluegill** | *Lepomis machrochirus* | Sligo Creek*, Bel Pre Creek |
| **Bluntnose Minnow** | *Pimephales notatus* | Bel Pre Creek |
| **Brown Bullhead** | *Ameiurus nebulosus* | Northwest Branch* |

| Common Name | Scientific Name | Location |
|---|---|---|
| **Common Shiner** | *Luxilux cornutus* | Northwest Branch* |
| **Creek Chub** | *Semotilus atromaculatus* | Sligo Creek*, Bel Pre Creek |
| **Cutlips Minnow** | *Exoglossum maxillingua* | Bel Pre Creek |
| **Eastern Mosquitofish** | *Gambusia holbrooki* | Northwest Branch* |
| **Fantail Darter** | *Etheostoma flabellare* | Bel Pre Creek |
| **Fathead Minnow** | *Pimephales promelas* | Bel Pre Creek |
| **Green Sunfish** | *Lepomis cyanellus* | Sligo Creek* |
| **Hybrid Minnow** | | Bel Pre Creek |
| **Hybrid Sunfish** | | Sligo Creek* |
| **Largemouth Bass** | *Micropterus salmoides* | Northwest Branch* |
| **Longnose Dace** | *Rhinichthys cataractae* | Sligo Creek* |
| **Pumpkinseed** | *Lepomis gibbosus* | Northwest Branch* |
| **Redbreast Sunfish** | *Lepomis auritus* | Bel Pre Creek |
| **Rosyside Dace** | *Clinostomus funduloides* | Bel Pre Creek |
| **Silverjaw Minnow** | *Ericymba buccata* | Bel Pre Creek |
| **Spottail Shiner** | *Notropis hudsonius* | Bel Pre Creek |
| **Swallowtail Shiner** | *Notropis procne* | Bel Pre Creek |
| **Tessellated Darter** | *Etheostoma olmstedi* | Sligo Creek*, Bel Pre Creek |
| **White Sucker** | *Catostomus commersonii* | Sligo Creek*, Bel Pre Creek |

*Source: MCDEP (Daniel Isenberg) Fish surveys, 2022*
** Not within project area limits.*

Data identifying aquatic species present and the stream health of Bel Pre Creek and Lamberton Creek in the segments of interest is available from sampling conducted by MCDEP and by the Maryland Biological Stream Survey (MBSS) Stream Waders from 1995 through 2021 (Appendix C). The Fish Index Biotic Integrity (FIBI) and Benthic Index of Biotic Integrity (B-IBI) were used as metrics to survey the proposed stream segments. FIBI is a composite index in which several individual metrics are combined to provide a community-level assessment of stream biological conditions. B-IBI is a scoring system that uses a quantitative method for determining and comparing the biological conditions of streams. Data going back to 1995 through 2021 indicate Bel Pre Creek stream health is in better condition from a fish-centric perspective than Lamberton Creek. However, the B-IBI data indicate poor stream health from a macro-invertebrate-centric perspective. Both segments have poor benthic organism integrity, reflecting the urban condition of their drainage basins. Bel Pre Creek has a greater number of fish species than Lamberton Creek. Although macroinvertebrate and finfish data collected in the stream segments spans a range of years, it is likely that data collected since the 1990s still adequately characterizes stream biota as no notable change in conditions has occurred since that time.

**Table 2-5: Summary of Aquatic Organisms for Selected Stream Segments**

| Parameter | Bel Pre | Lamberton |
|---|---|---|
| Benthic Index of Biotic Integrity (B-IBI) | Poor | Poor |
| Fish Index of Biotic Integrity (F-IBI) | Fair | No Data |
| Average Index (combined benthic macroinvertebrates and fish) | Fair | Poor |
| Fish sampling conducted | 1995 to 2021 | 1995 to 2009 |
| Number of fish species collected over years sampled | 27 | 5 |

*Source: MCDEP field surveys from 2016 and 2022*

**Table 2-6: MBSS and Stream Wader Data Summary for Stream Segments**

| Parameter | Bel Pre | Lamberton |
|---|---|---|
| Composite Index of Biotic Integrity (IBI) | Poor | No Data |
| Sampling conducted | 2004-11 | None |

*Source: MCDEP field surveys from 2016 and 2022*

#### *2.3.5.1 FWOP*

Improvements in water quality are expected over the period of analyses as a result of regulatory requirements in the State of Maryland's Phase III Watershed Implementation Plans (WIPs), which requires local jurisdictions to achieve pollutant reduction targets under the Clean Water Act (CWA). This will result in improvements in fish and benthic IBI scores. Without habitat restoration, IBI scores will continue to be limited. Sedimentation and lack of diverse habitat conditions likely contribute to low species abundance, richness, and poor trophic composition, all of which factor into IBI scores. Unstable bed and bank materials limits the quality of the habitat available for fish and benthic organisms. Thus, in the absence of stream restoration efforts, even with improvements in water quality, generalist species are likely to persist in these streams over the period of analysis. Streams will not likely establish a dynamic equilibrium that maintains habitat complexity and results in increases in species abundance and diversity.

### 2.3.6 Vegetation and Wildlife

Brush, et. al. (1976) mapped existing natural forests throughout the state of Maryland. Forests at that time along the Northwest Branch Anacostia River, including tributary Bel Pre Creek, upstream of Randolph Road were mapped as Sycamore-Green Ash-Box Elder-Silver Maple Association. Figure 2-3 depicts prevailing forest outside of the stream valleys as Tulip Poplar Association. Figure 2-3 does not differentiate riparian forest along Lamberton Creek from that of the surrounding landscape. The 1976 map is also included within the "Comprehensive Vegetation Management Plan" for M-NCPPC Parkland in Montgomery County, Maryland (Figure 2-3; April 2009).

Leaf-off high resolution imagery is available on Maryland's Environmental Resources and Land Information Network for the study area stream segments for several periods (2016-2017, 2014-2016, 2013-2014, and 2011-2013). Google Earth aerial imagery from 1988 through 2022 is also available to characterize vegetation both leaf-off and leaf-on. These images demonstrate that floodplain vegetation is primarily deciduous along the Bel Pre Creek segment, consistent with regional forest character. Lamberton Creek differs notably, in that the stream valley has multiple parcels of evergreen trees, as well as individual mature trees, downstream of Lovejoy Avenue. These are concentrated within approximately 1,500 feet downstream of Lovejoy Avenue.

Bel Pre Creek riparian mature forest differs in its height above the stream. This may reflect changes in stream/floodplain elevations since the trees were established, differences in how high floodwaters enter the floodplain and how rapidly floodwater drains off the floodplain, and other variables.

USACE biologists observed that most of the forested riparian area along the stream appears to be 5 feet or more above stream surface. USACE identified some areas in Bel Pre Creek where mature wetland trees occur along the stream at low elevations above the stream. These include the area of the floodplain immediately downstream of the Matt Henson Trail pedestrian bridge (both banks), as well as an area immediately downstream of Tivoli Bridge Boulevard (south bank). Conversely, USACE observed large mature upland trees occurring in the Bel Pre Creek floodplain near the Barrie Campus and immediately downstream at floodplain elevations minimally above the stream water surface. Lamberton Creek valley has mature white pine (*Pinus strobus*) growing. These appear to be natural, rather than planted based on locations in woods on a steep valley slope. White pine is more common in mountainous areas to the west (MD, WV, VA) than in the MD Piedmont. There are some Eastern hemlock (*Tsuga canadensis*) trees growing at the top of the north valley slope.

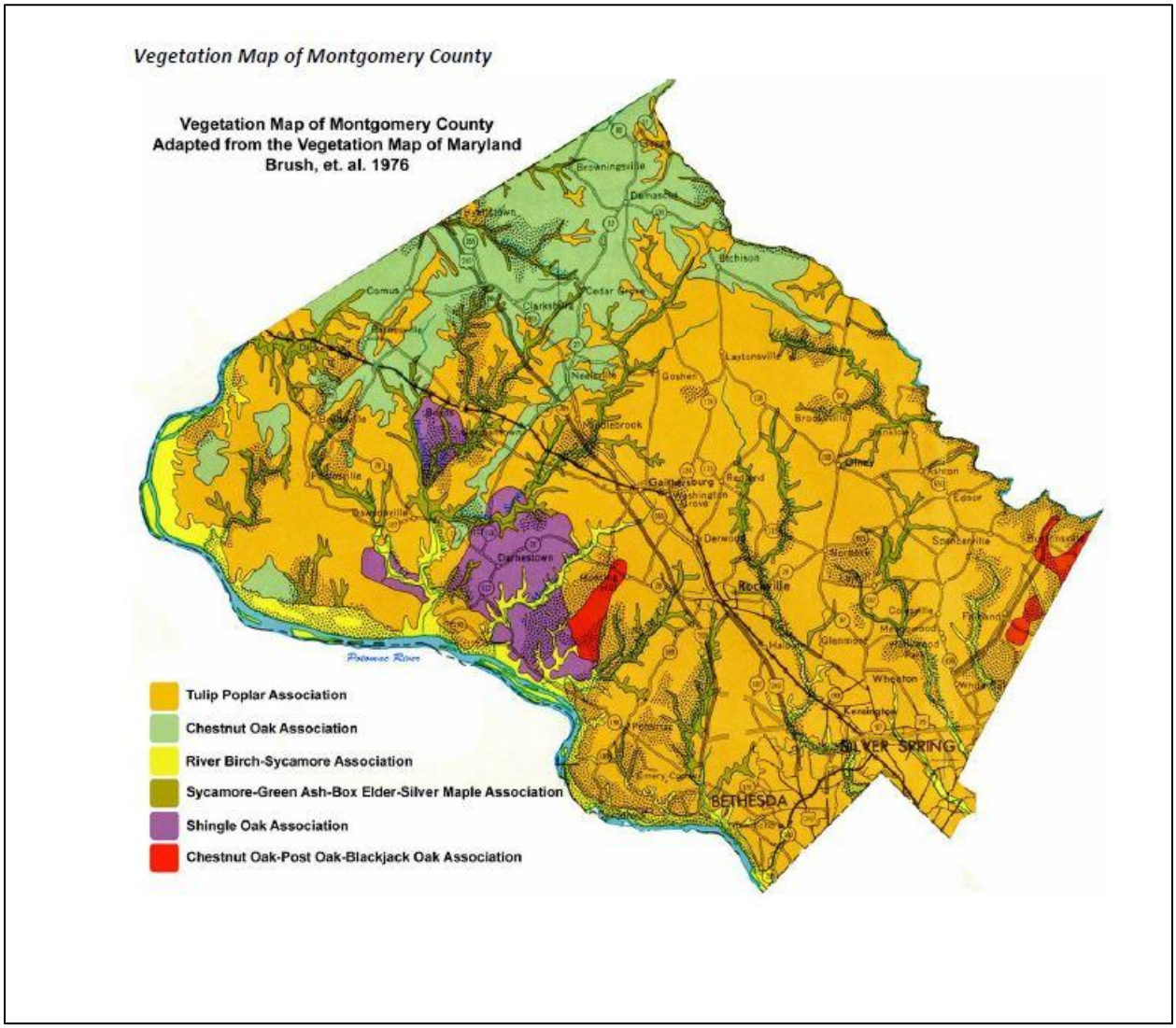


**Figure 2-3: Vegetation Map of Montgomery County**

*Source: Comprehensive Vegetation Management Plan for M-NCPPC Parkland in Montgomery County, Maryland (April 2009)*

The *Anacostia Watershed Environmental Baseline Conditions and Restoration Report* (2010) documents that, although much degraded, the watershed provides habitat for many species of plants and animals. The Anacostia Watershed Society maintains lists of birds, mammals, amphibians, and reptiles within the watershed. Currently they list 233 bird species, 61 amphibian and reptile species, and 35 species of mammals.

### *2.3.6.1 Non-Native Invasives*

Non-native invasives (NNI) are species that have been introduced to local areas from other geographical areas. In most cases, species that are non-native to a new area often flourish because they have no natural predators and can likely out-compete native

species because they are free from herbivores, diseases, and other environmental influences that keep the species balanced in their natural environment. Without environmental controls, NNIs can quickly overtake a natural, native area by spreading exponentially while damaging mature trees, understory shrubs, and reducing forest structure, habitat, and biodiversity. NNIs can degrade natural stream buffers and can also affect reforestation efforts by reducing long-term establishment of native plants (Montgomery Parks, 2020). NNIs were observed by USACE-Baltimore biologists in 2022 during various site visits. Areas of invasive bamboo were identified along Bel Pre Creek and Lamberton Creek segments, along with patches of oriental bittersweet (*Celastrus orbiculatus*) and winter creeper (*Euonymus fortune*). Japanese stiltgrass (*Microstegium vimineum*) was identified throughout Bel Pre Creek.

A goal of Montgomery Parks is to protect and enhance natural communities and natural diversity on County Parkland by removing NNI plants, restoring and maintaining natural communities, and educating staff and citizens about the threat of NNI species (Montgomery, 2007).

#### *2.3.6.2 FWOP*

A Comprehensive Vegetation Management Plan for M-NCPPC Parkland in Montgomery County, Maryland is utilized throughout the county. The Comprehensive Plan outlines broad goals and objectives for the protection, enhancement and long-term management of diverse vegetation or habitat types. The Plan also includes strategies and actions used to identify and evaluate existing vegetation and describes management prescriptions to be applied in order to achieve goals and objectives (M-NCPPC, 2009). Vegetation along Bel Pre Creek and Lamberton Creek banks would continue to degrade and erode into the channel, potentially causing further damage to the channel and creating more fish blockages.

### 2.3.7 Soils

Soil character plays an important role in determining natural vegetation patterns and runoff from a watershed. In the Anacostia River watershed, soils over the majority of the landscape have been substantially altered from their natural pre-European settlement condition by human activities. Historic forestry and farming practices throughout the watershed have induced severe erosion from upland areas and excess deposition in lowland areas. In urban areas, which comprise the majority of the watershed, soils have been substantially disturbed by cutting, filling, and grading activities. Large portions of the surface in urban areas of the watershed have been covered by impervious surfaces and soils are no longer exposed (AWRP, 2010).

The underlying geologic materials of the Piedmont, as well as recent sediment deposits plus fill from human activities, form the materials from which watershed soils are derived. Natural soils in uplands of the Piedmont form from saprolite derived from crystalline rock. Piedmont valley soils form in material eroded and deposited into the

valley from adjacent uplands, as well as in recent sediments deposited in the floodplains by streams.

**Table 2-7: Soil Mapping Units for Sligo, Bel Pre, and Lamberton Stream**

| Map unit symbol | Map unit name | Hydric Rating | Farmland Classification | K-Factor (Whole Soil) | Stream Segment Location |
|---|---|---|---|---|---|
| **2B** | Glenelg silt loam, 3 to 8 percent slopes | 0 | All areas are prime farmland | 0.37 | Bel Pre |
| **2C** | Glenelg silt loam, 8 to 15 percent slopes | 0 | Farmland of statewide importance | 0.37 | Bel Pre, Lamberton |
| **2UB** | Glenelg-Urban land complex, 0 to 8 percent slopes | 0 | Not prime farmland | 0.28 | Sligo, Lamberton |
| **2UC** | Glenelg-Urban land complex, 8 to 15 percent slopes | 0 | Not prime farmland | 0.28 | Bel Pre |
| **41B** | Elsinboro silt loam, 3 to 8 percent slopes | 0 | All areas are prime farmland | 0.49 | Bel Pre |
| **5B** | Glenville silt loam, 3 to 8 percent slopes | 10 | All areas are prime farmland | 0.37 | Bel Pre |
| **6A** | Baile silt loam, 0 to 3 percent slopes | 85 | Not prime farmland | 0.37 | Bel Pre |
| **16D** | Brinklow-Blocktown channery silt loams, 15 to 25 percent slopes | 5 | Not prime farmland | 0.24 | Bel Pre |
| **54A** | Hatboro silt loam, 0 to 3 percent slopes, frequently flooded | 100 | Not prime farmland | N/A | Bel Pre |
| **116D** | Blocktown channery silt loam, 15 to 25 percent slopes, very rocky | 5 | Not prime farmland | 0.28 | Bel Pre, Lamberton |
| **116E** | Blocktown channery silt loam, 25 to 45 percent slopes, very rocky | 5 | Not prime farmland | 0.28 | Bel Pre |

For the purposes of this report, soils were categorized into three characteristics and analyzed through the U.S. Department of Agriculture Natural Resources Conservation Service Web Soil Survey – National Cooperative Soil Survey. The three characteristics include hydric soils, farmland classification, and K-factor. Below are definitions and figures for each category.

- Hydric soils – "…defined by the National Technical Committee for Hydric Soils (NTCHS) as soils that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part (Federal Register, 1994). Under natural conditions, these soils are either saturated or inundated long enough during the growing season to support the growth and reproduction of hydrophytic vegetation" (USDA NRCS, 2023).

- Farmland classification – "…identifies map units as prime farmland, farmland of statewide importance, farmland of local importance, or unique farmland. It identifies the location and extent of the soils that are best suited to food, feed, fiber, forage, and oilseed crops. NRCS policy and procedures on prime and unique farmlands are published in the "Federal Register," Vol. 43, No. 21, January 31, 1978" (USDA NRCS, 2023).

- Erosion factor K – "…indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) and the Revised Universal Soil Loss Equation (RUSLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter and on soil structure and saturated hydraulic conductivity (Ksat). Values of K range from 0.02 to 0.69. Other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill erosion by water. "Erosion factor Kw (whole soil)" indicates the erodibility of the whole soil. The estimates are modified by the presence of rock fragments" (USDA NRCS, 2023).

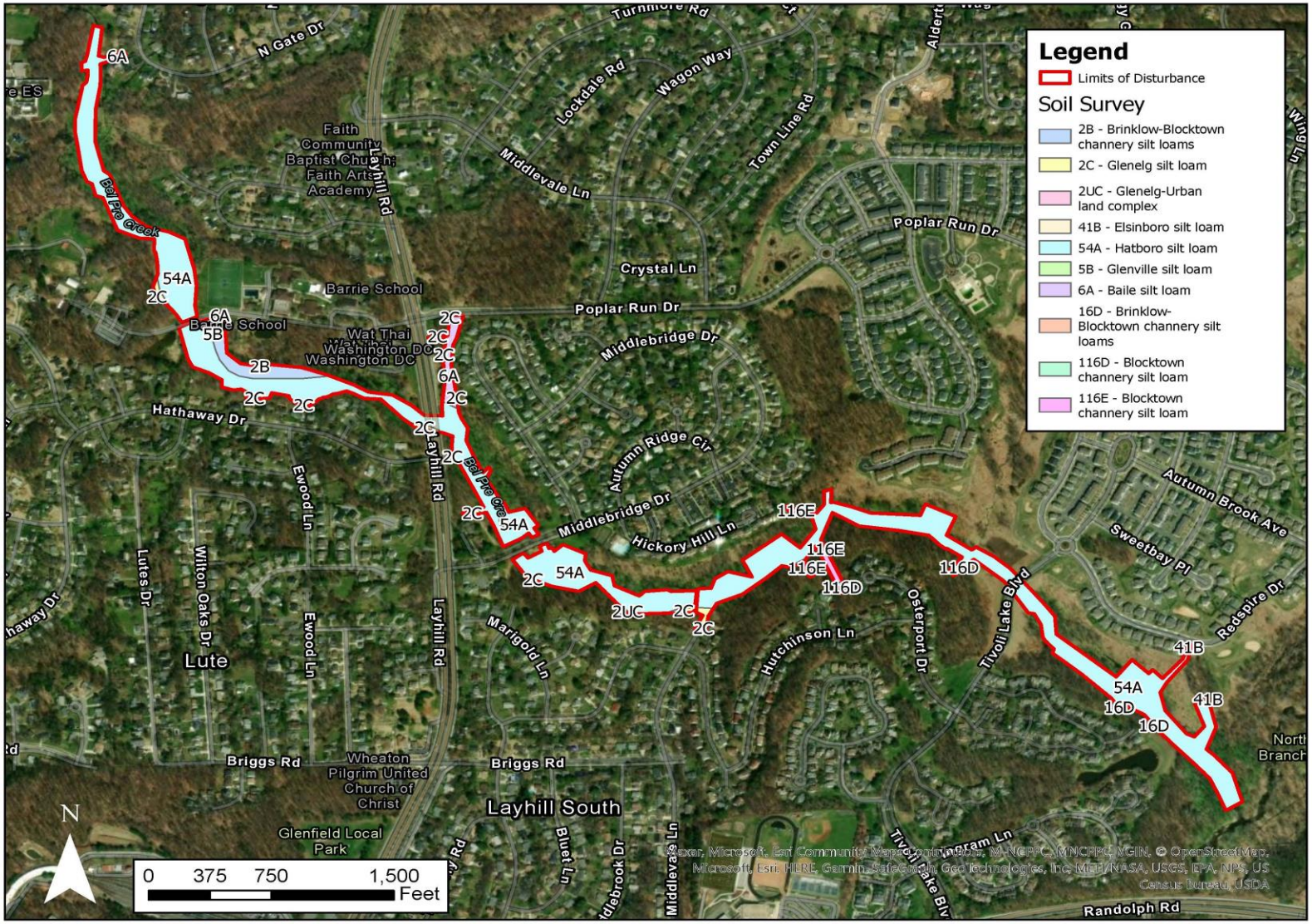


**Figure 2-4: Bel Pre Soil Survey**

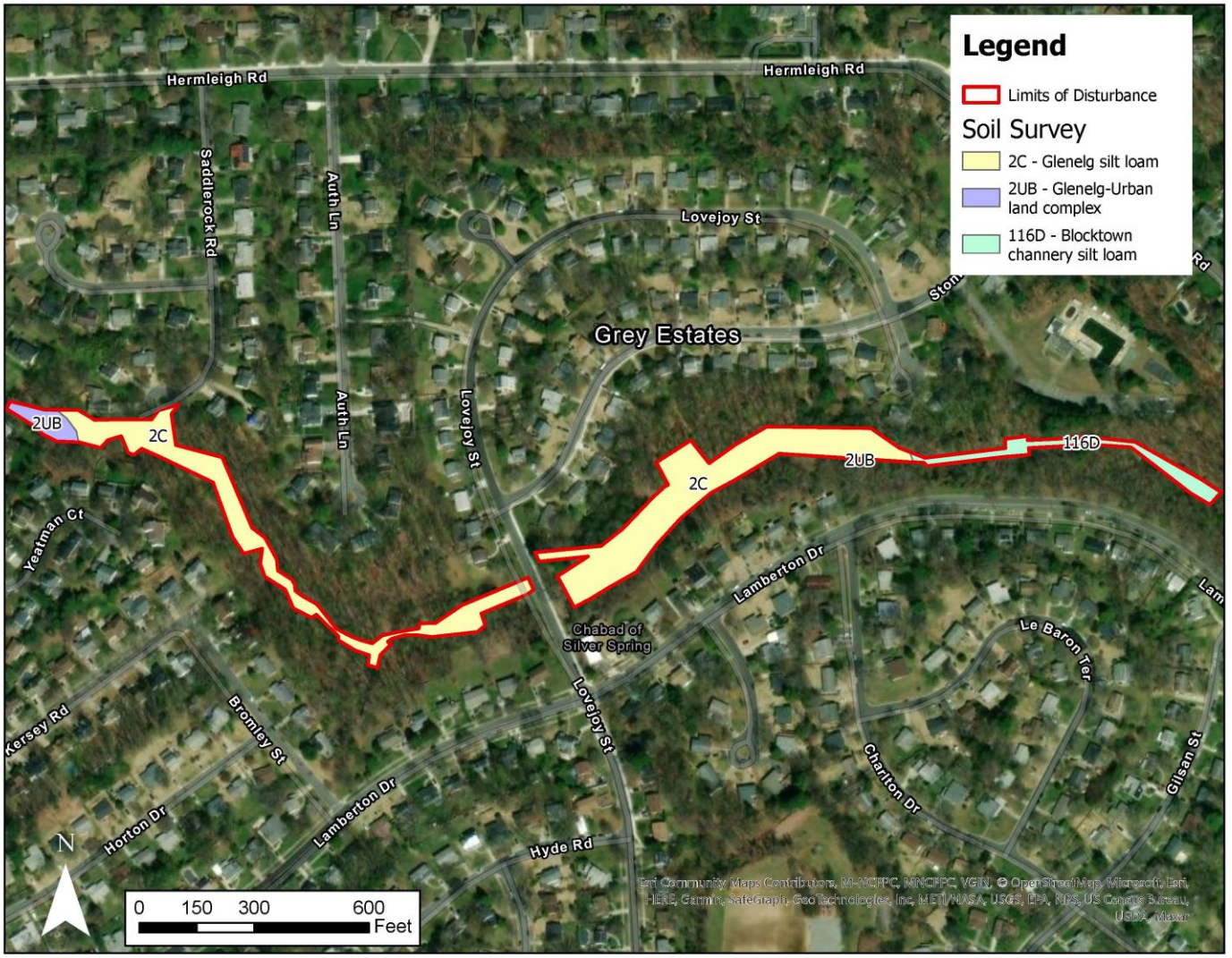


**Figure 2-5: Lamberton Soil Survey**

Anthropogenic impervious surfaces are surfaces that are impenetrable or nearly impenetrable by water. These surfaces include sidewalks, driveways, roads, parking lots, and rooftops. Typical urban, industrial, and high-density residential areas are predominantly impervious, whereas rural areas have very low percent imperviousness. Impervious cover is of particular concern because it limits groundwater recharge and promotes rapid stormwater runoff following precipitation events. Reduced groundwater recharge decreases baseflow in streams during warm season months when streams are sustained by groundwater discharge. This reduction in baseflow reduces the available area and quality of aquatic habitat. During storm events, streams with high degrees of impervious surface area in their watersheds tend to be “flashy”, meaning they rise rapidly after a precipitation event, and carry their floodwaters quickly downstream. The increased quantity and velocity of stormwaters causes streams to erode either through lateral cutting or incision. The tributaries in the Anacostia River watershed exhibit this characteristic.

Soils are classified into “hydrologic soil group” and assigned a letter (A, B, C, or D) to characterize direct rainfall runoff from a wet soil. Group A soils have low runoff potential. Group B soils have moderately low runoff potential, Group C soils have moderately high runoff potential and typically have between 20 to 40 percent clay. Group D soils have high runoff potential and typically have greater than 40% clay and or a high-water table (close to the surface).

Of the two drainage basins of interest, the soils in Lamberton Creek generate lower runoff than Bel Pre Creek. Historically, differences in hydrologic soil group would have been a principal control of runoff within the drainage basins. Today, the influence of impervious surfaces and lack of modern stormwater management that could control runoff are of principal importance.

#### *2.3.7.1 FWOP*

Soils within the stream segments and directly adjacent may continue to degrade causing increased sedimentation within the associated stream reaches.

## 2.4 Physical Environment

### 2.4.1 Climate

Montgomery County lies in the USDA Plant Hardiness Zone 7b. Plant hardiness zones are based on the average lowest temperatures of each region of the U.S. Zone 7b experiences average annual winter minimum temperatures of 5 to 10 degrees Fahrenheit (F) (USDA, 2023). February is the coldest month in Montgomery County, with an average monthly temperature of approximately 34°F (NOAA, 2022). The average monthly low temperature in Rockville, Montgomery County, is below freezing the months of December, January, and February (US Climate Data, 2022). Conversely, July is the warmest month in Montgomery County with an average temperature of approximately 77°F (NOAA, 2022). The average monthly high temperature is above

80°F in the months of June, July, and August in Rockville (US Climate Data, 2022). Average annual temperature in Montgomery County from 2000 to 2021 was approximately 56°F. The average annual temperature in Montgomery County has shown an increasing trend of several degrees °F over a period of record from 1895 through 2022 (NOAA, 2022). Montgomery County over the period of 2000 to 2021 received an average of 44.8 inches of precipitation per year. Variation in annual average precipitation from year to year is substantial and has varied by more than 30 inches over this period (NOAA, 2022). Rockville over the period of 1981 to 2010 received an average of 43.04 inches of precipitation per year. Montgomery County over the long period of record from 1900 to 2022, received an average of 42.1 inches of precipitation per year (NOAA, 2022). These data appear to indicate a trend of increasing precipitation annually. The average precipitation amount received per month varies somewhat throughout the year. May and September are the wettest months in Rockville, each receiving an average of more than 4 inches over the period 1981 to 2010. February, April, and December are the driest months, each receiving an average of approximately 3 inches over the period 1981 to 2010 (US Climate Data, 2022).

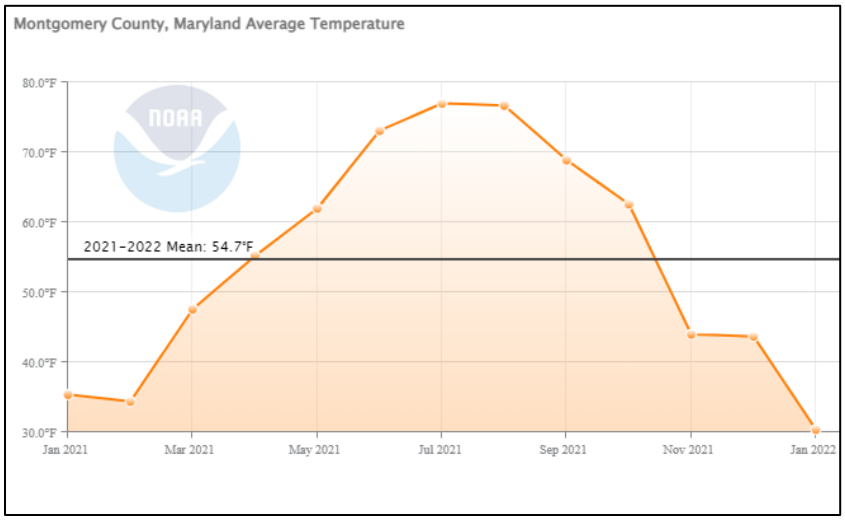


**Figure 2-6: Average Temperatures in Montgomery County, Maryland 2021-2022**

Figure 2-6 shows the average temperatures in each month between the years of 2021 and 2022 in Montgomery County. February was the coldest month with an average temperature of 34.4 °F. July was the warmest month with an average temperature of 77 °F. Average temperatures increase steadily starting in February until they reach the July peak. They then have a slightly steeper decrease going into the winter months.

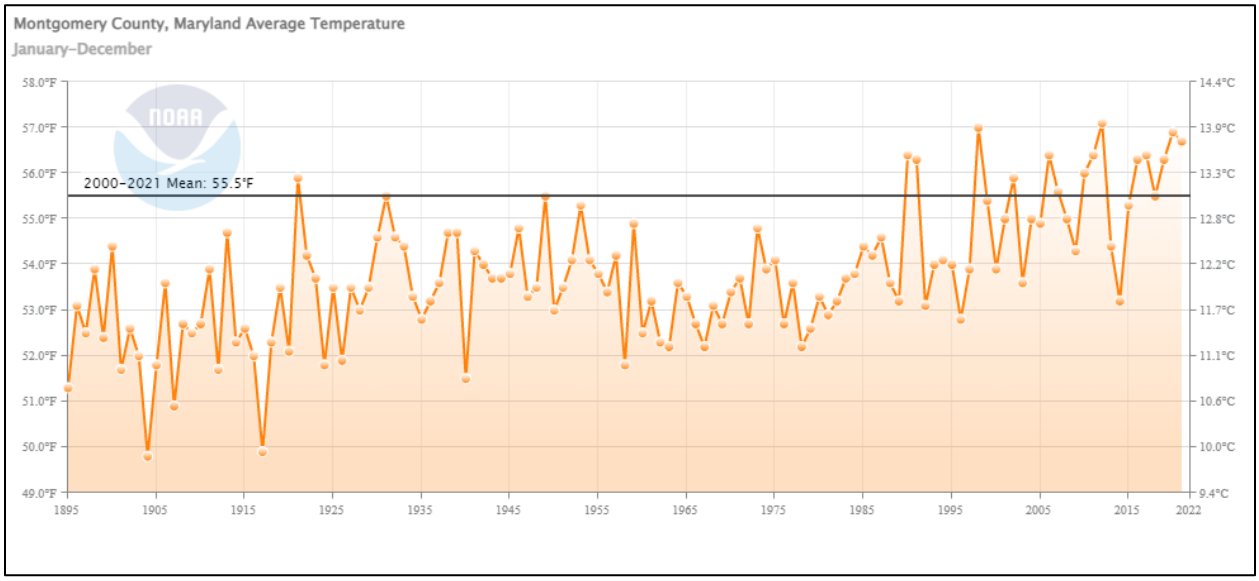


**Figure 2-7: Average Annual Temperatures in Montgomery County, Maryland 1895-2024**

Figure 2-7 shows the average annual temperatures from 1895 to 2024. The black line shows the mean annual temperature from 2000 to 2024. The plot shows that annual temperatures have increased steadily over the period of record. The majority of years from 1895 through 2000 fall under the mean average temperature recorded just in the last 20 years.

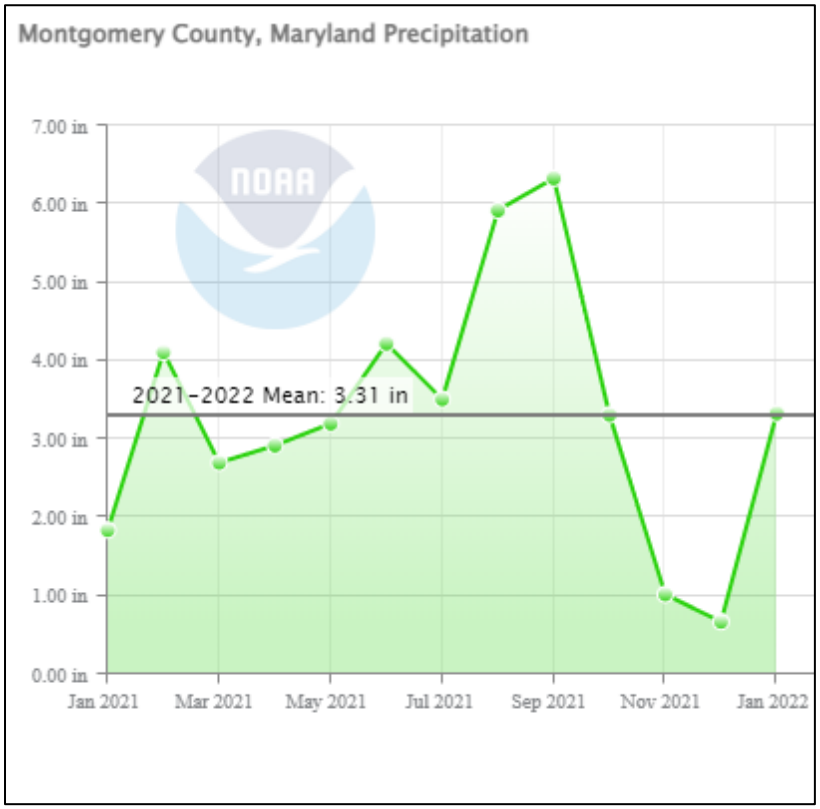


**Figure 2-8: Monthly mean precipitation in Montgomery County, Maryland 2021-2022**

Figure 2-8 shows the precipitation for each month between 2021 and 2022 in Montgomery County. The total precipitation in September was 6.33 inches which was the highest of the year. December only had 0.67 inches of precipitation, which was the lowest. There is a clear rise in precipitation in the summer months, especially late summer, and a decrease going into the fall.

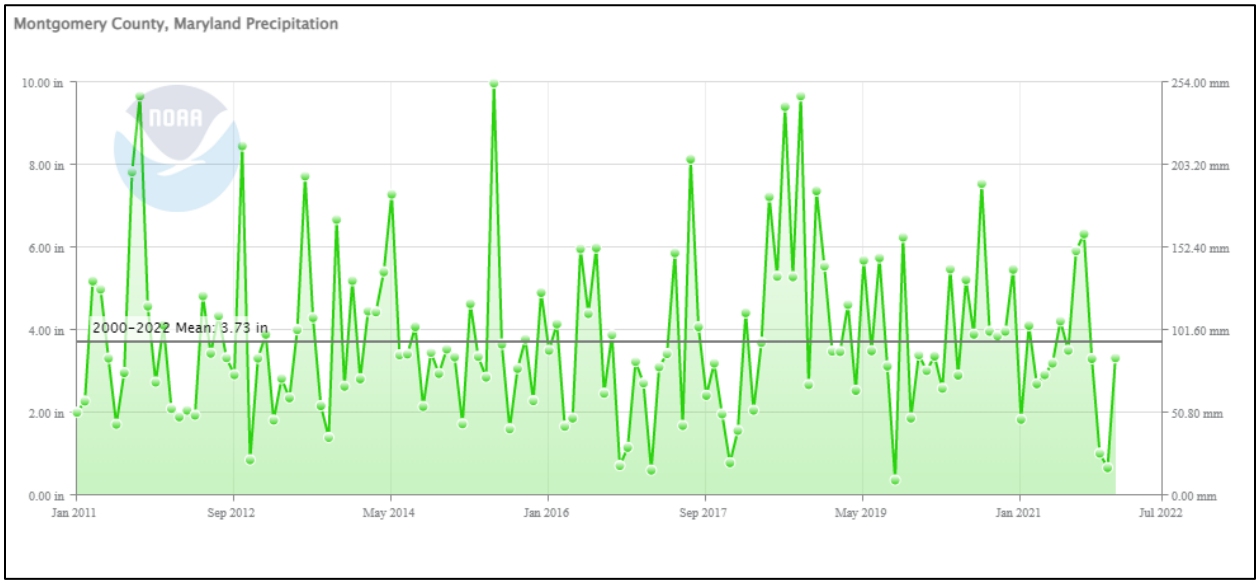


**Figure 2-9: Monthly mean precipitation in Montgomery County, Maryland 2011-2022**

Figure 2-9 shows monthly precipitation for the last 10 years in Montgomery County. The peak rainfall and low rainfall months are not always the same but follow the general trend of increased rainfall in later summer and decreased rainfall in the beginning of winter.

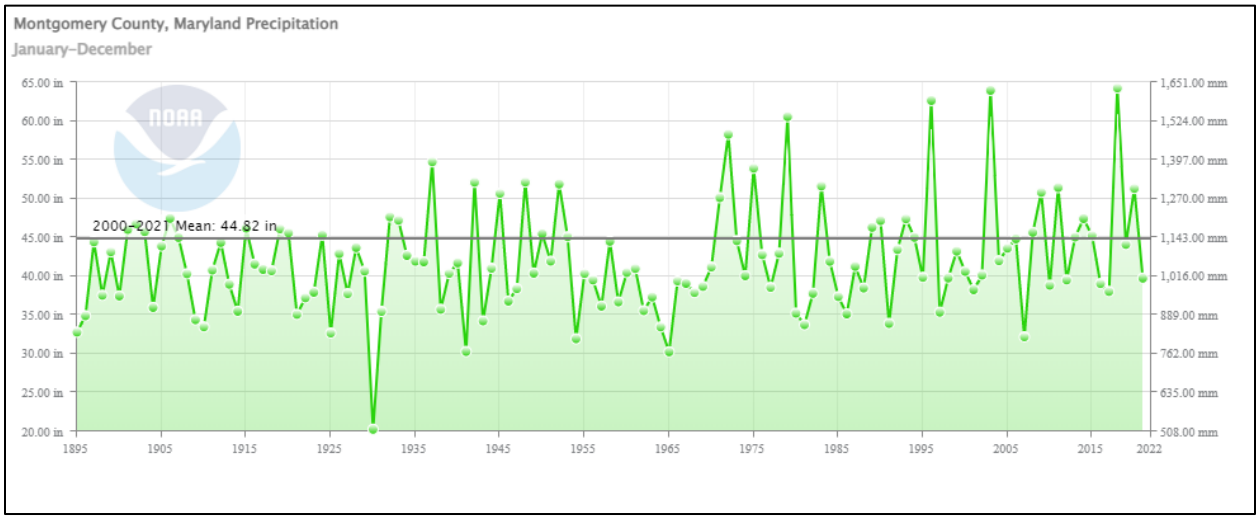


**Figure 2-10: Average annual precipitation in Montgomery County, Maryland 1895-2021**

Figure 2-10 shows the average annual from 1895 through 2021. The black line shows the mean annual precipitation over the last 20 years. Starting in the 1930s there has been a gradual increase in precipitation in Montgomery County. The discrepancies

between high precipitation and low precipitation years are also greater. For example, in the early 1900s the difference in participation amounts is between 5 and 10 inches. In the 2010s, the differences can be as much as 30 inches.

#### *2.4.1.1 FWOP*

Seasons are projected to change in length and timing in Montgomery County, Maryland with an earlier spring, delay of fall, and a shorter winter. Although the change in length and timing of seasons may provide beneficial uses for some crops, it can also limit plant diversity, encourage invasive species, and threaten human health and ecosystem health. By 2070, the frost-free period will average four to seven weeks longer in Montgomery County (PSU MARISA, 2022). Additionally, Montgomery County is already experiencing, on average, four days per year in excess of 95°F. By 2050, Montgomery County can expect a yearly average of 26 to 47 days above 95 °F. Annual rainfall in Montgomery County would likely increase by an average of two to three inches (PSU MARISA, 2022).

### 2.4.2 Land Use

Starting in the late 19th century, urbanization and industrialization increased within the Anacostia River watershed. Development of the landscape has resulted in loss of forest and wetland habitats, habitat fragmentation, and alteration of natural drainage patterns and stream flow leading to increases in erosion and sedimentation (ARWP, 2010). Much of the development in the watershed occurred prior to regulations that now require riparian buffers or stormwater management practices. Streams were paved over, piped, channelized, and rip-rapped thereby changing the physical stream hydrology and leading to degraded conditions (MWCOG, 2008). In its natural state, the lower Anacostia (tidal portion) was covered with wetlands associated with the Anacostia River estuary, delta, and floodplain. The Anacostia River watershed in Montgomery County is largely urban, with a high percent of impervious surface area. Present ecological conditions in the Anacostia River watershed are similar to those faced in other urban systems, including lack of stormwater management; loss and degradation of forest, wetland, stream, and riparian habitat; pollution from nutrients, chemical contamination, sediment, and trash; and loss of species diversity (AWRP, 2010).

The following M-NCPPC park lands occur within the project areas (Lamberton Creek and Bel Pre Creek); Northwest Branch Stream Valley Unit 4, Northwest Branch Stream Valley Unit 5, Matthew Henson State Park Unit #3, and Middlevale Neighborhood Park. The Bel Pre project area is located within an MD DNR Targeted Ecological Area (TEA) and Biodiversity Conservation Network (BIONET). TEAs are lands and watersheds of high ecological value that have been identified as conservation priorities by MD DNR for natural resource protection (MD DNR, 2017). A Biodiversity Conservation Network is used by MD DNR's Natural Heritage Program (NHP) to collect, manage, analyze, and distribute spatial data regarding the habitats of the state's rarest plants and animals, as well as high quality and rare natural communities and other living resources of

conservation concern. These areas of biodiversity are categorized into a five-tiered system:

**Tier 1** – Critically Significant for Biodiversity Conservation
**Tier 2** – Extremely Significant for Biodiversity Conservation
**Tier 3** – Highly Significant for Biodiversity Conservation
**Tier 4** – Moderately Significant for Biodiversity Conservation
**Tier 5** – Significant for Biodiversity Conservation

The headwaters of Bel Pre Creek and Lamberton Creek, are unranked. However, segments within middle portions of all the study areas are generally ranked "Tier 5, Significant for Biodiversity Conservation." The lower portion of Bel Pre Creek and adjacent Northwest Branch Anacostia are ranked as "Tier 3, Highly Significant for Biodiversity Conservation." The latter designation essentially covers the entire floodplain area (MD DNR, 2016).

#### *2.4.2.1 FWOP*

As most of the Anacostia River watershed has reached its capacity for development, areas located on M-NCPPC parkland are expected to remain being used for recreation and conservation purposes. Local entities may improve the parkland or trails through routine maintenance activities and locally funded native plantings. Otherwise, land use is not anticipated to change in a FWOP scenario.

### 2.4.3 Geology

The two study area streams and their drainage basins lie in the Northern Piedmont physiographic province. Geology of the province is complex. The stream segments of interest are mapped to be underlain by metamorphic bedrock, including metagraywacke, schist, diamictite, and metavolcanic rock. Above these rocks lies weathered rock known as saprolite (Means et al., 2010). Saprolite ranges in thickness from nothing where natural or manmade bedrock outcrops occur to many tens of feet of thickness on broad flat areas (USGS, 1975).

Field investigations by USACE biologists of habitat conditions and stream geomorphology for this study conducted in 2014 and 2015 found that stream bed materials in Bel Pre Creek and Lamberton Creek segments of interest included limited areas of outcropping bedrock. However, the streambeds predominantly consist of sediments ranging in size from silts to cobbles. Manmade bank stabilization boulders comprise a substantial portion of the substrate in Lamberton Creek and are locally abundant in Bel Pre Creek.

Baseflow, the portion of stream discharge that is not attributed to direct runoff from precipitation, is sustained by groundwater discharges into rivers and streams. Groundwater infiltrates the ground surface and moves downward and laterally to

discharge at a spring or stream. Groundwater sources in Montgomery County are from hydrologic units within the Piedmont Province. In general, rocks of the Northern Piedmont Province are relatively impermeable, so groundwater flow is restricted, and the rate at which water moves through the subsurface is low. Despite this, significant quantities of groundwater do occur in the Piedmont, primarily through fractures and in saprolite. Fractures, including rocks and faults, permit water to enter rocks, where chemical weathering may enlarge openings allowing for storage and groundwater flow. Saprolite forms when groundwater circulating through fractures in the upper layers of bedrock dissolves minerals and leaves disintegrated rock that retains the texture and structure of the parent rock. Most of Piedmont bedrock is covered with soil and saprolite, ranging from zero to 100 feet in thickness (MD DNR, 1987). Saprolites can retain large quantities of water.

#### *2.4.3.1 FWOP*

Under a FWOP condition, geology is anticipated to remain unchanged.

### 2.4.4 Topography

Ecoregion 65c (Piedmont Uplands) is characterized by rounded hills, low ridges, relative high relief, and narrow valleys. It is hillier, more dissected, and better drained than the Middle Atlantic Coastal Plain (63) and its underlying sedimentary rocks are distinct from the older, metamorphic rocks of the Piedmont. Elevations range from about 450 feet to 1,000 feet (137 to 304 meters). Today, urbanization and residential development are extensive within commuting distance to Baltimore, Washington, Wilmington, or Annapolis.

Elsewhere, less intensive agriculture, general farming, or part time agriculture occurs; the land use mosaic is distinct from the more forested Rolling, Inner Coastal Plain (65 meters). The average annual growing season varies according to latitude and proximity to water bodies and ranges from 160 to 225 days (U.S. National Oceanic and Atmospheric Administration, 1974).

The Fall Line acts as the western border and separates Ecoregion 65n from the higher and lithologically distinct ecoregions of the Piedmont. Ecoregion 65n's southern border with the Rolling Coastal Plain (65m) is the Potomac River; the river divides the mesic soils of the north from thermic soils of the more forested south. Ecoregion 65n's eastern boundary with the Middle Atlantic Coastal Plain (63) is primarily based on physiography; Ecoregion 63 is generally flatter than Ecoregion 65 (EPA EcoRegions, 2012).

#### *2.4.4.1 FWOP*

Localized geomorphology would change according to shifting of the various stream channels caused by erosion and over-sedimentation. However, overall topography is expected to remain consistent with the two study areas.

### 2.4.5 Waterways and Hydrology

The MDE designates surface waters in Maryland into 'use' classes. The two creeks for this project are designated as Use IV (Bel Pre Creek and Lamberton Creek). Use IV is defined as recreational trout waters. Both stream segments are within the MDE 8-digit Anacostia River watershed (MDE# 02140205).

The US Geological Survey (USGS) maintains a stream gage on the Northwest Branch Anacostia River at Colesville approximately 700 feet downstream of the mouth of Bel Pre Creek which has operated from 1923 to the present. USGS operated a stream gage on Bel Pre Creek from 1966-74. USGS does not have any active water flow measuring stations on the stream segments of interest (Bel Pre Creek and Lamberton Creek). Although the Northwest Branch Anacostia River is a much larger river than Bel Pre Creek and Lamberton Creek, and flows would be greater in volume and somewhat less variable because of less effect of differences in local precipitation, it is informative to view flow patterns in the Northwest Branch Anacostia River.

USGS "StreamStats" provides modeled flow information based on regional equations for the study area streams for a variety of flow events. Table 2-9 provides summary information on various flows of interest to stream health – water quality and aquatic life. The modeled flows show that over a typical two-year period, flows in each stream would vary from less than 1 cubic foot of water per second to many hundreds of cubic feet per second. Low-flow conditions represent groundwater-driven flows. In these urban drainage basins, groundwater would include precipitation that drains through the earth, but also water from leaking infrastructure below ground as well as in the stream itself. Low flows effectively serve to limit the quantity of aquatic habitat available. Flows that would have a 50% chance of occurring in any given year are typically considered to have a major effect on stream geomorphic character, and thus habitat. Infrequent flows that have a 1% chance of occurring in any given year are the flows that society considers in managing flooding risk. Note that any of those events could occur in consecutive years or even within the same year.

**Table 2-9: Summary hydrologic information**

| Stream | Drainage Basin area (square miles) | Percent Impervious Area | Low-flow (7 day, 2 year event) modeled flows in cubic feet/second* | Annual exceedance chance events (row below) and associated modeled flows in ft3/second (table cells) | |
|---|---|---|---|---|---|
| | | | | 50% | 1% |
| **Bel Pre (mouth)** | 4.5 | 38.8 | 0.904 | 840 | 5,170 |
| **Lamberton (mouth)** | 0.56 | 35.8 | 0.113 | 213 | 1,400 |
| | | | | | |

*Source: USGS StreamStats (2021) modeled flows*

#### *2.4.5.1 FWOP*

Streams in the project area appear to be reacting to changes in land use as evidenced by excessive erosion, incision, and patterns of sediment deposition. MDE has established stringent stormwater regulations related to channel-protection volume that are applicable to new development and redevelopment. Although erosive flows may be mitigated to some extent, the streams will remain unstable absent a geomorphic restoration project, with potential implications for continued loss of riparian area and degradation of aquatic habitat. The streams exist within a constrained urban landscape; therefore, excessive erosion could eventually cause loss of property and structures (i.e., roads, bridges, buildings, recreational facilities). The severe erosion of the bed and banks of the study stream reaches contributes to the sedimentation of the lower Anacostia River. High concentrations of suspended sediment have harmful effects on aquatic organisms and affects the usefulness (embeddedness) of their habitat for spawning and other lifecycle needs. Without bed and bank stabilization, these conditions are likely to continue over the period of analysis.

### 2.4.6 Water Quality

The landscape within the two project areas are within an urbanized setting. These areas are known to have uncontrolled stormwater runoff, which leads to the accelerated rates of erosion of the stream channel. The sediments released from this process includes sand, silt, and clay that can impair river and stream habitat in excess concentrations. Suspended sediments in large concentrations can increase water turbidity, increase water temperature, bind to a myriad of pollutants, and can clog gills of aquatic organisms. Total suspended solid load data from the USACE Anacostia Restoration Plan summarizes that the Northwest Branch, which contains the tributaries of Lamberton and Bel Pre Creeks transport 63 tons/year/square mile (AWRP, 2010). The sediment loads provide insight to the severity of erosion within the two project areas. Within the Northwest Branch approximately 20 percent of the subwatershed contains stormwater controls. Overall, the low percentage of stormwater management controls,

high levels of stream channel erosion, and old sanitary sewer systems all contribute to the adverse effect on water quality.

Nutrients either bounded to sediment or directly incorporated by non-point and point source pollution can negatively impact freshwater ecosystems. Point sources include factories and sewage treatment plants with direct pipe discharge, while non-point sources include septic systems, lawns, and farms. High nutrient loads of phosphorous and nitrogen can cause algal blooms, resulting to aquatic dead zones. These dead zones are caused by the subsequent die-off and decomposition of organic material, greatly reduce the dissolved oxygen (DO) level of the water; thereby killing fish and other aquatic life. Typical sources of phosphorous and nitrogen include fertilizers, human and animal wastes, organic material, and soil.

The phosphorus load for the Northwest Branch, which includes the tributaries of the Lamberton Creek and Bel Pre Creek project locations, contains an estimated 401 pounds/square mile/year (AWRP, 2010). In comparison the average Anacostia subwatershed phosphorous load is 500 pounds/square mile/year and a completely forested watershed would expect to generate approximately 8.2 pounds/square mile/year.

The nitrogen load for the Northwest Branch contains an estimated 5,132 pounds/square mile/year (AWRP, 2010). In comparison the average Anacostia subwatershed nitrogen load is 5,255 pounds/square mile/year and a completely forested watershed would expect to generate approximately 42 pounds/square mile/year.

Toxins also inhibit the water quality of each project location. Toxins refer to a variety of contaminants including but not limited to: 1) trace metals such as arsenic, mercury, copper, cadmium and lead and 2) organic compounds such as polycyclic aromatic hydrocarbons (PAH), polychlorinated biphenyls (PCB) and pesticides and herbicides such as dichlorodiphenyltrichloroethane (DDT), Chlordane, and atrazine. These toxins enter waterways from point and non-point pollution sources. Currently there is minimal toxin monitoring data for the project locations, so the extent of the potential problems caused by toxins is unknown. There are 119 National Pollutant Discharge Elimination System (NPDES) related industrial and municipal discharges in the Anacostia River watershed. Twelve of these (10 percent) are located in the Northwest Branch subwatershed. Bacteria data is also unavailable for tributaries of the Northwest Branch. Although it has been documented that most of the Anacostia tributaries rarely meet the established bacteria water quality standards produced by EPA. The major contributors of bacteria entering the waterways are human, domestic animals, and wildlife.

#### *2.4.6.1 FWOP*

The Chesapeake Bay Trust and Montgomery County Government have developed the Clean Water Montgomery Grant Program which funds public outreach and stewardship

projects, community-based restoration, water quality implementation projects, tree planting and reforestation projects, and litter reduction projects in the Anacostia River watershed (CBT, 2023). In fiscal year 2023, quarter 3, the Program awarded 23 of 30 applications (February 2023) (Montgomery County Climate Action Plan, March 2023). Clean Water Montgomery is another program within the County that encompasses programs, resources, incentives and educational opportunities for residents and businesses to reduce stormwater pollution and improve the health of Montgomery County streams through three main objectives:

1. Revitalizing the health of streams
2. Restoring natural ecosystems through planning and innovative design
3. Inspiring community led action to reduce pollution (MCDEP, 2023).

With the beforementioned restoration outreach programs and stewardship projects, waterways within the Anacostia River watershed would continue to see improvement in a FWOP condition. Other non-profit or government organizations may participate in revitalizing portions of the two segments being proposed through this study.

### 2.4.7 Air Quality

In 2023, Montgomery County is in moderate nonattainment for the 8-hour ozone pollutant, based on the 2015 National Ambient Air Quality Standards (NAAQS). Montgomery County is a maintenance for the 8-hour ozone pollutant (2008 standard). Nonattainment means that an area is not meeting or is above a given safe standard set by the USEPA for the particular criteria pollutant. Maintenance means that an area has a history of nonattainment, but the area is now consistently meeting the NAAQS(USEPA, 2021a). State agencies develop air quality plans, which are also referred to as State Implementation Plans (SIPs), designed to attain and maintain the NAAQS set by the USEPA and to prevent significant deterioration of air quality in areas that exceed the NAAQS. Maryland has individual SIPs for various pollutants, including nitrogen dioxide (NO2), particulate matter (PM2.5), 8-hour ozone (O3), regional haze, lead, etc. Federal agencies must ensure that their actions conform to the SIP in a nonattainment area, and do not contribute to new violations of ambient air quality standards, or an increase in the frequency or severity of existing violations, or a delay in timely state and/or regional attainment standards.

The purpose of the General Conformity Rule (GCR) is to:

- Ensure federal activities do not interfere with the budgets in the SIPs.
- Ensure the attainment and maintenance of NAAQS.
- Ensure actions do not cause or contribute to new violations of NAAQS.

A general air conformity analysis was completed (Appendix C) with respect to the 8-hour ozone NAAQS (2015 standard), and nitrogen oxides (NOx) and volatile organic compounds (VOCs), which are precursors for ozone. The results of this analysis are summarized in Section 4.3.8 and Appendix C.

#### *2.4.7.1 FWOP*

The USEPA strengthened the health-based air quality standard for 8-hour ozone in Fall 2021, lowering the standards from 75 parts per billion (ppb) to 70 ppb. The updated standard will improve public health protection, particularly for at-risk groups such as children, older adults, and people with heart or lung diseases. Maryland has continued to enforce strong regulations and monitoring programs that introduce protective regulations and regional collaborations with assistance from MDE (MDE, 2022).

### 2.4.8 Greenhouse Gas Emissions

Greenhouse gases (GHG) are produced from five major sources: transportation, electricity production, industry, commercial and residential, and agriculture (USEPA, 2021b). According to a World Resources Institute Report published in 2020, Maryland leads the nation in the number of emissions reductions (38 percent) in a 12-year period (MDE, 2021 & WRI, 2020). Montgomery County has developed a Climate Action Plan (CAP), which is a strategic plan to cut GHG emissions 80 percent by 2027 and 100 percent by 2035, compared to 2005 levels (Montgomery County, 2021). The CAP also includes strategies to reduce GHG emissions and climate-related risks to the County's residents, businesses, and the built and natural environment (Montgomery County, 2021).

Each GHG is assigned a global warming potential (GWP). The GWP is the ability of a gas or aerosol to trap heat in the atmosphere. The GWP rating system is standardized to $CO_2$, which has a value of one. For example, $CH_4$ has a GWP of 25, which means that it has a global warming effect 25 times greater than $CO_2$ on an equal-mass basis. To simplify GHG analyses, total GHG emissions from a source are often expressed as a $CO_2$ equivalent (CO2e). The CO2e is calculated by multiplying the emissions of each GHG by its GWP and adding the results together to produce a single, combined emission rate representing all GHGs. While $CH_4$ and $N_2O$ have much higher GWPs than $CO_2$, $CO_2$ is emitted in such higher quantities that it is the overwhelming contributor to CO2e from both natural processes and human activities. Per CEQ guidance, USACE is considering all available tools and resources in assessing GHG emissions and climate change related to the study.

#### *2.4.8.1 FWOP*

In 2022, Maryland passed a significant environmental bill into law, called the Climate Solutions Now Act. The law calls for a 60 percent reduction in climate-warming carbon emissions by 2031 and net-zero emissions by 2045. This Act is one of the most ambitious GHG reductions of any state in the nation. Notable requirements within the Act include improving the energy efficiency of large existing buildings; thus, reducing carbon emissions. By 2030, all state facilities would be required to get at least 75 percent of their electricity from low-to zero-carbon sources. A five million dollar fund for climate projects was established in the Act and directed 40 percent to be spent in low-to

moderate income neighborhoods (Wheeler, 2022). Additionally, in June 2021, a Climate Action Plan was completed for Montgomery County's strategic plan to cut GHG emissions 80 percent by 2027 and 100 percent by 2035. The Climate Action Plan includes strategies to reduce GHG emissions and climate-related risks to the County's residents, businesses, and the built and natural environment (Montgomery County, 2023).

### 2.4.9 Hazardous, Toxic, and Radioactive Waste

According to EPA's NEPAssist, the project sites are within one mile of a NPDES water discharger, hazardous waste Resource Conservation and Recovery Act (RCRA) facility, and an air emission facility. Generally, the Bel Pre Creek and Lamberton Creek are far removed from commercial activity and industrial development.

#### *2.4.9.1 FWOP*

State and national programs such as the NPDES permit program, RCRA, and the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), which are used to govern pollutant discharge, encourage states to develop comprehensive plans, control hazardous waste, and clean up and restore sites where hazardous materials have been released, would continue to be enforced in a FWOP condition.

### 2.4.10 Socioeconomics

Socioeconomic characteristics are defined by the interaction or combination of social and economic factors. Bel Pre Creek and Lamberton Creeks are located in Montgomery County, Maryland – the most populous county in the state. The county includes 507 square miles of land area. Montgomery County is the second wealthiest county per capita in Maryland. Montgomery County consists of three cities, twelve towns, four villages, 33 census designated places, and five unincorporated communities (Montgomery County, 2023). Based on the USCB American Community Survey (ACS) 5-year data (USCB, 2010 and 2021) the population for Montgomery County in 2010 was 947, 230. In 2021, the estimated population was 1,057,201, an increase of approximately 9 percent.

Each federal agency shall analyze the environmental effects, including human health, economic, and social effects, of federal actions, including effects on minority communities and low-income communities, when such analysis is required by the NEPA 42 USC, Section 4321, et seq." To determine whether the region of interest (ROI) contains a disproportionately high minority or low-income population, data for Montgomery County was compared to data for Maryland and the United States.

Within the ROI, approximately 8.8 percent of the population lived at or below the poverty level in 2021, which is lower than Maryland (10.3 percent) and the national (12.8 percent) average (U.S. Census Bureau, 2019) (Table 2-10).

**Table 2-10: Select Socioeconomic Data for Montgomery County**

| Category | United States | Maryland | Montgomery County |
|---|---|---|---|
| **Median household income (in 2021 dollars)** | $53,888 | $90,203 | $112,854 |
| **Per capita income (in 2021 dollars)** | $38,332 | $46,500 | $60,195 |
| **Persons in poverty, percent** | 12.8% | 10.3% | 8.8% |

*Source: 2021 ACS Median Household Income in Past 12 Months (in 2021 inflation adjusted dollars) Table B19013 (USCB, 2021c), Table B19301 (USCB, 2021d) Per Capita Income in Past 12 Months. Table S1901, Poverty Status in the past 12 months, Table S1701*

As shown in, Table 2-11 the ROI has higher percentages of people of color compared to the state of Maryland. Within the ROI, approximately 51 percent of the population is considered minority, which is higher than both state (50 percent) and national (25 percent) averages (U.S. Census Bureau, 2023). Hispanic or Latino accounted for the largest minority populations in Montgomery County (20 percent).

**Table 2-11: Demographic Information for Montgomery County**

| Race/Ethnicity | United States | Maryland | Montgomery County (ROI) |
|---|---|---|---|
| **Total Population Count** | **326,569,308** | **6,037,624** | **1,057,201** |
| **Hispanic or Latino** | 18% | 10% | 20% |
| **White** | **70%** | **54%** | **48%** |
| **Non-Hispanic White** | 60% | 50% | 42% |
| **Non-White** | **28%** | **47%** | **49%** |
| **Black or African-American** | 12% | 30% | 18% |
| **Asian** | 7% | 6% | 15% |
| **Some other race** | 7% | 5% | 9% |
| **Two or more races** | 3% | 6% | 7% |
| **American Indian** | 2% | <1% | 0.4% |
| **Native Hawaiian & Other Pacific Islander** | <1% | <1% | 0.0% |
| **Total People of Color Population** | **81,463,530 (25%)** | **3,009,130 (50%)** | **540,763 (51%)** |

*Source: EJ Screen ACS Summary Report 2016-2020; ACS 2021; Table DP05 ACS Demographic (USCB, 2021).*
**Hispanic population can be of any race. The total People of Color Population refers to all individuals other than non-Hispanic whites. * May not sum to totals due to rounding.*

On 21 April 1997, President Clinton issued E.O. 13045, *Protection of Children from Environmental Health Risks and Safety Risks*. This E.O. directs each federal agency to ensure that its policies, programs, activities, and standards address disproportionate environmental health or safety risks to children that may result from the agency's actions. E.O. 13045 recognizes that a growing body of scientific knowledge demonstrates that children may suffer disproportionately from environmental health and safety risks due to still developing neurological, immunological, physiological, and behavioral systems. Examples of risks to children include increased traffic volumes and industrial- or production-oriented activities that would generate substances or pollutants that children could be exposed to or ingest.

#### *2.4.10.1 FWOP*

In the FWOP condition, without restoration, the streams may continue to pose health and safety risks to those who live adjacent or downstream to the segments. Downed trees, water quality, and flash flood events may continue to impact specific communities within proximity to the stream reaches.

### 2.4.11 Cultural Resources

This section describes existing cultural resources within the project's area of potential effects (APE).

Cultural resources are locations of human activity, use, or occupation. They can be defined by expressions of human culture and history in the physical environment such as precontact of historic archaeological sites, buildings, structures, objects, districts, landscapes, and sacred sites, among others. Cultural resources may also include natural features, plants, and animals that are deemed important or significant to a group or community. It is important to note that historic properties, as defined by 36 Code of Federal Regulations (CFR) Part 800, the implementing regulations of Section 106 of the National Historic Preservation Act (NHPA) of 1966, as amended, are cultural resources that are eligible for or listed in the National Register of Historic Places (NRHP). To be considered a historic property, the resource must possess at least one of the following significance criteria:

- Association with events that have made a substantial contribution to the broad patterns of our history; or,
- Association with the lives of persons substantial in our past; or,
- Embodiment of the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic value, or that represent a substantial or distinguishable entity whose components may lack individual distinction; or,
- Have yielded, or may be likely to yield, information important in prehistory or history.

A historic property must also possess enough integrity to portray its significance. A resource that retains integrity will embody several, and usually most, of the seven aspects of integrity:

- Location is the place where the historic property was constructed or the place the historic event occurred.
- Design is the combination of elements that create the form, plan, space, structure, and style of a property.
- Setting is the physical environment of a historic property.
- Materials are the physical elements that were combined or deposited during a particular period of time and in a particular pattern or configuration to form a historic property.
- Workmanship is the physical evidence of the crafts of a particular cultural or people during a given period in prehistory or history.
- Feeling is a property's expression of aesthetic or historic sense of a particular period of time.
- Association is the direct link between an important historic event or person and a historic property.

Section 106 of the NHPA requires consultation with the State Historic Preservation Office (SHPO), federally recognized Native American Indian Tribes, and other interested consulting parties for proposed federal actions that may affect historic properties. The Maryland Historical Trust (MHT) is designated as the SHPO for Maryland. USACE initiated Section 106 consultation with the MD SHPO via letter dated 06 April 2023. USACE also initiated Section 106 consultation with the Delaware Nation, Delaware Tribe of Indians, Eastern Shawnee Tribe of Oklahoma, Pamunkey Indian Tribe, Seneca-Cayuga Tribe, Stockbridge-Munsee, and Tuscarora Nation on 05 April 2023.

As part of Section 106 consultation, a preliminary APE was defined to identify any potential historic properties that could be affected by the proposed project alternatives. The preliminary APE includes those areas where direct impacts are proposed and areas within which the undertaking may directly or indirectly cause alterations in the character or use of historic properties, including visual effects. For this project the preliminary direct APE includes areas of proposed stream realignment, erosion control, and any associated staging and access areas. The preliminary indirect APE includes the viewsheds of any nearby historic properties. The preliminary APE will be further refined with consulting parties as the study progresses.

While, in a letter dated 01 May 2023, MHT recommended that no historic properties would be affected by the proposed project, a December 2021 preliminary archaeological review completed by M-NCPPC recommended that additional archaeological investigations be conducted as the project moves forward. To satisfy the requirements under Section 106 of the NHPA, USACE is coordinating with MHT and M-NCPPC on

the development of a Programmatic Agreement (PA). The purpose of the PA is to allow the Final Feasibility Report/EA to move forward, while stipulating Phase I archaeological investigation requirements during the design phase when funding can be obtained for this effort.

#### *2.4.11.1 Previously Identified Resources*

The presence of previously identified cultural resources within 0.5 miles of the study area was assessed using MHT's cultural resources information system, Medusa. Information gathered from Medusa included previously mapped archaeological sites and architectural/above-ground resources included on the Maryland Inventory of Historic Properties (MIHP). This information is presented in Table 2-12, and only resources noted as not evaluated, eligible for, or listed in the NRHP, or listed as a National Historic Landmark (NHL), are featured.

Nine cultural resources are located within 0.5 miles of the study areas, consisting of four archaeological sites and five architectural/above-ground resources. One of these, the Rachel Carson House, is a National Historic Landmark. In accordance with Section 110(f) of the NHPA, federal agencies must, to the maximum extent possible, minimize harm to any NHL that may be directly or adversely affected by an undertaking. The Rachel Carson House, as well as the other eight resources, are not within the project's limits of disturbance and would not be adversely affected.

**Table 2-12: Maryland Inventory of Historic Properties**

| Resource Name | MIHP/NRHP No. | NRHP Status | Associated Alternative | Resource Type |
|---|---|---|---|---|
| Kemp Mill | 18MO176 | Not Evaluated | Bel Pre | Historic Archaeological Site |
| Kemp's Mill Site | M:33-5 | Not Evaluated | Bel Pre | Architectural/Above-Ground |
| Indian Field | 18MO319 | Not Evaluated | Bel Pre | Precontact Archaeological Site |
| Bel Pre | 18MO247 | Not Evaluated | Bel Pre | Precontact Archaeological Site |
| Fehlner | 18MO369 | Not Evaluated | Lamberton | Precontact Archaeological Site |
| Rachel Carson House | M:33-13 / 91002058 | Listed | Lamberton | Architectural/Above-Ground NHL |

### *2.4.11.2 Cultural Resource Investigation*

Eight cultural resources investigations have been conducted within 0.5 miles of the APEs; however, only five of these have been conducted within the proposed LODs. These include Curry 1979, Thomas 1979, Curry 1983, USACE 1998, and Mikolic and Read 2012. Summary information for these investigations is provided in Table 2-13.

**Table 2-13: Cultural Resource Investigations**

| Investigation Title | Author and Year | MD SHPO Report Call No. | Summary |
|---|---|---|---|
| Archeological Reconnaissance of Maryland Route 182 from Maryland Route 97 to Layhill, Montgomery County, Maryland* | Curry, Dennis C. – 1979 | MO 29 | The Maryland Geological Survey, Division of Archaeology investigated proposed rights-of-way associated with the widening of Maryland Route 182. No archaeological sites were documented during the investigation.<br><br>A small portion of the surveyed area is located within the proposed Bel Pre alternative, where it intersects with Route 182. No cultural resources were documented within this surveyed area. |
| Cultural Resources Reconnaissance Investigations for the Metropolitan Washington Area Water Supply Study Early Action Report, Final Report* | Thomas, Ronald A. – 1979 | MO 8 | MAAR investigated anticipated rights-of-way of proposed water pipeline routes and areas expected to be directly impacted by proposed reservoir impoundments as part of the Metropolitan Washington Area Water Supply Study. Although numerous locations within the study areas were identified as having a moderate to high potential for archaeological resources, none of these are located within the currently proposed project.<br><br>A small portion of the surveyed area is located within the proposed Bel Pre alternative south of Layhill Village. No |

| Investigation Title | Author and Year | MD SHPO Report Call No. | Summary |
|---|---|---|---|
| | | | cultural resources were documented within this surveyed area. |
| Preliminary Archeological Assessment of Proposed Inter-County Connector Alignments, Anne Arundel, Montgomery and Prince Georges Counties, Maryland | Epperson, Terrence W. - 1980 | MO 37 | The Maryland Geological Survey, Division of Archaeology conducted a preliminary assessment of the proposed Inter-County Connector alignments connecting Interstate 95 and MD 295 with Interstate 270. Four precontact and four historic archaeological sites were documented within or near the proposed alignments. |
| Archeological Reconnaissance of the Proposed Inter-county Connector, Montgomery and Prince George's Counties, Maryland* | Curry, Dennis C. – 1983 | MO 37B | The Maryland Geological Survey, Division of Archaeology investigated a 21-mile corridor designed to connect Interstate 270 with the Baltimore-Washington Parkway. The investigation documented six precontact sites and four historic sites, of which two were recommended for additional study. The remainder of the project area was noted as having been heavily disturbed by suburbanization and other forms of disturbance.<br><br>A small portion of the surveyed area is located within the proposed Bel Pre alternative south of Layhill Village. No cultural resources were documented within this surveyed area. |
| A Phase I/II Cultural Resource Survey for the Anacostia River Basin Environmental Restoration Project, Montgomery and Prince George's Counties, | Baumgardt, Kenneth – 1994 | MO 121 | USACE investigated thirteen proposed environmental restoration sites as part of the Anacostia River Environmental Restoration Project in Montgomery and Prince Georges Counties. The investigation |

| Investigation Title | Author and Year | MD SHPO Report Call No. | Summary |
|---|---|---|---|
| Maryland, and Washington, District of Columbia | | | determined that six of the project areas were extensively disturbed; four of the areas contained no cultural resources; one contained archaeological sites outside the APE; and two contained resources that warranted further investigation.<br><br>Of the two sites recommended for further investigation, one was determined not eligible for the NRHP while the other needed proposed Phase III data recovery and mitigation. Neither of these sites are within the currently proposed project areas. |
| Phase IA Cultural Resources Investigations Anacostia River Tributaries Northwest Branch Feasibility Study, Montgomery County, Maryland* | U.S. Army Corps of Engineers - 1998 | MO 174 | USACE investigated nine potential project sites for the Anacostia River Tributaries Northwest Branch Feasibility Study. Testing at known archaeological sites documented either a lack of artifacts or determined that they were outside of the study areas. No additional investigations were recommended.<br><br>A portion of the surveyed area is located at the eastern terminus of the Bel Pre alternative. No cultural resources were documented within this surveyed area. |
| Interim Report: Phase I Archeological Survey of the Intercounty Connector Environmental Stewardship and Compensatory Mitigation Areas NW-160 & NW-170 | Mikolic, Frank G. III - 2008 | MO 250 | Parsons Brinkerhoff performed additional archaeological testing at project areas NW-170 and NW-160 along the Northwest Branch in Montgomery County. One archaeological site at NW-170 was documented, Site 18MO667. This site was later determined to be associated with |

| Investigation Title | Author and Year | MD SHPO Report Call No. | Summary |
|---|---|---|---|
| Montgomery County, Maryland | | | a mid-twentieth century outbuilding and not eligible for the NRHP. No additional work was recommended. |
| Phase I Archeological Survey of Intercounty Connector Northwest Branch ES/CM Stream Restoration Sites NW-4, NW-49 through 52, NW-102, NW-113, NW-128, NW-160, NW-170, and PR-61, Montgomery County, Maryland. SHA Archeological Report No. 411* | Mikolic, Frank G., III and Esther Doyle Read - 2012 | MO 276 | Excavation of STPs and test units along proposed stream restoration sites near the Northwest Branch and Rocky Gorge Reservoir of the Patuxent River. The investigation documented the Northwest Branch Park #1 Site (18MO667) but did not recommend it as eligible for the NRHP. No additional work was recommended.<br><br>The tested stream restoration site designated NW-113 is centrally located within the proposed Bel Pre alternative, south of the Indian Spring Country Club. Testing of NW-113 revealed that the northern bank of Bel Pre Creek was disturbed from sewer line installation. Three STPs were placed on a small upland bench along Bel Pre Creek's southern embankment. No artifacts or cultural features were documented. |

*Portions of the investigation are within the currently proposed project.

#### *2.4.11.3 FWOP*

Under the FWOP, no ecosystem restoration management measures would be implemented. While no cultural resources have been previously identified within the APE, the FWOP could allow existing erosional processes to damage unknown sites.

### 2.4.12 Aesthetics

Lamberton and Bel Pre Creeks flow through forested parkland, which is accessible by the public and used for recreation. Along the tributary, residents can be found along trails that have scenic views of the waterbodies. However, streambank erosion has caused unstable streambanks and multiple species of invasive plants have supplanted

native species in many areas. Both issues negatively impact the aesthetics of the study areas. Some areas along the chosen tributaries are incised and have high, eroding streambanks which negatively impact the health of the local plants, vertebrates, and invertebrates as well as the scenic views of the streams.

#### *2.4.12.1 FWOP*

Aesthetics within the study areas would remain relatively unchanged. Being that the streams are on Park property, M-NCPPC and Montgomery Parks would continue to maintain recreational use areas for the public.

### 2.4.13 Recreation

Neighborhood parks and trails are found within both proposed project areas. A majority of proposed stream restoration for Bel Pre Creek and Lamberton Creek in this project is being implemented in park lands owned and managed by M-NCPPC. These park areas provide a place for local residents to utilize green space for picnics, outdoor games, biking, hiking, playgrounds, and wildlife viewing. Bel Pre Neighborhood Park is the largest of the parks and straddles the Bel Pre Creek via a walking bridge. Bel Pre Elementary School is located adjacent to Bel Pre Neighborhood Park and utilizes its proximity by using Bel Pre Creek for educational and recreational purposes. Students can walk along the trails and conduct elementary scientific studies in the stream that focus on environmental health.

**Table 2-14: Neighborhood Parks in the vicinity of project area**

| Stream Valley Park | Local Neighborhood Park | Location Notes with Respect to Stream | Other Notes |
|---|---|---|---|
| **Northwest Branch SVU 5 (Bel Pre Creek)** | Bel Pre Neighborhood Park | Straddles Bel Pre Creek | Accessible from Matthew Henson Trail |

In addition, there are ten park trails in the watershed listed by the Montgomery County Department of Parks (2014), including the Long Branch Trail, Sligo Creek Trail, Wheaton Regional Park Trail, Northwest Branch Trail, Rachel Carson Greenway Trail Corridor, Paint Branch Trail, Fairland Rec. Park Trails, Martin Luther King Jr. Rec. Park Trails, Matthew Henson Trail, and the Underground Railroad Experience Trail. These trails provide areas for hiking, biking, horseback riding, and rollerblading.

*Ecologically Notable Parkland Areas*

Maryland-National Capital Park and Planning Commission (M-NCPPC) identified ecologically notable areas within its parklands in Montgomery and Prince George's Counties and designated these as Best Natural Area (BNA) and or Biodiversity Area (BDA) (M-NCPPC, 2009). Bel Pre Creek stream segment abuts a BDA and Lamberton Creek stream segment lies within a BNA (Table 2-15).

**Table 2-15: M-NCPPC designated ecologically notable parkland areas**

| Stream Segment | Notable Ecological Designations |
|---|---|
| **Bel Pre Creek** | South bank steep slope mature forest (just uphill of floodplain) parallel to lowermost 0.7 miles (as fish swims) of stream designated a "Biodiversity Area." BDA locally abuts stream at steep slope areas |
| **Lamberton Creek** | Both north and south banks designated as "Best Natural Area" along lower 0.7 miles of creek. BNA directly abuts stream along entire 0.7 miles. |

*Source: Montgomery County Parks Anacostia Phase 3 (As depicted in Montgomery County Parks, March 2022 file: " DEP-ACOE_AnacostiaPhase3_MapPacket.pdf")*

Montgomery County has designated areas within the county that have high-quality or unusually sensitive streams and wetlands or other environmental features as “Special Protection Areas.” However, there are no Montgomery County “Special Protection Areas” within the drainage basins of the stream segments of interest.

#### *2.4.13.1 FWOP*

Normal recreation use would continue throughout Bel Pre Creek and/or Lamberton Creek. Although, public safety concerns may increase as the system may become more unstable and increase bank height and debris jams along segments of the waterways. Sligo Creek was originally formulated for restoration under this CAP program authority.

### 2.4.14 Noise

Noise levels are measured in decibels (dBA) for regulatory purposes. The threshold of human hearing is zero dBA, with values above 85 to 90 dBA considered loud and potentially harmful to hearing depending on length of exposure. Noise levels above 140 dBA can cause damage to hearing after a single exposure (OSHA). The project area is subject to noise from traffic traveling on nearby single lane roadways adjacent to the proposed project area (Google Earth 2019). The Montgomery County Noise Ordinance regulates noise levels in the study area and requires that construction noise not exceed levels defined in the ordinance of 75 dBA during weekdays and 55 dBA during nighttime and weekends. Noise data for the proposed project area was not located. In the vicinity of stream segments, daily noise levels would reflect typical urban/suburban community activities, with noise from vehicle traffic and occasional airplanes contribute to predominant human noise sources. During “leaf-on,” the stream segments themselves are partially isolated from anthropogenic noise by the riparian forest canopy.

#### *2.4.14.1 FWOP*

Under the FWOP condition, noise would remain the same or consistent with the continued urban setting of the study area.

## 2.5 Built Environment

### 2.5.1 Transportation

Montgomery County ranks seventh highest in Maryland for overall commute time with an average of 33.2 minutes (U.S. Census Bureau, 2010). Major highways in the study area include Interstate 495 and U.S. route 29. Interstate 495, commonly known as the Capital Beltway, circles the District of Columbia and comes into the study area in the vicinity of Silver Spring, Maryland. U.S. route 29 is a major east-west road running through Montgomery County near the border with Prince George's County. According to the State Highway Administration (2013) annual average daily traffic on these major highways range from approximately 15,000 to 244,000. There are many sections of the selected stream reaches that cross under roads and bridges. Generally, these sections are piped through culverts or other engineered structures.

The Lamberton Creek reach has local roads to the north and west, while Lamberton Drive to the south is a minor collector. Kemp Road to the northwest of Lamberton is a minor arterial. Figure 2-11 shows AADT at intersections around Lamberton.

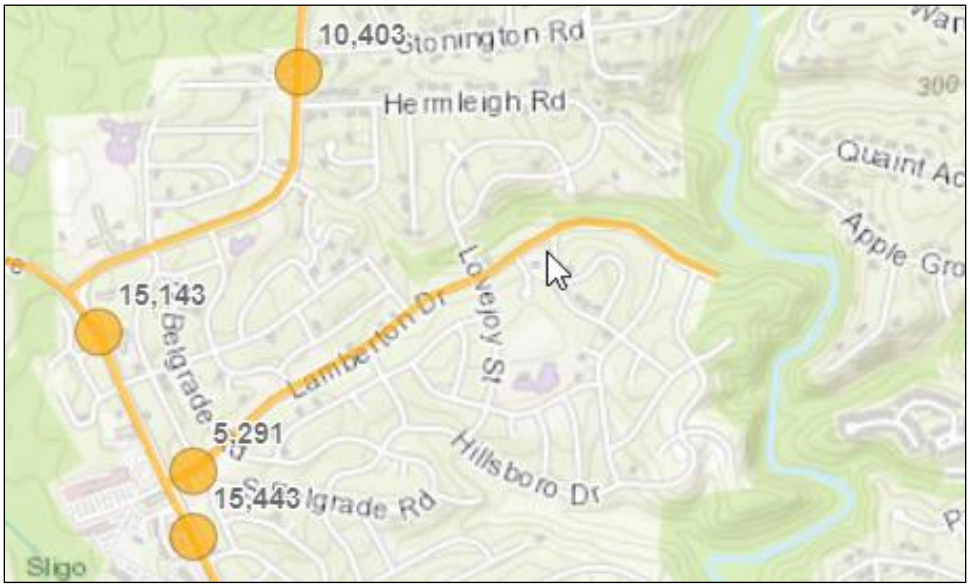


**Figure 2-11: Map of AADT at intersections of Lamberton Drive**

The Bel Pre Creek is mostly surrounded by local roads. The stream crosses Layhill Road, a principle arterial, Bel Pre Road, a minor arterial, and Homecrest Road, a minor collector. Figure 2-12 shows AADT at the surrounding intersections. Compared to the other tributaries, there is much less traffic around Bel Pre Creek even though it crosses multiple roads.

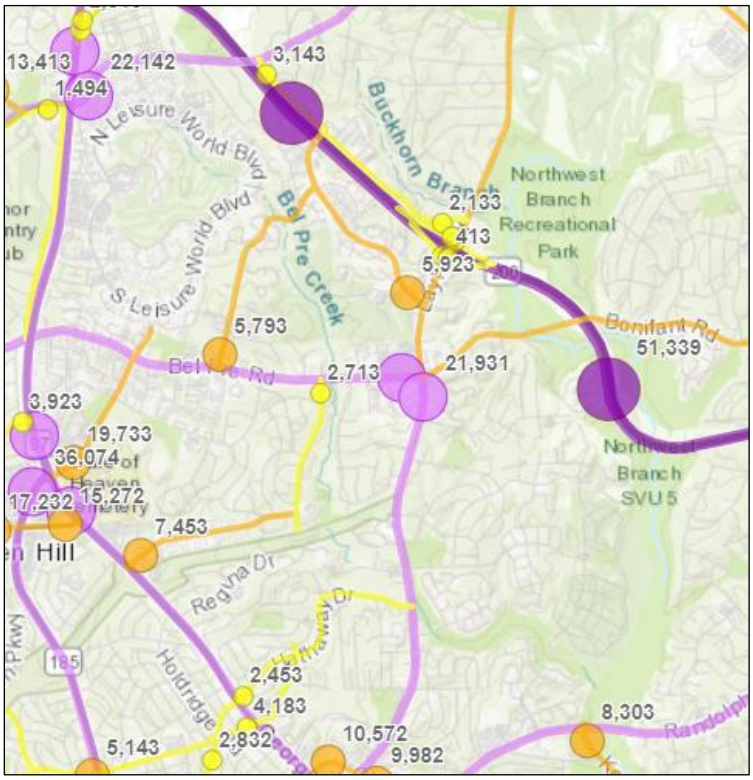


**Figure 2-12: Map of AADT at intersections around Bel Pre Creek**

Other forms of transportation include bus, train, and bicycle. According to the Montgomery County Planning Department there are five rail lines in the Montgomery County portion of the Anacostia Watershed.

#### *2.5.1.1 FWOP*

Under the FWOP condition, traffic and transportation would remain the same or consistent with its current trends.

### 2.5.2 Utilities

Sanitary sewer service is provided to 1.8 million residents in Montgomery and Prince George's Counties by Washington Sanitary Sewer Commission (WSSC), an agency established by the Maryland General Assembly in 1918. WSSC operates 5,400 miles of sewer mains, treating 180 million gallons of wastewater daily. There are six wastewater treatment plants and 47 wastewater pumping stations within the service area (WSSC, 2014). The sewer system is primarily a gravity system; therefore, a majority of the pipes follow stream valleys at the lowest elevation in the basin. A schematic of a gravity sewer system is shown in Figures 2-13 and 2-14. At some stream reaches, armoring of sewer infrastructure (i.e. placement of large rocks to protect infrastructure within stream beds) is evident. Maps of sewer infrastructure at the selected stream sites identify that most streams have sewer lines running parallel, at or under, the stream channel for long

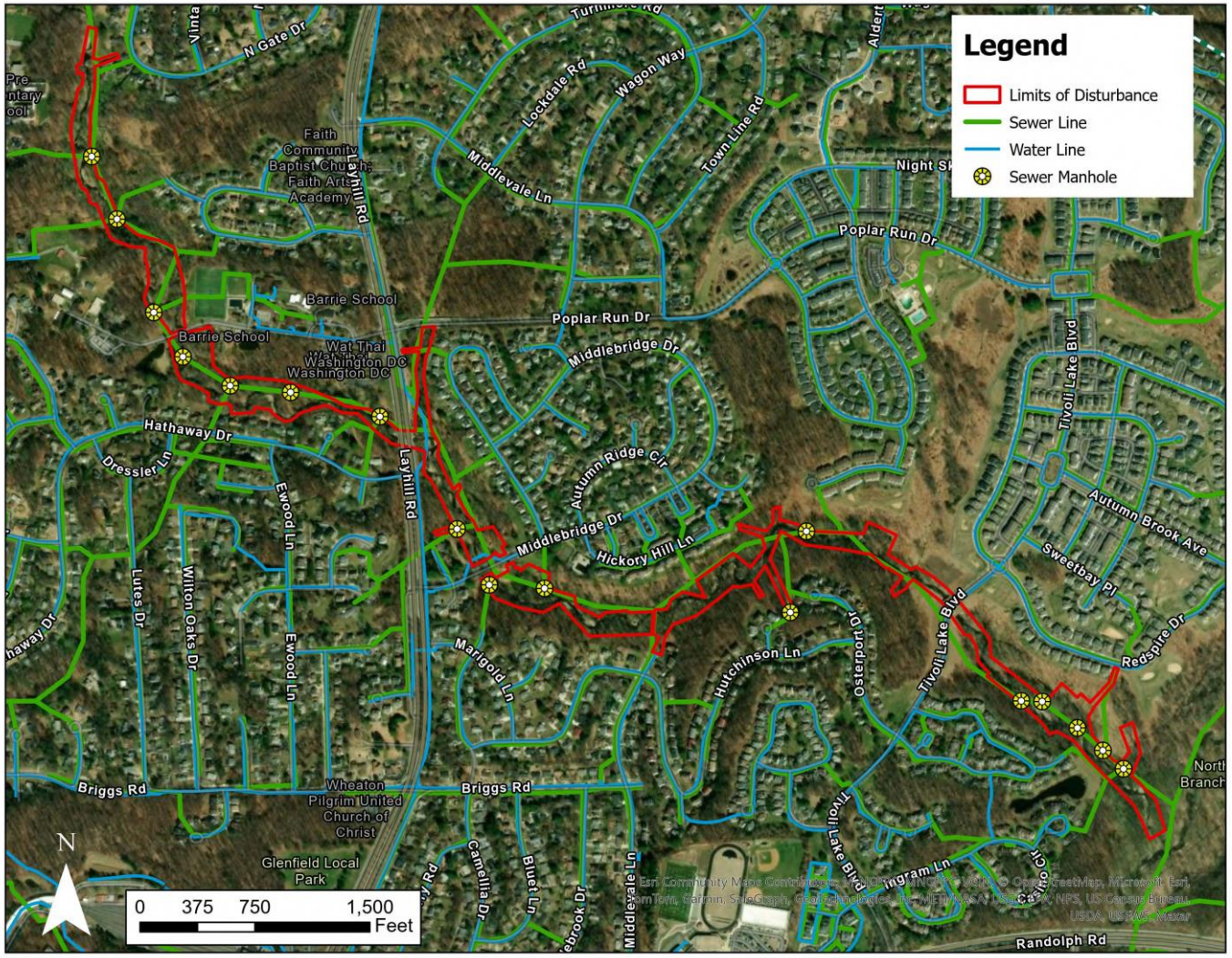


**Figure 2-13: Water and Sewer Line Map – Bel Pre Creek**

*Sewer manholes depicted on Figure 2-14 are only shown within the limits of disturbance for visual purposes, as opposed to showing sewer manholes in the entire map extents.*


**Figure 2-14: Water and Sewer Line Map – Lamberton**

distances. The presence of sanitary sewer infrastructure in stream beds not only affects water quality but can also cause fish blockages. Where piping runs under and perpendicular to a stream bed, in-stream erosion can expose buried utilities, creating new fish blockages.

Water is supplied to 1.8 million residents in Montgomery and Prince George's Counties mainly by the WSSC. Two surface water impoundments on the Patuxent River, including Triadelphia Lake at Brighton in Montgomery County and Rocky Gorge reservoir in Laurel, Prince George's County, supply more than 11 billion gallons of water annually. The majority of households in the selected stream reach locations are supplied by WSSC water supply.

There are a few locations where buried water supply infrastructure intersects the selected reaches. Other utilities in the area include Baltimore Gas and Electric, Washington Gas, and PEPCO Electric Service.

#### *2.5.2.1 FWOP*

Any utility that intersects the project areas or are located within the banks of any given stream channel may continue to become further exposed or degraded without restoration, with special consideration to manholes and sewer lines that lay within or adjacent to the stream channels.

# 3 PLAN FORMULATION AND EVALUATION

## 3.1 Planning Framework

Plan formulation is the process of building plans that meet the planning objectives and avoid planning constraints. Plan formulation for the Anacostia Watershed Restoration, Montgomery County, feasibility study has been conducted in accordance with the six-step planning process described in Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies (USWRC, 1983) and the Policy for Conducting Civil Works Planning Studies (ER 1105-2-103, 2023). The six steps in the iterative plan formulation process are:

1. Identify water resource problems and opportunities;
2. Inventory and forecast conditions;
3. Formulating alternatives;
4. Evaluating alternatives;
5. Comparing alternatives;
6. Recommendation of a plan.

Section 1 in this report outlines the problems and opportunities and introduces the planning objectives, constraints, and considerations. Section 2 discusses existing and future conditions. The following sections describe the plan formulation and selection process (steps 3 through 6, above), including the site selection process, combination of management measures and evaluation of alternatives, and the selection of the TSP. This process is illustrated in Figure 3-1, where the left side of the figure shows the site selection and screening process (described in Section 3.2) and the right side of the figure shows the evaluation of management measures and alternatives and the selection of the TSP (described in Sections 3.2 through 3.5). Appendix B Plan Formulation has additional information related to plan formulation considerations for this study.

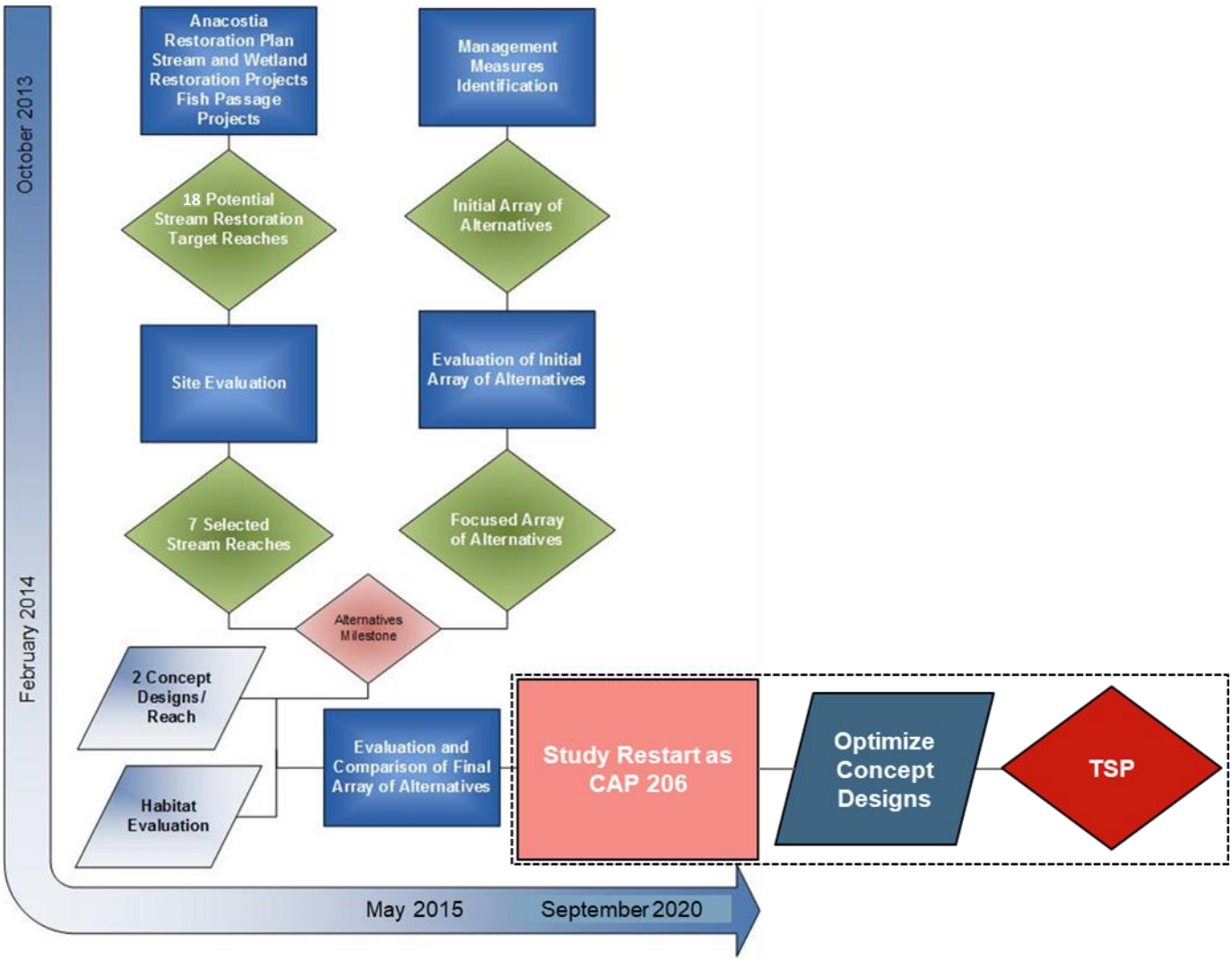


**Figure 3-1: Plan formulation for Anacostia Watershed Restoration, Montgomery County, Maryland**

## 3.2 Site Selection

During the initial analysis conducted for this feasibility study, eighteen stream segments were identified as potential restoration areas based primarily upon the location of sites identified in the ARP and the planning considerations and constraints outlined in Section 1.7 (see Figure 3-2 for stream locations). From these sites, seven were selected for further investigation and the development of conceptual designs. These sites were selected based on meeting the following criteria and working within the planning constraints and considerations. The selection criteria included:

1. Aquatic habitats are degraded (and fish and/or benthic IBI are poor);
2. The stream reach has potential for restoration by USACE projects;
3. Located on primarily public lands with forest cover or existing riparian buffer.

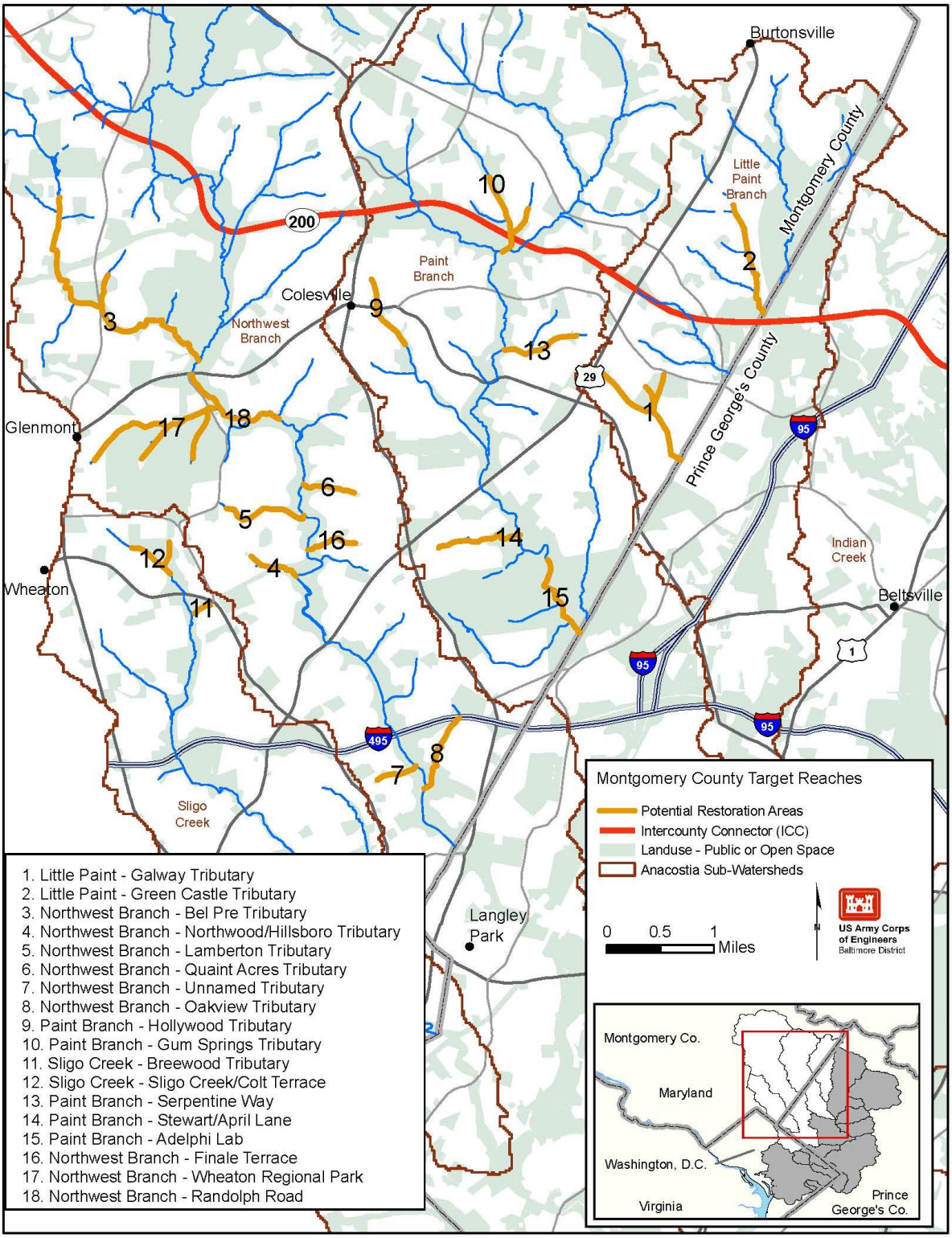


**Figure 3-2: Initial 18 Stream Segments for Anacostia Watershed Restoration Study**

Criterion 2 was based on a “yes” or “no” judgment as to whether a stream could be improved by USACE actions. Sites were not selected if improvement was constrained by factors that would not be affected by a USACE project. For example, sites were not selected if located downstream of large commercial or industrial developments that would adversely impact water quality such that habitat restoration would have little impact on aquatic life. Selecting sites upstream of large industrial or commercial areas also avoids illicit (i.e. non-stormwater) discharges to the stormwater system that could contribute to poor quality streams. Sites were also not selected if stream habitat was judged to be good, such that there was a danger of doing more harm than good if restoration was implemented.

Table 3-1 shows the stream reaches that were considered during the site selection process and the primary criteria used in the selection process. Where cells in Table 3-1 are blank, the criterion was either neutral or not assessed due to immediate elimination based on another criterion. Appendix B provides further information on all of the reaches considered for selection and a description of the general habitat condition, initial outline of potential restoration opportunities, and assessment of considerations for selected stream reaches.

Sites that met most of the above criteria were selected (Table 3-2 and Figure 3-3) for detailed study. The planning consideration to prioritize activities on public land was based on previous experience of the non-Federal sponsor working in the Anacostia River watershed, who found it difficult to obtain real estate easements for work on private property.

**Table 3-1: Site selection criteria for stream reaches considered for study**

| Reach | Subwatershed | Status | Criteria 1: Degraded habitat | Criteria 2: Improvement potential | Criteria 3: Public Lands | Notes |
|---|---|---|---|---|---|---|
| **Galway Tributary** | Little Paint Branch | Selected | √ | √ | | Upstream of long concrete channel – no identified major fish blockage. Some private land on downstream end of site |
| **Green Castle Tributary** | Little Paint Branch | Selected | √ | √ | √ | |
| **Bel Pre Tributary** | Northwest branch | Selected | √ | √ | | Some private lands on upstream end of identified site |
| **Northwood/Hillsboro Tributary** | Northwest Branch | Not selected | × | × | √ | MCDEP restoration project already in reach |
| **Lamberton Tributary** | Northwest Branch | Selected | √ | √ | √ | |
| **Quaint Acres Tributary** | Northwest Branch | Selected | √ | √ | √ | |
| **Unnamed Tributary** | Northwest Branch | Not selected | √ | × | √ | Restoration project in design phase with WSSC |
| **Oakview Tributary** | Northwest Branch | Not Selected | √ | × | √ | Restoration project in design phase with WSSC |
| **Northwest Branch Mainstem below Randolph Road** | Northwest Branch | Not selected | × | × | √ | Restoration work has been completed by others. |
| **Finale Terrace** | Northwest Branch | Not Selected | √ | x | x | Ownership and access unclear with little potential for habitat improvement |
| **Wheaton Regional Park** | Northwest Branch | Not Selected | √ | x | √ | Park Master Plan process underway with habitat improvements expected. |

| Reach | Subwatershed | Status | Criteria 1: Degraded habitat | Criteria 2: Improvement potential | Criteria 3: Public Lands | Notes |
|---|---|---|---|---|---|---|
| | | | | | | Infrastructure relocation necessary. |
| **Hollywood Tributary** | Paint Branch | Not Selected | √ | | √ | Scheduled to be restored by county |
| **Gum Springs Tributary** | Paint Branch | Not Selected | √ | √ | √ | Gum Spring was not selected as there is existing work by others to improve the stream through restoration and the purchase of large areas of forested parkland |
| **Stewart/April Lane** | Paint Branch | Selected | √ | √ | √ | |
| **Serpentine Way** | Paint Branch | Not selected | √ | × | √ | In study by others |
| **Adelphi Lab** | Paint Branch | Selected | √ | √ | | Federal property |
| **Breewood Tributary** | Sligo Creek | Not selected | √ | × | √ | WSSC project location |
| **Sligo Creek/Colt Terrace** | Northeast Branch | Selected | √ | √ | √ | |

*√ = criteria met; × = criteria not met; blank = neutral.*
*Sites "not selected" were not selected for further investigation under this feasibility study*

**Table 3-2: Characteristics of the project stream reaches selected for study**

| Reach | Length (miles) | Drainage Area (acres) | Number of adjacent ARP Projects* | IBI Score (Fish) | IBI Score (Benthic) | Percent Impervious Surface | Percent Riparian Cover (100-feet) |
|---|---|---|---|---|---|---|---|
| ***Little Paint Branch*** | | | | | | | |
| **Galway Tributary** | 1.8 | 890 | 6 | Poor | Fair | 52 | 70 |
| **Green Castle Tributary** | 1.2 | 950 | 2 | Good** | Partially Supporting** | 46 | 95 |
| **Subtotal** | **3.0** | **1840** | **8** | **Good**/ Poor** | **Fair/ Partially Supporting**** | | |
| ***Northwest Branch*** | | | | | | | |
| **Bel Pre Tributary** | 3.1 | 2800 | 7 | Poor | Fair | 32 | 86 |
| **Lamberton Tributary** | 1.0 | 350 | 0 | Poor | Poor | 31 | 97 |
| **Quaint Acres Tributary** | 0.5 | 470 | 1 | Fair | Poor | 7 | 97 |
| **Subtotal** | **4.6** | **3620** | **11** | **Good/ Fair/ Poor** | **Fair/Poor** | | |
| ***Paint Branch*** | | | | | | | |
| **Stewart/April Lane** | 0.8 | 230 | 0 | N/A | Poor | 70 | 60 |
| **Subtotal** | **0.8** | **230** | **0** | **N/A** | **Poor** | | |
| ***Sligo Creek*** | | | | | | | |
| **Sligo Creek/Colt Terrace** | 0.7 | 380 | 7 | Poor | Poor | 37 | 16 |
| **Subtotal** | **0.7** | **380-** | **7** | **Poor** | **Poor** | | |
| **Total** | **8.4** | **5690** | **26** | **N/A** | **N/A** | | |

**Adjacent projects include ARP ecosystem restoration projects only*
***IBI data from Prince George's County Department of Environmental Resources monitoring data from station 05-028*

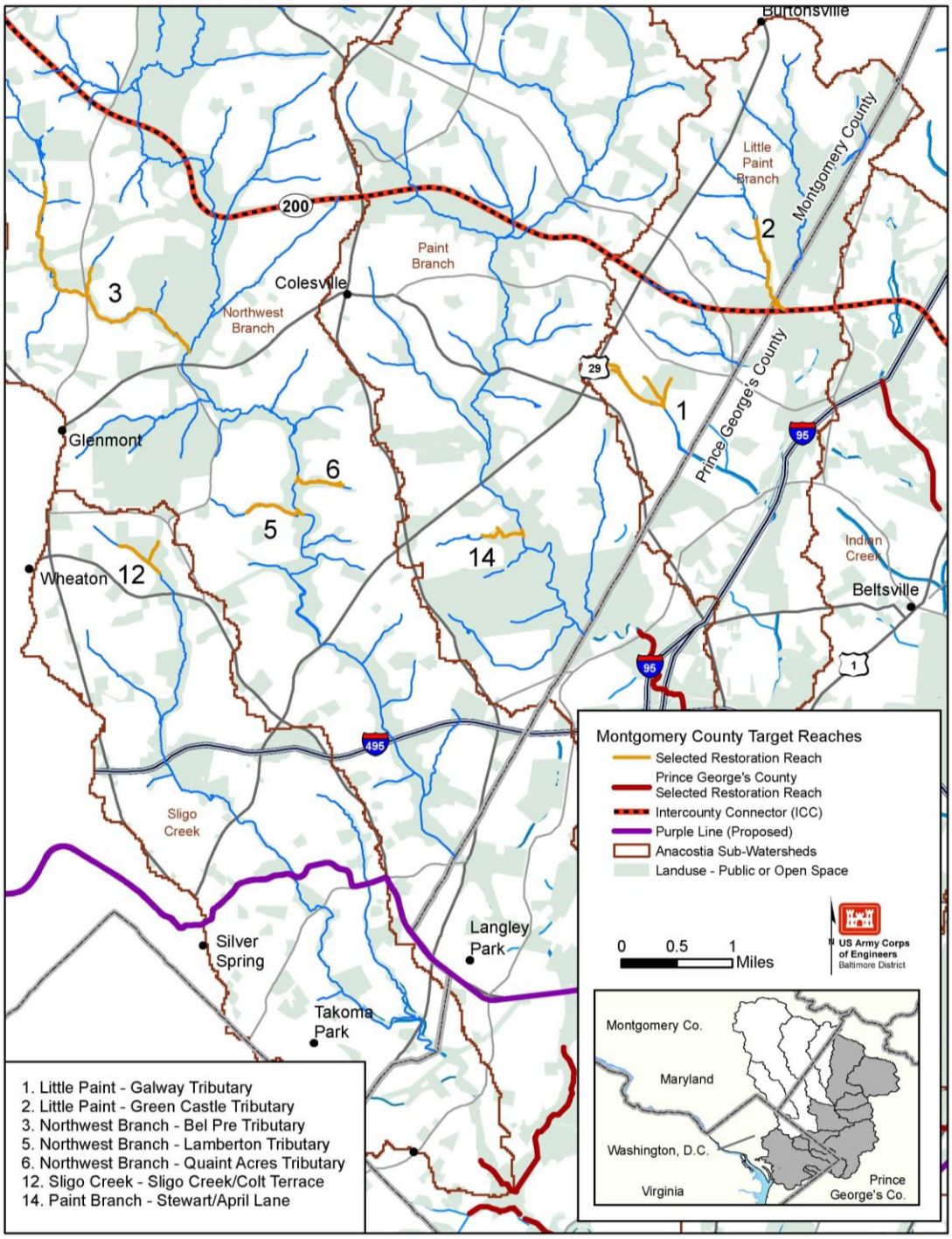


**Figure 3-3. Project area and selected stream reaches in Montgomery County, Maryland**

## 3.3 Management Measures

Potential management measures, features that can be implemented at the project reaches to address planning objectives, were identified following the development of project problems, opportunities, objectives, constraints, and considerations and are summarized in Table 3-3. Over the course of the planning process, project objectives evolved into the objectives identified in Section 1.7; however, objectives initially included in-stream habitat restoration, fish passage, wetland restoration, and enhancement of floodplain connectivity. Management measures for several restoration design philosophies were considered, including for:

- Natural channel design
- Legacy sediment removal
- Hard design
- Streambank Stabilization (USACE Engineer and Research Development Center (ERDC))
- Regenerative stormwater conveyance

There are multiple types of stream restoration, wetland restoration, and fish passage measures that could potentially be implemented. These measures can be combined over the length of a stream segment to achieve different restoration objectives. After conceptual designs for each potential restoration reach were developed, these measures were re-examined to determine whether additional alternatives could be generated. No additional measures were identified that met planning objectives and did not violate planning constraints. The potential project reaches were spatially constrained by adjacent private properties that preclude the use of some measures. Other measures require the removal of mature trees. While some measures may provide stream stability and prevent bank erosion (such as concrete and gabion structures), they are not formulated for ecosystem benefits. Measures for wetland restoration were considered because the project objectives initially included wetland restoration as a secondary objective. However, because formulation for wetlands was secondary, it was later determined that the available data was not sufficient to quantify wetland benefits for this evaluation. However, the project is anticipated to contribute to the reconnection of streams with the adjacent floodplains, which will increase saturation of hydric soils and potentially aid in the reestablishment of floodplain wetlands.

**Table 3-3: Ecosystem restoration management measures for the objectives***

| Measure | Objective | | | |
|---|---|---|---|---|
| | Stream Restoration | Fish Passage | Wetland Restoration* | Connectivity |
| Floodplain | | | | |
| Create New | ● | | ● | ● |
| Reconnect by lowering bank | ● | | ● | ● |
| Reconnect by raising stream | ● | | ● | ● |
| Vegetation (riparian and in-stream) | ● | | ● | |
| Habitat | | | | |
| Root wads | ● | | | |
| Boulders | ● | | | |
| Riffles/Pools | ● | | | ● |
| Lunkers and "man-made objects" | ● | | | |
| Coarse Woody Debris | ● | | ● | |
| Grade Control Structure | | | | ● |
| Step Pools | ● | ● | ● | ● |
| Weirs | ● | | ● | ● |
| Vanes | ● | | ● | ● |
| J-Hooks | ● | | ● | ● |
| Riffle grade control | ● | ● | | ● |
| Connection | | | | |
| Fish Ladder | | ● | | ● |
| Step Pools | ● | ● | | ● |
| Blanketing | | | | |
| Rip-Rap | ● | | | |
| Gabion Basket | | | | |
| Concrete channel excavation (mid-channel) | ● | ● | | ● |
| Concrete channel modification (baffles) | ● | | | ● |
| Imbricated Rip-Rap | ● | | | |
| Pipe Daylighting | ● | | | ● |
| Stream Relocation | ● | ● | ● | ● |
| Infrastructure Relocation | ● | ● | ● | ● |
| Riparian Invasive Species Removal | | | ● | ● |

**The initial objective for wetland benefits was removed over the course of the planning process, and fish passage and connectivity were combined into one objective.*

## 3.4 Arrays of Alternatives

Alternatives are a set of one or more management measures functioning together to address planning objectives. The alternatives listed in Table 3-4, which include combinations of the management measures presented above, were evaluated in this study.

**Table 3-4: Array of Alternatives**

| Alternative | Alternative Description |
|---|---|
| **Alternative 1: No Action** | No federal action through this study. |
| **Alternative 2a: Natural Channel Design** | This alternative includes in-stream habitat improvement with wetland restoration where appropriate, improved stream and floodplain connectivity, stream relocation where appropriate fish passage improvements, and invasive plant species removal where appropriate. |
| **Alternative 2b: Natural Channel Design with Major Infrastructure Modification** | This alternative includes all measures in alternative 2a in addition to relocation or movement of major infrastructure such as bridges, concrete channel alteration, and roads to provide habitat improvement. |
| **Alternative 2c: Natural Channel Design without Concrete Channel Removal** | This alternative includes all measures in alternative 2b but does not include concrete channel alteration to reduce overall costs. |
| **Alternative 3: Hard design** | This alternative includes the use of riprap, gabion baskets, and concrete matting for stream improvement, wetland restoration where appropriate, stream relocation where appropriate, fish passage improvement, and invasive plan species removal where appropriate. |
| **Alternative 4: Streambank Stabilization** | This alternative consists of stream bank stabilization techniques for stream restoration from ERDC and includes wetland restoration where appropriate, stream relocation where appropriate, partial removal of concrete in channelized stream reaches, daylighting pipes where appropriate, fish passage improvement, and invasive species removal where appropriate. |

## 3.5 Evaluation and Initial Screening of Array of Alternatives

The array of alternatives was evaluated using the criteria and metrics listed in Table 3-5, which are based on planning objectives and constraints presented in Section 1.8 and the Principles and Guidelines (P&G) criteria. The P&G criteria are completeness, effectiveness, efficiency, and acceptability and are defined below:

- **Completeness** – the extent to which a given alternative provides and accounts for all necessary investments or actions to ensure the realization of the planned effects.

- **Effectiveness** – the extent to which an alternative alleviates the specified problems and achieves the specified opportunities.
- **Efficiency** – the extent to which an alternative is the most cost-effective means of alleviating the specified problems and realizing the specified opportunities, consistent with protecting the nation's environment.
- **Acceptability** – the extent to which the alternatives are acceptable in terms of applicable laws, regulations and public policies.

**Table 3-5: Criteria and metrics used for evaluation of the initial array of alternatives**

| Criteria | Metric | Definition |
|---|---|---|
| **Effectiveness (Ecosystem Benefits)** | Yes/Neutral/No | Creation of stream complexity to support habitat diversity |
| **Ecosystem Impacts** | High/Low | Long-term negative impact to natural features within project area (e.g. trees, bedrock) |
| **Community Impacts (Surrounding Built Environment)** | High/Low | Alteration to flooding; recreation space & trails; public utilities; infrastructure |
| **Efficiency (Cost Effectiveness)** | $ / $$ / $$$ | General "low" ($100s/linear feet - lf), "medium" ($200s/lf), "high" ($300s/lf) |
| **Acceptability** | + 0 - | Acceptable in terms of applicable laws, regulations, and public policies. |
| **Sustainability** | High/Med/Low | Measure of the sustainability and practicality of operation, maintenance, repair, rehabilitation and replacement of the project (OMRRR). |

Table 3-6 shows the screening of alternatives using these criteria for the initial evaluation conducted in this study. Based on this analysis of the array of alternatives, Alternatives 2a and 2c best met the project objectives for ecosystem restoration. The natural channel design alternatives offer ecosystem restoration benefits with low environmental impact while being implementable and sustainable. The focused array of alternatives carried forward for concept designs and further evaluation include:

- Alternative 1: No Action
- Alternative 2a: Natural Channel Design
- Alternative 2c: Natural Channel Design without Concrete Channel Removal

**Table 3-6: Screening of alternatives**

| Criteria | Alternative 1 No Action | Alternative 2a Natural Channel Design | Alternative 2b NCD with Major Infrastructure Modification | Alternative 2c NCD without Concrete Channel Removal | Alternative 3 Hard Design | Alternative 4 Streambank Stabilization |
|---|---|---|---|---|---|---|
| **Effectiveness (Environmental Benefits)** | Neutral | Yes | Yes | Yes | Low | Neutral |
| **Environmental Impact** | High | Low | Low | Low | High | Low |
| **Community Impacts (Surrounding Built Environment)** | Low | Low | High | Low | Low | Low |
| **Efficiency (Cost)** | - | $$$ | $$$ | $$ | $$ | $ |
| **Acceptability** | + | + | + | + | + | + |
| **Sustainability** | Low | High | High | High | Med | High |
| **Screening Decision** | **Retained** | **Retained** | **Screened due to high costs associated with infrastructure modification** | **Retained** | **Screened due to low environmental benefits and does not meet ecosystem restoration objectives** | **Screened due to lower environmental benefits in contrast to Alternative 2** |

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# 4 ENVIRONMENTAL EFFECTS AND CONSEQUENCES

## 4.1 Introduction

This section presents the potential environmental consequences of implementing the Proposed Action. The potential impacts to the human and natural environment were evaluated relative to the existing environment described in **Section 2.0 – Existing and Future Without Project Conditions**. For each environmental resource or issue, anticipated direct, indirect, and cumulative impacts were assessed, considering both short- and long-term project impacts as required by NEPA (40 CFR 1501.5(c) and 40 CFR 1508.1(i) dated April 20, 2022). The effects of the No-Action Alternative are the same as FWOP Condition. The FWOP condition is evaluated for each resource topic in Chapters 2.3 and 2.4 above and is not repeated in this section.

Potential impacts are described in terms of type (beneficial or adverse); duration (short- or long-term); and intensity (negligible, minor, moderate, or major). Explanations of these terms are as follows:

- Type: The impact type refers to whether it is adverse (negative) or beneficial (positive). Adverse impacts would potentially harm resources, while beneficial impacts would improve resource conditions. Within the analysis, impacts are assumed to be adverse unless identified as beneficial.
- Duration: Impacts resulting from construction are considered short-term and would occur during construction or site improvements. Long-term impacts would persist during the operation of properties and facilities.
- Intensity: The intensity of an impact describes the magnitude of change that the impact generates. The intensity thresholds are as follows:
    - Negligible: There would be no impact, or the impact would not result in a noticeable change in the resource.
    - Minor (not significant): The impact would be slight, but detectable, resulting in a small but measurable change in the resource.
    - Moderate (not significant): The impact would be readily apparent and/or easily detectable but would not substantially alter the resource or exceed regulatory thresholds.
    - Major (significant): The impact would be widespread and would substantially alter the resource or exceed regulatory thresholds. A major, adverse impact would be considered significant under NEPA.

## 4.2 Natural Environment

### 4.2.1 Wetlands

#### *4.2.1.1 Proposed Action (Alternative 2a: Natural Channel Design)*

Wetland impacts from the proposed project would be adverse, short-term, and minor and should be avoided where possible. Through MD DNR's online mapping service, approximately 1.43 acres of riparian wetlands exist within the Bel Pre Creek project area. There are no MD DNR mapped wetlands within the Lamberton Creek project area. A wetland delineation will occur in the design and implementation phase and wetland acreages are subject to change. Any temporary wetland disturbance that may occur during construction would be fully restored without extensive grading (i.e., replanted with native wetland vegetation species following construction). Direct, long-term and beneficial impacts are anticipated, and it is expected that it will take several years for native wetland vegetation to become established. Minor grading would occur where the stream meets the wetland to promote connection between the stream and wetland areas. The restoration work would likely further assist the natural function of wetlands and result in an increase of aquatic resource functions and services. The project would be coordinated with MDE and others as appropriate to secure all other permits for work affecting wetlands or riparian areas, as necessary. A Park Construction Permit would also be necessary to perform any work on M-NCPCC property. The Park Construction Permit would be coordinated and acquired during the design and implementation phase of the project.

Reconnection of stream channels with the adjacent floodplain (by reducing stream incision) would improve existing floodplain functions by slowing stormwater velocity, storing sediment, increasing infiltration, and removing pollutants. Restored hydrology would allow wetlands to become reestablished along restored stream reaches which would also serve to replenish groundwater aquifers (increase infiltration) and provide important food and shelter for a variety of resident and transient wildlife, such as mammals, birds, reptiles, and amphibian species.

Prior to restoration work (during the design phase), existing wetlands will be delineated along the stream corridors. Identified wetlands adjacent to the limits of disturbance (LOD) would be marked, mapped, added to construction plans and, in every attempt, avoided. Efforts to minimize and avoid impacts to wetlands include minimizing areas needed for access and staging and locating staging and access points outside wetland boundaries. Access would be achieved by traveling in the stream bed or utilizing currently disturbed areas to avoid wetlands. Also, work areas could be accessed from the opposite streambank if wetlands are not present in those areas. The LOD will be adjusted and minimized to prioritize not impacting existing wetlands.

*Lamberton Creek*

The Proposed Action may result in direct, adverse, short-term, minor impacts to wetlands. Due to the local topography and steep slopes within the Lamberton study

area, minimal wetlands exist; however, through a preliminary field investigation by USACE biologists in November 2022, wetland seeps or pocket wetlands were identified along the southern portion of the study area. An official wetland delineation report was not developed as the site visit was early reconnaissance. Vegetation was sparse during the time of year of the site visit and most of the seeps were covered with dense leaf litter. All wetland impacts should be avoided to the extent practicable. Wetlands would not be allowed to be impacted for staging or foot traffic. It was also noted that the wetlands identified existed along previous access roads that may have been utilized for past restoration efforts.

*Bel Pre Creek*
The Proposed Action may result in direct, adverse, short-term, minor impacts to wetlands within the Bel Pre Creek study area. Existing wetlands exist throughout much of the study area at Bel Pre and a wetland delineation will be performed during the design and implementation phase to quantify impacts to existing wetlands. Alternative 2a would implement best management practices and alternative access routes to avoid wetlands and their associated buffers; however, some wetlands may not be easily avoidable to successfully restore the stream channel. All wetland impacts should be avoided to the extent practicable. Wetlands would not be allowed to be impacted for staging of foot traffic. Conversely, direct, long-term, positive benefits to wetlands would occur as a result of Alternative 2a. Creating a natural design in the stream channel would allow Bel Pre to be reconnected with the adjacent floodplain and serve as a means of hydrology to existing wetlands with the potential for new wetlands to be created after construction. Wetland restoration would introduce several functions and values to the tributary including flood flow attenuation, sediment trapping, wildlife habitat, and groundwater recharge.

### 4.2.2 Floodplains

#### *4.2.2.1 Proposed Action (Alternative 2a: Natural Channel Design)*

*Lamberton and Bel Pre Creeks*
The Proposed Action may result in direct, adverse, short-term, minor impacts to the 100-yearfloodplain. Impacts to the floodplain may occur through construction activities such as access roads. Construction staging and temporary stock piling should not occur within the floodplain unless absolutely necessary. The intent is to reconnect the stream to its floodplain so manipulation of the existing floodplain will be minimal. Additionally, mulch and wood matting would be required for all access roads and staging areas. Converting the existing stream channel into a natural channel will produce direct, long-term, positive benefits to the 100-yearfloodplain. Reconnecting the stream will create habitat opportunities, promote flood dispersion, and allow for sediment trapping within the floodplain. The existing seep and floodplain wetland complex should be protected from all impacts including hydrological changes.

### 4.2.3 Rare, Threatened, and Endangered Species

#### *4.2.3.1 Proposed Action (Alternative 2a: Natural Channel Design)*

The species identified in Section 2.3.3 have the potential to be present within the two project areas. If a species is present within the project areas at the time of construction, there may be indirect, adverse, short-term, minor impacts to RTE species as a result of the Proposed Action. The USFWS IPaC analysis for the determination key dated 16 January 2025 (Appendix C3) indicated that the Proposed Action will result in a "No Effect" to the Northern Long-Eared Bat and the Tricolored Bat. Minor impacts may be in the form of construction noises such as constructing access points and construction vehicles. However, these impacts are expected to be short-term and minor, and species would be expected to return to their normal habitat post-construction. Other 'at-risk' species or birds of conservation concern may be temporarily displaced during construction activities, but design would allow for access routes to maneuver around some resources that at-risk species may use as habitat. Additionally, work would be defined to the stream channel with minimal impacts to the surrounding floodplain/upland areas.

The Northern Long-Eared Bat was listed as threatened under the ESA in 2015 (80 Federal Register [FR] 17974), and a special rule pursuant to section 4(d) of the ESA was finalized in 2016 (81 FR 1900). The 4(d) rule applied take prohibitions to the northern long-eared bat. After the status of the Northern Long-Eared Bat changed from threatened to endangered, the USFWS developed the Interim Consultation Framework to help federal agencies ensure that their actions are not likely to jeopardize Northern Long-Eared Bats while streamlining formal consultation for federal actions consistent with the former 4(d) rule.

### 4.2.4 Migratory Birds

#### *4.2.4.1 Proposed Action (Alternative 2a: Natural Channel Design)*

The results of the RAIL data listed over 200 species, many of these are not expected to be nesting within the project area but have a potential to use the project area (USFWS PAR, 2023). The Proposed Action may have short-term indirect, adverse, impacts to population level effects on species utilizing the area during migration while the project is being constructed. Alternatives that would create improved riparian areas, remove invasive species and retain large forest tracts would offer direct, long-term benefits through way of resting areas for forest dwelling species using the project site during migration (USFWS, PAR 2023). The contractor would abide by the necessary TOYR associated with Northern Long-Eared Bat, wood thrush, and cerulean warbler to avoid impacts to these species potentially using the sites as breeding or nesting grounds.

### 4.2.5 Anadromous and Catadromous Fish

#### *4.2.5.1 Proposed Action (Alternative 2a: Natural Channel Design)*

American eel (*Anguilla rostrata*) has been surveyed by MCDEP within the proposed project areas; they are the only catadromous eel native to Atlantic coastal waters. Its

status was reviewed by the USFWS in 2007 and 2015 for listing under the ESA. Both times, the determination was that protection is not warranted. The population appears to be stable; a FWOP alternative would not have a positive or negative effect on this species within the project area. An alternative that removes fish blockages would have a positive impact on the species and water quality and allows aquatic organisms to travel further upstream in these tributaries. Mussels are restricted to the lower mainstem of the Anacostia River within the tidally influenced zone. This project is far enough upstream that it will not have any direct or indirect, adverse impacts to mussels in the watershed (USFWS PAR, 2023).

Sessile or slow-moving animals in the path of discharges, equipment, and construction materials may not survive by the placement of fill materials necessary for the permanent components of the projects. During project construction, fish and other motile animals would likely avoid the construction site. As aquatic benthic organisms are expected to recolonize temporarily disturbed or dewatered areas within a short period of time after temporary fill materials are removed following construction, these impacts are projected to be temporary. Fish relocation and exclusion netting would be required prior to construction. Timeframes for recolonization would vary depending on the organism, life-cycle traits, and mechanism of recolonization (e.g., downstream drift, upstream movement, migration from hyporheic zone, aerial transport) (Wallace, 1990; Mackay, 1992). Studies generally indicate that for this type of disturbance (resulting in improved habitat post-disturbance), colonization begins within days and populations may be largely recovered within several months (Gore 1979; Gore, 1982; Mackay, 1992) to years. Generally, filter feeders tend to colonize first, followed by grazers/collectors, and predators and shredders last (Malmqvist, et. al, 1991). Motile aquatic animals would return to temporarily impacted aquatic areas that are restored by the project.

Implementation of time-of-year restrictions extending from February 15 to June 15, of any year, will help to protect anadromous fish spawning that occurs during those times. The proposed project will abide by stream closure periods, per MDE regulation, and restrict all in-stream construction during those periods. The purpose of this project is to restore stream habitat, and therefore, all efforts will be made to protect that habitat during construction. Additionally, MDE may require other BMPs during construction to minimize impacts to aquatic life. With the combination of the minimal diversity of existing aquatic organisms based on IBI assessments in the watershed, natural recovery potential, and BMP measures, it is anticipated that negative impacts to aquatic life from construction would be minimal. The project would be coordinated with USFWS, MDE, M-NCPPC and MD DNR as necessary for consultations and to secure required permits.

Some turbidity may be generated during construction activities resulting in direct, adverse, short-term, minor impacts, but it is expected to have minimal impact on aquatic life, as discussed above. Overall, the long-term, stream geomorphic restoration work is expected to benefit aquatic organisms by permanently improving water quality, increasing baseflow, enhancing habitat quality, and increasing habitat diversity.

Restored streams would provide greater spawning and resident habitat for aquatic organisms. Habitat features would be more stable over time, and excess fine-grained sediment would not negatively affect riffle habitat.

### 4.2.6 Vegetation and Wildlife

#### *4.2.6.1 Proposed Action (Alternative 2a: Natural Channel Design)*

Direct, adverse, short-term and long-term, minor impacts to vegetation would be expected as a result of the Proposed Action construction activities. Efforts to prevent as little disturbance to natural habitat as feasible would be taken in implementing the Proposed Action. If disturbance would occur, the sponsor would comply with the provisions of Montgomery County Forest Conservation and M-NCPPC, likely through a Forest Conservation/Planting Plan or Tree Conservation Plan (TCP). All trees greater than 6" diameter at breast height (dbh) would need to be field surveyed and represented on design plans during the design and implementation phase. Additionally, treatment of NNIs on parkland should follow M-NCPPC's "Best Management Practices for Control of Non-Native Invasive Plants" (January 2015) guidance documents (USFWS PAR, 2023).

Direct, adverse, short-term, minor impacts are expected to wildlife. Construction occurring during colder weather months could potentially impact any amphibians or reptiles occurring at the sites because of the poor mobility of these species in colder weather. Nesting and roosting birds and offspring in the disturbance areas may be adversely affected. Other wildlife species are expected to temporarily relocate away from project areas to avoid construction but would likely return upon completion of the project. No permanent displacement of wildlife populations is expected. The project sites that include plantings would provide additional food for herbivorous wildlife. The project may require fencing or limit access to the plantings to attempt to minimize predation during establishment of vegetation. Wildlife associated within the streams and wetlands in the area would benefit by the improved water quality and additional habitat that the restoration projects would provide.

The upland riparian zone is currently a mixture of scrub/shrub, grasses, and deciduous trees. Invasive shrub species are mixed in with native species, but some locations include small areas where invasive species dominate. Upland riparian forest vegetation at the project sites are typically broad-leaved deciduous communities. Upland riparian plant communities along stream corridors provide shelter, shading to waters, detritus, and breeding and rearing areas for various fish and other aquatic organisms.

In order to address geomorphic instability, there would be direct, adverse, long-term (years to decades), minor, impacts to upland riparian vegetation. Work would include clearing of some of the existing riparian vegetation for access to the streams, creation of floodplain benches within incised channels, and minor grading and/or excavation to create shallow depressions and/or deepen existing pools. All riparian impacts would be temporary as vegetation would be replanted.

Direct, beneficial, long-term impacts (twenty years or more for replanted trees to reach maturity) would occur within areas where trees would be cleared to access and work within the streams. The impacts from the removal and re-establishment of scrub/shrub vegetation would be a short-term impact (several years), as recovery would be achieved sooner than the replacement of mature trees. It is anticipated that following project implementation, there would be no further loss of trees at these sites as the project would stabilize current bank erosion problems. All locations where vegetation is removed will be replanted with native vegetation following completion of construction.

Efforts will focus on minimizing the loss of mature trees and the associated long-term impacts. Preconstruction surveys will identify forested areas and specimen trees to retain mature trees and their value. Specimen trees, as defined by MD DNR (1997), are trees having a diameter measured at 4.5 feet above the ground of 30 inches or more, or trees having 75 percent or more of the diameter of the current state champion tree. Additionally, the planting contract will be structured to ensure survival of these plants and reduce encroachment of invasive plants. A portion of the cleared area will become stream habitat due to stream realignment.

Invasive species that reduce the ability of riparian plant communities to provide important ecological services (including habitat, shade, woody debris and leaf litter inputs to support the restored aquatic ecosystems) would be removed upon project construction and the disturbed area would be replanted with native vegetation. An invasive species management plan would be developed during the design and implementation phase of the project with specifications to ensure minimization of the spread of invasive species through best management practices, such as the cleaning of equipment to prevent seed transfer.

The work proposed would provide overall benefits to the stream and riparian zone through increased stream-floodplain reconnection, improvements to water quality through sediment and nutrient retention, decreased invasive species, increased bank stability, increased shading, and increased inputs of woody debris and detritus to the stream. Some riparian vegetation species may be favored at the detriment of other riparian species due to increasing saturation and floodplain interactions associated with restoration activities. Additionally, the prevention of future streambank erosion through the establishment of a more sustainable stream course would indirectly benefit riparian areas, established trees, and wetlands adjacent to the stream that would have been threatened by erosion and lost.

### 4.2.7 Soils

#### *4.2.7.1 Proposed Action (Alternative 2a: Natural Channel Design)*

Implementation of the Proposed Action would result in direct, adverse short-term, minor impacts to soils within the project areas. Short-term impacts would be expected due to

temporary ground disturbances during construction access and vehicles. Soil compaction would be avoided through the use of mulch and wood matting. Any new earth disturbance that occurs outside of the extents of the existing stream channel or within the riparian buffer would be replanted with native vegetation. These sites would be re-graded and re-vegetated with native seed grasses and landscape vegetation which would minimize long-term impacts in accordance with MCDEP and M-NCPPC county code and parkland code, respectively.

An Erosion and Sediment Control Plan would be required through the Montgomery County Soil Conservation District for each segment that would disturb more than 5,000 square feet and obtaining coverage under the NPDES General Construction Permit, as applicable to each segment. Sediment and erosion control BMPs include sandbags, silt fences, earthen berms, fiber rolls, sediment traps, erosion control blankets, check dams in medium-sized channels, or straw bale dikes in a smaller drain channel. Implementing erosion and sediment control BMPs during construction, as specified in those plans, would minimize the impacts to soils.

Accidental release of contaminants such as hydraulic and lubricating oils or cooling fluids could occur during construction, along with accidental releases of pollutants into soils during routine maintenance activities. Any accidental release of contaminants or liquid fuels would be addressed in accordance with the base's Spill Prevention, Control, and Countermeasure Plan (SPCCP). The likelihood of an accidental release would be low because of implementation of spill prevention and containment measures, as provided in the SPCCP (US EPA, 2023).

## 4.3 Physical Environment

### 4.3.1 Climate

#### *4.3.1.1 Proposed Action (Alternative 2a: Natural Channel Design)*

No impacts (direct or indirect) to the climate would occur as a result of the Proposed Action. It is likely that improved wetland function may assist with carbon sequestration.

### 4.3.2 Land Use

#### *4.3.2.1 Proposed Action (Alternative 2a: Natural Channel Design)*

Land use would not be impacted if the Proposed Action would alter acreage for a land use category in either the existing or surrounding project site. The Proposed Action is located on M-NCPPC parkland which will continue to be protected and unchanged (unless through further restoration efforts) throughout the foreseeable future.

### 4.3.3 Geology

#### *4.3.3.1 Proposed Action (Alternative 2a: Natural Channel Design)*

No impacts (direct or indirect) to geology are anticipated within the stream segments due to the Proposed Action.

### 4.3.4 Topography

#### *4.3.4.1 Proposed Action (Alternative 2a: Natural Channel Design)*

Topographic changes would largely be confined to the stream channel and floodplain and would be direct, adverse, long-term, and minor. Changes in floodplain topography at some sites are necessary to provide hydraulic stability, but also have the long-term, direct and indirect benefits of enhancing stream-floodplain reconnection. At some locations, the streams will be relocated along short lengths to increase stream stability and restore natural geomorphic condition and historical in-stream habitat. The locations where the stream is shifted, or where topography is changed, will be restored as riparian area and/or floodplain benches. Where existing infrastructure is to be protected, rocks placed to protect structures would increase streambed and floodplain elevations by up to several feet where the structures are located. At staging sites, local grading may be done to facilitate temporary storage of equipment and access to the stream. Staging areas would be restored to their original condition (e.g., replanted, except with native instead of invasive vegetation) after construction is completed.

### 4.3.5 Waterways and Hydrology

#### *4.3.5.1 Proposed Action (Alternative 2a: Natural Channel Design)*

As a result of the Proposed Action, there would be direct and indirect, long-term and beneficial improvements in the quality of the instream habitat. Stream function would increase and there would be an increase in acreage of connected floodplain habitat. The new design aims to allow for the development of a dynamic and diverse aquatic habitat. The Proposed Action would have direct and indirect, long-term, positive impacts on the hydraulic and hydrologic setting of the selected stream reaches. It's expected that the realignments occur within the existing channel envelope (banks) by shifting the stream (active channel) within an over widened channel and creating adjacent floodplain benches. In most places, the alignments are small adjustments to short lengths of the stream.

A mix of nested cross vanes, weirs, and riffle grade controls are proposed to eliminate fish blockages and/or provide continuous fish passage. At these sites, stream elevation would be permanently altered to provide for fish passage over existing blockages. The placement of in-stream structures would reestablish the general structure, function, and self-sustaining condition of a natural stream. Natural streams have riffle-pool sequences that maintain slope stability. In-stream structures would slow and/or divert water where needed to decrease bed and bank erosion, channel water to decrease the stress on stream banks, narrow the stream where over widened by channelization, promote sedimentation where desirable for habitat and stability, and provide habitat diversity to support a wide assemblage of aquatic organisms.

Materials required to reconnect streams with their floodplains would include materials derived from the existing stream channel or floodplain and imported suitable material to

reach the appropriate cut and fill balance. In the event that the project location is flooded by a storm event during construction, implementation of erosion and sediment control best management practices would be in place to reduce the movement and loss of sediment from the construction site. Temporary access crossings would adhere to local sediment and erosion control requirements and be suitably bridged, culverted, or otherwise designed and constructed to withstand and prevent the restriction of high flows and to maintain low flows. Hydraulic modeling will be examined during design phase to determine impacts and changes to water surface elevation and ensure no adverse impacts occur.

*Lamberton Creek*
Most of the upstream reach of the Lamberton Creek requires grading and planting and using tree-logs (from site) to provide a functional system. Some mature trees have exposed roots, with the construction of RGCs the stream bed will be lifted to cover the roots and provide diversity in the system with pools and riffle sequence. Wood toes will be used in outer bends to provide proper geometry for a self-maintained system. Further downstream, a longer RGC is being proposed to blend in with the existing rocks and (elevating streambed) to provide more protection for the right bank and a better transition to downstream areas. To maintain the park-like nature, more grading and planting will be used around the utility crossings where a new pedestrian bridge is proposed by Montgomery County Department of Transportation. At Lovejoy Street, multiple RGCs are proposed with alternating boulder clusters and woody materials to provide ecological uplift. Downstream of Lovejoy Street, USACE would propose a series of RGC from approximately 400-feet downstream to gradually lift the bed and provide grade control for potential fish passage and stabilize eroding stream banks.

*Bel Pre Creek*
Various field visits have occurred by USACE biologists. Based on the field visits and desktop surveys, this system requires harder engineering around the stream crossings and much softer engineering in other areas. In other words, revising the geometry and alternating floodplain activities to reduce channel stressors will be required. There are a lot of bedrock controls and other natural features that could help in elevating the bed and reconnecting the stream with the floodplain. Other features such as wood toe in the outer bend to eliminate lateral erosion and improve potential aquatic habitat and boulder clusters with and without the woody material will be used to provide pockets of habitat between the RGC structures. In addition, low floodplain benches in inner bends and straight reaches will be added to create a self-maintained system that blends in the natural park setting. There are a few steep gullies and concentrated onfalls from stormwater management ponds that have caused erosion and incision that will be restored with combination of boulders and woody materials (ARP Montgomery, 2023)

This is the type of stream that is better suited for a wider channel instead of a deeper armored channel. Also, it is important to note that the stream crossings have a major adverse impact on the stream stability with the exception of Middlebridge Drive and

Tivoli Lake Boulevard crossings. The crossing at Middlebridge Drive is a corrugated elliptical steel pipe that controls the higher velocities and provides a smoother transition from upstream to downstream. Also, the invert of the culverts is set at different elevation to separate base flows from flood flows. The Tivoli Lake Boulevard crossing is a bottomless arch that spans the stream and is armored with riprap, which is providing bed stability and added roughness.

The stream reaches would be impacted to varying degrees based on the number of structures implemented. In-stream structures would permanently cover the stream bed where installed. Installation of grade controls would permanently raise the stream bed. Placement of stone to armor the stream bed or banks for protection from erosive stream flows may be necessary. Rock placed to stabilize the stream bank would not obstruct normal sediment transport within the stream since the rocks would only cause minor reductions in channel width.

Following project implementation, in-stream habitat restoration structures (e.g., cross-vanes, j-hook structures, etc.) would alter erosional and depositional features within the stream, facilitating creation of a deeper, narrower channel and/or wider terraces/floodplains. Placement of structures and or fill materials (e.g., large cobbles) would encourage natural formation of riffles and enhance in-stream habitat. Bank erosion rates would be reduced, which would result in a reduction of sediment transported downstream. Bank slope would gradually become less steep at its toe as material accumulates.

The stream geomorphic restoration work is expected to increase connectivity between the channel and floodplain and slow the velocity of water reaching the stream, potentially increasing stream baseflow and providing conditions where wetlands may reestablish in the floodplains.

### 4.3.6 Water Quality

#### *4.3.6.1 Proposed Action (Alternative 2a: Natural Channel Design)*

The Proposed Action is focused on ecosystem restoration and providing a demonstrated functional lift to the targeted habitats and will be compliant with all federal regulations. In the State of Maryland, MDE would determine the type of permit issued under the Water Quality Certification (Section 401 of the Clean Water Act) for aquatic habitat restoration. Section 401 of the Clean Water Act (CWA) requires that any applicant for a federal permit or license to conduct an activity, including, but not limited to, the construction or operation of facilities, which may result in a discharge to a navigable water shall provide certification from the State that the proposed discharge complies with the State's water quality standards and requirements (MDE, 2023). It is expected that the proposed project will be eligible to be considered under the general and regional terms and conditions of Nationwide Permit #27 (NW27), Aquatic Habitat Restoration, Establishment, and Enhancement Activities. The proposed project is

focused on ecosystem restoration and providing a demonstrated functional lift to the targeted habitats. Therefore, as long as the terms and conditions of the NW27 and MDE's permit requirements are met, no additional Clean Water Act Section 404(b)(1) analysis is required.

Direct impacts would be adverse, short-term and minor. Minor adverse impacts to water quality would occur during stream geomorphic construction work as a consequence of increased turbidity created during construction from activities. Stream flow bypass pipes around construction areas, sediment and erosion control measures, construction sequencing, and other best management practices would limit turbidity and water quality impacts as much as possible. If a flooding event occurs during construction, it is likely that exposed earth at the site would be vulnerable to erosion, thereby increasing the turbidity of the floodwaters.

Once constructed, stream geomorphic restoration is expected to produce benefits in water quality within the stream reaches and watershed by promoting a balanced equilibrium within streams and reducing excess in-stream erosion. Reconnection of streams with their floodplains would cause minor improvements in water quality in the receiving stream by intercepting and filtering surface water flow from land adjacent to the floodplain. Water quality of floodwaters delivered to the wetlands during overbank flooding events would be improved as a consequence of sediment settling out on the floodplain; pollutants associated with these sediment particles would be stored on the floodplain and potentially removed by vegetation, thereby reducing pollution to the stream.

### 4.3.7 Air Quality

#### *4.3.7.1 Proposed Action (Alternative 2a: Natural Channel Design)*

The Proposed Action would cause direct, adverse, short-term, minor impacts occurring only during construction. Construction of the projects would cause temporary impacts to air quality due to exhaust from construction machinery and vehicles, as well as fugitive dust. A general air-quality conformity analysis was performed per the Clean Air Act (40 CFR Parts 51 and 93) to estimate vehicle and fugitive dust emissions. This is presented in Appendix C. Ozone precursors, VOCs and $NO_x$, as well as CO are below the de minimis thresholds which begin at 50 tons for VOC and 100 tons for other pollutants as presented. All other annual emission totals and aggregated study emission totals for criteria pollutants are not anticipated to exceed all other USEPA de minimis thresholds.

There is likely substantial uncertainty in the accuracy of the estimates given the numerous assumptions made and of the parameter values. Because the emissions estimates are substantially less than de minimis levels, no mitigation measures that could reduce emissions need to be conducted for compliance with the CAA.

### 4.3.8 Greenhouse Gas Emissions

#### *4.3.8.1 Proposed Action (Alternative 2a: Natural Channel Design)*

This EA estimates the social cost of GHG (SC-GHG) in metric dollars. The SC-GHG estimates the monetary value of the net harm to society associated with adding a small amount of that GHG to the atmosphere in a given year. It includes the value of all climate change impacts, including (but not limited to) changes in net agricultural productivity, human health effects, property damage from increased flood risk natural disasters, disruption of energy systems, risk of conflict, environmental migration, and the value of ecosystem services. In 2009, the Interagency Working Group on Social Cost of Greenhouse Gases (IWG) was established to ensure that federal agencies were using the best available science and to promote consistency in the values used across agencies.

Direct and indirect, adverse, short-term, and minor emissions associated with the project would originate from vehicles and other equipment during construction activities, as well as construction vehicles and workers' vehicles travelling to and from the construction site. United States Environmental Protection Agency's (USEPA) Motor Vehicle Emission Simulator Version 3 (MOVES3) software was utilized to estimate emissions for on-road and off-road vehicles and equipment. General Conformity rules of the CAA apply to all non-transportation related projects, excluding exempt actions which would cause only de minimis levels, are presumed to conform, or are specifically identified in the regulations as exempt. The General Conformity program is an emissions-based system which requires federal agencies taking or sponsoring an action in certain areas to ensure that increased air pollution emissions from that action conform with the current, approved SIP. This includes estimating both direct and indirect emissions that are likely to occur. Based on the Air Conformity Analysis for the two stream reaches, the emissions are substantially less than de minimis levels, and no mitigation measures are required for compliance with the CAA (Appendix C4).

### 4.3.9 Hazardous, Toxic, Radioactive Waste

#### *4.3.9.1 Proposed Action (Alternative 2a: Natural Channel Design)*

Based on a review of the site and existing information, a full Phase I environmental investigation for any of the reaches in the feasibility analysis was deemed as not necessary or recommended at this time. No adverse impacts are expected to HTRW. Should further investigation show environmental impact due to HTRW issues on any of the reaches, a Phase I survey would be recommended.

### 4.3.10 Socioeconomics

#### *4.3.10.1 Proposed Action (Alternative 2a: Natural Channel Design)*

The Proposed Action would be expected to have adverse impacts to socioeconomics if:

- It results in a disproportionate share of adverse environmental or social impacts being borne by People of Color or low-income populations;

- The health, safety, social structure, or economic viability of an at-risk population are affected;
- Minimization efforts could not eliminate disproportionate effects to People of Color or low-income populations; or,
- Activities that would disproportionately raise risks to children through environmental or health hazards.

No direct, adverse, long-term changes are anticipated to population levels and demographics as a result of the project. The project would improve overall community health and provide an improved natural resource for use to all. Aesthetics and safety in the project area would be improved through reduced streambank erosion and more stable riparian woody vegetation. Stabilization of stream banks may prevent streams from causing property damage, which could have a minor positive economic impact. Communities identified as 'disadvantaged' through the CEJST Screening tool may experience temporary increases in noise or construction vehicle traffic, but no long-term, substantial impacts are anticipated to during or post construction.

Standard health and safety practices would be followed at each project construction site to protect human health and ensure that safety risks to people, including construction workers and the public, are minimized. Efforts will be made to minimize impacts to the public's recreational uses of parklands adjacent to the stream, but the area would be secured from access by the public as necessary to ensure safety during project construction. Impacts to the safety of vehicular traffic would be minimized through careful consideration of access routes to each construction site, by construction sequencing, and by incorporating appropriate traffic management measures.

The Proposed Action would improve the quality of the human environment and accordingly benefit populations living or working in the vicinity of the streams. All citizens in the watershed, regardless of their race or income, would benefit from the Proposed Action. Accordingly, no negative adverse human health or environmental effects on socially vulnerable or low-income populations would occur based on actions undertaken for this project.

### 4.3.11 Cultural Resources

#### *4.3.11.1 Proposed Action (Alternative 2a: Natural Channel Design)*

Due to the presence of areas containing a moderate to high potential for archaeological resources, this alternative could affect unidentified resources located in areas that have not been previously disturbed. These include those areas proposed for staging and access, stream and floodplain connectivity, or stream relocation. Additional cultural resources investigations would be needed to determine if any resources are located within the undisturbed portions of the APE. To satisfy the requirements under Section 106 of the NHPA, USACE is coordinating with MHT and M-NCPPC on the development of a PA. The purpose of the PA is to allow the Final Feasibility Report/EA to move

forward, while stipulating Phase I archaeological investigation requirements during the design phase when funding can be obtained for this effort.

### 4.3.12 Aesthetics

#### *4.3.12.1 Proposed Action (Alternative 2a: Natural Channel Design)*

Impacts to aesthetics would be direct and indirect, short-term, and minor. The public may experience construction equipment within their normal viewshed or along walking trails if they're open and accessible in the proposed areas. Wildlife viewing may be temporarily hindered due construction activities, but normal behaviors would be expected to continue after construction. Conversely, restoration of the stream channels would provide a direct, long-term, beneficial impact to the viewshed of the two stream channels. Debris jams are anticipated to be reduced with water quality improving along the segments with the potential to attract wildlife.

### 4.3.13 Recreation

#### *4.3.13.1 Proposed Action (Alternative 2a: Natural Channel Design)*

Construction activities may cause direct and indirect, adverse, short-term, minor impacts. The project may limit recreational use of park and open lands temporarily with public access at project locations likely to be restricted altogether during construction for safety reasons. LODs includes proposed access and staging areas, which were limited to the greatest extent possible on M-NCPPC park lands and are included in Appendix A. Temporary access/staging areas are located near or adjacent to park facilities which could impact the use of these sites. Temporary access roads at most of the sites extend through park property. Details regarding recommended closure of park locations would be included during the design phase. Construction would be coordinated with M-NCPPC to minimize negative effects on park users and ensure compatibility with park needs to the maximum extent practicable.

##### 4.3.13.1.1 Capper Crampton Parklands

For the purposes of this project, it was determined in consultation with the National Capital Planning Commission (NCPC) that the stream restorations proposed by this project does not constitute a change to park use under the Capper Crampton Act; therefore, the NCPC does not have review authority over this project. Documentation of coordination with the NCPC is included in Appendix G.

### 4.3.14 Noise

#### *4.3.14.1 Proposed Action (Alternative 2a: Natural Channel Design)*

Implementation of the Proposed Action would not permanently alter the noise environment in and around the project site. The Proposed Action would be expected to have direct and indirect, adverse, short-term, minor impacts. Short-term increases in noise would be the result of construction mobilization, installation of temporary access roads, in-stream construction activities, and demobilization. There would be no long-term impacts on noise related to the operation of this proposed facility.

In terms of noise levels, the additional noise generated by construction activities (Table 4-1), specifically the use of heavy equipment such as graders, front-end loaders and dump trucks would be noticeable.

During construction, the following measures would be taken to minimize noise impacts:

- Construction activities would primarily occur during normal weekday business hours;
- Heavy equipment mufflers would be properly maintained and in good working order; and
- Equipment operators would wear adequate personal hearing protection to limit exposure and ensure compliance with federal health and safety regulations.

**Table 4-1: Typical Noise Levels of Principal Construction Equipment**

| Construction Vehicle Type | dBA |
|---|---|
| **Front End Loader** | 80 |
| **Backhoe** | 72-93 |
| **Concrete Truck** | 85 |
| **Roof Saw** | 76 |
| **Crane** | 75-77 |
| **Pick-Up Truck** | 83-94 |
| **Delivery Truck** | 83-94 |

*Source: USEPA, 1971*

According to Section 31B-6 *Noise level and noise disturbance standards for construction in Montgomery County*, noise levels from construction activity that exceed the following levels must be abated through adopting of a noise suppression plan.

1) From 7 a.m. to 5 p.m. weekdays:
   (i) 75 dBA if the Department has not approved a noise-suppression plan for the activity; or
   (ii) (ii) 85 dBA if the Department has approved a noise-suppression plan for the activity.
2) Construction noise levels must be measured at the location, at least 50 feet from the source, on a receiving property where noise from the source is greatest.
3) The Department must by regulation establish requirements for noise-suppression plans and adopt procedures for evaluating and approving plans. The regulations must provide that, at least 10 days before approving a noise-suppression plan, the Director must provide public notice reasonably calculated to reach at least a majority of households that might be affected by the construction activity noise levels above 75 dBA (Montgomery County, 2014).

Construction activities, including operation of construction vehicles, will result in a temporary increase in noise levels. There will be no permanent changes to the noise

levels in the project area. Due to the relatively close proximity of the project to residential areas, prior notification of the hours/dates of construction would be given and measures to minimize noise, such as equipment mufflers, will be used. The rise in noise levels will be minor and temporary and are primarily to occur during daylight hours of construction. Protective equipment will be recommended to protect workers from excessive noise levels during construction.

## 4.4 Built Environment

### 4.4.1 Transportation

#### *4.4.1.1 Proposed Action (Alternative 2a: Natural Channel Design)*

The Proposed Action may result in direct and indirect, adverse, short-term, minor impacts to transportation and traffic. Impacts may come in way of temporary road closures for construction access vehicles and equipment, or delivery of materials to the proposed sites. Heavier than normal columns of traffic may temporarily affect residential neighborhoods but will return to normal conditions after construction.

### 4.4.2 Utilities

#### *4.4.2.1 Proposed Action (Alternative 2a: Natural Channel Design)*

At the project sites, impacts to existing infrastructure would be avoided to the fullest extent possible but may cause direct and indirect, adverse, short-term, minor impacts. Some site locations have protected sewer, gas, electric, and water infrastructure utilities within and along stream reaches, but impacts to utilities would be avoided by working around existing utilities. In locations where infrastructure is impacted by stream degradation, the Proposed Action would include bank stabilization and grading to reduce impacts to existing infrastructure. Sewage, gas, and water supply infrastructure have been mapped and would be evaluated prior to construction to ensure that work can be performed without damages. More detailed plans for identifying and avoiding infrastructure impacts would be developed during design phase. Coordination would continue to be undertaken with utility companies and property owners to develop construction plans that minimize impacts to infrastructure and structures on properties.

### 4.4.3 Summary of Potential Effects

Table 4-2 provides a summary of assessed impacts of the proposed action in this IFR/EA. Further details are available in each respective section in this chapter.

**Table 4-2: Summary of Potential Impacts of Proposed Action**

| Resource | Impact type |
|---|---|
| **Wetlands** | Indirect, adverse, short-term, minor/<br>Direct, long-term, and beneficial |
| **Floodplains** | Direct, adverse, short-term, minor/<br>Direct, long-term, and beneficial |
| **Rare, Threatened, and Endangered Species** | Indirect, adverse, short-term, minor |
| **Migratory Birds** | Direct, adverse, short-term, minor/<br>Direct, long-term, and beneficial |
| **Anadromous and Catadromous Fish** | Direct, adverse, short-term, minor/<br>Direct, long-term, and beneficial |
| **Vegetation** | Direct, adverse, short-term and long-term, minor/<br>Direct, long-term, and beneficial |
| **Wildlife** | Direct, adverse, long-term, minor/<br>Direct, long-term, and beneficial |
| **Soils** | Direct, adverse, long-term, minor |
| **Climate** | No Impacts |
| **Land Use** | No Impacts |
| **Geology** | No Impacts |
| **Topography** | Direct, adverse, long-term, minor/<br>Direct, long-term, and beneficial |
| **Waterways and Hydrology** | Direct, adverse, short-term, minor/<br>Direct, long-term, and beneficial |
| **Air Quality** | Direct, adverse, short-term, minor |
| **Greenhouse Gas Emissions** | Direct and indirect, adverse, short-term, minor |
| **HTRW** | No Impacts |
| **Socioeconomic** | Direct and indirect, adverse, short-term, minor |
| **Cultural Resources** | No Impacts |
| **Aesthetics** | Direct and indirect, adverse, short-term, minor/<br>Direct, long-term, and beneficial |
| **Recreation** | Direct and indirect, adverse, short-term, minor/<br>Direct, long-term, and beneficial |
| **Noise** | Direct and indirect, adverse, short-term, minor |
| **Transportation** | Direct and indirect, adverse, short-term, minor |
| **Utilities** | Direct and indirect, adverse, short-term, minor |

# 5 PLAN COMPARISON AND SELECTION

## 5.1 Plan Evaluation and Comparison

The USACE objective in ecosystem restoration planning is to contribute to NER. Contributions to NER outputs are increases in net quantity and/or quality of desired ecosystem resources (USACE, 2000). In addition to NER, the alternatives in the final array were evaluated and compared using the four system of accounts detailed below;

- National Environmental Restoration (NER) - For ecosystem restoration projects, a plan that reasonably maximizes ecosystem restoration benefits compared to costs, consistent with the federal objective, shall be identified as the NER plan. This plan must be cost effective and justified to achieve the desired level of output.
- Regional Economic Development (RED) - The RED account registers changes in the distribution of regional economic activity that result from each alternative. Two measures of the effects of the plan on regional economies are used in the account: regional income and regional employment.
- Environmental Quality (EQ) - Beneficial effects in the EQ account are favorable changes in the ecological, aesthetic, and cultural attributes of natural and cultural resources. Adverse effects in the EQ account are unfavorable changes in the ecological, aesthetic, and cultural attributes of natural and cultural resources.
- Other Social Effects (OSE) - The OSE account is a means of displaying and integrating into water resource planning information on alternative effects from perspectives that are not reflected in the other three accounts. The categories of effects in the OSE account include the following: health and safety, economic vitality, social connectedness, community and cultural identity, social vulnerability and resiliency, public participation, leisure and recreation, and public safety.

This feasibility study used the Institute for Water Resources (IWR) Planning Suite to evaluate alternatives using cost effectiveness-incremental cost analysis (CE/ICA). CE/ICA consists of two analyses: (1) the cost effectiveness analysis must show that an alternative restoration plan's output cannot be produced more cost effectively by another alternative, meaning "for a given amount of ecosystem output, no other plans cost less, and no other plan yields more output for the same or less money;" and (2) incremental cost analysis, where alternatives are evaluated and compared against one another to arrive at the "best" level of output for increment of cost (IWR 2023). The most efficient plans are called "best buys" and they provide the greatest increase in output for the least increase in cost. USACE uses the information from CE/ICA to support decision-making and recommend a plan in combination with evaluation criteria, the significance of resources, risk and uncertainty, and the reasonableness of cost for USACE and the non-Federal sponsor.

In order to conduct CE/ICA, USACE developed two conceptual restoration alternatives for each of the seven sites detailed in Table 3-2 and Figure 3-3 based on Alternatives 2a and 2c. The conceptual designs for Alternatives 2a and 2c were used to create

parametric cost estimates and to quantify ecosystem restoration outputs (benefits). These were used to evaluate the cost-efficiency of the plans and to identify Best Buy plans, as described in this section.

### 5.1.1 Conceptual Design Alternatives

Two concept-level design alternatives were developed for the stream length proposed for restoration at each of the seven sites. This resulted in 14 total designs (see Appendix B). These designs differ based on the number of in-stream structures used, the types of materials used, and the plan for relocation of the channel and/or floodplain work. The planning process went through several iterations using CE/ICA narrowing down to one conceptual design per site for input into the final CE/ICA. The selection of conceptual design site alternatives was based on site constraints that were encountered during the planning process including consideration for rare plant species, mature forests, and built infrastructure.

### 5.1.2 Quantifying the Benefits of Ecosystem Restoration

Quantifying the ecosystem restoration benefits of restoration includes an assessment of the changes in habitat quality between future-without and future-with-project conditions, and an estimation of the area being restored. A physical habitat assessment was performed to assess quality changes, as described in subsequent sections.

#### *5.1.2.1 Rapid Habitat Assessment (RHA): In-Stream Habitat Quality*

MCDEP (2013, 1997) procedures were chosen to assess habitat conditions because they have been utilized by MCDEP since the 1990s and thus allowed for ready comparison of previous conditions to current conditions. MCDEP has utilized the protocols to assess existing conditions as well as conditions of streams following geomorphic restoration work. The MCDEP RHA procedures are founded on protocols developed by the USEPA in the 1980s and 1990s and are similar to procedures also utilized by Maryland Biological Stream Survey (MBSS) of the MD DNR. Use of MBSS procedures for this study was coordinated with USACE EcoPCX and approved for one time use on February 24, 2015, pursuant to USACE Engineering Circular 1105-2-412. Stream habitat assessment progressed through a sequence of steps to assess field conditions of each stream and quantify existing and forecast future without and with-project conditions (Table 5-1). Appendix B includes the USACE Model Documentation and a description of the methodology for RHA scoring, data inputs, and maps of the stream segments surveyed.

**Table 5-1: Steps in the assessment of stream habitat**

| Step | Location | Assessment Step |
|---|---|---|
| **1** | Office & Field | Subdivide project stream sites into reaches based on habitat conditions. |
| **2** | Field | Assess stream reach habitat condition |
| **3** | Office | Quantify Existing Stream Habitat |
| **4** | Office | Forecast future stream habitat for with and without project conditions |
| **5** | Office | Quantify changes in habitat between future with and without project conditions |

Streams often have the presence/absence of several natural and built environment features and conditions that have major controlling effect on habitat conditions within segments (Table 5-2). Segments can contain reaches with any combination of these features and conditions. Within each reach, a representative 75-meter length measured along the channel thalweg capturing the range of conditions in that reach is field-identified and sampled as per MCDEP procedures (2013, 1997; Appendix B). Segments which possess a range of varying habitat conditions along their length can be divided into reaches at break points based on presence/absence of these features/conditions. Reaches are sampled rather than the entire segment because this is cost and time efficient. RHA is performed within each reach.

**Table 5-2: Natural and built environment conditions used for characterizing segments of stream habitat**

| **Channel physical materials affecting habitat** |
|---|
| **Stream Substrate** |
| *Piped or in culvert* |
| *Concrete channel* |
| *Natural meander (not channelized)* |
| *Channelized (earthen)* |
| *Stabilized discontinuously but systematically* |
| *Stabilized continuously* |
| *Earth (alluvium, colluvium, in-place soil)* |
| *Bedrock channel/banks* |
| **Flows affecting habitat** |
| **Flows** |
| *Intermittent flow (such as via loss into substrate)* |
| *Frequent backwater from downstream* |
| *Ponded (lentic rather than lotic)* |
| *Receiving flow from joining stream and stormwater outfalls* |

Habitat quality in stream reaches is characterized using MCDEP (2013, 1997) RHA procedures. Following the RHA procedures and guidance, 10 habitat parameters are scored in the field including instream cover, epifaunal substrate, embeddedness, channel alteration, sediment deposition, riffle frequency, channel flow status, bank vegetative protection, bank stability, and riparian buffer zone. Each individual parameter can score from 0 to 20 (explanations of scores are provided with the "Habitat Assessment Field Data Sheet for Riffle/Run Prevalent Streams", Appendix B). The worst possible habitat score is 0, and the best possible score is 20. The RHA procedures divide the total score into distinct narrative classes ranging from excellent to poor (Table 5-3). The data is entered into spreadsheets in the office, and these 10 parameters are then summed to produce a total habitat score for the reach.

**Table 5-3: RHA Ranks**

| RHAB Score (out of 200) | Percentage | Narrative Ranking |
|---|---|---|
| **200 – 166** | 100% - 83% | Excellent |
| **165 – 154** | 82% - 77% | Excellent/Good |
| **153 – 113** | 76% - 57% | Good |
| **112 – 101** | 56% - 51% | Good/Fair |
| **100 – 60** | 50% - 30% | Fair |
| **59 – 54** | 29% - 24% | Fair/Poor |
| **53 – 0** | 23% - 0% | Poor |

*Source: MCDEP 2013*

#### *5.1.2.2 Stream Habitat Units: Quantifying In-Stream Habitat Benefits*

Quantifying stream habitat requires consideration of habitat quantity and quality. Physical habitat quantity is determined using stream length and stream order (Strahler 1957). Stream order shows a close correlation to stream width, depth, wetted perimeter, and volume, and is simpler to determine/measure. The total habitat available within a reach is represented by the simple equation:

**Habitat Quantity x Habitat Quality Score = Stream Habitat Units (SHU)**

SHUs are expected to accrue upon project completion and have been annualized over the project life (AASHU). The average maximum practical improvement in RHA scores is expected to be about 56.5 based on field investigations completed for each stream (see Appendix B). This means that one SHU is equivalent to 3.54 miles of first order stream restored or about 1.77 miles of second order stream restored to "excellent/good" habitat conditions. Excellent/good habitat conditions could support "excellent" or "good" aquatic communities. Excellent communities are "comparable to the biological community found in reference streams. Exceptional assemblage of species with a balanced community composition." Good communities have a "decreased number of

sensitive species, and a decreased number of specialized feeding groups with some intolerant species present (MCDEP 2013)."

With improved water quality, stream restoration resulting in improved RHA scores will equate to improved fish and benthic macroinvertebrate IBI scores, a key metric for Chesapeake Bay recovery.

#### *5.1.2.3 Future Without Project: Stream Improvements by Others*

Stream water quality is expected to improve over the 50-year evaluation period as a result of work completed by other stakeholders in the watershed. As part of Montgomery County's NPDES Municipal Separate Storm Sewer System (MS4) Permit, the Montgomery County Countywide Total Maximum Daily Load (TMDL) Stormwater Implementation Plan was prepared in 2024 to meet countywide goals for pollution reduction goals including a list of projects and programs. The stormwater implementation plan outlines countywide goals for pollution prevention and reduction of target pollutants including phosphorus, nitrogen, sediment, bacteria, polychlorinated biphenyls (PCBs), and trash in the Anacostia watershed. The target load reductions for key pollutants include reduction of 81% of total nitrogen by 2074, 81.2% of total phosphorus by 2065, and 85% of total suspended solids (TSS) or sediments by 2059 in the Northwest Branch of the Anacostia River and equivalent targets by 2056, 2050, and 2038 respectively for the Northeast Branch of the Anacostia River.

MDE is the state regulatory agency in charge of meeting statewide TMDL targets outlined in the state's Watershed Implementation Plan Phase III. MDE requires that urban stormwater runoff be managed through "…a unified approach for sizing stormwater BMPs in the State of Maryland to meet pollutant removal goals, maintain groundwater recharge, reduce channel erosion, prevent overbank flooding, and pass extreme floods." Design features required by MDE for MS4 stormwater permits include the use of pre-treatment vegetation, wetland pockets and pools, flow reduction techniques, native plants, meadows, trees, permeable soils, and the creation of sinuous flow paths. The Montgomery County stormwater implementation plan includes project investments in construction of BMPs, BMP retrofits, tree planting, and stream restoration actions as part of this effort.

In the FWOP condition, Sligo Creek/Colt Terrace will be restored by M-NCPPC and WSSC resulting in watershed improvements along this tributary of the Northwest Branch of the Anacostia River. Along Bel Pre Creek and Lamberton Creek, absent an aquatic ecosystem restoration (AER) project, future conditions without project in the streams are assumed to be equivalent to current conditions.

#### *5.1.2.4 Future With Project: Stream Habitat Condition*

The FWP stream habitat condition reflects the improvements associated with implementation of the project. The FWP condition coupled with stream habitat,

stormwater management, and water quality improvements planned by other stakeholders detailed in Section 5.1.2.3 are anticipated to lead to overall improvement in the ecosystem health in the Anacostia River watershed.

The stream habitat quantity and quality were measured for all seven sites using the RHA methodology detailed in previous sections during the 2014 general investigation study. Stream habitat conditions were validated in site visits conducted in 2022 and 2023 and were confirmed as similar to previous observations documented in the 2014 study. Table 5-4 summarizes the FWOP RHA for the seven sites based on observed conditions. The FWP RHA is also calculated for the conceptual design alternatives as input into the final CE/ICAs for each of the seven sites, which is estimated based on anticipated improvements of physical habitat from implementation of a stream restoration project at each site. As shown, RHA scores are expected to increase 28 to 109 percent over pre-restoration conditions, representing substantial habitat lift. Tables in Appendix B provide all metric scores and resulting RHA FWP scores for all design alternatives.

**Table 5-4: Predicted post-restoration improvement in physical habitat scores for epibenthic substrate and in-stream habitat for the selected design alternatives**

| Segment Number | Stream | FWOP RHA | With Project RHA |
|---|---|---|---|
| **1** | Galway Tributary | Good (116) | Excellent/Good (162) |
| **2** | Green Castle Tributary | Good (124) | Excellent/Good (159) |
| **3** | Bel Pre Tributary | Fair (98) | Excellent/Good (155) |
| **5** | Lamberton Tributary | Fair (90) | Excellent/Good (155) |
| **6** | Quaint Acres Tributary | Good/Fair (106) | Excellent/Good (164) |
| **12** | Sligo Creek/Colt Terrace | Fair (75) | Excellent/Good (157) |
| **14** | Stewart/April Lane | Good/Fair (110) | Excellent/Good (161) |

### 5.1.3 Estimating Costs

Parametric cost estimates were prepared for the concept-level designs by USACE cost engineers by individual segment during the previous general investigation study and used as inputs into CE/ICA. These costs included engineering design, construction, and construction management. Parametric costs were estimated by linear foot based on concept cost estimates contained in 2012 bid data for Northwest Branch Package 2. The 2012 estimate was escalated to 2014 costs using the Civil Works Construction Cost Index System (CWCCIS). Construction cost estimates of the concept-level designs for the seven individual segments ranged from $1,185,000 to $9,697,000 in 2014 dollars (see Appendix B). Upon the restart of this study under Section 206, these cost estimates were revised and updated to fiscal year 2023 dollars to inform plan optimization, and design and implementation of this project as discussed later in this report.

### 5.1.4 Cost Effectiveness/Incremental Cost Analysis

USACE policy requires the use of an incremental cost analysis for all ecosystem restoration projects or mitigation plans. The purpose of the CE/ICA analysis is to determine variation in cost per unit output, and to identify and describe those plans that have the lowest incremental cost per unit output (USACE, 2000). The IWR Planning Suite, certified version 2.0, software application was used to complete the CE/ICA analyses (USACE, 2015b). The outputs of CE/ICA are used to inform plan selection.

#### *5.1.4.1 CE/ICA Results*

The CE/ICA analysis included plans that were combination of stream sites and design alternatives for those stream sites. CE/ICA generates plans combining all possible plan elements to generate the cost effectiveness analysis. In the previous GI study for Anacostia Watershed Restoration Montgomery County, a total of 6,561 possible plan combinations were evaluated in the CE/ICA analysis. Of these, 29 plans (including the No-Action Alternative) were identified as being cost effective and 8 were identified as best buys (Figure 5-1). The 8 best buy plans (Table 5-5) were further evaluated using incremental cost analysis and compared based on the significance of the outputs and are presented in Figure 5-1 and Table 5-6. Additional information on this previous work is included in this Section and detailed in Appendix B.

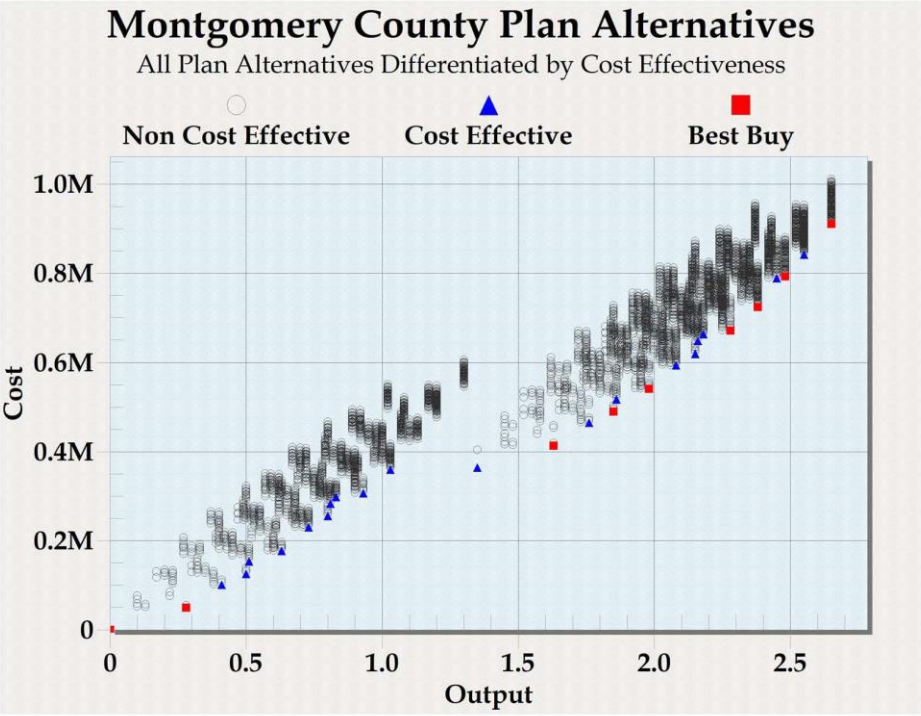


**Figure 5-1: Cost Effectiveness Analysis of Plans for the Northwest Branch Anacostia Watershed**

**Table 5-5: Northwest Branch Anacostia Watershed segments and best buy plans**

| Site | #5 | #3 | #12 | #6 | #1 | #14 | #2 |
|---|---|---|---|---|---|---|---|
| **Plan** | | | | | | | |
| **1** | No Action | | | | | | |
| **2** | Lamberton | | | | | | |
| **3** | Lamberton | Bel Pre | | | | | |
| **4** | Lamberton | Bel Pre | Sligo Creek | | | | |
| **5** | Lamberton | Bel Pre | Sligo Creek | Quaint Acres | | | |
| **6** | Lamberton | Bel Pre | Sligo Creek | Quaint Acres | Galway | | |
| **7** | Lamberton | Bel Pre | Sligo Creek | Quaint Acres | Galway | Stewart/April Lane | |
| **8** | Lamberton | Bel Pre | Sligo Creek | Quaint Acres | Galway | Stewart/April Lane | Green Castle |

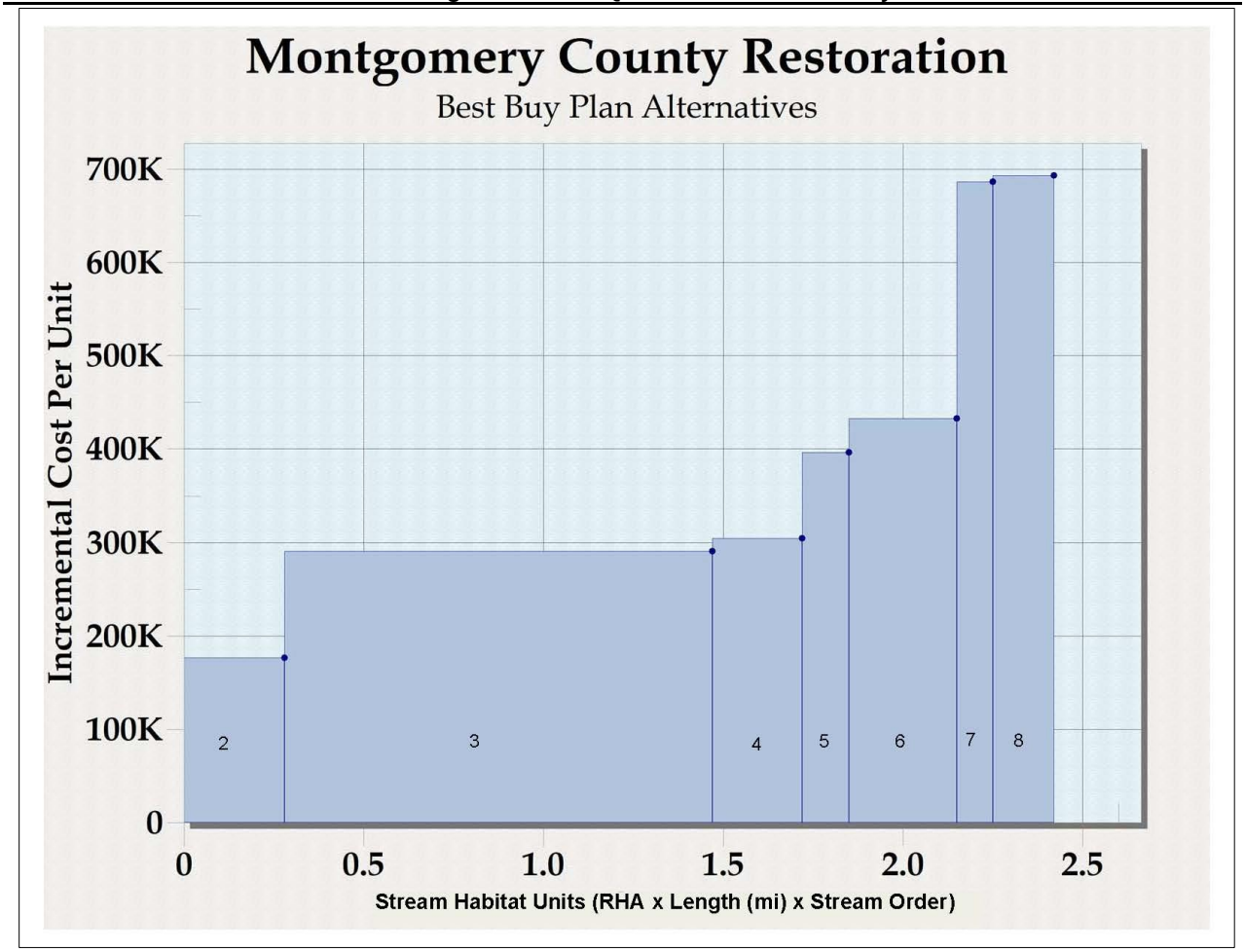


**Figure 5-2: Incremental Cost Analysis graph for Northwest Branch Anacostia Watershed showing best buy plans**

The evaluation of plans is conducted by assessing or measuring the differences between each with- and without plan condition and by appraising or weighting those differences. Evaluation consists of four general tasks: 1) forecast the most likely with-project conditions expected under each plan; 2) compare each with-project condition to the without-project condition and document differences between the two; 3) characterize the beneficial and adverse effects by magnitude, location, timing, and duration; and 4) qualify plans for further consideration. The outputs and plan effects are summarized in Table 5-6.

**Table 5-6: Outputs and plan effects for best buy plans for stream restoration in the Northwest Branch Anacostia Watershed**

| Plan | Total Cost | Stream Habitat Units (SHU) | Eel Passage (feet) | Non-anadromous Fish Passage (feet) | Saturation of Hydric Soils - Area (acres) | ARP Candidate Projects (Number) |
|---|---|---|---|---|---|---|
| **1** | 0 | 0 | 0 | 0 | 0 | 0 |
| **2** | $1,186,234 | 0.28 | 2,006 | 1,494 | 0 | 0 |
| **3** | $9,487,150 | 1.47 | 2,632 | 2,120 | 106 | 4 |
| **4** | $11,315,952 | 1.72 | 2,632 | 3,240 | 135 | 11 |
| **5** | $12,551,637 | 1.85 | 2,632 | 4,348 | 135 | 12 |
| **6** | $15,665,576 | 2.15 | 2,632 | 7,178 | 135 | 19 |
| **7** | $17,312,689 | 2.25 | 2,632 | 9,464 | 135 | 19 |
| **8** | $20,140,030 | 2.42 | 2,632 | 9,464 | 149 | 20 |

## 5.2 Identification of the NER Plan

This section describes the step-wise process for identifying the NER Plan. Additional supporting information is included in Appendix B.

**Step 1:** Based on the CE/ICA analysis (Figure 5-1), two plans (7 and 8) were rejected as they provide relatively little instream restoration benefit for the added cost. Plan 7 could add over 2,000 feet of additional accessible habitat to non-anadromous fish, but the relatively small increase in stream habitat units does not justify the added expense shown by the jump in incremental costs in Figure 5-2. Plan 8 adds approximately 14 additional acres for floodplain reconnection and wetland restoration, and over 0.25 additional stream habitat units. The incremental costs are not justified.

**Step 2:** The CE/ICA analysis represents the cost effectiveness analysis for the instream physical habitat benefits (Objective 1). Until reaching Plan 7, there is no significant change in slope of the graph, which would indicate a marked increase in incremental costs per stream habitat unit. Plan 3 provides significant instream benefits per unit of cost. This plan also incorporates all of the fish passage restoration opportunities

available and the majority of opportunities for reconnection of floodplain wetland. However, it only incorporates four potential projects identified in the ARP. Plan 3 is used as a baseline for comparison of the remaining plans (Plans 4 through 6).

**Step 3:** Plan 4 provides nearly 30 additional acres of floodplain reconnection and wetland restoration in the highly altered and urban Sligo Creek. The plan would address seven additional projects identified in the ARP, the majority of which are wetland restoration. The increase in incremental costs for additional SHU is negligible in comparison to Plan 3.

Plan 5 includes an addition 0.07 increase in SHU, 1,108 feet of passage for non-anadromous fish in the Quaint Acres tributary, and an additional ARP project. Plan 5 has marginal increases in habitat units for a higher incremental cost as denoted by Figure 5-2. The significance of outputs was determined to be low in comparison to the increase in incremental cost for this Plan when compared to Plan 4.

In comparison to Plan 4, Plan 6 addresses an additional eight projects identified in the ARP, seven of which are on the Galway Tributary. Stream restoration on the Galway Tributary would address a highly incised stream channel that borders a local public park. It would also allow the only opportunity for stream daylighting of all the stream segments investigated. This currently piped section of stream portion also flows through the public park. Finally, restoration of Galway Tributary would likely reduce sediment inputs to completed and planned restoration efforts downstream in the Little Paint Branch and Paint Branch subwatersheds. A mile-long stream section has been restored about one-mile downstream of the Galway Tributary site. Downstream of that point, restoration of Little Paint Branch and Paint Branch is planned or has been completed to its confluence with Indian Creek.

Compared to Plan 3 (Lamberton Creek and Bel Pre Creek) Plan 6 provides an additional 5,058 feet of passage for non-anadromous fish, which includes nearly 3,000 additional feet opened on Galway Tributary. This plan provides an additional 1.3 miles of restored second order urban stream habitat.

While there is benefit in restoring the additional streams compared to Plan 4, the increase in incremental costs for Plans 5 and 6 is not justified for federal participation. Restoration of the proposed stream reaches in Plan 4 will provide habitat diversity within the stream channels as well as diversity of habitat adjacent to the streams. Riffles and pools, created by using natural channel design, will form a diversity of aquatic habitats that provide the foundation for many of the biological and water quality functions that natural streams provide. Macroinvertebrates find habitat around rocks and coarse substrate, filtering food from the water column. Fish utilize pools along the stream and the overhead cover provided for protection and cooler water temperatures. The hyporheic zone has been identified as critically important in stream nutrient cycling, in moderating stream temperature regimes, and in creating unique habitats within streams.

Maximizing the creation of wetlands and restoration of the hydrologic flow between the stream and floodplain wetlands will enable the greatest amount of nutrient cycling and water retention possible with the project, providing a great benefit to downstream aquatic communities. Ultimately, this goal enhances surface water storage processes, supports soil moisture regulation, provides pathways for aquatic organism movement, and augments contact time for biogeochemical processes.

The USACE objective in ecosystem restoration planning is to contribute to NER. Contributions to NER outputs are increases in net quantity and/or quality of desired ecosystem resources (USACE, 2000). Selecting the NER plan requires careful consideration of the plan that meets planning objectives and constraints and reasonably maximizes the environmental benefits while passing tests of CE/ICA, significance of outputs and effects, acceptability, completeness, efficiency, and effectiveness. Based on an evaluation of these factors, Plan 4 is identified as the NER Plan.

The NER Plan (Plan 4) incorporates restoration at Lamberton Creek, Bel Pre Creek, and Sligo Creek. The NER plan reasonably maximizes ecosystem benefits as measured by SHU, reconnection of floodplain wetlands to the stream, and American eel and non-anadromous fish passage, while considering cost effectiveness and incremental cost analyses, significance of outputs, completeness, efficiency, effectiveness, and acceptability. Restoring the stream reaches in Plan 4 also addresses 11 candidate restoration projects identified in the ARP, reinforcing federal commitments to the Anacostia River watershed as described in a Section 1.5 of this report.

## 5.3 Cost Estimate Updates

USACE completed revised cost estimates in March 2025 and used these as inputs to re-run CE/ICA to validate project benefits and conclusions related to the cost effectiveness of plans examined in this study. CE/ICA included consideration of average annual costs and outputs in average annual habitat improvement units (AAHIU) for the two stream segments at Lamberton Creek and Bel Pre Creek. Note that Sligo Creek was removed from consideration in the recommended plan due to proposed work at that tributary by M-NCPPC and WSSC. Stream habitat outputs were revised to reflect the changes in the stream restoration extents for Lamberton Creek and Bel Pre Creek (see Appendix A). The stream restoration extents were coordinated with MCDEP and include removal of a segment in Lamberton Creek that was planned for stabilization by WSSC and considerations of access limitations on privately-owned lands in Bel Pre Creek, north of the Bel Pre Neighborhood Park.

Four plan combinations were examined, and all four combinations were determined to be cost effective (Table 5-7, Figure 5-3). Three plans were identified as best buy alternatives: Plan 1 - No Action; Plan 3 – Bel Pre; Plan 4 – Bel Pre & Lamberton Creek. In terms of incremental cost per output, Bel Pre Creek produces the most output at the

lowest incremental cost, followed by Lamberton Creek as illustrated in Figure 5-4. CE/ICA outputs are summarized in Appendix B of this report.

**Table 5-7: CE/ICA Inputs for Plan Components**

| Plan | Plan Components | Total Cost | Average Annual Costs | Average Cost ($/AAHU) | Output (AAHU) |
|---|---|---|---|---|---|
| **1** | No Action | $0 | $0 | $0 | 0 |
| **1** | Lamberton | $4,214,000 | $165,110 | $635,038 | 0.26 |
| **2** | Bel Pre | $14,684,000 | $579,280 | $512,637 | 1.13 |
| **3** | Bel Pre; Lamberton | $18,898,000 | $759,460 | $546,374 | 1.39 |

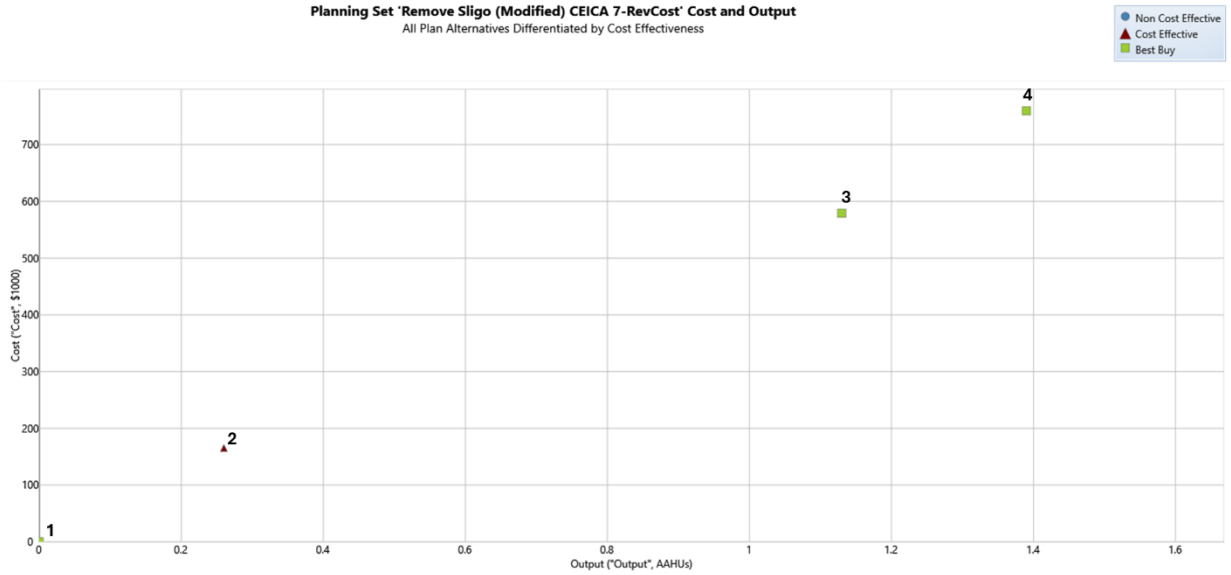


**Figure 5-3: Cost Effectiveness Analysis Costs and Outputs, differentiated by cost effectiveness and best buy plans**

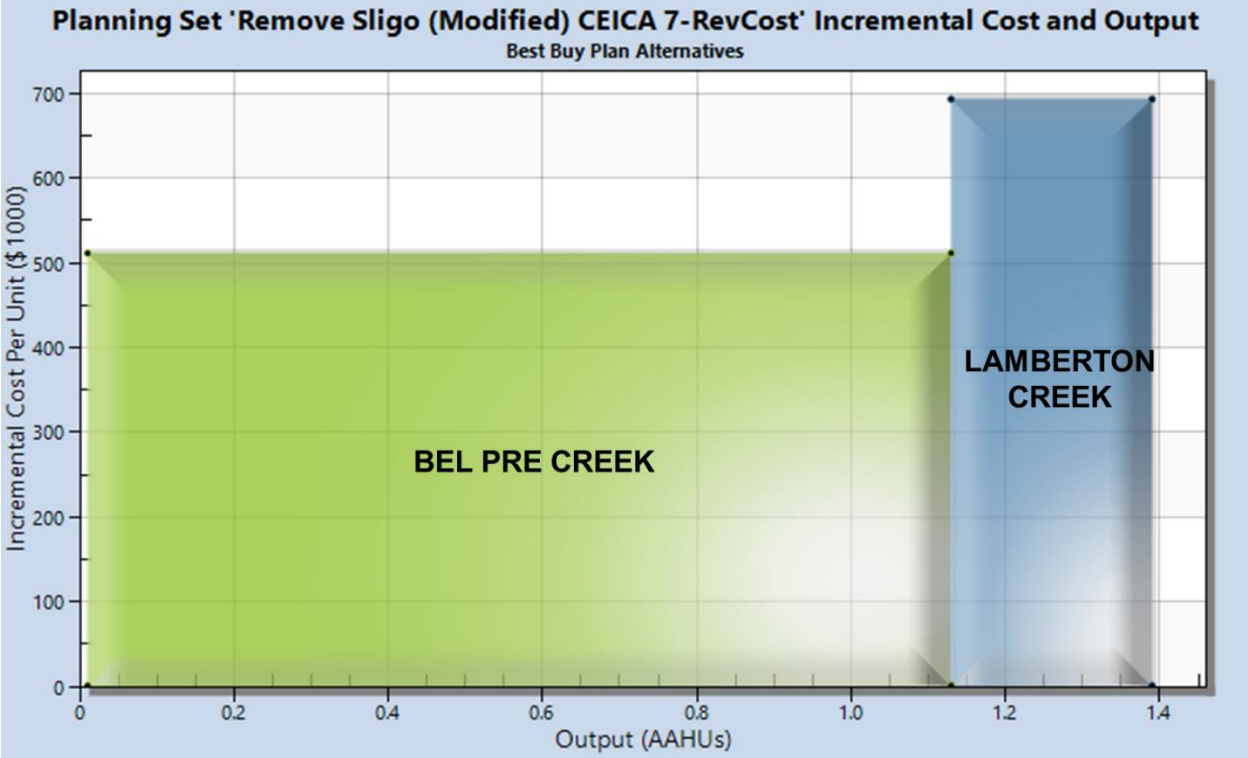


**Figure 5-4: Incremental Cost Analysis, Incremental Cost by AAHU**

## 5.4 Plan Selection

### 5.4.1 Detailed Analysis of the Final Array of Alternatives

The final array of alternatives carried forward for concept designs and further evaluation are detailed in Table 5-8. Alternative 2c was formulated as a variation of plan 2a without concrete removal in tributaries with existing concrete channels. After the CE/ICA evaluation, Alternative 2c was removed from consideration because restoration of the tributaries with concrete channel removal was not considered cost effective, therefore, Alternatives 2a and 2c for the three remaining stream sites are identical. Note that Alternative 2b had been previously screened as shown in Section 3.5 of this IFR/EA. Therefore, Alternative 2c was screened from consideration and Alternative 2a was carried forward for further evaluation for the two stream sites – Bel Pre Creek and Lamberton Creek.

**Table 5-8: Final Array of Alternatives**

| Alternative | Alternative Description | Screening Determination |
|---|---|---|
| **Alternative 1** | No Action | Retained |
| **Alternative 2a** | Natural Channel Design | Retained |
| **Alternative 2c** | Natural Channel Design without Concrete Channel Removal | Screened |

Criteria used to evaluate the final array of alternatives includes contributions to the planning objectives, completeness, effectiveness, efficiency, and acceptability, and evaluation based on the four system of accounts in the Principles and Guidelines (WRC 1983).

#### *5.4.1.1 Completeness, Effectiveness, Efficiency, and Acceptability*

The Principles and Guideline (P&G) specify four plan screening criteria: completeness, effectiveness, efficiency, and acceptability. The P&G screening criteria are summarized in Table 5-9. Only Alternative 2a meets all four criteria as the Alternative 1 No Action does not contribute to alleviate the specific problem and achieving opportunities in the project.

**Table 5-9: Principle and Guidelines Evaluation for Final Array of Alternatives**

| Alternatives | Acceptability | Completeness | Efficiency | Effectiveness |
|---|---|---|---|---|
| **Alternative 1: No Action** | Yes | Yes | Yes | No |
| **Alternative 2a – Natural Channel Design for Bel Pre Creek and Lamberton Creek, (Plan 4)** | Yes | Yes | Yes | Yes |

#### *5.4.1.2 Evaluation of the Four Accounts*

The final array of alternatives was evaluated using the four system of accounts and are summarized in Table 5-10. For aquatic ecosystem restoration, the four system of accounts include NER, EQ, RED, and OSE described in Section 5.1. There is significant overlap between NER and ER for aquatic ecosystem restoration projects, therefore, they are summarized together in Table 5-10.

**Table 5-10: Evaluation and Comparison of Final Array of Alternatives**

| Evaluation Criteria | Alternative 1: No Action | Alternative 2a: Natural Channel Design |
|---|---|---|
| **Total Project Cost** | $0 | $18.9 million |
| **National Ecosystem Restoration/Environmental Quality** | | |
| Stream Habitat Units | 0 | 1.39 |
| Improvement of Stream Habitat (miles) | 0 | 3.2 |
| Fish Passage Improvement (feet) | 0 | 2,632 |
| Improved Floodplain Connectivity (Wetted Acres) | 0 | 106 |
| **Regional Economic Development** | | |
| Jobs and Regional Economic Output | - | Net increase in jobs and regional economic activity |
| **Other Social Effects** | | |
| Educational Opportunities (Number of Opportunities) | 0 | 1 |

### *5.4.1.3 The Tentatively Selected Plan*

The Tentatively Selected Plan is Alternative 2a Natural Channel Design, which includes aquatic ecosystem restoration at Bel Pre Creek and Lamberton Creek. The TSP is the NER Plan. The TSP results in 3.2 miles of in-stream habitat improvement along Bel Pre Creek and Lamberton Creek, improving connectivity of the stream and improving the hydrologic connection to 106 acres of floodplain wetland habitat in Bel Pre Creek, and fish passage improvements of 2,600 feet for resident fish along Bel Pre Creek and Lamberton Creek. Under the OSE account, the TSP includes one educational opportunity associated with project engagement with an existing environmental education program along Bel Pre Creek at the Barrie School.

Improvement of the aquatic and riparian condition of the streams within the M-NCPPC's park systems translates to enhanced community health through creation of safer places for people to meet, recreate, and explore nature. The Anacostia Trail System adjacent to most of the stream sites is heavily used by the public for transportation and recreation. Improving greenways along these trails will increase community pride. There will be no negative adverse human health or environmental effects to minority or low-income populations based on actions undertaken for this project.

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# 6 THE RECOMMENDED PLAN

The alternative evaluation and comparison summarized in Section 5 of this draft IFR/EA resulted in identification of Alternative 2a Natural Channel Design for Bel Pre Creek and Lamberton Creek as the Tentatively Selected Plan (TSP). The TSP presented in this Draft IFR/EA is the National Ecosystem Restoration (NER) Plan, the plan that reasonably maximizes ecosystem restoration benefits to the nation when compared to costs, consistent with the Federal objective. Prior to release of this Draft Feasibility Report/EA, USACE, MCDEP and M-NCPPC had agreed to remove Sligo Creek from consideration in the USACE AER project as the segment will be part of a project to be implemented by M-NCPPC in coordination with WSSC.

The recommended plan presented in this Draft IFR/EA consists of stream restoration actions in Bel Pre Creek and Lamberton Creek. The recommended plan consists of restoring 2.5 miles of stream habitat in Bel Pre Creek extending from Bel Pre Neighborhood Park to 100 feet upstream of the confluence with the Northwest Branch of the Anacostia River (Figure 6-1) and restoring 0.7 miles of Lamberton Creek from the outfall at Yeatman Terrace to 1,000 feet upstream of the confluence with the Northwest Branch of the Anacostia River (Figure 6-2). Note that stream improvements in the downstream segment of Lamberton Creek are being planned for implementation by WSSC. The Bel Pre Creek and Lamberton Creek Plan is identified as both a cost-effective and best buy plan and is Plan 4 in Figure 5-3. The total project cost for the recommended plan which includes Bel Pre Creek and Lamberton Creek is estimated at $18.9 million. The cost sharing requirement for the CAP Section 206 program is 65 percent federal and 35 percent non-Federal. The recommended plan has a total estimated cost of $18.9 million, which would be cost shared $12.3 million federal and $6.6 million non-Federal. This plan will have the greatest impact on habitat improvement in the Anacostia Watershed in Montgomery County.

Concept designs for stream restoration have been developed for Bel Pre Creek and Lamberton Creek that consist of raising the stream bed using a series of grade control structures that include a mixture of riffle grade control (RGC) structures, j-hooks with riffle aprons, and cross vanes with riffle aprons and a series of riffle pool habitat, a sequence of shallow, fast-moving sections of stream (riffles) and deeper pools that are naturally found in streams and rivers (typical details shown in Figure 6-3). Structure placement and design will be determined upon completion of a survey during the design and implementation phase. The concept designs address undercutting of the channel and improve floodplain connectivity between the stream and adjacent wetlands and riparian habitat. Additionally, the recommended plan would provide significant floodplain enhancements using floodplain benches, grading, planting of native species, and removal of non-native invasive species. There are existing terrestrial resources around Bel Pre and Lamberton Creeks including mature forests, wetlands, seeps, and native vegetation that will be considered for protection as more detailed designs are developed

during the design phase. MCDEP and M-NCPPC have expressed support for the recommended plan to move forward to design and implementation.

## 6.1 Recommended Plan Accomplishments

Since 1987, restoration of the Anacostia River watershed has been conducted under the umbrella of the AWRC (now the Anacostia Watershed Restoration Partnership [AWRP]), which is made up of numerous federal, state, local, nongovernmental, and industry organizations. The recommended plan builds upon the actions outlined for USACE participation in the AWRP and ARP, and complements many other ongoing activities in the watershed, including implementation of stormwater best management practices (BMPs) implemented by others, stream restoration projects by other agencies, and changes in permitting for new development. The recommended plan will also benefit from projects that are being designed and constructed in Prince George's County through the Anacostia Watershed Restoration, Prince George's County (AWR-PG), Maryland project. The AWR-PG projects will address several partial fish barriers that limit movement of non-anadromous and migratory fish to Montgomery County. The AWR-PG projects are currently in the design and implementation phase, though benefits for Montgomery County are not predicated on the projects in Prince George's County.

Other agencies participating in restoration projects throughout the Anacostia River watershed include: MCDEP, Prince George's County Department of Environmental Resources, District of Columbia Department of Energy and Environment, MDE, MWCOG, University of Maryland, EPA, NPS, the National Oceanographic and Atmospheric Administration, U.S. Department of Agriculture, and the USFWS. Other agencies and entities participating in the restoration effort include General Services Administration, AWS, subwatershed groups, Audubon Society, and others.

The recommended plan supports E.O. 13508 Chesapeake Bay Protection and Restoration and contributes to goals and objectives outlined in the 2014 Chesapeake Bay Watershed Agreement by restoring habitat, fish passage, and wetlands in the Bay's contributing subwatersheds. It also supports the Urban Waters Federal Partnership by reconnecting urban areas with their waterways and improving community health and cohesion.

## 6.2 Recommended Plan Components

The recommended plan consists of improving stream habitat condition in Bel Pre Creek for a total length of 2.5 miles of the stream extending from Bel Pre Neighborhood Park to 100 feet upstream of the confluence with the Northwest Branch of the Anacostia River and restoring 0.7 miles of Lamberton Creek from the outfall at Yeatman Terrace to 1,000 feet upstream of the confluence with the Northwest Branch of the Anacostia River (Figure 6-1 and 6-2). The recommended plan addresses two fish blockages for resident

fish at the culvert on Poplar Run, a tributary of Bel Pre, and at the crossing on Lovejoy Street in Lamberton Creek resulting in a net increase of 2,600 feet of fish habitat improvements. The natural channel design approach for this segment consists of lifting the stream channel bed using a series of grade control structures that include constructed riffles, j-hooks with riffle aprons (at bends), and cross vanes with riffle aprons (on straight segments) to consistently raise the channel benefit and create a riffle pool sequence and habitat features (typical sections shown in Figure 6-3). Structure placement will be finalized upon completion of a field survey in the design phase.

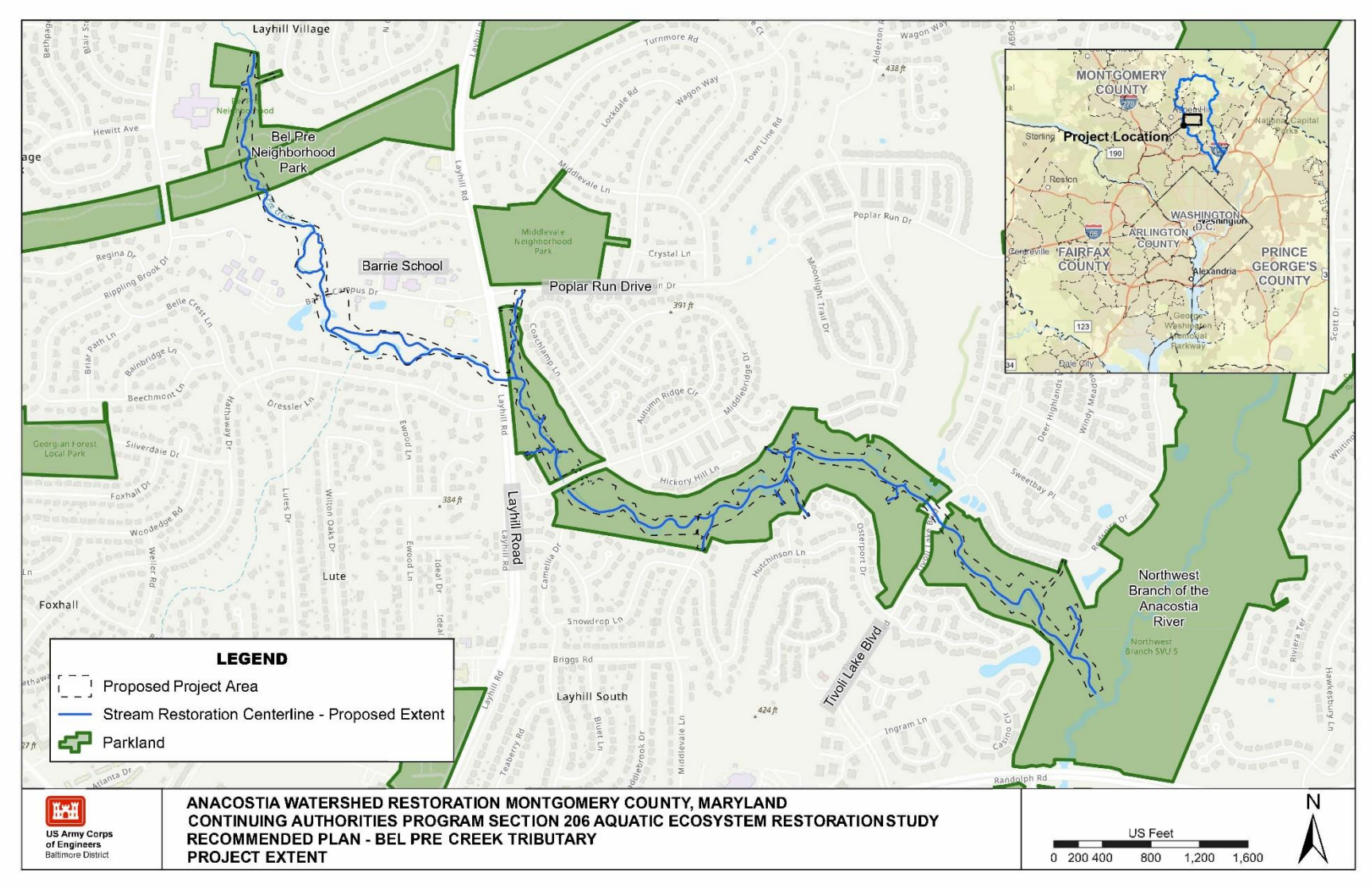


**Figure 6-1: Bel Pre Creek Restoration Extent**

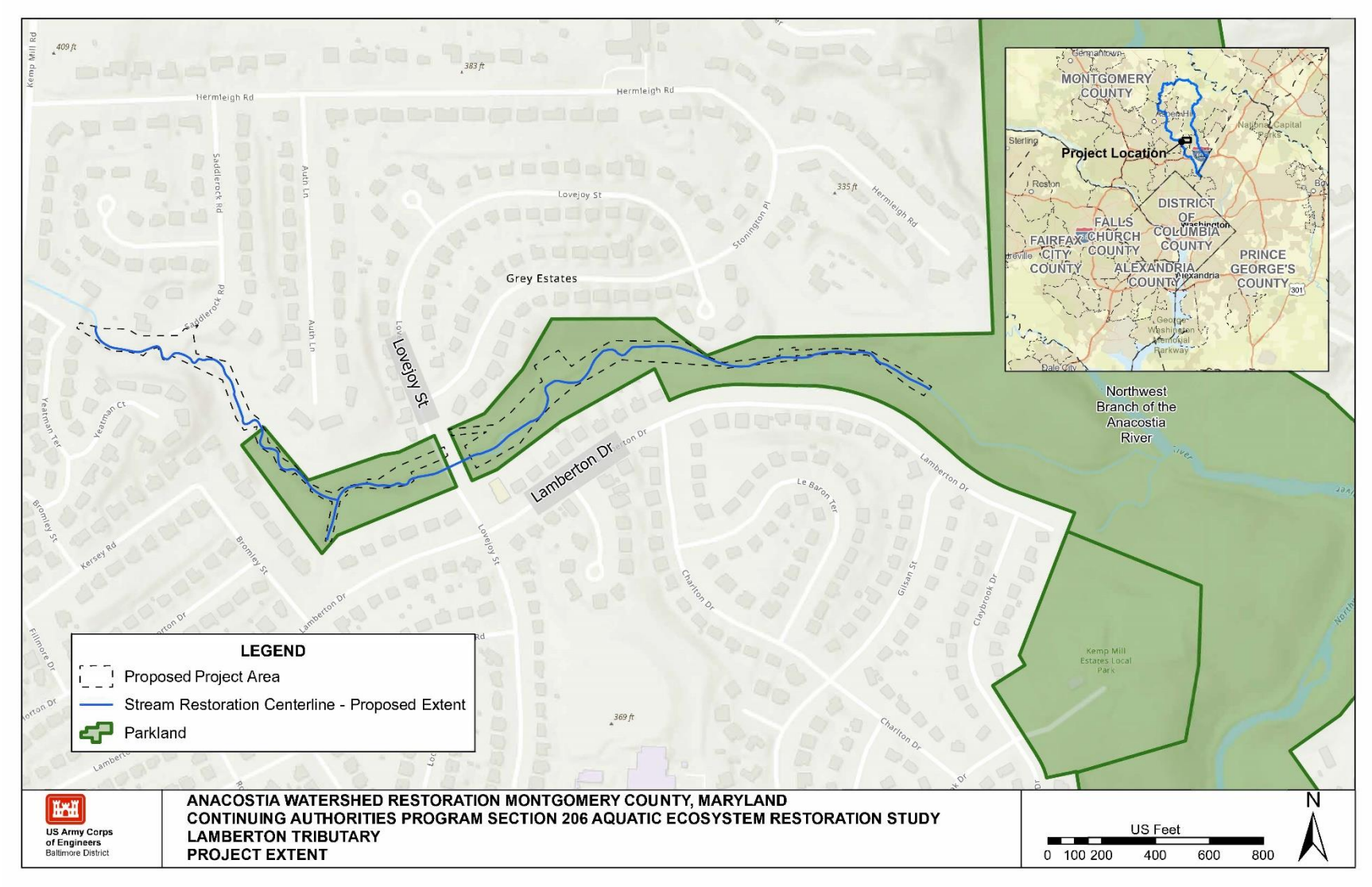


**Figure 6-2: Lamberton Creek Restoration Extent**

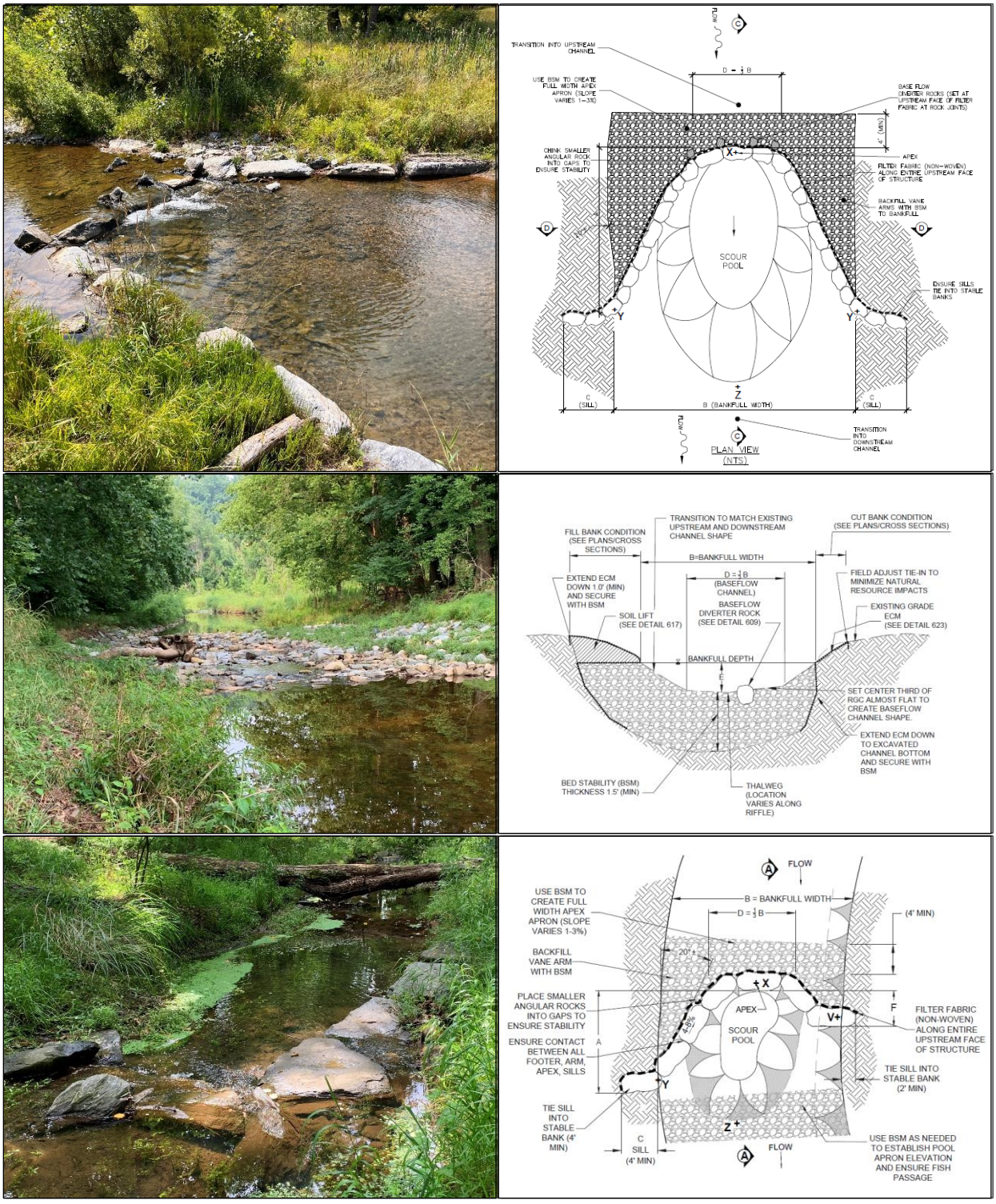


**Figure 6-3: Typical Details for In-Stream Structures**

*Cross-vane (top), typical detail shown with apron; riffle grade control (center); J-hook vane detail (bottom). Source: MCDEP and M-NCPPC*

In addition to the benefits provided for anadromous fish, riffles and pools support a diversity of aquatic habitats that provide the foundation for many of the biological and water quality functions that natural streams provide. Benthic (bottom dwelling) organisms find habitat around rocks and coarse substrate, filtering food from the water column, or gathering it from the bottom of the channel. Fish utilize the pools and the overhead cover provided for protection and cooler water temperatures. The increased stability provided by restoration activities are expected to establish a dynamic equilibrium in the stream that maintains habitat complexity and results in increases in species abundance and diversity.

Although wetland benefits could not be quantified in this IFR/EA, the project is expected to contribute to the reconnection of streams with their floodplains. This will increase saturation of hydric soils and potentially aid in the reestablishment of floodplain wetlands. Implementing this project in the near term will help to restore aquatic communities through nutrient cycling and water retention and will provide benefits to riparian wildlife including birds and amphibians.

Non-native/invasive species (NNI) are present in Bel Pre Creek including Garlic mustard, Japanese stiltgrass, Callery Pear (Pyrus calleryana), winter creeper (Euonymus fortunei), Japanese honeysuckle (Lonicera Japonica), and Vitis sp. (vines mainly in the vicinity of Layhill Road). NNI that are present in Lamberton Creek include Bamboo spp., bush honeysuckle (Lonicera tatarica) Vitis sp., and Callery pear. NNI management would include treatment, monitoring, and adaptive management of NNI. The project would include grading of stream banks to restore the natural channel geometry and planting of native species along the riparian zone. More details on NNI management, target species, grading and planting will be developed during the design and implementation phase.

## 6.3 Cost Estimate

The total costs for the recommended plan – stream restoration using natural channel design at Bel Pre Creek and Lamberton Creek are summarized in Table 6-1.

**Table 6-1: Project Cost Summary for the Recommended Plan**

| Construction Item | Cost |
|---|---|
| 01 Lands and Damages | $ 1,291,000 |
| 16 Bank Stabilization | $12,816,000 |
| 30 Planning Engineering and Design | $ 3,584,000 |
| 31 Construction Management | $ 1,207,000 |
| Total First Cost | $18,898,000 |

*Total Project Costs are in October 2024 (FY 2025) price levels and use a discount rate of 3.0 percent.*
*Costs have been rounded and may not add up from the accounts breakdown as shown.*

It is important to note that as the study moves into the design phase the conceptual designs and costs will be refined significantly to include the specific location and types of features and to identify impacts to property and infrastructure. Because designs are currently at a conceptual level, cost estimates include a level of contingency that is based on project risks and uncertainties. An abbreviated risk analysis (ARA) was performed to estimate the effects associated with design uncertainties including for construction elements (e.g. numbers of structures), quantities of materials, level of analyses, schedule, etc. For construction elements in account 16 Bank Stabilization, an estimated project contingency of 47.7 percent is used based on the cost and schedule risks outlined in the ARA and summarized in Appendix D. Contingencies for other accounts include 20.0 percent for Bel Pre Creek and Lamberton Creek for 01 Lands and Damages, 15.6 percent for account 30 Planning Engineering and Design and 11.3 percent for account 31 Construction Management.

## 6.4 Lands, Easements, Right-of Way, Relocations and Disposal

At this preliminary stage, the lands and damages real estate cost estimate is approximately $1.3 million. These costs include acquisition administration costs, contingency, and estimated damages of the recommended plan. Incidental acquisition costs are also included and include costs for title and appraisal review, coordination meetings, review of documents, legal support (including but not limited to approval of the nonstandard estate and easement drafting), crediting, project close out, and other costs incidental to the acquisitions and the project.

ER 405-1-12 Real Estate Handbook requires that USACE identify the minimum real estate interest for implementation of the proposed project as detailed in this section. It is anticipated that both MCDEP and M-NCPPC will be co-sponsors for the design and implementation phase of the project. The current understanding is that MCDEP will be acquiring all of the necessary real estate and have overall O&M and construction responsibilities for the project. The M-NCPPC will be responsible for providing owned lands for project construction and O&M. The majority of the project area is on M-NCPPC owned property. Upon project approval and funding, M-NCPPC will provide authorization for use of their property for project purposes to MCDEP and will therefore not be required to provide easements as fee simple authorization for the project exceeds the minimum real estate requirement detailed in this section. MCDEP will be required to acquire the necessary easements from the remaining property owners in the project.

The recommended plan will require the following real estate interests, the minimum of which is a real estate easement:

1. Bel Pre Creek:
    a. One (1) Temporary Work Area Easement (TWAE) for staging, totaling approximately 0.56 acres;
    b. Five (5) TWAEs for access, totaling approximately 1.81 acres;

c. Thirty-four (34) Standard Channel Improvement Easement (SCIE) for Operation & Maintenance (O&M), totaling approximately 31.73 acres.

Both TWAEs and fifteen PEREs are over M-NCPPC property and it is anticipated that M-NCPPC as a non-Federal sponsor will provide authorization for use of the property for project purposes instead of an easement. Seventeen PEREs are over privately-owned parcels and will need to be acquired by MCDEP during the design and implementation phase.

2. Lamberton Creek:
   a. Six (6) SCIE for O&M, totaling approximately 4.57 acres;
   b. One (1) Standard Road Easement (SRE) for O&M, totaling 0.04 acres.

Authorization of lands for use will be recorded in USACE real estate records. Easement for other properties in the proposed project will be recorded in the land records of Montgomery County and will be binding upon the owners, their heirs, assigns, transferees, and any other successors in interest. A complete description of all real estate needs is provided in the Real Estate Plan in Appendix F.

## 6.5 Monitoring and Adaptive Management Plan

### 6.5.1 Monitoring Plan

Current policy for monitoring is presented in planning guidance (ER 1105-2-100, EP 1105-2-58, and with further explanation in EC 1105-2-409). Monitoring is at the heart of adaptive management to determine if the outputs/results are satisfactory, and to determine if any adjustments are needed. The primary intent of the Monitoring Plan is to develop monitoring actions appropriate for the project's restoration goals and objectives. Per Section 2039 of the Water Resources Development Act of 2007 (WRDA 2007) and Engineer Pamphlet (EP) 1105-2-58, feasibility studies for ecosystem restoration are required to include a plan for monitoring the success of the ecosystem restoration. The preliminary Monitoring Plan was developed in accordance with implementation guidance for WRDA 2007 and is included in Appendix H of this Draft IFR/EA.

Monitoring includes the systematic collection and analysis of data that provides information useful for assessing project performance, determining whether ecological success has been achieved, or whether adaptive management may be needed to attain project benefits. The monitoring plan will be further developed in the design phase as specific design details are made available.

Monitoring will include a pre-construction survey and up to ten years of monitoring following construction of the project. Physical habitat and resident fish monitoring will be carried out to determine RHA and resident fish species abundance. Sampling is expected to occur during the spring of each year over multiple dates and times to capture different flows and patterns of migration. Specific parameters to be monitored to

determine RHA are instream cover, epifauna substrate, embeddedness, channel alteration, sediment deposition, riffle frequency, channel flow status, bank vegetative protection, bank stability, and riparian buffer zone width. These metrics are selected for monitoring because they are projected to be responsive to project implementation and representative of the physical and biological health of the project sites and stream networks. The target metric is to improve physical habitat from the current RHA parameter of Fair to Excellent/Good (see details in Appendix H).

To evaluate the success of the stream restoration measures, collaborative monitoring efforts and information sharing would occur between USACE, MCDEP, M-NCPPC, and other organizations involved in assessing the health of the stream. MCDEP already has a sampling program for the Anacostia River watershed as part of their Biological Monitoring Program, which assesses the health of county streams. Coordination with the county will occur to align monitoring carried out to access this project with county-led annual sampling efforts.

### 6.5.2 Adaptive Management Plan

Current adaptive management policy is presented in planning ER 1105-2-100, with further explanation in Engineer Circular (EC) 1105-2-409 and EP 1105-2-58 for CAP. Adaptive management addresses the uncertainties about a project's performance that exist when implementation decisions are made to undertake a water resources project. This technique allows decision making and implementation to proceed with the understanding that outputs will be assessed and evaluated and that some structural or operational changes to the project may be necessary to achieve desired results. At the heart of adaptive management is an appropriate monitoring program to determine if the outputs/results are satisfactory, and to determine if any adjustments are needed.

The preliminary Monitoring and Adaptive Management Plan is included in Appendix H. The primary intent of the Adaptive Management Plan is to develop adaptive management actions appropriate for the project's restoration goals and objectives. Per Section 2039 of the Water Resources Development Act of 2007 (WRDA 2007), feasibility studies for ecosystem restoration are required to include a contingency plan (Adaptive Management Plan) for all ecosystem restoration projects in order to make corrections to the project if planned benefits are not being realized. The preliminary Monitoring and Adaptive Management Plan in Appendix H was developed in accordance with implementation guidance for WRDA 2007. The plan identifies and describes the adaptive management (contingency) activities proposed for the project and estimate their cost and duration. The plan will be further developed in the design phase as specific design details are made available.

It is anticipated that minimal adaptive management measures will be required due to the type of structures and design philosophy incorporated into design. The designs are intended to aid in the re-establishment of a new dynamic equilibrium for the stream, and

not necessarily to lock the stream into its channel. Adaptive management activities may include adjustment of the lateral position or height of installed structures to ensure the achievement of the desired hydrologic regime and ecosystem benefits. If a constructed structure prevents fish movements, corrective action will be needed. The structure may need to be reset, stones or logs moved, a notch added, or other actions taken. Similarly, if hydrologic profiles result in scouring, erosion, or sediment deposition that result in poor RHA or IBI scores, structures, bank profiles, or other constructed features will require adjustment. Poor RHA scores and/or IBI scores will need to be evaluated on a case-by-case basis to determine what has influenced them and what actions will be required for a remedy. An unusually strong storm that occurs prior to establishment of vegetation and project features could cause severe damage to a project site that would need to be ameliorated. Adaptive management actions that stem from normal conditions are anticipated to be minimal in effort.

Total costs for monitoring and adaptive management are $290,400 and are divided between monitoring and adaptive management costs (Table 6-2). These costs are cost-shared with the non-Federal sponsor and are included in the project's total project costs shown in Table 6-1. The adaptive management portion of these costs is assumed to be minimal because once access to the streams has been closed and areas revegetated it will be difficult to re-enter to the sites with heavy equipment. Adaptive management actions will necessitate the use of small equipment or hand tools.

**Table 6-2. Monitoring and adaptive management costs for the Recommended Plan**

| Site | Approximate Total Cost | Monitoring Costs | Adaptive Management Costs |
|---|---|---|---|
| **Bel Pre Creek & Lamberton Creek** | $290,400 | $180,400 | $110,000 |

## 6.6 Project Risks

USACE has assessed risks and uncertainties associated with the recommended plan during the feasibility study and managed for risks that would drive the costs and schedule of the project. The primary risks for the project are increases in project cost resulting from increased project material costs, fuel, and labor, which have risen significantly since 2015 when the project was transferred to the CAP program authority.

Additional risks include those associated with the low level of detail in conceptual design used for cost estimation, potential impacts to areas of mature trees or native plant species and impacts to existing wetlands as a result of project construction, and potential that habitat benefits would not be realized as projected by the proposed project. To manage these risks, USACE has implemented risk management actions

including conducting a detailed survey in the design phase to inform detailed designs and identify priority protection areas to avoid (areas of mature tree and native plant species, wetlands), implementing best management practices for stream restoration, and including appropriate risk-based contingency in the total project costs presented in this report. Project monitoring and adaptive management are also being recommended to improve the chances that habitat benefits are realized by taking appropriate management actions that address changing conditions following construction of the project.

## 6.7 Cost Sharing

Cost sharing for the recommended plan will be done in accordance with Section 206 of the WRDA of 1996, as amended. The recommended plan will be cost shared 65 percent federal and 35 percent non-Federal as summarized in Table 6-3.

**Table 6-3: Cost sharing for the Recommended Plan**

| Construction Item | Federal Cost | Non-Federal Cost | Total |
|---|---|---|---|
| **Design and Implementation Phase Costs** | | | |
| **01 LANDS AND DAMAGES** | $0 | $1,291,000 | $1,291,000 |
| **16 BANK STABILIZATION** | $9,169,550 | $3,646,450 | $12,816,000 |
| **Subtotal** | **$9,169,550** | **$4,937,450** | **$14,107,000** |
| **30 PLANNING, ENGINEERING AND DESIGN** | $2,329,600 | $1,254,400 | $3,584,000 |
| **31 CONSTRUCTION MANAGEMENT** | $784,550 | $422,450 | $1,207,000 |
| **Total Project First Costs*** | **$12,283,700** | **$6,614,300** | **$18,898,000** |

*Total Project Costs are in October 2024 (FY 2025) price levels and use a discount rate of 3.0%.*
*Costs have been rounded and may not add up from the accounts breakdown as shown.*

## 6.8 Design and Implementation

Implementation would occur provided that sufficient funds are appropriated to design and construct the project. To initiate the design and implementation phase, USACE must enter into a Project Partnership Agreement with a non-Federal sponsor. MCDEP and M-NCPPC have identified that they will be co-sponsors for the design and implementation phase of this project. It is anticipated that MCDEP will be primarily responsible for funding the restoration effort whereas M-NCPPC will contribute real estate interests for implementation of this project. The design phase is cost shared 65 percent federal and 35 percent non-Federal. The design phase is estimated to take three years from October 2026 to October 2029. Construction of the project is estimated to take one and a half years from contract award from June 2030 to December 2031.

## 6.9 Environmental Operating Principles

The USACE Environmental Operating Principles (EOP) were developed to ensure that USACE missions include totally integrated sustainable environmental practices. The EOP relate to the human environment and apply to all aspects of business and operations. The principles were designed to provide direction on how to better achieve stewardship of air, water, and land resources, and to demonstrate a positive relationship between management of these resources and the protection and improvement of a sustainable environment. The seven principles are:

- Foster sustainability as a way of life throughout the organization.
- Proactively consider environmental consequences of all USACE activities and act accordingly.
- Create mutually supporting economic and environmentally sustainable solutions.
- Continue to meet our corporate responsibility and accountability under the law for activities undertaken by USACE, which may impact human and natural environments.
- Consider the environment in employing a risk management and systems approach throughout the life cycles of projects and programs.
- Leverage scientific, economic and social knowledge to understand the environmental context and effects of USACE actions in a collaborative manner.
- Employ an open, transparent process that respects views of individuals and groups interested in USACE activities.

Plan selection considered these principles to ensure the sustainability of the NER Plan. In addition, best management practices to maintain water quality standards, minimize or avoid impacts to trees, wetlands, and native vegetation, and to manage NNI species were considered in the recommended plan.

## 6.10 View of the Non-Federal Sponsor

The MCDEP is in support of the implementation strategy for the CAP Program Section 206 study that recommends Bel Pre Creek and Lamberton Creek under this authority. MCDEP and M-NCPPC will serve as co-sponsors for the design and implementation phase of this project and have submitted letters of support for the project included in Appendix C.

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# 7 ENVIRONMENTAL COMPLIANCE, COORDINATION & PUBLIC INVOLVEMENT

## 7.1 Environmental Compliance

For an activity or site to be environmentally acceptable for restoration work, the location, design, and operation must be in compliance with a number of environmental protection statutes and executive orders. Tables 7-1 and 7-2 outlines the statutes and executive orders that are potentially applicable to the project. All applicable permits, including a Park Construction Permit, will be secured as required prior to project construction. Environmental impacts are discussed in Sections 4.2 to 4.4, with supporting environmental compliance documentation and a summary of coordination efforts located in Appendix G.

## 7.2 Resource Agency Coordination

Water resources development studies conducted by USACE address problems and evaluate solutions that will provide benefits to the general public. NEPA and USACE planning regulations require public involvement. NEPA regulations state that in preparation of an EA, the agency shall involve environmental agencies, applicants, and the public to the extent practicable. Coordination with appropriate federal, state, regional, and local agencies is also a required part of the planning process. The intent of public involvement and agency coordination efforts undertaken during the study was to identify interested agencies and groups; encourage constructive interaction between the study team, representatives of the public, and agency representatives; and elicit and incorporate ideas, issues, and concerns important for the study area into the decision-making process.

USACE Baltimore has performed various site visits to the Anacostia River watershed and subject stream segments from 2021 to 2023. Most recently, USACE held an in-person field visit with USFWS, Montgomery Parks, M-NCPPC and MCDEP on January 25, 2023. The purpose of the site visit was to discuss the site extents, scope of work, and early proposed designs to USFWS. Shortly after, USACE kicked off coordination efforts with a study initiation notice which was sent out January 27, 2023. The notice was sent via electronic mail to the following agencies: USACE Baltimore Regulatory Division, USFWS, NOAA NMFS, EPA, National Park Service, USDA, MHT, MDE non-tidal and tidal wetlands group, MD DNR, M-NCPPC, MD SHPO, and seven federally recognized Tribal nations. A subsequent virtual agency coordination meeting was hosted by USACE on March 2, 2023. Of the agencies that were contacted for the study initiation notice, EPA, MDE, MD DNR, M-NCPPC, Montgomery Parks and MCDEP were in attendance for the virtual agency coordination meeting. USACE Baltimore continues to host project delivery team meetings at least once per month with MCDEP, Montgomery Parks, and M-NCPPC.

**Table 7-1. Federal environmental protection statutes and other requirements requiring consideration**

| Federal Statutes | Level of Compliance* |
|---|---|
| Archeological and Historic Preservation Act of 1974 | Partial |
| Bald and Golden Eagle Protection Act of 1962, as amended | Full |
| Chesapeake Bay Critical Area Act (1984) and its Criteria (1986) | N/A |
| Clean Air Act of 1970, as amended 1977 and 1990 | Full |
| Clean Water Act of 1972, as amended | Full |
| Coastal Barrier Resources Act of 1982 | N/A |
| Coastal Zone Management Act of 1972, as amended | N/A |
| Comprehensive Environmental Response, Compensation and Liability Act of 1980 | Full |
| Endangered Species Act of 1973 | Full |
| Farmland Protection Policy Act of 1984 | Full |
| Fish and Wildlife Coordination Act of 1958, as amended | Full |
| Magnuson-Stevens Fishery Conservation and Management Act | N/A |
| Marine Mammal Protection Act of 1972, as amended | N/A |
| National Environmental Policy Act of 1969, as amended | Partial |
| National Historic Preservation Act of 1966 | Partial |
| Noise Control Act of 1972, as amended | Full |
| Resource Conservation and Recovery Act of 1976 | Full |
| Rivers and Harbors Act of 1899 | N/A |
| Wild and Scenic Rivers Act of 1968 | N/A |

**Level of Compliance:*
*Full Compliance (Full): Having met all requirements of the statute, E.O., or other environmental requirements.*
*Partial Compliance (Partial): Not having met some of the requirements at current stage of planning.*
*Not Applicable (NA): No requirements for the statute, E.O, or other environmental requirement for the current stage of planning.*

**Table 7-2: Compliance of the Proposed Action with Applicable Executive Orders**

| Executive Orders | Status of Compliance |
|---|---|
| Protection and Enhancement of Environmental Quality (E.O. 11514/11991) | Full |
| Protection and Enhancement of Cultural Environment (E.O. 11593) | Partial |
| Floodplain Management (E.O. 11988) | Partial |
| Protection of Wetlands (E.O. 11990) | Full |
| Protection of Children from Health Risks and Safety Risks (E.O. 13045) | Full |
| Chesapeake Bay Protection and Restoration (E.O. 13508) | Full |
| Invasive Species (E.O. 13112) | Partial |
| Consultation and Coordination with Indian Tribal Governments (E.O. 13175) | Full |
| Responsibilities of Federal Agencies to Protect Migratory Birds (E.O. 13186) | Full |
| **Level of Compliance:*<br>*Full Compliance (Full): Having met all requirements of the statute, E.O., or other environmental requirements.*<br>*Partial Compliance (Partial): Not having met some of the requirements at current stage of planning.*<br>*Not Applicable (NA): No requirements for the statute, E.O, or other environmental requirement for the current stage of planning.* | |

## 7.3 Public Involvement and Views

*[This section will be revised after the public comment period is completed and the public has had an opportunity to review and comment on this IFR/EA.]*

# 8 DRAFT RECOMMENDATION

The Baltimore District endorses the recommended plan consisting of restoring stream habitat in Bel Pre Creek for a total length of 2.5 miles of the stream extending from Bel Pre Neighborhood Park to 100 feet upstream of the confluence with the Northwest Branch of the Anacostia River and restoring 0.7 miles of Lamberton Creek from the outfall at Yeatman Terrace to 1,000 feet upstream of the confluence with the Northwest Branch of the Anacostia River. The recommended plan addresses two fish blockages for resident fish at the culvert on Poplar Run, a tributary of Bel Pre, and the culvert at Lovejoy Street in Lamberton Creek resulting in a net increase of 2,600 feet of fish habitat improvements. The recommended plan is the NER Plan. Total project cost for the recommended plan is $18.9 million, which is cost shared 65 percent federal ($12.3 million), 35 percent non-Federal ($6.6 million) under the CAP 206 authority. The total project costs include $290,400 for monitoring and adaptive management of the project for ten years following construction of the project.

The natural channel design approach for this segment consists of lifting the stream channel bed using a series of grade control structures that include constructed riffles, j-hooks with riffle aprons (at bends), and cross vanes with riffle aprons (on straight segments) to consistently raise the channel and create a riffle pool sequence and habitat features. The concept designs address undercutting of the channel and improve floodplain connectivity between the stream and adjacent wetlands and riparian habitat. Additionally, the recommended plan would provide significant floodplain enhancements using floodplain benches, grading, planting of native species, and removal of NNI species. There are existing terrestrial resources around Bel Pre Creek and Lamberton Creek including mature forests, wetlands, seeps, and native vegetation that will be prioritized for protection as more detailed designs are developed during the design phase.

This Draft Feasibility Report and Environmental Assessment consists of all planning and design activities that demonstrate that federal participation is warranted at this time. The proposed action will have no significant adverse impact to the environment and will not constitute a major federal action affecting the quality of the human environment. Therefore, an Environmental Impact Statement will not be prepared. A Finding of No Significant Impact (FONSI) was prepared, a draft copy of which is available with this Draft IFR/EA. A signed copy will be made available upon completion of public and agency review.

To satisfy the requirements under Section 106 of the NHPA, USACE will enter into a Programmatic Agreement (PA) with the Maryland Historical Trust (MHT), the State Historic Preservation Office (SHPO) pursuant to 36 CFR § 800.14 (b)(ii). The purpose of the PA is to allow the Draft Feasibility Report/EA to move forward, while stipulating Phase I archaeological investigation requirements during the design phase when

funding can be obtained for this effort. The Draft PA is included in Appendix B of this Draft IFR/EA.

The recommendations contained herein reflect the information available at this time and current departmental policies governing formulation of individual projects. They do not reflect program, and budgeting priorities inherent in the formulation of a national Civil Works construction program nor the perspective of higher review levels within the Executive Branch. Consequently, the recommendations may be modified before they are transmitted to higher authority as proposals for authorization and implementation funding. However, prior to transmittal to higher authority, the sponsor, the states, interested federal agencies, and other parties will be advised of any modifications and will be afforded an opportunity to comment further.

**Signed in Final Feasibility Report after Public Review**

_____
Date Signed

_____
Francis B. Pera
Colonel, U.S. Army
Commander and District Engineer

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