



DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, NORTH ATLANTIC DIVISION
FORT HAMILTON MILITARY COMMUNITY
302 JOHN WARREN AVENUE
BROOKLYN, NY 11252-6700

JUN 26 2024

CENAD-PD-P (1105-2-10c)

MEMORANDUM FOR Commander, U.S. Army Corps of Engineers, New York District,
26 Federal Plaza New York, NY 10278-0090

SUBJECT: Transmittal of the Review Plan - Rahway River Basin Flood Risk Management (FRM) Project, New Jersey Feasibility Study (FRM) Project, Essex, Middlesex and Union Counties, Feasibility Study (P2#: 502592)

1. Reference Memorandum, CENAN-DE, dated 21 February 2024, subject as above.
2. The Flood Risk Management Planning Center of Expertise of the South Pacific Division (SPD) is the lead office to execute the referenced Review Plan. The Review Plan includes Independent External Peer Review.
3. The enclosed Review Plan is approved for execution and is subject to change as study circumstances require, consistent with study development under the Project Delivery Business Process. Subsequent revisions to this Review Plan or its execution require new written approval from NAD.
4. The point of contact is Mr. Larry Cocchieri, NAD Planning Program Manager at 347-370-4571 or Lawrence.J.Cocchieri@usace.army.mil.

Encl

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JOHN P. LLOYD
Brigadier General, USA
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DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, NEW YORK District
JACOB K. JAVITS FEDERAL BUILDING, 26 FEDERAL PLAZA
NEW YORK, NEW YORK 10278-0090

CENAN-DE

February 21, 2024

MEMORANDUM FOR COMMANDER, U.S. Army Corps of Engineers North Atlantic Division, 301 General Lee Avenue, Fort Hamilton Community, Brooklyn, New York 11252 (ATTN: Ricciardi)

SUBJECT: Transmittal of the Review Plan - Rahway River Basin Flood Risk Management (FRM) Project, New Jersey Feasibility Study (FRM) Project, Essex, Middlesex and Union Counties, Feasibility Study (P2#: 502592)

1. Reference:

- a. Engineer Regulation (ER) 1165-2-217, Civil Works Review Policy, 01 MAY 2021.
2. The New York District (NAN) is requesting review and approval of the enclosed Review Plan (enclosure 1) for the Rahway River Basin FRM Project, Essex, Middlesex and Union Counties, New Jersey Feasibility Study prepared in accordance with ER 1165-2-217 (reference 1a).
3. The Rahway River Basin FRM Feasibility phase may include life safety concerns associated with the design of a detention basin, in addition to high profile interest based on the history of the study, as detailed in the Review Plan. The NAN Study Team has made a risk-informed determination that this study warrants an Independent External Peer Review (IEPR), which will be conducted after the draft report package is released for concurrent review. This decision is detailed in the Review Plan (enclosure 1).
4. The Review Plan has been coordinated with the Flood Risk Management Planning Center of Expertise (FRM-PCX) as the review management organization and endorsed by the FRM-PCX in the enclosed memorandum (enclosure 2).
5. Please direct any questions or requests for information to Mr. Jack Steketee, Lead Planner at (917) 790-8363, jack.c.steketee@usace.army.mil.

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Alexander Young
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CENAN-DE

SUBJECT: Transmittal of the Review Plan - Rahway River Basin Flood Risk Management (FRM) Project, New Jersey Feasibility Study (FRM) Project, Essex, Middlesex and Union Counties, Feasibility Study (P2#: 502592)

Encls:

1. Rahway Fluvial Review Plan
2. FRM-PCX Endorsement Memorandum



DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS
SOUTH PACIFIC DIVISION
450 GOLDEN GATE AVENUE
SAN FRANCISCO CALIFORNIA 94102-3661

CESPD-PDP (FRM-PCX)

7 December 2023

MEMORANDUM FOR Olivia Cackler, Chief Plan Formulation Branch, New York District, U.S. Army Corps of Engineers (CENAN-PL-F)

SUBJECT: FRM-PCX Endorsement of the Review Plan for the Rahway River Basin, New Jersey, Flood Risk Management Feasibility Study

1. References:

- a. Engineer Regulation (ER) 1165-2-217, Civil Works Review Policy, 1 May 2021.
- b. CECW-P Memorandum, Subject: Model Coordination for Civil Works Planning Studies, 28 July 2023.

2. The Flood Risk Management Planning Center of Expertise (FRM-PCX) endorses the subject review plan, dated December 2023, for approval by the North Atlantic Division (NAD).

3. The FRM-PCX, as the assigned Review Management Organization (RMO), coordinated with the New York District (NAN) in the development of the review plan and reviewed the enclosed plan for compliance with references 1a and 1b. The FRM-PCX coordination and review were led by Ms. Natalie McKinley, FRM-PCX Regional Manager for the study. All review comments have been satisfactorily resolved.

4. The FRM-PCX concurs with the level and scope of review identified and supported in the review plan, including the decision to perform Independent External Peer Review (IEPR). The project does not meet any mandatory triggers for performing IEPR; however, a risk-informed decision to perform IEPR is provided in the review plan based on previous concerns about the environmental consequences of proposed detention measures and resulting public comments.

5. The FRM-PCX confirmed the models listed in the review plan are appropriately approved or certified and reasonable for use in the study with two exceptions. One model, TotalRisk, is pending FRM-PCX certification. Certification of TotalRisk is anticipated in December 2023 or January 2024 and no certification issues related to study execution are anticipated. The High Gradient Macroinvertebrate Index (HGMI) model was approved for use in 2014 but the approval expired in 2021. The process to reapprove the HGMI model has been coordinated with the Ecosystem Restoration Planning Center of Expertise and is anticipated to be completed in the second quarter Fiscal Year 2024.

6. The FRM-PCX confirmed NAN has prepared model user checklists, enclosed, to address requirements in reference 1.b. Checklists were provided to the FRM-PCX for all proposed models.

7. Please include this memorandum when transmitting the review plan for approval by NAD. Upon approval of the review plan, please provide a copy of the approved plan, a copy of the

CESPD-PDP (FRM-PCX)

SUBJECT: Review Plan Endorsement for the Rahway River Basin, New Jersey Flood Risk Management Feasibility Study

approval memorandum, and the link to where the plan is posted on the District website to Ms. McKinley.

8. Thank you for the opportunity to assist in the preparation of the review plan. Please coordinate the Agency Technical Review (ATR) and IEPR efforts outlined in the review plan, and any future updates to the plan, with Ms. McKinley.

Eric Thaut

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Encls

ERIC THAUT

Deputy Director, Flood Risk Management
Planning Center of Expertise

CF:

CELRH-PMD-F (McKinley)

CESAM-PD-FP (Harrington)

CENAN-PL-F (Steketee)

CENAN-PP-C (Salim)

CENAD-PD-C (Ricciardi)

CELRN-PM-P (Hall)

CENAD-PD-P (Cresitello)

CEMVK-EC-P (Calla)

CELRH-MXG (Robinette)

Review Plan
June 2024

1. Project Summary

Project Name: Rahway River Basin, New Jersey Flood Risk Management Feasibility Study

Location: Rahway River Basin Watershed in northeastern New Jersey, occupies approximately 15 percent of Essex County, 35 percent of Union County, and 10 percent of Middlesex County

P2 Number: 502592

Decision and Environmental Compliance Document Type: Feasibility Report

Congressional Authorization Required: Yes

Project Purpose(s): Flood risk management

Non-Federal Sponsor: New Jersey Department of Environmental Protection (NJDEP)

Points of Public Contact for Questions/Comments on Review Plan:

District: New York District (CENAN)

District Contact: Project Manager, (917) 790-8215

Major Subordinate Command (MSC): North Atlantic Division

MSC Contact: Program Manager (347) 370-4557

Review Management Organization (RMO): Flood Risk Management Planning Center of Expertise (FRM-PCX)

RMO Contact: Deputy Director, FRM-PCX , (415) 503-6852

Key Review Plan Dates

Date of RMO Endorsement of Review Plan	7 Dec 2023
Date of MSC Approval of Review Plan	26 June 2024
Date of IEPR Exclusion Approval	N/A
Has the Review Plan changed since RMO Endorsement?	No
Date of Last Review Plan Revision	None
Date of Review Plan Web Posting	Pending

Milestone Schedule and Other Dates

	Scheduled	Actual
FCSA Execution	-	28 Feb 2023
Interagency Meeting		8-Aug-2023
Alternatives Milestone	18-Sept-2023	18-Sept-2023
Vertical Team Alignment Memo (VTAM)	30-Nov-2023	11-Dec-2023
Tentatively Selected Plan	12-Dec -2024	-
Release Draft Report to Public	12 Feb-2025	-
Agency Decision Milestone	30-Jul-2025	-
Final Report Transmittal	27-Feb- 2026	-

State & Agency Briefing	(enter date)	-
Chief's Report	27 Aug 2026	-

2. References

Engineer Regulation 1165-2-217 – Water Resources Policies and Authorities – Civil Works Review Policy, 1 May 2021.

Engineer Circular 1105-2-412 – Planning – Assuring Quality of Planning Models, 31 March 2011.

Planning Bulletin 2013-02, Subject: Assuring Quality of Planning Models (EC 1105-2-412), 31 March 2013.

Office of Management and Budget, Final Information Quality Bulletin for Peer Review, Federal Register Vol. 70, No. 10, January 14, 2005, pp 2664-267

The online USACE Planning Community Toolbox provides more review reference information at: <https://planning.erdc.dren.mil/toolbox/current.cfm?Title=Peer%20Review&ThisPage=Peer&Side=No>.

3. Review Execution Plan

The general plan for executing all required independent reviews is outlined in the following two tables.

Table 1 lists each study product to be reviewed. The table provides the schedules and costs for the anticipated reviews. Teams also determine whether a site visit will be needed to support each review. The decisions about site visits are documented in the table. As the review plan is updated the team will note each review that has been completed.

Table 2 identifies the specific expertise and role required for the members of each review team. The table identifies the technical disciplines and expertise required for members of review teams. In most cases the team members will be senior professionals in their respective fields. In general, the technical disciplines identified for a District Quality Control (DQC) team will be needed for an Agency Technical Review (ATR) team. Each ATR team member will be certified to conduct ATR by their community of practice. If Independent External Peer Review (IEPR) is warranted, panel membership will reflect disciplines representing the areas of expertise applicable to the review being conducted. The table is set up to concisely identify common types of expertise that may be applicable to one or more of the reviews needed for a study.

Table 1: Schedule and Costs of Reviews

Product to undergo Review	Review Level	Site Visit	Start Date	End Date	Cost	Complete
HGMI Model Review/Reapproval	Model Review (see EC 1105-2-412) ¹	No	12/31/2022	03/31/2023	\$0	No
H&H and Economic and FWOP Modeling	Targeted DQC ²	No	07/23/2024	08/22/2024	\$10,000	No
H&H and Economic and FWOP Modeling	Targeted ATR	No	08/22/2024	09/19/2024	\$10,000	No
Existing Model/FWOP	IPR	No	08/15/2024	08/15/2024	\$5,000	No
Draft Feasibility Report / EA or EIS	District Quality Control (DQC)	Yes	1/22/2025	02/23/2025	\$45,000	No
Draft Feasibility Report / EA or EIS	Public Comment under National Environmental Policy Act	No	02/30/2025	4/15/2025	N/A	No
Draft Feasibility Report / EA or EIS	Agency Technical Review (ATR)	No	02/30/2025	4/29/2025	\$79,200	No
Draft Feasibility Report / EA or EIS	Independent External Peer Review (IEPR)	N/A	02/30/2025	5/16/2025	\$200,000 ³	No
Draft Feasibility Report / EA or EIS	Policy and Legal Compliance Review	Yes	02/30/2025	5/20/2025	N/A	No
Final Feasibility Report / EA or EIS	DQC	N/A	12/1/2025	01/11/2026	\$34,000	No
Final Feasibility Report / EA or EIS	ATR	N/A	01/12/2026	02/23/2026	\$49,000	No
Final Feasibility Report / EA or EIS	Policy and Legal Compliance Review	N/A	03/01/2026	04/14/2026	N/A	No

¹Models to be reviewed/reapproved include:

- HGMI

²FWOP models to undergo Targeted DQC/ATR include:

- HEC-RAS

- HEC-HMS
- HEC-FDA
- HEC-SSP

³IEPR cost estimate includes \$170,000 for the IEPR contract and \$30,000 for IWR and PCX labor.

Table 2: Review Teams - Disciplines and Expertise

Discipline / Role	Expertise	DQC	ATR	IEPR
DQC Team Lead	Extensive experience preparing Civil Works decision documents and leading DQC. The lead may serve as a DQC reviewer for a specific discipline (planning, economics, environmental, etc.).	Yes	No	No
ATR Team Lead	Professional with extensive experience preparing Civil Works decision documents and conducting ATR. Skills to manage a virtual team through an ATR. The lead may serve on the ATR team for a specific discipline (such as planning, economics, or environmental work).	No	Yes	No
IEPR Manager	Planner with extensive knowledge of IEPR policy and procedures and contract management and oversight skills.	No	No	Yes
Planning	Skilled water resources planner knowledgeable in complex planning investigations and the application of SMART principle to problem solving. Experience in formulation and evaluation of nonstructural plans and implementation/design of nonstructural measures.	Yes	Yes	Yes
Economics	Experience with applying theory, methods and tools used in the economic evaluation of water resources projects including HEC-FDA and LifeSim	Yes	Yes	Yes
Environmental Resources	Experience with environmental evaluation and compliance requirements, national environmental laws and statutes, applicable Executive Orders, and other planning requirements.	Yes	Yes	Yes
Cultural Resources	A senior cultural resources specialist with experience in environmental evaluation and compliance requirements pursuant to the “Procedures for Implementing NEPA” (ER 200-2-2), National Historic Preservation Act (NHPA) Section 106 requirements, national environmental laws and statutes, New Jersey state historic and cultural preservation statutes, and other federal planning requirements for civil works projects.	Yes	Yes	No
Hydrologic and Hydraulic Engineering	The Hydrologic and Hydraulic Engineering Panel Member will be a registered professional engineer in hydrologic and hydraulic engineering with an emphasis on large public works projects. Active participation in related professional societies is encouraged. The panel member will have extensive experience associated with flood risk management projects with an emphasis on large river control structures, including levees and floodwalls, detention basins, and channel modification. The panel member will have experience modeling large river systems and possesses a thorough understanding of the dynamics of open channel flow systems, floodplain hydraulics, and interior flood control systems. In addition, the panel member must understand riverine hydraulics. The panel member will be familiar application of risk and uncertainty analyses in flood	Yes	Yes	Yes

Discipline / Role	Expertise	DQC	ATR	IEPR
	risk management studies. The panel member must also be familiar with standard hydrologic and hydraulic computer models such as HEC-1, HEC-HMS, HEC-2, and HEC-RAS.			
Coastal Engineering	The Coastal Engineering panel member will have experience with coastal hydraulic modeling and possess understanding of the interaction between coastal and riverine systems.	Yes	Yes	No
Cost Engineering	Experience using cost estimation software; working knowledge of water resource project construction; capable of making professional determinations using experience.	Yes	Yes	No
Civil Engineering	A civil engineer with experience in feasibility-level design of FRM projects including but not limited to site selection and evaluation of alternative layouts and alignments; engineering requirements relating to lands, easements, rights-of-way, and borrow and disposal sites necessary for the construction, operation, and maintenance of the project; and determination of facility/utility relocations required for projects	Yes	Yes	Yes
Geotechnical Engineering (optional)	A geotechnical engineer would be required if an alternative including detention, floodwalls, or levees is identified as the TSP. Team member will be an expert at reviewing boring samples, sediment samples, and geotechnical requirements related to FRM measures	Yes	Yes	No
Real Estate	Experience developing Real Estate Plans and experience in real estate fee/easement acquisition and residential/business relocations for Federal and/or Federally Assisted Programs for implementation of Civil Works projects.	Yes	Yes	No
Climate Preparedness and Resilience	A member of the Climate Preparedness and Resiliency Community of Practice knowledgeable of inland hydrology climate change assessment policy and practice.	No	Yes	No
Risk and Uncertainty	For decision documents involving hydrologic, hydraulic, and/or coastal related risk management measures, include on the ATR team an expert on multi-discipline flood risk analysis to ensure consistent and appropriate identification, analysis, and written communication of risk and uncertainty.	No	Yes	No

4. Documentation of Reviews

Documentation of DQC. Quality Control will be performed continuously. A specific certification of DQC completion will be prepared at the base conditions (existing and future), draft and final report stages. Documentation of DQC will follow the District Quality Manual and the MSC Quality Management Plan. DrChecks will be used for documentation of DQC comments. An example DQC Certification statement is provided in ER 1165-2-217, Appendix D. Documentation of completed DQC, to include the DQC checklist, will be provided to the MSC, RMO and the ATR Team leader. The ATR team will examine DQC records and comment in the ATR report on the adequacy of the DQC effort.

Documentation of ATR. DrChecks will be used to document all ATR comments, responses, and resolutions. Comments should be limited to those needed to ensure product adequacy. All members of the ATR team will use the four-part comment structure (see ER 1165-2-217, Section 5). If a concern cannot be resolved by the ATR team and PDT, it will be elevated to the vertical team to resolve using the issue resolution process in ER 1165-2-217, Section 5.9. Unresolved concerns will be closed in DrChecks by noting the concern has been elevated. ATR documentation will include an assessment by the ATR team of the effectiveness of DQC. The ATR Lead will prepare a Statement of Technical Review (see ER 1165-2-217, Section 5.11, and Appendix D), for the draft and final reports, certifying that review issues have been resolved or elevated. ATR will be certified when all concerns are resolved or referred to the vertical team and the ATR documentation is complete.

Documentation of IEPR. The Outside Eligible Organization will submit a final Review Report no later than 60 days after the end of the draft report public comment period. USACE shall consider all recommendations in the final Review Report and prepare a written response for all recommendations. The final decision document will summarize the Review Report and USACE response and will be posted on the internet.

5. Supporting Information

Study or Project Background

Study Authority

The Rahway River Study was authorized in a resolution of the Committee on Transportation and Infrastructure of the U.S. House of Representatives. The Rahway River Basin resolution was dated 24 March 1998, which states:

Resolved by the Committee on Transportation and Infrastructure of the United States House of Representatives, That, the Secretary of the Army review the report of the Chief of Engineers on the Rahway River, New Jersey, published as House Document 67, 89th Congress, and other pertinent reports to determine whether any modifications of the recommendations contained therein are advisable at the present time, in the interest of water resources development, including flood control, environmental restoration and protection and other related purposes.”

The New York District (NAN) worked closely with the NJDEP and the Mayors’ Council and developed fourteen alternatives from an array of structural and nonstructural measures. Two alternatives were recommended by NAN to headquarters (HQUSACE) for implementation during the Tentatively Selected Plan (TSP) milestone.

During ADM briefing with HQUSACE, the Risk Management Center (RMC - the National Center of Expertise for assessment and management of Corps-wide infrastructure) identified significant concerns regarding the existing Orange Reservoir dam and its operation, specifically a forecast-based operation.

Given the significance of life safety concerns, further evaluation of the Rahway River Basin flood risk reduction alternatives was turned over to the New England District (NAE) in March 2018. NAE evaluated an additional five alternatives/optimizations in order to seek a mutually supported solution as per requests by the Mayors Council, through the NJDEP, to evaluate/revise alternatives, and none of them were economically justified or acceptable to the local communities. USACE issued a study termination memo on 10 December 2019 due to the inability to find feasible alternatives.

Section 336 of the Water Resources Development Act of 2020 (WRDA 2020) directs the Secretary to nullify the termination of the Rahway, New Jersey, Flood Risk management feasibility study, identify an acceptable project alternative, and complete and expedite a feasibility study for the identified alternative.

The Secretary shall

(1) nullify the determination of the North Atlantic Division of the Corps of Engineers that further activities to carry out the feasibility study for a project for flood risk management, Rahway, New Jersey, authorized by the resolution of the Committee on Transportation and Infrastructure of the House of Representatives adopted on March 24, 1998 (docket number 2548), is not warranted.

(2) identify an acceptable alternative to the project described in paragraph (1) that could receive Federal support; and

(3) carry out, and expedite the completion of, a feasibility study for the acceptable alternative identified under paragraph (2).

Study or Project Area

The Rahway River Basin is located in northeastern New Jersey. It lies within the metropolitan area of Greater New York City and occupies approximately 15 percent of Essex County, 35 percent of Union County, and 10 percent of Middlesex County. The basin is 83.3 square miles (53,300 acres) in area and is roughly crescent-shaped. Its greatest width is approximately 10 miles in the east-west direction, from the City of Linden to the City of Plainfield. Its greatest length is approximately 18 miles in a north-south direction, from West Orange to Metuchen. The tidal influence on the Rahway River extends roughly 5 miles from the Arthur Kill into the City of Rahway

The Rahway River consists of the mainstem Rahway River and four branches. The West Branch flows south from West Orange through South Mountain Reservation and downtown Millburn. The East Branch also originates in West Orange and Montclair and travels through South Orange and Maplewood. These two branches converge near Route 78 in Springfield to form the mainstem of the Rahway River. The Rahway River flows through the municipalities of Springfield, Union, Cranford and Clark before traveling through the City of Rahway. The Rahway River receives the waters of Robinson's Branch at Elizabeth Avenue between West Grand Avenue and West Main Street and the waters of the South Branch at East Hazelwood Avenue and Leesville Avenue before it leaves the City of Rahway and enters the city limits of Linden and Carteret. The Rahway River then flows into the Arthur Kill.

A system of levees and pump stations for flood risk management was constructed by USACE in 1974 within the City of Rahway, New Jersey. The project area is located along the right (west) bank of the Rahway River between Monroe Street and Hazelwood Avenue. The project is maintained by the New Jersey State Department of Environmental Protection. This project does not protect the Robinson’s Branch area in the City of Rahway discussed in this review plan. Existing projects by USACE are summarized in Table 1.

Study or Project Area Map

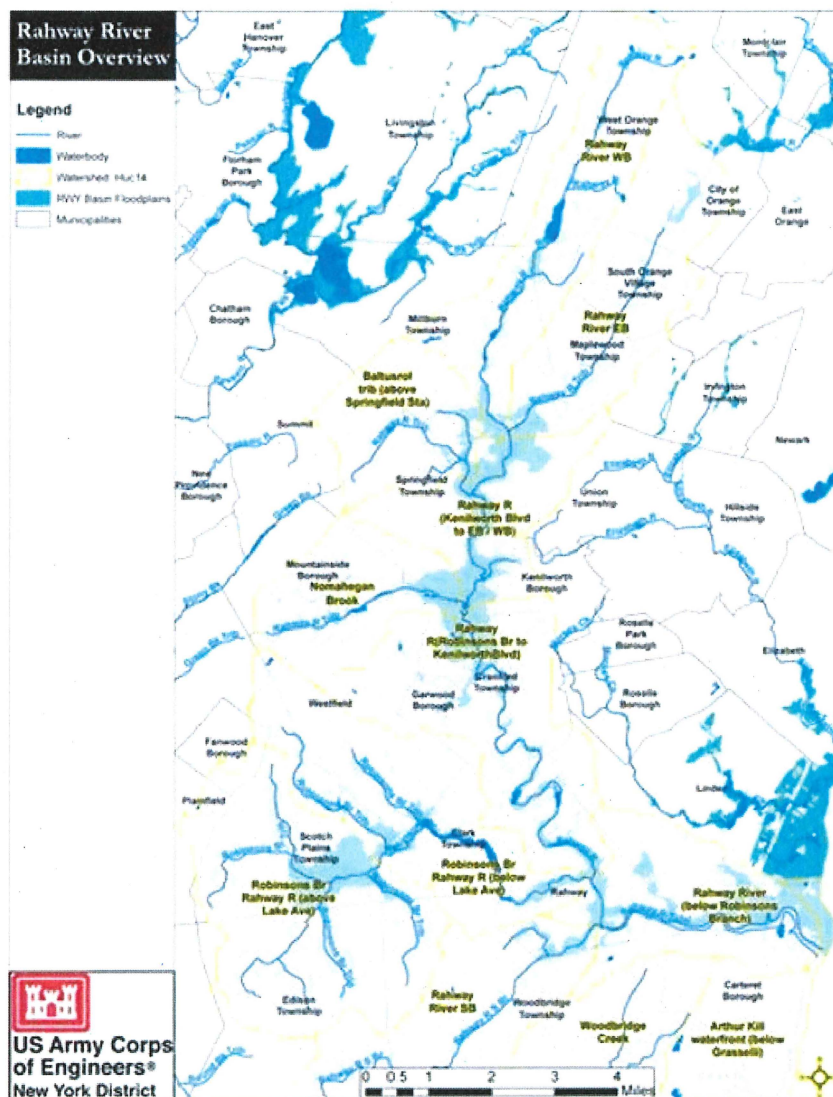


Figure 1 – Study Area Map.

Problem Statement

The water resources problem to be solved is fluvial flooding in the study area. Although, with a tidal influence present in the region, the interaction between fluvial and coastal flooding will require additional analysis. Flooding within the Rahway River Basin is caused principally by rainfall during storm events. The flooding in the region has resulted in damages to structures (residential and commercial) and their contents as well as a threat to the life safety of those living and working in the study area. The problem is exacerbated by

impervious surface coverage in the area which has resulted in a large increase of stormwater runoff into the Rahway River and its tributaries. The increased runoff coupled with inadequate channel capacities and bridge openings account for most of the flooding problems. Measures to reduce flood damages have been sought by local interests for many years.

Goals and Objectives

Goal: The goal of the study is to reduce flood risk to vulnerable populations and reduce economic and social impacts from riverine flooding in the Rahway River Basin Watershed. Objectives for this study are to:

Objectives:

- 50-year Period of Analysis – 2030 to 2080 for all objectives
- Provide flood risk management for business and residential structures
- Improved public health and safety, reduced traffic delays and emergency access for the fire department, medical personnel, and police protection
- Increase public awareness to the risk of flooding from the Rahway River
- Enhance the resources of the existing natural and social environment in the project area
- To reduce vulnerability to flood impacts of Environmental Justice communities in the study area

Future Without Project Conditions

- Development is assumed to remain stable as few open areas remain available for new development. Future development in upland areas would increase future flood risk. Without FRM, significant developed areas will remain susceptible to severe flooding including future flood damages and impacts to the general wellbeing of the residents living and working in the Basin.
- The following are assumed to be unchanged in the FWOP condition: socioeconomic/demographic characteristics, topography, geology, soils, water resources, vegetation, fish and wildlife, HTRW sites, cultural resources, recreation, aesthetic and scenic resources.
- Study will consider inland climate change, sea level change, and compound flooding.

Types of Measures/Alternatives Being Considered

Measures and Alternatives: The following management measures were considered during the study:

Structural Measures

Structural FRM measures are man-made, constructed measures that counteract a flood event in order to reduce the hazard or to influence the course or probability of occurrence of the event. Structural FRM measures to be evaluated in this study include:

- Levees
- Floodwalls
- Channel modification
- Dams (new dry or wet detention basins)

Nonstructural Measures

Nonstructural FRM measures are permanent or contingent measures applied to a structure and/or its contents that prevent or provide resistance to damage from flooding. Nonstructural measures differ from structural measures in that they focus on reducing the consequences of flooding instead of focusing on reducing the probability of flooding. Nonstructural FRM measures to be evaluated in this study include:

- Acquisition
- Relocation
- Elevation
- Floodproofing (wet or dry)

Natural and Nature-Based Features (NNBF)

NNBF includes “the use of landscape features to produce FRM benefits. NNBF projects may also produce other economic, environmental, and social benefits known as NNBF co-benefits.” NNBF features in fluvial systems include measures that reduce flood risk by integrating hydrology, hydraulic, morphological, and ecological principles (USACE 2021). NNBF measures to be considered for this study include:

- Stream Restoration
- Smaller Detention Ponds
- Restoration after Nonstructural Measures

An initial array of alternative has been developed by combining compatible FRM measures and will be revised as the PDT works through the formulation process, see Table 3

Table 3: Initial Array of Alternatives

Alternative	Alternative Description
Alternative 1	No Action
Alternative 2	Comprehensive plan – large scale detention (South Mountain Dry Detention)
Alternative 3	Combination plan – targeted channelization, along with buyouts and potential localized storage from bought out areas and targeted levees and floodwalls
Alternative 4	Nonstructural Plan consisting of acquisition, relocation, elevation, and floodproofing
Alternative 5	Lenape Park Detention Basin and Channel modification at the Rahway River at Cranford Township, and modification to

Estimated Cost/Range of Costs

Costs of the alternatives have not been fully developed at this project stage, however given the size of the study area, previous work conducted and proposed measures we estimate costs in a range of \$50 million to \$250 million.

6. Models to be Used in the Study

EC 1105-2-412 mandates the use of certified or approved models for all planning activities to ensure the models are technically and theoretically sound, compliant with USACE policy, computationally

accurate, and based on reasonable assumptions. Planning models are any models and analytical tools used to define water resources management problems and opportunities, to formulate potential alternatives to address the problems and take advantage of the opportunities, to evaluate potential effects of alternatives and to support decision making.

The following planning models may be used to develop the decision document:

Table 4: Planning Models.

Model Name and Version	Brief Model Description and How It Will Be Used in the Study	Certification / Approval
HEC-FDA 1.4.3	The Hydrologic Engineering Center’s Flood Damage Reduction Analysis (HEC-FDA) program provides the capability for integrated hydrologic engineering and economic analysis for formulating and evaluating flood risk management plans using risk-based analysis methods. The program will be used to evaluate and compare the future without- and with-project plans in Rahway Fluvial study and to aid in the selection of a recommended plan to manage flood risk.	Certified
LifeSim version 2.0	LifeSim program is an agent-based estimation software that simulates population distribution during a flood to estimate life loss and direct damages. LifeSim may be used to estimate life loss during a flood event.	Certified
TotalRisk 1.0	TotalRisk is a flexible, and scalable, risk analysis program that connects the components of flood risk analysis: hazard, response and consequences. TotalRisk natively interacts with LifeSim v2.0 to estimate life risk.	Certification Pending, anticipated in the 1 st quarter of FY24
RECONS	Regional Economic System (RECONS) is an economic model, designed to provide accurate and defensible estimates of regional economic impacts and contributions associated with USACE projects, programs, and infrastructure.	Certified
High Gradient Macroinvertebrate Index (HGMI)	The HGMI is a functional assessment model that will be used to quantify potential impacts and/or benefits to streams from proposed alternatives. The model utilizes the companion High Gradient Stream Habitat Assessment Worksheet developed as part of the EPA’s Rapid Bioassessment Protocol. The Worksheet consists of a table comprised of ten Habitat Parameters and four Condition Categories with a numerical scale that is used to evaluate and rate each Habitat Parameter.	Approved for regional use in 2014. Model re-approval is pending, anticipated in 2 nd quarter of FY24

Evaluation of Planned Wetlands (EPW)	EPW was developed as a tool to assess six wetland functions and determining whether a planned wetland has been adequately designed to achieve defined wetland function goals. It was designed specifically to serve during the planning of wetland restoration and mitigation actions and provides a framework for quantifying activities with a study area. As part of the model approval process, a companion workbook was developed to standardize documentation of the evaluation and reporting method.	Approved for regional use
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EC 1105-2-412 does not cover engineering models used in planning. The responsible use of well-known and proven USACE developed and commercial engineering software will continue. The professional practice of documenting the application of the software and modeling results will be followed. The USACE Scientific and Engineering Technology Initiative has identified many engineering models as preferred or acceptable for use in studies. These models should be used when appropriate. For example, HH&C models need to comply with the requirements of HH&C CoP Enterprise Standard 08101.

These engineering models may be used to develop the decision document:

Table 5: Engineering Models.

Model Name and Version	Brief Model Description and How It Will Be Used in the Study	Approval Status
HEC-RAS 6.3.1 (River Analysis System)*	The Hydrologic Engineering Center’s River Analysis System (HEC-RAS) program provides the capability to perform one-dimensional steady and unsteady flow river hydraulics calculations. The program will be used for steady/unsteady flow analysis to evaluate the future without- and with-project conditions along the streams of the Rahway River watershed (fluvial portion) and determine downstream impacts of proposed project features on authorized project features.	HH&C CoP Preferred Model
HEC-HMS 4.10*	This model will be used to define the watersheds’ physical features; describe the metrological conditions; interior drainage analysis; estimate parameters; analyze simulations; and obtain GIS connectivity	HH&C CoP Preferred Model
HEC-SSP 3.2*	This software allows users to perform statistical analyses of hydrologic data. This model will be used to perform generalized frequency analyses, volume frequency analyses, duration analyses, coincident frequency analyses, curve combination analyses, balanced hydrograph analyses, distribution fitting analyses, mixed population analyses, correlation analyses, and record extension analyses based on Bulletin 17C	HH&C CoP Preferred Model

AutoCAD Civil 3D	AutoCAD Civil 3D 2022 will be used to produce feasibility level plan sheets per current USACE CADBIM standards.	Industry Standard
MII	MII is the second generation of the Micro-Computer Aided Cost Estimating System (MCASES). It provides an integrated cost estimating system (software and databases) that meets USACE requirements for preparing cost estimates.	Cost Engineering Approved
Crystal Ball	Per ECB No. 2007-17, cost risk analysis methods will be used for the development of contingency for the total project cost estimate. Crystal Ball software is approved for use to conduct the total project cost and schedule risk analysis.	Cost Engineering Approved

*Models will be contracted out to A/E Firm.

Engineering modeling is being contracted out to an A/E firm for completion. The firm will meet the requirement of developing a QCP which will include the qualification of A/E team members. The District Engineering team will review and approve the QCP from the A/E team. An engineering model coordination questionnaire has been completed by the District Engineering team who is responsible for overseeing and interpreting the work completed by the A/E.

7. Factors Affecting Level and Scope of Review

All planning products are subject to the conduct and completion of District Quality Control. Most planning products are subject to Agency Technical Review and a smaller sub-set of products may be subject to Independent External Peer Review and/or Safety Assurance Review. Information in this section helps in the scoping of reviews through the considerations of various potential risks.

Objectives of the Reviews

The overall review objective for the Rahway Fluvial study is to evaluate the soundness of flood risk management solutions for the watershed. There are two key considerations specific to Rahway: the interaction between the tidal and riverine sections and potential environmental impacts of detention measures.

The interaction between the tidal/coastal and fluvial aspect of the flooding in the study area will be a focus of the review. A coastal engineer will be required on the review team to ensure the team is accurately capturing the causes of flooding and we are not overestimating or underestimating the extent of the tidal influence and compound flooding.

The environmental impacts of potential measures including the dams and detention basins will be another focus for the review. These measures being carried forward may be deemed controversial and their proper impact being captured is important to understanding these risks

Assessing the Need for IEPR

Mandatory IEPR Triggers

- Has the Chief of Engineers determined the project is controversial? No, the Chief of Engineers has not yet determined if the project study is controversial due to significant public disputes over

the size, nature, or effects of the project or the economic or environmental costs or benefits of the project. However, it is possible that if detention basins proceed in the study, there may be environmental concerns related to the potential impacts to the aesthetics and recreational use of park in which the detention basins are proposed that could become controversial.

- Has the Governor of an affected state requested an IEPR? No
- Is the cost of the project more than \$200 million? TBD

Assessing Other Risk Considerations

- Will the study likely be challenging? If so, describe how?

The study is likely to be moderately challenging from an engineering perspective. Additionally, if detention basins are retained in the study, USACE design standards for detention basins would be applicable. Design of detention basins would require extensive engineering analyses beyond what is currently scoped in the study's project management plan (PMP) and would require additional policy waivers from 3x3x3 requirements for scope and budget.

Provide a preliminary assessment of where the project risks are likely to occur and assess the magnitude of those risks.

USACE has previously encountered opposition to proposed plans due to environmental concerns in this study area, so if a recommended plan is controversial or encounters opposition from the public, the non-Federal sponsor, local municipalities, and/or stakeholders, there could be delays in project implementation.

- Is the project likely to be justified by life safety or is the study or project likely to involve significant life safety issues?

Flooding caused by Tropical Storm Irene in 2011 also resulted in 10 deaths in the basin portion of the watershed. As recently as Hurricane Ida in 2021, flooding in the Basin was documented by local stakeholders that resulted in damages to homes and businesses, inundation of roads, and flooding of vehicles. Additionally, the City of Orange and City of Rahway are both Environmental Justice communities and both have significant proportions of socially vulnerable populations.

- Is the information in the decision document or anticipated project design likely to be based on novel methods, involve innovative materials or techniques, present complex challenges for interpretation, contain precedent-setting methods or models, or present conclusions that are likely to change prevailing practices? If so, how?

It is unlikely that information in the decision document or proposed project design will be based on novel methods, involve the use of innovative materials or techniques, present complex challenges for interpretation, contain precedent-setting methods or models, or present conclusions that are likely to change prevailing practices.

- Does the project design require redundancy, resiliency, and/or robustness, unique construction sequencing, or a reduced or overlapping design/construction schedule? If so, how?

TBD

- Is the project expected to have more than negligible adverse impacts on scarce or unique tribal, cultural, or historic resources? If so, what are the anticipated impacts?

This project is not expected to have more than negligible adverse impacts on scarce or unique tribal, cultural, or historic resources. The project will be formulated to avoid adverse impacts to tribal, cultural, or historic resources.

- Is the project expected to have substantial adverse impacts on fish and wildlife species and their habitat prior to the implementation of mitigation measures? If so, describe the impacts?

The project is not expected to have substantial adverse impacts on fish and wildlife species and their habitat prior to the implementation of mitigation measures. The project will be formulated to minimize or avoid impacts to listed fish and wildlife species and their habitat.

- Is the project expected to have, before mitigation measures, more than a negligible adverse impact on an endangered or threatened species or their designated critical habitat? If so, what are the anticipated impacts?

The project is not expected to have more than negligible adverse impacts on endangered and threatened species or their designated critical habitat before the implementation of mitigation measures. The project will be formulated to avoid or minimize impacts to federally-listed fish and wildlife species and their critical habitat and to state-listed fish and wildlife species and their critical habitat.

8. Risk Informed Decisions on Level and Scope of Review

Targeted ATR. Will a targeted ATR be conducted for the study?

Yes, Targeted ATR of Hydrology & Hydraulics and Economics Modeling - includes 3 disciplines (Hydrology and Hydraulics Engineering, Coastal Engineering, and Economics) and an ATR Lead- \$2,500 per discipline, \$165 per hour for a total of 15 hours, for the review of FWOP

IEPR Decision. The New York District (CENAN) recommends conducting an IEPR for the Rahway Fluvial study. This decision stems from previous concerns of environmental consequences of proposed measures and resulting public comments made.

Safety Assurance Review. Safety Assurance Reviews are managed outside of the USACE and are conducted on design and construction products for hurricane, storm and flood risk management projects, or other projects where existing and potential hazards pose a significant threat to human life. In some cases, significant life safety considerations may be relevant to planning decisions. These cases may warrant the development of relevant charge questions for consideration during reviews such as ATR or IEPR. In addition, if the characteristics of the recommended plan warrant a Safety Assurance Review, a panel will be convened to review the design and construction activities on a regular schedule before construction begins and until construction activities are completed.

Decision on Safety Assurance Review.

The New York District Chief of Engineering has made a risk-informed decision to recommend a Safety Assurance Review (SAR) for design and construction of the project as some of the alternative plans being proposed include significant threat to human life; it is included as an appendix to this review plan. However, since a plan has not been selected the decision on SAR may be revisited once the tentatively selected plan (TSP) has been identified and optimized.

9. Policy and Legal Compliance Review

Policy and legal compliance review of draft and final planning decision documents is delegated to the MSC (see Director's Policy Memorandum 2019-01).

(i) Policy Review.

The policy review team is identified through the collaboration of the MSC Chief of Planning and Policy and the HQUSACE Chief of the Office of Water Project Review. The makeup of the Policy Review team will be drawn from Headquarters (HQUSACE), the MSC, the Planning Centers of Expertise, and other review resources as needed.

- The Policy Review Team will be invited to participate in key meetings during the development of decision documents as well as SMART Planning Milestone meetings. These engagements may include In-Progress Reviews, Issue Resolution Conferences or other vertical team meetings plus the milestone events.
- The input from the Policy Review team will be documented in a Memorandum for the Record (MFR) produced for each engagement with the team. The MFR should be distributed to all meeting participants.
- Teams may choose to capture some of the policy review input in a risk register if appropriate. These items should be highlighted at future meetings until the issues are resolved. Any key decisions on how to address risk or other considerations should be documented in an MFR.

(ii) Legal Review.

Representatives from the Office of Counsel will be assigned to participate in reviews. Members may participate from the District, MSC and HQUSACE. The MSC Chief of Planning and Policy will coordinate membership and participation with the office chiefs.

- In some cases, legal review input may be captured in the MFR for the particular meeting or milestone. In other cases, a separate legal memorandum may be used to document the input from the Office of Counsel.

Each participating Office of Counsel will determine how to document legal review input.

10. Public Comment

This Review Plan will be posted on the District's website. Public comments on the scope of reviews, technical disciplines involved, schedules and other considerations may be submitted to the District

for consideration. If the comments result in a change to the Review Plan, an updated plan will be posted on the District's website.

11. Documents Distributed Outside the Government

For information distributed for review to non-governmental organizations, the following disclaimer shall be placed on documents:

“This information is distributed solely for the purpose of pre-dissemination review under applicable information quality guidelines. It has not been formally disseminated by USACE. It does not represent and should not be construed to represent any agency determination or policy.”

Appendix A - Brief Description of Each Type of Review

This section describes each level of review to be conducted. Based upon the factors discussed in Section 1, this study will undergo the following types of reviews:

District Quality Control. All decision documents and accompanying components will undergo DQC. This internal review covers basic science and engineering work products. It fulfills the project quality requirements of the Project Management Plan. The DQC team will read all reports and appendices. The review must evaluate the correct application of methods, validity of assumptions, adequacy of basic data, correctness of calculations (error-free), completeness of documentation, and compliance with guidance and standards. Districts are required to check all computations and graphics by having the reviewer place a highlight (e.g., place a “red dot”) on each annotation and/or number indicating concurrence with the correctness of the information shown.

Agency Technical Review. ATR will be performed by a qualified team from outside the home district that is not involved in the day-to-day production of the project/product. These teams will be comprised of certified USACE personnel. The ATR team lead will be from outside the home MSC.

Independent External Peer Review. IEPR is required for this decision document. This is the most independent level of review and is applied in cases that meet criteria where the risk and magnitude of the project are such that a critical examination by a qualified team outside of USACE is warranted. Certain criteria dictate mandatory performance of IEPR and other considerations may lead to a discretionary decision to perform IEPR. For this study, a risk-informed decision has been made that IEPR is appropriate. The information in Section 1 – Factors Affecting the Scope of Review – informed the decision to conduct IEPR.

Cost Engineering Review. All decision documents will be coordinated with the Cost Engineering Mandatory Center of Expertise (MCX). The MCX assisted in determining the expertise needed on the ATR and IEPR teams. The MCX will provide the Cost Engineering certification. The RMO is responsible for coordinating with the MCX for the reviews. These reviews occur as part of ATR.

Model Review and Approval/Certification. EC 1105-2-412 mandates the use of certified or approved models for all planning work to ensure the models are technically and theoretically sound, compliant with USACE policy, computationally accurate, and based on reasonable assumptions. For this study, the District will be seeking re-approval of the HGMI ecological model in accordance with the process outlined in EC 1105-2-412 and in coordination with the ECO-PCX.

Policy and Legal Compliance Review. These reviews culminate in determinations that report recommendations and the supporting analyses and coordination comply with law and policy, and warrant approval or further recommendation to higher authority by the home MSC Commander.

Public Review. The District will post the Review Plan and approval memo on the District’s internet site. Public comment on the adequacy of the Review Plans will be accepted and considered. Additional public review will occur when the report and environmental compliance document(s) are released for public and agency comment.