DEPARTMENT OF THE ARMY
NORTH ATLANTIC DIVISION, CORPS OF ENGINEERS
FORT HAMILTON MILITARY COMMUNITY
GENERAL LEE AVENUE, BLDG 301
BROOKLYN, NY 11252

REPLY TO
ATTENTION OF

APR 24 2008

CENAD-PD-CID

MEMORANDUM FOR Commander, Philadelphia District; ATTN: CENAP-PL-PS, Mr. Mulveena) 100 Penn Square East, Philadelphia, PA 19107-3390

SUBJECT: Environmental Restoration Report and Environmental Assessment Lower Assunpink Creek Ecosystem Restoration Project - Broad Street Culvert

1. Reference:

a. CENAD-PDC memorandum dated 18 April 2008, subject: Lower Assunpink Creek Ecosystem Restoration Project, Trenton, NJ Section 1135 – Broad Street Culvert (PWI No. 167859, P2 No. 109828), copy enclosed;

b. CENAN-PL-PS memorandum dated 17 April 2008, subject as above.

2. Your responses to comments in reference (b) are satisfactory.

3. The subject report is approved.

4. The point of contact for this action is Mr. Ralph LaMoglia, P.E., (718) 765-7099.

Encl a/s

JOSEPH FORCINA, P.E.
District Support Team Leader

cf: CENAD-PSD-P (Mr. Doukas)

FINAL REPORT

Environmental Restoration Report and Environmental Assessment Lower Assunpink Creek Ecosystem Restoration Project - Broad Street Culvert

Prepared for

U.S. Army Corps of Engineers
Philadelphia District
Philadelphia, Pennsylvania

November 2007

CH2MHILL

1717 Arch Street, Suite 4400
Philadelphia, Pennsylvania 19103

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Acronyms and Abbreviations

$\mu g/m^3$	micrograms per cubic meter
DHS	Department of Human Services
DWQ	Division of Water Quality
EPA	U.S. Environmental Protection Agency
F	Fahrenheit
NAAQS	National Ambient Air Quality Standards
NJDEP	New Jersey Department of Environmental Protection
NMFS	National Marine Fisheries Service
NPV	net present value
PM-2.5	particulate matter
ppm	parts per million
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey

Executive Summary

The U.S. Army Corps of Engineers (USACE), Philadelphia District, has initiated an environmental restoration project for the lower Assunpink Creek area under authority of Section 1135 of the Water Resources Development Act of 1986. As amended, the Act provides authority for modifying the structure or operation of an existing USACE project to improve the quality of the environment in the public interest and for determining if the operation of such a project has contributed to the degradation of the quality of the environment. The City of Trenton, New Jersey, will serve as the non-Federal project sponsor.

The Lower Assunpink Creek Ecosystem Restoration Project study area is located along a 3-mile section of the lower Assunpink Creek in Trenton, New Jersey. Assunpink Creek is 25 miles long, and drains approximately 91 square miles in central New Jersey. The main tributaries that feed Assunpink Creek are Shabakunk Creek and Miry Run. The headwaters begin in Millstone Township, in Monmouth County, and flow into the Delaware River in Trenton. The project area evaluated for this report encompasses a 500-foot section of the lower Assunpink Creek in downtown Trenton where the creek is contained within a buried box culvert known as the Broad Street culvert.

From the Delaware River to the Trenton city limits, several former industrial sites, abandoned bridges, and the Broad Street culvert were identified as candidates for ecological restoration. The Broad Street culvert recently experienced a structural failure, which increased the urgency to implement a restoration action that would also address a public safety hazard. For this reason, this report documents the evaluation of alternatives for removal or "day lighting" of the Broad Street culvert along Assunpink Creek between South Broad Street and South Warren Street. Should there be additional Section 1135 funding available for the Lower Assunpink Creek Ecosystem Restoration Project, the other prospective restoration sites will be discussed in a subsequent report.

The Broad Street culvert is located in the heart of the downtown business district and is on a recovering urban stream that connects various greenway areas and transportation facilities. The proposed day lighting of the stream would occur through removal of the culvert roof structure, allowing the stream to be exposed to natural sunlight. The resulting open channel design will improve anadromous fish migration, as low-light conditions can disorient migrating fish, hindering their ability to spawn upstream. The project will also benefit businesses adjacent to the site, provide recreational options for visitors and local residents, and provide historical and educational opportunities for the community.

SECTION 1

Needs and Objectives of Proposed Action

It has been estimated that, since 1955, more than 100 acres of tidal wetlands and riparian habitat have been lost along the Delaware River and its tributaries, specifically ranging from Trenton, New Jersey south of the Route 1 bridge to the Philadelphia city limits. Much of the loss along the Delaware River can be linked to the Delaware River, Philadelphia to Trenton, Federal Navigation Project, specifically from historic placement of dredged material used to create "fast land". This activity has adversely affected freshwater tidal wetlands and associated riparian habitats, including Assunpink Creek.

The upper reaches of the stream, which include the Assunpink Wildlife Management Area, have been purchased and are earmarked for open space preservation. Downstream, the ecosystem is deteriorated and the riparian habitat is badly degraded. The existing ecosystem along lower Assunpink Creek consists of deteriorated riparian habitat in an urban industrial area. Construction rubble has been haphazardly dumped along the shoreline for stabilization purposes. Abandoned buildings and concrete and asphalt parking lots are adjacent to and landward of the creek's shoreline.

The Broad Street culvert in particular poses a significant barrier for anadromous fish migration from the Delaware River to the headwaters of Assunpink Creek. The September 3, 2006 partial collapse of a 24- by 35-foot section of culvert adjacent to the State of New Jersey Department of Human Services (DHS) building has increased the urgency to address the Broad Street culvert component of the Assunpink Creek restoration plan. An initial assessment of the failure, performed by Birdsall Engineering (Appendix A), attributed the collapse to the failure of the culvert roof deck slabs. Citing the potential for future sudden collapse of remaining roof slabs, the Birdsall report recommended that the entire culvert perimeter be cordoned off to any access. The City of Trenton has taken action to limit access; however, the collapsed deck slabs still remain within the creek, creating an obstruction and potential flooding hazard.

The goal of the Lower Assunpink Creek Ecosystem Restoration Project is to restore migratory fish habitat, enhance recreational opportunities, and improve the overall stream ecology of Assunpink Creek. Project goals will be accomplished through day lighting the Broad Street culvert and creation of an open-channel system. The proposed action evaluated in this report coincides with interstate management plans developed by the Atlantic States Marine Fisheries Commission in 1985 to restore herring stocks in streams experiencing stream blockages. Additionally, restoring the freshwater ecology and creating recreational opportunities for the public will benefit the overall economy of the City of Trenton and the region.

SECTION 2

Alternatives

The Broad Street culvert is a box culvert approximately 500 feet long, with two 9- by 22-foot flumes separated by a 3-foot center wall. The culvert contains a roof structure of 8-inch precast, hollow-core concrete deck slabs that are covered in soil, averaging 3 feet in the center of the culvert to 6 feet near the DHS building. The area over the culvert is mowed turf.

Five alternatives for the proposed ecological restoration at the Broad Street culvert were considered and evaluated, including Alternative Five – a No-Action Alternative. Attachment 1 contains the study area map and conceptual plan and profile drawings for all alternatives, and Attachment 2 contains project location photographs.

The alternatives were developed to address the ecological restoration goal of restoring fish migration within Assunpink Creek. With the exception of the No-Action Alternative, all proposed alternatives will assist the City of Trenton with the remediation of a public safety hazard. The alternatives are also supportive of the recreation objectives outlined in the Delaware Valley Planning Commission publication, Closing the Missing Link on the Assunpink Creek Greenway.

2.1 Alternative One – Removal of Culvert Roof Structure

For this alternative, the roof slabs, center wall, and the fill above the roof slab will be removed. The banks above the walls will be sloped back to match existing elevations. Architectural detail will be applied to remaining concrete walls to mimic the channel upstream of the South Broad Street Bridge and to create a more aesthetically pleasing structure. An overlook platform encroaching into the stream will be added in the current location of the hardscape patio leading from the entrance to the DHS building.

Both banks will be planted with upland trees and shrubs to create an aesthetically pleasing park environment similar to the Mill Hill Park and Greenway immediately upstream. A pedestrian walkway along the southern bank will connect sections of the Assunpink Greenway. Handrails will be added to both sides of the culvert for public safety.

2.2 Alternative Two – Removal of Roof Structure and Southern Culvert Wall

For this alternative, the roof slabs, center wall and the fill above the center wall will be removed. The southern wall of south box will be removed down to heights between 2 and 4 feet as constrained by Factory Street. The north bank above the remaining wall will be sloped back to match existing elevations. The southern bank will be benched to create a flood bench, with the extent of the bench also constrained by Factory Street.

The banks will be stabilized with riparian vegetation supplemented by stone boulders, riprap, or other hardscape material. Stone boulders will be grouted into the remaining bottom slab to provide roughening and to provide a varied flow pattern through the channel. The lower south bank will be planted with riparian trees and shrubs, while the upper banks will be planted with native upland trees to enhance the aesthetics of the park environment. The north bank above the remaining wall will be planted with upland trees. Architectural detail will be applied to the remaining concrete walls to mimic the channel upstream of the South Broad Street Bridge and to create a more aesthetically pleasing structure.

Two overlook platforms encroaching into the existing culvert will be added, one in the current location of the hardscape patio leading from the entrance to the DHS building and the other along the south bank near the South Broad Street Bridge. A pedestrian walkway along the southern bank will connect sections of the Assunpink Greenway. Handrails will be added as necessary for public safety.

2.3 Alternative Three – Removal of Roof Structure, Southern Culvert Wall and Partial Removal of the North Culvert Wall

For this alternative, the roof slabs, center wall and the fill above the center wall will be removed. As with Alternative Two, the south culvert wall will be removed down to heights between 2 and 4 feet as constrained by Factory Street. The southern bank will be benched to create a flood bench, with the extent of the bench also constrained by Factory Street. The north culvert wall will remain where constrained by the DHS building infrastructure; however, upstream from the DHS building the wall will be removed down to heights between 2 and 4 feet as constrained by East Lafayette Street.

The lowered portion of the north bank and the entire south bank will be benched to create a flood bench, with the extent of the benching constrained by East Lafayette and Factory Streets.

Two overlook platforms encroaching into the existing culvert will be added, one in the current location of the hardscape patio leading from the entrance to the DHS building and the other along the south bank near the South Broad Street Bridge.

The banks will be stabilized with riparian vegetation supplemented by stone boulders, riprap, or other hardscape material. Stone boulders will be grouted into the remaining bottom slab to provide roughening and to provide a varied flow pattern through the channel. The lower south bank will be planted with riparian trees and shrubs, while the upper banks will be planted with native upland trees to enhance the aesthetics of the park environment. The north bank above the remaining wall will be planted with upland trees, while the lowered portion will be planted with riparian vegetation. Architectural detail will be applied to the remaining concrete walls to mimic the channel upstream of the South Broad Street Bridge and to create a more aesthetically pleasing structure.

A pedestrian walkway along the southern bank will connect sections of the Assunpink Greenway. Handrails will be added where necessary for public safety.

2.4 Alternative Four – Complete Culvert Removal and Realignment of Creek Channel

For this alternative, the entire culvert structure will be removed and Assunpink Creek will be realigned. The realigned channel will be developed using natural channel design principles that will restore an appropriate channel pattern, dimension, and profile given the land use constraints associated with the study area.

The pattern, or alignment, will be shifted away from the DHS building infrastructure while considering the egress and ingress of the creek to the South Broad Street and South Warren Street bridges. The channel dimension, or cross-section, will generally be narrowed and deepened.

This alternative will incorporate instream structures such as log and rock cross-vanes and J-hooks that center the flow, control the grade, and vary the channel bottom, or profile. The resulting riffles and pools will create habitat for aquatic life. Both banks will be planted with riparian trees and shrubs to enhance the aesthetics of the park environment, in addition to providing bank stability. Biologs and coir matting will provide temporary structural stability until the vegetation becomes well established. A pedestrian walkway along the southern bank will connect sections of the Assunpink Greenway.

2.5 Alternative Five – No-Action Alternative

Under the No-Action Alternative, none of the above alternatives will be implemented. It is assumed that the collapsed portion of the culvert will be repaired; however, it is assumed a failure could occur again in the future. The No-Action Alternative serves as a baseline against which the impacts of the proposed “action” alternatives can be evaluated.

2.6 Alternatives Evaluation

2.6.1 Alternative One

Under this alternative, the roof structure and center wall of the culvert will be removed, architectural detail will be added to the side walls, an overlook platform will be built into the creek to replace the DHS building patio, and landscaping will be added along both banks of the creek.

Structural Stability

This alternative will provide increased structural stability compared to the existing condition because the soil load and suspect roof slabs will be removed from the system.

Maintenance Requirements

The overall requirement for maintenance, after the monitoring and warranty periods, will be incrementally greater than the level required to “maintain” the existing conditions. The slight expected increase in maintenance can be attributed to the introduction of the general public to the land and costs associated with maintaining landscaping. Public impacts from foot traffic and litter can be managed through education and facilities management (trash cans, signs, bollard fencing).

Cost Estimate

The order-of-magnitude cost estimate is $3,218,159. Please see Attachment 3 for more detailed costing information. This cost estimate was based on standard construction estimating references (such as R.S. Means Cost Data Manuals), previous CH2M HILL project experience, and preliminary price quotes from various suppliers.

Environmental Benefits

Under this alternative, the creek will be day lighted, removing a significant obstacle to fish passage. Removing the roof structure will encourage fish migration upstream, as low-light conditions can disorient migrating fish, hindering their ability to spawn upstream. This will help to create a sustainable anadromous fishery within Assunpink Creek. The area adjacent to the open channel will be planted with native upland trees and developed to enable public access, adding approximately 1.5 acres of parkland to the downtown Trenton area.

2.6.2 Alternative Two

As with Alternative One, this alternative will provide an open channel configuration for the creek. The roof structure and center wall of the culvert will be removed, architectural detail will be added to the side walls, two overlook platforms will be built into the creek, and landscaping will be added along both banks of the creek. Unlike Alternative One, the south culvert wall will be lowered to allow for a “softbank” approach with riparian landscaping along the southern bank of the channel. Instream structures will create riffles and pools and public access will be provided via a footpath and two overlook platforms.

Structural Stability

Alternative Two will provide increased structural stability compared to the existing condition because the soil load and suspect roof slabs will be removed from the system. The north wall will be retained at its existing height and the south wall will be removed to a height between 2 and 4 feet. Riparian landscaping along the south wall will prevent scour during periods of high flow. Biologs and coir matting will provide temporary structural stability until the vegetation becomes well established.

Maintenance Requirements

The overall requirement for maintenance, after the monitoring and warranty periods, will be greater than the level required to “maintain” the existing conditions and greater than Alternative One. The expected increase in maintenance can be attributed to the introduction of the general public to the land and cost associated with landscape management. Public impacts from foot traffic and litter can be managed through education and facilities management (trash cans, signs, bollard fencing).

Cost Estimate

The order-of-magnitude cost estimate is $4,278,688. Please see Attachment 3 for more detailed costing information. This cost estimate was based on standard construction estimating references (such as R.S. Means Cost Data Manuals), previous CH2M HILL project experience, and preliminary price quotes from various suppliers.

Environmental Benefits

The benefits to the Assunpink Creek fishery achieved through implementation of this alternative are similar to those benefits identified in Alternative One; however, the proposed riparian component and instream structures will offer additional ecological benefits. The restored riparian zone will provide a beneficial transition buffer between existing water and human land uses; improved habitats, including foraging and nesting areas, for various species of birds, small mammals, and aquatic wildlife species; improved runoff water quality by acting as a sediment and pollutant filter; and improved aesthetic and recreational values for the project area. The proposed overlooks will provide recreational fishing opportunities and, in conjunction with placed boulders, will create instream features. The resulting riffles, pools, and varied flow path will create visual interest as well as habitat for macroinvertebrates. By reducing the south culvert wall, this alternative will provide riparian habitat and improved aesthetics when compared to Alternative One. The area adjacent to the open channel will be developed to enable public access and will add approximately 1.5 acres of parkland to the downtown Trenton area.

2.6.3 Alternative Three

As with Alternatives One and Two, Alternative Three will provide an open channel configuration for the creek. The roof structure and center wall of the culvert will be removed, architectural detail will be added to the side walls, two overlook platforms will be built into the creek, and riparian landscaping will be added along both banks of the creek. As with Alternative Two, the south culvert wall will be removed down to heights between 2 and 4 feet. The north culvert wall will remain where constrained by the DHS building infrastructure; however, upstream from the DHS building the north wall will be removed down to heights between 2 and 4 feet.

Structural Stability

This alternative will provide increased structural stability compared to the existing condition because the soil load and suspect roof slabs will be removed from the system. Riparian landscaping along the south wall and lowered portions on the north will prevent scour during periods of high flow. Biologs and coir matting will provide temporary structural stability until the vegetation becomes well established.

Maintenance Requirements

The overall requirement for maintenance, after the monitoring and warranty periods, will be slightly greater than the level required to “maintain” the existing conditions and greater than Alternatives One and Two. The expected increase in maintenance can be attributed to the introduction of the general public to the land and the additional landscaping component. Public impacts from foot traffic and litter can be managed through education and facilities management (trash cans, signs, bollard fencing).

Cost Estimate

The order-of-magnitude cost estimate is $4,598,750. Please see Attachment 3 for more detailed costing information. This cost estimate was based on standard construction estimating references (such as R.S. Means Cost Data Manuals), previous CH2M HILL project experience, and preliminary price quotes from various suppliers.

Environmental Benefits

The environmental benefits that will be achieved from this alternative are greater than benefits identified in Alternatives One and generally equal to Alternative Two. In addition to providing fish passage opportunities, benefits include a restored riparian zone; improved habitats for various species of birds, small mammals, and aquatic wildlife species; improved runoff water quality by acting as a sediment and pollutant filter; and improved aesthetic and recreational value of the project area. By reducing a portion of the north culvert wall, this alternative will increase vegetation and improve aesthetics when compared to Alternatives One and Two. The overlooks will provide recreational fishing opportunities and, in conjunction with placed boulders, will create in-stream features.

This alternative will also provide an improved buffer for stormwater surface runoff sediment control compared to Alternatives One and Two. The area adjacent to the open channel will be developed to enable public access and will add approximately 1.5 acres of parkland to the downtown Trenton area.

2.6.4 Alternative Four

Alternative Four involves the complete removal of the culvert structure and the realignment of the creek into a natural channel. This alternative will provide a structurally sound streambank, while improving on the existing ecological community through in-stream structures and creation of fish spawning habitat. The pattern, or alignment, will be shifted away from the existing building's infrastructure while considering the egress and ingress of the creek to the South Broad Street and South Warren Street bridges. While this alternative is deemed feasible, it is expected to present more significant construction challenges compared to the other alternatives.

Structural Stability

This alternative will generally have less structural stability than the other alternatives because of the incorporation of a complete "softbank" approach for channel stabilization. Structural stability of the streambank will be accomplished through the root structure provided by diverse riparian vegetation and strategic placement of boulders. The channel dimension, or cross-section, will generally be narrowed and deepened. The project will incorporate instream structures such as log and rock cross-vanes and J-hooks, that center the flow, control the grade, and vary the channel bottom or profile. Both banks will be planted with riparian trees and shrubs to provide stability. Biologs and coir matting will provide temporary structural stability until the vegetation becomes well established. This alternative will provide an enhanced buffer for stormwater surface runoff sediment control, as well as provide an ecosystem that is conducive to sustaining wildlife species.

Maintenance Requirements

The Alternative Four overall requirement for maintenance, after the monitoring and warranty periods, will be greater than the other three alternatives because of the reliance on a complete “softbank” approach and the greater landscaping maintenance involved. This alternative has the greatest vegetative component and will therefore require increased replanting and maintenance. There is also a greater potential for debris to accumulate behind the planned instream structures. Public impacts from foot traffic and litter can be managed through education and facilities management (trash cans, signs, bollard fencing).

Cost Estimate

The order-of-magnitude cost estimate is $5,666,500. Please see Attachment 3 for more detailed costing information. This cost estimate was based on standard construction estimating references (such as R.S. Means Cost Data Manuals), previous CH2M HILL project experience, and preliminary price quotes from various suppliers.

Environmental Benefits

Alternative Four will provide increased environmental benefits compared to the other three alternatives. This is attributable to the complete removal of the concrete slab that serves as the stream bottom under the other three alternatives. Under this alternative, there will be opportunities to create fish-spawning habitat and other aquatic habitat through channel design, instream structures, and creation of pools and riffles. Removal of the concrete bottom slab will also increase fishery migration opportunities by creating a varied substrate and will increase biodiversity through increased macroinvertebrate habitat. Other benefits include a restored riparian zone, providing a beneficial transition buffer between existing water and human land uses; improved habitats, including foraging and nesting areas, for fish-eating birds, small mammals, and aquatic wildlife species; improved runoff water quality by acting as a sediment and pollutant filter; and improved aesthetic and recreational value of the project area. A more-diverse ecosystem conducive to sustaining aquatic and wildlife species will result. The area adjacent to the open channel will be developed to enable public access and will add approximately 1.5 acres of parkland to the downtown Trenton area.

2.6.5 Alternative Five – No Action Alternative

Under the No-Action Alternative, the culvert will remain and is assumed to eventually be repaired. In its assessment of the culvert collapse, Birdsall Engineering concluded that additional failure of roof panels is possible given the site conditions and culvert design. It is likely that once repaired, the entire area over the culvert will remain off-limits to the public because of safety concerns. The collapse also has deposited concrete debris within the channel that under high flows could create a flooding hazard upstream. Under the No-Action Alternative, a significant barrier to anadromous fish migration will remain in place.

2.7 Alternatives Evaluation Summary

The proposed alternatives were evaluated to determine which one most effectively (1) restores the buried stream bank, (2) improves stream ecology and fishery habitats, (3) effectively protects the stream bank, (4) minimizes the amount of long-term maintenance, (5) enhances recreation opportunities, and (6) minimizes the cost. Table 2-1 summarizes the preliminary evaluation of the alternatives.

TABLE 2-1
Summary of Alternatives Evaluation

Alternative	Cost	Habitat Units[2]	Incremental Cost per Unit of Output[2]	Structural Stability	Maintenance Requirements
Alternative One	$3,218,159	3,148	$8,698	1	1
Alternative Two	$4,278,688	5,667	$421	2	2
Alternative Three	$4,598,750	5,667	n/a	3	3
Alternative Four (Selected Alternative)	$5,666,500	11,167	$ 252	4	4
Alternative Five	No Cost[1]	2,778	n/a	5[3]	5[3]

[1] Does not consider repair cost or costs to replace suspect roof panels.
[2] Refer to Section 5 for Habitat Unit and Incremental Cost per Unit Output calculations.
[3] Assumes potential for future structural failure of roof panels.

The relative ecological benefits of each alternative were quantified through a habitat services analysis. Habitat or ecosystem services are defined as the physical, chemical, or biological functions that one natural resource provides for another natural resource, and thus indirectly provides value to the public. Examples include provision of food for wildlife, protection from predation, and nesting habitat, among others. These services can be quantified into habitat units for comparison purposes. Section 5 contains the habitat benefits analysis and incremental cost analysis completed for the alternatives; a summary analysis is presented in this section.

The amount of habitat units for each alternative was derived using a rapid assessment protocol that evaluates the improvements to instream habitat expected from each alternative, and relates them in percentage terms to a reference stream. These percentages were multiplied by the extent of the proposed action (500 linear feet) to obtain habitat units expressed in stream length. The habitat quality improvements are assumed to remain constant for each year over a 50-year period. Using a 3 percent real annual rate of discount, the habitat units are estimated in terms of discounted stream length years. An incremental cost analysis was conducted to derive the incremental cost per unit of output shown in Table 2-1.

For the evaluation of structural stability and maintenance requirements, each alternative was ranked from one to five (one being the highest). Channel stability under high-flow conditions, scour potential, and landscape maintenance cost were considered for the evaluation.

Alternative Four provides the lowest incremental cost per unit of output with the greatest production of habitat units while fulfilling the project object of restoring migratory fish habitat, enhancing recreational opportunities, and improving the overall stream ecology of Assunpink Creek. Therefore, Alternative Four is the Selected Alternative.

2.8 Selected Alternative - Conceptual Design

Alternative Four was identified as the Selected Alternative based on an evaluation of its ecological benefits, structural stability, expected long-term maintenance requirements, and construction cost estimates. Input received from the New Jersey Department of Environmental Quality, Division of Fish and Wildlife indicates support for the complete removal of the culvert as proposed under this alternative (Appendix B). A conceptual plan and profile for the Selected Alternative is included in Attachment 1.

To enable work to be accomplished with minimal impacts to water quality, stream flows will be diverted into the northern culvert flume. This will allow for the southern flume be demolished under dry conditions and for excavation and grading of the realigned channel. The alignment of the new channel will be shifted away from the existing building's infrastructure while considering the egress and ingress of the creek to the South Broad Street and South Warren Street bridges. Flows will be diverted into a temporary diversion channel to allow for the demolition of the northern flume.

Structural stability of the streambank will be accomplished through the root structure provided by diverse, native riparian vegetation and strategic placement of variously sized boulders. A bentonite layer will be added to the stream bed as necessary. The channel dimension, or cross-section, will generally be narrowed and deepened. The project will incorporate instream structures such as boulders, log and rock cross-vanes and J-hooks, that center the flow, control the grade, and vary the channel bottom or profile. Both banks will be planted with native riparian trees and shrubs to provide stability. Biologs and coir matting will provide temporary structural stability until the vegetation becomes well established.

A secondary benefit of the restoration of the stream and riparian habitat will be an increase in the recreational and educational potential for this area. To accentuate this, trees and shrubs will be planted in such a way as to create natural travel paths for pedestrians. Features such as access points, signage, and minimal facilities (benches, trash receptacles) will be installed in selected locations to allow easy access from one point of interest to the next. A paved footpath will also be provided in the upland area to provide recreational opportunities and public access. Additionally, recreational fishing opportunities for the public will increase with improved riparian habitat and stream bank restoration.

The construction cost estimate for the Selected Alternative - Conceptual Design is $5,666,500.

SECTION 3

Affected Environment

3.1 Physical Site Characteristics

3.1.1 Topography, Geology, and Soils

The topography of the Trenton, New Jersey area is relatively flat and low-lying. Elevations in this area range from near sea level to just above 100 feet above sea level. The average elevation of the city itself is approximately 95 feet above sea level. Elevations along the Assunpink Creek are below 30 feet above sea level, dropping to near sea level where the creek discharges into the Delaware River. The project area involves a section of the creek that flows through a highly urbanized and developed section of Trenton.

Trenton is underlain by a variety of rock types. The predominant rock types that are found within the project area are amphibolites and gniesses, including a small section comprised of Wissahickon schist towards the northeast corner of the project area. Gabro and Byram gniess can be found immediately north of the creek, and rocks of the Magothy and Raritan formations dominate the area south of the creek.

Soils within the project area are classified as being of the Galestown-Evesboro formation. These soils are characterized as being deep and excessively drained, with nearly level to gently sloping soils that are sandy throughout their depth.

Soils in the Evesboro formation are characterized as deep, loose, excessively drained, sandy soils in the upland region. They contain thick deposits of medium and coarse, highly quartzose sand that is not glauconitic in nature, and have a gradient that is gently or moderately sloping. The surface layer of the Evesboro soil consists of loamy sands that are approximately 18 inches thick. The soil is very dark gray in color in the top few inches, becoming dark yellowish brown in color throughout the rest of the layer. The subsoil is strong-brown, loose, loamy sand that extends to a depth of approximately 36 inches. The Evesboro soil is characterized by rapid permeability to a depth of up to 5 feet.

Soils in the Galestown formation formed in old alluvium that consists of thick deposits of sand or loamy sand along the Delaware River, the lower reaches of Crosswicks Creek south of Trenton, along Millstone Creek, and along Assunpink Creek. Galestown soils are characterized as deep, loose, excessively drained, sandy soils. The gradient of these soils are generally nearly level, or may be gently sloping on terraces along streams. The surface layer of the Galestown soil consists of loamy sand that is approximately 17 inches thick. The upper part of this loamy sand is dark yellowish brown in color, with the lower part being yellowish brown in color. The subsoil is a yellowish-red loamy sand that is approximately 15 inches thick. Galestown soil is characterized as having rapid to moderately rapid permeability to a depth of 5 feet or more and as highly susceptible to wind erosion in the early spring months.

3.1.2 Hydrology and Water Quality

Assunpink Creek flows in a southwesterly direction, emptying into the Delaware River. Areas of East Trenton often experience flood events because of the highly developed and low-lying areas surrounding the creek. A hydraulic model was developed as part of the study to evaluate the flood risk of any proposed modifications to existing bridges and culverts (Appendix C).

Assunpink Creek is classified by the New Jersey Department of Environmental Protection's Division of Water Quality (NJDEP DWQ) as FW2-NT. "FW" indicates that the creek is classified as freshwater, meaning that the water has as salinity of less than or equal to 3.5 parts per thousand at mean high tide. "FW2" indicates that the creek has been given a general surface water classification that has not been designated as FW1 or Pinelands Waters. This means that the creek may be subjected to manmade wastewater discharges or runoff from human activities. A classification of FW2 indicates that the water body has no extraordinary or distinctive characteristics, such as good clarity, color, scenic setting, or other characteristic of aesthetic value, or any ecological, recreational, water supply, or fisheries resource significance. "NT" indicates that Assunpink Creek is not suitable for trout production or trout maintenance because of its physical, chemical, or biological characteristics. However, the creek may be suitable for a wide variety of other fish species, including large mouth bass (*Micropterus salmoides*), American shad (*Alosa sapidissima*), blueback herring (*Alosa aestivalis*), and Alewife herring (*Alosa pseudoharengus*).

The U.S. Geological Survey (USGS) operates several streamgages on Assunpink Creek via the National Streamgaging Network Plan, one of which is found at Trenton:

Station Number	Station Name	Operational Status
01464000	Assunpink Creek at Trenton, NJ	Active

USGS has obtained 37 years of flow records using streamgage #01464000, 30 years of which recorded low-flow conditions in the stream. Streamgage #01464000 has also recorded a mean annual flow of 139 cubic feet per second for Assunpink Creek. The area of the drainage basin that is monitored in part by this streamgage is approximately 90.6 square miles, with a main channel length of 20.5 miles and a slope of 4.84 feet/mile.

The NJDEP Bureau of Water Quality Standards and Assessment conducted a study in 2003 to detect measurable amounts of metals in the state's freshwater bodies. Having taken samples from the Assunpink Creek at Peace Street in Trenton, the water assessment team found that chromium, nickel, and selenium were all present in measurable amounts. Arsenic, copper, lead, and zinc were not found. Insufficient data were collected while trying to detect the presence of cadmium, mercury, and silver.

An ongoing study being performed by NJDEP DWQ shows that in 1999, 94 percent of community water systems had no measurable amount of volatile organic compounds. In the same year, 97 percent of the community water systems had no detectable microbiological contaminants, and 93 percent had no detectable chemical contaminants. These numbers show that the water quality of community water systems is currently much better than the quality that was observed in the mid-1980s.

3.1.3 Air Quality

Six principal pollutants act as indicators of air quality in the United States. The National Ambient Air Quality Standards (NAAQS) are the concentrations of these principal pollutants, above which adverse effects on human health may occur. Areas of New Jersey where air pollution levels consistently stay below these standards are designated "Attainment." Areas where air pollution levels persistently exceed these standards are designated "Nonattainment." If an area was in “Nonattainment” but now attains the standard and has a plan approved by the U.S. Environmental Protection Agency (EPA) to maintain the standard, it is designated a "Maintenance" area. Mercer County is designated by EPA as a “Nonattainment” area for both particulate matter (PM-2.5) as well as 8-hour ozone. Table 3-1 shows the NAAQS that New Jersey has adopted.

TABLE 3-1
National Ambient Air Quality Standards

Pollutant	Concentration
Carbon Monoxide	9 parts per million (ppm)
Lead	1.5 micrograms per cubic meter (µg/m^3)
Nitrogen Dioxide	0.053 ppm (annually)
Ozone	0.085 ppm (maximum daily – 8 hours)
Particulate Matter (< 10 microns)	50 µg/m^3 (annually)
Sulfur Dioxide	0.03 ppm (annually)

3.1.4 Climate

Trenton is located in the southern climatic division of New Jersey. The average annual temperature is approximately 52.1° Fahrenheit (F), with an average temperature in the mid- to high 70s in the summer months and in the mid- to low 30s in the winter months. However, temperatures have been known to reach in excess of 100°F and below 0°F. Because of urbanization, Trenton itself is a heat island, trapping heat most often during the summer months. This heat-trapping effect can lead to much higher temperatures within the city limits than surrounding areas.

Trenton receives an average of 44.27 inches of precipitation annually. Snow typically occurs between mid-November and mid-April. Approximately 25 to 30 thunderstorms occur each year. Measurable amounts of precipitation fall about 120 days out of the year. The fall months tend to be the driest months, typically averaging 8 days with measurable precipitation. The rest of the months average 9 to 12 days of measurable precipitation events.

3.2 Fish and Wildlife Resources

Many species of common and migratory fish are known to inhabit Assunpink Creek and the nearby Delaware River. Migratory fish species common to Assunpink Creek include the American eel (*Anguilla rostrata*). Other common species known to occur in or around the project area include several species of sunfish (*Lepomis spp.*), large mouth bass (*Micropterus salmoides*), striped bass (*Morone saxatilus*), pickerel (*Esox spp.*), eastern mudminnow (*Umbra pygmaea*), brown bullhead (*Ameiurus nebulosus*), fallfish (*Semotilus corporalis*), white sucker (*Catostomus commersoni*), perch (*Aphredoderus spp.*), margined madtom (*Noturus insignis*), tessellated darter (*Etheostoma olmstedi*), American shad (*Alosa sapidissima*), blueback herring (*Alosa aestivalis*), and alewife herring (*Alosa pseudoharengus*).

3.3 Aquatic and Terrestrial Habitat

In general, the project area is significantly disturbed as a result of historical land uses, including both industrial and residential development. The creek is currently contained within a buried culvert with mowed turf placed at the surface, limiting aquatic and terrestrial habitat.

3.4 Threatened and Endangered Species

The National Marine Fisheries Service (NMFS) reported that the Federally endangered shortnose sturgeon (*Acipenser brevirostrum)* are known to occur in the Delaware River in the vicinity of Assunpink Creek. Specifically, shortnose sturgeon overwinter in dense sedentary aggregations in the upper tidal reaches of the Delaware River between river mile 118 and river mile 131 reaches. During the late summer months, shortnose sturgeon are more dispersed and are thought to be more widely distributed throughout the river and estuary than in the winter months.

According to NJDEP, the following state and Federally listed species have the potential to occur with ¼ mile of the project site:

TABLE 3-2
Threatened and Endangered Species Potentially within ¼ mile of the Project Area

Common Name	Scientific Name	Federal Status	State Status
dwarf wedgemussel	*Alasmidonta heterdon*	LE	E
green floater	*Lasmigona subviridis*		E
shortnose sturgeon	*Acipenser brevirostrum*	LE	E
yellow lampmussel	*Lampsillis cariosa*		T

LE =formally listed as endangered E = Endangered T = Threatened

According to U.S. Fish and Wildlife Service (USFWS) records, except for transient species, no Federally listed threatened or endangered species under the jurisdiction of USFWS are known to occur within the project area. It should be noted that Atlantic sturgeon (*Acipenser oxyrhynchus*) are continuing to move through the Delphi listing process and are expected to be a Federally listed species with the next few months per the NJDEP Division of Fish and Wildlife's conversations with the NMFS Endangered species section.

Initial agency correspondence regarding threatened and endangered species is included in Appendix D, and agency responses to the draft Environmental Assessment are included in Appendix E.

3.5 Cultural Resources

Phase 1A cultural resource investigations in the project area were performed by Hunter Research, Inc. in October 2003 in accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, 36 CFR 60 and 63- National Register of Historic Places; 36 CFR 800- Advisory Council on Historic Preservation; New Jersey Historic Preservation Office (HPO) guidelines; and, the New Jersey Historic Preservation Plan. The Phase IA Cultural Resources Reconnaissance Report – Summary and Recommendations section is included as Attachment 4. The report has been provided to the HPO for review and comment.

3.5.1 Historical Significance of the Assunpink Creek

To a large degree, the Assunpink Creek corridor represents the backbone of historic Trenton. From a historic architectural perspective, a large number of potential resources have been identified, including individual historic buildings and bridges, factory and recreational complexes, and historic districts. Trenton's oldest neighborhoods are in the vicinity of the mouth of the Assunpink. Also, the Mill Hill district is the location of the area's initial industrial development. The southern bank of the Assunpink at Broad Street was the site of Trenton's first industry, where a wooden grist mill was built by Mahion Stacy around 1678. In the 1700s, the Trent Mill (a grist mill owned at one point by Joseph Pierce) was later built on the site of the original Stacy Mill. During the 19th century, a paper mill occupied the same location on the southern bank. As part of Trenton's early paper industry, the paper mill was operated by William McCail and later by Henry M. Lewis.

During the American Revolution, the predecessor of the Broad Street Bridge (then only 16 feet wide and known as King Street Bridge) was the focus of fierce fighting during the Second Battle of Trenton, in which General Washington's troops held the British back. The Battle of the Assunpink was considered a critical defensive battle that resulted in heavy British losses and boosted the morale of the Continental Army.

3.5.2 Archaeological Resources

Various recent archaeological explorations indicate an intensive and widespread Native American presence along the downtown Trenton area of the Assunpink, extending through the Archaic and Woodland periods up to the arrival of the first Europeans. However, very little is known about prehistoric settlement farther upstream.

3.6 Socioeconomic Conditions

Trenton is located approximately 65 miles southwest of New York City, 35 miles northeast of Philadelphia, and 90 miles northwest of Atlantic City. According to the 2000 U.S. Census, the total population of Trenton is estimated at 85,403.

Table 3-2 lists populations, income, and poverty status for both the state of New Jersey, and for the City of Trenton. The median income is lower in Trenton than the state and county median incomes. In addition, the proportion of minorities and the poverty rate are higher in Trenton than the average for the state.

TABLE 3-3
Minority and Low-Income Statistics for New Jersey and the City of Trenton

Demographics / Income	New Jersey	City of Trenton
Total Population	8,414,350	85,403
White	72.6%	32.6%
Black	13.6%	52.1%
American Indian[a]	0.2%	0.3%
Asian	5.7%	0.8%
Pacific Islanders[b]	0.04%	0.2%
Other Race	5.4%	10.8%
Two or more races	2.5%	3.2%
Hispanic or Latino[c]	13.3%	21.5%
Median Household Income	$55,146	$31,074
Poverty Rate[d]	8.5%	21.1%

Source: U.S. Census Bureau, Census 2000, Redistricting Data Summary File, Tables PL1, PL2, PL3, and PL4. 2000 Census of Population and Housing, Summary File 3.

Notes:

[a] Includes Alaska Native.

[b] Includes Native Hawaiian.

[c] Persons of Hispanic origin can be of any race and are counted in those categories also.

[d] Calculated by dividing the population below poverty level by the population for whom poverty status is determined.

3.6 Land Use

The site is comprised of land owned by the City of Trenton and consists of open space covered in mowed turf. The project site is approximately 1,000 feet (2 city blocks) upstream from the Delaware River and is directly downstream of Mill Hill Park, which in turn is approximately 2,000 feet downstream of the Amtrak/New Jersey Transit train station. Directly upstream of the train station, the Assunpink Creek Park has been proposed and will continue upstream another 5,000 feet.

3.7 Recreational Opportunities

Two parks are located adjacent to Assunpink Creek in Trenton. Mill Hill Park is located on Front and Broad Streets, bordering the creek. The park includes restored mill ruins with an overlooking amphitheater and a 500-foot-long gabion retaining wall system along the creek. Stacy Park is located along the Delaware River; the south end boundary of the park is a short distance upstream of the mouth of the Assunpink.

The Assunpink Creek Greenway Project involves the creation of the Assunpink Creek Park between Monmouth Street and St. Joe's Avenue. The park will include paths for pedestrians and bicyclists along the creek, a community pool, baseball and soccer fields, basketball courts, picnic areas, playgrounds, roller hockey rink, a pavilion, and space for a farmers market and other community events.

Several facilities owned by the City of Trenton border Assunpink Creek. These sites are part of a larger City effort to acquire, assess, and remediate brownfields properties along the Assunpink Creek and turn the area into a greenway. The greenway will increase open space and create a link between neighborhoods, places of work and recreation, and historic sites.

SECTION 4
Environmental Effects

Implementation of the Selected Alternative will result in the restoration of approximately 500 linear feet of the Assunpink Creek stream bank currently contained within a buried concrete box culvert. The Selected Alternative will promote upstream migration of anadromous fish species and will create riparian and upland habitat in an urban park setting

The following section describes the environmental effects of the proposed action. This section is primarily focused on the Selected Alternative (Alternative Four); however, because each of the alternatives involves similar activities, impacts will generally be consistent for Alternatives One, Two and Three.

4.1 Physical Site Characteristics

4.1.1 Topography, Geology, and Soils

By implementing the Selected Alternative, topography within the project area will be altered. As the area over and surrounding the culvert is largely artificial fill, the proposed project would return contours to those more closely resembling the natural condition.

Implementation of the proposed project will not affect the geologic conditions within the project area.

Surficial soils will be disturbed by implementing the Selected Alternative. All materials removed from site for disposal will be disposed of in accordance with all appropriate local, state and Federal rules and regulations.

4.1.2 Hydrology and Water Quality

The proposed project will not significantly affect water quality or the aquatic ecosystem, and has been found to be in compliance with Section 404(b)(1) of the Clean Water Act, as amended (Attachment 5). There will be short-term impacts to water quality in the project area by implementing the Selected Alternative. Short-term impacts from construction activities will result in a temporary increase in sediment for work related to the demolition of the culvert structure. However, during construction stream flows will be diverted to the extent practical to isolate the work area from stream flows and minimize sedimentation.

The long-term benefits to the hydrology and water quality of the stream far outweigh any temporary construction-related impacts. The proposed project should improve water quality both within the project limits and from areas adjacent to the site that contribute stormwater surface runoff. The proposed riparian vegetation will provide uptake and filtering of stormwater surface runoff through the removal of sediment and pollutants.

In addition, the hydrologic model completed for the project did not indicate an increased flooding risk from removal of all or part of the culvert (Appendix C).

4.1.3 Air Quality

Implementation of the Selected Alternative will not have any long-tern adverse effect on air quality. Because Mercer County is designated by EPA as a "Nonattainment" area for both PM-2.5 as well as 8-hour ozone, a conformity analysis is typically required for proposed Federal actions that would cause emissions of criteria air pollutants that are above certain levels. General conformity under the Clean Air Act, Section 176 has been evaluated for the selected alternative according to the requirements of 40 CFR 93, Subpart B. This Alternative is exempt according to 40 CFR 93.153(c)(1) because the proposed actions will not cause emissions of these pollutants or their precursors. Only minor, short-term adverse impacts to air quality may occur as the result of the use of construction equipment and vehicles on the site during the construction and restoration activities. A Record of Non-Applicability (RONA) has been completed and is attached in Attachment 6 in accordance with Part 2 of the Army Technical Guide for Compliance with the General Conformity Rule, documenting the exempt status.

4.1.4 Climate

Implementation of the Selected Alternative will not affect climate.

4.2 Fish and Wildlife Resources

Adverse impacts resulting from implementing the Selected Alternative will be minor and of short duration. Most species that could be found using the project area are mobile and will be temporarily displaced from the project area during construction activities. Following restoration of the project area, it is anticipated that any species displaced during construction activities will return.

Removing the culvert is expected to enhance anadromous migration into the Assunpink Creek from the Delaware River. These species could include large mouth bass (*Micropterus salmoides*), American shad (*Alosa sapidissima*), blueback herring (*Alosa aestivalis*), and alewife herring (*Alosa pseudoharengus*). The recreational fishery for striped bass (*Morone saxatilus*) will benefit from the increase in the aquatic biodiversity and forage fish. Rocks and boulders, as well as other in-stream structures, will also increase fish habitat as well as macroinvertebrate populations. NJDEP's Division of Fish and Wildlife has stated that numerous species of fish will likely take advantage of spawning in Assunpink Creek should the barriers for fish passage (i.e., culvert) be removed (Appendix B).

Assunpink Creek has been identified by the National Marine Fisheries Service (NMFS; part of the US Department of Commerce National Oceanic and Atmospheric Administration) as providing habitat for two species of concern, the alewife (*Alosa pseudoharengus*) and the blueback herring (*Alosa aestivalis*). Because landing statistics and the number of fish observed on annual spawning runs indicate a drastic decline in these species throughout their range since the mid-1960's, the NMFS designated them as a species of concern on October 17, 2006. "Species of concern" are those species about which NMFS has some concerns regarding status and threats, but for which insufficient information is available to indicate a need to list the species under the Endangered Species Act. The restoration of this section of the creek will improve the habitat for these species as they migrate to spawning areas upstream.

The anticipated construction activities during the removal of the culvert, realignment of the creek, and restoration of the banks and bottom habitat could impede on the upstream migration of river herring, due to their known spawning in Assunpink Creek. The NMFS has recommended that the work be scheduled to avoid the upstream migration of these anadromous fishes from March 15 to June 30 of each year.

4.3 Aquatic and Terrestrial Habitat

The project will restore approximately 500 linear feet of stream bank currently contained within a concrete culvert. The project will not result in the discharge of dredged or fill material that will cause or contribute to significant degradation of Assunpink Creek. To the contrary, implementation of the Selected Alternative will improve aquatic and terrestrial habitats.

The project will also create riparian habitat and additional riparian buffer. The proposed creation of these areas will greatly improve the overall function and value of available habitat over the current conditions.

These habitat improvements are expected to have an overall beneficial impact to many aquatic and terrestrial wildlife species, fish-eating birds, passerine birds, and small mammals.

4.4 Threatened and Endangered Species

Implementing the Selected Alternative is not anticipated to have any adverse effects on state or Federally listed threatened or endangered species. Comments received from the NMFS indicate that the project as proposed will not adversely impact the Federally endangered shortnosed sturgeon, and that additional consultation under Section 7 of the Endangered Species Act will not be necessary.

The project is not expected to adversely impact the dwarf wedgemussel (*Alasmidonta heterdon*), green floater (*Lasmigona subviridis*), or yellow lampmussel (*Lampsillis cariosa*). Additional dialogue will continue with New Jersey Endangered and Nongame Species Program regarding specifics of the project. If deemed necessary, mussel surveys will be conducted upstream and downstream of the project area to confirm the absence of these species.

4.5 Cultural Resources

From a historical architectural perspective, removing the buried culvert and recontouring the creek banks will have little or no impact on cultural resources or standing buildings and structures eligible for listing on the National Register of Historic Places.

Most of the area in the vicinity of the culvert has been previously disturbed when the culvert was installed in the 1970s. Excavation work will largely involve removal of imported fill that was placed at the time of the culvert construction.

The proposed grading and recontouring in the project area could potentially expose archaeological components associated with the Mill Hill Historic District, including the Eagle Cotton Factory. Following review of the 2003 Phase 1A Cultural Resources Reconnaissance Report, the NJDEP Historic Preservation Office (HPO) recommended that a Phase I and potentially Phase II archaeological survey be initiated for the project. Continued consultation with the HPO under Section 106 of the National Historic Preservation Act will occur as final construction plans are developed to ensure the proposed excavation and grading work does not adversely affect unknown cultural resources.

Removal of the culvert will provide pedestrian access to the South Broad Street Bridge and provide an opportunity to educate the public on the historical significance of the area. The planned reconstruction of the South Broad Street Bridge will afford additional educational opportunities.

4.6 Socioeconomic Conditions

4.6.1 Project Construction

Removing the buried culvert will not directly displace existing populations or residents within or adjacent to the Assunpink Creek corridor and will not require any modifications to infrastructure outside of the project site.

Most construction workers needed for this project are likely to come from the local area. Workers in specialized trades may come from farther distances.

4.6.2 Project Operation and Maintenance

Restoration in the project area is anticipated to increase desirability of potential adjacent commercial development. Local businesses will be enhanced by the increased visitation of the public to the area.

This project will not negatively affect low-income or minority populations. In contrast, the residents of the area will benefit from increased access to the restored area.

4.7 Land Use

Implementing the Selected Alternative is not expected to have any significant adverse effects on the land use of the properties that make up the proposed project area. The area is currently mowed turf and is fenced off from the public because of the recent culvert collapse.

In contrast, the proposed project will assist in the revitalization of downtown Trenton and will provide approximately 1.5 acres of public park available for a variety of recreational uses. The project is also consistent with the Assunpink Greenway Project and its stated goal of linking all of the communities along Assunpink Creek through a series of interconnected trails along the streambanks.

4.8 Recreational Opportunities

Implementing the Selected Alternative will not adversely affect recreational opportunities within the project area. As noted earlier, because of the recent culvert roof collapse, the entire area over the culvert has been fenced off, limiting the public access to the area. In contrast, the Selected Alternative will greatly increase the attractiveness of the area and will promote public use for a variety of recreational and educational opportunities, including walking, picnicking, fishing, and nature/wildlife observation in the area.

The project will provide a corridor for wildlife migration, as well as provide scenic value and recreational opportunity in this predominately urban area of Trenton. The multiple-use trail will provide access to the restoration sites by the general public. Additionally, recreational fishing opportunities for the public will increase with improved riparian habitat and streambank restoration.

Heritage tourism benefits will likely accrue from the selected alternative due to the historic interpretation of the site as part of the Second Battle of Trenton and the current overlap of the site's location with that of the proposed Capital Park, a separate state-driven project currently under draft plan and review.

In addition to the recreational opportunities directly associated with the project, substantially higher benefits are possible through its role as a link in a linear park system. Linking the various public areas from the Delaware River through the end of the proposed Assunpink Creek Park will provide a valuable pedestrian and bicycle thoroughfare more than 2 miles in length, connecting downtown business and historical areas.

SECTION 5

Habitat Benefits Analysis

5.1 Derivation of a Quantitative Measure of Habitat Benefits for the Assunpink Creek Alternatives

Physical habitat is the living space for instream aquatic organisms. It is a spatially and temporally dynamic entity defined by the interaction of structural features of a stream channel and hydrological regime. Physical habitat is particularly critical for healthy fish communities (Maddock, 1999) and has been evaluated using a wide range of standard metrics to link physical habitat characteristics to instream quality indexes (Hall et. al., 1999).

The purpose of this analysis is to assess the likely quality of stream habitat services that each alternative may produce. Most valuation methods have their theoretical foundations in welfare economics, such as benefit-cost analysis, risk-benefit analysis, and cost-effectiveness analysis. Each analysis's framework comes with tools and measurement methods that have their advantages and disadvantages, depending on the decision they are intended to support and the nature of the effects they are attempting to measure. For example, the preferred metric in a benefit-cost analysis is usually dollars, in order to facilitate aggregating across a wide range of effects from alternative policy actions. However, in the case of assessing morbidity or mortality benefits, other metrics, such as reduced cancer risk or statistical lives saved, are often preferred.

To assess ecological value, environmental metrics based on the flows of ecosystem services may be used.[1] Such metrics are preferred over monetary metrics to capture ecological service flows that provide indirect human use benefits. Such basic ecosystem support services are relatively difficult to quantify in dollar terms and yet can be significantly affected by human activities. This is contrast with direct human use benefits from natural resources and the environment, such as recreational fishing and hunting, wildlife observation, nature photography, etc., which are generally quantified in dollar terms using economic valuation tools that rely on observations or verbal statements about recreation behavior. Thus, depending on the problem and the nature of the available data, different metrics may be used to measure, compare, and value the potential benefits from human actions.

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[1] From the DOI (1996) regulations, ...“services include provision of habitat, food and other needs of biological resources, recreation, other products or services used by humans, flood control, ground water recharge, waste assimilation, and other such functions that may be provided by natural resources.”

From the OPA (1996) regulations, “Services (or natural resource services) means the functions performed by a natural resource for the benefit of another natural resource and/or the public.” NOAA guidance further classifies natural resource services as:

Ecological services - the physical, chemical, or biological functions that one natural resource provides for another natural resource and thus indirectly provides value to the public. Examples include provision of food for wildlife, protection from predation, and nesting habitat, among others: and ,

Human services - the human uses of natural resources or functions of natural resources that provide direct value to the public. Examples include fishing, hunting, nature photography, and education, among others.

Past and present human activities at the Assunpink Creek have affected the environment and the quality and quantity of ecological services being provided. Some of those activities have resulted in a decline or decrease in ecological services, and some have resulted in an increase in ecological services through restoration actions such as habitat enhancement, creation and preservation.

Measuring these changes in services requires an understanding of how these ecological services have changed over time. Services that are produced over time are referred to as service flows. For example, humans consume the flow of services provided by their homes. That is, they consume the shelter and warmth provided by their homes during the course of a year. Similarly, ecological services are provided by a habitat over the course of a year as well. Streams provide habitat and the life requisites (food, cover, water, and breeding habitat) for macroinvertebrates and fish, and it is these stream ecological services (e.g., physical, chemical, or biological functions) that macroinvertebrates and fish consume and are a part of.

To measure service flows, major service flows from the site are identified, and some structural or functional metrics of the ability of the habitat to provide those service flows are then developed. A baseline or reference habitat is specified. This baseline habitat is defined to provide 100 percent of the service flows from a habitat. Using metrics of service flows, the service flows under alternative human activities are compared as a percentage relative to the baseline.

5.1.1 Assessment of Habitat Service Flows

A number of rapid assessment protocols have been developed to evaluate the quality of physical characteristics of instream habitat. This analysis uses the Ohio Qualitative Evaluation Index to assess the potential habitat or ecological service flows associated with the proposed alternatives. Per the Ohio Qualitative Evaluation Index, the expected physical characteristics generated from each alternative over the 500-foot section of the Assunpink Creek were evaluated according to the following metrics:

Substrate: This metric includes two components, substrate type and substrate quality.

- <u>Type:</u> The two most common types are scored, unless one substrate predominates (greater than 75 to 80 percent of bottom area). Substrate types are defined as follows:

    1. **Bedrock:** solid rock forming a continuous surface
    2. **Boulder:** rounded stones larger than 256mm in diameter or large "slabs" longer than 256mm
    3. **Cobble:** stones from 64 to 256mm in diameter
    4. **Gravel:** mixture of rounded coarse material from 2 to 64mm in diameter
    5. **Sand:** materials 0.06 to 2.0mm in diameter; gritty texture
    6. **Silt:** 0.004 to 0.06mm in diameter; fine material that generally feels "greasy" when rubbed between fingers

7. **Hardpan:** particles less than 0.004mm in diameter; usually clay that forms a dense, gummy surface that is difficult to penetrate
8. **Marl:** calcium carbonate; usually greyish-white; often contains mollusk shell fragments
9. **Detritus:** dead, unconsolidated organic material covering the bottom; includes sticks, wood, and other partially decayed plant material
10. **Muck:** black, fine, flocculent, completely decomposed organic matter
11. **Artificial:** substrates such as rock baskets, gabions, bricks, trash, concrete, etc., placed in stream for reasons other than habitat mitigation
12. **Sludge:** a thick layer of organic matter that is of human origin; if originates from point source, not included

- Quality: When scoring quality, **origin** refers to the parent material from which the stream substrate is derived. **Embeddedness** is the degree to which cobble, gravel, and boulder substrates are surrounded, impacted, or covered by fine materials. Substrates should be considered embedded if more than 50 percent of the surface of substrates are embedded (cannot be easily dislodged). This includes substrates that are concreted or "armour-plated". Scoring **Extensiveness** of the sampling area is as follows: **Extensive** is 75 percent of area, **Moderate** is 50 to 75 percent of area, **Sparse** is 25% to 50 percent of area, and **Low** is less than 25 percent of area.

  Silt cover is the extent to which the substrate is covered by silt. **Silt-heavy** means that nearly all the stream bottom is layered with a deep covering of silt. **Moderate** includes extensive coverings of silts, but with some areas of cleaner substrates. **Normal** silt cover includes areas where silt is deposited in small amounts along the stream margin or is present as a "dusting" that appears to have little functional significance. **Silt-free** substrates are those that are exceptionally clean of silt.

Instream Cover: The first half of instream cover is the *type* that is present. Any cover that is in more than 5 percent of the sampling area should be noted, but should not be counted if in areas of the stream that are too shallow (usually <20 cm) to make it useful. Instream cover *amount* can be categorized by: extensive, moderate, sparse, or nearly absent. **Extensive** cover is present in greater than 75 percent of the sampling area. **Moderate** is about 25 to 75 percent; **Sparse** is less than 25 percent; and **Nearly Absent** is when no large patch of any type exists anywhere in the sampling area.

Channel Morphology: Relates to quality of the stream with regard to creation and stability of macrohabitat. This includes: channel sinuosity, channel development, channelization, and channel stability.

- Sinuosity: The degree to which a stream bends. **No** sinuosity means the channel is straight. **Low** sinuosity would have one or two poorly defined bends. **Moderate** has more than two outside bends, with at least one being well-defined. **High** sinuosity would have more than two or three well-defined outside bends with deep areas outside and shallow areas inside.

- Development: Refers to development of riffle pool complexes. **Poor** means no riffles or shallow ones with sand and fine gravel. **Fair** are poorly developed or absent riffles. **Good** implies better-defined riffles with larger substrates. **Excellent** means the riffles are good and pools have a maximum depth of more than 1 meter and deep riffles and runs are present.

- Channelization: Refers to human-made channel modifications. **Recovered** means that the streams were channelized in the past, but have since regained most of their natural characteristics. **Recovering** means the stream was channelized, but is in the process of regaining its former, natural characteristics. **Recent** or **No Recovery** implies the stream was recently channelized or shows no significant recovery.

- Stability: Refers to how stable the channel remains. Channels with stable banks and substrates with little or no erosion are categorized as **High** stability. Artificially stable (concrete) channels also receive the **High** mark. **Moderate** scores are given to channels with stable riffle/pool and channel characteristics, but also exhibit symptoms of instability. **Low** scores go to channels with fine substrates in riffles, unstable (eroding) banks, and high bedload.

Riparian Zone: This metric measures the quality of the riparian buffer zone of floodplain vegetation, including riparian zone width, floodplain quality, and extent of bank erosion. To score each component, one looks downstream and averages both the left and right banks.

- Width of Floodplain: This is the width of the riparian vegetation. Estimates should only be taken for forest, shrub, swamp, and old field vegetation (fairly mature successional field that has stable, woody plant growth).

- Floodplain Quality: The two most predominant floodplain quality types are to be checked. Floodplain refers to areas immediately outside of the riparian zone or greater than 100 feet from the stream, whichever is wider on each side of the stream.

- Bank Erosion: This can have one of five different scorings:

    1. **None**-streambanks are stable and not being changed by water flows or animals

    2. **Little**-streambanks are stable, but slightly changed along the transect line; less than 25 percent of streambank is receiving any stress, is false, broken down, or eroding

    3. **Moderate**-streambanks are receiving moderate alteration along transect line; at least 50 percent of streambank is in natural stable condition; 50 percent is false, broken down, or eroding

    4. **Heavy**-streambanks have received major alterations along transect lines; less than 50 percent of streambank is in stable condition; over 50 percent of streambank is false, broken down, or eroding

5. **Severe**-streambanks along transect lines are severely altered; less than 25 percent of bank is stable condition; over 75 percent of bank is false, broken down, or eroding

Pool Quality: Pool quality consists of three areas: maximum depth of pool or glide, current type, and morphology:

- Depth: This can range from a score of 0 to 6. A pool or glide with maximum depths less than 20 cm is considered to have lost its function and the total metric score is 0.
- Current Type: There are seven possible categories for current type:
    1. **Torrential**-extremely turbulent with fast flow and large waves; water surface very broken with no consistently connected surface
    2. **Fast**-mostly non-turbulent flow with small standing waves in riffle-run areas; water surface partially broken, but some areas of consistent connectivity of surface
    3. **Moderate**-detectable and visible non-turbulent flow; water surface visibly connected
    4. **Slow**-water flow is perceptible, but very sluggish
    5. **Eddies**-small areas of circular current usually formed in pools just downstream from riffle-run areas
    6. **Interstitial**-flow only perceptible in interstitial spaces between substrate particles in riffle-run areas
    7. **Intermittent**-no flow; standing pools separated by dry areas
- Morphology: This category would be checked **wide** if pools are wider than riffles, **equal** if pools and riffles are the same size, and **narrow** if riffles are wider than pools. If morphology varies throughout the site, average the types.

Riffle Quality: If no riffles exist, a 0 should be recorded. If not, riffle quality consists of three areas:

- Riffle Depth: A score from 0 to 4 is to be chosen to describe the depth characteristics of the riffle. If the riffle is less than 5cm deep, riffles are considered to have lost their function and a score of 0 should be recorded.
- Substrate Stability: A score from 0 to 2 is chosen that best describes the substrate type and stability of the riffle habitats.
- Embeddedness: This is the degree that cobble, gravel, and boulder substrates are surrounded or covered by fine material. Substrates are embedded if more than half of the surface of the substrate is embedded in the fine material (are not easily dislodged), including substrates that are cemented. *Extensiveness* of the embeddedness in the area sampled is also recorded: **extensive** is 75 percent of

stream area; **moderate** is 50 to 75 percent of area; **sparse** is 25 to 50 percent of area; **low** is less than 25 percent of area.

5.2 Habitat Services Analysis

CH2M HILL calculated habitat units based on the expected flow of ecological services over time and space from each alternative, using the expected habitat services in percentage terms. Attachment 7 shows the completed assessment sheets used for the analysis. For each alternative, a team of stream design experts assessed each alternative for each metric. The scores were then tabulated and normalized to reflect the percentage of services provided from each alternative.

These percentages were multiplied by 500 linear feet to obtain ecological services expressed in stream length. Those services are assumed to remain constant for each year over a 50-year period. Using a 3 percent real annual rate of discount, the habitat units are estimated in terms of discounted stream length years. The real discount rate used is 3 percent, which represents society's intertemporal rate of preference, or the rate at which society is willing to forgo current consumption of goods and services for future consumption of those goods and services. Table 5-1 shows the percentage of services potentially generated from each alternative.

TABLE 5-1
Percentage of Habitat Services Potentially Generated from each Alternative

Alternative	Habitat Services *(in percent)*	Habitat Units *(in discounted stream length years)*
Alternative One	19	3,148
Alternative Two	34	5,667
Alternative Three	34	5,667
Alternative Four	67	11,167
Alternative Five	17	2,778

Alternative Five, the No-Action Alternative, is estimated to provide 17 percent of habitat services. Alternative One provides 19 percent, Alternatives Two and Three provide 34 percent, and Alternative Four provides 67 percent of habitat services.

5.3 Incremental Cost Analysis

An incremental cost analysis for the alternatives was conducted. The alternatives are first ranked from lowest to highest in terms of their output (in habitat units). Alternative Three is dropped from the analysis as it produces the same amount of output but at a higher cost than Alternative Two. Table 5-2 shows the remaining alternatives in terms of their total costs, total output in habitat units, the incremental cost, the incremental output and the incremental cost per unit of increasing output to the next successive level.

TABLE 5-2
Incremental Cost, Incremental Output, and Incremental Cost per Unit of Increasing Output to the Next Successive Level

Alternative	Cost	Output *(in Habitat Units)*	Incremental Costs	Incremental Output	Incremental Cost per Unit of Output
Alternative Five	No Cost*	2,778	n/a	n/a	n/a
Alternative One	$3,218,159	3,148	$3,218,159	370	$8,698
Alternative Two	$4,278,688	5,667	$1,060,529	2,519	$421
Alternative Four	$5,666,500	11,167	$1,387,812	5,500	$252

The incremental cost analysis suggests that Alternative Two has the lowest incremental cost ($1,060,529) of the alternatives considered with Alternative Four having the next lowest incremental cost ($1,387,812). Alternative 4 has the lowest cost per unit of output at $252. Alternative Two has a cost per unit of output of $421 and Alternative One has a cost per unit of $8,698.

SECTION 6

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Steve Miller	M.S., Environmental Engineering	Overall/Engineering – Senior Consultant
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Arundhati Bhosle	M.S., Civil Engineering	Cost Assessment
Kate Murphy	B.A., Environmental Studies	Environmental – Biology Task Lead

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SECTION 9

Finding of No Significant Impacts

Overview

The final Environmental Assessment identifies and evaluates the anticipated environmental impacts and benefits associated with the proposed Ecosystem Restoration project. Goals of the project include the restoration of the Assunpink Creek, restoration of fisheries, and creation of additional riparian communities. Upon completion of the proposed project, a significant obstacle to fish migration will be removed, wildlife habitat value and diversity will be enhanced, riparian buffers will serve to slow, filter and remove sediments and pollutants from stormwater surface runoff, as well as, provide riverfront recreational and educational opportunities in the area. The project will also support the future plans for the City of Trenton Assunpink Greenway project.

Purpose

The proposed "restoration" project, upon completion, will serve to enhance fishery habitat and migration, improve water quality and provide riverfront recreational and educational opportunities for the surrounding community. With the recent partial collapse of the Broad Street culvert roof structure, immediate action is needed to remedy what has become a public safety hazard in addition to an impediment to fish passage.

Specifications

Five alternatives were considered and evaluated for the proposed ecological restoration, including a "No-Action" alternative. These alternatives were evaluated for cost, environmental benefit, structural stability, maintenance requirements, and the ability of each alternative to be incorporated into the future plans for Assunpink Creek.

Alternative Four was selected as the "Selected" Alternative. Alternative Four was chosen based on ecological benefits, structural stability and expected long term maintenance requirements.

Finding of Compliance

An Environmental Assessment has been prepared for the project in order to determine the nature and extent of environmental impacts resulting from the implementation of the selected alternative.

The proposed project will be performed in compliance with the Clean Water Act, the Federal Endangered Species Act, the National Historic Preservation Act, and applicable New Jersey water quality and land use regulations.

Habitat Impacts

The final Environmental Assessment has been prepared to evaluate the anticipated impacts to existing environmental resources within the project area. Potential impacts were assessed mainly in regard to existing conditions occurring within the project and the anticipated ecological benefits that will result following implementation of the selected alternative. It was determined during the Habitat Benefits Analysis, that each of the proposed alternatives, with the exception of the "No-Action" alternative, will result in significant benefits. The selected alternative provided the best combination of environmental benefits and streambank stabilization without compromising the effectiveness of the restoration.

The draft Environmental Assessment prepared for the proposed project has been forwarded to the United State Fish and Wildlife Service, National Marine Fisheries Service, the United States Environmental Protection Agency, the New Jersey Department of Environmental Protection, the New Jersey Historic Preservation Office, and other applicable parties for review and comment. The final Environmental Assessment prepared for the proposed project has determined that there will be no adverse impacts to any critical or sensitive habitats or environments, including habitats for State or Federally listed threatened or endangered species, found within or in the vicinity of the proposed project.

Cultural Impacts

Properties and sites within or in the vicinity of the proposed project area that are listed on or are eligible for listing on the National Register of Historic Places have been addressed.

The South Broad Street Bridge is listed on the National Register, but adverse impacts to the bridge will be avoided.

A Phase I archaeological survey will be initiated for the project to ensure impacts to cultural resources are avoided. Continued consultation with the NJDEP SHPO under Section 106 of the National Historic Preservation Act will occur to ensure the proposed action does not adversely affect unknown cultural resources in the vicinity of the project.

Recommendations

Because the Environmental Assessment concludes that the proposed project is not a major Federal action significantly affecting the human environment, I have determined that an Environmental Impact Statement is not required.

26 JAN 2008
Date

Gwen E. Baker
Lieutenant Colonel, Corps of Engineers
District Engineer

Attachment 1 – Study Area Map and Conceptual Plan and Profile Drawings

N

2,000 1,000 0 2,000
Feet

CH2MHILL

FIGURE 1
VICINITY MAP
Lower Assunpink Creek - Broad Street Culvert
Environmental Restoration Report

CH2MHILL

FIGURE 2
STUDY AREA
Lower Assunpink Creek - Broad Street Culvert
Environmental Restoration Report

Attachment 2 – Project Location Photographs

Plate 1. View upstream of turf and fill covering the Broad Street culvert.

Plate 2. View downstream of turf and fill covering the Broad Street culvert.

Plate 3. View upstream showing the collapsed culvert roof section.

Plate 4. Location of the collapsed culvert roof section.

Attachment 3 – Cost Estimates for all Alternatives

Date: 11/29/2007

ASSUNPINK CREEK - BROAD STREET CULVERT REMOVAL

PRELIMINARY CONSTRUCTION COST SPREADSHEET

			Alternative 1			Alternative 2			Alternative 3			Alternative 4		
Item	Description	Unit	Contract	Unit price	Amount	Contract	Unit price	Amount	Contract	Unit price	Amount	Contract	Unit price	Amount
			Quantity	$	$	Quantity	$	$	Quantity	$	$	Quantity	$	$
1	Clearing Site, Structure	LS	1	10000	10000	1	10000	10000	1	10000	10000	1	10000	10000
2	Demolition and removal (Conc)	CY	1065	350	372750	1180	350	413000	1241	350	434350	1980	350	693000
3	Earth Excavation, Subsurface Structures	CY	5140	50	257000	11300	50	565000	13800	50	690000	18060	50	903000
4	Borrow Excavation, Zone 1	CY	910	100	91000	4000	100	400000	5200	100	520000	7400	100	740000
5	Sheeting left in place	SF	9200	8	73600	4600	8	36800	1800	8	14400	0	8	0
6	Riprap Stone Slope Protection, 12" thick (D50=4")	SY	0	50	0	227	50	11350	283	50	14150	0	50	0
7	Riprap Stone Slope Protection, 18" thick (D50=6")	SY	0	80	0	0	80	0	0	80	0	2900	80	232000
8	Boulder, 2'-3'	Unit	0	300	0	0	300	0	0	300	0	100	300	30000
9	Boulder, 3'-4'	Unit	0	350	0	30	350	10500	30	350	10500	30	350	10500
10	Boulder, 5'-6'	Unit	0	450	0	10	450	4500	10	450	4500	10	450	4500
11	Geotextile	SY	737	100	73700	2800	100	280000	3100	100	310000	3740	100	374000
12	Topsoiling, 4" thick	SY	737	10	7370	2800	10	28000	3100	10	31000	3740	10	37400
13	Topsoil Stabilization Matting	SY	737	10	7370	2800	10	28000	3100	10	31000	3740	10	37400
14	Fertilizing and seeding	SY	737	1	737	2800	1	2800	3100	1	3100	3740	1	3740
15	Bentonite layer	SF	0	22	0	0	22	0	0	22	0	25500	22	561000
16	Dense graded aggregate base course, 10" thick	SY	0	20	0	0	20	0	0	20	0	2833	20	56660
17	Soil Investigation	LS	1	20000	20000	1	20000	20000	1	20000	20000	1	20000	20000
18	Foundation Excavation	CY	100	20	2000	200	20	4000	300	20	6000	0	20	0
19	Concrete in Structures, Retaining walls	CY	50	1000	50000	100	1000	100000	100	1000	100000	0	1000	0
20	Concrete in Structures, Sidewalks	CY	20	2000	40000	20	2000	40000	30	2000	60000	0	2000	0
21	Reinforcement Steel in Structures, Epoxy Coated	LBS	2500	2	5000	5000	2	10000	3000	2	6000	0	2	0
22	In-Fill Soil	CY	200	60	12000	450	60	27000	450	60	27000	0	60	0
23	Architectural Finish	SF	10200	60	612000	10200	60	612000	10200	60	612000	0	60	0
24	Tree Plantation, Preparation etc	LS	1	40000	40000	1	40000	40000	1	40000	40000	1	40000	40000
25	4-Bar Open Steel Bridge railing	LF	1000	300	300000	600	300	180000	450	300	135000	0	300	0
26	Stream Diversion	Unit	1	20000	20000	1	20000	20000	1	20000	20000	10	20000	200000
27	Surveying	LS	1	20000	20000	1	20000	20000	1	20000	20000	1	20000	20000
	Sum				$2,014,527			$2,862,950			$3,119,000			$3,973,200
	Relocation of Exist. Utilities Contigency				$700,000			$700,000			$700,000			$700,000
	Contingencies: 10%	10			$201,453			$286,295			$311,900			$397,320
	Mobilization: 15%	15			$302,179			$429,443			$467,850			$595,980
	TOTAL				**$3,218,159**			**$4,278,688**			**$4,598,750**			**$5,666,500**

Attachment 4 – Phase 1A Cultural Resource Reconnaissance Report – Summary and Recommendations

Chapter 5

SUMMARY AND RECOMMENDATIONS

To a large degree the Assunpink Creek corridor represents the backbone of historic Trenton. For several thousand years, the opportunity to access and utilize both the waters of the creek and the Delaware River has attracted people to the lands surrounding the confluence of the two waterways. With the arrival of the first permanent settlers of European background in the late 1670s, the seeds of Trenton's urban growth were planted. The Assunpink Creek as one of the defining features of the local physical landscape has played an important role in the history of Trenton ever since. Trenton's population has at various times relied on the creek as a significant source of hydropower and as an important recreational asset. In spite of this, over the course of the 19^{th} and 20^{th} centuries, the city gradually encroached upon the creek corridor and left it a narrow strip that winds through the urban fabric of modern Trenton. Each of these many chapters of the long history of Trenton has left its own unique evidence in the landscape of the Assunpink Creek Corridor. The result is that the current project area is scattered throughout with potentially significant cultural resources.

A. HISTORIC ARCHITECTURAL RESOURCES

From a historic architectural perspective, quite a large number of potential resources have been identified. These include individual historic buildings and bridges, factory and recreational complexes and historic districts.

Only two National Register-listed historic architectural resources have been identified within the project area. These are the Mill Hill Historic District (SR 4/13/1977 NR 12/12/1977) and the Delaware and Raritan Canal Historic District (NJ 11/30/1972 NR 5/11/1973). Several other historic architectural resources within the project area have been evaluated as being eligible for listing on the National Register by New Jersey Historic Preservation Office opinion. These are the South Broad Street Bridge [D1] (NJHPO opinion 5/31/1980), The South Clinton Avenue Stone Arch Bridge over the Assunpink Creek[F1] (NJHPO opinion 10/8/1997), the South Clinton Avenue Pratt Thru Truss Bridge (NJHPO opinion 10/8/1997)[F2], the Pennsylvania Railroad New York to Philadelphia Historic District/ Camden and Amboy Trenton to New Brunswick Line [F17] (NJHPO opinion 5/9/2002).

The Yard Avenue Historic District is a locally certified historic district established by the City of Trenton on 10/12/1983. The district has suffered such an extensive loss of historic fabric that it would not qualify for listing on the New Jersey or National Registers of Historic Places.

Field survey activities have identified eight additional historic architectural resources that may be eligible for listing on the National Register of Historic Places. These include the Norman Druck Motor Company/Mandeville Motor Company buildings [F30, F31 and F32], the Belvidere and Delaware Railroad/Belvidere Delaware Railroad Bridge over the Assunpink Creek [G6], the Oak Street Bridge [G15], the Murray, Whitehead and Murray Rubber Company/Joseph Stokes Rubber Company Complex [G22], the Star Rubber Works/ Empire Rubber Works Complex [H14 and H15], the De Laval Steam Turbine Company facility [H16], the Hetzel Park and the Hetzel Park Bridge over the Assunpink [H8 and H9] and the William Baker Machine Shop/Globe Porcelain Company Building [I6].

Additional work would need to be undertaken in order to make full evaluations of National Register eligibility particularly with reference to the several multi-component resources [F30, F31 and F32, G6, G22, H14 and H15 and H16]. It is impossible to fully assess project impacts on any of these resources in the absence of more developed project plans, however, a few general statements can be made at this time. From a historic architectural standpoint, simple recontouring of the creek banks would have little or no impact on individually eligible standing buildings. Grading/environmental restoration could impact historic architectural resources with associated archaeological components and could have an adverse effect within eligible or listed historic districts. The Mill Hill Historic District would be particularly sensitive to activities such as these. Demolition of any listed or eligible historic buildings or structures or any contributing buildings, structures, objects or sites within the bounds of a historic district would constitute an adverse effect. The proposed demolition of any of the buildings or structures identified by this survey as being potentially eligible for listing would require intensive level historic architectural survey to confirm their eligibility.

B. ARCHAEOLOGICAL RESOURCES

Potential archaeological resources have been identified throughout the study area, but once more detailed plans of the proposed environmental restoration are produced, Phase IB testing and research can focus in on the actual areas of potential effect. Some of this work may require manual test excavation or machine-assisted excavation while work in other areas may be accomplished by archaeological monitoring during construction.

Surface grading to restore the riparian habitat adjacent to the Assunpink Creek would likely encounter a variety of sites and would most likely require monitoring. The potential opening of the 500-foot culvert downstream from the South Broad Street Bridge, (Section B) would undoubtedly uncover a host of archaeological resources including the Eagle Cotton Factory [B23]. The projected removal of two railroad bridges would most likely require some level of archaeological recordation when they are identified.

The project area contains many resources with varying degrees of historical and archaeological importance. These resources fall into several categories of archaeological interest such as prehistoric, historic, industrial, transportation and mortuary sites. Archaeological sites within the four recognized historic districts may have added significance as contributing resources to these districts.

1. Prehistoric Sites

Although only two prehistoric sites have been recorded within the limits of the project area, the probability of finding additional sites along the surviving sections of the first terrace are high. Elsewhere in the City of Trenton, prehistoric resources have been recorded in areas of intense industrial and residential development (Hunter Research, Inc. 1996, 2002b). Surface grading to restore the riparian habitat along the first terrace adjacent to the Assunpink Creek would likely encounter additional prehistoric archaeological deposits.

2. Historic Sites

Historic sites consist of residential properties such as individual homes, row homes, and unidentified buildings likely to be residential and/or commercial buildings. At this level of study, residential resources of note are located within the boundaries two historic districts, the Mill Hill Historic District, and the Yard Avenue Local Historic District (Study Sections C, D and F). In the Mill Hill Historic District Several unidentified buildings are shown on the 1714 map of Trenton, and most likely represent the individual homes of some of the city's earliest inhabitants and therefore likely to be considered significant archaeological sites. Other house sites and sites thought to be residential would require additional research to determine their significance.

Commercial sites identified within the Mill Hill Historic District (Study Sections C & D) are also considered potentially significance resources (Assunpink Block [C3], D.Wolff Company [C8], Fitzgerald Company [C9], T.S. Evertt's Livery [D14], an ice house later identified as Whittakers [D17] and a store building identified as "Wilson" [D18]). These sites could potentially provide useful data concerning the commerce and economics of the City of Trenton.

3. Industrial Sites

Industrial sites represent the largest number of resources recorded within the study limits. Industrial sites include factories/mills, and structural modifications made to the creek to generate power or protect against flooding. The remains of these sites offer important information regarding the layout and operation of these facilities. Information gained from artifacts discarded by these manufacturing facilities would also be significant.

Important resources of note are the Golding's Flint and Spar Mill [A11], Stryker's Flour Mill [A21], the Moore Flour Mill/Trenton Roller Mills [B2], the Moore Oil Mill and raceway [B3 and B4] the Trenton Cotton Factory/Wilson Woolen Mill [B10], the Eagle Cotton Factory [B23], the Stacy Gristmill [C2], the Speeler Pottery Company ceramic waster dump [D13], Green's ironworks [F14], and Samuel Henry's Mill and raceway [H11 and 12]. Viewed as a whole, the entire length of the study area could potentially be considered an industrial archaeological district. Although such a determination would require additional investigation.

4. Transportation Sites

Transportation sites consist of canals, railroads, trolleys, bridges and associated buildings or structures. Potentially eligible transportation related resources lie within the Delaware and Raritan Canal District (Section E) and the Pennsylvania Railroad New York to Philadelphia District (Camden and Amboy Railroad Branch Line Historic District) (Sections E and F). Archaeological resources within these districts may potentially be considered contributing resources and be eligible for listing on the National Register of Historic Places.

5. Mortuary Sites

Two mortuary sites lie within the study limits. The portion of the Mercer Cemetery adjacent to the Assunpink Creek does not appear to have been used for burials. However, ground-penetrating radar (GPR) should be used in this area to look for possible unrecorded or unmarked grave shafts if ground-disturbing activities are planned. An African-American cemetery known as the Locust Hill Cemetery consists of an unknown number of individuals buried in unmarked graves. GPR would be a prudent step in establishing the locations of fallen headstones and unmarked grave shafts as well as establishing boundaries for the cemetery.

C. CONCLUSIONS

While this survey has preliminarily identified a large number of potential historic architectural and archaeological cultural resources within the project area, the number that will likely be impacted by the actual project undertaking should be significantly less. The development of more detailed project plans will help to exclude many of these from potential project related impacts. Selective intensive level architectural survey and, where necessary, Phase IB archaeological investigations will help to further winnow this list.

Attachment 5 – Clean Water Act Section 404(b)(1) Evaluation

Clean Water Act Section 404(b)(1) Evaluation

I. Project Description

a. Location

The Lower Assunpink Creek Ecosystem Restoration Project study area is located along a 3-mile section of the Lower Assunpink Creek in Trenton, New Jersey. Assunpink Creek is 25 miles long, and drains approximately 91 square miles in central New Jersey. The main tributaries that feed Assunpink Creek are Shabakunk Creek and Miry Run. The headwaters begin in Millstone Township, in Monmouth County, and flow into the Delaware River in Trenton. The project area for the proposed action evaluated for this report encompasses a 500-foot section of the Lower Assunpink Creek in downtown Trenton where the creek is contained within a box culvert.

b. General Description

The goal of the Lower Assunpink Creek Ecosystem Restoration Project is to restore migratory fish habitat, develop recreational opportunities, and improve the overall stream ecology of Assunpink Creek. These goals coincide with interstate management plans developed by the Atlantic States Marine Fisheries Commission (ASMFC) in 1985 to restore herring stocks in streams experiencing stream blockages.

The Broad Street culvert recently experienced a structural failure, which increased the urgency to implement a restoration action that would also address a public safety hazard. For this reason, this report documents the evaluation of alternatives for removal or “day lighting” of the Broad Street culvert along Assunpink Creek between South Broad Street and South Warren Street. The Broad Street culvert is a box culvert approximately 500 feet long, with two 9- by 22-foot flumes separated by a 3-foot center wall. The culvert contains a roof structure of 8-inch precast, hollow-core concrete deck slabs that are covered in soil, averaging 3 feet in the center of the culvert to 6 feet near the New Jersey Department of Human Services (DHS) building. The area over the culvert is mowed turf.

The full range of reasonable alternatives was considered during the National Environmental Policy Act (NEPA) process, resulting in the systematic elimination of alternatives that did not meet the purpose of and need for the action. The alternative that best met the environmental and technical criteria for this project site was selected as the proposed action. The proposed action was selected based on an evaluation of ecological benefits, structural stability, expected long term maintenance requirements, recreational benefits and construction cost estimates.

The proposed action will provide an open channel configuration for Assunpink Creek where it is currently contained within a buried concrete culvert. This will be accomplished through the complete removal of the culvert structure and the realignment of the creek into a natural channel. The channel dimension, or cross-section, will generally be narrowed and deepened. The project will incorporate instream structures such as log and rock cross-vanes and J-hooks, that center the flow, control the grade, and vary the channel bottom or profile. Both banks will be planted with riparian trees and shrubs to provide stability.

To enable work to be accomplished with minimal impacts to water quality, stream flows will be diverted into the northern culvert flume. This will allow for the southern flume be demolished under dry conditions and for excavation and grading of the realigned channel. The alignment of the new channel will be shifted away from the existing building's infrastructure while considering the egress and ingress of the creek to the South Broad Street and South Warren Street Bridges. Flows will be diverted into a temporary diversion channel to allow for the demolition of the northern flume.

There will be opportunities to create fish-spawning habitat and other aquatic habitat through channel design, instream structures, and creation of pools and riffles. Removal of the concrete bottom slab will also increase fishery migration opportunities by creating a varied substrate and will increase biodiversity through increased macroinvertebrate habitat. Other benefits include a restored riparian zone, providing a beneficial transition buffer between existing water and human land uses; improved habitats, including foraging and nesting areas, for fish-eating birds, small mammals, and aquatic wildlife species; improved runoff water quality by acting as a sediment and pollutant filter; and improved aesthetic and recreational value of the project area. A more-diverse ecosystem conducive to sustaining aquatic and wildlife species will result.

c. Authority and Purpose

The United States Army Corps of Engineers (USACE), Philadelphia District has initiated an environmental restoration project for the lower Assunpink Creek under authority of Section 1135 of the Water Resources Development Act of 1986. As amended, the Act provides authority for modifying the structure or operation of an existing USACE project, for the purpose of improving the quality of the environment in the public interest and to determine if the operation of such projects has contributed to the degradation of the quality of the environment. The City of Trenton, New Jersey, has agreed to serve as the project sponsor.

d. General Description of the Discharge Material

(1) Characteristics of Fill Material

Once the culvert structure is removed, stone boulders and riprap will be placed within the new channel.

(2) Fill materials

The proposed project would involve the addition of stone boulders and riprap placed within the realigned channel.

e. Description of Proposed Discharged Site

The discharge site is a 500-foot section of the lower Assunpink Creek in downtown Trenton where the creek is contained within a box culvert.

f. Description of Disposal Method

All materials removed from the site for disposal will be disposed of in accordance with all appropriate local, state and Federal rules and regulations.

II. Factual Determination

a. Physical Substrate Determination

Where the existing culvert is removed, stabilized native soil will provide the channel bank substrate.

b. Water Circulation, Fluctuation, and Salinity Determinations

Water chemistry, clarity, color, odor, taste, dissolved gas levels, nutrients, eutrophication, and other physical water quality factors would not be affected by the proposed project. Salinity determinations are not applicable to the proposed action.

c. Suspended Particulate/Turbidity Determination

The proposed action is expected to only temporarily increase suspended sediments and turbidity locally in the Assunpink Creek during construction of the project. No noticeable impacts to dissolved oxygen levels, toxic metals, organics, or pathogens would be anticipated. Impacts to photosynthetic, filter feeder, and sight feeders are expected to be minimal to nonexistent. During construction, stream flows will be diverted to the extent practical to isolate the work area from stream flows and minimize sedimentation. Long term benefits to the aquatic ecology and water quality would result from the proposed action.

d. Contaminant Determinations

Materials for construction of the project would be chemically stable and non-contaminating. Construction would take place in areas where the soil is not considered likely to be contaminated. Neither the fill or its placement would cause relocation or increases of contaminants in the aquatic ecosystem. Certification of the project under Section 401 will be requested from the New Jersey Department of Environmental Protection, and all requirements would be met prior to construction.

e. Aquatic Ecosystem and Organism Determinations

The proposed action should have no significant effects on the aquatic ecosystem. The proposed action is expected to enhance the aquatic ecosystem and to promote anadromous fish migration into the Assunpink Creek from the Delaware River. Adverse impacts resulting from the proposed action will be short-term and minor. Most aquatic species found in the project area are mobile, and it is anticipated that any species displaced during construction will return to utilize the area. As the project effects are temporary and short-term in nature, the project is not anticipated to adversely impact any state or Federally listed species.

f. Proposed Disposal Site Determinations

No violations of water quality standards are likely to occur as a result of the proposed project. The proposed action would have no adverse effect on municipal or private water supplies, recreational or commercial fisheries, water-related recreation, aesthetics, parks, national historic monuments, or similar preserves. The project would likely enhance water quality locally and would increase recreational opportunities for the public.

g. Determination of Cumulative Effects on the Aquatic Ecosystem

Because of the restorative nature of the proposed project, it is not anticipated to act in concert with other typical area construction activities in adversely impacting local aquatic or terrestrial ecosystems.

h. Determination of Secondary Effects on the Aquatic Ecosystem

No significant detrimental secondary effects are anticipated as a result of the proposed action.

III. Actions Taken to Minimize Adverse Impacts

1. To enable work to be accomplished with minimal impacts to water quality, stream flows will be diverted into the opposite culvert flume for which work is occurring. This will allow for demolition of existing structures to occur under dry conditions. Where the existing concrete culvert wall is removed, existing native soil will be stabilized and planted with native riparian and upland vegetation. No impacts to vegetated wetlands will occur during construction of the proposed project.

IV. Finding of Compliance

1. No adaptations of the Section 404(b)(1) guidelines were made relative to this evaluation.

2. The alternative of no Federal action was not feasible. If the Broad Street culvert is not restored to an open channel, it would continue to be present a public safety hazard and would continue to be a significant barrier to anadromous fish migration.

3. Certification under Section 401 will be applied for from the State of New Jersey. Certification will be obtained prior to construction.

4. The project would not introduce toxic substances into Assunpink Creek.

5. No significant impacts to Federal or state listed threatened and endangered species would result from the project.

6. No municipal or private water supplies would be affected by the proposed project. No sensitive or critical habitats would be affected, and no long-term

adverse impacts would occur to these habitats. Local water quality and aquatic habitat will be enhanced by the project.

7. Project construction materials would be chemically and physically stable.

8. The selected alternative has been reviewed for environmental impacts in an Environmental Assessment (EA). The EA supports the determination that the proposed action would lead to a Finding of No Significant Impact, pending public review and comment.

9. When compared to the other alternatives, the selected alternative provided the best combination of environmental benefits while minimizing environmental impacts.

10. The proposed actions would not significantly affect water quality and the aquatic ecosystem, and are found to be in compliance with the requirements of guidelines for Sections 404(b)(1) of the Clean Water Act, as amended.

Attachment 6 – Record of Non-Applicability

GENERAL CONFORMITY - RECORD OF NON-APPLICABILITY

Project/Action Name:	Lower Assunpink Creek Ecosystem Restoration Project - Broad Street Culvert
Project/Action Identification Number:	PWI# 167859
Project/Action Point of Contact:	Brian Mulvenna
Phone:	215-656-6599
Project Begin Date:	Fall 2007
Project End Date:	Spring 2009

General Conformity under the Clean Air Act, Section 176 has been evaluated for the project described above according to the requirements of 40 CFR 93, Subpart B. The requirements of this rule are not applicable to this project/action because:

__XX__The project/action is an exempt action under 40 CFR 93.153(c)(1).

Supporting documentation and emission estimates are

(__) ATTACHED
(__) APPEAR IN THE NEPA DOCUMENTATION
(_X_) OTHER: Not Required

26 Jun 2008
Date

Gwen E. Baker
Lieutenant Colonel, Corps of Engineers
District Engineer

Attachment 7 – Qualitative Stream Evaluation Forms

OhioEPA Qualitative Habitat Evaluation Index Field Sheet QHEI Score: 17/90

River Code: ____ *RM:* ____ *Stream:* ASS Unpink Creek - Broad St Culvert
Date: 11/13/06 *Location:* Alt 1 - top removal
Scorers Full Name: Davenport/Miller *Affiliation:* CH2M HILL

1] SUBSTRATE (Check ONLY Two SubstrateTYPE BOXES; Estimate % present

TYPE	POOL RIFFLE		POOL RIFFLE	SUBSTRATE ORIGIN		SUBSTRATE QUALITY
				Check ONE (OR 2 & AVERAGE)		Check ONE (OR 2 & AVERAGE)
☐☐-BLDR /SLBS[10]	___ ___	☐☐-GRAVEL [7]	___ ___	☐ -LIMESTONE [1]	SILT:	☐- SILT HEAVY [-2]
☐☐-BOULDER [9]	___ ___	☐☐-SAND [6]	___ ___	☐ -TILLS [1]		☐ -SILT MODERATE [-1]
☐☐-COBBLE [8]	___ ___	☐☐-BEDROCK[5]	___ ___	☐ -WETLANDS[0]		☐ -SILT NORMAL [0]
☐☐-HARDPAN [4]	___ ___	☐☐-DETRITUS[3]	___ ___	☒ -HARDPAN [0]		☐ -SILT FREE [1]
☐☐-MUCK [2]	___ ___	☒☒-ARTIFICIAL[0]	100 100	☐ -SANDSTONE [0]	EMBEDDEDNESS:	☐ -EXTENSIVE [-2]
☐☐-SILT [2]	___ ___	NOTE: Ignore Sludge Originating From Point Sources		☐ -RIP/RAP [0]		☐ -MODERATE [-1]
				☐ -LACUSTRINE [0]		☒ -NORMAL [0]
				☐ -SHALE [-1]		☐ -NONE [1]
				☐ -COAL FINES [-2]		

NUMBER OF SUBSTRATE TYPES: ☐-4 or More [2] ☐-3 or Less [0]
(High Quality Only, Score 5 or >)
COMMENTS Open top concrete box

Substrate: 0 — Max 20

2] INSTREAM COVER (Give each cover type a score of 0 to 3; see back for instructions)
(Structure) **TYPE:** Score All That Occur

- 0 UNDERCUT BANKS [1]
- 0 OVERHANGING VEGETATION [1]
- 0 SHALLOWS (IN SLOW WATER) [1]
- 0 ROOTMATS [1]
- 0 POOLS> 70 cm [2]
- 0 ROOTWADS [1]
- 0 BOULDERS [1]
- 0 OXBOWS, BACKWATERS [1]
- 0 AQUATIC MACROPHYTES [1]
- 0 LOGS OR WOODY DEBRIS [1]

COMMENTS: ____

AMOUNT: (Check ONLY One or check 2 and AVERAGE)
- ☐ - EXTENSIVE > 75% [11]
- ☐ - MODERATE 25-75% [7]
- ☐ - SPARSE 5-25% [3]
- ☒ - NEARLY ABSENT < 5%[1]

Cover: 1 — Max 20

3] CHANNEL MORPHOLOGY: (Check ONLY One PER Category OR check 2 and AVERAGE)

SINUOSITY	DEVELOPMENT	CHANNELIZATION	STABILITY	MODIFICATIONS/OTHER	
☐ - HIGH [4]	☐ - EXCELLENT [7]	☐ - NONE [6]	☒ - HIGH [3]	☐ - SNAGGING	☐ - IMPOUND.
☐ - MODERATE [3]	☐ - GOOD [5]	☐ - RECOVERED [4]	☐ - MODERATE [2]	☒ - RELOCATION	☐ - ISLANDS
☒ - LOW [2]	☐ - FAIR [3]	☐ - RECOVERING [3]	☐ - LOW [1]	☐ - CANOPY REMOVAL	☐ - LEVEED
☐ - NONE [1]	☒ - POOR [1]	☒ - RECENT OR NO RECOVERY [1]		☐ - DREDGING	☐ - BANK SHAPING
				☐ - ONE SIDE CHANNEL MODIFICATIONS	

COMMENTS: ____

Channel: 7 — Max 20

4]. RIPARIAN ZONE AND BANK EROSION (check ONE box per bank or check 2 and AVERAGE per bank) River Right Looking Downstream

RIPARIAN WIDTH	FLOOD PLAIN QUALITY (*PAST 100 Meter RIPARIAN*)		BANK EROSION
L R (Per Bank)	L R (Most Predominant Per Bank)	L R	L R (Per Bank)
☐☐- WIDE > 50m [4]	☐☐-FOREST, SWAMP [3]	☐☐-CONSERVATION TILLAGE [1]	☒☒-NONE/LITTLE [3]
☐☐- MODERATE 10-50m [3]	☐☐-SHRUB OR OLD FIELD [2]	☒☒-URBAN OR INDUSTRIAL [0]	☐☐-MODERATE [2]
☒☒- NARROW 5-10 m [2]	☐☐-RESIDENTIAL,PARK,NEW FIELD [1]	☐☐-OPEN PASTURE,ROWCROP [0]	☐☐-HEAVY/SEVERE[1]
☐☐- VERY NARROW <5 m[1]	☐☐-FENCED PASTURE [1]	☐☐-MINING/CONSTRUCTION [0]	
☐☐- NONE [0]			

COMMENTS: ____

Riparian: 5 — Max 10

5.]POOL/GLIDE AND RIFFLE/RUN QUALITY

MAX. DEPTH	MORPHOLOGY	CURRENT VELOCITY [POOLS & RIFFLES!]	
(Check 1 ONLY!)	(Check 1 or 2 & AVERAGE)	(Check All That Apply)	
☐ - >1m [6]	☐ -POOL WIDTH > RIFFLE WIDTH [2]	☐ -EDDIES[1]	☐ -TORRENTIAL[-1]
☐ - 0.7-1m [4]	☒ -POOL WIDTH = RIFFLE WIDTH [1]	☒ -FAST[1]	☐ -INTERSTITIAL[-1]
☐ - 0.4-0.7m [2]	☐ -POOL WIDTH < RIFFLE W. [0]	☒ -MODERATE [1]	☐ -INTERMITTENT[-2]
☐ - 0.2- 0.4m [1]		☐ -SLOW [1]	☒ -VERY FAST[1]
☒ - < 0.2m [POOL=0]	COMMENTS: ____		

Pool/Current: 4 — Max 12

CHECK ONE OR CHECK 2 AND AVERAGE

RIFFLE DEPTH	RUN DEPTH	RIFFLE/RUN SUBSTRATE	RIFFLE/RUN EMBEDDEDNESS
☐ - *Best Areas >10 cm [2]	☐ - MAX > 50 [2]	☐ -STABLE (e.g.,Cobble, Boulder) [2]	☐ - NONE [2]
☐ - Best Areas 5-10 cm[1]	☐ - MAX < 50[1]	☐ -MOD. STABLE (e.g.,Large Gravel) [1]	☐ - LOW [1]
☐ - Best Areas < 5 cm [RIFFLE=0]		☐ -UNSTABLE (Fine Gravel,Sand) [0]	☐ - MODERATE [0]
			☐ - EXTENSIVE [-1]

COMMENTS: Open top concrete box ☒ - NO RIFFLE [Metric=0]

Riffle/Run: 0 — Max 8

Gradient: ____ — Max 10

6] GRADIENT (ft/mi): ______ DRAINAGE AREA (sq.mi.) : ~90

%POOL: 0 %GLIDE: 0
%RIFFLE: 0 %RUN: 100

*- Best areas must be large enough to support a population of riffle-obligate species

Ohio EPA Qualitative Habitat Evaluation Index Field Sheet QHEI Score:

30.6/90

River Code: ____ RM: ____ Stream: Assunpink Creek - Broad St Culvert
Date: ____ Location: Alts 2 + 3 partial wall removals
Scorers Full Name: Davenport/Miller Affiliation: CH2M HILL

1] SUBSTRATE (Check ONLY Two SubstrateTYPE BOXES; Estimate % present

TYPE	POOL	RIFFLE		POOL	RIFFLE	SUBSTRATE ORIGIN	SUBSTRATE QUALITY
☐☐-BLDR /SLBS[10]			☐☐-GRAVEL [7]			Check ONE (OR 2 & AVERAGE)	Check ONE (OR 2 & AVERAGE)
☐☒-BOULDER [9]	0	100	☐☐-SAND [6]			☐ -LIMESTONE [1] SILT:	☐- SILT HEAVY [-2]
☐☐-COBBLE [8]			☐☐-BEDROCK[5]			☐-TILLS [1]	☐-SILT MODERATE [-1]
☐☐-HARDPAN [4]			☐☐-DETRITUS[3]			☐ -WETLANDS[0]	☐-SILT NORMAL [0]
☐☐-MUCK [2]			☒☐-ARTIFICIAL[0]	20	80	☒-HARDPAN [0]	☐-SILT FREE [1]
☐☐-SILT [2]			NOTE: Ignore Sludge Originating From Point Sources			☐ -SANDSTONE [0] EMBEDDED	☐-EXTENSIVE [-2]
						☒-RIP/RAP [0] NESS:	☐-MODERATE [-1]
						☐-LACUSTRINE [0]	☒-NORMAL [0]
						☐-SHALE [-1]	☐-NONE [1]
						☐-COAL FINES [-2]	

NUMBER OF SUBSTRATE TYPES: ☐-4 or More [2]
(High Quality Only, Score 5 or >) ☐-3 or Less [0]

COMMENTS concrete bottom

Substrate: 9 (Max 20)

2] INSTREAM COVER (Give each cover type a score of 0 to 3; see back for instructions)

(Structure) TYPE: Score All That Occur

0 UNDERCUT BANKS [1]
1 OVERHANGING VEGETATION [1]
0 SHALLOWS (IN SLOW WATER) [1]
0 ROOTMATS [1]
0 POOLS> 70 cm [2]
0 ROOTWADS [1]
1 BOULDERS [1]
0 OXBOWS, BACKWATERS [1]
0 AQUATIC MACROPHYTES [1]
0 LOGS OR WOODY DEBRIS [1]

COMMENTS: placed/secured boulders

AMOUNT: (Check ONLY One or check 2 and AVERAGE)
☐ - EXTENSIVE > 75% [11]
☐ - MODERATE 25-75% [7]
☒ - SPARSE 5-25% [3]
☐ - NEARLY ABSENT < 5%[1]

Cover: 3.6 (Max 20)

3] CHANNEL MORPHOLOGY: (Check ONLY One PER Category OR check 2 and AVERAGE)

SINUOSITY	DEVELOPMENT	CHANNELIZATION	STABILITY	MODIFICATIONS/OTHER	
☐ - HIGH [4]	☐ - EXCELLENT [7]	☐ - NONE [6]	☒ - HIGH [3]	☐ - SNAGGING	☐ - IMPOUND.
☐ - MODERATE [3]	☐ - GOOD [5]	☐ - RECOVERED [4]	☐ - MODERATE [2]	☒ - RELOCATION	☐ - ISLANDS
☒ - LOW [2]	☐ - FAIR [3]	☐ - RECOVERING [3]	☐ - LOW [1]	☐ - CANOPY REMOVAL	☐ - LEVEED
☐ - NONE [1]	☒ - POOR [1]	☒ - RECENT OR NO RECOVERY [1]		☐ - DREDGING	☐ - BANK SHAPING
				☐ - ONE SIDE CHANNEL MODIFICATIONS	

COMMENTS:

Channel: 7 (Max 20)

4]. RIPARIAN ZONE AND BANK EROSION (check ONE box per bank or check 2 and AVERAGE per bank) River Right Looking Downstream

RIPARIAN WIDTH L R (Per Bank)	FLOOD PLAIN QUALITY (PAST 100 Meter RIPARIAN) L R (Most Predominant Per Bank)	L R	BANK EROSION L R (Per Bank)
☐☐ - WIDE > 50m [4]	☐☐-FOREST, SWAMP [3]	☐☐-CONSERVATION TILLAGE [1]	☒☒-NONE/LITTLE [3]
☐☐ - MODERATE 10-50m [3]	☐☐-SHRUB OR OLD FIELD [2]	☒☒-URBAN OR INDUSTRIAL [0]	☐☐-MODERATE [2]
☒☒ - NARROW 5-10 m [2]	☐☐-RESIDENTIAL,PARK,NEW FIELD [1]	☐☐-OPEN PASTURE,ROWCROP [0]	☐☐-HEAVY/SEVERE[1]
☐☐ - VERY NARROW <5 m[1]	☐☐-FENCED PASTURE [1]	☐☐-MINING/CONSTRUCTION [0]	
☐☐ - NONE [0]			

COMMENTS:

Riparian: 5 (Max 10)

5.]POOL/GLIDE AND RIFFLE/RUN QUALITY

MAX. DEPTH (Check 1 ONLY!)	MORPHOLOGY (Check 1 or 2 & AVERAGE)	CURRENT VELOCITY [POOLS & RIFFLES!] (Check All That Apply)	
☐ - >1m [6]	☐-POOL WIDTH > RIFFLE WIDTH [2]	☒-EDDIES[1]	☐-TORRENTIAL[-1]
☐ - 0.7-1m [4]	☒-POOL WIDTH = RIFFLE WIDTH [1]	☒-FAST[1]	☐-INTERSTITIAL[-1]
☐ - 0.4-0.7m [2]	☐-POOL WIDTH < RIFFLE W. [0]	☒-MODERATE [1]	☐-INTERMITTENT[-2]
☒ - 0.2- 0.4m [1]		☒-SLOW [1]	☐-VERY FAST[1]
☐ - < 0.2m [POOL=0]	COMMENTS:		

Pool/Current: 6 (Max 12)

CHECK ONE OR CHECK 2 AND AVERAGE

RIFFLE DEPTH	RUN DEPTH	RIFFLE/RUN SUBSTRATE	RIFFLE/RUN EMBEDDEDNESS
☐ - *Best Areas >10 cm [2]	☐ - MAX > 50 [2]	☐-STABLE (e.g.,Cobble, Boulder) [2]	☐ - NONE [2]
☐ - Best Areas 5-10 cm[1]	☐ - MAX < 50[1]	☐-MOD. STABLE (e.g.,Large Gravel) [1]	☐ - LOW [1]
☐ - Best Areas < 5 cm [RIFFLE=0]		☐-UNSTABLE (Fine Gravel,Sand) [0]	☐ - MODERATE [0]
			☐ - EXTENSIVE [-1]

COMMENTS: ____ ☒ - NO RIFFLE [Metric=0]

Riffle/Run: 0 (Max 8)

6] GRADIENT (ft/mi): ____ DRAINAGE AREA (sq.mi.) : ~90

%POOL: 10 %GLIDE:
%RIFFLE: %RUN: 90

Gradient: (Max 10)

*' Best areas must be large enough to support a population of riffle-obligate species

EPA 4520 06/24/01

Ohio EPA Qualitative Habitat Evaluation Index Field Sheet QHEI Score:

River Code: RM: Stream: Assunpink Creek - Broad St Culvert 60.3/90
Date: 11/13/06 Location: Alt 4 culvert removal + stream realignment
Scorers Full Name: Davenport/Miller Affiliation: CH2M HILL

1] SUBSTRATE (Check ONLY Two SubstrateTYPE BOXES; Estimate % present

TYPE POOL RIFFLE | POOL RIFFLE | SUBSTRATE ORIGIN | SUBSTRATE QUALITY
- ☐☐-BLDR /SLBS[10]
- ☒☐-BOULDER [9] 10 90
- ☐☐-COBBLE [8]
- ☐☐-HARDPAN [4]
- ☐☐-MUCK [2]
- ☐☐-SILT [2]
- ☐☒-GRAVEL [7] 90 10
- ☐☐-SAND [6]
- ☐☐-BEDROCK[5]
- ☐☐-DETRITUS[3]
- ☐☐-ARTIFICIAL[0]

NOTE: Ignore Sludge Originating From Point Sources

Check ONE (OR 2 & AVERAGE)
- ☐ -LIMESTONE [1]
- ☐ -TILLS [1]
- ☐ -WETLANDS[0]
- ☐ -HARDPAN [0]
- ☐ -SANDSTONE [0]
- ☒ -RIP/RAP [0]
- ☐ -LACUSTRINE [0]
- ☐ -SHALE [-1]
- ☐ -COAL FINES [-2]

Check ONE (OR 2 & AVERAGE)
SILT:
- ☐ - SILT HEAVY [-2]
- ☐ -SILT MODERATE [-1]
- ☐ -SILT NORMAL [0]
- ☐ -SILT FREE [1]

EMBEDDEDNESS:
- ☐ -EXTENSIVE [-2]
- ☐ -MODERATE [-1]
- ☐ -NORMAL [0]
- ☐ -NONE [1]

NUMBER OF SUBSTRATE TYPES: ☒-4 or More [2] ☐-3 or Less [0]
(High Quality Only, Score 5 or >)

COMMENTS natural channel design

Substrate 18 Max 20

2] INSTREAM COVER (Give each cover type a score of 0 to 3; see back for instructions)
(Structure) TYPE: Score All That Occur
- 0 UNDERCUT BANKS [1]
- 2 OVERHANGING VEGETATION [1]
- 1 SHALLOWS (IN SLOW WATER) [1]
- 0 ROOTMATS [1]
- 3 POOLS> 70 cm [2]
- 0 ROOTWADS [1]
- 3 BOULDERS [1]
- 0 OXBOWS, BACKWATERS [1]
- 0 AQUATIC MACROPHYTES [1]
- 1 LOGS OR WOODY DEBRIS [1]

COMMENTS:

AMOUNT: (Check ONLY One or check 2 and AVERAGE)
- ☐ - EXTENSIVE > 75% [11]
- ☒ - MODERATE 25-75% [7]
- ☐ - SPARSE 5-25% [3]
- ☐ - NEARLY ABSENT < 5%[1]

Cover 11.3 Max 20

3] CHANNEL MORPHOLOGY: (Check ONLY One PER Category OR check 2 and AVERAGE)

SINUOSITY
- ☐ - HIGH [4]
- ☐ - MODERATE [3]
- ☒ - LOW [2]
- ☐ - NONE [1]

DEVELOPMENT
- ☐ - EXCELLENT [7]
- ☐ - GOOD [5]
- ☒ - FAIR [3]
- ☐ - POOR [1]

CHANNELIZATION
- ☐ - NONE [6]
- ☐ - RECOVERED [4]
- ☒ - RECOVERING [3]
- ☐ - RECENT OR NO RECOVERY [1]

STABILITY
- ☐ - HIGH [3]
- ☒ - MODERATE [2]
- ☐ - LOW [1]

MODIFICATIONS/OTHER
- ☐ - SNAGGING
- ☐ - RELOCATION
- ☐ - CANOPY REMOVAL
- ☐ - DREDGING
- ☐ - ONE SIDE CHANNEL MODIFICATIONS
- ☐ - IMPOUND.
- ☐ - ISLANDS
- ☐ - LEVEED
- ☐ - BANK SHAPING

COMMENTS:

Channel 10 Max 20

4]. RIPARIAN ZONE AND BANK EROSION (check ONE box per bank or check 2 and AVERAGE per bank) River Right Looking Downstream

RIPARIAN WIDTH
L R (Per Bank)
- ☐☐ - WIDE > 50m [4]
- ☐☐ - MODERATE 10-50m [3]
- ☒☒ - NARROW 5-10 m [2]
- ☐☐ - VERY NARROW <5 m[1]
- ☐☐ - NONE [0]

FLOOD PLAIN QUALITY (PAST 100 Meter RIPARIAN)
L R (Most Predominant Per Bank)
- ☐ ☐-FOREST, SWAMP [3]
- ☐ ☐-SHRUB OR OLD FIELD [2]
- ☐ ☐-RESIDENTIAL,PARK,NEW FIELD [1]
- ☐ ☐-FENCED PASTURE [1]

L R
- ☐ ☐-CONSERVATION TILLAGE [1]
- ☒ ☒-URBAN OR INDUSTRIAL [0]
- ☐ ☐-OPEN PASTURE,ROWCROP [0]
- ☐ ☐-MINING/CONSTRUCTION [0]

BANK EROSION
L R (Per Bank)
- ☒ ☒-NONE/LITTLE [3]
- ☐ ☐-MODERATE [2]
- ☐ ☐-HEAVY/SEVERE[1]

COMMENTS:

Riparian 5 Max 10

5.]POOL/GLIDE AND RIFFLE/RUN QUALITY

MAX. DEPTH
(Check 1 ONLY!)
- ☐ - >1m [6]
- ☒ - 0.7-1m [4]
- ☐ - 0.4-0.7m [2]
- ☐ - 0.2- 0.4m [1]
- ☐ - < 0.2m [POOL=0]

MORPHOLOGY
(Check 1 or 2 & AVERAGE)
- ☐ -POOL WIDTH > RIFFLE WIDTH [2]
- ☒ -POOL WIDTH = RIFFLE WIDTH [1]
- ☐ -POOL WIDTH < RIFFLE W. [0]

COMMENTS:

CURRENT VELOCITY [POOLS & RIFFLES!]
(Check All That Apply)
- ☒ -EDDIES[1]
- ☒ -FAST[1]
- ☒ -MODERATE [1]
- ☒ -SLOW [1]
- ☐ -TORRENTIAL[-1]
- ☐ -INTERSTITIAL[-1]
- ☐ -INTERMITTENT[-2]
- ☐ -VERY FAST[1]

Pool/Current 9 Max 12

CHECK ONE OR CHECK 2 AND AVERAGE

RIFFLE DEPTH
- ☒ - *Best Areas >10 cm [2]
- ☐ - Best Areas 5-10 cm[1]
- ☐ - Best Areas < 5 cm [RIFFLE=0]

RUN DEPTH
- ☒ - MAX > 50 [2]
- ☐ - MAX < 50[1]

RIFFLE/RUN SUBSTRATE
- ☒ STABLE (e.g.,Cobble, Boulder) [2]
- ☐ MOD. STABLE (e.g.,Large Gravel) [1]
- ☐ UNSTABLE (Fine Gravel,Sand) [0]

RIFFLE/RUN EMBEDDEDNESS
- ☐ - NONE [2]
- ☒ - LOW [1]
- ☐ - MODERATE [0]
- ☐ - EXTENSIVE [-1]

COMMENTS: ☐ - NO RIFFLE [Metric=0]

Riffle/Run 7 Max 8

Gradient Max 10

6] GRADIENT (ft/mi): ______ DRAINAGE AREA (sq.mi.) : ~90

%POOL: 40 %GLIDE: 10
%RIFFLE: 20 %RUN: 30

*Best areas must be large enough to support a population of riffle-obligate species

Ohio EPA Qualitative Habitat Evaluation Index Field Sheet QHEI Score: [ ]

River Code: ______ RM: ______ Stream: Assunpink Creek - Broad St Culvert 15/90
Date: 11/13/06 Location: Alt 5 - No Action Alternative (Existing Conditions)
Scorers Full Name: Davenport/Miller Affiliation: CH2M HILL

1] SUBSTRATE (Check ONLY Two SubstrateTYPE BOXES; Estimate % present

TYPE	POOL RIFFLE		POOL RIFFLE	SUBSTRATE ORIGIN		SUBSTRATE QUALITY
				Check ONE (OR 2 & AVERAGE)		Check ONE (OR 2 & AVERAGE)
☐☐-BLDR /SLBS[10]	___ ___	☐☐-GRAVEL [7]	___ ___	☐ -LIMESTONE [1]	SILT:	☐- SILT HEAVY [-2]
☐☐-BOULDER [9]	___ ___	☐☐-SAND [6]	___ ___	☐ -TILLS [1]		☐ -SILT MODERATE [-1]
☐☐-COBBLE [8]	___ ___	☐☐-BEDROCK[5]	___ ___	☐ -WETLANDS[0]		☐ -SILT NORMAL [0]
☐☐-HARDPAN [4]	___ ___	☐☐-DETRITUS[3]	___ ___	☒ -HARDPAN [0]		☐ -SILT FREE [1]
☐☐-MUCK [2]	___ ___	☒☒-ARTIFICIAL[0]	100 100	☐ -SANDSTONE [0]	EMBEDDEDNESS:	☐ -EXTENSIVE [-2]
☐☐-SILT [2]	___ ___	NOTE: Ignore Sludge Originating From Point Sources		☐ -RIP/RAP [0]		☐ -MODERATE [-1]
				☐ -LACUSTRINE [0]		☒ -NORMAL [0]
				☐ -SHALE [-1]		☐ -NONE [1]
				☐ -COAL FINES [-2]		

NUMBER OF SUBSTRATE TYPES: ☐-4 or More [2] ☐-3 or Less [0]
(High Quality Only, Score 5 or >)

COMMENTS Concrete Culvert

Substrate [0] Max 20

2] INSTREAM COVER (Give each cover type a score of 0 to 3; see back for instructions)
(Structure) TYPE: Score All That Occur

0 UNDERCUT BANKS [1]
0 OVERHANGING VEGETATION [1]
0 SHALLOWS (IN SLOW WATER) [1]
0 ROOTMATS [1]
0 POOLS> 70 cm [2]
0 ROOTWADS [1]
0 BOULDERS [1]
0 OXBOWS, BACKWATERS [1]
0 AQUATIC MACROPHYTES [1]
0 LOGS OR WOODY DEBRIS [1]

COMMENTS:

AMOUNT: (Check ONLY One or check 2 and AVERAGE)
☐ - EXTENSIVE > 75% [11]
☐ - MODERATE 25-75% [7]
☐ - SPARSE 5-25% [3]
☒ - NEARLY ABSENT < 5%[1]

Cover [1] Max 20

3] CHANNEL MORPHOLOGY: (Check ONLY One PER Category OR check 2 and AVERAGE)

SINUOSITY	DEVELOPMENT	CHANNELIZATION	STABILITY	MODIFICATIONS/OTHER	
☐ - HIGH [4]	☐ - EXCELLENT [7]	☐ - NONE [6]	☒ - HIGH [3]	☐ - SNAGGING	☐ - IMPOUND.
☐ - MODERATE [3]	☐ - GOOD [5]	☐ - RECOVERED [4]	☐ - MODERATE [2]	☒ - RELOCATION	☐ - ISLANDS
☒ - LOW [2]	☐ - FAIR [3]	☐ - RECOVERING [3]	☐ - LOW [1]	☐ - CANOPY REMOVAL	☐ - LEVEED
☐ - NONE [1]	☒ - POOR [1]	☒ - RECENT OR NO RECOVERY [1]		☐ - DREDGING	☐ - BANK SHAPING
				☐ - ONE SIDE CHANNEL MODIFICATIONS	

COMMENTS:

Channel [7] Max 20

4]. RIPARIAN ZONE AND BANK EROSION (check ONE box per bank or check 2 and AVERAGE per bank) River Right Looking Downstream

RIPARIAN WIDTH	FLOOD PLAIN QUALITY (PAST 100 Meter RIPARIAN)		BANK EROSION
L R (Per Bank)	L R (Most Predominant Per Bank)	L R	L R (Per Bank)
☐☐- WIDE > 50m [4]	☐ ☐-FOREST, SWAMP [3]	☐ ☐-CONSERVATION TILLAGE [1]	☒ ☒-NONE/LITTLE [3]
☐☐- MODERATE 10-50m [3]	☐ ☐-SHRUB OR OLD FIELD [2]	☒ ☒-URBAN OR INDUSTRIAL [0]	☐ ☐-MODERATE [2]
☐☐- NARROW 5-10 m [2]	☐ ☐-RESIDENTIAL,PARK,NEW FIELD [1]	☐ ☐-OPEN PASTURE,ROWCROP [0]	☐ ☐-HEAVY/SEVERE[1]
☐☐- VERY NARROW <5 m[1]	☐ ☐-FENCED PASTURE [1]	☐ ☐-MINING/CONSTRUCTION [0]	
☒☒ - NONE [0]			

COMMENTS:

Riparian [3] Max 10

5.]POOL/GLIDE AND RIFFLE/RUN QUALITY

MAX. DEPTH	MORPHOLOGY	CURRENT VELOCITY [POOLS & RIFFLES!]	
(Check 1 ONLY!)	(Check 1 or 2 & AVERAGE)	(Check All That Apply)	
☐ - >1m [6]	☐ -POOL WIDTH > RIFFLE WIDTH [2]	☐ -EDDIES[1]	☐ -TORRENTIAL[-1]
☐ - 0.7-1m [4]	☒ -POOL WIDTH = RIFFLE WIDTH [1]	☒ -FAST[1]	☐ -INTERSTITIAL[-1]
☐ - 0.4-0.7m [2]	☐ -POOL WIDTH < RIFFLE W. [0]	☒ -MODERATE [1]	☐ -INTERMITTENT[-2]
☐ - 0.2- 0.4m [1]		☐ -SLOW [1]	☒ -VERY FAST[1]
☒ - < 0.2m [POOL=0]	COMMENTS:		

Pool/ Current [4] Max 12

CHECK ONE OR CHECK 2 AND AVERAGE

RIFFLE DEPTH	RUN DEPTH	RIFFLE/RUN SUBSTRATE	RIFFLE/RUN EMBEDDEDNESS
☐ - *Best Areas >10 cm [2]	☐ - MAX > 50 [2]	☐-STABLE (e.g.,Cobble, Boulder) [2]	☐ - NONE [2]
☐ - Best Areas 5-10 cm[1]	☐ - MAX < 50[1]	☐-MOD. STABLE (e.g.,Large Gravel) [1]	☐ - LOW [1]
☐ - Best Areas < 5 cm [RIFFLE=0]		☐-UNSTABLE (Fine Gravel,Sand) [0]	☐ - MODERATE [0]
			☐ - EXTENSIVE [-1]

COMMENTS: ______ ☒ - NO RIFFLE [Metric=0]

Riffle/Run [0] Max 8

6] GRADIENT (ft/mi): ______ DRAINAGE AREA (sq.mi.) : ~90

%POOL: [ ] %GLIDE: [ ]
%RIFFLE: [ ] %RUN: [100]

Gradient [ ] Max 10

*' Best areas must be large enough to support a population of riffle-obligate species

EPA 4520 06/24/01

Is Sampling Reach Representative of the Stream (Y/N)___ If Not, Explain:

Subjective Rating (1-10)

Aesthetic Rating (1-10)

Gradient: ☐ - Low, ☐ - Moderate, ☐ -High

	Gear:	Distance:	Water Clarity:	Water Stage:	Canopy -% Open
First Sampling Pass					

Stream Measurements:

Average Width	Average Depth	Maximum Depth	Av. Bankfull Width	Bankfull Mean Depth	W/D Ratio	Bankfull Max Depth	Floodprone Area Width	Entrench. Ratio

Major Suspected Sources of Impacts (Check All That Apply):

- None ☐
- Industrial ☒
- WWTP ☐
- Ag ☐
- Livestock ☐
- Silviculture ☐
- Construction ☐
- Urban Runoff ☒
- CSOs ☐
- Suburban Impacts ☐
- Mining ☐
- Channelization ☒
- Riparian Removal ☒
- Landfills ☐
- Natural ☐
- Dams ☐
- Other Flow Alteration ☒
- Other: Culvert

Stream Drawing:

Instructions for scoring the alternate cover metric: Each cover type should receive a score of between 0 and 3, Where: 0 - Cover type absent; 1 - Cover type present in very small amounts or if more common of marginal quality; 2 - Cover type present in moderate amounts, but not of highest quality or in small amounts of highest quality; 3 - Cover type of highest quality in moderate or greater amounts. Examples of highest quality include very large boulders in deep or fast water, large diameter logs that are stable, well developed rootwads in deep/fast water, or deep, well-defined, functional pools.

Yes	No	
☐	☒	Is Stream Ephemeral (no pools, totally dry or only damp spots)?
☒	☐	Is there water upstream? How Far: 90 sq mi DA
☒	☐	Is There Water Close Downstream? How Far: Delaware River
☐	☒	Is Dry Channel Mostly Natural?

Appendix A – Birdsall Engineering, Inc. Letter Report, September 5, 2006

BE, BIRDSALL ENGINEERING, INC.
CONSULTING & ENVIRONMENTAL ENGINEERS

A BIRDSALL SERVICES GROUP COMPANY

Via Facsimile (609)-633-8598

State of New Jersey
Department of Human Services
Office of Facilities Support
P.O. Box 700
Trenton, NJ 08625-0700

September 5, 2006
Proposal No. BEI060905RCM1

Attn: William Schaffer

Re: Capital Place One
222 South Warren Street
Trenton, NJ

Dear Mr. Schaffer:

Per your request, Birdsall Engineering Inc. (BEI) responded to a structural failure that occurred directly adjacent to the Capital Place One office building, which is occupied by the State of New Jersey, Department of Human Services. The structural failure consisted of a large 'sinkhole' in the ground abutting the Southeast corner of the building. It was first noticed in the morning of September 3, 2006. BEI personnel consisting of Thomas K. Rospos, P.E., Richard C. Maloney, P.E. and Nicolas Dicotiis, were onsite to inspect the 'sinkhole' at 3:30 p.m. on September 3, 2006.

Observation revealed that the 'sinkhole' is the result of a failure of the roof structure of an underground culvert that carries the Assunpink Creek from South Broad Street past South Warren Street. Plans of the building's recent renovation (Sheets T-3 and A-100, prepared by Ronald Schmidt & Associates, P.C., dated 2-22-00) and field inspection show that this culvert runs from the bridge at South Broad Street and traverses the open field located to the East and South of Capital Place One, and literally passes "right by" the Southeast corner of the building. The original structural plans of the building (prepared by Gleit, Olenek & Associates P.C., dated 4/20/77) show that the culvert wall abuts that actual corner of the building's foundation. Water was flowing through both flumes of the culvert at the time of the inspection.

Inspection at the culvert ends indicate that the culvert structure is made up of two concrete sidewalls and a concrete center wall which divides the culvert into two 22' +/- wide flume openings. The culvert contains a roof structure that consists of 8" deep precast, hollow-core concrete deck slabs, spanning each 22' wide half of the culvert. The precast deck slabs contain a reinforced concrete topping (thickness unknown). The culvert roof is then covered with soil. The areas of the culvert around Capital Place One and along South Warren Street also contain concrete walls and brick patios over the culvert roof. The height of soil and structure over the culvert roof ranges from approximately 3' in the open field to over 6' in the areas of the brick patios.

Inspection revealed that the structural failure consisted of the culvert roof structure in an approximately 24' by 35' area directly at the patio and stairs to the South of Capital Place One.

☒ 611 Industrial Way West
Eatontown, NJ 07724-2213
P 732.380.1700
F 732.380.1701

☐ 529 Route 9
Barnegat, NJ 08005-2120
P 609.698.1144

☐ 95A Connecticut Drive
Burlington, NJ 08016
P 609.239.4378

☐ 560 Hudson Street
Hackensack, NJ 07601
P 201.562.1500

BIRDSALL ENGINEERING, INC.
CONSULTING & ENVIRONMENTAL ENGINEERS

A BIRDSALL SERVICES GROUP COMPANY

The roof deck slabs over the northern flume of the culvert collapsed into the culvert. The collapse of the deck slabs removed support for the soil and structure above, which in turn collapsed into the culvert. Sections of the wall and stair structure above the roof collapse still remain in place, however these sections are extremely unstable and could collapse into the culvert at any time. The use of precast hollow-core slabs in a buried condition is a very questionably application and the failure of the deck slabs can most likely be attributed to some combination of the following three conditions.

Hollow-core slabs contain large voids inside the slabs and gain their strength from high-strength strands of steel that are located in the bottom segments of the deck slab. In an exterior application, especially a buried application, the deck slab is exposed to continual moisture and water infiltration. In this application, the slabs are exposed to the creek below and continual water seepage through joints from the soil above. Evidence of water seepage was seen on the exposed walls in the collapsed area. The steel strands usually contain only about 1 ¼" of concrete cover and when exposed to such moist conditions, the possibility of eventual corrosion of the strands is great. When the strands corrode, they expand and cause the concrete to spall, only accelerating the corrosion process and reducing the bonding strength of the strand to the deck slab. Both of these conditions can eventually lead to sudden collapse. Secondly, when hollow-core deck slabs are not properly installed with weep holes and are then exposed to freezing, the cores which inevitably collect water are subject to freezing which can also cause catastrophic damage to the structural integrity of the deck slabs. Finally, 8" deck slabs spanning approximately 22' have allowable load carrying capacities that are lower than the conditions that appear to exist at this site. The load of three feet of soil alone is on the order of 350 pounds per square foot, which is beyond the traditional carrying capacities for 8" decks. This load only rises at the areas of the raised patios and walls, and also does not include the load of the reported ponds of water that collect in the open field during heavy rains.

From our visual inspection, we have determined that the collapse is from the failure of the culvert roof deck slabs. Further, based on the reasons outlined above, we have concern that other sections of the culvert roof may contain highly questionably structural integrity with the potential for sudden collapse. While walking the open field over the culvert, one section of grass appeared to have settled over the culvert roof only strengthening our concern of the roof's integrity. **BEI highly recommends that the entire culvert roof area including a minimum buffer of 10 feet on each side of the culvert be pardoned off to any access. No access should be allowed on top of the culvert until the entire culvert roof structure can be inspected and properly repaired.** Our inspection was limited to visual observations as made from the ground surface and did not include any inspection of the actual roof of the culvert, which will require access into the culvert to perform. It is our understanding that the actual culvert belongs to the City of Trenton. This letter assumes that further inspection of the culvert will be the responsibility of the City of Trenton including investigation into the items mentioned above.

BIRDSALL ENGINEERING, INC.
CONSULTING & ENVIRONMENTAL ENGINEERS

A BIRDSALL SERVICES GROUP COMPANY

September 5, 2006
Proposal No. BEI060905RCM1

We informed Mr. M. Sean Semple, Acting Director of the Division of Traffic and Transportation for the City of Trenton, who was present on site at the time of the inspection, of our findings and recommendations. We further informed Mr. Semple of the fact that South Warren Street was located over the culvert. He stated that this section of the culvert did in fact contain a reinforced concrete roof and not the precast deck slabs observed at the 'sinkhole' location and at the beginning of the culvert at South Broad Street. We further request through this letter that the State of New Jersey send a copy of this letter to the City of Trenton formalizing our recommendations of their structure.

With regards to the actual building, Capital Place One, review of the structural drawings indicate that the building structure is supported on steel H-piles that extend down to "ledge rock". The perimeter grade beam of the building is thickened to 12'-6" at the Southeast corner of the building to apparently address the existence of the culvert structure. With the failure being related to the culvert roof slabs and the building being independently supported on its own deep foundation system, the structural failure of the culvert roof does not compromise the structural integrity or safety of the building structure. It is our professional opinion that it is safe to occupy and use Capital Place One as long as external access is restricted from the areas over the culvert roof and a 10' buffer on each side of the culvert as was outlined in the field at the time of the inspection and as marked on the attached plan of the building site.

We trust that this inspection letter addresses your immediate concerns. If you need further assistance as this issue proceeds or if you have any questions, please do not hesitate to contact either Thomas Rospos at 732-380-1700, extension 1201, or the undersigned at extension 1274.

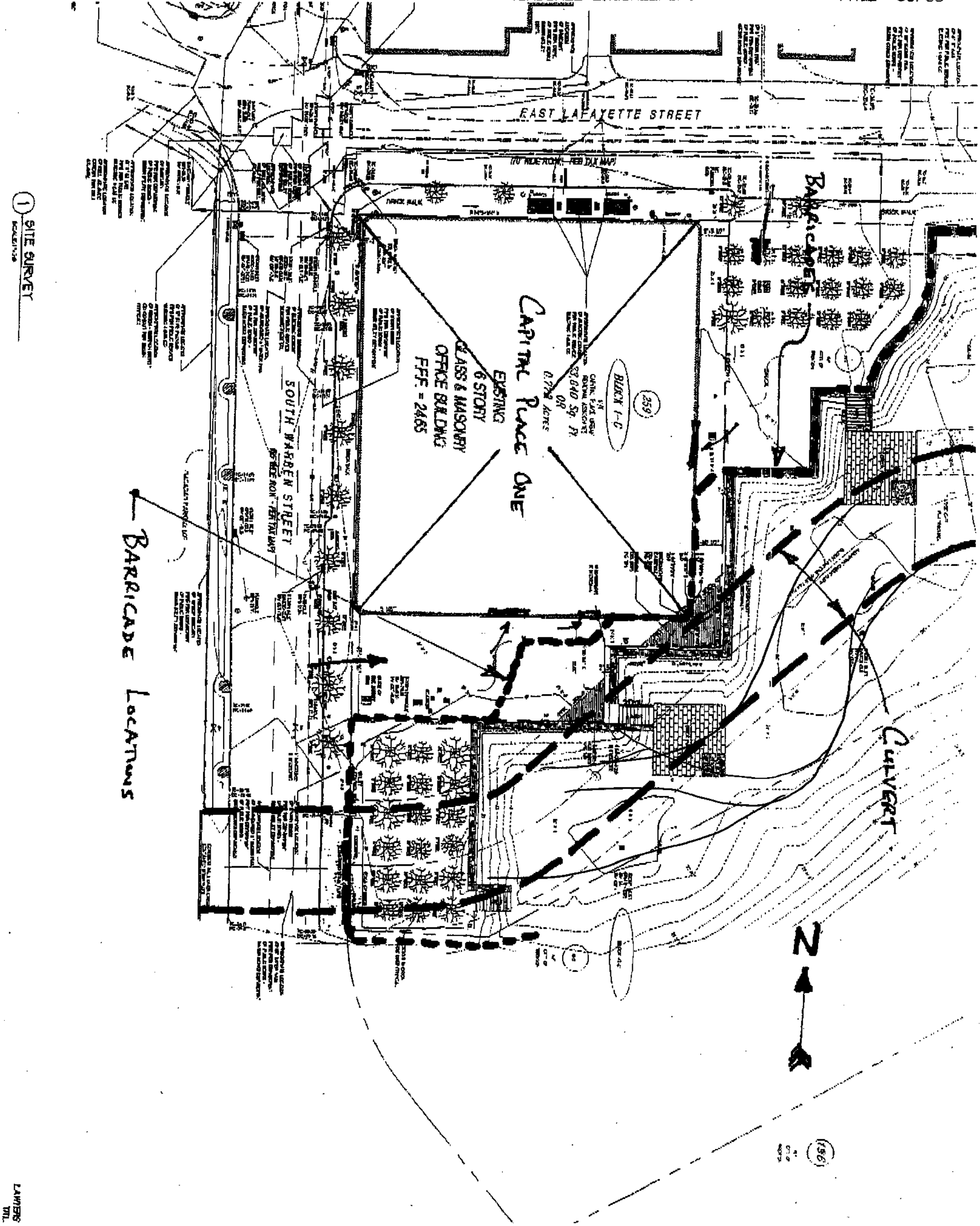
Very truly yours,

BIRDSALL ENGINEERING, INC.

Richard C. Maloney, P.E.
Vice President

RCM:aic
Attachment

cc: Thomas K. Rospos, P.E., Executive Vice President, BEI
William T. Birdsall, P.E., Senior Vice President, BEI


EAST LAFAYETTE STREET
SOUTH WARREN STREET
CAPITAL PLACE ONE
EXISTING 6 STORY GLASS & MASONRY OFFICE BUILDING
BLOCK 1-C
259
BARRICADES
BARRICADE LOCATIONS
CULVERT
N
136
SITE SURVEY

Appendix B – NJDEP Division of Fish and Wildlife Correspondence

From: Lisa Barno [Lisa.Barno@dep.state.nj.us]
Sent: Friday, September 08, 2006 9:21 AM
To: Murphy, Kate/PHL
Cc: Christopher Smith
Subject: Assunpink Creek

Hi Kate -

As far as the benefits of removing the culvert - it would greatly enhance anadromous fisheries runs into Assunpink Creek from the Delaware River for American shad, alewife and bluback herring. Those species, in particular Am shad will not pass through a dark culvert, particulalrly considering the extensive length of the cuilvert on Assunpink. It will also benefit other resident fish species by improving in-stream habitat. Of course, this will all depend on how well a channel design is developed for the project - need to get away from the trapezoidal, straight channel design which only benefits getting water from point A to point B but does nothing for creating viable stream habitat. Will need curves, bends, deeper pool areas, and shallow stretches with substrate which remain in tact but is not rip rap from one side of the bank to the other. Of course riparian vegetation along the banks of the new channel will do well of additional habitat, as well as water temperatures. Rock and boulders, as well as log structures will also increase fish habitat as well as macroinvertebrate populations.

As for the negatives, there are always the impacts, sedimentation etc associated during the construction phase, and again good channel design, is critical to the success of the project.

Hope this is helpful. Unfortunately, although just returning from vacation I will be at a conference next week but Chris Smith is the regional biologist and is very familiar with Assunpink Creek. He can be reached at 856 629 0450 if you have any additional questions.

Lisa Barno
Chief, Freshwater Fisheries

Lisa Barno

Murphy, Kate/PHL

From: Christopher Smith [Christopher.Smith@dep.state.nj.us]
Sent: Friday, September 08, 2006 3:25 PM
To: Murphy, Kate/PHL
Subject: Assunpink Creek

Kate

Lisa Barno asked that I contact you regarding the potential Assunpink Creek project. I have read the correspondence between yourself and Lisa about the proposed project. As Lisa has stated that any removal of impediments and underground culverts/pipes will great increase the passage of migratory fish such as river herring, American shad, American eel to name a few. Additionally, the warmwater fish population (largemouth bass, smallmouth bass, bluegill, perch, etc.) will also benefit by increased and improved habitat.

My first question is what specific section of the creek is proposed for culvert removal? All or just selected segments?

To answer some of the questions that have been raised regarding recreation usage of the area following a stream restoration; this really depends on the level of restoration. If all obstructions were removed within the vicinity of Trenton, fish would have about 3.5 miles of habitat before they reach the first impediment at Whitehead Pond Dam. Anadromous fish, river herring, were collected in 1975 at the Warren St. bridge however have never been collected farther upstream. Boat access would depend on tidal stage and water depth but would essentially provide about 3.5 miles of stream. Shoreline access would depend on ownership of neighboring property.

It is difficult to say exactly how many species would utilize the creek once restoration was completed but the removal of obstructions would provide the potential for a full range of warmwater and anadromous species to use the creek.

I know that I have only scratch the surface of the questions. Please contact me directly with anymore questions.

Chris

Christopher Smith
Senior Fisheries Biologist
New Jersey Department of Environmental Protection Division of Fish and Wildlife Bureau of Freshwater Fisheries 220 Blue Anchor Rd.
Sicklerville, NJ 08081
(856) 629-4950

Murphy, Kate/PHL

From: Lisa Barno [Lisa.Barno@dep.state.nj.us]
Sent: Friday, September 08, 2006 10:25 AM
To: Murphy, Kate/PHL
Subject: RE: Assunpink Creek

Benefits are HUGE to get the bottom removed

Lisa Barno

>>> <Kate.Murphy@CH2M.com> 09/08/06 10:10 AM >>>
One additional question to follow up: The culvert does not have a natural bottom, and therefore the water travels at a faster rate at this point. There are two options if the culvert is removed, which are: to remove the entire culvert, cement bottom included, or to remove just the top and the majority of the side walls. How would not removing the bottom of the cement culvert impact fish species and other in stream habitat (if they choose this option, they would most likely do something to slow down the water at this point). Are the benefits much greater to remove the entire bottom to create a natural bottom, or do you feel the fish would still be able to pass? Basically, we are trying to obtain information for a cost benefit analysis.

Thank you so much for all of the information you have provided. I appreciate you taking the time for this!

I hope you enjoyed your vacation-

Thanks,

Kate

-----Original Message-----
From: Lisa Barno [mailto:Lisa.Barno@dep.state.nj.us]
Sent: Friday, September 08, 2006 9:21 AM
To: Murphy, Kate/PHL
Cc: Christopher Smith
Subject: Assunpink Creek

Hi Kate -

As far as the benefits of removing the culvert - it would greatly enhance anadromous fisheries runs into Assunpink Creek from the Delaware River for American shad, alewife and bluback herring. Those species, in particular Am shad will not pass through a dark culvert, particulalrly considering the extensive length of the cuilvert on Assunpink. It will also benefit other resident fish species by improving in-stream habitat.
Of course, this will all depend on how well a channel design is developed for the project - need to get away from the trapezoidal, straight channel design which only benefits getting water from point A to point B but does nothing for creating viable stream habitat. Will need curves, bends, deeper pool areas, and shallow stretches with substrate which remain in tact but is not rip rap from one side of the bank to the other. Of course riparian vegetation along the banks of the new channel will do well of additional habitat, as well as water temperatures. Rock and boulders, as well as log structures will also increase fish habitat as well as macroinvertebrate populations.

As for the negatives, there are always the impacts, sedimentation etc associated during the construction phase, and again good channel design, is critical to the success of the project.

Hope this is helpful. Unfortunately, although just returning from vacation I will be at a conference next week but Chris Smith is the regional biologist and is very familiar with Assunpink Creek. He can be reached at 856 629 0450 if you have any additional questions.

Lisa Barno

Chief, Freshwater Fisheries

Lisa Barno

Appendix C – Assunpink Creek Hydraulic Model Technical Memorandum

Hydraulic Modeling of Lower Assunpink Creek

PREPARED FOR: Brian Mulvenna/USACE

PREPARED BY: CH2M HILL

COPIES: Scott Oppelt/CH2M HILL
Aditya Tyagi/CH2M HILL

DATE: September 28, 2006

Objective and Scope

The objective of this technical memorandum is to present the results of the hydraulic modeling of the Lower Assunpink Creek for three continuous miles between the confluence with the Delaware River to the upstream corporate limit of the City of Trenton. There are two main purposes of this hydraulic modeling effort: (1) to study various alternatives of culvert removal at the Broad Street and its potential impacts on flooding and determine the best alternative, and (2) to provide flow velocities and corresponding shear stresses required for stream restoration improvement efforts such as designing appropriate stream cross sections and bank stabilization projects.

HEC-RAS Model and Input Data Requirements

HEC-RAS is a hydraulic model developed by the Hydrologic Engineering Center (HEC) of the U.S. Army Corps of Engineers. HEC-RAS is a one-dimensional model, intended for computation of water surface profile computations. The system is capable of modeling subcritical, supercritical, and mixed-flow regimes for streams consisting of a full network of channels, a dendritic system, or a single river reach for both steady and unsteady flows. The model results are typically applied in floodplain management and flood insurance studies to evaluate the effects of floodplain encroachment. The function of the HEC-RAS model is to determine water surface elevations at all locations of interest. The data needed to perform these computations are separated into geometric data, steady flow data, and boundary conditions.

Geometric Data

The basic geometric data used by HEC-RAS for hydraulic analysis consist of layout and dimensions of river reaches stream channel cross sections at various locations along the stream, reach length, and hydraulic structures such as bridges and culverts. In each cross section, the locations of the stream banks are identified and used to define the left floodplain, main channel, and right floodplain (Figure 1). HEC-RAS subdivides the cross sections in this manner because of differences in hydraulic parameters. For example, the wetted perimeter in the floodplain is much higher than in the main channel. Thus, friction forces between the water and channel bed have a greater influence in flow resistance in the floodplain. As a result, the flow velocity and conveyance are substantially higher in the main channel than in the floodplain.

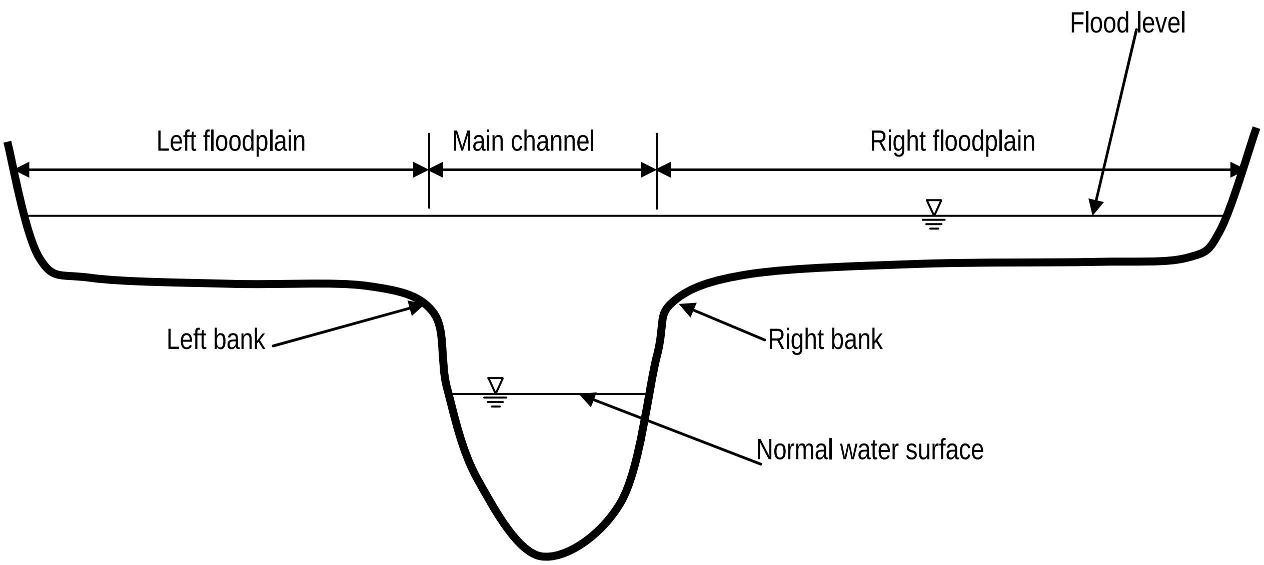


Figure 1: A typical stream cross section

At each cross section, HEC-RAS uses several input parameters to describe shape, elevation, and relative location along the stream:

1. River station (cross section) number
2. Horizontal (station) and vertical (elevation) coordinates for each terrain point describing the cross section
3. Left and right bank station locations
4. Reach lengths between the left floodplain, stream centerline, and right floodplain of adjacent cross sections (The three reach lengths represent the average flow path between two adjacent cross sections. As such, the three reach lengths between adjacent cross sections may differ in magnitude due to bends in the stream.
5. Manning's roughness coefficients
6. Channel contraction and expansion coefficients
7. Geometric description of any hydraulic structures, such as bridges, culverts, and weirs.

Flow Regime, Discharge Data, and Boundary Conditions

The flow regime needs to be specified in order to conduct a desired hydraulic analysis. Computations proceed upstream for subcritical flow and downstream for supercritical flow. In cases where the flow regime changes from subcritical to super critical or super critical to subcritical, the program is run in a mixed flow regime mode.

Discharge information is required at each cross section starting from upstream to down stream for each reach. The flow rate can be changed at any cross section within a reach.

Boundary conditions are necessary to establish the starting water surface elevations at the ends of the river system. The water surface is specified at the downstream end for subcritical regime, at the upstream end for the supercritical regime, and at both downstream and upstream for mixed flow regime.

HEC-RAS Model Development for the Lower Assunpink Creek

GIS layers including the digital terrain model (DTM) of the river system, corporate boundaries, spot elevations, hydrography, and roads were processed to develop geometric data for HEC-

RAS. Additional layers were created to define the stream centerline, flow paths, main channel banks, and cross section cut lines at approximately 200-foot intervals as shown in Figure 2.

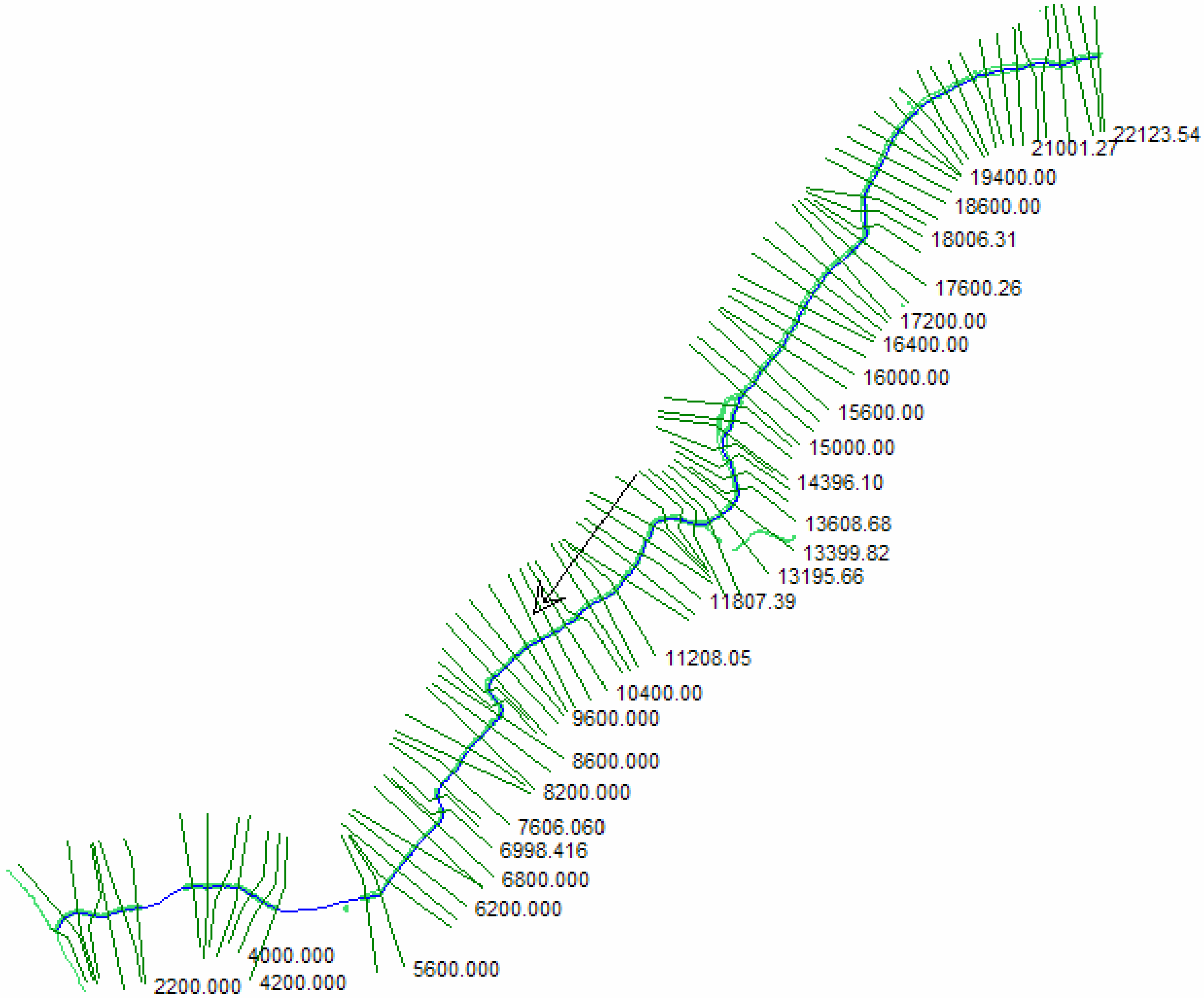


Figure 2: Lower Assunpink Creek Cross sections Cut Lines.

With the use of GIS terrain data, cross sections can contain many more points than actually necessary to describe the terrain. HEC-RAS has a limit of 500 points in any cross section. Because of this limit, unnecessary points were eliminated first by using HEC-RAS's points filter tool and second by manually by checking the cross section features with the contour maps created from the DTM. The cross section point filter performs two different types of filtering on each cross section. The first type is called a Near Points Filter that searches for points that are close together. If two points are found to be within the horizontal and vertical distance tolerance, one of them is removed. The second type of filter is a Collinear Points Filter, which searches for points that are in a straight line, or nearly in a straight line. This filter searches to find three consecutive points that may be in a straight line. If a line is connected between points one and three, and point two is within a predefined tolerance from that line, then point two can be removed. A second check is done to ensure that the slope of the line that connects point one and two does not change significantly when point one and three are connected. After the filtering operation each cross section was checked manually for its correctness and more unnecessary data points were removed. The obtained profile of the Assunpink Creek thalweg is presented in Figure 3.

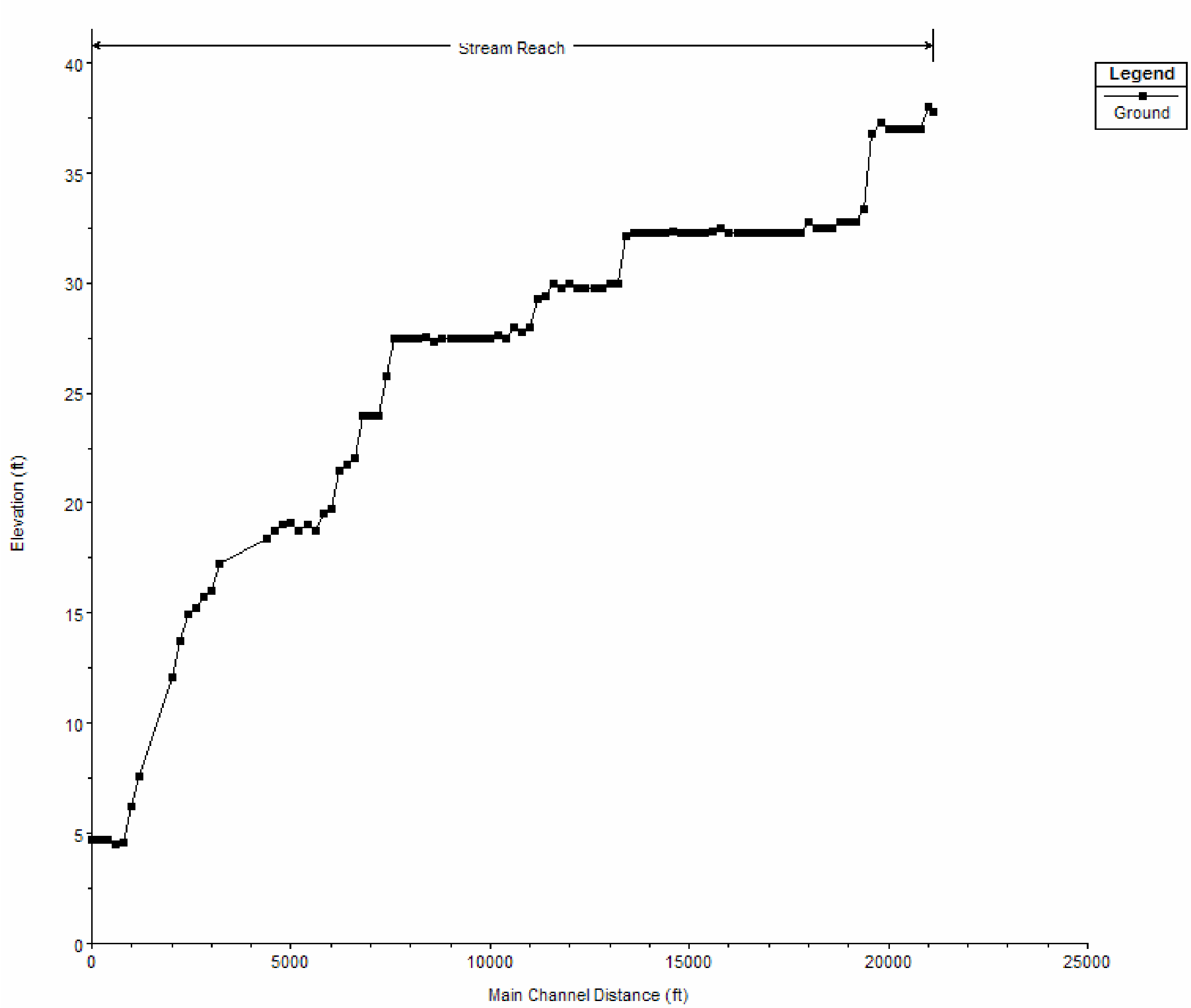


Figure 3: Lower Assunpink Creek Thalweg Profile.

Once all of the necessary cross section data have been entered and checked for accuracy, the bridges and culverts were added into the model. HEC-RAS computes energy losses caused by structures such as bridges and culverts in three components. One component consists of losses that occur in the reach immediately downstream from the structure where an expansion of flow takes place. The second component is the losses at the structure itself, which can be modeled by several different methods. The third component consists of losses that occur in the reach immediately upstream of the structure where the flow is contracting to pass through the opening. The routines in HEC-RAS allow bridge analysis with several different methods without changing the bridge geometry. Based on the survey data in Appendix 1, the bridges and culverts were added to the model. Figure 4 shows the schematic of the Lower Assunpink Creek after entering the hydraulic structure data.

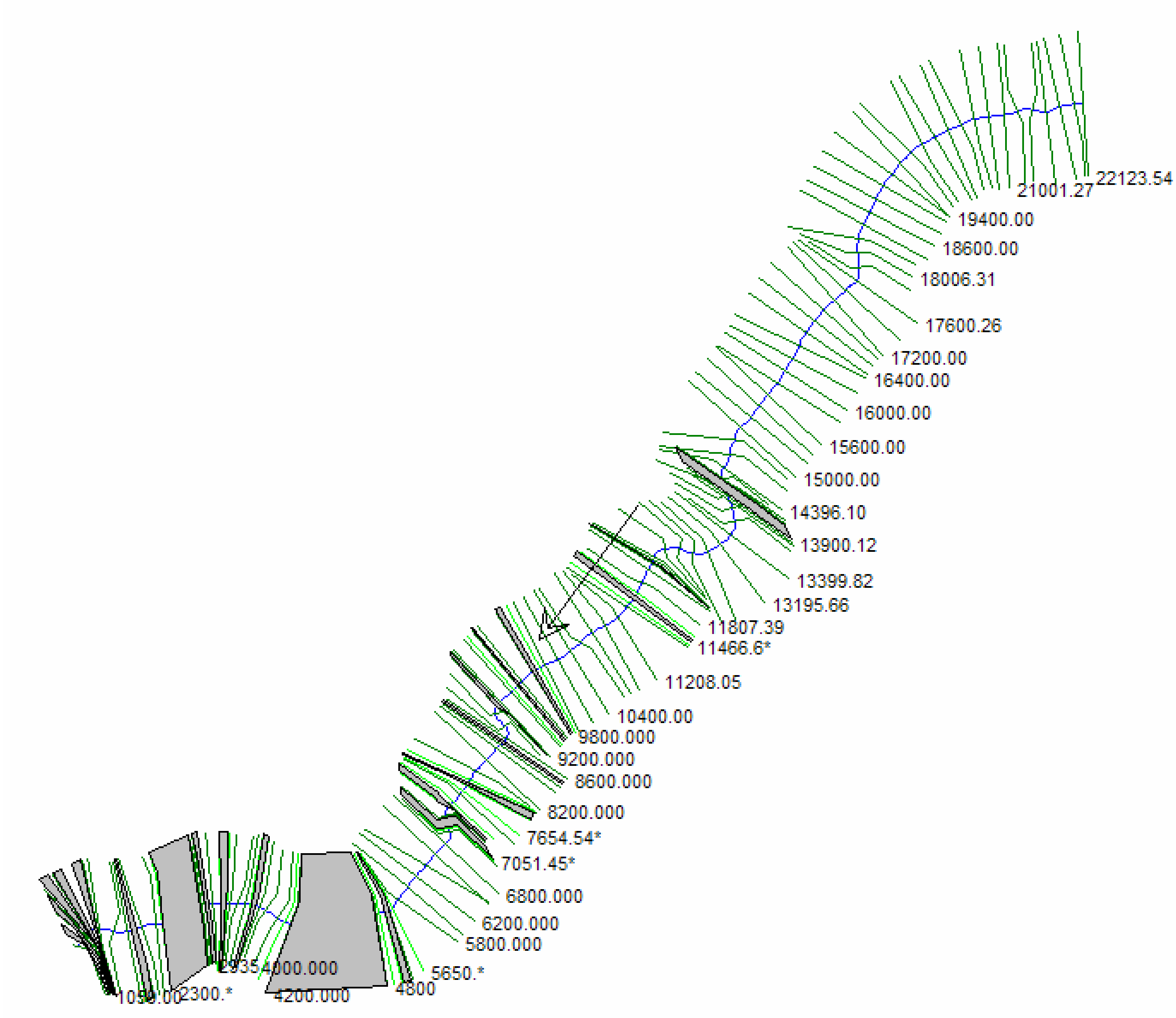


Figure 4: Lower Assunpink Creek schematic showing location of bridges and culverts

While entering the bridge and culvert data into the model, it was observed that most GIS-based cross sections do not match the surveyed cross sections. The surveyed cross sections consist of only a few data points and most of the stream beds were defined with 2-3 straight lines by joining the surveyed points. On the other hand, the GIS-based cross sections consist of many data points and the shape of stream bed is made of many small straight lines. Thus, in entering the bridge and culvert data, the GIS-terrain data was used to define the cross section when the survey data was not deemed sufficiently accurate. Further, it was observed that the information of the upper chord elevation at several bridge locations was missing in the survey sheets (Appendix 1). In these cases approximate upper chord elevations were assumed based on a previous bridge survey. Table 1 lists the name of the hydraulic structures, their location (river station), their width, and upstream and downstream distances as entered into the model.

TABLE 1
Location of Bridges and Culverts, their Width and Upstream, Downstream Distance

S. No.	Bridge and Culvert Name	River Station	Upstream Dist (ft)	Bridge Width (ft)	Downstream Dist (ft)
1	Nottingham Way Bridge	13923.61	5	50.97	11
2	Assunpink Park Foot Bridge	12127.11	2	6	2
3	N. Olden Ave. Bridge	11566.65	5.835	55	5.835
4	Oak Street	9833.33	5	56.675	4.995
5	South of Oak Street Covered Bridge	9546.97	2.5	26	2.5
6	Belvidere Railroad Bridge 8	9156	5	38	5
7	Lincoln Ave. Bridge	8517.5	5	55	55
8	Monmouth St. Bridge	7775.755	5	38.49	5
9	Wall St. Bridge	7363.801	5	54	5
10	E. State St. Bridge	7126.452	7.5	135	7.5
11	Clinton Ave. Bridge	5562.5	5	65	5
12	Market St. Bridge	4800	10	1180	10
13	S. Montgomery St. Bridge	3612	5	62	5
14	Jackson St. Bridge	3200	5	65	5
15	Broad St. Bridge	2967.5	5	55	5
16	South of Broad St. Culvert	2495	10	570	10
17	Memorial Road Bridge	1891.11	8.5	70.825	8.495
18	Parking Lot Bridge S. of Memorial Rd.	1353.59	2.5	38.115	2.505
19	Bridge # 23	1273.52	2.72	34	2.72
20	North Bound Lanes of John Fitch Pwy	1213.798	2.5	45	2.5
21	South Bound Lanes of John Fitch Pwy	1118.798	2.5	45	2.5
22	South Bound on-ramp to John Fitch Pwy	1041.5	2.5	30	2.5

After completing the addition of hydraulic structures, levees and ineffective areas were defined at appropriate locations based on cross section geometry throughout the model reach. It is important to mention that the locations and elevations of both levees and ineffective areas were defined based on assumptions as the detailed survey data was not available to define these features into the model very accurately.

Manning's Roughness Coefficients

For the majority of hydraulic studies, Manning's roughness coefficient *n* is the most important of the energy loss parameters. The value of *n* depends on surface roughness, vegetation, channel irregularities, channel alignment, scour and deposition, obstructions, size and shape of channel, stage and discharge, seasonal changes, temperature, and suspended material and bedload. The variation of water surface elevations along a stream is largely a function of the channel boundary roughness and the stream energy required to overcome friction losses. Unfortunately, Manning's *n* can seldom be calculated directly with great accuracy and is typically estimated through detailed field inspections and engineering judgment. For the current study, no field investigation was conducted to determine the Manning's *n* values. Thus, recent photographs and existing literature values from earlier studies were used to estimate the *n* values. Due to many channel irregularities in cross sections across the floodplain throughout the study channel, the values of Manning's *n* should be allowed to vary horizontally. However, due to unavailability of field data, the Manning's *n* was instead lumped into three parts: main channel, left overbank, and right overbank. Based on the Flood Insurance Study (FEMA, 1990), the Assunpink Creek *n* values ranged from 0.04 to 0.08 for the main channel and from 0.05 to 0.15 for the overbanks.

Contraction and Expansion Coefficients

Contraction and expansion of flow due to changes in the cross section is a common cause of energy loss. Whenever this occurs, the loss is computed from the contraction and expansion coefficients specified at various cross sections into the model. In most stream cross sections where changes in the flow area are small, the contraction and expansion coefficients were assumed to be 0.1 and 0.3, respectively. When the change in the effective cross section area is abrupt such as bridges, contraction and expansion coefficients were assumed to be 0.3 and 0.5, respectively. Further, the contraction and expansion coefficients around bridges and culverts where more severe constriction was apparent, the coefficients were assumed as 0.6 and 0.8.

Lower Assunpink Creek Flow Regime, Discharge Data, and Boundary Conditions

A subcritical flow regime was assumed to perform the current hydraulic analysis. Based on the Flood Insurance Study (FEMA, 1990), the discharge data and downstream boundary conditions in Table 2 were assumed.

TABLE 2
Flow and Boundary Condition Data

	Assunpink Creek Flow (cfs)		
Storm Event	Upstream of Stockton Street Culvert; Cross section # 12999.64	Upstream of Confluence with Pond Run; Cross section # 22123.54	Downstream Boundary Condition (Delaware River stage, ft)
10	2400	2150	23.00
50	3400	3000	24.48
100	3850	3400	24.50
500	4800	4300	28.50
July 1975 Event*	5454	3000	27.50

Note: July 1975 Event data was taken from USGS (1976)

Model Calibration

After entering the study reach input data and assembling the hydraulic model, the model was run for several discharges and the input data were corrected as necessary. Close inspection was given to effective flow area transitions between adjacent cross sections and profiles through bridges to detect modeling anomalies and address all warnings and error messages. Once the model was found to perform reasonably well, the calibration process was initiated to match model results to available data. The reliability of the results of a hydraulic model study depends on the applicability of the model to the physical situation, and the quality of the data used to model the study reach and calibrate the model. This process consists of three main steps: (1) obtaining the relevant data and translating it into model input, (2) calibrating the model, and (3) verifying the model.

As mentioned in the preceding paragraph, the calibration process focuses on matching the computed water surface elevations with available water surface elevations for a given discharge and boundary conditions. In this case, the model was calibrated by comparing against the water surface elevation data available for the 100-year event from the Flood Insurance Study (FEMA, 1990). The model was then verified against other events in the FIS and an actual event that occurred in July 1975. The "observed" water surface elevation data for the 10-, 50-, 100-, and 500-year events were obtained from the flood profiles presented in the Flood Insurance Study (FEMA, 1990), whereas, the data for the flood of July 1975 was taken from the USGS study (USGS, 1976). The pertinent data are summarized in Tables 3 and 4.

TABLE 3
Flood Profiles Based on the Flood Insurance Study

		Elevation (ft)				
Station Name	**Distance (ft)**	**Stream Bed**	**10-year Flood**	**50-year Flood**	**100-year Flood**	**500-year Flood**
Nottingham Way	12800	27.5	41.5	44	44.7	46.5
South Olden Ave.	10500	27.5	40	42.5	43.5	44.5
Oak Street	8830	27.5	37.7	40	40.5	42
Monmouth St	6920	25.5	34	36.75	37.5	38.25
Wall St	6500	225	33.25	35.5	36	37
East State St	6240	22	33.25	35.5	36	37
South Clinton Ave	4720	18.5	29	31.5	32.2	33.5
Delaware River	2070	13.25	26	24	24.5	28.5

Source: FEMA (1990)

The 100-year event was used to calibrate the model. As no field data is available for Manning's *n* and the stream reach is only about 3 miles long, the Manning's *n* values for the main channel were not varied along the reach. Similarly, overbank *n* values were not varied along the reach. Thus, the Manning's *n* values at all cross sections were assumed to be the same. This may not be true if some parts of the stream are lined or have some other roughness characteristics. To calibrate the model for the 100-year event, the model was ran for various assumed *n*-values and the calculated water surface profiles were compared with the flood profile corresponding to 100-year event given in Table 3. The best match as shown in Figure 5 was selected as the calibration set.

TABLE 4
Flood Profile during the July 21, 1975 Event

Street and Location	Distance from confluence with the Delaware River (ft)	Elevation (ft)
70 ft downstream from Nottingham Way Street	12144	47
65 ft downstream from North Olden avenue	10032	44.75
500 ft downstream from Olden avenue	9504	43.7
Upstream of Oak Street	8448	42.35
100 ft upstream Penn Central RR Supr-line Bridge	7920	40.7
USGS Gaging Station Upstream of Chambers Street	7392	39.4
30 ft upstream from Monmouth Street	6336	38.2
340 ft upstream from South Clinton Avenue	5808	36.3
150 ft downstream from entrance to culvert under Stockton Street - US Highway 1 Interchange	4752	34.8
40 ft upstream from Peace Street	4224	34
220 ft upstream from Montgomery Street	2640	27.8
175 ft upstream from South Broad Street	2112	24.9
150 ft downstream from Peace Street	528	13.3

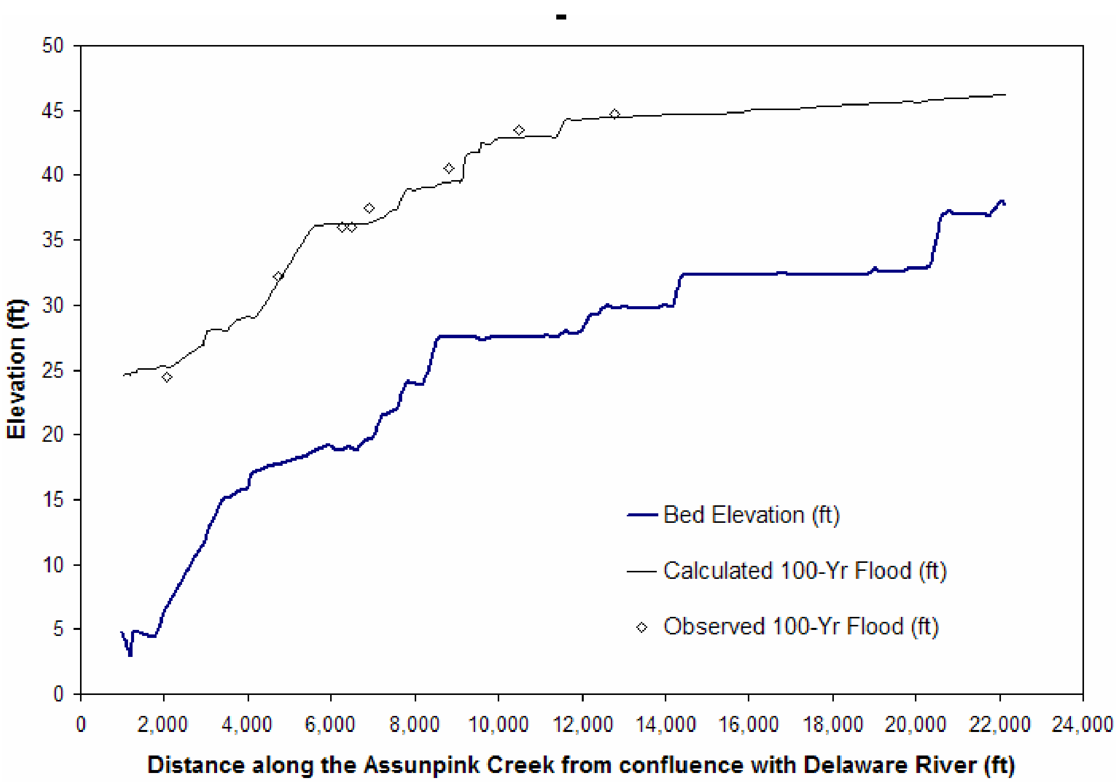


Figure 5: Lower Assunpink Creek Hydraulic Modeling Calibration Run: 100-year Event

The calibrated Manning's *n* values were used to calculate water surface profiles for the 10-, 50-, and 500-year storms and the July 1975 event as shown in Figures 6 to 9.

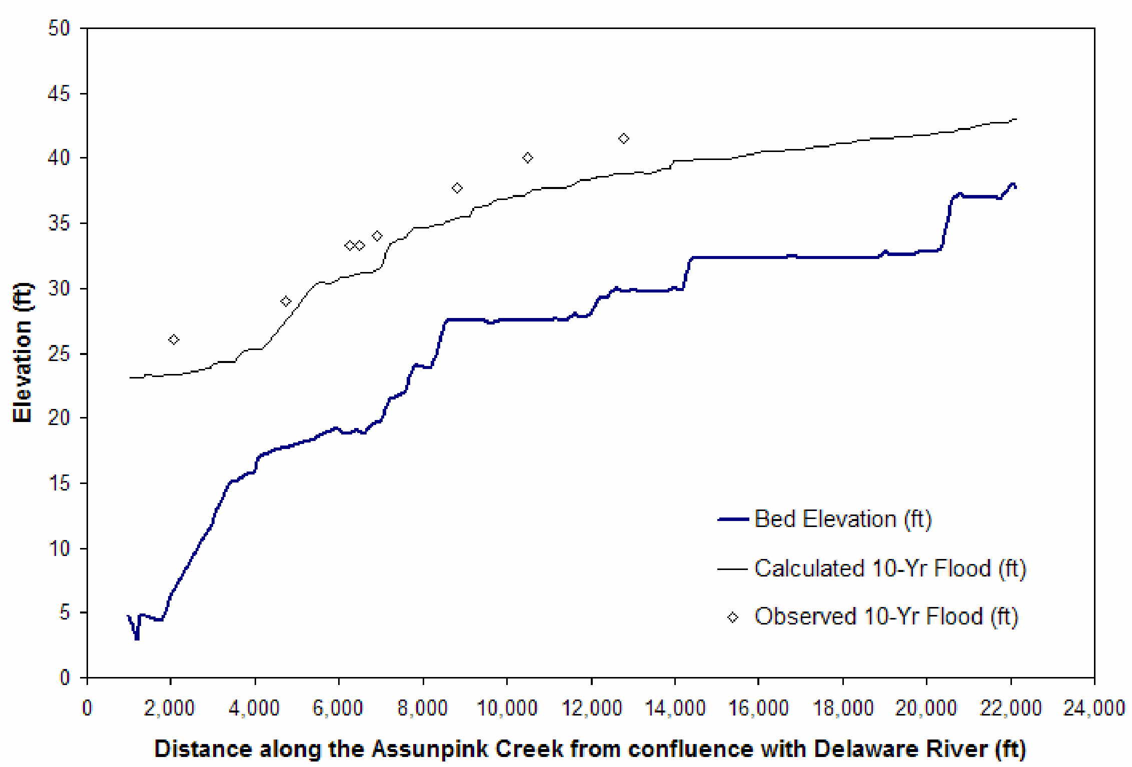


Figure 6: Lower Assunpink Creek Hydraulic Modeling, Model Verification Run: 10-year Event

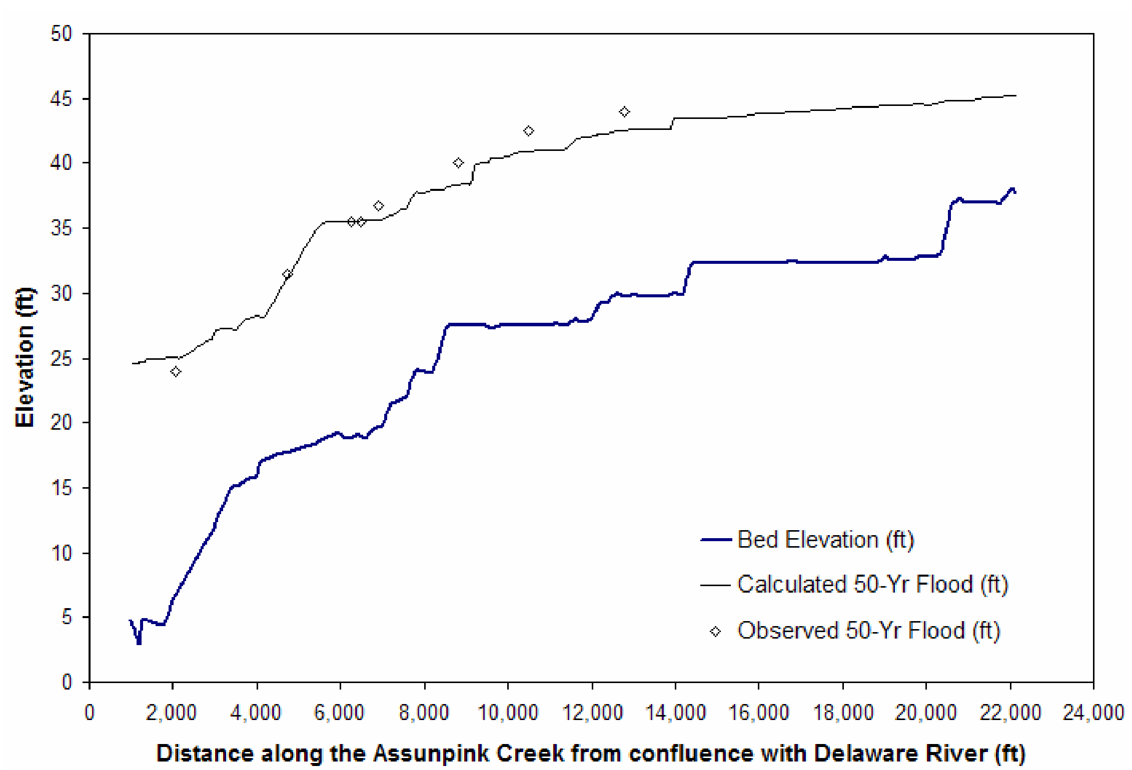


Figure 7: Lower Assunpink Creek Hydraulic Modeling, Model Verification Run: 50-year Event

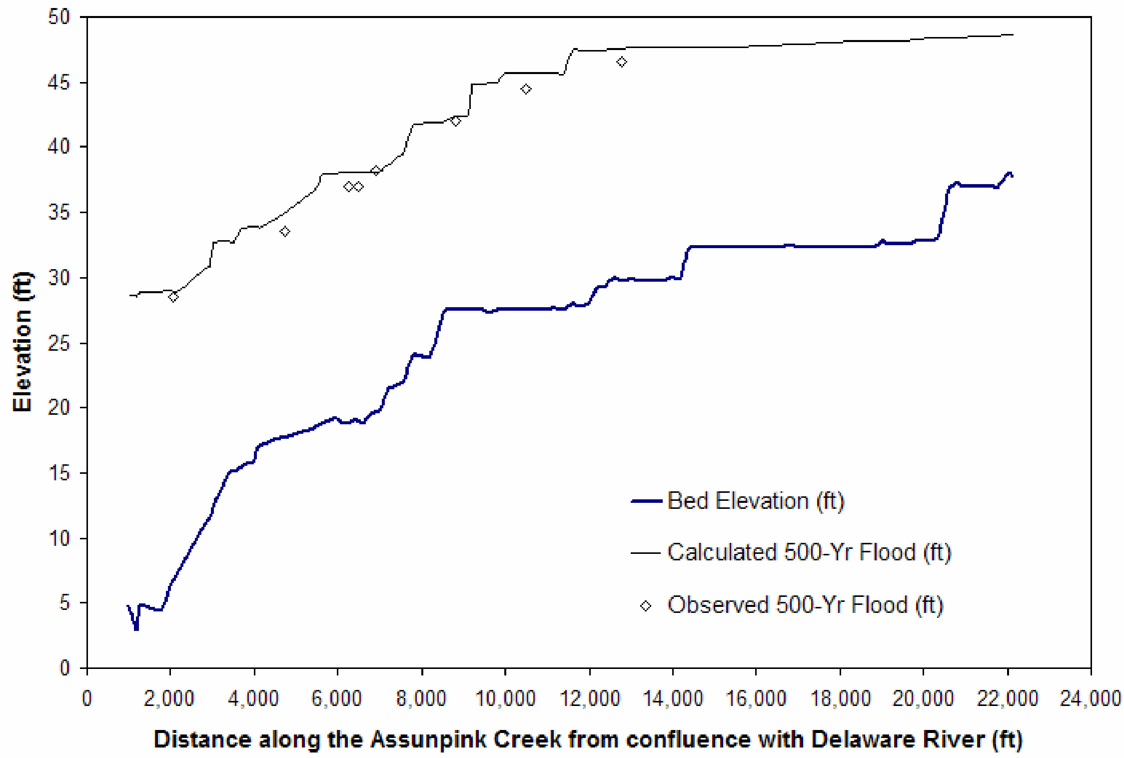


Figure 8: Lower Assunpink Creek Hydraulic Modeling, Model Verification Run: 500-year Event

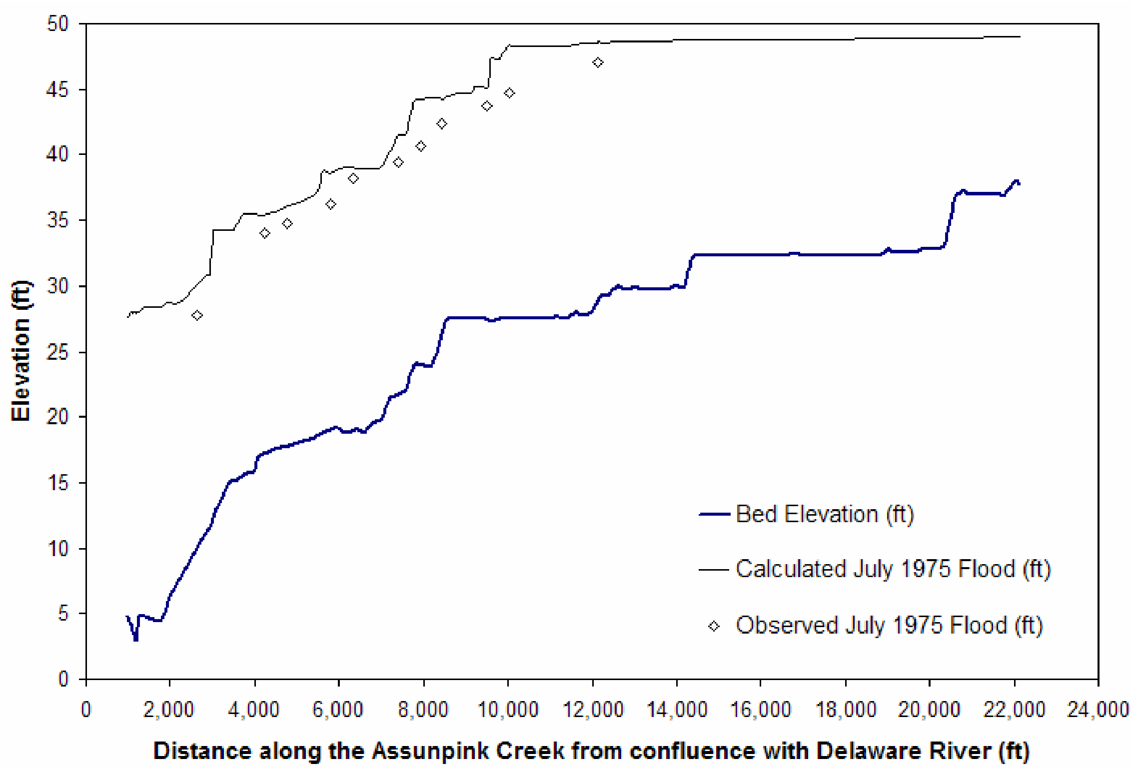


Figure 9: Lower Assunpink Creek Hydraulic Modeling, Model Verification Run: July 1975 Event

The detailed graphical and tabular outputs of the HEC-RAS model for the calibration and verification storm events are presented in Appendices 1 and 2. From Figures 5 to 9 of Appendix 1, it can be noticed that the hydraulic model is a reasonable representation for all events except the 10-year event for which the model underestimates the water surface elevations. To match the 10-year event flood profile with the observed profile the Manning's *n* needs to be further refined by varying it horizontally across the cross sections and along the stream reach. Additional improvement can be attained by refining the assumptions in defining levees and ineffective areas. Thus, additional field work is necessary for further refinement of the model. However, the accuracy needed depends on the objective of the study. As far as the impact of removing some hydraulic structures (such as a culvert) is concerned, the model accuracy seems to be sufficient as it is predicting the trends of water surface profile reasonably well. It is important to mention here that all the bridges on Assunpink Creek between its confluence with the Delaware River and Market Street (Bridges 12 to 22 in Table 1) are submerged due to the backwater from the Delaware River during all the storms except the 10-year event.

References

Federal Emergency Management Agency (1990). "Flood Insurance Study," City of Trenton, New Jersey, Mercer County.

US Geological Survey (1976). "Flood of July 21, 1975 in Mercer County, New Jersey," USGS Water Resources Investigation report 51-75, prepared in cooperation with New Jersey Department of Environmental Protection, Division of Water Resources.

Appendix-1: HEC-RAS Profiles Plots

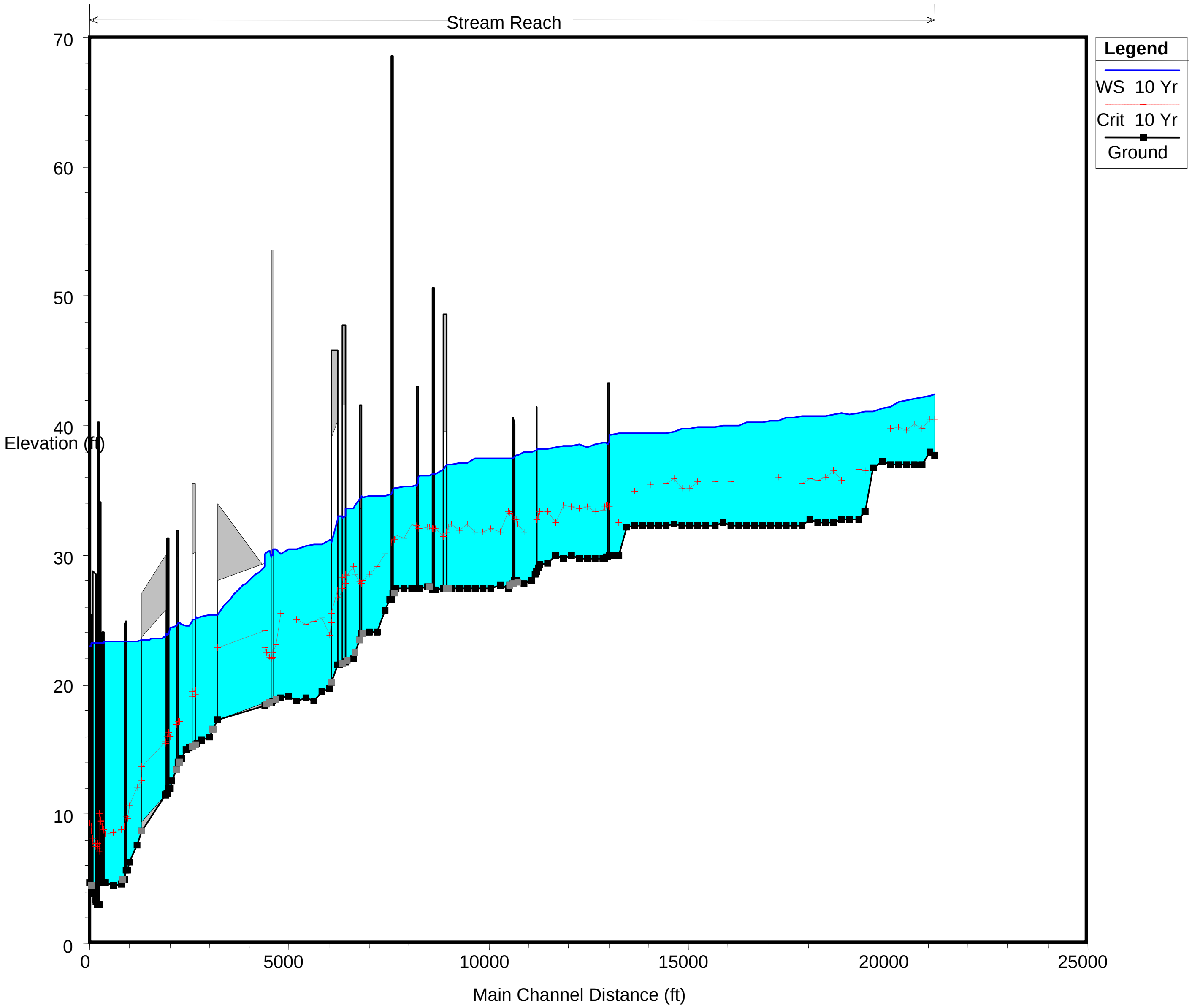


Figure : 10-year Flood Profile Plot

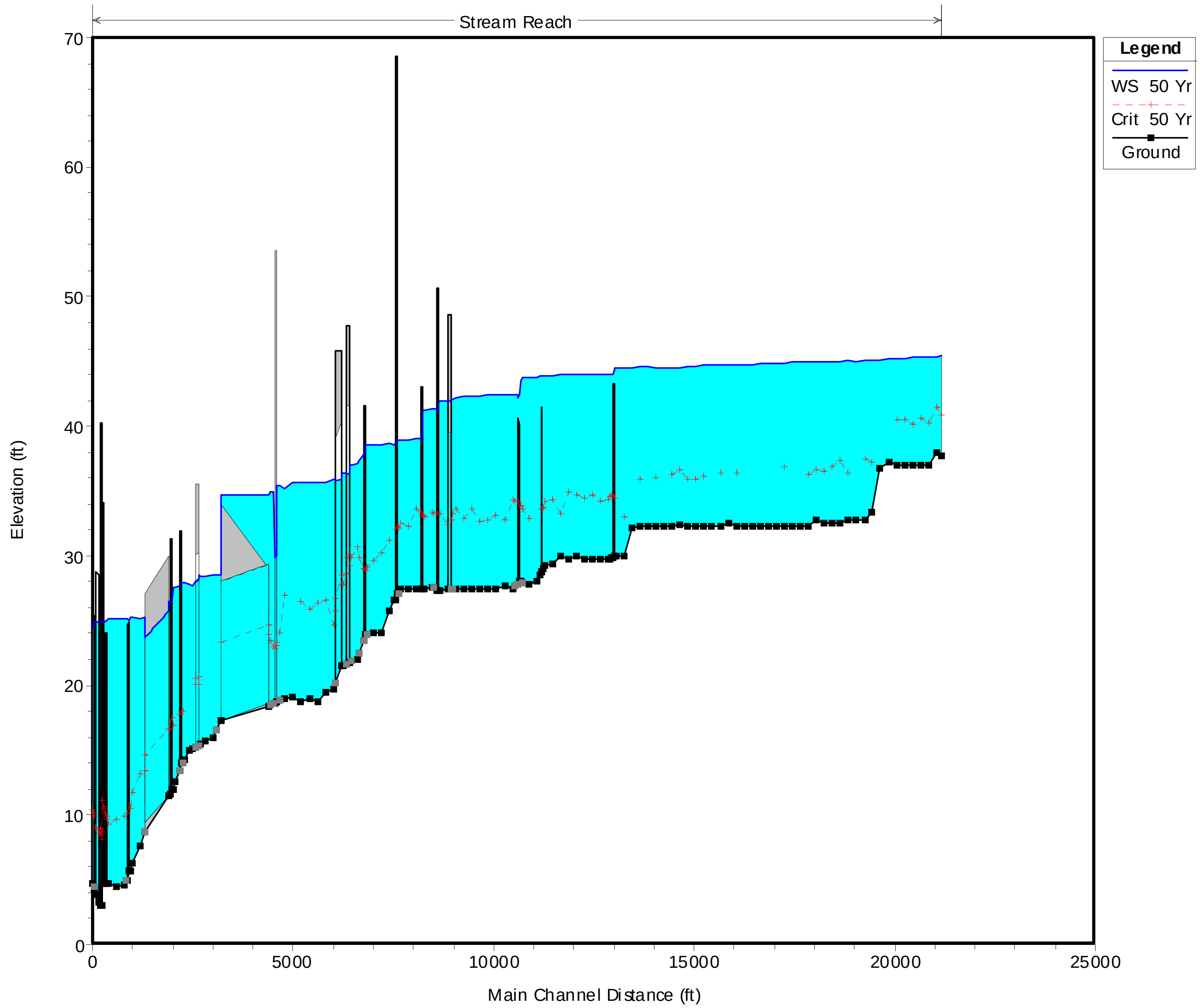


Figure : 50-year Flood Profile Plot

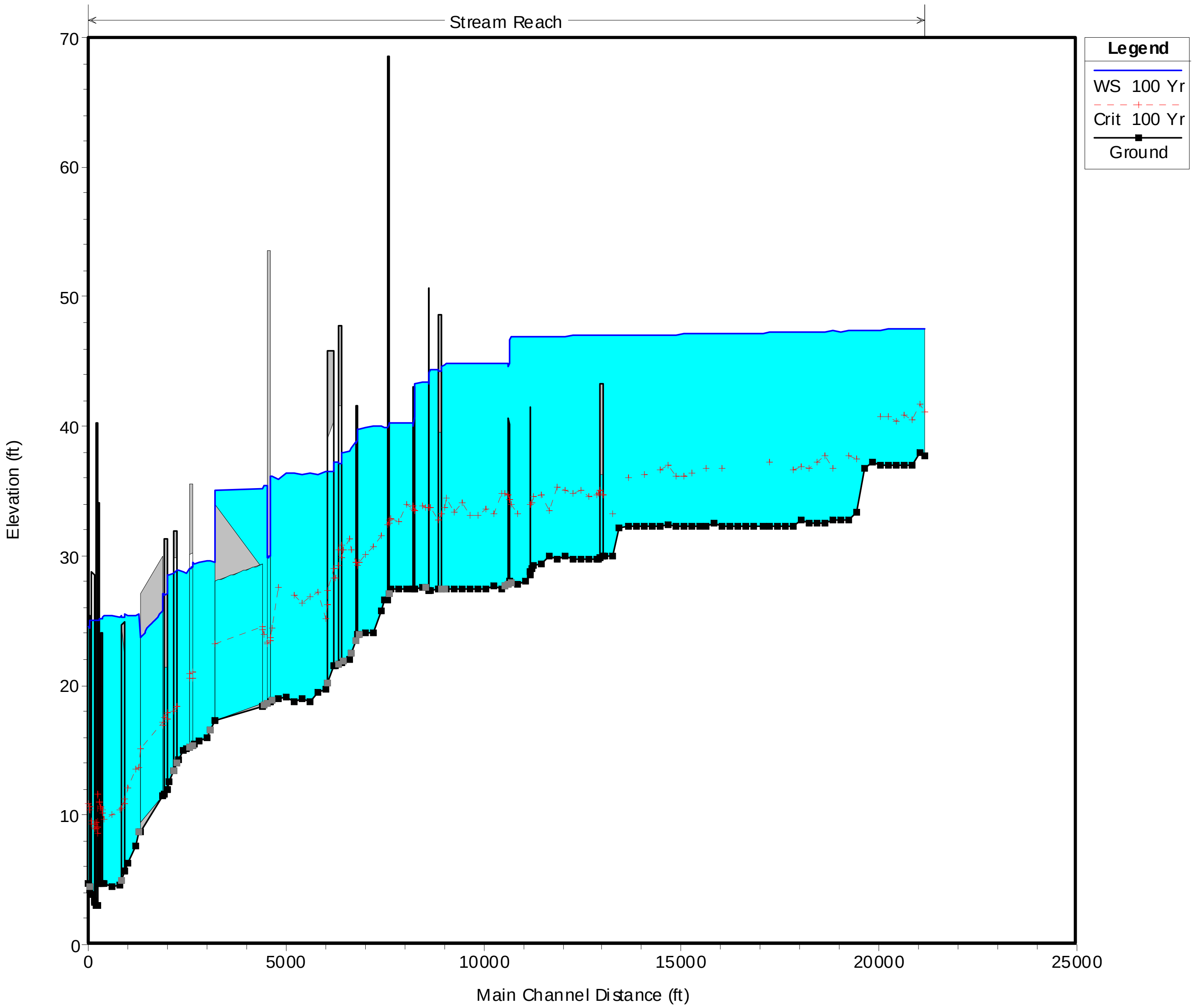


Figure : 100-year Flood Profile Plot

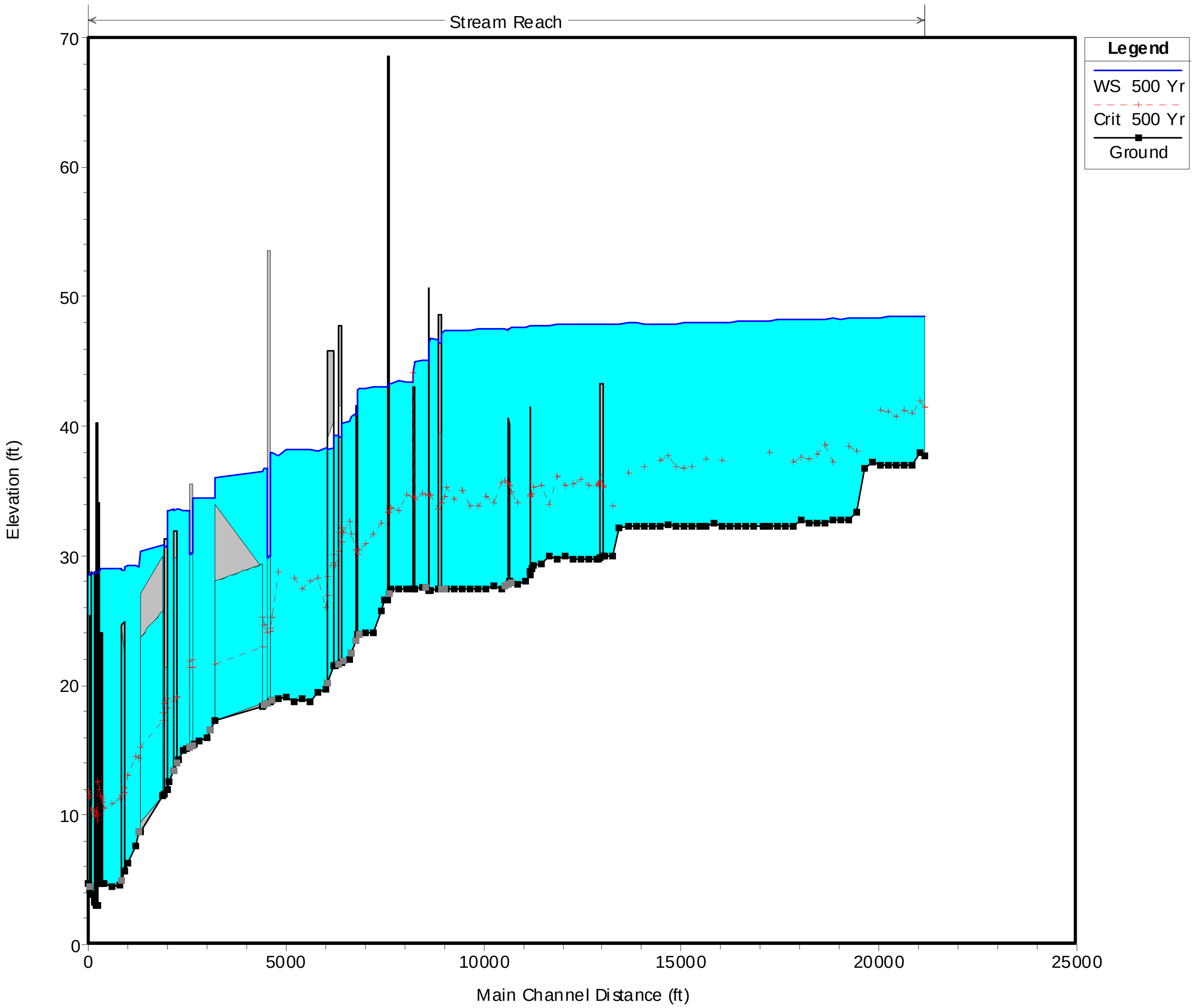


Figure : 500-year Flood Profile Plot

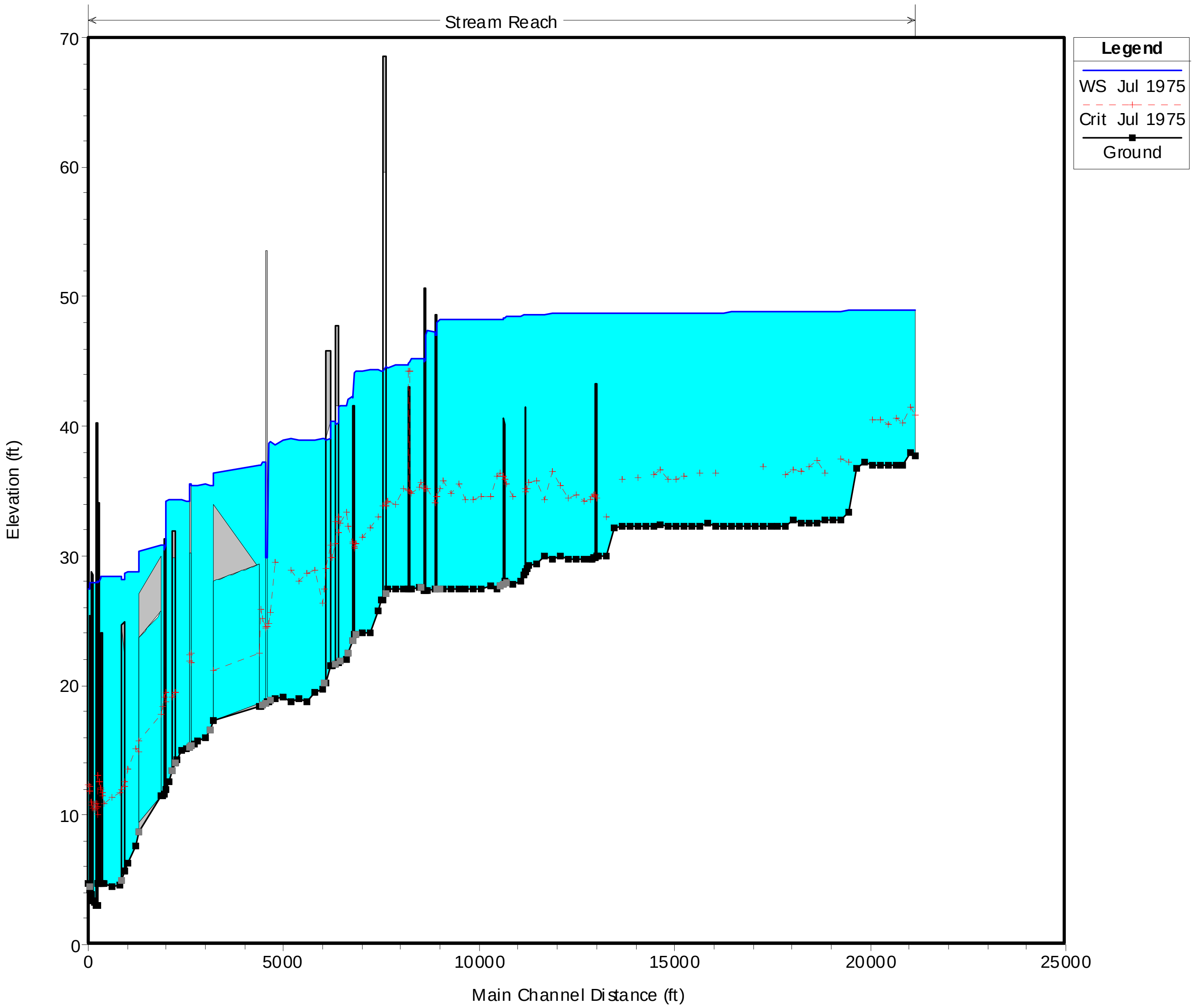


Figure : July 1975 Event Flood Profile Plot

Appendix D – Threatened and Endangered Species Correspondence

United States Department of the Interior

FISH AND WILDLIFE SERVICE

New Jersey Field Office
Ecological Service
927 North Main Street, Building D
Pleasantville, New Jersey 08232
Tel: 609-646-9310
Fax: 609-646-0352
http://njfieldoffice.fws.gov

IN REPLY REFER TO:
ES-03/NE159

Danielle Trittenbach, Environmental Scientist
CH2M Hill
1700 Market Street, Suite 1600
Philadelphia, Pennsylvania 19103-3916
Fax number: (215) 563-3828

Reference: Threatened and endangered species review within the vicinity of the proposed Assunpink Creek Ecosystem Restoration Project located within City of Trenton (Municipality), Mercer (County), New Jersey.

The U.S. Fish and Wildlife Service (Service) has reviewed the above-referenced proposed project pursuant to Section 7 of the Endangered Species Act of 1973 (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq.*) to ensure the protection of federally listed endangered and threatened species. The following comments do not address all Service concerns for fish and wildlife resources and do not preclude separate review and comment by the Service as afforded by other applicable environmental legislation.

Except for an occasional transient bald eagle (*Haliaeetus leucocephalus*), no other federally listed or proposed endangered or threatened flora or fauna under Service jurisdiction are known to occur within the vicinity of the proposed project site. Therefore, no further consultation pursuant to Section 7 of the Endangered Species Act is required by the Service. This determination is based on the best available information. If additional information on federally listed species becomes available, or if project plans change, this determination may be reconsidered. Please be aware that this determination is valid for 90 days; therefore, if the project is not initiated within this time, the Service should be contacted prior to project implementation to verify the accuracy of this information. The Service will review current information to ensure that no federally listed threatened or endangered species will be adversely affected by the proposed project.

Enclosed is current information regarding federally listed and candidate species occurring in New Jersey. The Service encourages federal agencies and other planners to consider candidate species in project planning. The addresses of State agencies that may be contacted for current site-specific information regarding federal candidate and State-listed species are also enclosed.

Authorizing Supervisor: [signature]

Enclosures: Current summaries of federally listed and candidate species in New Jersey
Addresses for additional information on candidate and State-listed species

Sect 7 (es-NEsct7.fax) 11/24/03

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
NORTHEAST REGION
One Blackburn Drive
Gloucester, MA 01930-2298

JAN 15 2004

Danielle Trittenbach
CH2M HILL
99 Cherry Hill Road
Suite 304
Parsippany, NJ 07054-1102

Dear Ms. Trittenbach,

This correspondence is in response to your letter dated January 7, 2004 requesting information on the presence of any federally listed threatened or endangered species and/or designated critical habitat for listed species under the jurisdiction of the National Marine Fisheries Service (NOAA Fisheries) in the vicinity of a proposed stream improvement and ecosystem restoration project along Assunpink Creek in Trenton, New Jersey. The proposed project will encompass a 3 mile stretch of the creek, between the Delaware River and the Trenton City limits.

Federally endangered shortnose sturgeon are known to occur in the Delaware River from the lower bay upstream to at least Lambertville, New Jersey. Assunpink Creek is a tributary to the Delaware River. Tagging studies by O'Herron et al. (1993) show that the most heavily used portion of the river appears to be between river mile 118 below Burlington Island and the Trenton Rapids at river mile 137. Shortnose sturgeon overwinter in dense sedentary aggregations in the upper tidal reaches of the Delaware River between river mile 118 and river mile 131, with large concentrations around Newbold Island and Duck Island. During the late summer months, shortnose sturgeon are more dispersed and are thought to be more widely distributed throughout the river and estuary than in the winter months.

Section 7(a)(2) of the Endangered Species Act (ESA) of 1973, as amended, states that each Federal agency shall, in consultation with the Secretary, insure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of a listed species or result in the destruction or adverse modification of designated critical habitat. Because federally endangered shortnose sturgeon are present in the Delaware River, any discretionary federal action that may affect this species must undergo section 7 consultation. The federal action agency, in this case the Army Corps of Engineers (ACOE), would be responsible for initiating section 7 consultation, at which time the project details would be submitted to NOAA Fisheries, Northeast Regional Office, One Blackburn Drive, Gloucester, MA 01930. An assessment of the project's impacts to federally endangered shortnose sturgeon should be included with the project details. After reviewing this information, NOAA Fisheries would then be able to conduct a consultation under section 7 of the ESA.

If you have not already done so, it is recommended that you also contact the U.S. Fish and Wildlife Service for federally listed threatened or endangered species within their jurisdiction. The contact number for the Northeast Regional office is (413) 253-8200.

We look forward to your continued cooperation with consultation matters. Should you have any questions about these comments or about the section 7 consultation process in general, please contact Julie Crocker at (978)281-9328 ext. 6530.

Sincerely,

Mary Colligan

Mary A. Colligan
Assistant Regional Administrator
for Protected Resources

File Code: Sec 7 (ACOE) – spp. present DE River

State of New Jersey

James E. McGreevey
Governor

Department of Environmental Protection
Division of Parks and Forestry
Office of Natural Lands Management
Natural Heritage Program
P.O. Box 404
Trenton, NJ 08625-0404
Tel. #609-984-1339
Fax. #609-984-1427

Bradley M. Campbell
Commissioner

January 12, 2004

Danielle Trittenbach
CH2M Hill
1700 Market Street, Suite 1600
Philadelphia, PA 19103-3916

Re: Lower Assunpink Creek Environmental Restoration Project

Dear Ms. Trittenbach:

Thank you for your data request regarding rare species information for the above referenced project site in Hamilton Township and Trenton City, Mercer County.

Searches of the Natural Heritage Database and the Landscape Project are based on a representation of the boundaries of your project site in our Geographic Information System (GIS). We make every effort to accurately transfer your project bounds from the topographic map(s) submitted with the Request for Data into our Geographic Information System. We do not verify that your project bounds are accurate, or check them against other sources. Landscape patches are searched using the boundary depicted on your map buffered by 15 meters. The 15-meter buffer is to accommodate for inherent GIS mapping imprecision.

Neither the Natural Heritage Database nor the Landscape Project has records for any rare wildlife species on the referenced site.

We have also checked the Natural Heritage Database and the Landscape Project habitat mapping for occurrences of any rare wildlife species or wildlife habitat within 1/4 mile of the referenced site. Please see the table below for species list and conservation status.

Species within 1/4 mile of referenced site.

Common Name	Scientific Name	Federal Status	State Status	Grank	Srank
dwarf wedgemussel	*Alasmidonta heterodon*	LE	E	G1G2	S1
green floater	*Lasmigona subviridis*		E	G3	S1
shortnose sturgeon	*Acipenser brevirostrum*	LE	E	G3	S3
yellow lampmussel	*Lampsilis cariosa*		T	G3G4	S1

We have also checked the Natural Heritage Database for occurrences of rare plant species or natural communities. The Natural Heritage Data Base has a record for an occurrence of *Agastache scrophulariifolia* that may be on or in the immediate vicinity of the site. The attached list provides more information about this occurrence. **Because some species are sensitive to disturbance or sought by collectors, this information is provided to you on the condition that no specific locational data are released to the general public. This is not intended to preclude your submission of this information to regulatory agencies from which you are seeking permits.**

Also attached is a list of rare species and natural communities that have been documented from Mercer County. If suitable habitat is present at the project site, these species have potential to be present.

Status and rank codes used in the tables and lists are defined in the attached EXPLANATION OF CODES USED IN NATURAL HERITAGE REPORTS.

If you have questions concerning the wildlife records or wildlife species mentioned in this response, we recommend that you visit the interactive I-Map-NJ website at the following URL, http://www.state.nj.us/dep/gis/imapnj/imapnj.htm or contact the Division of Fish and Wildlife, Endangered and Nongame Species Program.

PLEASE SEE THE ATTACHED 'CAUTIONS AND RESTRICTIONS ON NHP DATA'.

Thank you for consulting the Natural Heritage Program. The attached invoice details the payment due for processing this data request. Feel free to contact us again regarding any future data requests.

Sincerely,

Herbert A. Lord

Herbert A. Lord
Data Request Specialist

cc: Robert J. Cartica
Lawrence Niles
NHP File No. 04-4007426

Appendix E – Response to Draft Environmental Assessment Comments

United States Department of the Interior

FISH AND WILDLIFE SERVICE

New Jersey Field Office
Ecological Services
927 North Main Street, Building D
Pleasantville, New Jersey 08232
Tel: 609/646 9310
Fax: 609/646 0352
http://www.fws.gov/northeast/njfieldoffice

In Reply Refer To:
07-I-A0231

JUL 2 5 2007

Minas M. Arabatzis, Chief
Planning Division
U. S. Army Corps of Engineers
Wanamaker Building, 100 Penn Square East
Philadelphia, Pennsylvania 19107-3390

Dear Mr. Arabatzis:

The U.S. Fish and Wildlife Service (Service), New Jersey Field Office has reviewed the U.S. Army Corps of Engineers, Philadelphia District (Corps) *Draft Environmental Restoration Report and Environmental Assessment Lower Assunpink Creek Ecosystem Restoration Project – Broad Street Culvert* (draft EA). The proposed project involves removal of the roof structure of a damaged culvert, improving passage of anadromous fish during migration and providing recreational opportunities for visitors and local residents. The proposed project site is located along Lower Assunpink Creek at Broad Street, City of Trenton, Mercer County, New Jersey. As requested in your June 27, 2007 cover letter, the Service is providing fish and wildlife review comments on the proposed action, including a determination of whether federally listed endangered and threatened species would be adversely affected.

AUTHORITY

The following comments on the proposed action are provided pursuant to Section 7 of the Endangered Species Act of 1973 (ESA) (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq.*), to ensure the protection of federally listed endangered and threatened species. Additional comments are provided as technical assistance on the draft EA and do not preclude further comment pursuant to the National Environmental Policy Act (83 Stat. 852; 42 U.S.C. 4321 *et seq.*) (NEPA).

FEDERALLY LISTED SPECIES

No federally listed or proposed threatened or endangered flora or fauna under Service jurisdiction are known to occur within the vicinity of the proposed project site. Therefore, no further consultation pursuant to Section 7 of the Endangered Species Act is required by the Service. If 1

RESPONSE

1 Comment acknowledged; no response necessary.

additional information on federally listed species becomes available, or if project plans change this determination may be reconsidered.

SERVICE REVIEW

Alternatives Considered

Five alternatives have been evaluated by the Corps regarding modification of the Broad Street Culvert.

Alternative 1 – remove the roof structure and center wall of the culvert, replace the nearby building patio with an overlook platform, and add landscaping on both banks of the creek.

Alternative 2 – remove the roof structure and center wall of the culvert, construct two overlook platforms, add landscaping on both banks of the creek, and lower the southern culvert wall to provide a "softbank" approach with riparian landscaping.

Alternative 3 - remove the roof structure and center wall of the culvert, construct two overlook platforms, add landscaping on both banks of the creek, lower the southern culvert wall to provide a "softbank" approach with riparian landscaping, and lower a portion of the northern culvert wall.

Alternative 4 – remove the entire culvert, re-align the creek into its natural channel, provide for fish-spawning habitat, and plant riparian trees along the banks. Alternative 4 is the Corps' preferred alternative.

Alternative 5 – No Action. Alternative 5 would not fulfill the project purpose and need.

Service Comments

The Service has reviewed the draft EA and supports Alternative 4 as the most environmentally beneficial of the action alternatives. Alternative 4 would enhance fish migration passage and spawning habitat, and restore this portion of the creek to its natural channel. Thank you for the opportunity to comment on the subject draft report. Please contact Carlo Popolizio of my staff at (609) 383-3938, extension 32, if you require further assistance. 2

Sincerely,

John C. Staples
Acting Supervisor

RESPONSE

2 Comment acknowledged; the selected alternative is alternative 4 – complete culvert removal and realignment of creek channel.

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE

Habitat Conservation Division
James J. Howard Marine
Sciences Laboratory
74 Magruder Road
Highlands, NJ 07732

July 23, 2007

Minas M. Arabatzis, Chief,
Planning Division
Philadelphia District
Army Corps of Engineers
Wanamaker Building
100 Penn Square East
Philadelphia, PA 19107-3390

ATTN: Barbara Conlin, Project Biologist
RE: Lower Assunpink Creek Ecosystem Restoration Project – Broad Street Culvert

Dear Mr. Arabatzis:

NOAA Fisheries, Northeast Region's Habitat Conservation Division (NMFS) has reviewed the environmental assessment (EA) for the Lower Assunpink Creek Ecosystem Restoration Project – Broad Street Culvert project. According to the EA, the US Army Corps of Engineers (ACOE) and non-federal sponsor, the City of Trenton, will remove the entire culvert structure and realign and restore Assunpink Creek between the South Broad Street and South Warren Street bridges in Trenton, New Jersey. This project will improve the creek's value for fish under the jurisdiction of the NMFS by removing the concrete roof slabs, walls and bottom of the culvert and replacing it with a more natural channel. Riparian trees and shrubs will be planted along the banks. Riprap, boulders and logs will be used to create a diverse stream corridor. The NMFS supports fully this restoration plan. **1**

Assunpink Creek has been identified as providing habitat for anadromous fishes such as alewife (*Alosa pseudoharengus*) and blueback herring (*Alosa aestivalis*). Because landing statistics and the number of fish observed on annual spawning runs indicate a drastic decline in these species throughout much of their range since the mid 1960's, they have been designated as species of concern by NMFS in a Federal Register Notice dated October 17, 2006 (71 FRN 61022). "Species of concern" are those species about which NMFS has some concerns regarding status and threats, but for which insufficient information is available to indicate a need to list the species under the ESA. The restoration of this section of the creek will improve the habitat for these important species as they migrate to spawning areas in the upstream portions of the creek. **2**

Because river herring spawn in Assunpink Creek and construction activities such as the removal of the culvert, realignment of the creek and restoration of the banks and bottom habitat could impede the upstream migration of these fishes, the work should be scheduled to avoid the upstream migration of these anadromous fishes from March 15 to June 30 of each year. **3**

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RESPONSE

1 Comment acknowledged; the selected alternative is alternative 4 – complete culvert removal and realignment of creek channel.

2 Comment acknowledged; additional information added to Section 4.2.

3 Comment acknowledged; requested change has been made.

No essential fish habitat under the Magnuson Stevens Fishery Conservation and Management Act (MSA)
has been designated in the project area. As a result, further consultation pursuant to 50 CFR 600.920(l).
Consultation should be reinitiated if new information becomes available or the project is revised in such as
manner that affects the basis for the above determination. However, Buckel and Conover (1997) in Fahey
et al. (1999) reports that diet items of juvenile bluefish (*Pomatomus saltatrix*) in the Hudson River Estuary
include *Alosa* species such as these. Because the restoration of this waterway will improve the habitat for
these anadromous fish, it will also have an indirect benefit to federally managed species and their essential
fish habitats by improving the quality or quantity of their prey species. 4

While federally endangered shortnose sturgeon (*Acipenser brevirostrum*) occurs in the Delaware River,
they are not known to occur within Assunpink Creek. Further coordination under Section 7 of the
Endangered Species Act is not necessary. However, should project plans change, or if new information
becomes available that changes the basis for this determination, consultation should be reinitiated. 5

If you have any questions regarding this matter, please contact me at 732 872-3037 or Karen Greene at 732
872-3023

Sincerely,

Stanley W. Gorski
Field Offices Supervisor

RESPONSE

4 Comment acknowledged; no response necessary.

5 Comment acknowledged; findings added to Section 4.4.

Trenton Downtown Association, Inc.
23 East State Street, Trenton, NJ 08608 (609) 393-8998

August 20, 2007

Minas M. Arabatzis
Chief, Planning Division
Philadelphia District
U.S. Army Corps of Engineers
100 Penn Square East
Philadelphia, PA 19107-3390

Re: Environmental Restoration Report and Environmental Assessment
Assunpink Creek Ecosystem Restoration Project
Broad Street Culvert, City of Trenton, Mercer County, New Jersey
Invitation for Public Comment on Draft Report, June 18, 2007

Dear Mr. Arabatzis:

The Trenton Downtown Association (TDA), a not-for-profit organization charged with promoting the revitalization of New Jersey's capital city, is pleased to offer the following comment on the above-referenced draft report.

The proposed "daylighting" and environmental restoration of the culverted section of the Assunpink Creek between South Broad and South Warren Streets is a laudable goal favored, so far we are aware, by all downtown interests – city, county and state government, private property owners, residents, local businesses and developers. 1

We note that this project overlaps with several other public agency initiatives designed to improve the downtown, most notably the proposed Capital Park and the planned rehabilitation of the South Broad Street bridge over the Assunpink, both State-driven projects that involve the same city block. In addition, the proposed expansion of the Mercer County Courthouse complex, public/private plans for redevelopment of the Capital City Renaissance District and the Route 29 Boulevard project are all major ongoing endeavors taking place in immediately adjoining parts of the downtown. TDA strongly urges that planning and decision-making for the Assunpink Creek Restoration Ecosystem Restoration Project be coordinated with the above-noted endeavors to ensure their economic and environmental compatibility. 2

With specific reference to the proposed Capital Park, for which a draft master plan document is about to be issued, TDA supports this project's goal of creating a linear park downstream from the South Broad Street bridge that will allow for pedestrian access, passive recreation, historic interpretation, storm water quality enhancement and 3

RESPONSE

1 Comment acknowledged; no response necessary.

2 Recommendation acknowledged.

3 Recommendation acknowledged.

ecological restoration. TDA is currently actively pursuing promotion of the downtown as a heritage tourism destination through programming of annual events such as Patriots Week. The draft environmental assessment report is noticeably silent on the heritage tourism benefits that may accrue from historic interpretation of the Second Battle of Trenton and the city's early industrial history, both of which were focused on the stretch of the Assunpink between South Broad and South Warren Streets and which will feature prominently in Capital Park. **4**

While TDA envisions the culverted section of the Assunpink being revived as parkland, the north side of the creek, along Lafayette Street, occupies a critical economic interface with the downtown commercial core. The frontages along this street between South Broad and South Warren Streets offer a great opportunity to extend the café/gallery/shop fabric of South Warren Street along the Assunpink Creek corridor in the direction of Mill Hill, thus creating a block-long arts/entertainment thread running parallel to the newly restored stream. **5**

Of the five alternatives presented in the draft report TDA concurs with the U.S. Army Corps of Engineers' selection of Alternative Four as the preferred alternative since this will provide the maximum environmental benefit and is most compatible with the goals of the proposed Capital Park. **6**

The Trenton Downtown Association appreciates the opportunity to comment on the draft environmental assessment report. Please do not hesitate to contact me if you require further information or clarification of the points raised in this letter.

Sincerely,

Tuneshia Nash Laird, Executive Director
Trenton Downtown Association

copies: Mayor Douglas Palmer, City of Trenton
John S. Watson, Jr., Deputy Commissioner, NJDEP
TDA Executive Committee and Board

RESPONSE

4 Requested change has been made; additional information added to Section 4.8.

5 Recommendation acknowledged.

6 Comment acknowledged; the selected alternative is alternative 4 – complete culvert removal and realignment of creek channel.

WRT

Planning & Design

August 22, 2007

Minas M. Arabatzis
Chief, Planning Division
Philadelphia District

U.S. Army Corps of Engineers
100 Penn Square East, Philadelphia, PA
19107 - 3390

Philadelphia
Coral Gables
Dallas
Lake Placid
San Diego
San Francisco

***Re: Public Comment** - Environmental Restoration Report and Environmental Assessment, Lower Assunpink Creek Ecosystem Restoration Project - Broad Street Culvert*

Dear Mr. Arabatzis,

Wallace Roberts & Todd, LLC (WRT) has been working with New Jersey Department of Environmental Protection (NJDEP) on the New Jersey Capital Park master plan over the last eight months that included the Assunpink Creek culvert block within its study area. As a part of the master plan, WRT and its master plan consultant team reviewed the draft Environmental Assessment (EA) report for the Assunpink ecosystem restoration project available on the USACE's website for public comment. WRT would like to submit this letter as our comment to the draft EA for your review. A copy of our recent draft master plan report can also be furnished for your reference. Two illustrative sections are attached for your reference of this block with this letter. **1**

WRT and its consultant team support the goal of restoring the ecological function of the creek as shown in alternative number 4 of the draft EA that recommends removing the entire culvert structure and sloping the ground surface to the creek. **2** However the master plan also recommends additional design features that differ as follows:

1. The creek is in an urban area adjacent to an existing Mill Hill park where public access to the water edge is important. Therefore we recommend that fully naturalized edge shall also include level terraces for use by pedestrians **3** (including trails) as well as to maintain the ecosystem function as part of the design.

[illegible]

Wallace Roberts & Todd, LLC
1700 Market Street, 28th Floor
Philadelphia, PA 19103
215.732.5215
www.wrtdesign.com
fax 215.732.2551

RESPONSE

1 Comment acknowledged; two illustrative sections attached (WRT, 8/22/07, Page 3).

2 Comment acknowledged; the selected alternative is alternative 4 – complete culvert removal and realignment of creek channel.

3 Recommendation acknowledged.

WRT

2. The Assunpink Creek culvert block (and adjacent areas) has heritage artifacts (mill foundations etc.) These needs to be further investigated and excavated for heritage tourism and archaeological interpretation. 4

3. We recommend exposing and restoring the other historic arch of the South Broad Street Bridge project which, NJDOT is planning to retrofit. This will facilitate pedestrian connections as well as maintain the historic integrity of the bridge. 5

We recommend that further discussion and co-ordination is necessary between USACE, NJDEP and the City of Trenton at the draft stage of these two exciting projects. Please do not hesitate to call or email me if you have any further questions. 6

Sincerely,

Yogesh Saoji, AIA, AICP
Associate

Project Manager
New Jersey Capital Park Master Plan

Wallace Roberts & Todd, LLC
1700 Market Street
28th Floor, Philadelphia, PA 19103

Phone 215-430-5039 Fax 215-732-2551
Email ysaoji@ph.wrtdesign.com

Y:y

RESPONSE

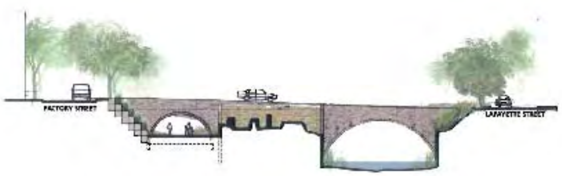
4 Recommendation acknowledged; as stated in Section 4.5, additional consultations with the State Historic Preservation Office will occur.

5 Recommendation acknowledged.

6 Recommendation acknowledged.

8/22/2007
Page 3

South Broad Street Bridge / Assunpink Creek Section – Looking East



South Broad Street Bridge / Assunpink Creek Section – Looking West

No responses necessary.

State of New Jersey
DEPARTMENT OF ENVIRONMENTAL PROTECTION

JON S. CORZINE
Governor

Division of Land Use Regulation
P.O. Box 439, Trenton, NJ 08625-0439
Fax # (609) 292-8115
www.state.nj.us/dep/landuse

LISA P. JACKSON
Commissioner

Minas M. Arabatzis, Chief, Planning Division
Department of the Army
Philadelphia District, Corps of Engineers
Wanamaker Building - 100 Penn Square East
Philadelphia, Pennsylvania 19107-3390

SEP 05 2007

RE: Federal Consistency Determination, Water Quality Certificate
DLUR File No.: 1111-07-0001.1
Activity No.: CDT-070001-Water Quality Certificate
Applicant: Army Corp of Engineers
Project: Lower Assunpink Creek Ecosystem Restoration Project
Block: 105 Lot: 2
Trenton City, Mercer County

Dear Mr. Arabatzis:

The New Jersey Department of Environmental Protection, Division of Land Use Regulation, has received your request dated June 27, 2007 requesting a Water Quality Certificate pursuant to N.J.S.A. 58:10A-1 *et seq*. The Division of Land Use Regulation hereby approves a Water Quality Certificate for the project described below provided that the conditions discussed below are met to the satisfaction of the Department.

Project Description

The overall objective of the Lower Assunpink Creek Ecosystem Restoration Project is to restore migratory fish habitat, enhance recreational opportunities and improve the overall stream ecology of the Assunpink Creek. The selected alternative (Alternative Four) proposes to completely remove an existing culvert structure to "daylight" the creek. This alternative will use riparian vegetation for bank stabilization, and the channel will be realigned, narrowed, and deepened. Log and rock cross-vanes and J-hook will be used instream to center the flow and control the grade. The banks of the stream will be planted with trees and shrubs to provide long-term stability, biologs and coir matting will be used for temporary stabilization. This alternative will provide a buffer for stormwater surface runoff sediment control and will also increase the ecological community. The proposal is found in the Draft Report for "Environmental Restoration Report and Environmental Assessment Lower Assunpink Creek Ecosystem Restoration Project – Broad Street Culvert", dated March 2007, prepared by CH2MHill prepared for U.S. Army Corp of Engineers, Philadelphia District. **1**

Project Specific Conditions

1. Prior to construction the applicant must obtain a Flood Hazard Area Control Act permit for the proposed project within State Open Waters on site, in accordance with N.J.A.C. 7:13 from the Division of Land Use Regulation. **2**

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RESPONSE

1 Comment acknowledged; the selected alternative is alternative 4 – complete culvert removal and realignment of creek channel.

2 Comment acknowledged;

If you have any questions regarding this letter, or require further assistance from this Division, please do not hesitate to contact Cathryn Schaffer of my staff at 609-777-0454.

Sincerely,

Christopher Jones, Acting Manager
Bureau of Urban Growth and Redevelopment

C: City of Trenton Construction Official

No responses necessary.

Jon S. Corzine
Governor

State of New Jersey
Department of Environmental Protection
Environmental Regulation
Office of Permit Coordination and Environmental Review
401 East State Street
P.O. Box 423
Trenton, New Jersey 08625-0423
Phone: (609) 292-3600 Fax: (609) 777-1330

Lisa P. Jackson
Commissioner

November 5, 2007

Mr. Minas M. Arabatzis
Chief, Planning Division
Philadelphia District
U.S. Army Corps of Engineers
100 Penn Square East
Philadelphia, PA 19107-3390

RE: Assunpink Creek Ecosystem Restoration Project
Broad Street Culvert
Trenton, Mercer County, New Jersey

Dear Mr. Arabatzis:

The Office of Permit Coordination and Environmental Review of the New Jersey Department of Environmental Protection (NJDEP) has completed its review of the Draft Environmental Assessment for the Assunpink Creek Ecosystem Restoration Project – Broad Street Culvert, Trenton, Mercer County, New Jersey. We offer the following comments for your consideration.

Land Use Regulations

The NJDEP's Division of Land Use Regulation's review of the proposed project resulted in the attached September 15, 2007 letter which approved a Water Quality Certificate for the project provided the applicant obtains a Flood Hazard Area permit from their Division. The letter approved the selection of Alternative Four. **1**

Cultural Resources

In 2004 the NJDEP's Historic Preservation Office (HPO) commented in the attached March 26, 2004 letter on the overall project and on the 2003 Phase IA survey for the larger project (a section of which was attached for the Broad Street Culvert EA as Attachment 4). The HPO has not yet received subsequent phases of cultural resource survey for review for the project. Similar to other project sections, the Broad Street Culvert portion of the larger Lower Assunpink Environmental Restoration Project area will necessitate Phase I and potentially II **2**

RESPONSE

1 Comment acknowledged; the selected alternative is Alternative 4 – complete culvert removal and realignment of creek channel.

2 Comment acknowledged; HPO's recommendations have been added to Section 4.5.

archaeological survey prior to ground disturbance, as recommended in the Hunter Research report and the HPO's 2004 letter. The HPO's findings and recommendations for the project remain germane as the necessary actions to elicit and finalize Consultation with the HPO under Section 106 of the National Historic Preservation Act. The United States Army Corps of Engineers (USACE) has not yet completed 36 CFR 800.4 Identification of Historic Properties. 3

The USACE should additionally ensure coordination with the NJDEP's Division of Parks and Forestry and the City of Trenton, as noted in the attached, if not already completed.

Natural Recourses

The NJDEP's Division of Fish and Wildlife's (DFW) comments and concerns are directed to the specific impact areas noted below.

Alternatives Analysis

The DFW strongly agrees with the adoption of Alternative Four that 4
includes the complete removal of the existing culvert. They do ask for clarification that the design will be able to pass all fish species present in the area 5
and velocities will not hinder species with low burst speed and endurance. The DFW agrees with the stream geomorphology data provided on with stream design, low flow passage and the matching of the low flow channel to the existing streambed up and downstream. The DFW requests that more information be 6
furnished to them on the grouting of stone boulders into the bottom.

Threatened and Endangered Species

The DFW agrees with the list of species found in Section 4.4. In addition 7
to the information provided in the EA on shortnose sturgeon, they have deep concerns about Atlantic sturgeon. It should be noted that Atlantic sturgeon are continuing to move through the Delphi process and are expected to be a 8
Federally listed specie within the next few months per the DFW's recent conversations with NMFS Endangered Species section. It should also be noted that river herring are now listed as species of "Special Concern" by the same 9
federal agency.

Planting Materials

All planting materials used in the vegetation plan should be native, non- 10
invasive species.

RESPONSE

3 Comment acknowledged; HPO's recommendations have been added to Section 4.5

4 Comment acknowledged; the selected alternative is alternative 4 – complete culvert removal and realignment of creek channel.

5 Request acknowledged; detailed design drawings and supporting velocity calculations will be provided to NJDEP when available.

6 Request acknowledged; grouting of stone boulders is not applicable to selected Alternative 4.

7 Comment acknowledged; no response necessary.

8 Comment acknowledged; information has been added to Section 3.4.

9 Comment acknowledged; information has been added to Section 4.2.

10 Comment acknowledged; a statement that native, non-invasive species will be utilized has been added to Section 2.8.

Stream Designs

The stream design presented as Figure 2 on page 3 of the Hydraulic Modeling of Lower Assunpink Creek section appears to meet the design criteria put forward by Lisa Barno and Chris Smith from the DFW's Bureau of Freshwater Fisheries in previous communications. 11

Construction Methodology

The DFW agrees that all BMPs should be employed to minimize the amount of sediment entering the Delaware River. 12

If there are any questions concerning these natural resources comments, please feel free to contact Donald Wilkinson (856-785-2711) of the DFW.

Thank you for the opportunity to be part of the review process.

Sincerely,

Kenneth C. Koschek
Supervising Environmental Specialist
Office of Permit Coordination and
Environmental Review

Attachments

C: Cathryn Schaffer, NJDEP
Donald Wilkinson, NJDEP
Deborah Fimbel, NJDEP

RESPONSE

11 Comment acknowledged; no response necessary.

12 Comment acknowledged; no response necessary.