US Army Corps of Engineers®

Prepared by:

Galveston District

Southwestern Division

Buffalo Bayou & Tributaries Resiliency Study **(Dam NID TX00018 &TX00019)**

Review Plan

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Document Type: Decision Document

Section 1

Purpose and Requirements

1.1 Purpose

Review Plan (RP) for Buffalo Bayou & Tributaries Resiliency Study, consists of Addicks and Barker Dam Safety Modification Study (DSMS) phase 2, and Section 216 feasibility study (FS). The study involves identification of data requirements in order to formulate and recommend Flood Risk Management (FRM) alternatives for the study area. It will also study the risk and resiliency associated with the existing completed infrastructure components. The review plan will help ensure a quality-engineering product is developed by the Corps of Engineers in accordance with EC 1165-2-217, “Review Policy for Civil Works”.

The DSMS phase 2 is a continuation of the DSMS phase 1 effort to address all credible potential failure modes associated with Addicks and Barker Dams that was completed in 2013. DSMS Phase 2 would assess incremental risk, overtopping with breach, as well as residual risk in the pool area and downstream. The study will assess and communicate dam and life safety risk and impacts of potential end-round flooding and land-use.

Section 216 FS is to evaluate the flood risk management problems in the Buffalo Bayou watershed including upstream and downstream area of the dam, water drainage from Cypress Creek watershed, and non-breach risk from spillway. This will involve the identification of measures and alternatives to address problems in the Section 216 study area.

The RP shall layout a value added process and describe the scope of review for the DSMS and FS. There will be one feasibility report with the Dam Safety Modification Report (DSMR) as an appendix.

1.2 References

- EC 1165-2-217, Review Policy For Civil Works, 20 February 2018
- ER 1110-1-12, Quality Management, 31 Mar 2011
- ER 1110-2-1156, Safety of Dams – Policy and Procedure, 31 Mar 2014
- ER 1105-2-100, Planning Guidance Notebook, Appendix H, Policy Compliance Review and Approval of Decision Documents, Amendment #1, 20 Nov 07
- Project Management Plan (PMP) for study
- Addicks and Barker Dams Safety Modifications Report, 2013
- Galveston District Quality Management Plan
  https://team.usace.army.mil/sites/SWG/EC/Shared%20Documents/EC%20Division/Quality%20Management%20Initiatives/EC%20QMP%20Formatted%2020160526.pdf

1.3 Requirements

This RP was developed in accordance with EC 1165-2-217, which establishes an accountable, comprehensive, life-cycle review strategy for Civil Works products. This RP will be provided to Project Delivery Team (PDT), District Quality Control (DQC), Hydrologic Hazards and Loading Curve Reviewer, Agency Technical Review (ATR), Independent External Peer Review (IEPR) Teams, and Policy and Legal Compliance Review. The Baseline risk assessment for the DSMS phase 2 will undergo ATR review for technical adequacy and its use in the feasibility study instead of a Quality Control and Consistency Review (QCC). In addition relevant Senior Oversight Group (SOG) members will be incorporated into the review and milestone process for policy review and milestone meetings In addition to these levels of review, decision documents are subject to cost engineering review and certification (per EC 1165-2-217) and planning model certification/approval (per EC 1105-2-412).

1.4 Review Management Organization

The USACE Risk Management Center (RMC) will be the Review Management Organization (RMO) for this project. This RP will be updated for additional project phases.

1.5 Milestone Schedule

The study schedule milestone is shown in table 1.

Table 1: Milestone schedule

Activities/Milestones:	Actual/ Projected
Execute Federal Cost Share Agreement (FCSA)	10-October-18
Alternative Milestone Meeting	4-February-19
Tentatively Selected Plan	April 2020
Agency Decision Milestone	September 2020
Chief's Report	October 2021

Section 2

Project Background and Information

2.1 Project Background and Study Information

2.1.1 Decision Document

The final report for the study will be one Feasibility Study Report (FSR) with a DSMR as an appendix to the FSR. The DSMR will document the baseline risk for Addicks and Barker Dams, located in Harris County

and Fort Bend County, TX. Also to be documented in the DSMR will be the semi quantitative risk analysis (SQRA) of all the alternatives carried forward. The DSMR will determine whether or not Federal investment is warranted to remediate the project. If warranted, a risk management plan will be identified and recommended to address the incremental dam safety risk associated with the project.

The FSR will provide alternatives to improve Buffalo Bayou & Tributaries in order to provide flood control for the City of Houston. The report will be in compliance with the National Environmental Protection Act (NEPA), other Federal Laws, Executive Orders, and Corps' regulations. The feasibility study report will include an assessment of risk condition, development and selection of alternative risk management plans, environmental impact statement (EIS) and other documents as needed for approval. The alternative risk management plans aim to lower the risk of the dam and the EIS evaluates the environmental impacts on resources.

The decision document (FSR) will present the planning, engineering and implementation details of the recommended plan. Once the report is approved and a Chief's report is issued, the PDT will proceed to PED with the recommended plan if there is a Bipartisan Budget Act of 2018 (BBA18) funds remaining.

2.1.2 Background

2.1.2.1 Study/Description

The Buffalo Bayou & Tributaries Project authorized the improvement of Buffalo Bayou and its tributaries above the turning basin of the Houston Ship Channel at Houston, Texas, to provide flood risk management to protect the City of Houston from flood damages and the prevention of the deposition of silt in the turning basin of the Houston Ship Channel by means of detention reservoirs, bypass, tunnels, enlargement and rectification of channels, and the construction of control works, and any diversions which may be found advisable.

The primary component of the completed Project are the Addicks and Barker Dams. Addicks and Barker Dams are located in southeast Texas in the San Jacinto River basin approximately 17 miles west of downtown Houston. The majority of the Addicks and Barker Reservoirs fall within Harris County; however, a small portion of Barker Reservoir crosses into Fort Bend County. Addicks Reservoir is located on the north side of Interstate Highway 10 (IH-10) with State Highway 6 (SH 6) bisecting the reservoir north to south. Barker Reservoir is located on the south side of IH-10, and west of SH 6. The dams are strategically located above the confluence of Buffalo Bayou and South Mayde Creek. Beyond this confluence, Buffalo Bayou continues east through downtown Houston, where it joins with White Oak Bayou, and eventually becomes the Houston Ship Channel, which flows into San Jacinto Bay, into Galveston Bay, and then into the Gulf of Mexico. The project was completed in 1948 and is operated 365 days a year. Both Addicks and Barker Reservoirs provide flood risk management only and do not maintain permanent pools.

The Addicks Reservoir project features include an earthen dam, concrete outlet works, and uncontrolled auxiliary spillways. The earthen dam consists of an unzoned, random fill embankment that is 61,166 feet long and 48.5 feet above the original streambed. The top of the dam elevation currently ranges from 117.4 to 121 feet (NAVD88) and the crest is 12 feet wide. The crest elevations of the main embankments were raised in 1986 to comply with necessary freeboard requirements. The outlet works have five 8 feet by 6 feet concrete conduits controlled by six gates. One conduit was originally gated using 2 gates. Two additional conduits were gated in 1948, and the remaining conduits gated by 1963. Both ends of the dam are armored with roller-compacted concrete that serve as uncontrolled spillways. The abutment, or existing ground, at either end of Addicks Dam is lower than the top of dam elevation. Existing ground at the north end of Addicks Dam is at elevation 108 feet (NAVD88) and ties into the spillway crest at 112.5 feet (NAVD88). The existing ground at the south end is at elevation 111.0 feet and ties into the spillway crest at 115.5 feet (NAVD88).

The Barker Reservoir project features include an earthen dam, concrete outlet works, and uncontrolled spillways. The earthen dam consists of an unzoned, random fill embankment that is 71,900 feet long with a maximum height of 42.9 feet at the outlet works. The top of the dam elevation currently ranges from 110.0 to 113.1ft (NAVD88) and the crest is 12 feet wide. The crest elevation of the main embankments were raised in 1986 to comply with necessary freeboard requirements. The outlet works consist of five gated concrete conduits (9 feet by 7 feet) and 6 gates. Initially only one of the five conduits was gated. Two additional conduits were gated in 1948, and in 1963 the remaining two conduits were gated. Both ends of the dam are armored with roller-compacted concrete and serve as uncontrolled spillways. The abutment, or existing ground, at either end of Barker Dam is lower than the top of dam elevation. Existing ground at both ends of Barker Dam is at elevation 104.0 feet. The spillway crest at the north end is at elevation 105.5 feet (NAVD88) and the south end is at 106.7 feet (NAVD88).

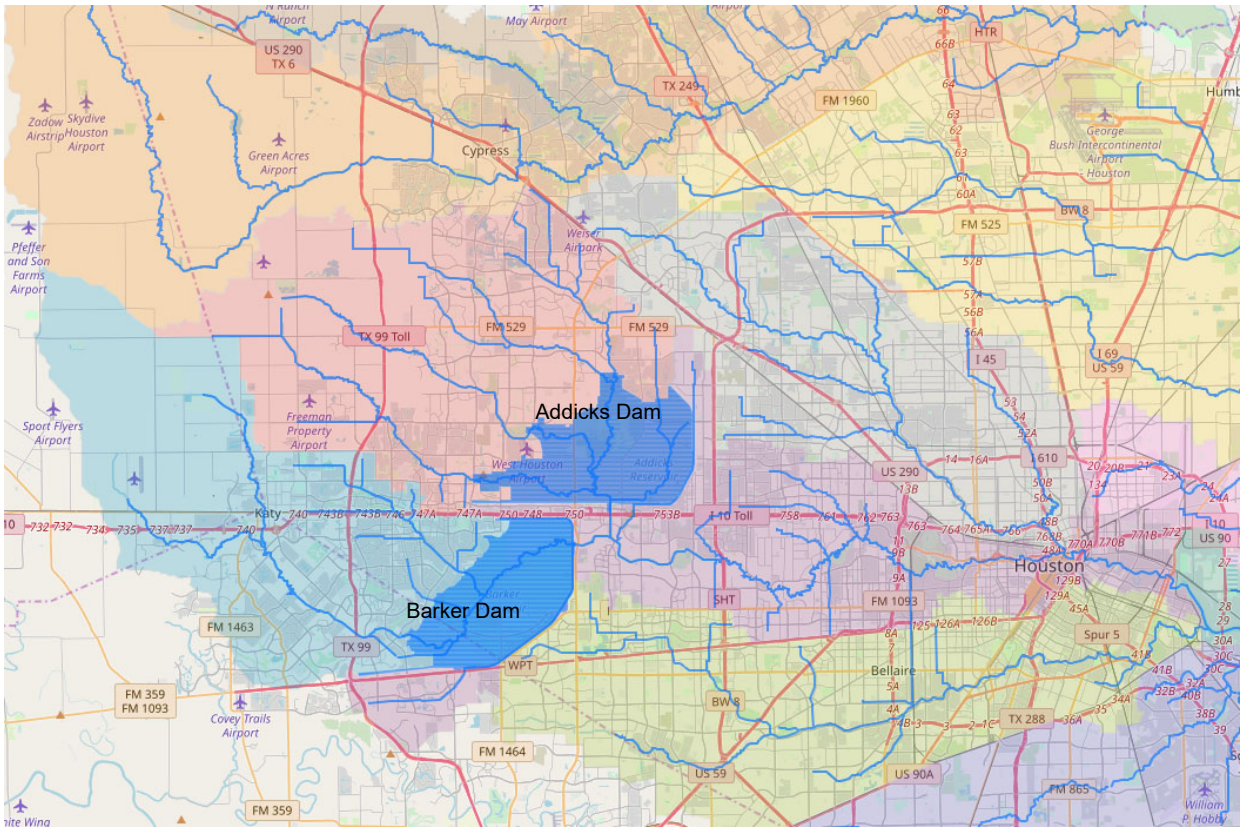

Figure 1: Location of Addicks and Baker Dams

2.1.2.2 Dam Safety Action Classification (DSAC)

Dam Safety Action Classification (DSAC) is a classification system that is used to categorize the safety level of dams. Addicks and Barker Dams are currently classified as DSAC-I which is defined as “Very High Urgency of Action.” Based on the definition the dams are critically near failure or at extreme high risk. Classification I projects are dams where progression toward failure is confirmed to be taking place under normal operations within a few years without intervention; or the incremental risk. This DSAC rating was determined based on the 2009 Issue Evaluation Study (IES) and was confirmed by the SOG in 2011.

2.1.2.3 Dam Safety Modification Study – Phase 1

Dam safety modification studies was performed to identify and evaluate alternatives to address the dam safety issues related to Addicks and Barker Dams. The teams identified 22 and 23 Potential Failure Modes (PFMs) for Addicks and Barker Dams, respectively. Following their more detailed examination and

discussion, six PFMs at each dam were determined to be significant failure modes for both Addicks and Barker Dams. The significant failure modes are: Seepage flow along or beneath the outlet works structure due to voids or low stress areas; Loss of auxiliary spillway RCC slabs and breach of auxiliary spillway at high pools, instability of the outlet works parabolic chute slab and stilling basin retaining walls; extreme hydraulic pressure outside the conduit, erosion of embankment; and foundation seepage and piping. Dam safety modification study –phase 1 recommended a plan to deal with the extreme high risk associated with seepage and piping, around, and near the conduits. Series of Interim Risk Reduction Measures (IRRMs) were implemented prior to the construction of the permanent measure. Construction is currently ongoing for a new outlet structure to include an intake tower, steel lined conduits, parabolic chute slab, stilling basin, cutoff wall, downstream filter, and abandoning the existing structure in place at Addicks and Barker Dams. It also includes the additional seepage cutoff element at Noble Road for the Barker Reservoir. The primary purpose of the project is to provide continued flood risk management.

The DSMS Phase 1 recommended a Phase 2 study that will be completed in the current study to address the non-breach risk and potential failure modes associated with the auxiliary spillway flows and flows around the ends of the dams. The failure modes that are being addressed in the Phase 1 study are all well above the tolerable risk, and are addressed with the recommended alternative in the DSMR accepted in 2013.

2.2 Factors Affecting the Scope and Level of Review

Quality control will be achieved through DQC, ATR, Type I IEPR, and ongoing coordination with RMC and Flood Risk Management Planning Center of Expertise (FRM-PCX). Questions that were considered in determining the scope and level of review are identified in Table 2. The PDT's assessment of these questions in relation to this study is listed Table 2. The questions in Table 2 are from the EC 1165-2-217, Civil Works Review Policy, to determine the level of review required. Table 2 shows justification that a Type I IEPR is required for the Addicks and Barker Dam DSMS and the feasibility study.

Table 2: Factors Determining the Level of Review

Questions to Determine Scope	Buffalo Bayou & Tributary Resiliency Study
Will the study likely be challenging?	The study will be challenging because of urbanization of the project area and complex hydraulic systems and associated floodplains.
Provide a preliminary assessment of where the project risks are likely to occur and assess the magnitude of those risks.	TBD
Is the project likely to be justified by life safety or is the study or project likely to involve significant life safety issues?	The nature and intensity of past flood events indicate that there is a risk for life safety in future events. The study team will continue to assess the risk to life safety as more details emerge and the study progresses. This information will be used in evaluating the need for Type I and II IEPR.
Has the Governor of an affected state requested a peer review by independent experts?	There has not been a request to study this project by a State Governor or an affected state.
Will the it likely involve significant public dispute as to the project's size, nature, or effects?	The Project will likely involve significant public debate based on its size, nature, effects, economics, or environmental consequences. The

Questions to Determine Scope	Buffalo Bayou & Tributary Resiliency Study
	without project environmental and economic consequences is significant and would have an adverse impact to the community. Public participation is expected to be high as a result.
Is the project/study likely to involve significant public dispute as to the economic or environmental cost or benefit of the project?	The Project will likely involve significant public debate based on its size, nature, effects, economics, or environmental consequences. Public support is however expected to be medium to high as a result.
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?	It is not likely this study will implement novel methods, innovative materials or techniques, contain precedent-setting methods or models, or present conclusions likely to change current practice. The formulation, evaluation, and design of all study measures and alternatives will be performed using standard practices and methods.
Does the project design require redundancy, resiliency, and/or robustness, unique construction sequencing, or a reduced or overlapping design/construction schedule?	This study is not likely to require unusual redundancy, resiliency, or unique construction sequencing. The formulation, design, and construction of all measures and alternatives will be performed using standard practices and methods, which include provisions for redundancy, resiliency, and robustness, where necessary.
Is the estimated total cost of the project greater than $200 million?	Project cost cannot be estimated at this time as alternative risk management plans have not yet been developed.
Will an Environmental Impact Statement be prepared as part of the study?	An assessment of potential impacts will be conducted in accordance with NEPA. Certain alternatives may require preparation of an Environmental Impact Statement.
Is the project expected to have more than negligible adverse impacts on scarce or unique tribal, cultural, or historic resources?	TBD
Is the project expected to have substantial adverse impacts on fish and wildlife species and their habitat prior to the implementation of mitigation measures?	TBD
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?	TBD

2.3 Project Sponsor

Harris County Flood Control District, Texas is the non-Federal sponsor. Products and analyses provided by non-Federal sponsors as in-kind services are subject to DQC, ATR, IEPR, and policy and legal compliance reviews. Sponsor Peer Review of In-Kind Contributions - There will not be in-kind contributions for this effort.

Section 3

District Quality Control

3.1 Requirements

All decision documents (including data, analyses, environmental compliance documents, etc.) shall undergo DQC prior to ATR. This internal review process covers basic science and engineering work products. It fulfils the project quality requirements of the Project Management Plan. The home district shall manage DQC in accordance with SWD and district Quality Management Plan (QMP) (see EC 1165-2-217, section 8.a.1). Any discrepancies between a reviewer and a PDT member will be resolved face-to-face. If a concern cannot be satisfactorily resolved between the DQC team and the PDT, it will be elevated to the section supervisor for further resolution.

The home district shall manage DQC and will appoint a DQC Lead to manage the local review (see EC 1165-2-217, section 8.a.1). The DQC Lead should prepare a DQC Plan and provide it to the RMO and MSC prior to starting DQC reviews. Table 3 identifies the required expertise for the DQC team. A specific certification of DQC completion is required at the draft and final report stages. As a part of DQC, the RMC Senior Advisor and Technical Advisor will review the DSMS and FS report prior to the draft and final report submission for ATR to help ensure completeness.

3.2 Documentation

Quality Control should be performed continuously throughout the study. DQC is the review of basic science and engineering work products focused on fulfilling the project quality requirements. It is managed by the Galveston District and may be conducted by staff within and outside the home district as long as they are not doing the work involved in the study, including contracted work that is being reviewed. Basic quality control tools include a QMP providing for seamless review, quality checks and reviews, supervisory reviews, Project Delivery Team (PDT) reviews, etc. Additionally, the PDT is responsible for a complete reading of the report to assure the overall integrity of the report, technical appendices and the recommendations before approval by the District Commander.

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. An example DQC Certification statement is provided in EC 1165-2-217, on page 19 (see Figure F). Documentation of completed DQC should be provided to the MSC, RMO and ATR Team leader 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 (see EC 1165-2-217, section 9). District Quality Control will be documented using the DrChecks^{SM} review software/website whenever possible. Attach a DrChecks^{SM} report to the DQC Certification to help illustrate the thoroughness of the DQC. A sample DQC review certification statement in Attachment 2.

3.3 Product to undergo DQC

The anticipated products from the following disciplines are expected to undergo DQC at this point are: planning, hydrology, hydraulics, real estate, environmental resources, economics, geotechnical engineering, cost engineering, civil design, and structural design. The products anticipated to undergo DQC for the FSR and DSMR may include, but are not limited to:

(1) Draft FSR, Baseline Risk Assessment, Draft EIS, and Draft Technical Appendices
(2) Draft Cost Estimate
(3) Draft Real Estate Plan (REP)
(4) Final FSR, Final DSMR, Final EIS, and Final Technical Appendices
(5) Final Cost Estimate
(6) Final REP
(7) Hydrology and Hydraulics Report
(8) FIA Consequences Analysis
(9) Semi-Quantitative Risk Analysis (SQRA) of all Alternatives

Review of additional specific disciplines may be identified, if necessary.

3.4 Required DQC Expertise

The required DQC expertise and team members are outlined in Table 3, and follow the disciplines outlined for product submittal as a part of the Buffalo Bayou & Tributaries resiliency study and DSMS.

Table 3: Required DQC level Team Expertise

DQC Team Members/Disciplines	Expertise Required
DQC Lead	The DQC lead should be a senior professional with extensive experience in preparing Civil Works decision documents and conducting DQC. The lead should also have the necessary skills and experience to lead a virtual team through the DQC process. The DQC lead may also serve as a reviewer for a specific discipline (such as planning, economics, environmental resources, etc).
Planning	The Planning reviewer should be a senior water resources planner with experience in FRM studies.
Consequences (Economist)	Economics reviewer should be a senior economist with experience in conducting benefits and costs analyses associated with FRM projects.
Environmental Resources	The Environmental Resources reviewer should have a strong background in Federal and Texas environmental laws and regulations.
Geotechnical Engineering	The geotechnical engineer shall have experience in the field of geotechnical engineering, analysis, design, and construction of embankment dams and dam safety engineering. The geotechnical engineer shall have experience in subsurface investigations, soil mechanics, internal erosion (seepage and piping), slope stability evaluations, erosion protection design, tunneling design and earthwork construction. The geotechnical engineer shall have knowledge and experience in the forensic investigation of seepage, settlement,

	stability, and deformation problems associated with embankments constructed on similar geological formations.
Real Estate	The Real Estate (RE) reviewer should have knowledge in reviewing RE plans for feasibility studies with FRM features.
Cost Engineering	The Cost Engineering / Estimating reviewer should be a reviewer with experience in FRM.
Hydrology & Hydraulic Engineering	Team member should be an H&H subject matter expert, demonstrate experience in the field of urban and coastal hydrology and hydraulics, and have a thorough understanding of dam & levee systems, the effects of management practices, high impact of urban development on hydrology, the use of levees and floodwalls within the space constraints of an urban environment, the use of non-structural systems as they apply to flood proofing, warning systems, and evacuation, and the use of HEC computer modeling systems. The individual should be a certified professional engineer (PE).
Structural Engineering	Team member should have a thorough understanding of structural measures to include, but not be limited to, retaining walls, pump stations, gate structures, bridges and culverts, utility penetrations, and stoplog and sandbag gaps. The individual should be a certified PE.
Construction	The reviewer should have experience in engineering construction field
Operation	The Operations (Ops) reviewer should be well versed and have previous experience in the operations and maintenance (O&M) of FRM infrastructure.

3.5 DQC Schedule and Estimated Cost

Although DQC is always seamless, the following milestone reviews are schedule in Table 4. The total cost for the DQC is approximately $50,000 to $100,000.

Table 4: DQC Schedule

Project Phase/Submittal	Review Start Date	Review End Date
Draft Feasibility Study	28 April 2020	11 May 2020
Final Feasibility Report	18 FEB 2021	04 March 2021
Draft Technical Appendices	28 April 2020	11 May 2020
Draft EIS/NEPA Documentation	28 April 2020	11 May 2020
Final EIS/NEPA Documentation	18 FEB 2021	04 March 2021
Baseline Risk Assessment	May 2019	June 2019
Final DSMS	18 FEB 2021	04 March 2021

Draft Cost Estimate	28 April 2020	11 May 2020
Final Cost Estimate	18 FEB 2021	04 March 2021

Section 4

Agency Technical Review

4.1 Requirements

All Civil Works products (including supporting data, analyses, environmental compliance documents, water control manuals, etc.) shall undergo ATR in accordance with EC 1165-2-217. ATR reviews will occur seamlessly, including early involvement of the ATR team for key decisions, and at the scheduled milestones as shown in Table 5. ATR reviews will be scaled to the appropriate level of technical effort required to evaluate the project findings and recommendations based on the complexity of the project and the level of risk assessment that was conducted. A site visit will be scheduled for the ATR Team.

The ATR 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. ATR is mandatory for all decision documents (including supporting data, analyses, environmental compliance documents, etc.). ATR is managed within USACE by the designated RMO and the teams will be comprised of certified USACE personnel. The ATR team lead will be from outside the home MSC. If significant life safety issues are involved in a study or project a safety assurance review should be conducted during ATR. ATR teams will be comprised of qualified senior USACE personnel from outside the home district. The ATR team lead will be assigned by the RMC.

The Hydrologic Hazards Assessment and Loading Curve will undergo an Agency Technical Review by an RMC H&H Advisor or designated Alternate prior to the Risk Assessment Elicitation, or as directed by the RMC. The reviewer will provide advance review of this work product to avoid unnecessary delays to the completion of the DSMS and FS report. Ideally, this reviewer will serve as the H&H ATR team member for the DSMS and FS Report. The reviewer is shown section 4.4.1.

All decision documents shall be reviewed by the Cost Engineering Mandatory of Expertise (MCX) in coordination with the Dam Safety Modification Mandatory Center of Expertise (DSMMCX) Cost Engineering Team. The Cost Engineering MCX will assist in identifying the appropriate resources needed on the ATR. The MCX will provide the Cost Engineering certification. The PDT is responsible for coordinating with the Cost Engineering MCX for the reviews. These reviews typically occur as part of ATR. The ultimate decisions concerning the risks and appropriate actions remain with the USACE vertical team.

4.2 Documentation of ATR

Documentation of ATR for FSR and baseline risk assessment will be performed using the requirements of EC 1165-2-217. This will generally include the four part comment structure and the use of DrChecks^{SM} for comment collaboration, response, and back checking. The four key parts of a quality review comment will normally include:

(1) The review concern – identify the product's information deficiency or incorrect application of policy, guidance, or procedures;

(2) The basis for the concern – cite the appropriate law, policy, guidance, or procedure that has not been properly followed;

(3) The significance of the concern – indicate the importance of the concern with regard to its potential impact on the plan selection, recommended plan components, efficiency (i.e. cost), effectiveness (i.e. function/outputs), implementation responsibilities, safety, Federal interest, or public acceptability; and

(4) The probable specific action needed to resolve the concern – identify the action(s) that the reporting officers must take to resolve the concern.

In some situations, especially addressing incomplete or unclear information, comments may seek clarification in order to then assess whether further specific concerns may exist. The ATR documentation in DrChecks[sm] will include the text of each ATR concern, the PDT response, a brief summary of the pertinent points in any discussion, including any vertical team coordination (the vertical team includes the district, RMO, MSC, and HQUSACE), and the agreed upon resolution. If an ATR concern cannot be satisfactorily resolved between the ATR team and the PDT, it will be elevated to the vertical team for further resolution in accordance with the policy issue resolution process described in either ER 1110-2-12 or ER 1105-2-100, Appendix H, as appropriate. Unresolved concerns can be closed in DrChecks[sm] with a notation that the concern has been elevated to the vertical team for resolution.

Hydrologic Hazards review comments are documented in the form of a Word document or DrChecks[sm], as specified below. After resolution of the comments, the reviewer will sign the ATR completion form and this is to be include in the FS and DSMS review documentation. This signature will ensure all comments have been addressed during ATR and signify concurrence.

4.3 Products to Undergo ATR

The ATR will be managed by the RMC and the ATR lead. DrChecks[sm] review software will be used to document all ATR comments, responses and associated resolutions accomplished throughout the review process. The products anticipated to undergo ATR for the FS may include, but are not limited to:

(1) Probable Maximum Flood Update Report
(2) Draft FSR, Baseline Risk Assessment, Draft EIS, and Draft Technical Appendices
(3) Draft Cost Estimate
(4) Draft REP
(5) Final FSR, Final DSMR, Final EIS, and Final Technical Appendices
(6) Final Cost Estimate
(7) Final REP
(8) H&H Analysis
(9) SQRA for alternatives

Review of additional specific disciplines may be identified, if necessary.

4.4 Required Team Expertise and Requirements

4.4.1 ATR Team

As the RMO, the RMC will identify the team lead and component members. The ATR team will be comprised of individuals from outside the home district that have not been involved in the development of the DSMS & FS and will be chosen based on expertise, experience, and/or skills. ATR teams will be established in accordance with EC 1165-2-217.

The name, organization, contact information, credentials, and years of experience of each member will be identified at the time the review is conducted. Once the RMC designates the ATR panel members, the review plan will be updated to reflect this selection.

The following disciplines will be required for ATR of this project:

ATR Lead: The ATR team leader will be a senior USACE dam safety professional and will have experience leading and conducting ATR for similar projects and work products. The ATR team leader will be from outside the home MSC and will have the necessary skills and experience to lead a virtual team through the ATR process. The ATR Lead may also serve as a reviewer for a specific discipline.

Geotechnical Engineer - The Geotechnical Engineer should be an expert in the field and have recent experience in the design requirements for FRM measures. The geotechnical engineer will have experience in the design, construction, and evaluation of embankment dams, potential failure mode analysis, and dam safety risk analysis. This geotechnical should also have experience in investigating existing subsurface conditions and materials, determining their physical/mechanical and chemical properties that are relevant to the project considered, internal erosion evaluation, slope stability evaluation, earthwork construction and assessing risks posed by site conditions.

Planning – The Planning reviewer should be a senior water resources planner with experience in DSMS, FS, flood risk management studies and the disposition process. This planner should also be familiar with current Administration Policy, Executive Orders and guidance related to planning studies, and alternative optimization.

Hydrology and Hydraulic (H&H) Engineer – The Hydrology and Hydraulic Engineering reviewer will be an expert in the field of hydrology and hydraulics and have a thorough understanding in application of dams, levees and other FRM measures. The hydraulic engineer will be knowledgeable and experienced with the routing of inflow hydrographs through multipurpose flood control reservoirs utilizing multiple discharge devices, evaluation of extreme flood events (e.g., PMF), development of the flood hazard/loading (i.e., stage-frequency and duration relationships), USACE hydrologic and hydraulic modeling, and breach and non-breach inundation for dam safety risk analysis. The reviewer should have a demonstrated experience applying and interpreting outputs from models such as HEC-RAS.

Structural Engineer – The structural engineer will have experience evaluating the design, construction, and evaluation of hydraulic structures for dams (gates/closure structures, and penetrations), potential failure mode analysis, and dam safety risk analysis.

Consequences (Economist) – The economist (or consequence specialist) will have experience evaluating flood risk management projects in accordance with ER 1105-2-100 and USACE models and techniques to estimate population at risk, life loss, and economic damages for dam safety risk analysis.

Climate Change Reviewer – The climate change reviewer will have experience in performing climate change assessments and have an understanding of how this would impact the risk based design for FRM. The reviewer will be knowledgeable and experienced with the most current climate change policies, literature, and tools used to perform the assessments with a background in inland hydrology. The reviewer will be familiar with the Climate Hydrology Assessment Tool, Non-stationarity Detection Tool, and Vulnerability Assessments.

Civil Engineer – Reviewer should be a senior level, with extensive experience with civil site layout and dam safety projects. The Civil Engineering reviewer should be an expert in the field and have a thorough understanding of the applicability, design, and construction characteristics of FRM measures such as levees, closure structures, toe drainage, and cut-off walls.

Environmental Resources – The Environmental Compliance Specialist should have experience in the ecology of large river habitat types and evaluation of environmental consequences as a result of FRM measures for NEPA compliance. This reviewer should have a strong background in inland riverine ecosystems (e.g. riparian, aquatic, wetland), NEPA and other State and Federal environmental laws and regulations.

Cultural Resources - The Cultural Resources reviewer should be a senior archaeologist with experience in Section 106 of the National Historic Preservation Act Compliance.

Cost Engineering – The reviewer for cost estimating shall be a registered or certified cost engineer with a BS degree or higher in engineering or construction management, and should have experience estimating complex, phased multi-year civil works construction projects and hydraulic retention structures. The reviewer shall have extensive knowledge of MII software and the Total Project Cost Summary (TPCS) as required during ATR. A certification from the Cost Directorate of Expertise (DX) in Walla Walla District is required.

Construction – Reviewer should be a senior level with extensive experience in the engineering construction field with particular emphasis on dam safety projects.

Real Estate – The reviewer should have senior experience in the preparation of Real Estate Plans. The reviewer should also have experience with real estate issues for related to FRM studies and flowage easements associated with existing Corps projects, as well as a working knowledge of USACE real estate policy, regulation and have experience with ROW determination and maps, and evaluation of necessary easements.

Operation - The Ops reviewer should be well versed and have previous experience in the operations and maintenance (O&M) of flood risk management (FRM) infrastructure. The reviewer should have a minimum of 10 years of general experience in the O&M of FRM projects or have a minimum of five years of direct, hands-on experience in the O&M of a FRM project. This experience should include, but may not be limited to, knowledge of the manpower, equipment, and requirements necessary to preform sound O&M of a project, a general understanding of the use of contracts for the purpose of providing O&M on a project, and a general knowledge of basic engineering, hydraulics and hydrology, and natural resource management associated with the operations of a FRM project.

4.4.2 QCC Panel

QCC will not be performed on this study. However, the RMO will integrate qualified ATR members with the requisite technical background to review the risk assessment for technical competence and its use in the feasibility study as per the vertical team.

4.5 Statement of Technical Review Report

At the conclusion of Draft and Final milestones, the ATR team will prepare a Statement of Technical Review Report with a completion and certification memo. The report will be prepared in accordance with EC 1165-2-217 and shall:

- Identify the document(s) reviewed and the purpose of the review;
- Disclose the names of the reviewers, their organizational affiliations, and include a short paragraph on both the credentials and relevant experiences of each reviewer;
- Include the charge to the reviewers;
- Describe the nature of their review and their findings and conclusions;
- Identify and summarize each unresolved issue (if any); and

- Include a verbatim copy of each reviewer's comments (either with or without specific attributions), or represent the views of the group as a whole, including any disparate and dissenting views.

ATR may be certified when all ATR concerns are either resolved or referred to the vertical team for resolution and the ATR documentation is complete. The ATR Lead will prepare a Statement of Technical Review certifying that the issues raised by the ATR team have been resolved (or elevated to the vertical team). A Statement of Technical Review should be completed, based on work reviewed to date, draft report, and final report. A sample Statement of Technical Review is included in Attachment 3.

4.6 ATR Schedule and Estimated Cost

The preliminary ATR schedule is listed in Table 5. The total cost for the ATR is approximately $80,000 to $150,000.

Table 5: ATR Schedule

Project Phase/Submittal	Review Start Date	Review End Date
Hydrologic Hazards Review	17 June 2020*	16 July 2020
Draft Feasibility Report	17 June 2020*	16 July 2020
Final Feasibility Report	4 March 2021*	18 March 2021
Draft EIS/NEPA Documentation	17 June 2020*	16 July 2020
Final EIS/NEPA Documentation	4 March 2020*	18 March 2021
Final Technical Appendices	4 March 2020*	18 March 2021
Baseline Risk assessment	17 June 2020*	16 July 2020
Final DSMS	4 March 2021*	18 March 2021
Draft Cost Estimate	17 June 2020*	16 July 2020
Final Cost Estimate	26 Jan 2021	17 Feb 2021
Draft Real Estate Plan	17 June 2020*	16 July 2020
Final Real Estate Plan	4 March 2020*	18 March 2021
Note: Schedule shown is for submittal of comments only. There is additional two weeks period for comments backcheck.*		

Section 5

DSOG Review

5.1 Requirements

The baseline risk assessment will be first presented to the chair of the SOG to ascertain if the risk is actionable and different from the DSMS phase 1, based on the updated hydrological data. The chair will determine if the risk assessment warrants SOG's review. If the risk assessment is recommended to SOG, SOG will make recommendations on the risk characterization, actionable failure modes, and sensitivity to loading changes. In addition SOG members will be incorporated into the existing review and milestone process. The SQRA of the alternatives carried forward and their influence on the incremental risk will be

presented to SOG prior to the Tentatively Selected Plan (TSP) meeting. This may be done out of cycle via virtual meeting to meet the study schedule.

5.2 Documentation

At the conclusion of the DSOG briefing, a memo will be prepared by the DSOG Chairperson that summarizes the risk characterization of the dam, confirms or adjusts the recommended DSAC, proposes Dam Safety and O&M actions to reduce risk, and is signed by the Headquarters Dam Safety Officer.

Section 6

Type I Independent External Peer Review

6.1 Decision on Type I IEPR

Type I IEPR is conducted for decision documents if there is a vertical team decision that the covered subject matter meets certain criteria where the risk and magnitude of the proposed project are such that a critical examination by a qualified team outside the USACE is warranted. Table 2 in Section 2 outlines the rationale on the decision of Type I IEPR for the feasibility study and the DSMS. Due to the rationale provided in that table this project will require Type I IEPR.

6.2 Products to Undergo Type I IEPR

The Type I IEPR will be performed for the draft Feasibility Report, including NEPA/environmental compliance documentation, risk assessment and technical appendices. Planning and engineering models will be reviewed for how they were applied to the project and contributed to decisions made throughout the planning process. Type I IEPR panel members will be provided with ATR documentation and significant public comments made during public meetings and on the products under review. Arising issues between PDT and reviewers should be resolved with face-to-face resolution.

6.3 Required Type I IEPR Panel Expertise

Type I IEPR panels will be established in accordance with EC 1165-2-217. The following disciplines will be required for the Type I IEPR of this project:

The OEO will determine the final participants on the Type I IEPR panel. The name, organization, contact information, credentials, and years of experience of each member will be identified at the time the review is conducted. Once the OEO designates the IEPR panel members, the review plan will be updated to reflect this selection. A safety assurance review will be include in the Type I IEPR process.

Civil Works Planner/Economist - The Civil Works Planner selected as a Review Panel member should be from academia, a public agency, a non-governmental entity, or an Architect-Engineer or Consulting Firm with a minimum of 10 years demonstrated experience in public works planning. The Review Panel member must be very familiar with USACE plan formulation process, procedures, standards and economic evaluation techniques. The Review Panel member should also be familiar with evaluation of alternative plans for Dam Safety Modification and Feasibility Studies. Familiarity with USACE standards and procedures is required. In addition, the Review Panel member should have experience related to

evaluating traditional Civil Works plan benefits associated with Dam Safety Modification Studies, Feasibility studies, to include experience in Corps methodologies for determining the cost effectiveness of alternatives evaluations. The review panel member must have experience with the National Economic Development (NED) analysis procedures, particularly as they relate to hurricane and coastal storm damage risk reduction. Also the review panel member must have extensive experience in reviewing analyses used to evaluate measures and alternatives to ensure that they are sufficiently comprehensive and complete to result in approval of recommended alternative

Environmental /NEPA - The Review Panel member should be a scientist from academia, a public agency, a non-governmental entity, or an Architect-Engineer or Consulting Firm with a minimum MS degree or higher in a related field. The Review Panel member must have at least 10 years of experience directly related to environmental evaluation or review and should have extensive knowledge of the following: estuarine ecology, wetlands, urban ecosystems, and riverine systems. Demonstrated experience working with NEPA impact assessments, including cumulative effects analyses, for complex ecosystem projects with competing trade-offs is highly desirable.

Hydrology and Hydraulic Engineer – The Review Panel member must be a registered professional engineer with a minimum of 15 years of experience in hydrologic and hydraulic engineering. The Review Panel member should be experienced with all aspects of hydrology and hydraulic engineering including: hydrology, urban hydrology and hydraulics, open channel systems, effects of management practices and low impact development on hydrology, design of earthen dams and detention ponds, use of non-structural systems as they apply to flood proofing, warning systems, and evacuation. The Review Panel member must be familiar with Hydraulic Engineering Center (HEC) modeling computer software, or equivalent commercial software, including HEC River Analysis System (RAS) and HEC Hydrologic Modeling System (HMS). Additionally, the candidate should have specialized experience in river engineering, sediment transport, and familiarity with rivers with water control structures and dredging projects. The reviewer should have knowledge of, and experience with, the routing of inflow hydrographs through multipurpose flood control reservoirs utilizing multiple discharge devices, including gated sluiceways and gated spillways

Geotechnical Engineer – The Geotechnical Engineering panel member should be a senior-level geotechnical engineer with extensive experience, a minimum of 15 years, in the field of geotechnical engineering related to the analysis, design, and construction of embankment dams, including rehabilitations of these structures. The panel member should have knowledge and experience in the evaluation of backward erosion piping (BEP) potential failure modes in the foundations of embankment dams, and in the development, design, and construction of remediation alternatives for correcting BEP issues. The panel member should have experience in failure mode analysis, risk assessment of embankment dams, evaluation of risk reduction measures for dam safety assurance projects, and familiarity with the USACE dam safety guidance. The panel member should have a working knowledge of all applicable USACE design criteria, and shall be a licensed Professional Engineer.

Civil/Tunneling/Structural Engineer – The civil engineer must be expert in the design and construction of hydraulic structures for large and complex Civil Works projects, including outlet works and spillways. The reviewer should be expert in the tunnels, stability analysis and structural design of mass concrete scour protection and familiar with preparing plans and specifications for USACE projects. The reviewer must have knowledge of USACE design and construction procedures, policies, dam safety assurance policy and guidance. The reviewer must demonstrate knowledge in a variety of construction-related activities, including site layout, surveying, 3-dimensional modeling, construction techniques, grading, hydraulic structures, erosion control, interior drainage, earthwork, and concrete placement, design of access roads, retaining wall design, and relocation of underground utilities. The reviewers should be experienced in evaluating risk reduction measures for dam safety assurance projects and must have practical knowledge of construction methods and techniques as they relate to structural portions of projects. The reviewer should have active participation in related professional engineering and scientific societies and registered professional engineer. The reviewer must have a minimum M.S. degree or higher in engineering.

Construction Engineer – Reviewer should be a senior level, with extensive experience in the engineering construction field with particular emphasis on dam safety projects. The Construction reviewer should have a minimum of 15 years of experience.

6.4 Documentation of Type I IEPR

Documentation of the Type I IEPR will be prepared in accordance with EC 1165-2-217. Panel comments will be compiled by the OEO and should address the adequacy and acceptability of the economic, engineering and environmental methods, models, and analyses used. IEPR comments should generally include the same four key parts as described for ATR comments in Section 4.d above. The OEO will prepare a final Review Report that will accompany the publication of the final decision document and shall:

- Disclose the names of the reviewers, their organizational affiliations, and include a short paragraph on both the credentials and relevant experiences of each reviewer;
- Include the charge to the reviewers;
- Describe the nature of their review and their findings and conclusions; and
- Include a verbatim copy of each reviewer's comments (either with or without specific attributions), or represent the views of the group as a whole, including any disparate and dissenting views.

The final Review Report will be submitted by the OEO no later than 60 days following the close of the public comment period for the draft decision document. USACE shall consider all recommendations contained in the Review Report and prepare a written response for all recommendations adopted or not adopted. The final decision document will summarize the Review Report and USACE response. The Review Report and USACE response will be made available to the public, including through electronic means on the internet.

6.5 Scope, Schedule, and Estimated Cost of Type I IEPR

The Type I IEPR will be performed in accordance with EC 1165-2-217. Type I IEPR review will occur from June 2020 to August 2020, which is start of the review process through delivery of the final IEPR report. The estimated cost for the Type I IEPR's of this project are in the range of $150,000 to $ 250,000. This estimate will be refined when the Project Work Statement for the Type I IEPR Contract is completed.

Section 7

Policy and Legal Compliance Review

All decision documents will be reviewed throughout the study process for their compliance with law and policy. Guidance for policy and legal compliance reviews is addressed in Appendix H, ER 1105-2-100 and Chapter 9 of ER 1110-2-1156. These reviews should also be performed in accordance with DPM CW 2018-05, see Table 12 for the "One HQ" Legal Policy Review Team. This team will be formed by the Chief of Office of Water Project Review (OWPR), MSC Planning Chief, and the MSC RBT Chief. These reviews culminate in determinations that the recommendations in the reports 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. DQC and ATR augment and complement the policy review processes by addressing compliance with pertinent published Army policies, particularly policies on

analytical methods and the presentation of findings in decision documents. Initial and final policy compliance reviews will be conducted concurrently by the MSC and HQUSACE.

(i) Policy Review.

- 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.

Section 8

Public Participation

As required by EC 1165-2-217, the approved RP will be posted on the District public website (https://www.swg.usace.army.mil/). This is not a formal comment period and there is no set timeframe for the opportunity for public comment. If and when comments are received, the PDT will consider them and decide if revisions to the RP are necessary.

All NEPA documentation will undergo a 45 day public review period. Comments will be incorporated as appropriate prior to report finalization and approval.

Section 9

Review Plan Approval and Updates

The MSC Commander or delegated official, is responsible for approving this RP. The Commander's approval reflects vertical team input (involving the District, MSC, and RMC) as to the appropriate scope,

level of review, and endorsement by the RMC. The RP is a living document, all changes made to the approved RP will be documented in Attachment 3, Table 13. The latest version of the RP, along with the Commanders' approval memorandum, will be posted on the District's webpage and linked to the HQUSACE webpage. The approved RP should be provided to the RMO.

Section 10

Model Certification and Approval

10.1 Engineering Models

The use of certified or approved engineering models is required for all activities to ensure the models are technically and theoretically sound, compliant with USACE policy, computationally accurate, and based on reasonable assumptions. The responsible use of well-known and proven USACE developed and commercial engineering software will continue and the professional practice of documenting the application of the software and modeling results will be followed. 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. Where such validations have not been completed, appropriate independent checks of critical calculations will be performed and documented as part of DQC, ATR, and Type I IEPR (if required). The following engineering models, software, and tools are anticipated to be used:

Table 6 Engineering Models and Status

Model Name	Brief Model Description and how it will be used	Validation Date
HEC-HMS 4.3	By applying this model, the PDT is able to define the watersheds' physical features, describe the meteorological conditions, estimate pertinent parameters, analyze simulations, and obtain GIS connectivity.	Certified
HEC-RAS 5.0.6	E.g. 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. It will be used for steady flow analysis to evaluate the future without-project and future with-project conditions.	Certified
HEC-ResSim 3.3.1.140	This model predicts the behavior of reservoirs and to help reservoir operators plan release in real-time during day-to-day and emergency operations. ResSim includes the following features: graphical user interface, map-based schematic and rule-based operations.	Certified
HEC-WAT 1.0	The model is an integration tool that allows multi-disciplinary teams in USACE offices to perform water resources studies. HEC-WAT accomplishes this through a framework that provides the user with the ability to perform studies in a comprehensive, systems-based approach. The HEC-WAT framework promotes the building, editing and running of models commonly applied by multi-disciplinary teams	Not Certified

	including the saving and displaying of data and results in a coordinated fashion. Performing a risk analysis in a systems approach is an underpinning of the HEC-WAT framework, and is based on the Flood Risk Analysis (FRA) compute option.	
RMC-RFA 1.0.0	The US Army Corps of Engineers (USACE) Risk Management Center (RMC) developed the Reservoir Frequency Analysis software (RMC-RFA), an inflow volume-based stochastic modeling platform, to facilitate stage-frequency analysis within the USACE Dam Safety Program. RMC-RFA produces a reservoir stage-frequency curve with uncertainty bounds by utilizing a deterministic flood routing model while treating the seasonal occurrence of the flood event, the antecedent reservoir stage, inflow volume, and the inflow flood hydrograph shape as uncertain variables rather than fixed values.	Certified
Geostudio	This program includes the Seep/W and Slope/W models for seepage and slope stability analyses. Both models are identified in SET and in wide use within the Corps and the A/E community.	Certified
Dam Safety Risk Analysis Engine (DAMRAE)	The computer program DAMRAE (Dam Safety Risk Analysis Engine) Database was developed by the Utah Water Research Laboratory (UWRL) at Utah State University (Logan) for USACE, was used to perform risk analysis.	Approved
PLAXIS	PLAXIS is program that has been developed specifically for the analysis of deformation, stability and flow in geotechnical engineering. The input procedures enable the enhanced output facilities provide a detailed presentation of computational results	Not Certified
MCACES (Enterprise Model)	This is a cost estimating model that was developed by Building Systems Design Inc. The Corps began using this model in 1989. This will be used as a tool to determine cost estimates for project alternatives before Design	Certified

10.2 Planning Models

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, for the purposes of EC 1105-2-412, are defined as any models and analytical tools that planners use 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 the planning product. 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, ATR, and Type I IEPR (if required).

Table 7 Planning Models and Status

Model Name	Version	Certification or Approval Date
HEC-LifeSim 1.01	LifeSim is a spatially-distributed dynamic simulation modeling system for estimating potential life loss and direct economic damages from natural and dam and levee failure floods with the purpose of helping study teams better understand the consequences of a flood event. LifeSim accounts explicitly for the impact of warning issuance time; warning diffusion; the population at risk's (PAR's) protective action initiation; the PAR's evacuation potential; detailed flood dynamics; and, loss of shelter on loss of life.	Pending
HEC-FIA 2.2	HEC-FIA will be used to perform the initial evaluation of the measures. The Hydrologic Engineering Center's Flood Impact Analysis software (HEC-FIA) calculates post-flood or forecasted-flood impacts for a user-specified event. It is also used to determine flood damage reduction benefits attributed to individual flood control projects (reservoirs, levees, and diversions) and for real-time response activities as part of the U.S. Army Corps of Engineers Water Management System.	Certified
HEC-FDA 1.4.2	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 FRM plans using risk-based analysis methods. The program will be used to evaluate and compare the future without- and with-project plans along the Buffalo Bayou and tributaries to aid in the selection of a recommended plan to manage flood risk.	Certified
IWR Planning Suite II (Version 2.0.9)	The IWR Planning Suite is a water resources investment decision support tool that will be used to complete a Cost Effective Incremental Cost Analysis (CE/ICA) for mitigation plans.	Certified for National Use – May31, 2018
Existing approved species Habitat Suitability Index (HSI) models (e.g. red drum, brown/white shrimp, etc.), the Oyster Habitat Suitability Index Model, or other appropriate model certified/approved by the Ecosystem PCX	The PDT will use the species HSI models to quantify impacts and mitigation and or ecosystem restoration benefits for the focused array of alternatives. Species will be identified during the kick-off resource agency meetings. Specific HSI models will be listed when known.	Various

Section 11

Review Plan Points of Contact

Table 8 RP POC's

Title	Organization
Lead Engineer	USACE/SWG
Program Manager	USACE/SWG
RPEC Planning	USACE/SWD
SWD Dam Safety Program Manger	USACE/SWD
Senior Reviewer	CEIWR-RMC

ATTACHMENT 2

Sample DQC Review Certification Statement

Project Name

Document Name

DQC Certification of PRODUCT/FEATURE NAME

Project Team

As the (lead planner/designer/economist/architect/geologists, etc.) for the PRODUCT/ FEATURE NAME, I certify the following work shown herein was completed using the appropriate USACE guidance or industry standard if applicable. I certify the work is based on:

• Appropriate assumptions, methods, procedures, computations (including quantities) and materials used in the analyses

• Evaluation of alternative designs, if applicable

• Appropriate data and level of data

• Reasonable results that meet the customer's needs consistent with law and existing USACE policy.

I certify that the write-up (page 1-xx), computations (page 1-xx), drawings, (page 1-xx) and specifications (sec no.) meet the customer requirements shown herein. For items previously designed by others and included as the design basis shown herein, I certify that I have verified the work for adequacy, completeness, and accuracy.

Name Title Office Symbol (Signature)

Project Team: (optional)

Name Title Office Symbol (Initials)

Name Title Office Symbol (Initials)

As the Reviewer/Checker I have performed DQC and concur with the findings of the (lead planner/designer/economist/architect/geologist, etc.) for the PRODUCT/FEATURE NAME.

Name Title Office Symbol (Signature)

DQC Review Lead

Name Title Office Symbol (Signature)

Project Manager/Lead Planner/Technical Lead

Name Title Office Symbol (Signature)

Supervisor (of the author or section where the product is produced)

ATTACHMENT 3

STATEMENT OF TECHNICAL REVIEW

[Project Name and Location] [Product Type]
[Date]

COMPLETION OF AGENCY TECHNICAL REVIEW

The Agency Technical Review (ATR) has been completed for the *[product type & short description of item]* for *[project name and location]*. The ATR was conducted as defined in the project's Review Plan to comply with the requirements of EC 1165-2-209. During the ATR, compliance with established policy principles and procedures, utilizing justified and valid assumptions, was verified. This included review of: assumptions, methods, procedures, and material used in analyses, alternatives evaluated, the appropriateness of data used and level obtained, and reasonableness of the results, including whether the product meets the customer's needs consistent with law and existing US Army Corps of Engineers policy. The ATR also assessed the District Quality Control (DQC) documentation and made the determination that the DQC activities employed appear to be appropriate and effective. All comments resulting from the ATR have been resolved and the comments have been closed in DrChecks[sm].

Signature

[Name, Office Symbol] *[Date]*
ATR Team Leader

Signature

[Name, Office Symbol] *[Date]*
[Home District] Project Manager

Signature

[Name] *[Date]*
Architect Engineer Project Manager [1]
[Company, Location]

Signature

[Name, Office Symbol] *[Date]*
Review Management Organization Representative

CERTIFICATION OF AGENCY TECHNICAL REVIEW

Significant concerns and the explanation of the resolution are as follows:
[Describe the major technical concerns and their resolution]

As noted above, all concerns resulting from the ATR of the project have been fully resolved.

Signature

[Name, Office Symbol] *[Date]*
Chief, Engineering Division

Signature

[Name, Office Symbol] *[Date]*
Chief, Planning Division [2]

Instructions to complete Statement of Technical Review form.

Information in Blue brackets and text is required. Once the input is provided, text should be formatted in black and the brackets should be deleted.

Add appropriate additional signatures (Operations, Construction, AE principal for ATR solely conducted by AE, etc).

[1] *Only needed if some portion of the design/study was contracted*
[2] *Decision Documents Only*

Delete these instructions in the completed form.

ATTACHMENT 4
Review Plan Revisions

Table 13 RP Revisions

Revision Date	Description of Change	Page/Paragraph Number

ATTACHMENT 6

Term	Definition		
ASA(CW)	Assistant Secretary of the Army for Civil Works		
ATR	Agency Technical Review		
DQC	District Quality Control		
EC	Engineering Circular		
EDR	Engineering Document Report		
EIS	Environmental Impact Statement		
EO	Executive Order		
ER	Ecosystem Restoration		
FDR	Flood Damage Reduction		
FEMA	Federal Emergency Management Agency		
FRM	Flood Risk Management		
IEPR	Independent External Peer Review		
MSC	Major Subordinate Command		
NED	National Economic Development		
NER	National Ecosystem Restoration		
NEPA	National Environmental Policy Act		
O&M	Operation and maintenance		
OMB	Office and Management and Budget		
OMRR&R	Operation, Maintenance, Repair, Replacement and Rehabilitation		
PCX	Planning Center of Expertise		
PDT	Project Development Team		
PPA	Project Partnership Agreement		
PL	Public Law		
QMP	Quality Management Plan		
RMO	Review Management Organization		