BABB CREEK MITIGATION BANK
FINAL PROSPECTUS

CHARLESTOWN TOWNSHIP,
TIOGA COUNTY, PENNSYLVANIA

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1.0 Introduction

1.1 Project Name and Organization

Pennsylvania Resource, LLC (FPR, Bank Sponsor), a wholly-owned subsidiary of Resource Environmental Solutions, LLC (RES) proposes to establish the Babb Creek Mitigation Bank (Bank Site, Project) within the approved Pennsylvania Statewide Umbrella Mitigation Banking Instrument (PSUMBI). The purpose of the PSUMBI is to provide compensatory mitigation for unavoidable impacts to waters of the United States (U.S.) as a result of activities authorized under Section 401 and 404 of the Clean Water Act; Section 10 of the Rivers and Harbors Act; Pennsylvania Department of Environmental Protection (PADEP) Chapters 102, 105, and 106 regulatory programs; and Department of the Army Permits, provided such activities have met all applicable requirements and are authorized by the appropriate agencies.

The Bank Sponsor is submitting this Final Prospectus to the U.S. Army Corps of Engineers (USACE), Baltimore District, and Interagency Review Team (IRT) to evaluate the proposed Bank Site in accordance with 33 CFR 332.8(d)(2). The proposed Bank Site is located within the Central West Branch Susquehanna River Subbasin (8-digit HUC #02050205) (Pennsylvania State Water Plan Watershed Subbasin #9) and abutting the Upper Susquehanna River Subbasin (PA State Water Plan Subbasin #4). The proposed primary and secondary service areas are shown on Figure 1: Service Area Map (Appendix A: Figures).

1.2 Authorities

The establishment, use, operation, and maintenance of the PSUMBI and the Bank Site are carried out in accordance with the following authorities:

1. Clean Water Act (33 USC 1251 et seq.);
2. Rivers and Harbors Act (33 USC 403);
3. Fish and Wildlife Coordination Act (16 USC 661 et seq.);
4. Regulatory Programs of the Corps of Engineers, Final Rule (33 CFR Parts 320-332);
5. Guidelines for Specification of Disposal Sites for Dredged and Fill Material (40 CFR Part 230);
6. Memorandum of Agreement between the Environmental Protection Agency and the Department of the Army concerning the Determination of Mitigation Under Clean Water Act, Section 404 (b)(1) Guidelines (February 6, 1990);
7. Regulatory Guidance Letter No. 05-01. U.S. Army Corps of Engineers, February 14, 2005;
8. Compensatory Mitigation for Losses of Aquatic Resources; Final Rule. 33 CFR Parts 325 and 332, Department of the Army, Corps of Engineers and 40 CFR Part 230, Environmental Protection Agency, April 10, 2008
9. Regulatory Guidance Letter No. 08-03. U.S. Army Corps of Engineers, October 10, 2008;
10. Pennsylvania Department of Environmental Protection, Chapters 102, 105, and 106 regulatory programs; and
11. Pennsylvania State Programmatic General Permits (PASPGP) 3, 4 5, and 6 and the requirements of Title 25 PA Code 105 rules and regulations.

1.3 Phasing

The Sponsor is submitting this Final Prospectus for review and approval by the Interagency Review Team (IRT) as a precursor to the Draft Mitigation Site Plan (MSP). Upon approval, the Final MSP for the Bank Site will be included as an addendum to the PSUMBI, and the Bank Site will be deemed a component of the PSUMBI. Credits will be released in accordance with the schedule of credit availability outlined in the Final MSP. Credits released for the Bank Site will be accounted for in the bank ledger. Bank sites will have separate ledgers and separate entries in the Regulatory In Lieu Fee and Bank Information Tracking System (RIBITS), but all ledgers will be governed by the PSUMBI.

2.0 Mitigation Objectives

2.1 Location

The Bank Sponsor has secured land (Project or Bank Site) consisting of waterways, wetlands, and riparian floodplains within the Headwaters Babb Creek Watershed (12-digit HUC #020502050401) of the Pine Creek Watershed (8-digit HUC # 02050205) (Appendix A: Figures, Figure 1: Service Area Map). Two mainstem tributaries are identified within the Project limits – Babb Creek and Tributary 21811 to Babb Creek (Appendix A: Figures, Figure 1B: Watershed Map & Figure 2A: Project Area Map, PA DEP Historic Streams GIS Data, 2004). Multiple unnamed tributaries (UNTS), wetlands, and riparian floodplains surround these two mainstem tributaries of the Project.

The Project is in Charleston Township, Tioga County, Pennsylvania (PA) and is approximately 4.0 miles southeast of Charleston and 8.5 miles southwest of Covington (Appendix A: Figures, Figure 2A: Project Area Map).

The Project address and approximate center coordinates are listed below.

ADDRESS	Welsh Road, Wellsboro, PA 16901
APPROXIMATE CENTER COORDINATES	41°43'15.115" North -77°13'49.48" West

Below are the driving directions from the USACE Baltimore District Regulatory Tioga Branch Office in Tioga, PA.

1. Head west on Ives Run Ln (0.2 mile).
2. Turn left to stay on Ives Run Ln (1.3 mi)
3. Turn left on PA-287 S (5.9 miles)
4. Turn left onto Catlin Hollow Rd (5.1 miles)
5. Slight left onto Charleston Rd (0.2 mi)
6. Turn right onto Dartt Settlement Rd (1.1 mi)
7. Continue onto Gas company Rd (1.8 mi)
8. Turn right onto Cherry Flats Rd (0.9 mi)
9. Turn left onto Welsh Rd (1.5 mile). The Bank Site will be on your right.

Arrangements must be made with the Bank Sponsor prior to visiting the Project site as landowner coordination is necessary.

2.2 Objectives

The goal of the Project is to restore and preserve self-sustaining, functional environmental resources identified within the Project area. In accordance with these goals, the Project strives to replace the functions and values lost through adverse impacts to streams and wetland areas due to various Section 10 and/or Section 404 authorized projects occurring elsewhere within the Central West Branch Susquehanna River Subbasin (Pennsylvania State Water Plan Watershed Subbasin #9) and adjacent secondary service watersheds (Appendix A: Figures, Figure 1: Service Area Map).

Restoration efforts will create a stable stream and riparian system and improve habitat for a variety of species. In addition to reestablishing appropriate riparian buffer zones along streams, restoration activities will buffer and capture stormwater runoff, preventing nutrients and sediments from discharging directly into the watershed and downstream waterways.

Anticipated functional gains from the proposed restoration activities include:

- restoration of streams and wetlands
- reestablishment of stream and floodplain connectivity
- improved hydrologic connectivity

- improved onsite flood capacity, storage, and attenuation
- improved onsite stream stability and appropriate channel geometry
- improved aquatic and riparian terrestrial habitat
- improved vegetative diversity throughout all habitats within the Project area
- removal of invasive species, and
- perpetual protection of the Bank Site through appropriate legal instruments to support the continuity and progressive evolution of the functional improvement goals once achieved.

Larger-scale environmental objectives of the Bank Site will:

- support the national goal of no-net-loss of wetlands
- enhance and create wildlife habitat
- provide compensation for wetland and stream losses in a manner that contributes to the long-term sustainable ecological function of Pine Creek Watershed
- reduce nutrient pollution entering waters of the U.S., and
- protect aquatic resources from harmful activities and processes, both natural and anthropogenic.

Multiple techniques and alternatives were considered in developing a site-specific mitigation approach for the Bank Site. The intensity of restoration proposed in different areas of the Bank Site depends upon the existing degree of resource degradation in those areas. The Project incorporates a variety of active restoration and enhancement activities which will maximize ecological uplift, while minimizing disturbance and construction impacts to existing resources. The Bank Sponsor anticipates that restoration efforts at the Bank Site will establish and preserve a functional stream, wetland, and riparian corridor that will be self-sustaining in the long term.

3.0 Site Protection Instrument

The Bank Site will be protected by a Declaration of Restrictive Covenant for Conservation (Declaration) that will be placed on the property parcels in advance of the proposed restoration activities, thereby ensuring the long-term protection of the Project. The Declaration restricts activities that are incompatible with the objectives of the Project. The Declaration will be recorded in the county courthouse after receipt of all required permits, clearances, approvals, and authorizations and prior to Project implementation. An example Declaration is included as Appendix B: Site Protection Instrument. Survey Plats showing the title information as well as the reserved rights areas will also be filed as part of the Declaration.

As described in Section VI.H. of the PSUMBI, the Sponsor will act as the initial Long-Term Steward unless another qualified, watershed-focused entity is willing to assume Long-Term Stewardship responsibilities. The Sponsor's heirs, assigns, or purchasers will be responsible for protecting lands contained within the Bank Site in accordance with the terms of the approved MSP, unless the lands are transferred or sold to a third-party Long-Term Steward such as a local, state, or federal resource agency or non-profit conservation organization. Entrusting the Bank Site to a third-party Long-Term Steward may commence only when the Sponsor and the IRT have mutually concluded that the Bank Site has achieved all of its objectives and sufficiently satisfied performance standards. The third party may transfer the Declaration to a conservation easement if they so wish, with review and approval by the USACE.

4.0 Site Selection

The site selection process prioritized the suitability of the site to provide the desired ecological and aquatic resource functions. Sites were evaluated based on their likelihood of restoring and preserving a self-sustaining and functional stream, wetland, and riparian complex across a large contiguous area. A Project's ability to meet its objectives depends upon successful application of an appropriate restoration approach to address the existing degradation within the Project site, and the significant extent of existing degradation was a key factor during the site selection process. Selecting a site that is located at the headwaters of its watershed is another important consideration for accomplishing the Project's objectives. Restoration in these locations reduces the risk of failure due to uncontrollable activities or inputs occurring upstream or upslope.

The factors used to select the proposed Bank Site include the following:

- Hydrologic conditions, soil characteristics, and other physical and chemical characteristics
- Watershed-scale features such as aquatic habitat diversity, habitat connectivity, and other landscape-scale functions
- The size and location of the compensatory mitigation site relative to hydrologic sources (including the availability of water rights) and other ecological features
- Compatibility with adjacent land uses and watershed management plans
- Reasonably foreseeable effects that compensatory mitigation may have on ecologically important aquatic or terrestrial resources (e.g., shallow sub-tidal habitat, mature forests), cultural sites, functions and services, or habitat for federally- or state-listed threatened and endangered species, and
- Other relevant factors including, but not limited to, development trends, anticipated land use changes, habitat status and trends, local or regional goals for the restoration or protection of particular habitat types or functions (e.g., re-establishment of habitat corridors or habitat for species of concern), water quality goals, floodplain management goals, and the relative potential for chemical contamination of the aquatic resources.

Additional key factors the Bank Sponsor considered in the site selection process include:

- the headwaters' location within the sub-watershed
- the extent of degradation, disturbance, and restoration feasibility, and
- the potential impacts of restoration activities upon neighboring properties.

4.1 General Watershed Characteristics

The proposed Project is located within the headwaters of the Babb Creek Watershed, a sub-watershed of the Pine Watershed, which ultimately drains into the Susquehanna River and the Chesapeake Bay (Appendix A: Figures, Figure 1: Service Area Map). The Babb Creek Watershed covers approximately 130 square miles, with more than 140 miles of streams, including approximately 18 miles of Babb Creek. The watershed is in the northcentral portion of PA, lying within Charleston Township in central Tioga County.

The Project is in the Glaciated Low Plateau Section of the Appalachian Physiographic Province (Appendix A: Figures, Figure 2B: Physiographic Area Map), which is characterized by rounded hills and valley which formed as a result of fluvial and glacial erosion and glacial deposition (DCNR 2018). The Glaciated Low Plateau is located at the base of the high escarpments which form the adjacent uplands and the Poconos. The geology consists of sandstone, siltstone, and shale in low-amplitude folds. Land use is highly divided by the province boundaries with extensive forest land in the surrounding Deep Valley and High Plateau and predominantly agriculture in the fertile Low Plateau.

Soils within and surrounding the Project have depths ranging from 10 to 40 inches with slopes between zero and 15 percent, making them prime soils for agricultural uses (USGS Websoil, 2021). Additionally, permeable soils suitable for infiltration cover a large portion of the watershed and the Project Site.

4.2 Congruence with Watershed Needs

Existing land uses and pressure from timbering and active/historic and resource extraction threaten the natural ecosystems still present within the Babb Creek Watershed. Persistent degradation of water quality and habitat not only impacts ecosystem health and fishery value within the watershed but contributes to larger reaching impacts downstream to the Susquehanna River and the Chesapeake Bay.

4.3 Babb Creek Watershed

Drainage systems within the Babb Creek Watershed require restoration. Land uses within the Babb Creek Watershed are predominantly forest (72%) and agriculture (18%). Despite ongoing efforts by conservation agencies and farmers in Tioga County to implement best management practice to curtail high sediment

and nutrient loads from overland runoff (e.g., no till farming), many stream sides in agricultural lands remain denuded of riparian vegetation and stream channels are left deeply entrenched with eroding banks. As shown in Figure 2A: Project Area Map (Appendix A: Figures), these data are consistent with the land use characteristics of the Bank Site, in which the riparian zone of the mainstem and unnamed tributary are largely vacant of vegetation, providing little to no protection to the waters from erosion, sedimentation and overland runoff.

The Tioga County Conservation District (TCCD) is one of the leading conservation organizations in the region working to provide technical and financial assistance to the community within Babb Creek Watershed. The TCCD's mission statement is "to provide for the conservation of natural resources of Tioga County through leadership, education, and technical assistance." Established in 1946, the TCCD has been working closely with the agricultural community to help develop conservation plans, implement best-management practices, and identify pollution sources within the watershed at a local level.

Historic and active surface mining was prevalent within the Babb Creek watershed and ultimately resulted in widespread acid mine drainage impacts to Babb Creek, which was considered biologically dead in the 1990s due to high pH and heavy metals (USEPA 2009). The U.S. Environmental Protection Agency (EPA) issued TMDLs for Babb Creek in 1996 and a local watershed group, the Babb Creek Watershed Association, successfully implemented numerous water treatment projects to restore Babb Creek. Babb Creek was removed from the 303(d) Impaired Waters List in 2016 (WBSRC 2016). Downstream Lick Creek remains on the 303(d) list and additional effort is needed to remediate mining impacts within the watershed.

Despite impairments and degradation of the waters, the Babb Creek Watershed, with its 130 square mile drainage area, 141 miles of streams, multiple small ponds and freshwater wetlands, and numerous natural heritage and recreational areas, represents a very economically and ecologically important asset for the local economy. The Bank Site is centrally located between the Tioga State Forest and immediately between two locally significant Natural Heritage Program (PNHP) Natural Areas, the Babb Creek Headwaters, and the Charleston School Wetlands. These sites are thought to contain biological significance due to the concentration and diversity of wetlands and warrant future investigations (TNC, 2006, Figure 3). The Bank Site is also within the supporting landscape for the Nickel Run Headwaters North and South, which are also significant wetland communities which host rare species. The Bank Site is also located near several other state managed properties and PNHP core habitats and their supporting landscapes surrounding the proposed Project site. Table 1: Ecological Inventory Descriptions below, presents a list of the PNHP core habitats that are located within the surrounding landscape of the Bank Site. PNHP core habitat areas are also displayed on Figure 3: Ecological Inventory Map (Appendix A: Figures).

Table 1: Ecological Inventory Descriptions			
Agency	Site Name	Approximate Distance (miles) & Direction from Project	Description
PNHP	Charleston School Wetlands	<1 Mile North	Group of wetland includes forested wetlands and open graminoid meadows
PNHP	Babb Creek Headwaters	< 1 Mile South	Series of wetlands contains some open water habitat, wet meadow marshy areas, meandering streams, and clusters of forested wetlands. Site surrounded by high concentrations of agricultural land. Likely that runoff from fields is affecting the wetlands.
DCNR	Tioga State Forest	<2 miles South and 12 Miles Northwest	State Forest and contains multiple PNHP core natural areas
PNHP	Whitneyville Meadow	9 Miles Northeast	A wet meadow along a small stream- containing population of a plant species of concern
PNHP	Fossil Farm	6.5 Miles North	A small stream modified by beaver has some small open ponds which supports one dragonfly species of concern.
DCNR	Hills Creek State Park	5.3 Mile North	State Park containing Taucher Pond Natural Area and species of concern
PFBC	State Game Land 37	7.5 Miles East	SGL 37 is predominantly forested (61% oak, 28% northern hardwood, 6% conifer) with an age distribution heavily weighted toward the 81–125 year age class due to limited access, stream crossings and a combination of steepness and soil conditions. There are isolated vernal pool complexes within the Tom Brown Hollow, 8 existing beaver ponds within 2 complexes, and several unique habitats. A variety of game species can be found. SGL 37 is also part of the Northern Allegheny Plateau Important Mammal Area (IMA).
PNHP	The Muck	6.1 Miles Northeast	Also known as "Stokesdale Marsh"; a 500+ acre marsh north of Wellsboro. supports numerous invertebrate species of concern. Site within Important Bird Area #27.

The Babb Creek Watershed has been classified by the PNHP Aquatic Community Classification (ACC) as a Tier 1 Enhancement Watershed (Appendix A: Figure 4: ACC Watershed Designation Map). Enhancement watersheds reflect conditions that are likely not pristine and are prime candidates for restoration action because they are not as severely degraded as watersheds classified as Restoration watersheds. Enhancement techniques are most likely to yield the most significant ecological gains in these watersheds in proportion to the amount of effort put forth through restoration activities.

With the continued degradation of the regional landscape, the significance and importance of restoring and protecting the region's natural resources is critical. The need for continued resource restoration and protection efforts is warranted, as threats of development and other degradative land use continue to grow. Balancing the environmental protection of lands and waters with the growing residential and commercial development needs is a delicate task that should begin with protecting the natural resources that provide the sustenance for all life.

Larger watershed initiatives also support the conservation, restoration, and protection of the region in which the Bank Site is located. These larger initiatives, their missions, and their goals are described in more detail, below.

4.4 Susquehanna River Basin Commission

The Bank Site is part of the Susquehanna River Basin. According to the information provided on the Susquehanna River Basin Commission website (SRBC, 2015), "The Susquehanna River is the nation's sixteenth largest river and is also the largest river lying entirely in the U.S. that flows into the Atlantic Ocean. The Susquehanna and its hundreds of tributaries drain 27,510 square miles, an area nearly the size of South Carolina, spread over parts of the states of New York (NY), PA, and Maryland (MD)."

The river, from its origin in Otsego Lake near Cooperstown, NY, flows over 400 miles south where it empties into the Chesapeake Bay at Havre de Grace, MD, contributing one-half of the freshwater flow to the Chesapeake Bay.

The river basin borders major population centers of the east coast, and although relatively undeveloped, has experienced problems with water pollution and over usage. To address these problems, the Susquehanna River Basin Compact (Compact) was signed into law on December 24, 1970. The Compact, as adopted by the Congress of the U.S. and the legislatures of NY, PA, and MD provides the mechanism to guide the conservation, development, and administration of the water resources of the vast river basin. The Compact also established the Susquehanna River Basin Commission (SRBC) as the agency to coordinate the water resources efforts of the three states and the federal government. The mission of the SRBC is to enhance public welfare through comprehensive planning, water supply allocation, and management of the water resources of the Susquehanna River Basin.

To accomplish this mission, the SRBC works to: reduce damages caused by floods; provide for the reasonable and sustained development (which includes any change in land use from a natural or semi-natural state for a purpose such as agriculture, housing, commercial and etc.,) and use of land surface and ground water for municipal, agricultural, recreational, commercial and industrial purposes; protect and restore fisheries, wetlands and aquatic habitat; protect water quality and instream uses; and ensure future availability of flows to the Chesapeake Bay.

The proposed mitigation activities at the Project site directly support the SRBC's efforts to accomplish their mission, specifically with respect to protection and restoration of fisheries, wetlands, and aquatic habitats.

The activities of the SRBC are further guided by multiple goals, some of which are also directly supported by the proposed restoration activities. These goals include the following:

- To be a leader in issues concerning the conservation, utilization, allocation, development, and management of water resources within the Susquehanna River Basin. The proposed restoration activities may support this goal as it is anticipated to provide an exemplary example of conservation and natural resource management.
- To provide public information and education about the water resources of the basin. The proposed restoration activities may also provide a location where education about the conservation and restoration of natural resources can occur.

SRBC staff develops and implements the program as directed by the commissioners and as found in SRBC's comprehensive plan, Comprehensive Plan for the Water Resources of the Susquehanna River Basin (SRBC, 2015). The SRBC Comprehensive Plan identifies six priority management areas along with goals to be used to guide management efforts. Of the six, below are two management areas that will be directly supported by the proposed restoration activities:

- Water Quality
    - Monitor and assess the biological, chemical, and physical quality of the basin's waters to support restoration and protection efforts.
    - Develop, support, and implement plans and projects to remediate and enhance the basin's water quality.
    - Protect the quality of the basin's biological resources and sources of public drinking water

supply.

- Ecosystems
  - Perform ecosystem monitoring and assessment to provide data needed for effective watershed management.
  - Protect and restore biological resources throughout the basin and in each of the major subbasins.
  - Restore populations of migratory fish throughout the Susquehanna River system.

4.5 Susquehanna Greenway Partnership

The Susquehanna Greenway Partnership (SGP) links natural, cultural, historic, and recreational resources along the 500-mile corridor of the Susquehanna River in PA. (SGP 2015). The SGP has established a basin-wide organization for resource management and community conservation - factors of lasting importance to the economies and quality of life for river communities.

The SGP works to advance public and private efforts to connect people with their natural and cultural resources and promote a sustainable and healthy environment. To accomplish this mission, the SGP has laid out six initiatives. Of the six, the following two are directly supported by the proposed Project restoration activities:

- Conserving & Enhancing Natural Resources
  - The Project proposes to restore the natural resources on-site and protect them in perpetuity. As stated by the SGP, "Conserving critical wetlands, forestlands, farmlands and riparian areas…will enhance our water resources and the quality of life for all living things." In support of this statement, the SGP also works to preserve and enhance riparian corridors along the river and its tributaries in addition to advocating for priority conservation projects.
- Interpreting Natural and Cultural Assets
  - Interpreting natural and cultural assets along the river promotes the critical connection between the Susquehanna River Corridor and the Chesapeake Bay. Interpretation emphasizes the preservation and conservation of the Susquehanna's many diverse natural and cultural resources, and historic communities and increases pride in the community and ownership of its resources. The Project will become a natural asset that will improve the health of the landscape as well as the improve aesthetics and could potentially become a part of a greenway driving tour, similar to the SGP's Middle Susquehanna Driving Tour.

Although on a smaller scale as compared to the Susquehanna River Basin, it is clear that the restoration activities proposed for the Bank Site will support a subset of the management areas and the goals of both the SRBC and the SGP.

4.6 Chesapeake Bay

The Bank Site is in the Chesapeake Bay Watershed. The Chesapeake Bay, spanning parts of six states and draining 64,000 square miles of land, is the largest estuary in the U.S. It is a complex ecosystem made up of the Bay itself, its feeding network of waterbodies, and all the plants and animals it supports. As evidenced by the bulleted list below, the Bay plays a critical role in the health of the regional watershed (CBP 2012).

- The Bay supports more than 2,700 species of plants and animals, including 348 species of finfish and 173 species of shellfish.
- The Bay produces about 500 million pounds of seafood per year.
- The Chesapeake region is home to at least 29 species of waterfowl. Nearly one million waterfowl winter on the Bay – approximately one-third of the Atlantic coast's migratory population. The birds stop to feed and rest on the Bay during their annual migration along the Atlantic Flyway.
- Nearly 80,000 acres of bay grasses grow in the shallows of the Chesapeake Bay and its tributaries. Young and molting blue crabs rely on bay grass beds for protection from predators.

- Approximately 284,000 acres of tidal wetlands grow the Chesapeake Bay region. Wetlands provide critical habitat for fish, birds, crabs, and many other species.
- Forests cover 58 percent of the Chesapeake Bay watershed. The region loses about 100 acres of forest each day to development.

Due to pollution and multiple threats to this precious resource, the Bay was the first estuary in the nation to be targeted for restoration as an integrated watershed and ecosystem.

The Bay Program partnership implements and tracks progress toward goals to reduce pollution, restore habitats, manage fisheries, protect watersheds, and foster stewardship. The health of local streams and water bodies, including those within the Project site depend on how the land surrounding them is used, protected, and preserved. The restoration and protection of the waters within the Project site, therefore, align with the restoration goals of the Bay Program partnership in its effort to restore the overall health of the Chesapeake Bay. Specifically, restoration efforts at the Project site will involve reducing sediment pollution, restoring wetlands, streams and riparian corridors, planting of native wetland, riparian, and upland vegetation, and protection of these resources in perpetuity.

5.0 Bank Site Description

The proposed Bank Site is located 4 miles southeast of Charleston, in Charleston Township, Tioga County, PA. The Bank Site contains mainstem Babb Creek and unnamed tributaries that flow throughout the site (Appendix A: Figures, Figure 2A: Project Area Map). As shown in Figure 5: Designated Waters Map (Appendix A: Figures), the tributaries within the Project area are designated as Cold-Water Fisheries (CWF) and Migratory Fisheries (MF) (PA Code: Title 25: Chapter 93.9l). Babb Creek, and its associated tributaries, has an existing designated use of Exceptional Value (EV) and is designated as a naturally reproducing trout stream by the PA Fish and Boat Commission (PFBC) (Figure 5: Designated Waters (Appendix A: Figures)).

The Bank Site encompasses a relatively shallow and gently sloping topographic setting within a wide valley bottom that has been agriculturally active since prior to the 1930s. The existing land use within the Bank Site consists of patches of emergent, scrub-shrub, and forested wetlands within a matrix of active pasture and crop land. The land uses surrounding the Bank Site are similarly dominated by agriculture with fingers of patches of mixed forestland.

Streams, wetlands, and open water resources were identified on-site have been degraded significantly due to historic and on-going agricultural activities including cattle grazing, hay production, and crop cultivation. Sources of degradation include

- ditching and channelization
- dewatering
- channel incision and bank erosion
- sedimentation
- soil compaction
- excessive nutrient runoff
- topographic alterations
- instable and infrequent aquatic and terrestrial habitat elements, and
- low native vegetative diversity and coverage.

Representative site photographs are included as Appendix C: Representative Site Photographs.

6.0 Baseline Information

6.1 Baseline Data Review

Extensive baseline site investigations will be completed at the Project site. Baseline investigations and data collection will include:

- Subsurface soil investigations and surveys
- Topographic and boundary surveys
- Wetland delineation and waterbody identifications
- Flora community composition data
- Informal terrestrial and aquatic fauna community composition data
- PA Natural Diversity Inventory Review (PNDI)
- Bed stability and habitat pebble counts
- Bank Erosion Hazard Index (BEHI) Assessments
- Hydrologic data (In-stream and/or Subsurface)
- Benthic macroinvertebrate and fish sampling (if applicable)
- Large woody debris (LWD) surveys
- Habitat and/or functional assessment(s)
- Photo and field note documentation.

The following sub sections provide additional information regarding baseline data collection and analysis to support the Project. The Sponsor will assess and apply these data to guide the proposed restoration approach, as described in Section 8.0 Restoration Design Approach, Ecological Reference Site, & the Mitigation Work Plan.

6.2 Land Use

6.3 Adjacent Land Use

The proposed Bank Site is surrounded by large tracts of agriculturally productive land, primarily pasture and crop fields. The Babb Creek Headwaters Natural Area borders the southern edge of the Bank Site (Appendix A: Figures, Figure 3: Ecological Inventory Map). Surrounding the Bank Site and its immediate landscape, the cultural description of the land includes small residential towns that are seeing greater traffic as tourists recognize the recreational opportunities of the landscape.

6.4 Bank Site Historic and Present Land Use

Historic imagery dating back to 1938 (Figure 6A: 1938 Historic Aerial) confirms that the historical land use was centered around agriculture, primarily livestock grazing and crop production. As demonstrated in the historic aerials, no riparian buffers were left to protect the waters from the agricultural runoff from the surrounding farmsteads. The majority of the waters in the Project area were once ditched and impounded to maximize agricultural productivity.

The Bank Site is currently in varying stages of ecological degradation and recovery due to historical anthropogenic influences, many of which are consistent with historic land use trends across the state. In its current condition, the Bank Site's biological integrity has been adversely ecologically and physically altered by agricultural uses.

6.5 Soils

The U.S. Department of Agriculture Natural Resource Conservation Service (USDA-NRCS) identifies six distinct soil series/complexes within the Project. The soil identities and summary attributes are included in Table 2: Soil Series, and the mapped locations of the soils are shown in Appendix A, Figure 8: Soils Map.

Table 2: Soil Series [1]								
Soil Series Symbol	Soil Series Description	Soil Series Setting (Landform)	Farmland Classification	Soil Limitations				Hydrologic Soil Group
				Depth to Restrictive Features		Natural Drainage Class	Hydric Rating Percentage (%)[2]	
				Depth to Any Soil Restrictive Layer (inches)	Depth to Water Table (inches)			
MoA	Morris gravelly silt loam, 0 to 3 percent slopes	Hills, mountains	Farmland of state importance	10-22	6-18	Somewhat poorly drained	5	D
MoB	Morris gravelly silt loam, 3 to 8 percent slopes	Hills, mountains	Farmland of state importance	10-22	6-18	Somewhat poorly drained	5	D
MoC	Morris gravelly silt loam, 8 to 15 percent slopes	Hills, mountains	Farmland of state importance	10-22	6-18	Somewhat poorly drained	5	D
No	Norwich silt loam, 0 to 5 percent slopes	Depressions	Not prime farmland	10-24	0-6	Poorly drained	95	D
Ow	Orrville silt loam	Flood plains	Farmland of state importance	40-70	12-30	Somewhat poorly drained	15	B/D
WeA	Wellsboro channery loam, 0 to 3 percent slopes	Hills, mountains	Prime farmland	14-30	13-24	Moderately well drained	0	D

Notes:

1. Soils data obtained from the following: Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. Web Soil Survey. Available online at http://websoilsurvey.nrcs.usda.gov/. Accessed December 2021.
2. Criteria for hydric soils. Map units are composed of one or more map unit components or soil types, each of which is rated as hydric soil or not hydric. Map units that are made up dominantly of hydric soils may have small areas of minor nonhydric components in the higher positions on the landform, and map units that are made up dominantly of nonhydric soils may have small areas of minor hydric components in the lower positions on the landform. Each map unit is rated based on its respective components and the percentage of each component within the map unit

6.6 Environmental Resource Identification

Formal wetland and stream delineations were performed in November 2021. Wetland delineations were completed following the *1987 Army Corps Wetland Delineation Manual* (USACE, 1987) and the *Northcentral and Northeast Regional Supplement Version 2.0* (USACE, 2012). Streams were identified and geographically located using handheld global positioning satellite systems (GPS) technology. Results from the environmental survey are described briefly. The delineation report, along with sampling points, USACE data forms, and photos will be reported in the Draft MSP. A summary of existing and proposed resources identified within the Project's limits is provided below in Table 3: Summary of Existing and Proposed Resources.

6.7 Wetlands

Wetland delineation efforts at the Bank Site identified formal boundaries of existing PEM, PSS and PFO wetlands. Table 3: Summary of Existing and Proposed Resources provides a breakdown of the approximate sizes of the wetlands within the Bank Site. Figure 9: Existing Conditions Map (Appendix A: Figures), shows the locations of the preliminary wetlands within the proposed Bank Site. These preliminary estimates are based on the National Wetlands Inventory (NWI), National Hydrography Dataset (NHD), the University of Vermont's Spatial Analysis Laboratory Modeled Wetlands, and professional expertise.

Table 3: Summary of Existing and Proposed Resources

Resource Type	Existing	Proposed	Units
Streams	9,301	13,044	Linear Feet
Wetlands	32.16	50.90	Acres
Open Water	4.34	0.00	
Uplands	31.41	17.01	
Bank Site Acreage	67.91		

Notes:
1. Pre-restoration (existing) lengths are based on the resources within the Site Protection Area only and do not account for all delineated resources on site.
2. Upland acreage does not account for stream acreages.

The Bank Site consists predominantly of and scrub-shrub (PSS) wetlands with some Palustrine Emergent (PEM) wetlands and Palustrine Forested Wetlands (PFO) scattered throughout (Appendix A: Figures, Figure 9: Existing Conditions Map & Delineation Map). While a larger portion of wetlands onsite were characteristic of a floodplain complex hydrogeomophic (HGM) wetland class, some wetlands were classified as slope wetlands while the remaining were characterized as depressional. The wetlands are dominated by invasive vegetation, including narrowleaf cattail (*Typha angustifolia*) and reed canary grass (*Phalaris arundinacea*).

6.8 Streams

As indicated above, the waters within the Bank Site are designated as a CWF, MF, and EV according to the PA Code: Title 25: Chapter 93.9a to 93.9z and are considered as attaining for the aquatic life use designation according to the Clean Water Act Section 305(b) reporting and Section 303(d) Integrated Streams List in PA. Babb Creek is designated as having an existing use of Exceptional Value (EV), and is a naturally reproducing trout stream per PFBC. Contours of the Bank Site are shown in Figure 10: Topographic Map. Figure 11: Municipal Water Supply Service Area (Appendix A: Figures) shows the areas around the Bank Site that provide a public water supply. As shown in Figure 12: Drainage Area and FEMA Map (Appendix A: Figures), a portion of the Bank Site is located within the FEMA 100-year flood Zone A (1 percent chance annual flood zone).

Figure 9: Existing Conditions Map and Figure 9A: Delineation Map (Appendix A: Figures), detail the location of watercourses identified within the Bank Site. Table 3: Summary of Existing and Proposed Resources provides a breakdown of the stream lengths within the Bank Site. Streams on-site exhibit varying degrees of degradation. Areas of vertical and horizontal instability are present due to historic and ongoing agricultural practices, presenting ideal conditions for channel relocation and rehabilitation.

6.9 Open Water

The bank Site contains some open water resources historically intended to relieve agricultural areas of excess hydrology. Restoration activities will focus on returning these areas to natural wetland habitats as well as utilizing the additional influx of hydrology for the adjacent resources.

6.10 Functional Evaluations

The Bank Sponsor will conduct hydrologic, biogeochemical and habitat evaluations at the Bank Site to gain an understanding of the current state and functionality of the existing resources.

A combination of degradation indices and biological indices will be employed to measure the overall degradation and physical impairment at baseline monitoring locations to be determined at a future time and identified on mapping provided with the Draft MSP. Following a data-driven restoration decision approach, results of the degradation indices will be used to guide the overall restoration design for the Project. Physical and Morphological Conditions

6.11 BEHI

The Bank Sponsor will utilize the Bank Erosion Hazard Index (BEHI) procedure to determine stream bank erosion conditions and potentials within the Bank Site. The BEHI procedure assigns point values to several aspects of bank condition and provides an overall score that can be used to inventory stream bank conditions and prioritize eroding banks for restorative action.

BEHI assessments will be completed at baseline monitoring locations within the Bank Site. Preliminary results of the BEHI calculations will indicate an average BEHI rating across the Project Site.

6.12 LWD

Large-woody debris (LWD) indices will be collected at baseline monitoring locations. Hedman et al. (1996) studied in-stream LWD loading for various riparian forest serai stages in the southern Appalachian Mountains. The results that generated from this study will be used to compare LWD loading at the Bank Site to assess the degree of impairment at the selected baseline monitoring locations. Hedman et al. (1996) defined LWD as woody debris greater than 1.5 meters in length and greater than or equal to 10 centimeters (cm) in diameter. For accurate comparison, the previous definition will be used for the assessment of LWD loading at the Bank Site. Channel widths will be collected to calculate the approximate area of the channel. The collected LWD data and channel dimensions will then be used to calculate the approximate LWD volume per channel area. A lack of LWD presence negatively affects the vertical and horizontal stability, bed stability, habitat availability, and carbon retention for fish and macroinvertebrate habitat within the stream system.

6.13 Habitat and Stability Pebble Counts

Two methods of pebble counts will be conducted separately to assess both streambed stability and habitat availability. Habitat pebble counts will be conducted using a Wolman sampling approach. One-hundred pebbles will be collected within the wetted parameter at 100-meter sampling reaches Stability pebble counts will be conducted using transect sampling approach, collecting 100 pebbles from individual riffles to properly assess bed stability. Data collected from the performed pebble counts will be analyzed via cumulative frequency distributions, bed particle type distributions, and grain size analysis.

6.14 Biological Indices

6.15 Fish Community Survey

A semi-quantitative fish survey will be completed at baseline monitoring locations within the Bank Site. Fish will be collected using a backpack electrofishing unit and team of dip-netters. Semi-quantitative sampling efforts will follow protocols established in *Wadeable Semi-Quantitative Fish Sampling Protocol for Streams* (PADEP, December 2013). Individuals will be identified to the species level in the field and released upon proper identification. The collected data will be utilized to calculate appropriate biological metrics, which

included Species Richness, Percent Generalist, Percent Tolerant, Percent Insectivore, Percent Intermediate, Shannon's Diversity Index, and Shannon's Evenness Index.

6.16 Benthic Macroinvertebrate Sampling

Macroinvertebrate samples will be collected at baseline monitoring locations across the Bank Site. Protocols established by PADEP's *Bureau of Point and Non-Point Source Management* will be used as guidelines for the macroinvertebrate sampling process. Qualified biologists will identify samples to the taxonomic rank of genus. The resulting data will be used to calculate the index of biotic integrity (IBI) and aquatic life use attainment benchmarks, derived from the following metrics: Taxa Richness, EPT Richness (PTV 0-4), Beck's Biotic Index Version 3, Hilsenhoff Biotic Index, Shannon's Diversity Index, Percent Sensitive Individuals (PTV 0-3), BCG 123/BCG 456 Taxa, BCG 123/BCG 456 Individuals, Mayfly Taxa, and Mayfly Percent.

6.17 Upland Assessment

The Bank Site is composed of a mosaic of degraded PEM, PSS, and PFO wetlands and uplands, characteristic of the long history of active agricultural activities across central PA. Agricultural fields surrounding and partially within the Project area that were farmed at the turn of the century continue to be used to produce corn, winter wheat, and soybeans, while also supporting livestock grazing. Despite this long history of intensive agricultural use surrounding the Project area, a mid-successional forested upland/wetland complex remains northwest of the Project and contains dominant woody vegetation including hemlock (*Tsuga canadensis*). Within the uplands inside the Bank Site, the vegetation is dominated by crops, European pasture grass, or invasive species including multi-flora rose (*Rosa multiflora*), Japanese barberry *(Berberis thunbergii)* and reed canary grass, which inhibit native plant regeneration throughout.

6.18 Threatened and Endangered Species

A PA Natural Diversity Index Environmental Review (PNDI) was completed on June 2, 2021. The PNDI records indicate there are no known impacts to threatened and endangered and/or special concern species and resources within the Project Site. Therefore, no further coordination through the PNDI process is required with the jurisdictional agencies including the PA Game Commission (PGC), the PA Department of Conservation and Natural Resources (PADCNR), the PA Fish and Boat Commission (PFBC) and the U.S. Fish and Wildlife Service (USFWS). A copy of the PNDI receipt is provided as part of Appendix G: Jurisdictional Agency Coordination.

6.19 Cultural Resources

The Bank Sponsor will initiate formal consultation with the PA Historical Museum Commission (PHMC) Bureau of Historic Preservation (BHP) to determine the potential presence of historic and archaeological resources within the Project site. A preliminary review of the PA-Share website did not show any results within or adjacent to the Project Site (share.phmc.pa.gov, 2021).

7.0 Determination of Stream and Wetland Credits

Preliminary crediting estimates based upon the USACE-sponsored Ratio Model are included in Table 4: Preliminary Ratio Based Crediting Summary, below. An example credit ledger is provided in Appendix H: Bank Ledger.

Hydrologic, geomorphic, geotechnical, and biological data will be collected at the Bank Site and assessed to develop measures of condition differential and complete functional crediting calculations based on identified causes of degradation and the proposed restoration design. Indices from these data will be used to develop a crediting strategy based on the PADEP Aquatic Resource Compensation Protocol Riverine and Wetland Rapid Assessments (Compensation Protocol). The functional compensation credit ledger is provided in Appendix H: Bank Ledger.

Per the Pennsylvania Function Based Aquatic Resource Compensation Protocol (Draft Version 1.0), additional compensation is awarded for the protection and preservation of upstream and lateral resources that abut areas where restoration is intended to occur. This compensation is awarded as a Compensation

Value Adjustment Factor for Riverine Upstream Corridor Conservation and Riverine Lateral Conservation. The Bank Sponsor may propose credit modifiers for capturing headwater tributaries and supporting the permanent protection of the tributaries and/or riparian buffers within the greater catchment basin.

This crediting approach was proposed and approved at other Bank Sponsor approved mitigation banks including Quaker Mitigation Bank, Robinson Fork Mitigation Bank Phase 1, Laurel Hill Mitigation Bank, and Upper Susquehanna River Mitigation Bank Phase 2, all of which preserved a significant extent of headwater tributaries, resources, and riparian corridors.

Table 4: Preliminary Ratio Based Crediting Summary provides a breakdown of the USACE-sponsored ratio based crediting scenario. Impact mapping and calculations will be provided in the Draft MSP. The Preliminary Resource Development Map (PRDM), which shows each stream and wetland compensation strategy, is provided in Appendix A: Figures, Figure 13: Preliminary Resource Development Map.

The following section provides a description of the physical work proposed to deliver functional gain. Design plans and details will be provided in the Draft MSP.

Table 4: Preliminary Ratio Based Crediting Summary

Resource Type	Restoration Type	Mitigation Ratio		Proposed Value	Generated Credits
Streams (linear feet)	Restoration (Relocation)	1	:1	12,342.01	12,342.01
	Rehabilitation	1.5	:1	296.90	197.93
	Enhancement	2.5	:1	405.14	162.06
	Preliminary Totals			13,044.05	12,702.00
	Base Credits Generated in the Catchment and Lateral Modifier Reaches that are proposed for the Credit Adjustment Modifiers			TBD	TBD
	Proposed Additional Credits Generated per the Credit Adjustment Modifiers			TBD	TBD
	Preliminary Total Credits Generated			-	-
Wetlands (acres)	Reestablishment	1	:1	18.85	18.85
	Rehabilitation	1.5	:1	16.08	10.72
	Enhancement	2.5	:1	15.97	6.39
	Preliminary Totals			50.90	35.96

Notes:

1. Proposed crediting values do not include preservation resources.
2. Please note that crediting is not awarded by Cowardin Classification (PEM, PSS, or PFO) but rather restoration approach which varies based on the extent of the work proposed.

8.0 Restoration Approach, Ecological Standard, & Mitigation Work Plan

8.1 Restoration Design Approach

Restoration of the Bank Site will be conducted utilizing applicable restoration approaches detailed in Sections 8.5 thru 8.11. Restoration efforts will result in the establishment and preservation of self-sustaining, functional stream, wetland, and riparian areas. Restoration efforts will apply techniques and lessons learned from several well performing Bank Sites constructed across the State. The Bank Sponsor therefore proposes to use previously restored sites as ecological and functional reference sites/standards.

8.2 Reference Sites/Standards

Previously constructed and restored mitigation sites established by the Bank Sponsor will be used as/for reference sites and standards for the Bank Site. Below are summaries of information and additional details regarding the evaluation of reference sites for the purposes of Bank Site design, establishment, and for evaluating targeted functional restoration outcomes.

8.3 Robinson Fork Mitigation Bank I

The 533-acre Robinson Fork Mitigation Bank 1 (RFMB1), located in Washington County, PA was permitted in 2015 and constructed over two seasons through 2017. RFMB1 includes over 95,949 linear feet of stream restoration and over 46 acres of wetland, and additional riparian/adjacent upland habitat conservation and protection.

RFMB1 is a watershed scale floodplain (integrated valley) restoration site, encompassing several headwaters reaches and portions of the mainstem Robinson Fork. Implementing restoration at the headwaters location within a watershed is important for providing greater control of inputs (pollutants) entering the system, while also reducing the risk of restoration failure.

Restoration efforts at RFMB1 focused on creating an integrated and dynamic stream and floodplain system, restoring localized groundwater aquifers, reconnecting stream and floodplains to the groundwater table, optimizing and diversifying aquatic and terrestrial habitat, and creating a hydrologic system that allows for the retention of nutrients, stream bed material and organic carbon. Since construction, RFMB1 has been monitored annually, and results have exceeded expectations for performance each year.

8.4 Codorus Creek Mitigation Bank – Phase I

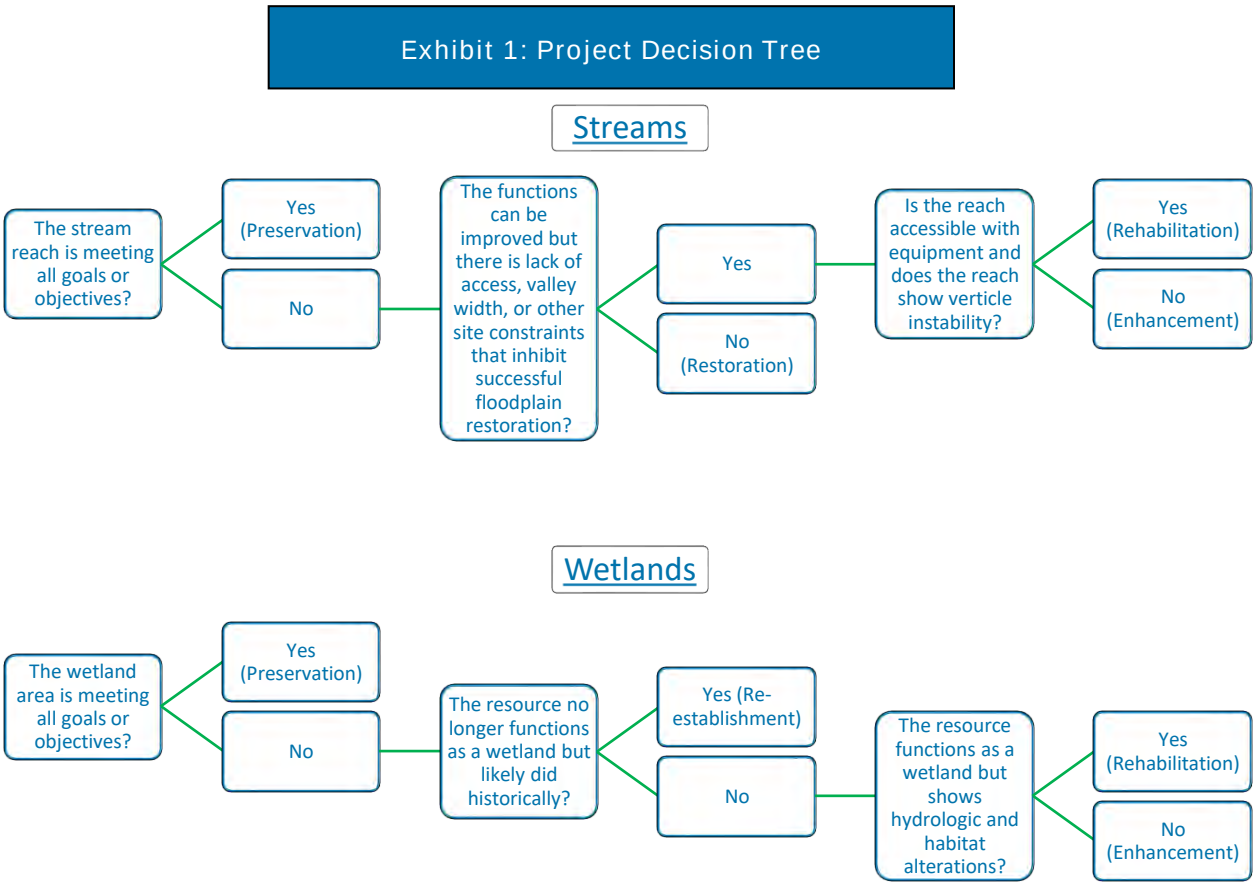
The 44-acre Codorus Creek Mitigation Bank (CCMB), located in York County, PA, was constructed during the summer of 2019 and resulted in the restoration of over 10,800 linear feet of stream and 8.6 acres of wetland resources. Like RFMBI and Quaker Mitigation Bank, the CCMB also employed a watershed scale approach, prioritizing headwater reaches to control and/or limit inputs entering the system and reduce risk of underperformance and/or failure.

The site was restored following the floodplain (integrated valley) restoration approach. Year 1 monitoring occurred in 2020, with results exceeding expectations.

8.5 Determination of Restoration Designation

The Project will incorporate a variety of restoration and enhancement activities which will maximize ecological uplift, while minimizing disturbance and construction impacts to existing resources. Restoration efforts will result in the establishment and preservation of self-sustaining, functional stream, wetland, and riparian areas.

The Sponsor uses professional judgment, experience, and data driven decision-making to determine which restoration designation is appropriate for each area within the Bank Site. Areas are assessed predominantly based on the degree of impairment and existing site constraints (such as conservation area extents, accessibility and constructability, and existing/surrounding infrastructure). Flow Chart 1: Project Decision Tree provides a breakdown of general questions evaluated to determine preliminary restoration designations. Baseline data will be analyzed and used to support the designation decisions and to ensure that the appropriate and successful restoration techniques are applied.



8.6 Mitigation Work Plan

In accordance with the PSUMBI, the Design Plan for the Bank Site will be included in the Draft MSP. This plan will include:

- Design Parameters
- Erosion and Sediment Control Plan
- Construction Details
- Grading Plan and Profile
- Planting Specifications
- Planting Details
- Planting and Seeding Schedules, and
- Hydrologic Modeling

8.7 Stream Restoration Reaches

Stream restoration reaches are generally characterized as severely degraded reaches exhibiting significant vertical/horizontal instability, physical alterations, limited floodplain connection/continuity, low habitat diversity, high shear stress, and limited carbon/sediment retention. Restoration reaches are designated based on reach characteristics including extent of degradation, vertical incision, and floodplain disconnection. The streams designated for restoration represent those that have experienced the greatest extent of degradation.

The Sponsor will apply a floodplain restoration approach to stream reaches designated for restoration. These efforts will result in the full restoration of channel pattern, floodplain, and profile using a combination of channel relocation, floodplain grading, and subsurface grade control structures (log or rock). These measures will aim to restore the stream at or near its original elevation by either removing the sediment that sits above the historic floodplain layer or raising the valley up to an elevation where field indicators suggest the floodplain historically existed.

Restoring the channel pattern and floodplain will promote the spread of high flow events through the reconnected floodplain and dissipate the kinetic energy that frequently mobilizes bed and bank substrate. Subsurface log and rock structures will be used to establish grade control and ensure long-term vertical bed stability. This approach will improve channel stability and increase floodplain connection and continuity. In addition, the design will promote the stabilization of bed sediment and provide habitat for aquatic communities. Restoration efforts enhance LWD and fine carbon retention, providing additional food sources and unique niches that will promote the further improvement of aquatic biological communities. The re-establishment of stream habitat and floodplain diversity will also provide new habitat for amphibians and terrestrial organisms and aid in the reestablishment of historic wetland communities. Furthermore, floodplain restoration efforts will improve hydrologic connectivity, water storage capacity, and biogeochemical cycling through the reestablishment of the hyporheic zone.

8.8 Stream Rehabilitation Reaches

Stream rehabilitation reaches tend to have narrow floodplains/steeper slopes and exhibit channel degradation (incision/erosion), limited carbon/sediment retention, and low LWD volumes. These reaches are accessible to mechanized equipment and can benefit from the strategic placement of in-stream structures. Rehabilitation efforts restore the channel profile and improve habitat, but do not alter the channel pattern. Measures incorporate mechanically placed structures to provide grade control, address erosion, and improve habitat. Structures placed include but are not limited to grade logs, log vanes, debris jams, toe wood, and stick ups. These structures retain sediment, gravel, and organic carbon while also re-establishing grade control and improving habitat.

8.9 Wetland Re-establishment

Wetland reestablishment is the manipulation of the physical, chemical, or biological characteristics present to develop a wetland that does not currently exist. Re-establishment efforts focus on the restoration of hydrology, topography, and vegetation. In some instances, wetland reestablishment will be accomplished through floodplain restoration via the reestablishment of stream/floodplain connection and the hyporheic zone.

However, floodplain restoration techniques may not be the only method utilized for re-establishing wetlands. Where present, existing drain tiles, ditches, or swales will be removed, disabled or plugged to restore hydrology. Disturbed/compacted soils will be restored through raking or tiling to restore on-site hydrology and microtopography. In other areas buried wetland soils will be exposed through the removal of accumulated surface sediment, fills, or by re-contouring certain areas. Hummocks, depressions, and pools will be installed to create a diverse heterogenous habitat with different levels of hydrology. Harvested woody debris (trees, stumps, shrubs, etc.) will be spread throughout re-established wetland areas to create surface habitat features. In addition, the wetland re-establishment areas will be fully planted and seeded with native hydrophytic vegetation (woody and herbaceous).

8.10 Wetland Rehabilitation

Wetland rehabilitation is the manipulation of the physical, chemical, or biological characteristics of a site with the goal of repairing natural/historic functions to a degraded wetland. Rehabilitation results in a gain in wetland function but does not result in a gain in area. Rehabilitated wetlands may include fragmented floodplain wetlands that have receded from stream/floodplain disconnection, wetlands that have been degraded by years of cattle grazing/agricultural practices resulting in soil compaction, or wetlands that

have been physically manipulated to drain better. Rehabilitation efforts focus on functional improvements to hydrology, topography, and vegetation within an existing degraded wetland. In some instances, wetland rehabilitation will be accomplished through regrading existing wetlands located within floodplain restoration zones to improve hydrology by reconnecting the stream/floodplain with the hyporheic zone. Wetland acreage surrounding these wetlands will increase significantly, as wetland re-establishment occurs in adjacent areas. Rather than continuing to exist as isolated wetlands driven by toe-of-slope, depressional, or fringe hydrology, these wetlands will become part of larger wetland floodplain complexes.

Floodplain restoration techniques may not be the only method utilized for rehabilitating wetlands. Where present, existing drain tiles, ditches, or swales found within these wetlands will be removed disabled or plugged to improve hydrology. Disturbed/compacted soils will be re-worked through raking or tiling to improve hydrology and microtopography. Hummocks, depressions, and pools will be installed to create a diverse heterogenous habitat with different levels of hydrology. Harvested woody debris (trees, stumps, shrubs, etc.) will be spread throughout rehabilitated wetland areas to create surface habitat features. In addition, the wetland rehabilitated areas will be fully planted and seeded with native hydrophytic vegetation (woody and herbaceous).

8.11 Wetland Enhancement

The manipulation of the physical, chemical, or biological characteristics of an aquatic resource to heighten, intensify, or improve a specific wetland function(s). Enhancement does not result in a gain in wetland area. Enhancement efforts will focus on improving habitat through planting, seeding, invasive species control, or installing woody habitat features.

8.12 Upland Restoration Sequence

Upland areas with little to no existing woody stands will be replanted and seeded with native herbaceous and woody material. Degraded woody stands will be swept for invasive species and selectively planted if needed. Healthy upland forested stands will be preserved.

9.0 Maintenance Plan

Per Section VI. Maintenance and Monitoring of the Bank of the PSUMBI, the Sponsor will perform all necessary maintenance and monitoring during the active and interim maintenance and monitoring phase of the Bank Site life cycle to ensure the continued viability of the Bank Site once initial construction is complete. Maintenance activities will continue through completion of the monitoring period as described in Exhibit B of the PSUMBI. Monitoring will occur until all released credits have been sold or until the Bank has been closed-out and becomes the responsibility of the Long-Term Steward. The Long-Term Steward will be responsible for monitoring and maintaining the Bank Site as described in Section 13.0 Long-Term Management Plan. At Bank Site closure, the Sponsor will remain responsible for long-term maintenance and management activities until a Long-Term Steward is identified. The Sponsor will also be responsible for maintenance and monitoring activities during the interim maintenance and monitoring period, if applicable.

The need to perform maintenance will be assessed in the monitoring reports and during monitoring site visits, and if deemed necessary by the Sponsor or the IRT, the appropriate required maintenance will be conducted.

Routine maintenance activities will be conducted yearly at minimum at the Bank Site to ensure continued viability of the Site from the time of Bank approval through Bank Closure. Maintenance and monitoring crews will assess the Bank Site to ensure no trespass, vandalism, dumping, or trash accumulations occur. Crews will be responsible for posting and repairing any damaged signage, and where applicable, maintaining and repairing fencing, gates, and in-stream structures. Maintenance activities will also include supplemental planting efforts and invasive species management if and where necessary, as detailed below. As shown in Table 5: Invasive Species Management Timeline, crews will be onsite multiple times a year for the first three years, and at minimum annually until Bank Site close-out. Crews will primarily focus on

invasive species management, however additional observations and activities (as indicated above) will be noted and addressed as necessary.

Invasive species management is a key component of the Maintenance Plan. The control of invasive species and the promotion of the native plant community have many ecological, physical and chemical benefits that will result in highly functional wetland and stream ecosystems. Some of these benefits include habitat and food sources for wildlife, natural erosion and flood control, and active nutrient cycling and temperature regulation, all of which will benefit water quality.

Intensive maintenance will occur during the first three years of establishment (Table 5: Invasive Species Management Timeline). This maintenance will involve a combination of species-specific mechanical and chemical weed control to support the establishment of a diverse herbaceous native plant community while controlling invasive species on site.

Mechanical control will involve mowing, trimming, or cutting of invasive or undesirable annual species to prevent these species from setting seed and to allow light filtration for developing herbaceous material, trees, and shrubs. Two or more timed mowing events are expected to be needed during the first three years of establishment to promote the establishment of a healthy community of perennial herbaceous species that will be resistant to re-colonization of annual invasive species. Once established, these stands are resistant to re-colonization by annual invasive species and greatly reduce maintenance requirements for the Bank Site in the future.

Chemical control methods will be needed for highly aggressive invasive species that grow rhizomatously, disperse large quantities of seed, and/or are generally resistant to most methods of mechanical weed control. There are several different methods for chemical application, all of which require the use of the proper herbicide. Aquatic-approved herbicides will be used in wetland areas. When possible, a dicot-, monocot-, or family-specific herbicide will be used to target specific invasive species. This will allow native species to continue to grow and establish in those areas, creating more competition and reducing the invasive species' ability to re-colonize. Additionally, the invasive species to be managed on site are active earlier and later in the year than native species, as they are cold weather adapted. This allows for herbicide application to be conducted before native species have propagated and/or budded out in spring and after they have gone dormant in fall, further reducing any negative impacts to native species in those areas. A general invasive species management table has been provided below. As these are dynamic systems, maintenance activities will be modified as needed on a yearly basis to best suit the Bank Site's needs. Yearly maintenance activities and proposed activities for future years are discussed in annual monitoring reports. The following table illustrates the proposed invasive species management timeline.

Table 5: Invasive Species Management Timeline			
Year	Season	Mechanical	Chemical
Years 1 and 2	Winter	Cut and paint stump control on woody invasive material	
	Spring	Late spring mowing	Early season weed control
	Summer	Early summer mowing/trimming as needed	
	Fall	Late fall mowing if needed	Late-season weed control
Year 3	Winter	Cut and paint stump control on woody invasive material, if needed	
	Spring	Spot mowing or trimming, if needed	Early season weed control
	Summer	Trimming, if needed	
	Fall	Spot mowing or trimming, if needed	Late-season weed control
Year 4	Winter		
	Spring		Early season weed control
	Summer		
	Fall		Late-season weed control
Year 5+	Winter	Species-specific maintenance conducted on an as-needed basis	
	Spring		
	Summer		
	Fall		

If properly maintained and managed, maintenance requirements drastically drop off between years four and five, mainly requiring one to two events a year that are highly targeted to specific areas and species. Upon Bank Closure, all terms and conditions set forth in the Long-Term Management Plan, described in Section 13: Long-Term Management Plan will take effect.

Maintenance for streams should require little to no work as the streams are designed to be self-sufficient. The stream restoration is designed to reduce shear stresses that occur within the channel and floodplain, and with the implementation of sub-surface grade control structures, vertical and horizontal stream instability at the Bank Site decreases. The sub-surface grade control structures reduce vertical incision because the structures are placed on bedrock or are stacked with a splash log on the downstream end, inhibiting vertical movement. Additionally, because the structures extend all the way across the floodplain, the channel cannot cut around the structures, even if it were to completely shift its location horizontally.

Reduced shear stresses significantly reduce the likelihood of horizontal instability. If an extreme storm event occurred (greater than 100-year RI), and the stream did move horizontally, there would still be minimal risk of vertical incision or stream impairment because of the presence of the sub-surface grade control structures that extend across the valley floodplain.

During the maintenance and monitoring period of the Bank Site, streams will be monitored annually. Stream monitoring, as detailed in Section 11.0 Monitoring Requirements, will include longitudinal and cross section profiles, grade control structure surveys, stream elevation monitoring, pebble counts and BEHI assessments. If, during the monitoring event, it appears the stream is not within acceptable design parameters, and if the results indicate failure to achieve performance standards, the Bank Sponsor will evaluate the failure and implement a maintenance activity or conduct remedial work to correct the deficiency.

Please refer to Section 11.0 Monitoring Requirements, Section 13.0 Long-Term Management Plan and 14.0 Adaptive Management Plan for additional discussions related to monitoring requirements and overall stream stability maintenance and management.

10.0 Performance Standards

In accordance with standards developed in PSUMBI and commentary from the IRT, performance standards for the Bank Site will be developed to account for site-specific features of the Bank Site. The proposed performance standards will follow guidance received from the USACE and will take into consideration the design approaches proposed and level of work, resource types, and key indicators of functions or features desired.

11.0 Monitoring Requirements

In accordance with the standards developed in PSUMBI, the Sponsor will monitor the Bank Site following the guidelines below to achieve the Bank's site-specific goals. Monitoring requirements detailed in PSUMBI provide the framework or basic structure for which monitoring, and reporting may occur. Monitoring of the Bank Site will demonstrate compliance with the performance standards detailed in Section 10: Performance Standards.

Immediately following construction, permanent monitoring stations will be established. These areas will be surveyed in and physically demarcated in the field to ensure re-surveying consistency throughout the proceeding monitoring years.

11.1 As-Built Survey and Report

Following construction, the Bank Sponsor will complete an as-built survey of all stream restoration (relocation), rehabilitation reaches, and graded areas. This will include stream cross sections placed at or near the location of the baseline data monitoring stations, a full longitudinal profile of all restoration (relocation) reaches, and surveys of each installed in-stream structure. The as-built survey will include a topographic survey of all graded areas as well an as-built planting plan sheet that displays the general locations and quantities of all vegetative material that was planted. The as-built report will be submitted to the IRT following Bank Site construction and site planting.

11.2 Annual Monitoring Reports

Following construction completion, annual monitoring reports will be submitted to the IRT by December 31 each year monitoring occurs, for a minimum of seven years, or five years if early release is requested and approved by the IRT. If performance standards have not been achieved by Year 7 of monitoring, the monitoring period may be extended, and/or additional mitigation may be required.

The monitoring report will include all data collected from the year's monitoring and maintenance site visit, which will be used for comparison to the Bank Site's progress towards the performance standards. If the Bank Site achieves all performance standards prior to Year 7, an early release may be requested.

Additionally, reports will include a brief discussion of the restoration-related activities that took place at the Bank Site, as well as the maintenance and management activities conducted during that year. The reports may also include a proposed maintenance schedule for the following year based upon the results of the annual monitoring. At a minimum, monitoring reports will include the following:

For the entire site:

- A description of the general condition of all wetland and upland areas, including a general status on plantings and the herbaceous seeding, and a visual estimation of percent invasive species at the Site
- A description of all maintenance work that was completed throughout the year
- Representative site photos from the established photo point
- Proposed maintenance activities for the next year, and if needed a corrective action plan or explanation to address any Performance Standards that have not been achieved, if applicable, and
- Monitoring results and data

At permanent cross sections:

- photos taken from ground level at each permanent cross section monitoring station
- a stream bank vegetation plot, which generally extends two feet up the bank from the normal high-water mark and twenty feet up-stream (2′ x 20′)
- A BEHI analysis
- Visual observation of all stream banks near the permanent cross section
- In-stream LWD measurements
- A survey of the stream cross section at that location, and
- Pebble (Habitat and Stability) counts.

During years 3 and 5, and at bank close-out, fish and macroinvertebrate surveys and results will be collected and compared to the baseline data. These data, however, will not be used as a performance standard for credit release.

At each wetland monitoring plot:

- photos taken in four cardinal directions
- estimate of percent cover of all native and invasive species, and
- observed woody stem density, quality, and percent deer browse.

In general, monitoring reports will also include tables and graphs to document results and trends that may be occurring at the Bank Site. These tables and graphs can be used to assess site progress.

At Bank closure, a final report detailing the maintenance and management tasks conducted and the budget expended throughout the initial monitoring period will be submitted. The final report will include the following:

- Summary of the general conditions of the Bank Site
- recommendations regarding enhancement measures
- any problems that may need attention and any changes to the long-term monitoring or management plan that appear to be warranted based on monitoring results to date, and
- if applicable, any necessary maintenance activities anticipated at Bank closeout and associated cost estimates will be provided to the agencies and Long-Term Steward.

The Bank Sponsor will address any maintenance and repair issues that would require attention prior to Bank closeout.

12.0 Credit Release Schedule

The Bank Sponsor is presenting two credit release options: 1) the conventional credit release schedule based on PSUMBI; and 2) an alternate adjusted credit release schedule. The Bank Sponsor may propose to follow either of these credit release options, if requirements are met, with approval from the PA IRT.

The Bank Sponsor currently intends to adopt the conventional credit release schedule as detailed in PSUMBI but may request an alternate adjusted credit release schedule at a later time.

12.1 PSUMBI-Based Credit Release Schedule

Five credit release stages are proposed as part of the credit release schedule for the Bank Site. In general, credit releases are tied to bank objectives and achievement of performance standards. A description of each stage and the effect of monitoring results on mitigation credit releases are provided in this section.

The Administrative credit release stage represents the first fifteen percent of the Project's total mitigation credits that are released and available for sale upon the following: approval of the final MSP, implementation of the financial assurances, and recordation of the SPI. These three items must be completed before any credits can be released during this stage.

The Construction credit release stage represents 15 percent of the Bank Site's remaining total mitigation credits that can be made available for sale upon the following: completion of Bank Site construction, which includes the initial physical and biological improvements to the Bank Site pursuant to the MSP, and approval of the as-built plans that reflect the final grading and planting of the Bank Site.

The remaining 70 percent of the Bank Site's mitigation credits are tied directly to performance-based milestones. Performance standards are measurable criteria for assessment achievement of the Banks's goals and objectives. The performance standards for the Bank Site are discussed in Section 10: Performance Standards.

The release of mitigation credits, as authorized by the USACE, occurs throughout the establishment period of the Bank, which typically lasts for 7 to 10 years, and as the suite of performance standards for each credit release stage is met. Once a stage's performance standards are met, the USACE awards the release of that stage's percentage of credit release.

The results from the annual monitoring events determine whether the Bank Site has achieved its performance standards at a given credit release stage. The credit release stages are not tied to monitoring years. Please note that results of the monitoring, and therefore achievement of the performance standards, represent an aggregate for the entire site. As such, some reaches may not achieve all performance standards in each stage. A performance standard may still be met, and credits awarded, if the average of the resources met the performance standard.

12.2 Credit Release Schedule

The Bank Sponsor may request an adjustment to the conventional credit release schedule detailed below.

Table 6: Credit Release Schedule

Project Milestone	Credit Release Schedule	Conventional	
		Credit Release	Cumulative Release
MSP Approval, Site Protections, Financial Assurances Executed	Initial Administrative Credit Release	15%	15%
Completion of Construction and As-Built Approval	Interim Credit Release 1	15%	30%
Stage 1 Performance Standards	Interim Credit Release 2	35%	65%
Stage 2 Performance Standards	Interim Credit Release 3	25%	90%
Stage 3 Performance Standards	Final Credit Release	10%	100%

Notes:
1. The Sponsor understands that performance standards must be met and approved by the USACE/IRT prior to credit release.
2. The Sponsor reserves the right to request an alternate credit release schedule.

12.3 Credit Ledger

Credits and debits will be accounted for by way of a mitigation bank ledger (Appendix H: Bank Ledger) that is maintained by the Bank Sponsor. Following each approved credit transaction, an updated copy of the bank's ledger will be submitted to the USACE. Furthermore, the mitigation credit availability will be updated in the USACE Regulatory In lieu fee and Bank Information Tracking System (RIBITS).

13.0 Long-Term Management Plan

Per the provisions identified in PSUMBI, the Sponsor has established the following Long-Term Management Plan (LTM Plan) to ensure that the Bank Site is managed, monitored, and maintained in perpetuity following achievement of all performance standards and site sign-off from the USACE. The LTM Plan, described below, establishes objectives, priorities, and tasks to monitor, manage, maintain, and report on the jurisdictional waters of the U.S. within this Bank Site. The site will be managed by a third-party Long-Term Steward. Per PSUMBI, if a third-party Long-Term Steward is not identified that will assume responsibilities for long-term management, including the long-term funding mechanism, the Sponsor will remain legally responsible for long-term management of the mitigation site. If a Long-Term Steward is identified, the Sponsor must first meet all requirements for Bank Closure (including identification of the Long-Term

Steward and execution of a Long-Term Management Agreement) before the Sponsor is relieved of all further long-term management responsibilities.

13.1 LTM Funding

A Long-Term Management Fund (LTMF) will be established to provide funding for the Long-Term Steward's maintenance, monitoring and management responsibilities for the Bank Site. The LTMF will be developed based upon the Pennsylvania Land Trust Association Stewardship Calculator (PALTA, see references for citation). The LTMF assumes that the conservation area will be held by a local, non-profit land conservancy, and that minimal staffing and efforts will be necessary to complete annual monitoring, reporting, and maintenance activities. The LTMF accounts for one site visit per year to assess and document site conditions. Minimal site maintenance is assumed to be necessary every 2 to 3 years. The LTMF also considers landowner communications, legal costs, and costs to respond and defend the site against minor and major violations. The endowment account funding approach is detailed in Section 15.0 Financial Assurances.

The Bank Sponsor will also establish a Catastrophic Event Fund (CEF) to be available, if necessary, to address unanticipated and/or unforeseen catastrophic events. The CEF may be pooled with the LTMF. The CEF can include replacement of an off-site mitigation site in the event of surface impacts to the Bank Site from existing utility-related encumbrances, invasive species outbreaks, and rehabilitation activities associated with damage resulting from 100-year or greater storm event. Please note that as stated in PSUMBI, "Should a catastrophic event or event of Force Majeure occur, an Adaptive Management Plan will be developed to correct the problem. The Bank Sponsor will not be responsible for Mitigation Bank Site failure that is attributed to a natural catastrophe, such as flood, drought, disease, regional pest infestation, etc., which the IRT, acting through the Chairs, determines is beyond the reasonable control of the Bank Sponsor to prevent or mitigate. The Bank Sponsor is, however, required to take corrective actions associated with catastrophic events and events of Force Majeure that do not result in Mitigation Bank Site failure and to use the Financial Assurances to fund corrective measures required to repair the Mitigation Bank Site from such events."

The CEF may be pooled with the LTMF or established as a separate endowment fund and will be managed by the same third-party endowment manager as the LTMF. Funding of the CEF will be similar to the LTMF funding schedule. The endowment account funding approach is detailed in Section 15.0 Financial Assurances.

13.2 LTM Reporting

An annual report will be submitted to the IRT by December 31 containing photographs and a brief discussion of any maintenance needed to keep the property in a mature non-threatened state. As the initial Long-Term Steward, the Sponsor will be responsible for long-term maintenance, unless a Long-Term Steward is identified prior to Bank closure. If a Long-Term Steward is not identified prior to Bank closure, the Sponsor, acting as the initial Long-Term Steward, will be responsible for long-term maintenance and monitoring, until an alternative Long-Term Steward is identified and approved by the IRT, in advance of assignment.

13.3 General Long-Term Management Activities

At minimum, during the long-term management period, one site visit is to be conducted annually. During the long-term management period, annual site visits act as assessment opportunities that allow for the assessment of general Bank Site conditions, including general topographic conditions, hydrology, vegetation cover and composition, invasive species presence, bank stability, erosion/incision observations, and any additional observations. Below is a discussion of the list of observations to be made during the annual long-term management period site visits.

13.4 Periodic Patrols

At least one annual walk-through survey will be conducted to qualitatively monitor the general condition of these habitats. General topographic conditions, hydrology, general vegetation cover and composition, invasive species, and erosion will be noted, evaluated, and mapped during a site examination. Notes to be made will include observations of species encountered, water quality, general extent of wetlands and streams, and any occurrences of erosion, structure failure, or invasive or non-native species establishment. The report should provide a discussion of any recent changes in the watershed.

13.5 Invasive Species Monitoring

Each year's annual walk-through survey (or a supplemental survey) will include a qualitative assessment (e.g. visual estimate of cover) of invasive species. Additionally, during each maintenance event, the project manager and field crew will actively evaluate the condition of the project and will note any additional maintenance activities that may be needed. At the end of the year, the observations made during the year will be used to establish the maintenance schedule for the following year, which will be presented to the IRT in the yearly monitoring report.

13.6 Signage

Signs identifying the protected site will be established and visibly displayed across the Bank Site to prevent casual trespass, while also allowing necessary access. During each site visit, the condition of signs, crossings, and property boundaries will be assessed. Recommendations to implement repair or replace signage, crossings, or property boundary markers will be made, if applicable.

13.7 In-Stream Structures

Visible in-stream structures will be visually monitored during the annual monitoring event. Any active erosion around in-stream structures will be noted, and remedial actions recommended.

13.8 Forestry Management Practices

Vegetation will be reduced in any areas recommended by authorities, and as approved by the IRT, for fire control. Any practices to reduce diseased or dead vegetation will be allowed if the vegetation compromises the long-term viability of the Project or any installed structure within the Bank Site.

13.9 Trash and Trespass

At least once yearly, trash will be removed and any necessary measures to prevent or repair damage from vandalism and trespass impacts will be taken.

13.10 Right to Inspection

The IRT and its authorized agents will have the right to inspect the Bank Site and take actions necessary to verify compliance with the LTM Plan. The LTM Plan herein will be enforceable by any proceeding at law or in equity or administrative proceeding by the IRT, including the Corps or PADEP. Failure by any agency (or owner) to enforce the LTM Plan contained herein will in no event be deemed a waiver of the right to do so thereafter. If the Long-Term Steward fails to succeed to adhere to the requirements of the LMT Plan, the IRT Chairs may locate/identify a new Long-Term Steward or request that the Sponsor assist in the process if after Bank Closure.

14.0 Adaptive Management Plan

Adaptive management will be used to address uncertainties that may potentially affect compensatory mitigation activities. By their very nature, adaptive management actions are implemented on an "as needed" basis and are informed by maintenance and monitoring of the Bank Site. Maintenance and monitoring site visits will determine the degree to which issues and events adversely affect or limit proposed compensatory mitigation activities. It is anticipated that the range of uncertainties will narrow as monitoring of the Bank Site progresses throughout the monitoring phase.

The Bank Site will be monitored and maintained yearly to assess conditions and progression towards meeting performance standard requirements. As part of this process, it is expected that unanticipated conditions will arise which may require adaptive management. Most of the adaptive management needs will be recorded in the annual monitoring reports, along with suggested remedial or corrective actions.

The Sponsor will adaptively manage issues and events that adversely affect, or limit proposed compensatory mitigation by employing corrective or remedial actions to address unsuccessful mitigation activities (e.g., grade adjustments, reseeding, replanting, increased invasive vegetation control).

Vegetative management will be modified on a yearly basis to address Project needs. Modifications and/or adjustments will be recorded in the annual monitoring reports. If there is any instability noted around the in-stream structures, the instability will be noted in the annual monitoring report, and if needed remedial actions will be recommended. This may include, but not be limited to, additional work in or around the structure or work further upstream of the structure to remove the cause of instability at the structure.

Any conditions that arise which may require immediate attention will be brought to the attention of the IRT outside of the regular monitoring reporting period along with remedial actions that were conducted.

A few potential situations that would necessitate an Adaptive Management Plan (AMP) due to unforeseen and/or unanticipated performance standard failures are provided below.

14.1 Stream Stability

The restoration approach at the Bank Site is designed to reduce shear stresses that occur within the channel and distribute those stresses more evenly across the floodplain. This design approach decreases the potential for vertical and horizontal stream instabilities.

The potential for vertical incision is largely removed by the presence of the sub-surface grade control structures because the structures are placed on bedrock or are stacked with a splash log on the downstream end. Additionally, because the structures extend across the width of the floodplain, the channel cannot cut below the structures, even if the channel were to completely shift its location horizontally. If there were a significant vertical degree of incision, it would have resulted from one of the sub-surface structures being improperly installed. Under these circumstances, the failure would be evaluated, and remedial construction work would be conducted to correct the deficiency.

Reduced shear stresses significantly decrease the likelihood of horizontal instability. If an extreme storm event occurred (greater than 100-year RI), and the stream did move horizontally, there would still be no risk of vertical incision because of the presence of the sub-surface grade control structures, and therefore, the stream function would not be impaired. The only risk would be if the stream channelized, which would reduce retention time and available habitat, however the presence of LWD installed across the floodplain during construction, and the floodplain plantings create roughness and friction throughout floodplain that would prevent any channel movement from creating a straight channel. If horizontal changes did occur, they would be surveyed, and evaluated to see if they negatively affected the Bank Site design. If they did not, no remedial action would be needed; if they did, corrective construction work would be done, however this is extremely improbable based upon the project design.

14.2 Tree and Shrub Establishment and Growth

Yearly planting densities and annual growth will be monitored as part of the annual monitoring activities for the Bank Site. Some mortality is expected in any restoration project. If there were a massive mortality in any given year, it would most likely be driven by one of two scenarios, drought conditions or herbivory.

Plantings are conducted either early in the spring or late in fall to allow the trees to establish with adequate rainfall and start developing their root systems prior to regular summer drought periods. There is little to no threat of plantings in the wetland areas being affected by drought based on the expected hydrology within the restored floodplain systems. Secondly, because bare root species are being planted, the root systems are also more proportionate to the above ground biomass, allowing for better establishment. With larger material (#7 container material for example), the above ground biomass is proportionately larger