

REVIEW PLAN

December 2022

Project Name: Waccamaw River, Horry County, South Carolina Flood Risk Management Study

P2 Number: 493919

Decision Document Type: Integrated Feasibility Report and Environmental Assessment; the decision document will require Congressional authorization and appropriation before the recommended plan may be implemented.

Project Type: Flood Risk Management

District: Charleston District

District Contact: Project Manager, (843) 329-8162

Major Subordinate Command (MSC): South Atlantic Division

MSC Contact: Chief of Planning and Policy, (904) 232-1665

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

RMO Contact: FRM-PCX Regional Manager for SAD, (314) 331-8404

Review Plan Purpose

This plan defines the scope and level of peer review for the Waccamaw River, Horry County, SC Flood Risk Management (FRM) Study Feasibility Report. It establishes the appropriate level of independence of review, as well as detailed requirements to accomplish review, including documentation and dissemination. The plan was developed under Engineer Regulation (ER) 1165-2-217, which establishes an accountable, comprehensive, life-cycle review strategy for Civil Works products by providing a seamless process for review of all Civil Works projects from initial planning through design, construction, and Operation, Maintenance, Repair, Replacement, and Rehabilitation. This plan will be appended to the Project Management Plan and will be updated as necessary throughout the life-cycle of the project.

Key Review Plan Dates

Date of RMO Endorsement of Review Plan: 19 DEC 2022

Date of MSC Approval of Review Plan: 19 DEC 2022

Date of IEPR Exclusion Approval: N/A

Has the Review Plan changed since PCX Endorsement? N/A

Date of Last Review Plan Revision: N/A

Date of Review Plan Web Posting: JAN 2023

Date of Congressional Notifications: Pending

Milestone Schedule

	<u>Scheduled</u>	<u>Actual</u>	<u>Complete</u>
<u>FCSA Signature:</u>	19 AUG 2022	19 Aug 2022	Yes
<u>Alternatives Milestone:</u>	18 NOV 2022	18 Nov 2022	Yes
<u>Tentatively Selected Plan:</u>	18 JAN 2024	<i>(enter date)</i>	No
<u>Release Draft Report to Public:</u>	18 MAR 2024	<i>(enter date)</i>	No
<u>Agency Decision Milestone:</u>	31 JUL 2024	<i>(enter date)</i>	No
<u>Final Report Transmittal (District):</u>	01 AUG 2025	<i>(enter date)</i>	No
<u>Chief's Report:</u>	19 FEB 2026	<i>(enter date)</i>	No

Project Fact Sheet
December 2022

Project Name: Waccamaw River, Horry County, South Carolina Flood Risk Management Study

Location: Waccamaw River Basin, with focus in Horry County

Authority: This study is authorized by Section 216 of the Flood Control Act of 1970 (P.L. 91-611).

The existing Waccamaw River Federal navigation project was authorized by the following: River and Harbor Acts of June 14, 1880 – S. Ex. Doc. 117, 46th Cong., 2d session and Annual Report, 1880, p. 848, and of July 3, 1930 – H. Doc. 82, 70th Cong., 1st session.

Sponsor: Horry County

Type of Study: Feasibility Study

SMART Planning Status: 3x3x3 exception requested for cost and schedule

Project Area: The Waccamaw River Sub-basin is part of the larger Yadkin Pee Dee River Basin which spans North and South Carolina. The Waccamaw River flows from its source at Lake Waccamaw in Columbus County, NC 140 miles southwesterly to Winyah Bay at Georgetown, SC which opens to the Atlantic Ocean. For the purposes of this Flood Risk Management Feasibility Study, the focus area for risk reduction is the portion of the Waccamaw River Basin that lies within Horry County but the entire basin makes up the study area and will be considered as appropriate (see Figure 1). The Waccamaw River enters South Carolina and flows southwest across Horry County for 81 miles, through the City of Conway which is the County seat. Near Burgess, SC it is joined from the northwest by the Great Pee Dee River and the Atlantic Intracoastal Waterway (AIWW). The Waccamaw River continues southwest, separated from the ocean by only five miles in a long tidal estuary. Along its upstream, the Waccamaw is a shallow, slow-moving, blackwater river surrounded by vast forested wetlands.

Horry County sits at a low elevation relative to sea level and has broad, flat topography. The County is positioned at the lowest elevation of the expansive river systems of the Pee Dee and the Waccamaw. The Waccamaw River, Pee Dee River and the AIWW all flooded during Hurricane Florence in 2018. Flooding in the Waccamaw River also occurs from the Pee Dee river backflowing upstream into the Waccamaw River and its tributaries. The flat topography contributes to slow draining. The County's coastal location and tidal connections also make riverine flooding subject to the influences of storm surge, shallow coastal flooding, and sea level rise.

Horry County has a population of approximately 352,000, and is expected to double in size by 2040. The majority of development in the County is located in the lowest elevations. Population

centers along the Waccamaw River and its tributaries that have experienced repetitive flooding during tropical storms as well as other rainfall events include Bucksport, Conway, Socastee, and Longs/Red Bluff.

Problem Statement: The purpose of the Waccamaw River, Horry County, SC Flood Risk Management (FRM) Study is to address flood risk to communities and transportation routes specifically within Horry County and generally within the Waccamaw River Basin, and to recommend a plan to reduce this risk. The study is needed due to the extent of flooding, which has ranged from more frequent riverine flooding to severe and widespread impacts like those sustained during Hurricanes Joaquin (2015), Matthew (2016) and Florence (2018). Tidal effects, flat topography and low elevations result in slow drainage when high water events occur. Flooding is significant and affects major transportation routes, leaving densely populated communities along the coast isolated and unable to receive supplies. Inundation of transportation routes blocks access to hospitals and other critical infrastructure.

Problems associated with frequent, long duration flooding in the study area include:

- Expected annual damages (EAD) over \$7.2M over the 50-year period of analysis;
- Impacts to residential, commercial and public structures, including critical infrastructure throughout Horry County;
- Elevated risk to socially vulnerable populations in the communities of Conway, Longs and Red Bluff; and road damages, including traffic delays and detours.

The objectives of the study are to reduce life-safety risk associated with the inundation of structures and public infrastructure throughout the study area; reduce the risk of damages from flooding within affected communities to structures, industry, and public infrastructure; and to increase the reliability of evacuation and supply routes during high water events.

Federal Interest: Preliminary economic analysis indicates that structures and contents in the 500-year floodplain are appraised at \$1.4 billion and damages resulting from a 100-year flood event are estimated at \$650.7 million. Replacement values and alternative cost estimates will be refined over the course of the study. Overall preliminary EAD stand at about \$7.2 million and could be expected to support Total Project Costs in the range of \$102 to \$204 million based upon residual damages associated with study alternatives.

Risk Identification: Risks have been identified, discussed, analyzed, and documented using a risk register spreadsheet. This includes consideration of the consequences, likelihood and uncertainty ratings, and risk management options. Risks related to economics, environmental, and engineering are typical to those recognized during very early scoping. The risk register will be updated as the study evolves and more information is made available about future without conditions and about future with project conditions for the potential measures. Significant risks to life safety from the proposed measures are not expected but will be assessed later in the study via LifeSim and in compliance with PB 2019-04.

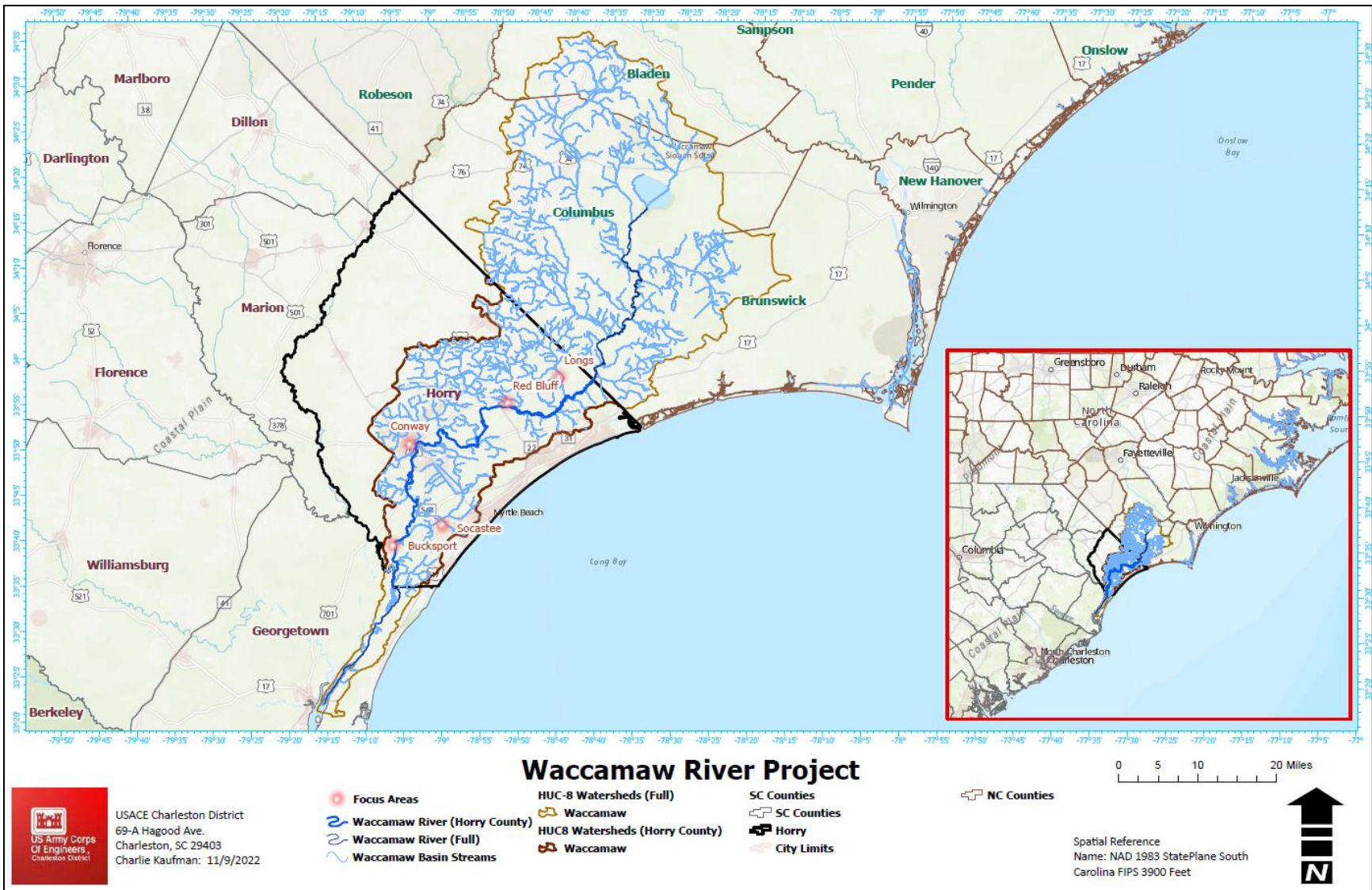


Figure 1. Map of study area (Waccamaw River Basin) and focus area (within Horry County).

1. FACTORS AFFECTING THE LEVELS OF REVIEW

Scope of Review. Issues driving the scope of review include the complexity of the hydrology in the basin, effects on transportation and industry that are more challenging to quantify, and incorporation of environmental justice considerations. Discussions have already begun regarding Comprehensive Benefits/Other Social Effects/Environmental Justice to help in recommending alternatives. Typically in the past only the Tentatively Selected Plan (TSP) was evaluated in this regard. Now, however, each of the focused array of alternatives must be analyzed regarding non-NED (National Economic Development) benefits. Such additional analysis could reasonably be expected to expand the scope of its review, particularly when implementation guidance and tools are still being developed.

- Will the study likely be challenging? Interpreting the complex modeling results could be challenging. Additionally, the non-NED portions of the economics analysis should be expected to require a more expansive review. Efforts should be made to find an economic reviewer who is not only familiar with the January 2021 Comprehensive Benefits Memo but also has familiarity/experience in implementing the ideas directed by it.
- Provide a preliminary assessment of where the project risks are likely to occur and assess the magnitude of those risks.
The risk register contains a total of 23 risks identified and discussed at this time. There are a few risks that may influence study scope and review.

Modeling the hydrology and hydraulics (H&H) is expected to be complex. This is due to multiple sources of flooding that impact communities in the study area, including flash flooding and immediate river rise, delayed downstream flooding, backflow flooding from connected basins, and tidal and coastal influences. Analyzing coincident flooding will be necessary. The watershed is also large and the nature of flooding varies based on location, suggesting that the modeling analyses will be customized by location. Additionally, the ability to capture the intricate features of the Waccamaw River due to its size and type of flooding in the H&H modeling may also affect the economic analysis and determination of federal interest. This is considered a high risk.

It is currently assumed that effects on the environment as a result of proposed measures/alternatives would not be significant, or could be mitigated to less than significant, therefore an Environmental Impact Statement (EIS) is not necessary for compliance with the National Environmental Policy Act (NEPA). This is a medium risk because known environmental resources in proposed locations for measures are limited, yet it is very early in the study process. If during the course of the Environmental Assessment it is realized that significant effects may result as the measures are refined that require evaluation commensurate with an EIS, then the NEPA

process would transition to an EIS. This may have consequences on the study schedule, depending on when this occurs during the study schedule.

The following have also been identified as constraints for the study:

- Measures must be consistent with AIWW purpose and function;
- Measures should be consistent with SCDNR management plan for wetlands.

- Is the project likely to be justified by life safety or is the study or project likely to involve significant life safety issues? Reducing life-safety risk associated with the inundation of structures and public infrastructure is an objective of the study. The Review Plan will be updated once LifeSim results are available to better inform the significance of this risk, and then again if necessary once the PDT identifies a TSP if it includes a new dam or levee, to meet the requirements of PB 2019-04 and Dam and Levee Safety guidance. Based on existing information about life-safety risk and measures being considered, the District Chief of Engineering has assessed there is not a significant threat to human life associated with aspects of the study or failure of the proposed project, but this will be confirmed and the Review Plan revised if appropriate, as the study progresses.

- Has the Governor of an affected state requested a peer review by independent experts?
No.

- Will the project/study likely involve significant public dispute as to the project's size, nature, or effects? While there will be public interest, significant public dispute is not anticipated at this time. The local sponsor, Horry County, is in the process of finalizing a comprehensive, county-wide flood resilience plan since Hurricane Florence devastated the county in 2018. The process involved extensive public involvement, including focus groups with some of the most vulnerable communities. This information is being used as a basis for engaging stakeholders and the public for this study. Both USACE and the sponsor are expecting the types of measures and flood hazards presented in this study to be familiar to the engaged public, although the scale at which the measures may be proposed may be of new interest. Some measures that may be considered highly unacceptable that also meet other study constraints have already been screened.

- Is the project/study likely to involve significant public dispute as to the economic or environmental cost or benefit of the project? No, unlikely at this time for the same reasons as cited above. Additionally, if Comprehensive Benefits/Other Social Effects (OSE) are appropriately considered, then dispute over the recommended plan is expected to be less likely.

- 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? At this time, most of the proposed measures and analysis are expected to be standard flood measures, although

there will be a combination of coastal and riverine flooding to be considered. Some less traditional and more natural solutions that promote watershed conservation such as through removal of existing weirs are being considered.

- Does the project design require redundancy, resiliency, and/or robustness, unique construction sequencing, or a reduced or overlapping design/construction schedule? No, at this time the project design and construction schedule are anticipated to be standard for USACE FRM projects.
- Is the estimated total cost of the project greater than \$200 million? The estimated cost of the project is not known at this time. Preliminary Expected Annual Damages estimates could be expected to support Total Project Costs in the range of \$102 to \$204 million. Because this range is generally less than \$200 million, the current assumption is that the total cost will not exceed \$200M. Preliminary costs will be estimated on the array of alternatives as the study evolves after the Alternatives Milestone Meeting (AMM).
- Will an Environmental Impact Statement be prepared as part of the study? At this time, it is not anticipated that an Environmental Impact Statement will be needed. An Environmental Assessment is expected to be prepared.
- Is the project expected to have more than negligible adverse impacts on scarce or unique tribal, cultural, or historic resources? Information currently available at the county-wide scale indicates that Horry County features a significant number of cultural resources ranging from historic properties to archaeological sites. Archaeological sites are scattered throughout the county, but concentrations can be found in close proximity to rivers, creeks, streams, and marshes, including near the Waccamaw River that date to both the prehistoric and historic periods. Potential impacts on historic and cultural resources will be evaluated through the Environmental Assessment.
- Is the project expected to have substantial adverse impacts on fish and wildlife species and their habitat prior to the implementation of mitigation measures? Information currently available at the county-wide scale indicates that Horry County has upland, wetland, and riparian habitats. Federal at-risk species in the county include the saltmarsh sparrow, robust redhorse, tri-colored bat, Southern hognose snake, spotted turtle, Monarch butterfly, and seven plant species. Numerous migratory bird species transit the area. Aquatic species include fish, mussels, and macroinvertebrates. Portions of the Waccamaw River are bordered by conservation areas with high quality resources. Potential impacts on fish and wildlife species will be evaluated through the Environmental Assessment.
- 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? Information currently available at the county-wide scale indicates there are

five Federally listed threatened or endangered species known in Horry County. They include the red-cockaded woodpecker, the northern long eared bat, the wood stork, the Eastern black rail, and one plant species, American chaffseed. There is designated critical habitat for the Atlantic sturgeon in the near-by Pee Dee River. There are known locations for bald eagle nests in Horry County. Potential impacts on endangered or threatened species or their designated critical habitat will be evaluated through the Environmental Assessment.

2. REVIEW EXECUTION PLAN

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. District Quality Control (DQC) is an integrated review approach that includes a Quality Management Plan providing for seamless review, Quality Checks (first line supervisory reviews, Project Delivery Team (PDT) reviews), a detailed peer review/checking of the documents, computations, and graphics, etc. DQC teams are the peer and supervisory reviewers with the necessary expertise and experience to address compliance with current USACE policies and procedures, as well as verify the accuracy of the information used in the study process. DQC will be conducted within relevant District and Major Subordinate Command (MSC) Quality Management System (QMS) processes. All work products and decision documents (including the report, data, analyses, environmental compliance documents, etc.) will undergo DQC. This review fulfills the project quality requirements of the Project Management Plan.

Agency Technical Review. The purpose of Agency Technical Review (ATR) is to confirm that the technical approaches being used are sound. The reviewers will assess whether the analyses are technically correct and comply with guidance, and that documents explain the analyses and results in a clear manner. ATR is performed by a qualified team from outside the home district that is not involved in the day-to-day production of the project/product. The team will be comprised of certified USACE personnel. The ATR Team Lead will be from outside the home MSC. Identification of ATR team members and validation of appropriate credentials of reviewers is a responsibility of the Review Management Organization (RMO). The PDT should conduct early ATRs of interim work products at critical points during the technical analysis that supports agency decision-making but in parallel with the study process so as not to delay it.

Independent External Peer Review. Independent External Peer Review (IEPR) may be required for decision documents under certain circumstances. 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. A risk-informed decision is made as to whether IEPR is appropriate.

Cost Engineering Review. All decision documents shall be coordinated with the Cost Engineering Mandatory Center of Expertise (MCX). The MCX will assist 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 typically occur as part of ATR.

Model Review and Approval/Certification. Engineer Circular (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.

Policy and Legal Review. All decision documents will be reviewed for compliance with law and policy. ER 1105-2-100, Appendix H provides guidance on policy and legal compliance reviews. These reviews culminate in determinations that report recommendations and that the supporting analyses and coordination comply with laws and policies, and warrant approval or further recommendation to higher authority by the home MSC Commander. These reviews are not further detailed in this section of the Review Plan.

Table 1 provides the schedules and costs for reviews. The specific expertise required for the teams are identified in later subsections covering each review. Those subsections also identify requirements, special reporting provisions, and sources of more information.

Table 1. Levels of Review

Product(s) to undergo Review	Review Level	Start Date	End Date	Cost	Complete
Draft Integrated Feasibility Report and Environmental Assessment	District Quality Control	22 Jan 24	20 Feb 24	\$65K	No
Draft Integrated Feasibility Report and Environmental Assessment	District Legal Review	21 Feb 24	12 Mar 24	n/a	No
Draft Integrated Feasibility Report and Environmental Assessment	Agency Technical Review (concurrent with public review)	19 Mar 2024	13 May 2024	\$70K	No
Draft Integrated Feasibility Report and Environmental Assessment	Policy and Legal Review (concurrent w public review)	19 Mar 2024	13 May 2024	n/a	No
Final Integrated Feasibility Report and Environmental Assessment	District Quality Control	29 April 2025	02 June 2025	\$65k	No
Final Integrated Feasibility Report and Environmental Assessment	Agency Technical Review	03 June 2025	14 July 2025	\$50K	No
Final Integrated Feasibility Report and Environmental Assessment	District Legal Review (certification)	15 July 2025	30 July 2025	n/a	No
Final Integrated Feasibility Report and Environmental Assessment	Policy and Legal Review	04 August 2025	18 September 2025	n/a	No

a. DISTRICT QUALITY CONTROL

DQC will be conducted in accordance with the Technical Guide for District Quality Control and Agency Technical Reviews of Planning Studies Memorandum issued on 15 June 2022. The home district will implement a QMS that includes the process of selecting the DQC Review Team, managing the DQC, certifying DQC, and documenting DQC. They will appoint a DQC Lead to manage the local review (see ER 1165-2-217, Chapter 4). Table 2 identifies the required expertise of the DQC team for this study.

Table 2. Required DQC Expertise

DQC Team Disciplines	Expertise Required
DQC Lead	A senior professional with extensive experience preparing Civil Works decision documents and conducting DQC. The lead may also serve as a reviewer for a specific discipline (such as planning, economics, environmental resources, etc).
Planning	The plan formulation reviewer should have experience in riverine and coastal flood risk management studies; and familiarity with the “Planning Guidance Notebook” (ER 1105-2-100), the Water Resources Council’s Principles and Guidelines, and SMART Planning guidance, as well as Interim Implementation Guidance Memo on Environmental Justice and Justice40 Initiative dated 15 March 2022.
Economics	The economics reviewer should have experience in the analysis of demographics, land use, recreation analysis, and flood damage assessments; regional economic development associated with a project; discussion and implementation of other social effects (OSE) associated with flood risk, and well as OSE benefits from reduction in flood risk including familiarity with life risk consequence assessment, and economic justification of projects in accordance with current USACE policy for urban flood damages.
Environmental Resources	The environmental reviewer should have experience in the integration of environmental evaluation and compliance requirements pursuant to the “Procedures for Implementing the National Environmental Policy Act (NEPA)” (ER 200-2-2), national environmental statutes, applicable executive orders, and other Federal planning requirements, into the planning of Civil Works projects. Experience with the Endangered Species Act (ESA) and

	Essential Fish Habitat (EFH), fishery resources, mitigation, and tidal freshwater systems is required.
Cultural Resources	A cultural resources reviewer should be an archaeologist/historian familiar with records searches, cultural resource survey methodology, area of potential effects, Section 106 of the National Historic Preservation Act, and State and Federal laws/executive orders pertaining to National Historic Districts.
Hydrology	The reviewer should have experience in the field of rainfall runoff models, flow-frequency analysis, hydrologic effects of flood control operations, risk and uncertainty analysis, and hydrologic analysis using computer modeling techniques such as HEC-RAS 2D.
Hydraulic Engineering	The reviewer should have experience in the field of hydraulics and have a thorough understanding of open channel dynamics; detention/retention basins; application of levees; floodplain mapping, risk and uncertainty analysis; and computer modeling techniques, such as HEC-RAS.
Geotechnical Engineering	The reviewer should be a geotechnical engineer familiar with levee/embankment stability and seepage analyses, and design, floodwall analyses and design, bearing capacity analyses, settlement analyses, planning analysis, fragility curves, and a number of other closely associated technical subjects.
Coastal Engineering	The coastal engineering reviewer should have experience with coastal storm risk management investigations and projects and climate change analyses. The coastal engineer should also be an expert in the field of coastal storm modeling, such as STWAVE and ADCIRC.
Civil Engineering	The reviewer should be a civil engineer with experience in designing grading plans and levees, levee stability, and levee and bank-protection removal or modification, earthen channels, and concrete bypasses. This reviewer or other reviewer should also have experience with implementing non-structural measures for flood risk management.
Structural Engineering	The reviewer should be a structural engineer who has experience with the design of floodwalls and floodgates, sheetpile walls, and bridge elevation.
Cost Engineering	The reviewer should be a cost estimating specialist competent in cost estimating for construction using MCACES/MII; working knowledge of construction;

	capable of making professional determinations based on experience.
Real Estate	The reviewer should be a real estate specialist familiar with real estate valuation, gross appraisal, utility relocations, takings, and partial takings as needed for implementation of Civil Works projects.

Documentation of DQC. Quality Control should be performed continuously throughout the study on all work products, including documents, computations, and graphics. A specific certification of DQC completion is required at the draft and final report stages. Documentation of DQC should follow the District Quality Manual and the MSC Quality Management Plan. ProjNet (a.k.a. DrChecks) will be used to manage and document the DQC process. An example DQC Certification statement is provided in ER 1165-2-217, Appendix D.

Documentation of completed DQC should be provided to the MSC, RMO and ATR Team Lead prior to initiating an ATR. The ATR team will examine DQC records and comment in the ATR report on the adequacy of the DQC effort. Missing or inadequate DQC documentation can result in delays to the start of other reviews.

b. AGENCY TECHNICAL REVIEW

ATR will be conducted in accordance with the Technical Guide for District Quality Control and Agency Technical Reviews of Planning Studies Memorandum issued on 15 June 2022. The RMO manages ATR, which will be the FRM-PCX for this study. The review will be conducted by an ATR Team whose members are certified to perform reviews. Table 3 identifies the disciplines and required expertise for this ATR Team.

Table 3. Required ATR Team Expertise

ATR Team Disciplines	Expertise Required
ATR Lead	A senior professional with extensive experience preparing Civil Works decision documents and conducting ATR. The lead should have the skills to manage a virtual team through an ATR. The lead may serve as a reviewer for a specific discipline (such as Planning).
Planning	A senior water resources planner with experience in riverine and coastal flood risk management studies; familiarity with the “Planning Guidance Notebook” (ER-1105-2-100), the Water Resources Council’s Principles and Guidelines, and SMART Planning guidance, as well as Interim Implementation Guidance Memo on Environmental Justice and Justice40 Initiative dated 15 March 2022.

Economics	A senior economist with experience in the analysis of demographics, land use, recreation analysis, and flood damage assessments; regional economic development associated with a project; implementation of other social effects (OSE) associated with flood risk, as well as OSE benefits from reduction in flood risk; familiarity with life risk consequence assessment and economic justification of projects in accordance with current USACE policy for urban flood damages.
Environmental Resources	A senior professional with experience in the integration of environmental evaluation and compliance requirements pursuant to the “Procedures for Implementing the National Environmental Policy Act (NEPA)” (ER 200-2-2), national environmental statutes, applicable executive orders, and other Federal planning requirements, into the planning of Civil Works projects. Experience with ESA, EFH, fishery resources, mitigation, and tidal freshwater systems is required.
Cultural Resources	A senior professional with experience with records searches, cultural resource survey methodology, area of potential effects, Section 106 of the National Historic Preservation Act, and State and Federal laws/executive orders pertaining to American Indian Tribes.
Hydrology Engineering	The reviewer should be an expert in the field of hydrology and have a thorough understanding and knowledge of the development of flow and stage frequency curves, application of detention/retention basins, interior drainage, proper design of culverts, nonstructural solutions involving flood warning systems. Reviewer should also be an expert in coincident frequency analysis in areas of combined flooding from coastal and riverine sources. Reviewer shall also be an expert in computer modeling techniques that will be used such as HEC-RAS and HEC-HMS.
Hydraulic Engineering	The reviewer should be an expert in the field of hydraulics and have a thorough understanding of open channel dynamics; flood risk management measures; floodplain mapping, risk and uncertainty analysis; and computer modeling techniques, such as HEC-RAS and HEC-HMS.
Coastal Engineering	The reviewer should be a senior engineer with experience with coastal storm risk management investigations and projects. The coastal engineer should also be an expert in the field of coastal storm modeling, such as STWAVE, and ADCIRC.
Geotechnical Engineering	The reviewer should be a geotechnical engineer familiar with levee/embankment stability and seepage analyses and design, floodwall analyses and design, pile foundation design, bearing

	capacity analyses, settlement analyses, planning analysis, fragility curves, and a number of other closely associated technical subjects.
Cost Engineering	The reviewer should be a senior cost engineer. This position will be filled by a cost engineer from the Cost Engineering MCX.
Civil Engineering	The reviewer should be a senior civil engineer familiar with structural and nonstructural FRM measures.
Real Estate	A senior real estate specialist familiar with real estate valuation, gross appraisal, utility relocations, takings, and partial takings as needed for implementation of Civil Works projects.
Climate Preparedness and Resilience CoP Reviewer	A member(s) of the Climate Preparedness and Resiliency Community of Practice (CoP) will be identified by the CoP and participate in the ATR review for riverine and coastal analyses.
Risk and Uncertainty	The risk analysis reviewer will be experience with performing and presenting risk analyses in accordance with ER 1105-2-101 and other related guidance, including familiarity with how information from the various disciplines involved in the analysis interact and affect the results.

Documentation of ATR. ProjNet (a.k.a. DrChecks) will be used to document the ATR process including all ATR comments, responses and resolutions. Comments should be limited to those needed to ensure product adequacy and adherence to guidance. It will be recommended that all reviewers use the four parts of a quality review found in ER 1165-2-217, Chapter 5. If a concern cannot be resolved by the ATR team and PDT, it will be elevated to the vertical team for resolution using the ER 1165-2-217 issue resolution process. Concerns can be closed in ProjNet by noting the concern has been elevated for resolution. The ATR Lead will prepare a Statement of Technical Review and ATR Certification (see ER 1165-2-217, Chapter 5), only for the final report, certifying that review issues have been resolved or elevated. ATR may be certified when all concerns are resolved or referred to the vertical team and the ATR documentation is complete.

c. INDEPENDENT EXTERNAL PEER REVIEWS

(i) IEPR.

IEPR is managed outside of USACE when conducted on studies. The IEPR panel assesses the adequacy and acceptability of the economic and environmental assumptions and projections, project evaluation data, economic analysis, environmental analyses, engineering analyses, formulation of alternative plans, methods for integrating risk and uncertainty, models used in the evaluation of environmental impacts of proposed projects, and biological opinions of the project study. IEPR is critical for studies where there is a significant federal investment, significant controversy, or due to a request by the Governor of an affected State. When none of

the three mandatory triggers for IEPR are met, a discretionary decision based on a risk-informed assessment of the contribution of an IEPR to the study is made. Table 4 documents the District’s IEPR decision assessment.

Table 4. IEPR Assessment.

Mandatory IEPR Trigger	District Assessment
1. Estimated total cost of the project, including for construction, LERRDS, mitigation, is greater than \$200M.	The estimated cost of the TSP is currently unknown, but is currently assumed to be under \$200M. If it is later determined to be over \$200M, the IEPR decision will be revisited at that time.
2. Governor of an affected State requests an independent peer review.	There has been no request by a State Governor nor does the District anticipate such a request.
3. Controversy due to significant public dispute over the size, nature, or effects of the project, or the economic or environmental costs or benefits of the project.	The District does not anticipate controversy due to significant public dispute regarding an eventual recommended plan (see Section 1 of this document)
Discretionary IEPR Decision	District Assessment
1. When request is made by head of Federal or state agency if they determine the project is likely to have a significant adverse impact on resources under their jurisdiction	There has been no request by a Federal or state agency nor does the District anticipate such a request.
Risk-Informed Decision	District Assessment
1. PDT recommendation on value of independent expert review based on risk-informed assessment of the subject matter, life safety concerns, novel approaches, controversy, precedence-setting, significant interagency interest, or significant effects to the Nation.	Based on the factors discussed in Section 1 above, the PDT recommends that conducting IEPR would not substantially benefit or add value to the project study.

Decision on IEPR. At this time, it is assumed that a IEPR will not be performed for this study. None of the mandatory triggers have been met at this time. The District has considered the discretionary and risk-informed triggers and has made a risk-informed decision not to pursue an IEPR at this time because it would not substantially benefit or add value to the study. This decision will be revisited if new or different information presents itself as the study evolves.

(ii) Safety Assurance Review.

Another type of independent external peer review is the Safety Assurance Review (SAR). The purpose of SAR is to have external panels assess the critical decisions and criteria of the PED or

construction activities prior to initiating physical construction and periodically throughout construction as required. The SAR is applied in cases that meet certain criteria where the risk and magnitude of the proposed project warrant critical examination by a qualified team of experts outside of USACE.

Decision on SAR. A decision will be made at a later date about the need for a Safety Assurance Review, but it is not anticipated due to the lack of significant life safety risks.

d. MODEL CERTIFICATION OR APPROVAL

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 use of a certified/approved planning model does not constitute technical review of a planning product. The selection and application of the model and the input and output data is the responsibility of the users and is subject to DQC and ATR, and IEPR if applicable. Table 5 summarizes the planning models that may be used during the feasibility study.

Table 5. Planning Models.

Model Name and Version	Brief Model Description and How It Will Be Used in the Study	Certification / Approval
IWR-Planning Suite	This software assists with the formulation and comparison of alternative plans. While IWR-PLAN was initially developed to assist with environmental restoration and watershed planning studies, the program can be useful in planning studies addressing a wide variety of problems. IWR-PLAN can assist with plan formulation by combining solutions to planning problems and calculating the additive effects of each combination, or "plan." IWR-PLAN can assist with plan comparison by conducting cost effectiveness and incremental cost analyses, identifying the plans which are the best financial investments and displaying the effects of each on a range of decision variables.	Certified
RECONS	RECONS (Regional Economic System) is a Corps corporate model specifically developed to assess the Regional Economic Development (RED) impacts of Corps civil works projects. This model will be used to support discussion of the RED benefits associated with project implementation. The RECONS model will estimate the impacts to the local	Certified

	economy, in terms of income, employment and tax revenues, resulting from project construction.	
HEC-FDA Version 1.4.3	The program integrates hydrologic engineering and economic analysis to formulate and evaluate plans using risk-based analysis methods. It will be used to evaluate/ compare plans to aid in selecting a recommended plan.	Certified
LifeSim	Simulates life loss using hydrologic and demographic data and risk-based estimation techniques.	Certified

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. The selection and application of the model and the input and output data is still the responsibility of the users and is subject to DQC and ATR, and IEPR if applicable. Table 6 summarizes the engineering models that may be used during the feasibility study.

Table 6. Engineering Models.

Model Name and Version	Brief Model Description and How It Will Be Used in the Study	Approval Status
HEC-RAS 2D, Version 5.0, 6.3	The software performs 1-D steady and unsteady flow river hydraulics calculations and has capability for 2-D (and combined 1-D/2-D) unsteady flow calculations.	HH&C CoP Preferred
HEC HMS Version 4.2	This software is a numerical model that includes a large set of methods to simulate watershed, channel, and water-control structure behavior, thus predicting flow, stage, and timing.	HH&C CoP Preferred
ADvanced CIRCulation Model 52.30 (ADCIRC)	ADCIRC was developed to predict storm surge water level and help control the impact of storm damage. ADCIRC is a hydrodynamic modeling technology that conducts short- and long-term simulations of tide and storm surge elevations and velocities in deep-ocean, continental shelves, coastal seas, and small-scale estuarine systems	HH&C CoP Preferred
Steady State Spectral Wave 6.2.28 (STWAVE)	STWAVE allows coastal project engineers to numerically model wave generation and transformation over complex bathymetry, interaction of waves with currents and structures,	HH&C CoP Preferred

	and propagation of waves in entrances and harbors.	
--	--	--

e. POLICY AND LEGAL REVIEW

Policy and legal compliance reviews for draft and final planning decision documents are delegated to the MSC (see Director’s Policy Memorandum 2018-05, paragraph 9).

(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 team is identified in Attachment 1 of this Review Plan. 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 should 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.
- In addition, 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.

DISCLAIMER: This information is distributed solely for the purpose of pre-dissemination review under applicable information quality guidelines. It does not represent and may not be construed to represent any agency determination or policy.