SCOPE OF WORK

Delaware River Watercraft Hardscape Access
Point Pleasant/Fairview Sites

Delaware & Raritan (D&R) Canal State Park
Kingwood Township, Hunterdon County, NJ

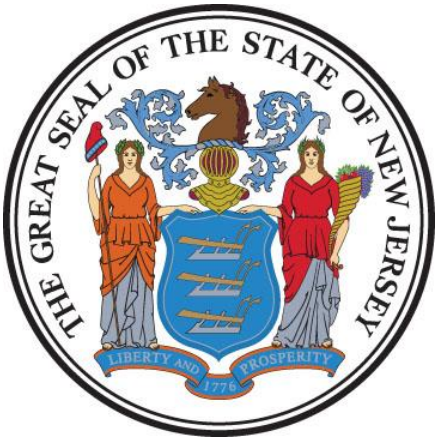
Project No. P1365-00

STATE OF NEW JERSEY

Honorable Philip D. Murphy, Governor
Honorable Tahesha L. Way, Lt. Governor

DEPARTMENT OF THE TREASURY

Elizabeth Maher Muoio, Treasurer



DIVISION OF PROPERTY MANAGEMENT AND CONSTRUCTION

Thomas A. Edenbaum, Director

Date: September 16, 2025

Document Format Revision 8-1-2022

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I. OBJECTIVE

The objective of this project is the installation of permanent public watercraft hardscape access points at the Fairview and Point Pleasant locations of the Delaware & Raritan (D&R) Canal State Park in Hunterdon County. Currently, the public accesses the Delaware River at the D&R Canal State Park access points using moveable wooden staircases (see **Exhibit 'C'** Photos).

II. CONSULTANT QUALIFICATIONS

A. CONSULTANT & SUB-CONSULTANT PRE-QUALIFICATIONS

The Consultant shall be a firm pre-qualified with the Division of Property Management & Construction (DPMC) in the following discipline(s):

- **P005 Civil Engineering**

The Consultant shall also have in-house capabilities or Sub-Consultants pre-qualified with DPMC in:

- **P015 Land Surveying**
- **P031 Archaeology**

As well as, **any and all** other Architectural, Engineering and Specialty Disciplines necessary to complete the project as described in this Scope of Work (SOW).

III. PROJECT BUDGET

A. CONSTRUCTION COST ESTIMATE (CCE)

The initial Construction Cost Estimate (CCE) for this project is $250,000.

The Consultant shall review this Scope of Work and provide a narrative evaluation and analysis of the accuracy of the proposed project CCE in its technical proposal based on its professional experience and opinion.

B. CURRENT WORKING ESTIMATE (CWE)

The Current Working Estimate (CWE) for this project is $463,750.

The CWE includes the construction cost estimate and all consulting, permitting and administrative fees.

The CWE is the client agency's financial budget based on this project Scope of Work and shall not be exceeded during the design and construction phases of the project unless DPMC approves the change in Scope of Work through a Contract amendment.

C. CONSULTANT'S FEES

The construction cost estimate for this project ***shall not*** be used as a basis for the Consultant's design and construction administration fees. The Consultant's fees shall be based on the information contained in this Scope of Work document and the observations made and/or the additional information received during the pre-proposal meeting.

IV. PROJECT SCHEDULE

A. SCOPE OF WORK DESIGN & CONSTRUCTION SCHEDULE

The following schedule identifies the estimated design and construction phases for this project and the estimated durations.

PROJECT PHASE	ESTIMATED DURATION (Calendar Days)
1. Site Access Approvals & Schedule Design Kick-off Meeting	**14**
2. Schematic Design Phase	**28**
• *Project Team & DPMC Plan/Code Unit Review & Comment*	14
3. Design Development Phase	**42**
• *Project Team & DPMC Plan/Code Unit Review & Comment*	14
4. Final Design Phase	**56**
• *Project Team & DPMC Plan/Code Unit Review & Approval*	14
5. Final Design Re-Submission to Address Comments	**7 (See Note)**
• *Project Team & DPMC Plan/Code Unit Review & Approval*	14
6. DCA Submission Plan Review	**30**
7. Permit Application Phase	**7**
• *Issue Plan Release*	

8. Bid Phase	**42**
9. Award Phase	**28**
10. Construction Phase	**180**
11. Project Close Out Phase	**30**

Note: The Final Design Phase is considered complete upon the release of Construction Documents by either the DPMC Code Group or the Department of Community Affairs (DCA).

B. CONSULTANT'S PROPOSED DESIGN & CONSTRUCTION SCHEDULE

The Consultant shall submit a project design and construction schedule with its technical proposal that is similar in format and detail to the schedule depicted in **Exhibit 'A'**. The schedule developed by the Consultant shall reflect its recommended project phases, phase activities, activity durations.

A written narrative shall also be included with the technical proposal explaining the schedule submitted and the reasons why and how it can be completed in the time frame proposed by the Consultant.

This schedule and narrative will be reviewed by the Consultant Selection Committee as part of the evaluation process and will be assigned a score commensurate with clarity and comprehensiveness of the submission.

V. PROJECT SITE LOCATION & TEAM MEMBERS

A. PROJECT SITE ADDRESS

The location of the project site is:

Delaware and Raritan (D&R) Canal State Park
Kingwood Township, Hunterdon County

Fairview Access Point GPS Coordinates:
Latitude: 40.354800°
Longitude: -75.080107°

Point Pleasant Access Point GPS Coordinates:
Latitude: 40.423882°
Longitude: -75.006002°

See **Exhibit 'B'** for the project site location map.

B. PROJECT TEAM MEMBER DIRECTORY

The following are the names, addresses, and phone numbers of the Project Team members.

1. DPMC Representative:

Name:	Youstina A. Mansy, Project Manager
Address:	Division of Property Management & Construction 20 West State Street, 3rd Floor Trenton, NJ 08608-1206
Phone No:	(609) 633-2077
E-Mail:	Youstina.Mansy@treas.nj.gov

2. Department of Environmental Protection:

Name:	William C. White, Construction Mgmt. Specialist 2
Address:	Department of Environmental Protection 275 Freehold-Englishtown Road Englishtown, NJ 07726
Phone No:	(609) 802-5886
E-Mail:	William.White@dep.nj.gov

VI. PROJECT DEFINITION

A. BACKGROUND

The Delaware and Raritan (D&R) Canal opened in 1834 and was constructed across central New Jersey as a direct transportation route for freight, mainly coal, between Philadelphia and New York City. The New Jersey Department of Environmental Protection (NJDEP), Division of Parks and Forestry, State Park Service owns and manages the D&R Canal and towpath as a linear state park. The pathway that is more than 70 miles long that runs adjacent to the D&R Canal and is central New Jersey's most popular recreational corridor.

The D&R Canal State Park's region, at the lower scenic Delaware River in Kingwood Township has become an ideal location for watercraft access to the River using canoes, kayaks, paddleboards and non-motorized boats (see **Exhibit 'B'** Site Map). The beautiful scenic views and the natural landscapes along the D&R Canal State Park pathway make it a popular recreation location in Central New Jersey for walking, hiking, and biking. There are numerous historic structures that still remain along the waterway.

A feasibility study has been conducted for the NJDEP Office of Resource Development (ORD) on May 7, 2025 by LAN Associates for providing an improved hardscape access to the Delaware River at the Fairview Road and Point Pleasant River access points of the D&R Canal State Park (see **Exhibit 'E'** Feasibility Study).

B. FUNCTIONAL DESCRIPTION OF THE BUILDING/SITE

Currently, each of the locations at the Fairview Road and the Point Pleasant access points in Kingwood Township use temporary moveable wooden stair structures that are heavy and a challenge to move for those that regularly maintain the area. The public has encountered difficulty accessing the river using the existing wooden staircases during high volume periods. These temporary wooden stairs were designed to be removable during severe weather flooding and after the summer season (see **Exhibit 'C'** Photos).

The included study (see **Exhibit 'E'** Feasibility Study) explores the existing conditions and provides alternative permanent solutions and the associated construction costs, in assisting the NJDEP, construct permanent hardscape stair access at the Fairview Road and Point Pleasant locations along the D&R Canal State Park. Therefore, the proposed method of river access at these two sites will be permanently in-place and protective of the banks. Additionally, the existing access point would benefit from stabilizing improvements to prevent further erosion.

VII. CONSULTANT DESIGN RESPONSIBILITIES

A. HARDSCAPE ACCESS DESIGN REQUIREMENTS

1. General

The Consultant shall provide the Design, Construction Administration, Permitting and Bid/Award services for the removal of the temporary wooden stair structures and replacement with an improved permanent hardscaping access along the D&R Canal State Park at the Fairview Road and Point Pleasant River access points in Kingwood Township. Included in the design shall be any necessary improvements made to the walking path leading to the access point.

The Design Consultant shall review and use the LAN Associates 'Feasibility Study' in assisting the Agency to determine a permanent access solution which is functional, durable and requires low-maintenance and repair. The study provides various solutions. However, the example shown in **Exhibit 'D'** is an option that provides a vision for this application.

The Consultant shall comply with project requirements set by the New Jersey Department of Environmental Protection (NJDEP) Office of Resource Development (ORD), the Parks, Forests & Historic Sites staff, and project team. All meetings and interviews to identify and outline all functional requirements for the design of the new hardscape access shall be documented. The design documents shall include all permits and approvals according to the Feasibility Study and any other local permitting. The watercraft hardscape access design shall meet the requirements of the NJ Barrier Free Code.

2. Functional Design

The Consultant shall meet and coordinate with NJ Department of Environmental Protection (NJDEP) Office of Resource Development, Parks, Forests, & Historic Sites and use the LAN Associates Feasibility Study as a guide to outline all functional requirements in the design and construction of a permanent hardscaping access solution at both the Fairview Road and Point Pleasant access points.

The Consultant shall include in the design documentation, in addition to any Agency requirements, the following considerations:

- The proper removal and clearing, as necessary, of landscape debris and other obstacles.
- The removal of the wooden stairs structure, anchors, cables, etc.
- The required excavation, trenching, earthwork, and drainage in preparation of the determined permanent hardscape access solution for the desired solution.
- The recommended hardscape stairs built with retaining wall and step material.

- Improvements and/or replacement components of the wood-chipped path, fencing and posts, as necessary.
- Any necessary widening of the walking path (see **Exhibit 'B'** Photos Fairview location)
- Signage as necessary

This project site shall be marked with any appropriate signage and/or fencing, as necessary, during any construction.

The construction documents shall provide a design that follows all code requirements and standards.

3. Survey Requirements

The Consultant shall survey the site area and determine whether any additional surveys are required (i.e. boundary site survey, site topography, or cultural resource surveys) for the successful completion of this Project. All original documentation shall be returned to the provider at the completion of the project.

The Consultant shall survey the site area and determine site property lines meets and bounds, as well as the site topography. The survey shall include surroundings in the D&R Canal State Park, as required to complete the design and permit applications successfully for this project.

4. Demolition

The Consultant shall include in the design documents all necessary select demolition and debris. The Consultant shall include in the design documentation the safe removal/ disposal of all the above at the discretion of the Agency.

Drawings shall identify the approved location of the dumpster(s), vehicle parking and boat trailers, construction equipment, etc. and specify any safety and or security measures required in those areas. The Consultant shall identify any required construction barriers or other measures to be taken to protect equipment and personnel from construction dirt, dust and provide safety during any demolition and construction work.

5. New Permanent Hardscape Stairs Access

The Consultant shall provide the design and specifications to construct a new hardscape stairs built with retaining walls and steps along the bank of the river. Using the Feasibility Study as a guide and reviewed by the Agency, the step material shall be constructed from materials such as concrete pavers, stone pavers, concrete blocks, bricks or poured concrete (see **Exhibit 'D'** Hardscape Example).

The Consultant shall provide all calculation(s) to confirm the correct degree of slope, grading, earthwork, exterior improvements, etc. required for the new hardscape access.

The Consultant shall determine the foundation and depth of the base for the new hardscape access. The design shall include, as necessary, a provision for controlling soil erosion around the hardscape access.

The construction documents shall be in compliance with USACE, and any other regulations that do apply. The construction documents shall meet the requirements of the NJ Barrier Free Code.

See below for suggested regulatory requirements and permit applications.

6. Contractor Staging Area

Construction documents shall include Agency approved staging area by the Project Team indicating the location where the contractor can store debris, materials, tools, and equipment.

The Consultant shall provide a site location map on the drawing cover sheet that identifies the vehicular travel routes from major highways to the project construction site and the approved access roads to the contractor's worksite staging area.

7. Archeological Analysis

The Consultant shall perform an archaeological analysis on the site. Specific archaeological analysis requirements shall be coordinated with the State Historic Preservation Office.

B. REGULATORY REQUIREMENTS

The Design Consultant shall review for their permitting analysis and regulatory requirements of the below listed Agency.

It is the Consultant's responsibility to identify and obtain all other State Regulatory Agency permits, certificates, and approvals that will govern and affect the work described in this Scope of Work.

1. NJ Department of Environmental Protection

The project site is located within the Coastal Area Facility Review Act (CAFRA) where the Design Consultant shall include but not limited to identifying water-ward of the mean high high-water line, sites located within a tidal flood hazard area, and wetlands with mapped threatened endangered species.

Below is a summary of regulations that could be applicable to this project in the potential permitting:

a. U.S. Army Corps of Engineers (USACE) pursuant to Pursuant to 33 USC 408;
b. U.S. Army Corps of Engineers (USACE) Authorization pursuant to Section 10 of the Rivers and Harbors Act of 1899, and Section 404 of the Clean Water Act;
c. NJDEP Division of Land Use Regulation (DLUR) pursuant to the Freshwater Wetlands Protection Act Rules at N.J.A.C. 7:7A;
d. NJDEP Division of Land Use Regulation (DLUR) pursuant to the Flood Hazard Area Control Act Rules N.J.A.C. at 7:13;
e. NJDEP Division of Land Use Regulation (DLUR) pursuant to the Coastal Zone Management Rules N.J.A.C. at 7:7;
f. NJ Natural Heritage Program pursuant to the Office of Natural Lands Management protocols; and
g. Passaic County Soil Conservation District pursuant to the Soil Erosion and Sediment Control Act at N.J.A.C. 2:90.

2. US Army Corps of Engineers (USACE)

The Consultant shall determine if portions of the project take place on USACE owned property and include in the design State permits required in coastal waterways or wetlands, waterfront development areas, and waterways within 1000 feet of ordinary high water or mean high tide along the Delaware River adjacent to the D&R Canal.

Portions of the project including the bulkhead removal and/or replacement, reclamation of formerly filled area, and fence replacement adjacent to the Canal's bulkhead would likely take place on USACE owned property.

The project site is within the Delaware River and the Consultant shall include in the design the required permits from the NJDEP and United States Army Corps of Engineers (USACE).

3. State Historic Preservation Office Approval

The Consultant shall complete an "Application for Project Authorization under the New Jersey Register of Historic Places Act" and submit it to the State Historic Preservation Office for review and approval prior to securing the required UCC permits.

The "Application for Project Authorization Under the New Jersey Register of Historic Places Act" can be found at: http://www.nj.gov/dep/hpo/2protection/sr_revapp_min.pdf

C. PERMIT APPLICATIONS

The Consultant is responsible to prepare permit application packages for all State and Federal

Agencies. The Consultant shall identify any and all approvals needed, and any other costs associated with the new design and construction. The Consultant shall also develop a detailed estimate of construction costs.

D. DESIGN MEETINGS & PRESENTATIONS

1. Design Meetings

Conduct the appropriate number of review meetings with the Project Team members during each design phase of the project so they may determine if the project meets their requirements, question any aspect of the contract deliverables, and make changes where appropriate. The Consultant shall describe the philosophy and process used in the development of the design criteria and the various alternatives considered to meet the project objectives. Selected studies, sketches, cost estimates, schedules, and other relevant information shall be presented to support the design solutions proposed. Special considerations shall also be addressed such as: Contractor site access limitations, utility shutdowns and switchover coordination, phased construction and schedule requirements, security restrictions, available swing space, material and equipment delivery dates, etc.

It shall also be the responsibility of the Consultant to arrange and require all critical Sub-Consultants to be in attendance at the design review meetings.

Record the minutes of each design meeting and distribute within three (3) calendar days to all attendees and those persons specified to be on the distribution list by the Project Manager.

2. Design Presentations

The minimum number of design presentations required for each phase of this project is identified below for reference:

Schematic Phase: One (1) oral presentation at phase completion.

Design Development Phase: One (1) oral presentation at phase completion.

Final Design Phase: One (1) oral presentation at phase completion.

E. EXISTING DOCUMENTATION

Copies of the following documents will be provided to each Consulting firm at the pre-proposal meeting to assist in the bidding process.

- Feasibility Study Delaware River Access Improvement Kingwood Township, New Jersey, LAN Ref. #2.3397.197, Date January 27, 2025. Revised May 7, 2025, LAN Associates

Review these documents and any additional information that may be provided at a later date such as reports, studies, surveys, equipment manuals, as-built drawings, etc. The State does not attest to the accuracy of the information provided and accepts no responsibility for the consequences of errors by the use of any information and material contained in the documentation provided. It shall be the responsibility of the Consultant to verify the contents and assume full responsibility for any determination or conclusion drawn from the material used. If the information provided is insufficient, the Consultant shall take the appropriate actions necessary to obtain the additional information required.

All original documentation shall be returned to the provider at the completion of the project.

III. PERMITS & APPROVALS

A. NJ UNIFORM CONSTRUCTION CODE PLAN REVIEW AND PERMIT

The project construction documents must comply with the latest adopted edition of the NJ Uniform Construction Code (NJUCC).

The latest NJUCC Adopted Codes and Standards can be found at:

http://www.state.nj.us/dca/divisions/codes/codreg/

1. NJ Uniform Construction Code (NJUCC) Plan Review

Consultant shall estimate the cost of the NJUCC Plan Review by DCA and include that amount in their fee proposal line item entitled **"Plan Review and Permit Fee Allowance,"** refer to paragraph X.A.

Upon approval of the Final Design Phase Submission by DPMC, the Consultant shall submit the construction documents to the DCA, Bureau of Construction Project Review to secure a complete plan release.

As of July 25, 2022, the DCA is only accepting digital signatures and seals issued from a third party certificate authority.

Procedures for submission to the DCA Plan Review Unit can be found at:

https://www.state.nj.us/dca/divisions/codes/forms/pdf_bcpr/pr_app_guide.pdf
Consultant shall complete the "Project Review Application" and include the following on Block 5 as the "Owner's Designated Agent Name":

Trevor M. Dittmar, DPMC
PO Box 235
Trenton, NJ 08625-0235
Trevor.Dittmar@treas.nj.gov 609-984-5529

The Consultant shall complete the NJUCC "Plan Review Fee Schedule", determine the fee due and pay the NJUCC Plan Review fees, refer to Paragraph X.A.

The NJUCC "Plan Review Fee Schedule" can be found at:

http://www.state.nj.us/dca/divisions/codes/forms/pdf_bcpr/pr_fees.pdf

2. NJ Uniform Construction Code Permit

Upon receipt of a complete plan release from the DCA Bureau of Construction Project Review, the Consultant shall complete the NJUCC permit application and all applicable technical sub-code sections. The "Agent Section" of the application and certification section of the building sub-code section shall be signed. These documents, with **six (6) sets of DCA approved, signed and sealed construction documents** shall be forwarded to the DPMC Project Manager.

The Consultant may obtain copies of all NJUCC permit applications at the following website:

https://www.nj.gov/dca/divisions/codes/resources/constructionpermitforms.html

All other required project permits shall be obtained and paid for by the Consultant in accordance with the procedures described in Paragraph VIII.B.

3. Prior Approval Certification Letters

The issuance of a construction permit for this project may be contingent upon acquiring various "prior approvals" as defined by N.J.A.C. 5:23-1.4. It is the Consultant's responsibility to determine which prior approvals, if any, are required. The Consultant shall submit a general certification letter to the DPMC Plan & Code Review Unit Manager during the Permit Phase of this project that certifies all required prior approvals have been obtained.

In addition to the general certification letter discussed above, the following specific prior approval certification letters, where applicable, shall be submitted by the Consultant to the DPMC Plan & Code Review Unit Manager: Soil Erosion & Sediment Control; Water & Sewer Treatment Works Approval; Coastal Areas Facilities Review; Compliance of Underground Storage Tank Systems with N.J.A.C. 7:14B; Pinelands Commission; Highlands Council; Well Construction and Maintenance; Sealing of Abandoned Wells with N.J.A.C. 7:9D; Certification that all utilities have been disconnected from structures to be demolished; Board of Health Approval for Potable Water Wells; Health Department Approval for Septic Systems; and

Notification to Adjoining Property Owners with N.J.A.C. 5:23-2.17(c). It shall be noted that in accordance with N.J.A.C. 5:23-2.15(a)5, a permit cannot be issued until the letter(s) of certification is received.

4. Multi-building or Multi-site Permits

A project that involves many buildings and/or sites requires that a separate permit shall be issued for each building or site. The Consultant must determine the construction cost estimate for *each* building and/or site location and submit that amount where indicated on the permit application.

5. Special Inspections

In accordance with the requirements of the New Jersey Uniform Construction Code N.J.A.C. 5:23-2.20(b), Bulletin 03-5 and Chapter 17 of the International Building Code, the Consultant shall be responsible for the coordination of all special inspections during the construction phase of the project.

Bulletin 03-5 can be found at:

https://www.nj.gov/dca/codes/publications/pdf_bulletins/b_03_5.pdf

a. Definition

Special inspections are defined as an independent verification by a certified special inspector for **Class I buildings and smoke control systems in any class building**. The special inspector is to be independent from the Contractor and responsible to the Consultant so that there is no possible conflict of interest.

Special inspectors shall be certified in accordance with the requirements in the NJUCC.

b. Responsibilities

The Consultant shall submit with the permit application, a list of special inspections and the agencies or special inspectors that will be responsible to carry out the inspections required for the project. The list shall be a separate document, on letter head, signed and sealed.

B. OTHER REGULATORY AGENCY PERMITS, CERTIFICATES AND APPROVALS

The Consultant shall identify and obtain all other State Regulatory Agency permits, certificates, and approvals that will govern and affect the work described in this Scope of Work. An itemized list of these permits, certificates, and approvals shall be included with the Consultant's Technical

Proposal and the total amount of the application fees should be entered in the Fee Proposal line item entitled, **"Plan Review and Permit Fee Allowance."**
The Consultant may refer to the DPMC "Procedures for Architects and Engineers Manual," Paragraph "**9. REGULATORY AGENCY APPROVALS"** which presents a compendium of State permits, certificates, and approvals that may be required for this project.

The Consultant shall determine the appropriate phase of the project to submit the permit application(s) in order to meet the approved project milestone dates.

Where reference to an established industry standard is made, it shall be understood to mean the most recent edition of the standard unless otherwise noted. If an industry standard is found to be revoked, or should the standard have undergone substantial change or revision from the time that the Scope of Work was developed, the Consultant shall comply with the most recent edition of the standard.

IX. ALLOWANCES

A. PLAN REVIEW AND PERMIT FEE ALLOWANCE

The Consultant shall obtain and pay for all of the project permits in accordance with the guidelines identified below.

1. Permits

The Consultant shall determine the various permits, certificates, and approvals required to complete this project.

2. Permit Costs

The Consultant shall estimate the application fee costs for all of the required project permits, certificates, and approvals (excluding the NJUCC permit) and include that amount in its fee proposal line item entitled **"Plan Review and Permit Fee Allowance."** A breakdown of each permit and application fee shall be attached to the fee proposal for reference.
NOTE: The NJUCC permit is excluded since it will be paid for by the State.

3. Applications

The Consultant shall complete and submit all permit applications to the appropriate permitting authorities and the costs shall be paid from the Consultant's permit fee allowance. A copy of the application(s) and the original permit(s) obtained by the Consultant shall be given to the DPMC Project Manager for distribution during construction.

4. Consultant Fee

The Consultant shall determine what is required to complete and submit the permit applications, obtain supporting documentation, attend meetings, etc., and include the total cost in the base bid of its fee proposal under the "Permit Phase" column.

Any funds remaining in the permit allowance will be returned to the State at the close of the project.

X. SOW SIGNATURE APPROVAL SHEET

This Scope of Work shall not be considered a valid document unless all signatures appear in each designated area below.

The client agency approval signature on this page indicates that they have reviewed the design criteria and construction schedule described in this project Scope of Work (including the subsequent contract deliverables and exhibits) and verifies that the work will not conflict with the existing or future construction activities of other projects at the site.

SOW PREPARED BY: Alison F. Gottlieb 9/16/2025
ALISON F. GOTTLIEB, PROJECT MANAGER DATE
DPMC PROJECT PLANNING & INITIATION

SOW APPROVED BY: James Wright 9/16/2025
JAMES WRIGHT, MANAGER DATE
DPMC PROJECT PLANNING & INITIATION

SOW APPROVED BY: 10/7/25
WILLIAM C. WHITE, CONST. MGMT SPECIALIST 2 DATE
DEPARTMENT OF ENVIRONMENTAL PROTECTION

SOW APPROVED BY: Youstina Mansy 10/8/2025
YOUSTINA A. MANSY, PROJECT MANAGER DATE
DPMC PROJECT MANAGEMENT GROUP

SOW APPROVED BY: Jeanette M. Barnard 10.27.25
JEANETTE M. BARNARD, DEPUTY DIRECTOR DATE
DIV PROPERTY MGT & CONSTRUCTION

XI. CONTRACT DELIVERABLES

The following are checklists listing the Contract Deliverables that are required at the completion of each phase of this project. The Consultant shall refer to the DPMC publication entitled "Procedures for Architects and Engineers," 3.0 Edition, dated September 2022 available at https://www.nj.gov/treasury/dpmc/Assets/Files/ProceduresforArchitectsandEngineers.pdf for a detailed description of the deliverables required for each submission item listed. References to the applicable paragraphs of the "Procedures for Architects and Engineers" are provided.

Note that the Deliverables Checklist may include submission items that are "S.O.W. Specific Requirements." These requirements will be defined in the project specific scope of work and included on the deliverables checklist.

This project includes the following phases with the deliverables noted as "Required by S.O.W" on the Deliverables Checklist:

SCHEMATIC DESIGN PHASE;

DESIGN DEVELOPMENT PHASE;

FINAL DESIGN PHASE;

PERMIT APPLICATION PHASE;

BIDDING AND CONTRACT AWARD;

CONSTRUCTION PHASE; and

PROJECT CLOSE-OUT PHASE

XII. EXHIBITS

A. SAMPLE PROJECT SCHEDULE FORMAT
B. PROJECT SITE LOCATION MAP
C. PHOTOS
D. HARDSCAPE ACCESS EXAMPLE
E. FEASIBILITY STUDY

END OF SCOPE OF WORK

DPMC Project No.: P1365-00

Deliverables Checklist
Schematic Design Phase

A/E Name: _____

A/E Manual Reference	Submission Item	Required by S.O.W.		Previously Submitted		Enclosed	
		Yes	No	Yes	No	Yes	No
13.4.1.	A/E Statement of Site Visit						
13.4.2.	Narrative Description of Project						
13.4.3.	Building Code Information Questionnaire						
13.4.4.	Space Analysis						
13.4.5.	Special Features						
13.4.6.	Catalog Cuts						
13.4.7.	Site Evaluation						
13.4.8.	Subsurface Investigation						
13.4.9.	Surveys						
13.4.10.	Arts Inclusion						
13.4.11.	Design Rendering						
13.4.12.	Regulatory Approvals						
13.4.13.	Utility Availability						
13.4.14.	Drawings (6 Sets)						
13.4.15.	Specifications (6 Sets)						
13.4.16.	Current Working Estimate/Cost Analysis in CSI Format						
13.4.17.	Project Schedule						
13.4.18.	Formal Presentation						
13.4.19.	Scope of Work Compliance Statement						
13.4.20.	Schematic Design Phase Deliverables Checklist						
S.O.W. Reference	**S.O.W. Specific Requirements**						

This checklist shall be completed by the Design Consultant and included as the cover sheet of this submission to document to the DPMC the status of all the deliverables required by the project specific Scope of Work.

_____ _____

Consultant Signature Date

DPMC Project No.: P1365-00

Deliverables Checklist
Design Development Phase

A/E Name: _____

A/E Manual Reference	Submission Item	Required by S.O.W.		Previously Submitted		Enclosed	
		Yes	No	Yes	No	Yes	No
14.4.1.	A/E Statement of Site Visit						
14.4.2.	Narrative Description of Project						
14.4.3.	Building Code Information Questionnaire						
14.4.4.	Space Analysis						
14.4.5.	Special Features						
14.4.6.	Catalog Cuts						
14.4.7.	Site Evaluation						
14.4.8.	Subsurface Investigation						
14.4.9.	Surveys						
14.4.10.	Arts Inclusion						
14.4.11.	Design Rendering						
14.4.12.	Regulatory Approvals						
14.4.13.	Utility Availability						
14.4.14.	Drawings (6 Sets)						
14.4.15.	Specifications (6 Sets)						
14.4.16.	Current Working Estimate/Cost Analysis in CSI Format						
14.4.17.	Project Schedule						
14.4.18.	Formal Presentation						
14.4.19.	Plan Review/Scope of Work Compliance Statement						
14.4.20.	Design development Phase Deliverables Checklist						
S.O.W. Reference	**S.O.W. Specific Requirements**						

This checklist shall be completed by the Design Consultant and included as the cover sheet of this submission to document to the DPMC the status of all the deliverables required by the project specific Scope of Work.

_____ _____

Consultant Signature Date

Deliverables Checklist
Final Design Phase

A/E Name: _____

A/E Manual Reference	Submission Item	Required by S.O.W.		Previously Submitted		Enclosed	
		Yes	No	Yes	No	Yes	No
15.4.1.	A/E Statement of Site Visit						
15.4.2.	Narrative Description of Project						
15.4.3.	Building Code Information Questionnaire						
15.4.4.	Space Analysis						
15.4.5.	Special Features						
15.4.6.	Catalog Cuts						
15.4.7.	Site Evaluation						
15.4.8.	Subsurface Investigation						
15.4.9.	Surveys						
15.4.10.	Arts Inclusion						
15.4.11.	Design Rendering						
15.4.12.	Regulatory Approvals						
15.4.13.	Utility Availability						
15.4.14.	Drawings (6 Sets)						
15.4.15.	Specifications (6 Sets)						
15.4.16.	Current Working Estimate/Cost Analysis in CSI Format						
15.4.17.	Project Schedule						
15.4.18.	Formal Presentation						
15.4.19.	Plan Review/Scope of Work Compliance Statement						
15.4.20.	Final Design Phase Deliverables Checklist						
S.O.W. Reference	**S.O.W. Specific Requirements**						

This checklist shall be completed by the Design Consultant and included as the cover sheet of this submission to document to the DPMC the status of all the deliverables required by the project specific Scope of Work.

_____ _____

Consultant Signature Date

DPMC Project No.: P1365-00

Deliverables Checklist
Permit Application Phase

A/E Name: _____

A/E Manual Reference	Submission Item	Required by S.O.W.		Previously Submitted		Enclosed	
		Yes	No	Yes	No	Yes	No
16.1.	N.J. UCC Permit Application						
16.4.	Drawings, Signed and Sealed (6 Sets)						
16.5.	Specifications, Signed and Sealed (6 Sets)						
16.6.	Current Working Estimate/Cost Analysis in CI Format						
16.7.	Project Schedule						
16.8.	Plan Review/Scope of Work Compliance Statement						
16.9.	Permit Application Phase Deliverables Checklist						
S.O.W. Reference	**S.O.W. Specific Requirements**						

This checklist shall be completed by the Design Consultant and included as the cover sheet of this submission to document to the DPMC Project Manager the status of all the deliverables required by the project specific Scope of Work.

_____ _____

Consultant Signature Date

DPMC Project No.: P1365-00

Deliverables Checklist
Bidding and Contract Award Phase

A/E Name: _____

A/E Manual Reference	Submission Item	Required by S.O.W.		Previously Submitted		Enclosed	
		Yes	No	Yes	No	Yes	No
17.1.1.	Notice of Advertising						
17.1.2.	Bid Proposal Form						
17.1.3.	Bid Clearance Form						
17.1.4.	Drawings (6 Sets)						
17.1.5.	Specifications (6 Sets)						
17.1.6.	Construction Schedule						
17.3	Pre-Bid Conference/Mandatory Site Visit						
17.3.1.	Meeting Minutes						
17.4	Bulletins						
17.5	Post Bid Meeting						
17.6.	Contract Award "Letter of Recommendation"						
17.8.	Bid Protests - Hearings						
17.9.	Bidding and Contract Award Phase Deliverables Checklist						
S.O.W. Reference	**S.O.W. Specific Requirements**						

This checklist shall be completed by the Design Consultant and included as the cover sheet of this submission to document to the DPMC the status of all the deliverables required by the project specific Scope of Work.

_____ _____

Consultant Signature Date

Deliverables Checklist
Construction Phase

A/E Name: _____

A/E Manual Reference	Submission Item	Required by S.O.W.		Previously Submitted		Enclosed	
		Yes	No	Yes	No	Yes	No
18.2.	Pre-Construction Meeting						
18.3.	Submittal Log						
18.4.	Construction Schedule						
18.5.	Project Progress Meetings						
18.7.	Contractor's Invoicing and Payment Process						
18.8.	Contractor Submittals						
18.10.	Testing						
18.11.	Shop Drawings (6 Sets)						
18.12.	As-Built & Record Set Drawings (6 Sets)						
18.13.	Change Orders						
18.14.	Construction Photographs						
18.15.	Field Observations						
18.17.	Construction Phase Deliverables Checklist						
S.O.W. Reference	**S.O.W. Specific Requirements**						

This checklist shall be completed by the Design Consultant and included as the cover sheet of this submission to document to the DPMC the status of all the deliverables required by the project specific Scope of Work.

_____ _____

Consultant Signature Date

Deliverables Checklist
Project Close-Out Phase

A/E Name: _____

A/E Manual Reference	Submission Item	Required by S.O.W.		Previously Submitted		Enclosed	
		Yes	No	Yes	No	Yes	No
19.3.	Development of Punch List and Inspection Reports						
19.5.	Determination of Substantial Completion						
19.6.	Correction/Completion of Punch List						
19.7.	Submission of Close-Out Documentation						
19.7.1.	As-Built and Record Sets of Drawing (6 Sets)						
19.8.	Final Payment						
19.9.1.	Contractors Final Payment						
19.9.2.	A/E's Final Payment						
19.10.	Project Close-Out Phase Deliverables Checklist						
S.O.W. Reference	**S.O.W. Specific Requirements**						

This checklist shall be completed by the Design Consultant and included as the cover sheet of this submission to document to the DPMC the status of all the deliverables required by the project specific Scope of Work.

_____ _____

Consultant Signature Date

February 7, 1997
Rev.: January 29, 2002

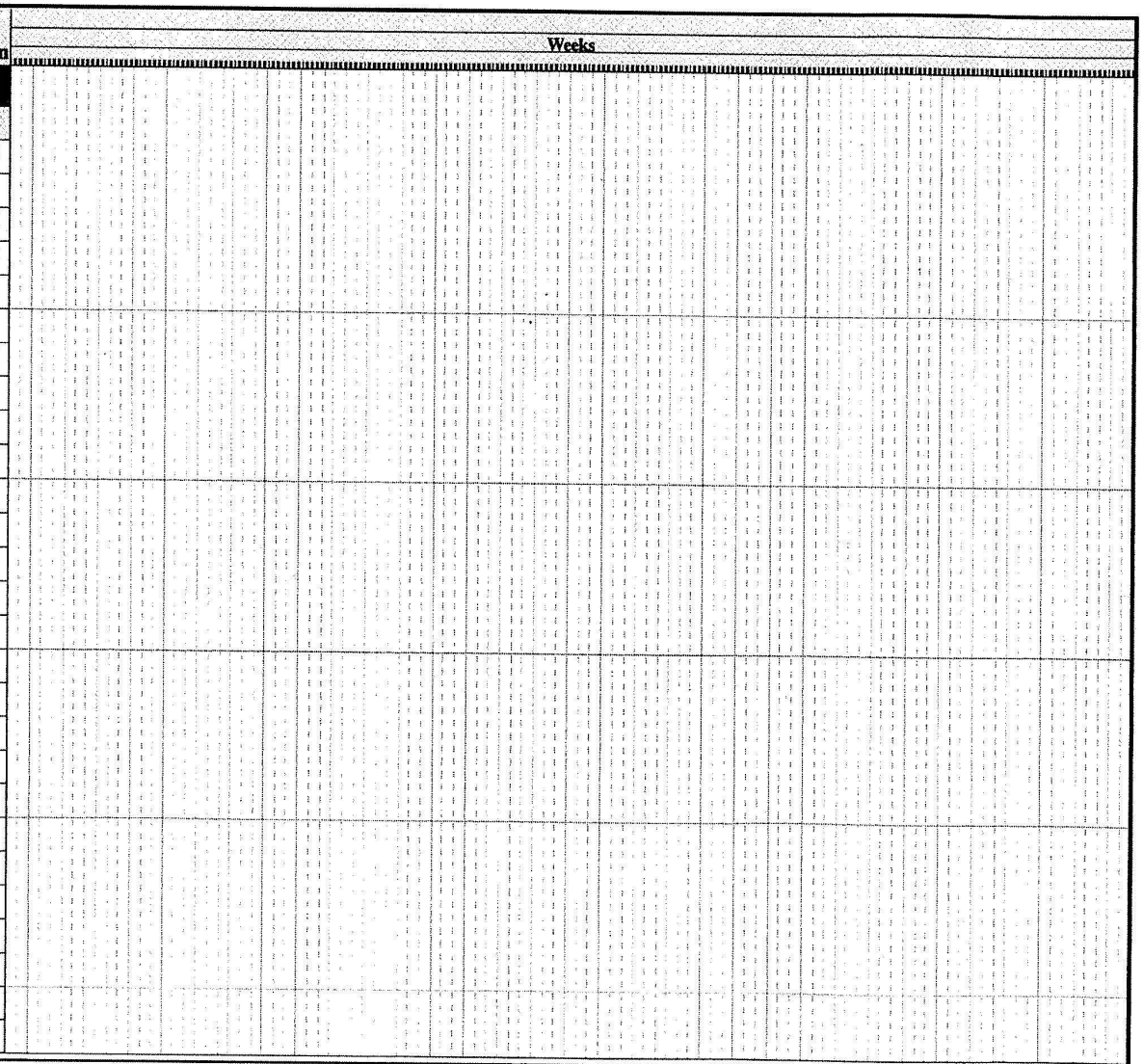
Responsible Group Code Table

The codes below are used in the schedule field "GRP" that identifies the group responsible for the activity. The table consists of groups in the Division of Property Management & Construction (DPMC), as well as groups outside of the DPMC that have responsibility for specific activities on a project that could delay the project if not completed in the time specified. For reporting purposes, the groups within the DPMC have been defined to the supervisory level of management (i.e., third level of management, the level below the Associate Director) to identify the "functional group" responsible for the activity.

CODE	DESCRIPTION	REPORTS TO ASSOCIATE DIRECTOR OF:
CM	Contract Management Group	Contract Management
CA	Client Agency	N/A
CSP	Consultant Selection and Prequalification Group	Technical Services
A/E	Architect/Engineer	N/A
PR	Plan Review Group	Technical Services
CP	Construction Procurement	Planning & Administration
CON	Construction Contractor	N/A
FM	Financial Management Group	Planning & Administration
OEU	Office of Energy and Utility Management	N/A
PD	Project Development Group	Planning & Administration

EXHIBIT 'A'

Activity ID	Description	Rspn
<PROJ>		
Design		
CV3001	Schedule/Conduct Predesign/Project Kick-Off Mtg.	CM
CV3020	Prepare Program Phase Submittal	AE
CV3021	Distribute Program Submittal for Review	CM
CV3027	Prepare & Submit Project Cost Analysis (DPMC-38)	CM
CV3022	Review & Approve Program Submittal	CA
CV3023	Review & Approve Program Submittal	PR
CV3024	Review & Approve Program Submittal	CM
CV3025	Consolidate & Return Program Submittal Comments	CM
CV3030	Prepare Schematic Phase Submittal	AE
CV3031	Distribute Schematic Submittal for Review	CM
CV3037	Prepare & Submit Project Cost Analysis (DPMC-38)	CM
CV3032	Review & Approve Schematic Submittal	CA
CV3033	Review & Approve Schematic Submittal	PR
CV3034	Review & Approve Schematic Submittal	CM
CV3035	Consolidate & Return Schematic Submittal Comment	CM
CV3040	Prepare Design Development Phase Submittal	AE
CV3041	Distribute D. D. Submittal for Review	CM
CV3047	Prepare & Submit Project Cost Analysis (DPMC-38)	CM
CV3042	Review & Approve Design Development Submittal	CA
CV3043	Review & Approve Design Development Submittal	PR
CV3044	Review & Approve Design Development Submittal	CM
CV3045	Consolidate & Return D.D. Submittal Comments	CM
CV3050	Prepare Final Design Phase Submittal	AE
CV3051	Distribute Final Design Submittal for Review	CM
CV3052	Review & Approve Final Design Submittal	CA
CV3053	Review & Approve Final Design Submittal	PR
CV3054	Review Final Design Submitl for Constructability	OCS



NOTE:
Refer to section "IV Project Schedule" of the Scope of Work for contract phase durations.

DBCA - TEST

Sheet 1 of 3

Bureau of Design & Construction Services

EXHIBIT 'A'

Activity ID	Description	Rspn	Weeks
CV3055	Review & Approve Final Design Submittal	CM	
CV3056	Consolidate & Return Final Design Comments	CM	
CV3060	Prepare & Submit Permit Application Documents	AE	
CV3068	Prepare & Submit Bidding Cost Analysis (DPMC-38)	CM	
Plan Review-Permit Acquisition			
CV4001	Review Constr. Documents & Secure UCC Permit	PR	
CV4010	Provide Funding for Construction Contracts	CA	
CV4020	Secure Bid Clearance	CM	
Advertise-Bid-Award			
CV5001	Advertise Project & Bid Construction Contracts	CP	
CV5010	Open Construction Bids	CP	
CV5011	Evaluate Bids & Prep. Recommendation for Award	CM	
CV5012	Evaluate Bids & Prep. Recommendation for Award	AE	
CV5014	Complete Recommendation for Award	CP	
CV5020	Award Construction Contracts/Issue NTP	CP	
Construction			
CV6000	Project Construction Start/Issue NTP	CM	
CV6001	Contract Start/Contract Work (25%) Complete	CON	
CV6002	Preconstruction Meeting	CM	
CV6003	Begin Preconstruction Submittals	CON	
CV6004	Longest Lead Procurement Item Ordered	CON	
CV6005	Lead Time for Longest Lead Procurement Item	CON	
CV6006	Prepare & Submit Shop Drawings	CON	
CV6007	Complete Construction Submittals	CON	
CV6011	Roughing Work Start	CON	
CV6012	Perform Roughing Work	CON	
CV6010	Contract Work (50%+) Complete	CON	
CV6013	Longest Lead Procurement Item Delivered	CON	
CV6020	Contract Work (75%) Complete	CON	

NOTE:
Refer to section "IV Project Schedule" of the Scope of Work for contract phase durations.

Bureau of Design & Construction Services

EXHIBIT 'A'

Activity ID	Description	Rspn	Weeks
CV6014	Roughing Work Complete	CON	
CV6021	Interior Finishes Start	CON	
CV6022	Install Interior Finishes	CON	
CV6030	Contract Work to Substantial Completion	CON	
CV6031	Substantial Completion Declared	CM	
CV6075	Complete Deferred Punch List/Seasonal Activities	CON	
CV6079	Project Construction Complete	CM	
CV6080	Close Out Construction Contracts	CM	
CV6089	Construction Contracts Complete	CM	
CV6090	Close Out A/E Contract	CM	
CV6092	Project Completion Declared	CM	

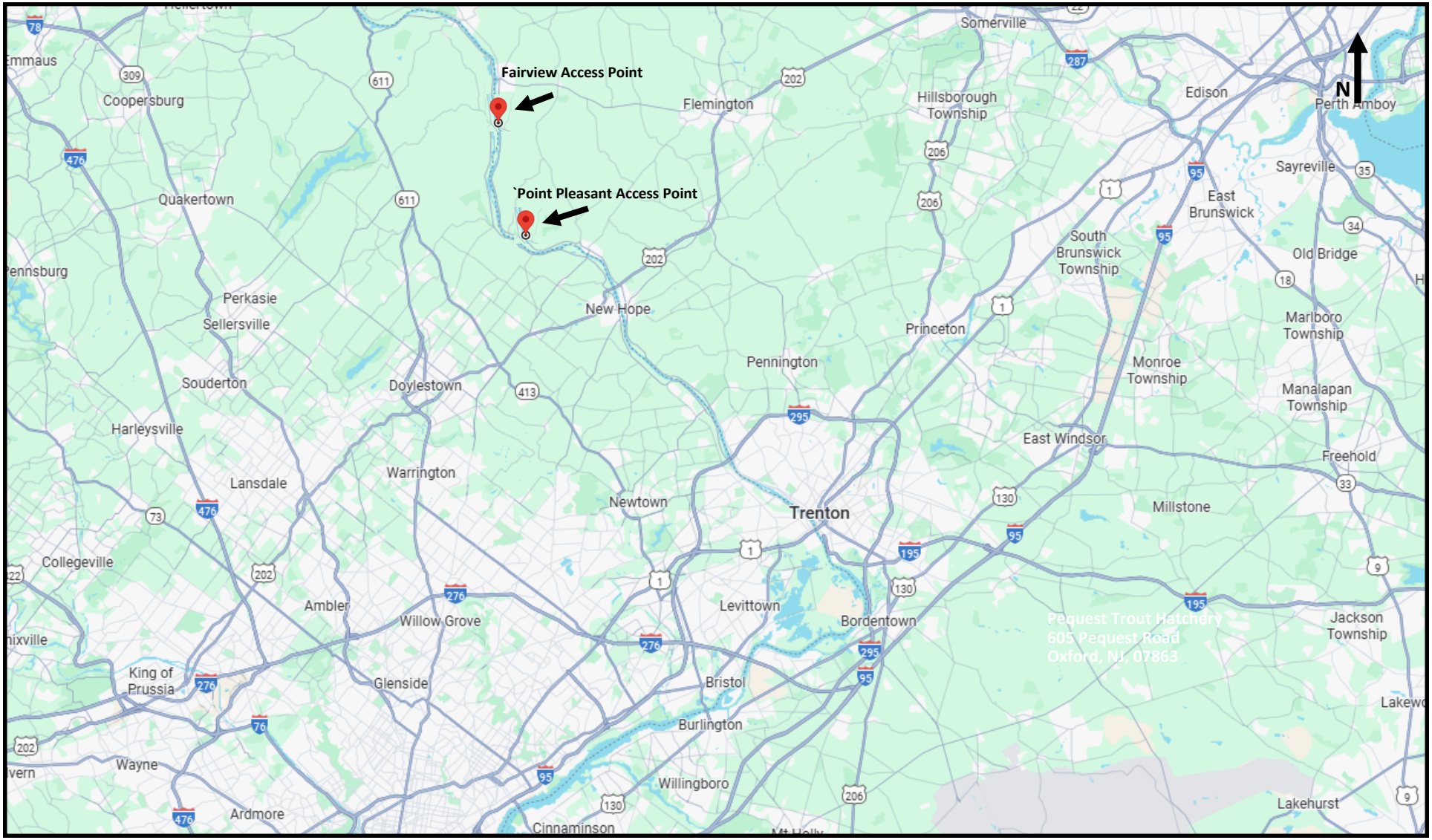
NOTE:
Refer to section "IV Project Schedule" of the Scope of Work for contract phase durations.

DBCA - TEST

Sheet 3 of 3

Bureau of Design & Construction Services

EXHIBIT 'A'



Project Site Location Map

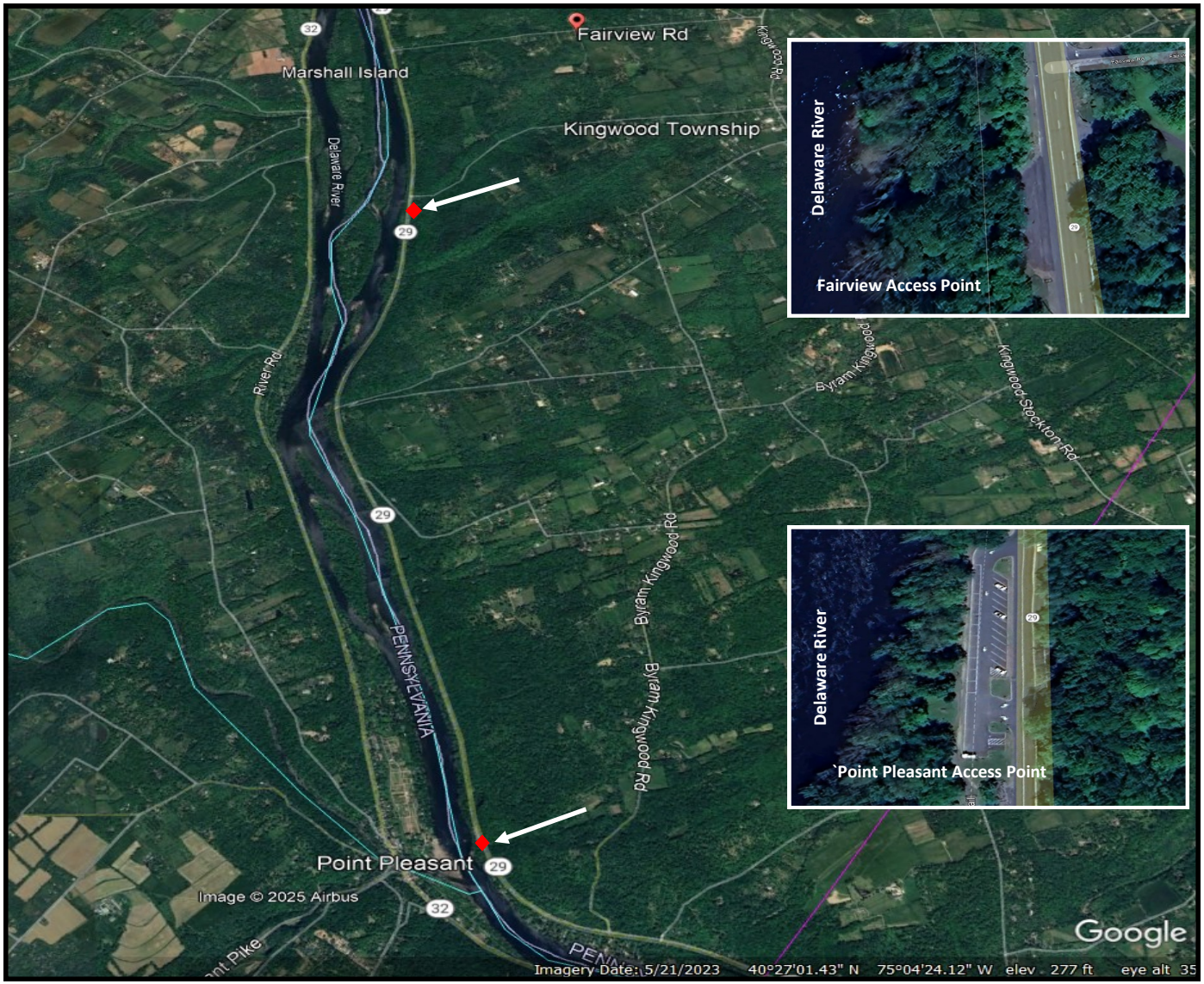
D & R Canal State Park

EXHIBIT 'B'

Project Location Map

D & R Canal State Park

EXHIBIT 'B'



Project Site

D & R Canal State Park

EXHIBIT 'B'

Fairview Road Access Point

Photos

D & R Canal State Park

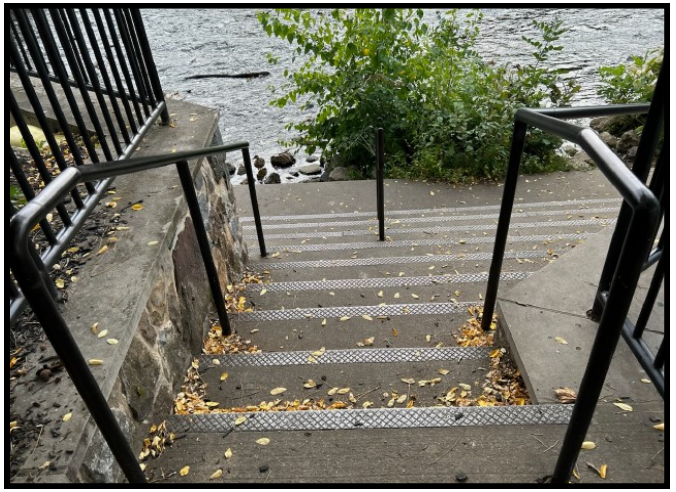
EXHIBIT ‘C’

Point Pleasant Access Point

Photos

D & R Canal State Park

EXHIBIT 'C'



Hardscape Access Example

D & R Canal State Park

EXHIBIT ‘D’

FEASIBILITY STUDY
DELAWARE RIVER ACCESS IMPROVEMENT
KINGWOOD TOWNSHIP, NEW JERSEY

LAN Job #2.3397.197

Submitted to:
New Jersey Department of Environmental Protection
Natural & Historic Resources
Office of Resource Development
275 Freehold-Englishtown Road
Englishtown, NJ 07729-8813

LAN Ref. #2.3397.197
January 27, 2025
Revised May 7, 2025

LAN ASSOCIATES

EXHIBIT 'E'

TABLE OF CONTENTS

FEASIBILITY STUDY REPORT

EXHIBIT 'E'

1.0 INTRODUCTION:

LAN Associates was retained by the New Jersey Department of Environmental Protection (NJDEP) Office of Resource Development to perform a feasibility study for improved hardscaping access to the Delaware River at the Fairview Road and Point Pleasant River Access Points. These access points are located on Block 50 Lot 100 within the Township of Kingwood in Hunterdon County, New Jersey. They are part of the Delaware and Raritan Canal State Park, providing users with recreational access to the Delaware River for activities such as tubing, canoeing and kayaking. The New Jersey Department of Environmental Protection Parks, Forests and Historic Sites ("Parks") owns and manages the Delaware and Raritan (D&R) Canal and towpath as a state park.

Currently, Parks utilizes existing temporary wooden stair structures designed to be used for the tubing season between May 15th and October 15th. These temporary structures can also be removed in the event of flooding. The temporary removable stairs have proven to be rather awkward and heavy to remove, and especially, install.

Parks would like to install a permanent solution to provide river access at each of these sites and replace the temporary removable stair structures. Parks is interested in pursuing hardscaped stairs or ramp options that would withstand both frequent and less frequent storm events. It is understood that the improved tubing launch areas shall provide a level platform that would allow at least two rows of people to enter the river at a time.

LAN was retained to investigate the feasibility of designing such permanent Delaware River access solutions and to evaluate:

i. Site conditions and restrictions;
ii. Similar launch areas along the Delaware River and other comparable locations;
iii. Pros and cons of various options;
iv. Suitable materials and safety;
v. Expected maintenance of various options;
vi. Estimated construction costs of various options;
vii. Permitting requirements.

2.0 EXISTING CONDITIONS & UNDERSTANDING OF NEEDS:

To begin the feasibility study, LAN has reviewed the existing conditions to identify the current site restrictions, uses and challenges associated with the existing temporary wooden stairs method of river access. To fully understand the project needs, LAN performed site investigations and discussed the difficulties with those who regularly maintain the temporary removable wooden stairs.

The following documents regarding the existing temporary wooden stairs were reviewed:

1. US Army Corps of Engineers Department of the Army Permit dated December 19, 2013
2. Delaware and Raritan Canal Commission General Permit No. 1 dated May 8, 2020
3. NJDEP Flood Hazard Area Individual Permit dated June 3, 2020
4. "Fairview Road – Site Plan" prepared by LAN Associates, Inc. dated March 9, 2020, last revised June 2, 2020
5. "Point Pleasant – Site Plan" prepared by LAN Associates, Inc. dated March 9, 2020, last revised June 2, 2020.

Under current conditions, there are busloads of visitors brought to the Fairview Road and Point Pleasant River Access Points to launch tubes. These users have struggled to access the river using the existing temporary wooden stairs put in place causing a long lead time to enter and exit the water. Therefore, it is understood that the improved tube launch areas shall provide a level platform that would be wide enough to allow two or more rows of people to enter the river at a time. Improving the width and accessibility of the tube launch areas will decrease this queuing effect by making it easier for more users to enter and exit the water in a shorter amount of time. This will enhance the user experience and operation of these two access points.

In addition to providing a more level and wider solution, Parks wishes to implement a permanent hardscaped strategy. The existing removable wooden stairs structures at the river access points have proven to be an unsustainable method since they are not easy to move and maintain. According to the description within the NJ D&R Canal State Park General Permit No. 1, dated May 8, 2020, and NJDEP FHA Individual Permit, dated June 3, 2020, the existing removable wooden stairs are constructed with stair stringers secured with screw anchors and tie-off cables at the top and middle portion of the stairs. The bottom of the stairs is not secured so that this portion can be removed during periods when the surface of the Delaware River is elevated by 12.6 feet or more, as measured by the U.S. Geological Survey Gage located at Riegelsville, PA. The anchors remain in place after the temporary stairs are removed throughout the tubing season. Parks maintenance staff are required to remove the heavy bottom ladder periodically throughout the tubing season based on the river flow conditions.

Given the recent increase in larger rainfall events as well as future projections, too much effort is needed to continue to maintain the existing removable wooden stairs as designed. During the tubing season, each time there is anticipated flooding, Parks must remove, transport and store the removable wooden stairs. Parks is looking for a replacement of these seasonal temporary wooden stairs structures that will require less maintenance and can remain in-place permanently through on-and-off seasons and withstand 99% of all storm events.

A site investigation was conducted on October 11, 2024 to visually assess the current conditions of the subject Fairview Road and Point Pleasant River Access Points. Site investigations were additionally conducted at other river access points along the D&R Canal within the State Park including the Kingwood Boat Launch, Byram Boat Launch, Bulls Island Recreational Area Boat Launch and Fireman's Eddy River Access. These other sites were visited to offer insight into other existing methods of river access, to assess the design, functionality and durability of these access methods, and to understand if any of these existing methods could be implemented at the subject sites. This part of the investigation will be further discussed in Section 3 of this report.

At the Fairview Road location, the tubing launch site is easy to find by following the woodchipped path along the post and rail fencing. The river access point is at the end of the path. The temporary wooden stairs structure was being stored on the ground a few feet back from the access point as shown in Exhibit A Photo 3. The access point has a woodchipped surface at the top of the bank then drops off to muddier conditions at the water's edge. With the current change in surface elevations of about 4-5 feet, there is no safe way to access the river here other than when the removeable stairs are in place. As presented in Exhibit A Photos 6-9, the exposed soil bank shows evidence of continued erosion. The access point would benefit from stabilizing improvements to prevent further erosion. This access point is narrower than the Point Pleasant tubing launch site and is likely to get overcrowded with larger groups of tubing visitors.

EXHIBIT A	FAIRVIEW ROAD ACCESS POINT EXISTING CONDITIONS

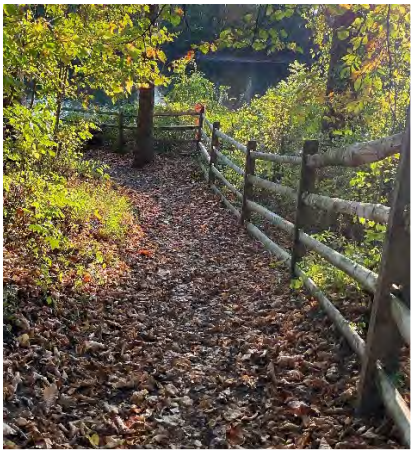


Photo 1

Photo 2

Photo 3

Photo 4

Photo 5

Photo 6

Photo 7

Photo 8

Photo 9

At the Point Pleasant location, the post and rail fencing is used to navigate to the tubing launch point at the end of the woodchipped path. This site is wider and more open than the Fairview Road site and has a longer path leading to the river access point. It also has a significantly higher drop-off of about 10 feet down to the water's edge. A woodchipped surface is at the top of the bank and the bottom is sandy at the water's edge.

There is no safe way to access the river here other than when the temporary stairs are in place. As presented in Exhibit B Photos 4-7, the exposed soil bank shows evidence of continued erosion and this site

would benefit from stabilizing improvements to prevent further erosion. The temporary wooden stairs structure and tie off cables were being stored on the ground about 15 feet back from the access point as shown in Exhibit B Photo 3. The loops and anchors for the tie off cables were visible in place along the bank as shown in Exhibit B Photos 7-8.

EXHIBIT B	POINT PLEASANT ACCESS POINT EXISTING CONDITIONS

Photo 1

Photo 2

Photo 3

Photo 4

Photo 5

Photo 6

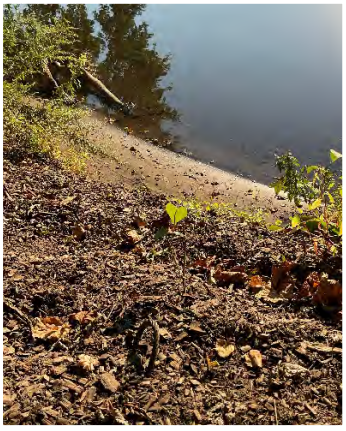


Photo 7

Photo 8

Photo 9

In terms of site constraints, larger equipment such as a bulldozer would have an easier time accessing the Point Pleasant site versus the Fairview Road site because of the wider path leading to it. The steepness of the banks at both sites is also factored into the constraints to be considered. Most likely, both sites will require some level of regrading the bank and installation of hard armoring or other methods to protect

against further erosion. Such improvements may also result in minimal vegetation clearance. Construction of these improvements are likely to involve some water control methods such as diversion or damming within the Delaware River. Although the river access points are near the parking lots at both sites, the tube launch points can only be accessed by foot compared to being able to drive up to the river access points at most of the other launch points within the State Park.

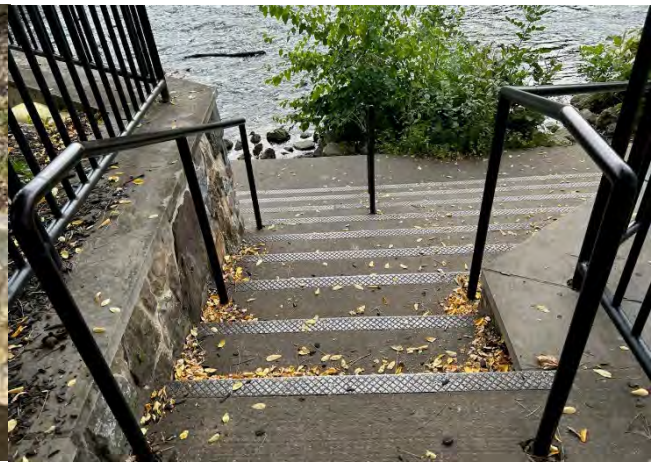
The removeable wooden stairs are large heavy structures that require more than one person to lift and install. Placing and removing the stairs is partially causing erosion of the exposed soil bank. Heavy run-off flows are also contributing to the erosion from rushing down the steep face of bare soil. Furthermore, storage of these structures on-site at the access points may present issues such as visitors attempting to move or install them themselves. This could cause damage to the equipment or present safety concerns if visitors who are untrained in the installation attempt to do so. The Fairview Road and Point Pleasant River Access Points are unusable when the stairs are not in place. Therefore, the proposed method of river access at these two sites will be permanently in-place and protective of the banks.

3.0 DESIGN ALTERNATIVES:

LAN discussed the overall vision for the river access point improvements with the NJDEP Office of Resource Development and the NJDEP Parks, Forests and Historic Sites. Per these discussions, LAN analyzed different options for tubing access design alternatives that fit the desired criteria. Other launch areas along the D&R Canal were investigated and research of various river access methods and relevant guidance documentation was performed to produce the following design alternative analysis. This section of the report presents different options for permanent tubing access solutions and identifies their strengths, weaknesses, anticipated maintenance and construction costs, as well as their overall suitability for the Fairview Road and Point Pleasant sites.

3.1 OPTION 1: HARDSCAPE STAIRS + RETAINING WALL

Parks provided LAN with the images below that show hardscape stairs that access the South Branch Raritan River in downtown Clinton, New Jersey. The bank of the river here is a built stone bulkhead along the concrete paved plaza and roads in the center of town. Although this site is not directly comparable to the Fairview Road and Point Pleasant Access Points in the D&R Canal State Park, it does provide inspiration in determining ways for similar applications.



The images below show examples of hardscape stairs built with retaining walls. The steps can be constructed from different types of materials such as concrete pavers, stone pavers, concrete blocks, bricks or poured concrete. Concrete pavers are durable, cost-effective and can resemble other materials such as brick, stone or slate based on the forms and colors they are made from. Stone pavers are 100% natural and there are a variety of stone types to choose from that vary in price. Concrete can also be poured to form concrete slabs as the steps for

hardscape stairs and as the walls. These concrete slabs can be stamped to add texture or pattern into the steps, which can help increase the traction.

The blocks used for a masonry retaining wall need to be able to lock together so that the blocks do not slide forward from the pressure of the earth being retained behind it. To provide lower walls on steeper slopes, a stepped or terraced retaining wall can be used as shown in the fourth example photo below.

Once the material is selected, the bank would be excavated in the location of the proposed walls and stairs. First, a trench is dug out for the wall footing to be built. The retaining wall steps are built after completing the wall footing, placing 6 inches of compacted ¾-inch crushed gravel base material beneath and behind each step. The riser and tread dimension of the steps will depend on the dimensions of the pavers used or concrete slabs poured. These dimensions can vary based on the needs of the sites but should remain consistent with standard 6–7-inch riser height and 10-12-inch tread length. A 4-inch diameter perforated drainage pipe is placed on non-woven filter fabric and installed behind the first course of block. This is best practice to allow water to daylight out the sides and prevent saturation of the soil creating excess surcharge on the wall, which could result in failure of the wall.

Once the retaining wall steps are complete, the retaining wall is constructed on each side of the steps. As the blocks are stacked, filter fabric is laid out every two course of blocks as backfill is added of washed ¾-inch gravel behind the wall in the excavated area. For taller walls (greater than 3-4 feet) geogrid is installed between the layer of blocks and laid back into the gravel backfill as far back as the height of the wall. The top course of blocks will require an adhesive to be used to have the top blocks or caps remain in place. The last 6-12 inches from the top of the wall is backfilled with topsoil which will blend into the rest of the bank behind the wall.

This option for hardscape stairs would be a feasible solution at both locations given the steep slopes at each launch point. This method is similar to the existing means of river access while achieving the permanency desired. Installing handrails would increase the safety of this access method.

EXHIBIT 'E'

3.1.A POTENTIAL ADVANTAGES:

1. The retaining wall stairs could be built as wide as needed for the appropriate amount of tubing users to be able to access the river at once.
2. Aside from the excavation, there would be less heavy equipment use required for construction. The retaining wall and steps would be mostly constructed by hand.
3. Both the hardscape stairs and retaining wall would prevent erosion along the shoreline and protect the bank.
4. Concrete, pavers or stone provide a highly stable, level, and highly durable surface for river access. These materials ensure a long lifespan and require low maintenance.
5. The materials of the retaining wall and steps are able to be submerged and would withstand both smaller and larger storm events and flooding. When using concrete, it should be high PSI air-entrained concrete.
6. Hardscape stairs built in a retaining wall can offer river access at a range of water levels.
7. This option can be combined with a boat rail along the edge of the stairs to be able to transport smaller boats into the water as well.
8. The steep slopes of the Fairview Road and Point Pleasant River Access Points suggest that hardscape stairs would be the best option for getting users from the existing higher elevation of the top of the bank down to the lower elevation of the "toe" of the shoreline. Therefore, the function of the proposed hardscape stairs would not differ much from the current function of when the removeable wooden stairs are installed. However, it would greatly improve the launch area by creating permanent stairs to replace the temporary removeable wooden stairs that have required too much maintenance. The permanent hardscape stairs would be much more stable and easier for tubing visitors to descend and ascend than the existing removeable wooden stairs.

3.1.B POTENTIAL DISADVANTAGES:

1. Retaining walls can become expensive, especially when they become taller. The materials themselves can be expensive, and the design costs and level of permitting will increase based on the wall height. A retaining wall greater than 4 feet in height will require structural engineer certification.
2. The paver material used for these hardscape stairs can become slippery when wet, especially if using more natural stone pavers. Using concrete slab steps with a broom-finish and ¼-inch deep grooves would increase the safety of this option by providing adequate traction.

3.1.C ANTICIPATED MAINTENANCE:

This option for improved river access would be a low-maintenance option. However, retaining walls are prone to natural wear and tear that should be monitored. Cold weather can create cracks in the blocks, impacting the integrity of the wall and steps. Throughout the winter and spring, the hardscaped stairs and walls should be inspected a few times for any cracks in the blocks and any gaps between them. Maintenance may include patching any gaps forming between the blocks, using sealants to address small cracks, and consistently eliminating weeds. Depending on the materials used for the steps, maintenance may involve regularly resealing to avoid water intrusion.

The wall should also be inspected for loose blocks or bulges that could be caused by soil shifting or becoming oversaturated, which will have to be corrected to keep the wall intact. Maintenance should involve inspecting the drainage pipe for any damage or clogs and clearing sediment build up. Checking for settlement and eroded areas at the top surface of the wall should also be included in the regular seasonal inspections. Any erosion that has occurred should have the soil replaced and seeded so that runoff

isn't pooling in these areas. To best maintain the walls, plants can be used to keep the soil compacted and the roots will help hold soil in place and reduce erosion.

3.1.D CONSTRUCTION COST ESTIMATE:

The cost of this hardscape stairs option will be dependent on the material selected and overall design of what the stairs and wall will look like. For the purposes of this feasibility analysis, the order of magnitude cost estimate assumes a 15-foot-long shoreline protection retaining wall with a maximum height of 12 feet, and 15 5-foot-wide steps. RS Means Data was referenced to obtain the following cost estimates based on the different construction materials and types of walls.

Option 1 - Hardscape Stairs + Retaining Wall (Concrete)					
Item No.	Description	Quantity	Unit	Unit Cost ($)	Cost ($)
	Division 1 - General Requirements				
1	*Mobilization and Demobilization*	1	LUMP	$10,000.00	$10,000.00
2	*Strip Site*	0.5	DAY	$2,000.00	$1,000.00
3	*Site Dumpsters*	4	EA	$1,500.00	$6,000.00
	Sub-Total				***$17,000.00***
	Division 3 - Concrete				
4	*Cast In Place, Stairs (3,500 PSI) Forms, Rebar*	2	CY	$750.00	$1,500.00
	Sub-Total				***$1,500.00***
	Division 31 - Earthwork				
5	*Rough Grading Site, Bulldozer + Operator*	1	DAY	$2,000.00	$2,000.00
6	*Excavation, Excavator + Operator*	1	DAY	$2,500.00	$2,500.00
	Sub-Total				***$4,500.00***
	Division 32 - Exterior Improvements				
7	*Base Course 3/4" Crushed Stone, 6" Deep*	75	SF	$25.00	$1,875.00
8	*Retaining Wall Gravel Backfill*	180	SF	$25.00	$4,500.00
9	*Geogrid Reinforcement*	540	SF	$5.00	$2,700.00
10	*4" Perforated Drainage Pipe*	15	LF	$20.00	$300.00
11	*Non-woven Filter Fabric*	15	SF	$3.00	$45.00
12	*Seeding and Fine Grading*	350	SF	$10.00	$3,500.00
	Sub-Total				***$12,920.00***
	Division 35 - Waterway and Marine Construction				
13	*Shoreline Protection Concrete Retaining Wall, 12' Max Height*	7	CY	$750.00	$5,250.00
14	*Shoreline Protection Concrete Retaining Wall Footing*	1	CY	$500.00	$500.00
	Sub-Total				***$5,750.00***
	Site Work Construction Estimate Sub-Total				$41,670.00
	Engineering Design Work (10%)				$4,167.00
	Bonds & Insurance (15%)				$6,250.50
	Contingency (10%)				$4,167.00
	COST ESTIMATE TOTAL :				**$56,254.50**

Option 1A - (15) 5 Ft-Wide Hardscape Stairs + 15 Ft-Long Retaining Wall (Concrete)					
Item No.	Description	Quantity	Unit	Unit Cost ($)	Cost ($)
	Division 1 - General Requirements				
1	*Mobilization and Demobilization*	1	LUMP	$10,000.00	$10,000.00
2	*Strip Site*	0.5	DAY	$2,000.00	$1,000.00
3	*Site Dumpsters*	4	EA	$1,500.00	$6,000.00
	Sub-Total				***$17,000.00***
	Division 3 - Concrete				
4	*Cast In Place, Concrete Footing for Wall*	6	CY	$650.00	$3,900.00
5	*Cast In Place, Concrete Retaining Wall*	7	CY	$750.00	$5,250.00
6	*Cast In Place, Concrete Stairs with Forms*	6	CY	$1,500.00	$9,000.00
	Sub-Total				***$18,150.00***
	Division 31 - Earthwork				
7	*Shoring*	150	SF	$100.00	$15,000.00
8	*Excavation for Wall*	2	DAY	$2,500.00	$5,000.00
9	*Excavation for Stairs*	1	DAY	$2,500.00	$2,500.00
10	*Grading and Seeding*	250	SF	$10.00	$2,500.00
	Sub-Total				***$25,000.00***
	Division 32 - Exterior Improvements				
11	*Retaining Wall Stone Backfill*	360	SF	$25.00	$9,000.00
12	*Retaining Wall Dirt Backfill*	1	DAY	$2,500.00	$2,500.00
	Sub-Total				***$11,500.00***
	Site Work Construction Estimate Sub-Total				$71,650.00
	Bonds & Insurance (15%)				$10,747.50
	Engineering Design Work (10%)				$7,165.00
	Contingency (10%)				$7,165.00
	COST ESTIMATE TOTAL :				**$96,727.50**

Option 1 - Hardscape Stairs + Retaining Wall (Paver)					
Item No.	Description	Quantity	Unit	Unit Cost ($)	Cost ($)
	Division 1 - General Requirements				
1	*Mobilization and Demobilization*	1	LUMP	$10,000.00	$10,000.00
2	*Strip Site*	0.5	DAY	$2,000.00	$1,000.00
3	*Site Dumpsters*	2	EA	$1,500.00	$3,000.00
	Sub-Total				***$14,000.00***
	Division 4 - Masonry				
4	*Standard Brick Masonry Stairs*	75	SF	$45.00	$3,375.00
	Sub-Total				***$3,375.00***
	Division 31 - Earthwork				
5	*Rough Grading Site, Bulldozer + Operator*	1	DAY	$2,000.00	$2,000.00
6	*Excavation, Excavator + Operator*	1	DAY	$2,500.00	$2,500.00
	Sub-Total				***$4,500.00***
	Division 32 - Exterior Improvements				
7	*Base Course 3/4" Crushed Stone, 6" Deep*	75	SF	$25.00	$1,875.00
8	*Retaining Wall Gravel Backfill*	180	SF	$25.00	$4,500.00
9	*Geogrid Reinforcement*	540	SF	$5.00	$2,700.00
10	*4" Perforated Drainage Pipe*	15	LF	$20.00	$300.00
11	*Non-woven Filter Fabric*	15	SF	$3.00	$45.00
12	*Seeding and Fine Grading*	350	SF	$10.00	$3,500.00
	Sub-Total				***$12,920.00***
	Division 35 - Waterway and Marine Construction				
13	*Shoreline Protection Paver Retaining Wall, 12' Max Height*	180	SF	$45.00	$8,100.00
14	*Shoreline Protection Paver Retaining Wall Footing*	1	CY	$500.00	$500.00
	Sub-Total				***$8,600.00***
	Site Work Construction Estimate Sub-Total				$43,395.00
	Engineering Design Work (10%)				$4,339.50
	Bonds & Insurance (15%)				$6,509.25
	Contingency (10%)				$4,339.50
	COST ESTIMATE TOTAL :				**$58,583.25**

EXHIBIT 'E'

Option 1 - Hardscape Stairs + Retaining Wall (Stone)					
Item No.	Description	Quantity	Unit	Unit Cost ($)	Cost ($)
	Division 1 - General Requirements				
1	*Mobilization and Demobilization*	1	LUMP	$10,000.00	$10,000.00
2	*Strip Site*	0.5	DAY	$2,000.00	$1,000.00
3	*Site Dumpsters*	4	EA	$1,500.00	$1,000.00
	Sub-Total				***$12,000.00***
	Division 4 - Masonry				
4	*Stone Masonry Stairs*	75	SF	$55.00	$4,125.00
	Sub-Total				***$4,125.00***
	Division 31 - Earthwork				
5	*Rough Grading Site, Bulldozer + Operator*	1	DAY	$2,000.00	$2,000.00
6	*Excavation, Excavator + Operator*	1	DAY	$2,500.00	$2,500.00
	Sub-Total				***$4,500.00***
	Division 32 - Exterior Improvements				
7	*Base Course 3/4" Crushed Stone, 6" Deep*	75	SF	$25.00	$1,875.00
8	*Retaining Wall Gravel Backfill*	180	SF	$25.00	$4,500.00
9	*Geogrid Reinforcement*	540	SF	$5.00	$2,700.00
10	*4" Perforated Drainage Pipe*	100	LF	$20.00	$2,000.00
11	*Non-woven Filter Fabric*	100	SF	$3.00	$300.00
12	*Seeding and Fine Grading*	350	SF	$10.00	$3,500.00
	Sub-Total				***$14,875.00***
	Division 35 - Waterway and Marine Construction				
13	*Shoreline Protection Stone Retaining Wall, 12' Max Height*	180	SF	$55.00	$9,900.00
14	*Shoreline Protection Paver Retaining Wall Footing*	1	CY	$500.00	$500.00
	Sub-Total				***$10,400.00***
	Site Work Construction Estimate Sub-Total				$45,900.00
	Engineering Design Work (10%)				$4,590.00
	Bonds & Insurance (15%)				$6,885.00
	Contingency (10%)				$4,590.00
	COST ESTIMATE TOTAL :				**$50,490.00**

3.2 OPTION 2: HARDSCAPE STAIRS + RIPRAP

LAN explored an approach similar to Option 1 above that utilizes hardscape stairs but with riprap protection along the shoreline instead of a retaining wall. Like Option 1, the steps can be constructed from different types of materials such as concrete pavers, stone pavers, concrete blocks, bricks or poured concrete. The example photos below demonstrate concrete slabs used for the steps, which would keep the material cost low while achieving high durability for the permanent access method. The stairs would be constructed with 6 inches of compacted ¾-inch crushed gravel base material beneath and behind each step. The riser and tread dimension of the steps will depend on the dimensions of the pavers used or concrete slabs poured. These dimensions can vary based on the needs of the sites but should remain consistent with standard 6–7-inch riser height and 10-12-inch tread length. Riprap is comprised of a barrier of stones placed on secured non-woven filter fabric on top of properly compacted soil.

The banks at both the Fairview Road and Point Pleasant Access Points would need to be re-graded to have a 3:1 slope. Maintaining 3:1 as the maximum slope of the riprap shoreline prevents ice jacking and better deflects wave action. Stone used for the riprap should be properly sized according to the calculations of the river's channel velocity at the two subject launch areas. Fieldstone riprap that's 6-12 inches or 12-18 inches in diameter is a baseline of what is used in these applications. Fieldstone is a good selection because it is heavier, smoother and rounder than other crushed riprap. Therefore, it's likely to last and not damage the filter fabric beneath or trap floating debris.

This option for hardscape stairs would be a feasible solution at both locations given the steep slopes at each launch point. This method is similar to the existing means of river access while achieving the permanency desired. Installing handrails would increase the safety of this access method.

3.2.A POTENTIAL ADVANTAGES:

1. The stairs could be built as wide as needed for the appropriate amount of tubing users to be able to access the river at once.
2. Less excavation would be required than the hardscape stairs with retaining wall option in Option 1. The riprap would be installed along the re-graded slope of the bank and eliminates the excavation for the backfill required to support a retaining wall.
3. Both the hardscape stairs and riprap hard armoring would protect against erosion along the shoreline of the canal and help to preserve the bank.
4. Concrete, pavers or stone provide a highly stable, level, and highly durable surface for river access. These materials ensure a long lifespan and require low maintenance.
5. The materials of the steps and riprap are able to be submerged and would withstand both smaller and larger storm events. When using concrete for the steps, it should be high PSI air-entrained concrete.
6. Hardscape stairs built with riprap hard armoring can offer river access at a range of water levels.
7. This option can be combined with a boat rail along the edge of the stairs to be able to transport smaller boats into the water as well.
8. The steep slopes of the Fairview Road and Point Pleasant River Access Points suggest that hardscape stairs would be the best option for getting users from the existing higher elevation of the top of the bank down to the lower elevation of the “toe” of the shoreline. Therefore, the function of the proposed hardscape stairs would not differ much from the current function of when the removeable wooden stairs are installed. However, it would greatly improve the launch area by creating permanent stairs to replace the temporary removeable wooden stairs that have required too much maintenance. The permanent hardscape stairs would be much more stable and easier for tubing visitors to descend and ascend than the existing removeable wooden stairs.
9. Construction of the hardscape stairs set in riprap would be completed in a shorter time than the construction of Option 1, especially if the retaining wall would need to be terraced with multiple levels based on the steepness of the banks.

10. Hardscape stairs set into riprap retains a more natural aesthetic that would blend into the more primitive environment of the State Park versus the more monolithic appearance of the retaining wall.

3.2.B POTENTIAL DISADVANTAGES:

1. The paver material used for these hardscape stairs can become slippery when wet, especially if using more natural stone pavers or stone slabs. Using concrete slab steps with a broom-finish and ¼-inch deep grooves would increase the safety of this option by providing adequate traction.
2. If the riprap is poorly installed, placed on too steep of a slope, or inadequately sized, the stones could be washed away by the river. This would require replacing the riprap plus the expense of new material and the labor cost.

3.2.C ANTICIPATED MAINTENANCE:

This option would be a low-maintenance option. The steps would be as durable as the hardscape stairs in Option 1. The hardscape stairs should be monitored for damage. Cold weather can create cracks in the pavers or concrete, impacting the integrity of the stairs. Throughout the winter and spring, the hardscaped stairs should be inspected a few times for any cracks in the steps and any gaps between them. Maintenance may include patching any gaps forming between the pavers or steps, using sealants to address small cracks and consistently eliminating weeds.
Depending on the materials used for the steps, maintenance may involve regularly resealing to avoid water intrusion.

The rip-rap edges require maintenance to ensure the stones and fabric remain in-place. Maintenance also includes having to clear any trapped debris. It is recommended that riprap is inspected at least biannually and after every major storm event for displacement, slumping and erosion. Repairs may be required if these storm events damage the riprap or filter fabric. Maintenance also involves removing any woody vegetation to prevent roots from growing and dislodging the riprap.

3.2.D CONSTRUCTION COST ESTIMATE:

The cost of this hardscape stairs option will be dependent on the material selected for the stairs. It will also depend on the size of stone needed for the riprap since the cost will increase as the size of the stone increases. The cost of riprap will vary depending on the material type used and the installation methods. For the purposes of this feasibility analysis, the order of magnitude cost estimate assumes 25-foot-long, 4-foot-wide riprap shoreline protection and 15 5-foot-wide steps. RS Means Data and was referenced to obtain the following cost estimates based on the different construction materials. A few of the sources found in the “References” section of this report also provide cost estimates for hand placed rip rap that were utilized.

Option 2 - Hardscape Stairs + Riprap (Concrete)					
Item No.	Description	Quantity	Unit	Unit Cost ($)	Cost ($)
	Division 1 - General Requirements				
1	*Mobilization and Demobilization*	1	LUMP	$10,000.00	$10,000.00
2	*Strip Site*	0.5	DAY	$2,000.00	$1,000.00
3	*Site Dumpsters*	2	EA	$1,500.00	$3,000.00
	Sub-Total				***$14,000.00***
	Division 3 - Concrete				
4	*Cast In Place, Stairs (3,500 PSI) Forms, Rebar*	2	CY	$750.00	$1,500.00
	Sub-Total				***$1,500.00***
	Division 31 - Earthwork				
5	*Rough Grading Site, Bulldozer + Operator*	1	DAY	$2,000.00	$2,000.00
6	*Excavation, Excavator + Operator*	1	DAY	$2,500.00	$2,500.00
7	*Riprap for Slope Protection, 18" min. thickness*	100	SF	$75.00	$7,500.00
	Sub-Total				***$12,000.00***
	Division 32 - Exterior Improvements				
8	*Base Course 3/4" Crushed Stone, 6" Deep*	100	SF	$25.00	$2,500.00
9	*Non-woven Filter Fabric*	100	SF	$3.00	$300.00
10	*Seeding and Fine Grading*	350	SF	$10.00	$3,500.00
	Sub-Total				***$6,300.00***
	Site Work Construction Estimate Sub-Total				$33,800.00
	Engineering Design Work (10%)				$3,380.00
	Bonds & Insurance (15%)				$5,070.00
	Contingency (10%)				$3,380.00
	COST ESTIMATE TOTAL :				**$45,630.00**

Option 2 - Hardscape Stairs + Riprap (Paver)					
Item No.	Description	Quantity	Unit	Unit Cost ($)	Cost ($)
	Division 1 - General Requirements				
1	*Mobilization and Demobilization*	1	LUMP	$10,000.00	$10,000.00
2	*Strip Site*	0.5	DAY	$2,000.00	$1,000.00
3	*Site Dumpsters*	2	EA	$1,500.00	$3,000.00
	Sub-Total				***$14,000.00***
	Division 4 - Masonry				
4	*Standard Brick Masonry Stairs*	75	SF	$45.00	$3,375.00
	Sub-Total				***$3,375.00***
	Division 31 - Earthwork				
5	*Rough Grading Site, Bulldozer + Operator*	1	DAY	$2,000.00	$2,000.00
6	*Excavation, Excavator + Operator*	1	DAY	$2,500.00	$2,500.00
7	*Riprap for Slope Protection, 18" min. thickness*	100	SF	$75.00	$7,500.00
	Sub-Total				***$12,000.00***
	Division 32 - Exterior Improvements				
8	*Base Course 3/4" Crushed Stone, 6" Deep*	100	SF	$25.00	$2,500.00
9	*Non-woven Filter Fabric*	100	SF	$3.00	$300.00
10	*Seeding and Fine Grading*	350	SF	$10.00	$3,500.00
	Sub-Total				***$6,300.00***
	Site Work Construction Estimate Sub-Total				$35,675.00
	Engineering Design Work (10%)				$3,567.50
	Bonds & Insurance (15%)				$5,351.25
	Contingency (10%)				$3,567.50
	COST ESTIMATE TOTAL :				**$48,161.25**

EXHIBIT 'E'

Option 2 - Hardscape Stairs + Riprap (Stone)					
Item No.	Description	Quantity	Unit	Unit Cost ($)	Cost ($)
	Division 1 - General Requirements				
1	*Mobilization and Demobilization*	1	LUMP	$10,000.00	$10,000.00
2	*Strip Site*	0.5	DAY	$2,000.00	$1,000.00
3	*Site Dumpsters*	2	EA	$1,500.00	$3,000.00
	Sub-Total				***$14,000.00***
	Division 4 - Masonry				
4	*Stone Masonry Stairs*	75	SF	$55.00	$4,125.00
	Sub-Total				***$4,125.00***
	Division 31 - Earthwork				
5	*Rough Grading Site, Bulldozer + Operator*	1	DAY	$2,000.00	$2,000.00
6	*Excavation, Excavator + Operator*	1	DAY	$2,500.00	$2,500.00
7	*Riprap for Slope Protection, 18" min. thickness*	100	SF	$75.00	$7,500.00
	Sub-Total				***$12,000.00***
	Division 32 - Exterior Improvements				
8	*Base Course 3/4" Crushed Stone, 6" Deep*	100	SF	$25.00	$2,500.00
9	*Non-woven Filter Fabric*	100	SF	$3.00	$300.00
10	*Seeding and Fine Grading*	350	SF	$10.00	$3,500.00
	Sub-Total				***$6,300.00***
	Site Work Construction Estimate Sub-Total				$36,425.00
	Engineering Design Work (10%)				$3,642.50
	Bonds & Insurance (15%)				$5,463.75
	Contingency (10%)				$364.25
	COST ESTIMATE TOTAL :				**$45,895.50**

3.3 OPTION 3: TIMBER + GRAVEL STAIRS

Another hardscape stairs option considered is a staircase constructed of timber filled with crushed stone or pea gravel, also referred to as infiltration stairs. First, the area is excavated and leveled out where each step will be. The riser height of the steps will depend on the dimensions of the pressure-treated timber posts used. These dimensions can vary based on the needs of the sites but will likely create a 4-inch or 6-inch riser height. The steps themselves are made of 3 timber posts spiked together. The tread and width dimensions of the steps can also vary based on the needs of the sites and the timber posts are cut accordingly. 15 inches is typically comfortable as the tread length.

Once the timber post steps are set and leveled, rebar is hammered into the timber posts to hold them in place in the ground and more spikes are used to attach each step to each other. Next, non-woven geotextile filter fabric is spread across the bottom of the steps framed by the timber posts. This filter fabric will also act as a weed barrier. Finally, the steps are filled with ¾-inch crushed stone or pea gravel until it is about 1-inch below the top of the timber posts. This 1-inch lip is to reduce water from flowing across the stairs and encourage infiltration through the gravel. It is suggested to place a 2-inch base layer of crushed stone down below the filter fabric if filling the steps with pea gravel.

The Fairview Road and Point Pleasant River Access Points would further benefit from having riprap installed along the edges of the infiltration stairs. However, planting the areas adjacent to the stairs with shrubs and groundcover plants could also help prevent erosion. The infiltration stairs would be a feasible solution at both locations given the steep slopes at each launch point. This method is similar to the existing means of river access while achieving the permanency desired. Installing handrails would increase the safety of this access method.

It would be best for the bottom step to be at a higher elevation than the bottom of the bank and have a sloped gravel path leading from the stairs to the water's edge. This way, the bottom steps do not have to be submerged in the river, adding protection against higher currents and the potential for undercutting or ripping out the stairs. The timber used for the posts must be pressure-treated to withstand this application as river access.

3.3.A POTENTIAL ADVANTAGES:

1. The stairs could be built as wide as needed for the appropriate amount of tubing users to be able to access the river at once.
2. Aside from the excavation, there would be less heavy equipment use required for construction. The timber and gravel stairs can otherwise be completely constructed by hand.
3. Construction of both the infiltration stairs and the riprap or plantings would prevent the erosion along the shoreline and protect the bank. This option is a good solution for controlling erosion on steep paths since the steps use crushed stone to slow down and infiltrate runoff.
4. This option can be combined with a boat rail along the edge of the stairs to be able to transport smaller boats into the water as well.
5. The steep slopes of the Fairview Road and Point Pleasant River Access Points suggest that hardscape stairs would be the best option for getting users from the existing higher elevation of the top of the bank down to the lower elevation of the "toe" of the shoreline. Therefore, the function of the proposed hardscape stairs would not differ much from the current function of when the removeable wooden stairs are installed. However, it would greatly improve the launch area by creating permanent stairs to replace the temporary removeable wooden stairs that have required too much maintenance. The permanent hardscape stairs would be much more stable and easier for tubing visitors to descend and ascend than the existing removeable wooden stairs.
6. Construction of the stairs could be completed in a short amount of time, around 2 weeks, according to LAN's research of similar projects.
7. The infiltration through the stairs increases the safety of this option so that it's not a solid slick surface when wet like concrete, wooden or stone stairs. This supports the longevity of the stairs in terms of resisting ice damage during the winter months.

EXHIBIT 'E'

3.3.B POTENTIAL DISADVANTAGES:

1. Timber can be a slippery surface when wet. Anti-slip grip tread should be added along the timber step to add traction on the stairs and increase the safety of this option.
2. If the riprap is poorly installed, placed on too steep of a slope, or inadequately sized, the stones could be washed away by the river. This would require replacing the riprap plus the expense of new material and the labor cost.
3. Timber is not as long-lasting of a material as concrete or stone. Therefore, it would not provide the same level of durability as Options 1 and 2.
4. Being that much of the tread surface is the gravel fill, this method of hardscape stairs would not be as level or stable of a surface as Options 1 and 2. Especially if the stairs started to lose some of the gravel material over time.
5. If the timber posts are not sufficiently secured when constructed, a higher intensity storm or flooding event may damage the stairs that become submerged. Or over time, if these access points begin to experience higher water levels, it may weaken the security of the timber posts in the bank and shift the stairs.
6. This option would likely present a greater amount of maintenance required than most of the other improvement options.

3.3.C ANTICIPATED MAINTENANCE:

Eventually, the timber posts may rot, especially if they remain submerged from higher river levels or from snow and ice damage. Timber is susceptible to rot, warping and decay. This will require regular maintenance to ensure the longevity of the stairs. Any rotted, or otherwise damaged, timber posts would have to be replaced, which would require some disassembly to remove the targeted step plus the expense of new material and the labor cost. However, using pressure-treated timber will prevent such rotting. Regular inspections of the stairs should also involve checking for loose spikes or shifting timber. The timber stairs may have to be maintained by adding fasteners if necessary to keep the timber frames in place.

Also, sediment may build up in the gravel over time, which would be maintained by removing, cleaning and returning the gravel back into the timber post frames. In the conditions of higher river levels or more intense storm events, the gravel could be washed away from the steps, which would require refilling the timber posts plus the expense of new material and the labor cost. The stairs also may lose some of the gravel fill just over time from the continued use.

3.3.D CONSTRUCTION COST ESTIMATE:

The total cost associated with this improvement would increase from including the riprap hard armoring or plantings as erosion control. It will also depend on the size of stone needed for the riprap since the cost will increase as the size of the stone increases. The cost of riprap will vary depending on the material type used and the installation methods. For the purposes of this feasibility analysis, the order of magnitude cost estimate assumes 25-foot-long, 4-foot-wide riprap shoreline protection and 15 5-foot-wide steps. The labor to construct the stairs would not involve as much heavy equipment as the other hardscape stairs options. RS Means Data was referenced to obtain the following cost estimate. A few of the sources found in the “References” section of this report also provide cost estimates for hand placed rip rap that were utilized.

Option 3 - Timber + Gravel Stairs					
Item No.	Description	Quantity	Unit	Unit Cost ($)	Cost ($)
	Division 1 - General Requirements				
1	*Mobilization and Demobilization*	1	LUMP	$10,000.00	$10,000.00
2	*Strip Site*	0.5	DAY	$2,000.00	$1,000.00
3	*Site Dumpsters*	2	EA	$1,500.00	$3,000.00
	Sub-Total				***$14,000.00***
	Division 31 - Earthwork				
4	*Rough Grading Site, Bulldozer + Operator*	1	DAY	$2,000.00	$2,000.00
5	*Excavation, Excavator + Operator*	1	DAY	$2,500.00	$2,500.00
6	*Riprap for Slope Protection, 18" min. thickness*	100	SF	$75.00	$7,500.00
	Sub-Total				***$12,000.00***
	Division 32 - Exterior Improvements				
7	*Timber Stair Framing Posts*	135	LF	$25.00	$3,375.00
8	*Timber Reinforcing Connector Rods*	60	EA	$10.00	$600.00
9	*3/4" Pea Gravel / Gravel Fill*	25	SF	$25.00	$625.00
10	*Non-woven Filter Fabric*	175	SF	$3.00	$525.00
11	*Seeding and Fine Grading*	350	SF	$10.00	$3,500.00
	Sub-Total				***$8,625.00***
	Site Work Construction Estimate Sub-Total				$34,625.00
	Engineering Design Work (10%)				$3,462.50
	Bonds & Insurance (15%)				$5,193.75
	Contingency (10%)				$3,462.50
	COST ESTIMATE TOTAL :				**$46,743.75**

3.4 OPTION 4: SEGMENTAL CONCRETE RAMP

A fourth option that LAN has explored is a ramp built out of prefabricated concrete segments. This option is similar to the ramps found elsewhere in the D&R Canal State Park at the Kingwood Boat Launch, Byram Boat Launch and Bulls Island Recreational Area. The ramp is constructed by bolting the concrete segments together and securing them onto a compacted gravel surface. The gaps between each segment are then backfilled with compacted gravel. After, riprap would be placed along the sides of the ramp onto filter fabric. The width of the ramp can vary depending on the location's needs and bank conditions but cannot be greater than 20 feet under Army Corp regulations.

The precast concrete segments should be high PSI concrete, 5-7% air entrained reinforced concrete so that they will stay intact for a long lifespan. Each concrete segment would be 12 inches in width with a broom-finish that provides adequate traction for safely walking along the ramp. The concrete segments should also be connected to each other with stainless steel or galvanized rebar loops that allow slight movement with the ebb and flow of the river. The galvanization allows these connecting bolts to be wet or submerged while preventing corrosion. The foundation of the ramp is an 8-inch-deep bed of ¾-inch compacted gravel placed on a filter fabric to keep it in place.

Although a hardscape ramp is an alternative worth analyzing, this is not the most feasible option given the site constraints of the Fairview Road and Point Pleasant Access Points. Unlike the Kingwood, Byram and Bulls Island Recreational Area sites, the two subject sites for tube launching are steep and have a significant drop off in elevation from the top of the bank to the "toe" of the shoreline. It would take extensive earthmoving and transformation of the topography at the two subject sites to re-grade it for a sustainable and safe ramp to work.

EXHIBIT C	KINGWOOD BOAT LAUNCH

Photo 1

Photo 2

Photo 3

Photo 4

Photo 5

Photo 6

Photo 7

EXHIBIT 'E'

EXHIBIT D — BYRAM BOAT LAUNCH

Photo 1

Photo 2

Photo 3

Photo 4

Photo 5

Photo 6

Photo 7

EXHIBIT E — BULLS ISLAND RECREATIONAL AREA BOAT LAUNCH

Photo 1

Photo 2

Photo 3

Photo 4

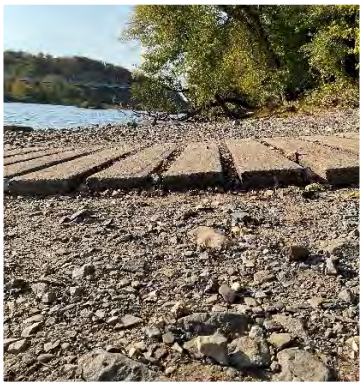


Photo 5

Photo 6

EXHIBIT 'E'

3.4.A POTENTIAL ADVANTAGES:

1. The prefabricated concrete segments that make up the ramp are typically up to 12 feet long. This provides wide access to the river for multiple tubing users to enter at a time.
2. Aside from the excavation, there would be less heavy equipment use required for construction. The segmental concrete ramp would be mostly constructed by hand.
3. The existing banks at the Fairview Road and Point Pleasant River Access Points would likely require riprap to be installed along the edges of the proposed ramp based on the elevations. Both the ramp and the riprap would be able to resist erosion along the shoreline and protect the bank.
4. A segmental concrete ramp provides a highly stable, highly durable surface for river access. The materials ensure a long lifespan and require low maintenance.
5. The materials of the ramp are able to be submerged and would withstand both smaller and larger storm events. The pre-fabricated concrete segments should be high PSI air-entrained concrete.
6. A ramp can offer river access at a range of water levels.
7. Construction of the ramp could be completed in a fairly short amount of time, around 3 weeks, according to LAN's research of similar projects.
8. The spaces between each concrete segment filled with gravel promotes drainage through the ramp itself. This will increase the safety of the ramp so that it's not a solid slick surface when wet. It will also increase the longevity of the ramp in terms of resisting ice damage during the winter months.
9. A ramp would support more uses than just tubing. It may be used for small boats that are able to access the launch point.
10. Installing these ramps that are similar to the existing segmental concrete ramps at the D&R Canal State Park Kingwood Boat Launch, Byram Boat Launch and Bulls Island Recreational Area would promote design consistency throughout the park. Furthermore, through the experience of already having these types of ramps operating at the other park's river access points, it's likely that this solution would work at the Fairview Road and Point Pleasant River Access Points as well. Additionally, it may be possible to obtain the same contractors that have the experience of completing the other segmental concrete ramps within the park for this project if Parks is in favor of reutilizing the same company.

3.4.B POTENTIAL DISADVANTAGES:

1. If the riprap is poorly installed along the edges of the ramp or inadequately sized, the stones could be washed away by the river. This would require replacing the riprap plus the expense of new material and the labor cost.
2. The Fairview Road and Point Pleasant River Access Points would require significant regrading in these areas to be able to provide a safe and feasible slope of the proposed ramp. The desired slope of a concrete ramp is typically 12-15%. From the previous plans "Fairview Road – Site Plan" and "Point Pleasant – Site Plan" prepared by LAN Associates dated 03/09/20 last revised 06/02/20, the profile and contours of the bank at the Fairview Road Access Point show the slope to be about 40% where the existing removable stairs are located and about 50% at the Point Pleasant River Access Point. From the site visit, it has been identified that the slopes at both sites are even steeper under current conditions, closer to 60-70%.
3. Given that the Fairview Road and Point Pleasant launch sites are accessible only by foot, a segmental concrete ramp may be excessive for non-vehicular use.
4. Larger equipment needed for earthmoving may have a harder time accessing these tubing launch sites, especially at the Fairview Road Access Point. Larger, heavier equipment can cause more disturbance to the environmentally sensitive area of the bank.

3.4.C ANTICIPATED MAINTENANCE:

The ramp itself would remain permanently in place. However, as shown by Exhibit C Photo 7, Exhibit D Photo 5 and Exhibit E Photo 5, the gravel that is backfilled in between the concrete segments may wash away in the conditions of higher river levels or more intense storm events or just over time. This would require refilling the concrete segments plus the expense of new material and the labor cost. The concrete segments ramp would have a long lifespan in these launch area locations since they would not have to support any vehicular loads. It is important for the portion of the ramp that is submerged in the water to not only reach the water, but also be embedded in the riverbed, as shown in Exhibit C Photo 5 and Exhibit D Photo 6, so that the river does not undercut the ramp.

The rip-rap edges require maintenance to ensure the stones and fabric remain in-place. Maintenance also includes having to clear any trapped debris. It is recommended that riprap is inspected at least biannually and after every major storm event for displacement, slumping and erosion. Repairs may be required if these storm events damage the riprap or filter fabric. Maintenance also involves removing any woody vegetation to prevent roots from growing and dislodging the riprap.

3.4.D CONSTRUCTION COST ESTIMATE:

Although the construction cost of the ramp itself is relatively low, a large factor that will drive the cost is the intensity of the earthmoving required to achieve the appropriate slope of the ramp. The total cost associated with this improvement would also increase from including the riprap as erosion control along the edges of the ramp. It will also depend on the size of stone needed for the riprap since the cost will increase as the size of the stone increases. The cost of riprap will vary depending on the material type used and the installation methods. For the purposes of this feasibility analysis, the order of magnitude cost estimate assumes a 40-foot-long, 5-foot-wide ramp and 25-foot-long, 6-foot-wide riprap shoreline protection. RS Means Data was referenced to obtain the following cost estimate. A few of the sources found in the “References” section of this report also provide cost estimates for hand placed rip rap that were utilized.

Option 4 - Segmental Concrete Ramp					
Item No.	Description	Quantity	Unit	Unit Cost ($)	Cost ($)
	Division 1 - General Requirements				
1	*Mobilization and Demobilization*	1	LUMP	$10,000.00	$10,000.00
2	*Strip Site*	0.5	DAY	$2,000.00	$1,000.00
3	*Site Dumpsters*	2	EA	$1,500.00	$3,000.00
	Sub-Total				***$14,000.00***
	Division 3 - Concrete				
4	*Precast Concrete Ramp Segments, 6" Thick*	30	EA	$250.00	$7,500.00
	Sub-Total				***$7,500.00***
	Division 5 - Metals				
5	*Galvanized Steel Bolts*	60	EA	$15.00	$900.00
	Sub-Total				***$900.00***
	Division 31 - Earthwork				
6	*Rough Grading Site, Bulldozer + Operator*	2	DAY	$2,000.00	$4,000.00
7	*Excavation, Excavator + Operator*	2	DAY	$2,500.00	$5,000.00
8	*Riprap for Slope Protection, 18" min. thickness*	150	SF	$75.00	$11,250.00
	Sub-Total				***$20,250.00***
	Division 32 - Exterior Improvements				
9	*Base Course 3/4" Crushed Stone, 8" Deep*	200	SF	$25.00	$5,000.00
10	*Compacted Gravel Fill, 6" Deep*	50	SF	$25.00	$1,250.00
11	*Non-woven Filter Fabric*	150	SF	$3.00	$450.00
12	*Seeding and Fine Grading*	550	SF	$10.00	$5,500.00
	Sub-Total				***$12,200.00***
	Site Work Construction Estimate Sub-Total				$54,850.00
	Engineering Design Work (10%)				$5,485.00
	Bonds & Insurance (15%)				$8,227.50
	Contingency (10%)				$5,485.00
	COST ESTIMATE TOTAL :				**$74,047.50**

3.5 OPTION 5: CONCRETE RAMP

Another option that LAN has explored is a concrete ramp. This option is similar to the ramp found at the Lambertville Boat Launch within the D&R Canal State Park. Concrete ramps are constructed by placing an 8-inch-deep bed of ¾-inch compacted gravel placed on a filter fabric placed over the subgrade and then pouring the concrete surface of the ramp. Once cured, the poured concrete slab is pushed with a bulldozer to be partially in the water. After, riprap would be placed along the sides of the ramp onto filter fabric. The width of the ramp can vary depending on the location's needs and bank conditions but cannot be greater than 20 feet under Army Corp regulations.

The concrete must be a special shoreline concrete and should be 3,000-4,000 PSI with an air entrainment rate of 4-6% air entrained reinforced concrete. Concrete ramps should be reinforced with number 4 (1/2-inch diameter) Grade 60 rebar, placed at 12 inches on center lengthwise, and 18 inches on center across. Steel reinforcement should be 3 inches from the surface, and bottom and sides of the concrete. This results in a slab at least 6 inches thick. The concrete ramp should have a rough broom-finish with ¼-inch deep grooves that provide adequate traction for safely walking along the ramp. Sometimes, a "V" groove is used or exposed aggregate can be applied to the surface.

Because this concrete ramp would not be used for the typical application purposes (i.e. vehicle accessed boat ramps), the concrete ramp at the Fairview Road and Point Pleasant River Access Points would have a concrete pad with a reasonably small square footage. Although a hardscape ramp is an alternative worth analyzing, this is not the most feasible option given the site constraints of the Fairview Road and Point Pleasant Access Points. Unlike the Kingwood, Byram and Bulls Island Recreational Area sites, the two subject sites for tube launching are steep and have a significant drop off in elevation from the top of the bank to the "toe" of the shoreline. It would take extensive earthmoving and transformation of the topography at the two subject sites to re-grade it for a sustainable and safe ramp to work.

3.5.A POTENTIAL ADVANTAGES:

1. The dimensions of the concrete slab poured for the ramp can vary based on the needs of the site. A ramp provides wide access to the river for multiple tubing users to enter at a time.
2. The existing banks at the Fairview Road and Point Pleasant River Access Points would likely require riprap to be installed along the edges of the proposed ramp based on the elevations. Both the ramp and the riprap would be able to resist erosion along the shoreline of the canal and protect the bank.
3. A concrete ramp provides a highly stable, highly durable surface for river access. The materials ensure a long lifespan and require low maintenance.
4. The materials of the ramp are able to be submerged and would withstand both smaller and larger storm events. The concrete should be high PSI air-entrained concrete.
5. A ramp can offer river access at a range of water levels.
6. Construction of the ramp could be completed in a fairly short amount of time, around 3-5 weeks, according to LAN's research of similar projects.
7. A ramp would support more uses than just tubing. It may be used for small boats that are able to access the launch point.
8. Installing these ramps that are similar to the existing concrete ramps at the D&R Canal State Park Lambertville Boat Launch would promote design consistency throughout the park. Furthermore, through the experience of already having this type of ramp operating at the other park's river access points, it's likely that this solution would work at the Fairview Road and Point Pleasant River Access Points as well. Additionally, it may be possible to obtain the same contractors that have the experience of completing the other concrete ramps within the park for this project if Parks is in favor of reutilizing the same company.

3.5.B POTENTIAL DISADVANTAGES:

1. The concrete surface can become slippery when wet or muddy if the proper traction isn't achieved in the concrete finish.

EXHIBIT 'E'

2. If the riprap is poorly installed, placed on too steep of a slope, or inadequately sized, the stones could be washed away by the river. This would require replacing the riprap plus the expense of new material and the labor cost.
3. The Fairview Road and Point Pleasant River Access Points may require significant regrading in these areas to be able to provide a safe and feasible slope of the proposed ramp. The desired slope of a concrete ramp is typically 12-15%. From the previous plans “Fairview Road – Site Plan” and “Point Pleasant – Site Plan” prepared by LAN Associates dated 03/09/20 last revised 06/02/20, the profile and contours of the bank at the Fairview Road Access Point show the slope to be about 40% where the existing removable stairs are located and about 50% at the Point Pleasant River Access Point. From the site visit, it has been identified that the slopes at both sites are even steeper under current conditions, closer to 60-70%.
4. Given that the Fairview Road and Point Pleasant launch sites are accessible only by foot, a concrete ramp may be excessive for non-vehicular use.
5. Unlike the segmental concrete ramp that would be constructed mainly by hand, the construction of a concrete ramp would require more heavy equipment use. Larger equipment may have a harder time accessing these tubing launch sites, especially at the Fairview Road Access Point. Larger, heavier equipment can cause more disturbance to the environmentally sensitive area of the bank.

3.5.C ANTICIPATED MAINTENANCE:

The concrete ramps would have a long lifespan in these launch area locations since they would not have to support any vehicular loads. The maintenance of the concrete ramps would involve regularly resealing the concrete to avoid water intrusion. It is important for the portion of the ramp that is submerged in the water to not only reach the water but also be embedded in the riverbed so that the river does not undercut the ramp.

The rip-rap edges require maintenance to ensure the stones and fabric remain in-place. Maintenance also includes having to clear any trapped debris. It is recommended that riprap is inspected at least biannually and after every major storm event for displacement, slumping and erosion. Repairs may be required if these storm events damage the riprap or filter fabric. Maintenance also involves removing any woody vegetation to prevent roots from growing and dislodging the riprap.

3.5.D CONSTRUCTION COST ESTIMATE:

Although the construction cost of the ramp itself is relatively low, a large factor that will drive the cost is the intensity of the earthmoving required to achieve the appropriate slope of the ramp. The total cost associated with this improvement would also increase from including the riprap as erosion control along the edges of the ramp. It will also depend on the size of stone needed for the riprap since the cost will increase as the size of the stone increases. The cost of riprap will vary depending on the material type used and the installation methods. For the purposes of this feasibility analysis, the order of magnitude cost estimate assumes a 40-foot-long, 5-foot-wide ramp and 25-foot-long, 6-foot-wide riprap shoreline protection. RS Means Data was referenced to obtain the following cost estimate. A few of the sources found in the “References” section of this report also provide cost estimates for hand placed rip rap that were utilized.

Option 5 - Concrete Ramp					
Item No.	Description	Quantity	Unit	Unit Cost ($)	Cost ($)
	Division 1 - General Requirements				
1	*Mobilization and Demobilization*	1	LUMP	$10,000.00	$10,000.00
2	*Strip Site*	0.5	DAY	$2,000.00	$1,000.00
3	*Site Dumpsters*	2	EA	$1,500.00	$3,000.00
	Sub-Total				***$14,000.00***
	Division 3 - Concrete				
4	*Cast In Place, 6" Slab on Grade (3,500 PSI) Forms, Rebar*	4	CY	$750.00	$3,000.00
	Sub-Total				***$3,000.00***
	Division 31 - Earthwork				
5	*Rough Grading Site, Bulldozer + Operator*	2	DAY	$2,000.00	$4,000.00
6	*Excavation, Excavator + Operator*	2	DAY	$2,500.00	$5,000.00
7	*Riprap for Slope Protection, 18" min. thickness*	150	SF	$75.00	$11,250.00
	Sub-Total				***$20,250.00***
	Division 32 - Exterior Improvements				
8	*Base Course 3/4" Crushed Stone, 8" Deep*	200	SF	$25.00	$5,000.00
9	*Non-woven Filter Fabric*	150	SF	$3.00	$450.00
10	*Seeding and Fine Grading*	550	SF	$10.00	$5,500.00
	Sub-Total				***$10,950.00***
	Site Work Construction Estimate Sub-Total				$48,200.00
	Engineering Design Work (10%)				$4,820.00
	Bonds & Insurance (15%)				$7,230.00
	Contingency (10%)				$4,820.00
	COST ESTIMATE TOTAL :				**$65,070.00**

3.6 OPTION 6: GRAVEL RAMP

The sixth design option considered is a gravel ramp. This option is similar to the ramp found at the Fireman's Eddy River Access within the D&R Canal State Park. As shown in the example photos below and in Exhibit F of Fireman's Eddy River Access, gravel ramps are sloped areas that provide a stabilized open surface for launching. Once properly graded and compacted, the area is covered with gravel to help with drainage and control soil erosion. The gravel should be placed on a base layer of sand as seen in Exhibit F photos below.

Although a natural surface ramp is an alternative worth analyzing, this is not the most feasible option given the site constraints of the Fairview Road and Point Pleasant Access Points. Unlike the Fireman's Eddy River Access, the two subject sites for tube launching are steep and have a significant drop off in elevation from the top of the bank to the "toe" of the shoreline. It would take extensive earthmoving and transformation of the topography at the two subject sites to re-grade it for a sustainable and safe ramp to work.

EXHIBIT F	FIREMAN'S EDDY RIVER ACCESS

Photo 1

Photo 2

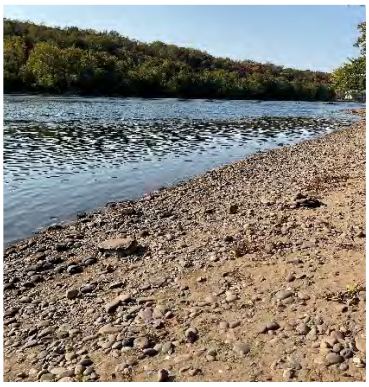


Photo 3

Photo 4

Photo 5

Photo 6

3.6.A POTENTIAL ADVANTAGES:

1. The dimensions of the gravel ramp can vary based on the needs of the site. A ramp provides wide access to the river for multiple tubing users to enter at a time.
2. A ramp can offer river access at a range of water levels.
3. Construction of the ramp could be completed in a fairly short amount of time, around 2 weeks, according to LAN's research of similar projects.
4. Natural materials used for the surface of the ramp blend with the natural landscape of the State Park. Installing a gravel ramp retains the natural aesthetic of the shoreline that would blend into the more primitive environment of the State Park versus the more monolithic appearance of the hardscape ramps.
5. The gravel surface with sand base layer would promote drainage through the ramp. This infiltration through the ramp increases the safety of this option so that it's not a solid slick surface like the other hardscape ramp and stairs options presented in this study.
6. A ramp would support more uses than just tubing. It may be used for small boats that are able to access the launch point.
7. Installing this ramp that is similar to the existing gravel ramp at the D&R Canal State Park Fireman's Eddy River Access would promote design consistency throughout the park.

8. Implementing a natural surface ramp is typically a very cost-effective low-budget option. However, the earth moving required at the subject locations to achieve the slope of the ramp may raise the costs significantly.

3.6.B POTENTIAL DISADVANTAGES:

1. A gravel ramp would not withstand more intense storm events or flooding as effectively as the other options presented in this study. Higher river levels and channel velocity may wash away the gravel surface of the ramp.
2. The Fairview Road and Point Pleasant River Access Points would require significant re-grading in these areas to be able to provide a safe and feasible slope of the proposed ramp. The desired slope of a gravel ramp is typically 8-10%. From the previous plans “Fairview Road – Site Plan” and “Point Pleasant – Site Plan” prepared by LAN Associates dated 03/09/20 last revised 06/02/20, the profile and contours of the bank at the Fairview Road Access Point show the slope to be about 40% where the existing removable stairs are located and about 50% at the Point Pleasant River Access Point. From the site visit, it has been identified that the slopes at both sites are even steeper under current conditions, closer to 60-70%.
3. Larger equipment needed for the extensive earthmoving and re-grading of the bank may have a harder time accessing these tubing launch sites, especially at the Fairview Road Access Point. Larger, heavier equipment can cause more disturbance to the environmentally sensitive area of the bank.
4. This type of ramp provides some bank stabilization from the gravel surfacing but can end up being more erosive from frequent use. The hard armoring of the other hardscape stairs, ramps and riprap options would better protect the banks at the subject river access points.

3.6.C ANTICIPATED MAINTENANCE:

Gravel ramps work best in areas with minimal wave action or water level fluctuation. As seen throughout Exhibit F Photos, some of the gravel gets washed away or displaced over time at this location along the Delaware River. This is also seen at the other locations visited within the State Park as shown in Exhibit D Photo 5 and Exhibit E Photo 6 where these segmental concrete ramps are surrounded by a gravel ramp surface. Therefore, a gravel ramp at the Fairview Road or Point Pleasant Access Point is likely to experience displacement of the gravel from the effects of the river. Maintaining the surfacing of the ramp would involve frequent monitoring of the ramp for material loss, replacing the gravel, plus the expense of new material and the labor cost.

3.6.D CONSTRUCTION COST ESTIMATE:

Although fewer construction materials are required to build this type of ramp, a large factor that will drive the price is the intensity of the earthmoving required to achieve the appropriate slope of the ramp. A gravel ramp would involve even more excavation than the ramps presented in Options 4 and 5. For the purposes of this feasibility analysis, the order of magnitude cost estimate assumes a 40-foot-long, 15-foot-wide ramp. RS Means Data was referenced to obtain the following cost estimate.

Option 6 - Gravel Ramp					
Item No.	Description	Quantity	Unit	Unit Cost ($)	Cost ($)
	Division 1 - General Requirements				
1	*Mobilization and Demobilization*	1	LUMP	$10,000.00	$10,000.00
2	*Strip Site*	0.5	DAY	$2,000.00	$1,000.00
3	*Site Dumpsters*	2	EA	$1,500.00	$3,000.00
	Sub-Total				***$14,000.00***
	Division 31 - Earthwork				
4	*Rough Grading Site, Bulldozer + Operator*	2	DAY	$2,000.00	$4,000.00
5	*Excavation, Excavator + Operator*	2.5	DAY	$2,500.00	$6,250.00
	Sub-Total				***$10,250.00***
	Division 32 - Exterior Improvements				
6	*Compacted Gravel Surfacing, 6" Deep*	600	SF	$25.00	$15,000.00
7	*Sand Base Layer, 4" Deep*	8	CY	$85.00	$680.00
8	*Seeding and Fine Grading*	350	SF	$10.00	$3,500.00
	Sub-Total				***$19,180.00***
	Site Work Construction Estimate Sub-Total				$43,430.00
	Engineering Design Work (10%)				$4,343.00
	Bonds & Insurance (15%)				$6,514.50
	Contingency (10%)				$4,343.00
	COST ESTIMATE TOTAL :				**$58,630.50**

3.7 OPTION 7: SWITCHBACK PATH

The final design option considered is a switchback path leading to the "toe" of the shoreline. These are pathways built into steep slopes that lead from higher elevations to the water's edge. The gradual descent to the water is achieved by the path switching back and forth in direction rather than a straight slope from the top of bank to the bottom (i.e. ramps). The path itself can be surfaced with a variety of materials and can also have curbing installed on either side to guide and increase safety. The surface of the path can be hardscaped with concrete or pavers, or it can be filled with crushed gravel or woodchips. Once the proper grading is achieved to create the switchbacks, the areas can be seeded to restore vegetation. The bottom and sides of the switchback would also be hard armored with riprap, adding protection against erosion from higher currents and preventing undercutting of the switchback path side slopes. This is also referred to as the construction of crib walls that support these pathways.

It would be best for the bottom landing area of the switch back to be at a slightly higher elevation than the bottom of the bank and have a sloped gravel surfaced path leading to the water's edge. Another alternative could be to have the bottom of the switchback meet a small set of hardscaped steps, preferably poured concrete that could endure being submerged during higher river levels.

3.7.A POTENTIAL ADVANTAGES:

1. Although constrained by the site and bank conditions, a switchback could provide wide access to the river for multiple tubing users to enter at a time.

2. Using concrete or pavers to construct the switchback surface would provide a highly stable, highly durable surface for river access. These materials ensure a long lifespan and require low maintenance.
3. Natural materials used for the surface of the switchback would blend with the natural landscape of the State Park and would retain the natural aesthetic of the shoreline. Natural surfacing of the switchback would blend into the more primitive environment of the State Park versus the more monolithic appearance of the hardscape options.
4. A gravel or woodchipped surface would promote drainage along the switchback. This infiltration through the switchback increases the safety of this option so that it's not a solid slick surface like the other hardscape ramp and stairs options presented in this study.
5. If implementing a natural surface along the switchback such as gravel or woodchips, this could be a very cost-effective option. However, the earth moving required to grade the switchback may increase the cost.
6. Switchback paths may provide users with an easier descent than stairs would, especially when managing to bring tubes down to the water. It would also allow for easier transportation of small boats that could access the launch sites.
7. Grading the switchback along the bank would result in more balanced cut and fill than the excavation involved in the ramp options.

3.7.B POTENTIAL DISADVANTAGES:

1. The crib walls of the switchback basically function as retaining walls, which can become more expensive as the wall heights increase. The materials themselves can be expensive, and the design costs and level of permitting will increase based on the wall height. A crib wall greater than 4 feet in height will require structural engineer certification.
2. If pavers are used for the surfacing of the switchback, the path can become slippery when wet, especially if using more natural stone pavers. Using concrete with a rough broom-finish and deep grooves for the hardscape alternative would increase the safety of this design option by providing adequate traction.
3. Larger equipment needed for grading the switchback along the bank may have a harder time accessing these tubing launch sites, especially at the Fairview Road Access Point. Larger, heavier equipment can cause more disturbance to the environmentally sensitive area of the bank.
4. Although the switchback would entail less excavation at the sites than the ramp options, a significant amount of earth moving may still be required to create the switchback.
5. More intense storm events causing flooding and high channel velocity may undermine the integrity of the switchback and continue the erosion of the bank.

3.7.C ANTICIPATED MAINTENANCE:

This option for improved river access would be a low-maintenance option. However, the crib walls require regular inspections to ensure the stones remain in place and clear of any trapped debris. The wall should also be inspected for loose stones or bulges that could be caused by soil shifting or becoming oversaturated, which will have to be corrected to keep the wall intact. It is recommended that crib walls are inspected at least biannually and after every major storm event for displacement, slumping and erosion. Maintenance also involves removing any woody vegetation to prevent roots from growing and dislodging the stones of the crib wall.

Maintenance of the switchback will be dependent on the materials used for surfacing. Maintaining gravel surfacing of the path would involve monitoring for material loss, replacing the gravel, plus the expense of new material and the labor cost. Maintenance may involve regularly resealing concrete to avoid water intrusion if a hardscape path

is built. Maintenance may include patching any gaps forming between pavers, using sealants to address small cracks and consistently eliminating weeds if pavers are used.

3.7.D CONSTRUCTION COST ESTIMATE:

The cost of this option will be dependent on the material selected and overall design of what the switchback will look like. A large factor that will drive the cost is the intensity of the earthmoving required to achieve the switchback path. The total cost associated with this improvement would also be driven by the stone used for the crib wall slope protection. The cost of the crib walls will vary depending on the material type and size used and the installation methods. For the purposes of this feasibility analysis, the order of magnitude cost estimate assumes a 40-foot-long, 6-foot-wide path with crib wall slope protection and edging along the path. RS Means Data was referenced to obtain the following cost estimate.

Option 7 - Switchback Path					
Item No.	Description	Quantity	Unit	Unit Cost ($)	Cost ($)
	Division 1 - General Requirements				
1	*Mobilization and Demobilization*	1	LUMP	$10,000.00	$10,000.00
2	*Strip Site*	0.5	DAY	$2,000.00	$1,000.00
3	*Site Dumpsters*	1	EA	$1,500.00	$1,500.00
	Sub-Total				***$12,500.00***
	Division 3 - Concrete				
4	*Cast In Place, Stairs (3,500 PSI) Forms, Rebar*	1	CY	$750.00	$750.00
	Sub-Total				***$750.00***
	Division 31 - Earthwork				
5	*Rough Grading Site, Bulldozer + Operator*	2	DAY	$2,000.00	$4,000.00
6	*Excavation, Excavator + Operator*	2	DAY	$2,500.00	$5,000.00
7	*Riprap for Slope Protection, 18" min. thickness*	75	SF	$75.00	$5,625.00
	Sub-Total				***$14,625.00***
	Division 32 - Exterior Improvements				
8	*Compacted Gravel Surfacing, 6" Deep*	240	SF	$25.00	$6,000.00
9	*Sand Base Layer, 4" Deep*	3	CY	$85.00	$255.00
10	*Pathway Edging*	80	LF	$20.00	$1,600.00
11	*Non-woven Filter Fabric*	75	SF	$3.00	$225.00
12	*Seeding and Fine Grading*	550	SF	$10.00	$5,500.00
	Sub-Total				***$7,580.00***
	Site Work Construction Estimate Sub-Total				$35,455.00
	Engineering Design Work (10%)				$3,545.50
	Bonds & Insurance (15%)				$5,318.25
	Contingency (10%)				$3,545.50
	COST ESTIMATE TOTAL :				**$47,864.25**

4.0 DESIGN CRITERIA RANKING / ORDER OF MAGNITUDE COST ESTIMATION:

Cost Estimate Rank	Design Alternative	Cost ($)
1	Option 2A - Hardscape Stairs + Riprap (Concrete)	$45,630.00
2	Option 2C - Hardscape Stairs + Riprap (Stone)	$45,895.50
3	Option 3 - Timber + Gravel Stairs	$46,743.75
4	Option 7 - Gravel Switchback Path	$47,864.25
5	Option 2B - Hardscape Stairs + Riprap (Paver)	$48,161.25
6	Option 1C - Hardscape Stairs + Retaining Wall (Stone)	$50,490.00
7	Option 1B - Hardscape Stairs + Retaining Wall (Paver)	$58,583.25
8	Option 6 - Gravel Ramp	$58,630.00
9	Option 5 - Concrete Ramp	$65,070.00
10	Option 4 - Segmental Concrete Ramp	$74,047.50
11	Option 1A - Hardscape Stairs + Retaining Wall (Concrete)	$96,727.50

Pros Table	1 Hardscape Stairs + Retaining Wall	2 Hardscape Stairs + Riprap	3 Timber + Gravel Stairs	4 Segmental Concrete Ramp	5 Concrete Ramp	6 Gravel Ramp	7 Switchback Path
Width Variability/Multiple Person Access	X	X	X	X	X	X	
Less Heavy Equipment	X		X	X			
Shoreline Protection	X	X	X	X	X		X
User Stability	X	X		X	X		X
Durability Over Time and During Storm Events	X	X		X	X		
Low Maintenance	X	X			X		X
Submersible	X	X		X	X		
Boat Rail Option	X	X	X				
Natural Aesthetic						X	X
Park Consistency				X	X	X	
Short Construction Timeline Length		X	X	X	X	X	
Infiltration			X	X		X	X
Cost Effective		X	X				X
Total	8	9	7	9	8	5	6

Cons Table	1 Hardscape Stairs + Retaining Wall	2 Hardscape Stairs + Riprap	3 Timber + Gravel Stairs	4 Segmental Concrete Ramp	5 Concrete Ramp	6 Gravel Ramp	7 Switchback Path
High Amount of Excavation/Bank Disturbance Required	X			X	X	X	X
Potential for Slippery Surface	X	X	X	X	X		X
Difficult for Heavy Equipment Access	X	X		X	X	X	X
Potential for Material Loss			X	X		X	X
Potential Need for Structural Design	X						X
Potential for Undercutting			X				X
Total	4	2	3	4	3	3	6

5.0 PERMITTING ANALYSIS:

The New Jersey Department of Environmental Protection (NJDEP), Division of Land Resource Protection (DLRP) oversees environmental permitting pursuant to the Freshwater Wetlands Protection Act Rules and Flood Hazard Area Control Act Rules under the NJDEP's Watershed and Land Management (WLM) Program. The WLM has a comprehensive focus on protecting residents from increased flood damage and runoff, facilitating resiliency, protecting threatened and endangered plant and animal species and preserving the quality of the State's waters. The following regulations of the NJDEP Watershed & Land Management relative to the site were reviewed:

- N.J.A.C. 7:7A Freshwater Wetlands Protection Act Rules - This chapter constitutes the rules governing the implementation of the Freshwater Wetlands Protection Act, N.J.S.A. 13:9B-1 et seq.
- N.J.A.C. 7:13 Flood Hazard Area Control Act Rules - This chapter sets forth requirements governing human disturbance to the land and vegetation in the following areas: The flood hazard area of a regulated water and riparian zone of a regulated water.

The Delaware and Raritan Canal Commission (DRCC) oversees governmental projects with the Delaware and Raritan Canal State Park to ensure that projects conform to the Master Plan under N.J.A.C. 7:45. The DRCC objectives are to protect the water supply system as well as encourage recreational activities.

USACE Public Notice dated March 14, 1994, states that the Delaware River is a body of water over which the NJDEP will not assume Section 404 program jurisdiction. The Delaware River is a Waters of the United States (WOTUS) and regulated by both the NJDEP and the USACE.

The discussion within the below subsections identifies the required permitting and thresholds. This table summarizes the NJDEP and USACE permits required under options discussed above.

Rule	1 Hardscape Stairs Retaining Wall	2 Hardscape Stairs Riprap	3 Timber Gravel Stairs	4 Segmental Concrete Ramp	5 Concrete Ramp	6 Gravel Ramp	7 Switchbank Path
NJDEP DLRP Flood Hazard Area Control Act Rules	FHAIP for RZ and channel disturbance	FHAIP for RZ and channel disturbance	FHAIP for RZ disturbance	PBR18	PBR18	FHAIP for RZ and channel disturbance	FHAIP for RZ disturbance
NJDEP DLRP Freshwater Wetlands Protection Act Rules	FWWIP waterward of OHWM	FWWIP waterward of OHWM	FWWIP waterward of OHWM	GP19 waterward of OHWM	GP19 waterward of OHWM	FWWIP waterward of OHWM	FWWIP waterward of OHWM
NJDEP Delaware and Raritan State Park	Complete application is required for all governmental projects in the Park.						
USACE	NWP18 waterward of OHWM	NWP18 waterward of OHWM	NWP18 waterward of OHWM	NWP 36 waterward of OHWM	NWP36 waterward of OHWM	NWP 36 waterward of OHWM	NWP18 waterward of OHWM

4.1 NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION (NJDEP)

Rule: Freshwater Wetlands Protection Act at N.J.A.C. 7:7A, Flood Hazard Area Control Act at N.J.A.C. 7:13, Green Acres Program at N.J.A.C. 7:36, and Delaware and Raritan Canal State Park at N.J.A.C. 7:45

Once the site and activity have been defined, the environmental constraints must be determined and reviewed for any part of the site or activity that are regulated by the Division of Land Resource Protection under one of the applicable DEP Land Use Statues and Rules. The NJDEP has assumed jurisdiction over wetlands in delegable waters. In non-delegable waters both the NJDEP and USACE maintain jurisdiction. The NJDEP regulates water in two distinct ways, flood hazard areas and riparian zones. The NJDEP also assumes jurisdiction of tidal waters.

Previous Authorizations:

The NJDEP authorized the construction of two new access stair structures as well as split rail fencing located along the Delaware River on Block 50, Lot 100 under Flood Hazard Area Individual Permit (NJDEP#1016-08-0007.1 LUP 20001) dated June 3, 2020, expiration date June 2, 2025.

The Delaware and Raritan Canal Commission authorized the Stair Replacement and Rehabilitation Project under General Permit 1 (DRCC#:20-3460H) dated May 8, 2020.

United States Department of the Army authorized installation of temporary stairs at two locations in Kingwood Township [CENAP-OP-R-2013-842-24 (LOP)].

New Authorizations

FHACAR:

The seven (7) options identified above all require authorization from the Flood Hazard Control Act Rules (FHACAR) for the disturbances to the 50-foot Riparian Zone and disturbances to the Special Flood Hazard Area and the Floodway. The only authorizations available for these activities are either a permit-by-rule or an individual permit. There are no available general permits-by-certification nor general permits that authorize this type of activity in fluvial water.

Permits-by-rule may be utilized if designed to resist flotation, collapse, and displacement due to hydrostatic and hydrodynamic forces from floodwaters and comply with the applicable design and construction standards of the Uniform Construction Code and the Federal flood reduction standards. The activity cannot adversely affect low-flow aquatic passage, expose unset or raw cement to flowing water, destroy, jeopardize, or adversely modify a present or documented habitat

for threatened or endangered species and the project is not a major development as defined in the Stormwater Management rules at N.J.A.C. 7:8-1.2. The activity must meet all of the conditions of the permit-by-rule itself.

Permit-by-rule 18 – Construction of a boat launching ramp authorizes the construction of a boat launching ramp provided the ramp is constructed at or below grade, has a footprint of no more than 2,000 square feet; follow set timing restrictions. (Note that PBR18 is being recodified and amended mid-2025 to a Permit-by-Registration 9 which will require the activity to be registered but NJDEP authorization will not be required).

Permit-by-rule 22 Construction of a trail and/or boardwalk authorizes the creation of a trail and/or boardwalk, provided the trail or boardwalk is no wider than six (6) feet; does not raise the ground elevation. Boardwalk planks may be elevated above the ground provided the area underneath remains open to the passage of floodwaters. Riparian zone disturbance within 25 feet of top of bank unless the trail/boardwalk is necessary for access to a footbridge, dock or pier. No tress are cleared, cut and/or removed and riparian zone vegetation is limited to less than quarter (¼) acre.

Individual Permit authorizes activities that do not meet the requirements for a permit-by-rule. An activity proposed in a channel must demonstrate that the project cannot be accomplished without disturbance to the channel and must eliminate or minimize channel disturbance where possible. The project must be designed to be perpendicular to the channel. Disturbed sections should be stabilized especially if there are changes in slope, channel width and hydraulic capacity. Further, disturbance to the riparian zone's vegetation must be minimized.

Excavation, fill and grading activities cannot impede the overland flow of stormwater, any slope greater than 50 percent is stabilized using soil bioengineering, retaining walls, rip-rap or other appropriate slope protection.

Construction of a retaining wall must demonstrate that the retaining wall is designed with stable footings, at least three (3) feet below grade, withstand displacement, overturning, and failure and resistant to erosion as well as the possibility of a shifting bed/bank overtime.

FWPAR

The Freshwater Wetlands Protection Act Rules (FWPAR) regulate freshwater wetlands, transition areas (buffers) and State open waters through either a General Permit, Transition Area Waiver or Individual Permit. The previous activity of access stairs did not seek a FWPAR authorization likely because of the lack of wetlands, as proven by the USACE determination that no wetlands are present and that the State open waters disturbances were *de minimis*. Presently, the State open waters may incur adverse impacts or at least greater impacts than the access stair's anchors provided. The discharge of dredged or fill material into State open waters is regulated by FWPAR.

General Permit 19 - Docks and Piers – Can be obtained for activities in State open water if the activity complies with the following.

1. The proposed boat ramp is for use by the public.
2. The activities proposed shall disturb no more than one tenth ($^1/_{10}$) of an acre of State open waters.

If the concrete ramp is chosen, then a demonstration of a non-feasible onsite alternative location that will involve less or no disturbance to State open waters is required.
If the project for a boat ramp cannot comply with the criteria for a GP19, the applicant would need to apply for an Individual Permit (IP). An IP application would need to include a description as to why the project cannot be minimized to satisfy the General Permit criteria described above.

General Permit 17 – Trails and Boardwalks authorizes the construction of a trail, boardwalk or bike path within freshwater wetlands, transition areas, and/or State open waters provided the trail is no wider than six (6) feet. Since the project is being undertaken on a publicly owned site, there is no limit to the length of the activity.

Individual Permit authorizes projects that cannot meet the criteria for the above general permits, then an individual permit may be sought. The project/activity cannot have another practicable alternative that would have less adverse impact on the aquatic ecosystem.

Note that the Delaware River and Delaware River tributary contain State Threatened species, Yellow Lampmussel which the NJDEP maintains restrictions for instream work of April 1 – June 30 and August 1 – October 30.

Rank 3 - State Threatened: Delaware River tributary

Habitat: Rank 3 - State Threatened
Feature Name: Delaware River tributary
Segment Length: 0.47 miles
Landscape Region: Skylands
Listed Freshwater Fish and Mussel Species:

Status	Species	Feature Label	Year	Count
Federal	No records	No records	No records	No records
State Endangered	No records	No records	No records	No records
State Threatened	Yellow Lampmussel	Live Individual Sighting	2013	3
Special Concern	No records	No records	No records	No records

Furthermore, the entire length of the Delaware River is confirmed spawning run for American Shad and River Herring. The NJDEP timing restriction instream work standard is from October 1 – November 30th.

Green Acres Program

The site is encumbered by Green Acres however Parks is free to make recreation improvements to the land because they mange it. No authorization or Green Acres approval is required.

D&R Canal State Park
The D&R Canal Commission (DRCC) defines the Park as the Delaware and Raritan Canal State Park as determined by the Department. Furthermore, the DRCC defines the Review Zone and also maps the review zone on NJDEP Geoweb. The subject sites are located outside of the mapped Review Zones but within the D&R Canal State Park. Review Zones are regions of the Park broken into subzones designated as Zone A and Zone B. Zone A is related to the Canal and Zone B is the rest of the Park. The D&R has previously determined that the sites are located within Zone A.

The objectives of the Master Plan of the D&R Canal State Park are aimed at encouraging the widest possible range of compatible recreational activities. According to N.J.A.C. 7:45-2.2(b) any project located outside the review zone is exempt from Commission review and approval. Concurrent with its authority to review projects in the Commission "Review Zone" N.J.A.C. 7:45-2.3 directs that in addition to the review zone, the Commission shall approve all State actions that impact on the Park." The previous Fairview and Point Pleasant river access area project were subject to Commission jurisdiction.
Accordingly, any State agency planning to undertake a governmental project in the Delaware and Raritan Canal State Park shall submit a complete application together with all supporting information to the Commission pursuant to N.J.A.C. 7:45-3.5(b).

4.2 UNITED STATES ARMY CORPS OF ENGINEERS (USACE)

Rule: *Section 10 of the Rivers and Harbors Act, Section 404 of the Clean Water Act, and Section 103 of the Marine Protection, Research and Sanctuaries Act of 1972*

The NJDEP assumed responsibility for administering the Federal Wetlands Program in delegable waters. The subject site is located north of the head of tide in Trenton, NJ (limit of tidal influence). The project area along the Delaware River is not tidal (non-delegable water) but it is used or can be used to transport interstate or foreign commerce. According to the USACE Public Notice dated March 14, 1994, the Delaware River is a body of water over which the NJDEP will not assume Section 404 program jurisdiction. The Delaware River is a Waters of the United States (WOTUS) and regulated by both the NJDEP and the USACE. Should the activity impact the ordinary high water, then a USACE authorization is required. The USACE instrument for authorization includes Nationwide Permits, Individual Permits and Letters of Permission. Note that in 2013 the USACE issued a Preliminary Jurisdictional Determination that identifies the site as non-wetlands waters.

The USACE authorized the installation of temporary (seasonal) stairs at two (2) locations in and along the Delaware River (USACE#CENAP-OP-R-2013-842-24) under Letter of Permission dated December 19, 2013. The Letter of Permission expired December 31, 2016.

Avoidance of the ordinary high-water mark (OHWM) at the Delaware River for the purposes of recreational access is preferred. If avoidances are not practicable, then the project may qualify for the following:

Nationwide Permit 18 authorizes minor discharges of dredged or fill material into all WOTUS provided the activity does not excavate greater than 25 cubic yards below the plane of the OHWM; does not cause a loss of more than one tenth acre of WOTUS. A preconstruction notification (PCN) is required should volume of area excavated exceed 10 cubic yards below the OHWM or if the dredged or fill material is in a special aquatic site.

Nationwide Permit 36 authorizes activities required for the construction of boat ramps provided the discharge of dredged or fill material in WOTUS does not exceed 50 cubic yards; the boat ramp does not exceed 20 feet in width. A PCN is required if these thresholds are exceeded.

REFERENCES

https://dwr.virginia.gov/boating/building-boat-ramps/

https://www.river-management.org/assets/PreparetoLaunch/ch.3%20part%201%201.15.14.pdf

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https://www.epa.gov/system/files/documents/2021-11/bmp-riprap.pdf

https://awwatersheds.org/infiltration-steps-do-it-yourself-conservation-practices/

https://lakeshoreguys.com/boat-ramp-construction/

https://www.amconconcreteproducts.com/product/boat-ramps/

EXHIBIT 'E'