

# REVIEW PLAN

July 2019

**Project Name:** Metro Louisville, KY Feasibility Study

**P2 Number:** 145626

**Decision Document Type:** Feasibility Report

**Project Type:** Flood Risk Management; 2018 Supplemental Appropriations Act

**District:** Louisville

**District Contact:** Project Manager; (502) 315-6780

**Major Subordinate Command (MSC):** Great Lakes and Ohio River Division

**MSC Contact:** Planning Regional Formulator; (513) 684-3008

**Review Management Organization (RMO):** FRM-PCX

**RMO Contact:** FRM-PCX Regional Manager; (304) 399-5859

## Key Review Plan Dates

**Date of RMO Endorsement of Review Plan:** Pending

**Date of MSC Approval of Review Plan:** Pending

**Date of IEPR Exclusion Approval:** Pending

**Has the Review Plan changed since PCX Endorsement?** No

**Date of Last Review Plan Revision:** None

**Date of Review Plan Web Posting:** TBD

**Date of Congressional Notifications:** TBD

## Milestone Schedule

|   | <u>Scheduled</u> | <u>Actual</u>       | <u>Complete</u> |
|---|------------------|---------------------|-----------------|
| <b><u>Alternatives Milestone:</u></b>         | 28 Feb 19        | 28 Feb 19           | Yes             |
| <b><u>Tentatively Selected Plan:</u></b>      | 27 Sep 19        | <i>(enter date)</i> | No              |
| <b><u>Release Draft Report to Public:</u></b> | TBD              | <i>(enter date)</i> | No              |
| <b><u>Agency Decision Milestone:</u></b>      | 31 Jan 20        | <i>(enter date)</i> | No              |
| <b><u>Final Report Transmittal:</u></b>       | 30 Apr 20        | <i>(enter date)</i> | No              |
| <b><u>Senior Leaders Briefing:</u></b>        | TBD              | <i>(enter date)</i> | No              |
| <b><u>Chief's Report:</u></b>                 | 30 Sep 20        | <i>(enter date)</i> | No              |

**Project Fact Sheet**  
July 2019

**Project Name:** Metro Louisville, KY Feasibility Study

**Location:** Louisville, KY; Jefferson County

**Authority:** Section 216 of the 1970 Flood Control Act and the Bipartisan Act of 2018, Public Law 115-123

**Sponsor:** Louisville/Jefferson County Metropolitan Sewer District

**Type of Study:** Feasibility

**SMART Planning Status:** 3x3x3 compliant

**Project Area:** Jefferson County, Kentucky lies within the broad floodplain of the south bank of the Ohio River and covers a land area of approximately 386 square miles. In addition to the Ohio River, major streams of Jefferson County include Pond Creek, Beargrass Creek, Mill Creek and Floyds Fork. The total levee system has a length of 25.92 miles and consists of approximately 21.0 miles of earth levee, 4.21 miles of concrete wall, and 15 pumping stations (73 pumps), 152 gates, and other necessary appurtenances. The project also incorporates a total of 98 closures; 21 of which have been permanently sealed and 19 of which are relatively small sandbag closures. The leveed area is estimated at approximately 48,768 acres (~76.2 sq. miles) and affords flood risk management against Ohio River floods equal to the maximum of record, elevation 460.15 feet (NAVD88) in January 1937, with a freeboard of three feet.

**Problem Statement:** Address major performance deficiencies caused by degradation or exceedance of service life to restore the Louisville Metro Flood Protection System (LMFPS) to authorized level of flood risk management through the 50-year period of analysis. Reduce current risks to life, health and safety of residents in the study area for the 50-year period of analysis.

**Federal Interest:** The study is being conducted in accordance with the CECW-PB Memorandum dated 16 August 2005 (2005 Memorandum), subject “Reconstruction of U.S. Army Corps of Engineers Structural Flood Damage Reduction Projects for which Non-Federal Interests are Responsible for Operation, Maintenance, Repair, Rehabilitation and Replacement.” In accordance with the 2005 Memorandum, federal interest in the flood protection project itself is not addressed in this study, due to the fact Corps’ interest has already been established through the original project planning and implementation process.

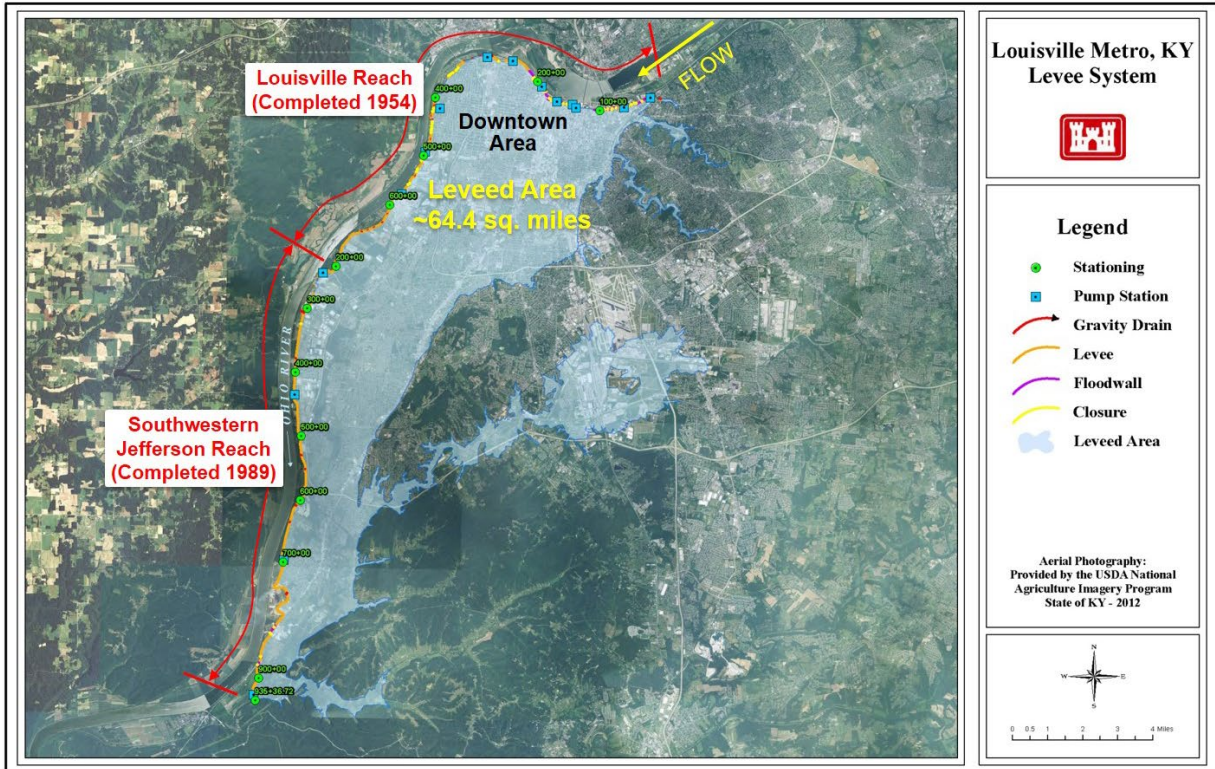
**Risk Identification:** There are no events which are known to have caused performance problems in the LMFPS; other than a failure by the sponsor at the time (City of Louisville) to install a few downtown closures during the 1964 flood (which occurred approximately 8 years after construction of the Louisville Reach). Resultant damages were on the order of \$150,000; occurring only to a few nearby buildings.

The 1964 flood was the largest event experienced by the Louisville Reach; however, it was prior to construction of the Southwestern Jefferson Reach. The 1964 flood resulted in a loading of about 45%, or approximately 15-ft from the top of the levee. Including the Southwestern Jefferson Reach, the largest event experienced occurred in 1997. During this flood, the river was approximately 16-ft above flood stage (or about 3-ft lower than the 1964 flood) and no issues were reported.

The non-Federal sponsor has been consistently diligent in Operation & Maintenance responsibilities and is expected to continue a proactive program to address aging and degraded components of the LMFPS into the future. In addition, no critical deficiencies in the LMFPS have been identified in levee embankments, floodwalls or closure structures through the most recent Periodic Inspection conducted in 2019.

Twelve of the 16 pump stations in the LMFPS are vulnerable to failing equipment including pumps, pump motors, and motor control systems due to the frequency of use, and in some cases their 60-years of service. Many of the pumps themselves have not been upgraded nor had any major rehabilitation since their original installation and exhibit varied levels of degradation. The consequences of failure or reduced performance of any one of these pump stations would vary depending on the specific pump station location; however, the nature of flood that would occur from inadequate interior drainage would be slow to rise allowing for significant lead time to warn or evacuate residents from impacted areas. This risk is currently present in the LMFPS and would not increase with the implementation of the project.

Key risks identified to date include use of the Sponsor's hydraulic/hydrologic (H&H) model to evaluate interior ponding alternatives; the accuracy of evaluation of damages at in-line pump stations; environmental; social justice; incorporation of climate forecasts; and incorporation of addressing risks identified in the SQRA. None of these risks pose a significant threat to human life or the environment. The H&H model that will be used (InfoWorks) has not been CoP approved and a waiver for its use is being requested.



STUDY AREA

## 1. FACTORS AFFECTING THE LEVELS OF REVIEW

**Scope of Review.** Below is a discussion of the factors affecting the risk informed decisions on the appropriate levels of review

- Will the study likely be challenging?

Louisville/ Jefferson County Metropolitan Sewer District completed a critical repair and reinvestment plan in 2017. This plan coupled with USACE periodic inspections and assessments provided significant input to identify problems/issues with the current system. Problems and opportunities were also validated and refined through multiple meetings with MSD between October and January 2019. In general, the predominant issues with the LMFPS are: (1) the reliability of out-of-date and failing equipment at pump stations; (2) closure and floodwall segments that have exceeded their service life; and (3) the interior drainage system's ability to convey future runoff at a rate necessary to prevent damages.

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

Key project risks identified to date include use of the Sponsor's hydraulic/hydrologic model to evaluate interior ponding alternatives; accuracy of evaluation of flood damages at in-line pump stations; environmental; social justice; incorporation of climate forecasts; and incorporation of risks identified in the Semi-Quantitative Risk Assessment (SQRA). None of these risks pose an incremental threat to human life or the environment.

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

The levee system was assigned an LSAC II in the screening level risk assessment prior to the SQRA. There is no substantial past performance issue associated with the levee system, largely because the system has not been significantly loaded. Most of the floodwalls have not been loaded. Incremental risk associated with the levee system from the SQRA is contributed to mostly from overtopping and floodwall performance. From the updated stage frequency, the incipient overtopping of the levee is a river stage with a return period of approximately once per every 8,500 years. Due to the high population at risk (PAR), the system is expected to remain a high risk system regardless of performance. For the 2 feet of overtopping scenario, the levee system has an estimated daytime PAR of 172,000.

The preliminary array of structural measures being considered for this study center on reconstruction of portions of floodwalls, levees, closure structures, and pump stations. If these measures were to fail or not perform adequately, they would not create a higher risk to human life and safety than the risk that currently exists in the LMFPS. A SQRA is currently underway to update the rating, and risk driving performance issues identified through that assessment may be considered as part of

this study to address life safety and the resiliency of the current system. Current risk assessment efforts (SQRA) will inform the study problem identification and alternative evaluation. An objective of the study is to reduce current risks to life, health and safety of residents in the study area for the 50 yr. period of analysis.

- Has the Governor of an affected state requested a peer review by independent experts?

The Governor has not requested peer review by independent experts.

- Will it likely involve significant public dispute as to the project's size, nature, or effects?

The project and study are not anticipated to be controversial or result in significant public dispute as to the size, nature, or effects of the project.

- Is the project/study likely to involve significant public dispute as to the economic or environmental cost or benefit of the project?

The project and study are not anticipated to be controversial or result in significant public dispute as to the economic or environmental costs and benefits of the project.

- 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?

The anticipated project design will take advantage of prevailing practices and methodologies. It is not expected to be based on novel methods or involve the use of innovative techniques.

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

The anticipated project design will take advantage of prevailing practices and methodologies. It is not anticipated that the project will require unique construction sequencing. Redundancy and resiliency are key components to levee system design/modifications and will be required.

- Is the estimated total cost of the project greater than \$200 million?

TBD. The magnitude of the cost of this project has not been determined yet. Preliminary analyses indicate that the project may have a Class 4 cost estimate that is slightly greater than \$200 million, but it is uncertain at this time whether final project costs will remain above this threshold.

- Will an Environmental Impact Statement be prepared as part of the study?

No. It is anticipated that an Environmental Assessment will be prepared as part of this Feasibility Study.

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

No. The project is not expected to have more than negligible adverse impacts on scarce or unique tribal, cultural, or historic resources.

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

No. The project is not expected to have substantial adverse impacts on fish and wildlife species and their habitat prior to the implementation of mitigation measures.

- 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?

No. The project is not expected to have, before mitigation measures, more than a negligible adverse impact on an endangered or threatened species or their designated critical habitat

## 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.** All decision documents (including data, analyses, environmental compliance documents, etc.) undergo DQC. This internal review process covers basic science and engineering work products. It fulfills the project quality requirements of the Project Management Plan.

**Agency Technical Review.** 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. These 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.

**Independent External Peer Review.** Type I 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 Type I IEPR is appropriate. (See discussion in Section c).

**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.** 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 the supporting analyses and coordination comply with law and policy, 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. These subsections also identify requirements, special reporting provisions, and sources of more information.

**Table 1: Levels of Review**

| <b>Product(s) to undergo Review</b>                                | <b>Review Level</b>             | <b>Start Date</b> | <b>End Date</b> | <b>Cost</b> | <b>Complete</b> |
|--|---------------------------------|-------------------|-----------------|-------------|-----------------|
| <i>Draft Feasibility Report and EA</i>                             | <i>District Quality Control</i> | 08/02/19          | 08/30/19        | \$25K       | No              |
| <i>Draft Feasibility Report and EA</i>                             | <i>Agency Technical Review</i>  | 10/28/19          | 12/03/19        | \$50K       | No              |
| <i>Draft Feasibility Report and EA (exclusion request pending)</i> | <i>Type I IEPR</i>              | N/A               | N/A             | \$0         | No              |
| <i>Draft Feasibility Report and EA</i>                             | <i>Policy and Legal Review</i>  | 10/28/19          | 12/03/19        | \$0         | No              |
| <i>Final Feasibility Report and EA</i>                             | <i>District Quality Control</i> | 2/10/20           | 2/28/20         | \$15K       | No              |
| <i>Final Feasibility Report and EA</i>                             | <i>Agency Technical Review</i>  | 3/2/20            | 3/31/20         | \$30K       | No              |



|  |                                |        |         |     |    |
|--|--------------------------------|--------|---------|-----|----|
| <i>Final Feasibility Report and EA</i> | <i>Policy and Legal Review</i> | 4/1/20 | 4/29/20 | \$0 | No |
|--|--------------------------------|--------|---------|-----|----|

\* As previously stated, a Semi-Quantitative Risk Assessment (SQRA) funded by the Risk Management Center (RMC) is currently underway to update the Levee Safety Action Classification (LSAC) rating. Any risk driving performance issues identified through the SQRA will be utilized to inform problem identification and support formulation and evaluation of alternatives for the Feasibility Study. Due to the initial uncertainty regarding the funding of the SQRA by the RMC and the schedule for its completion including reviews of the SQRA, a separate Review Plan was developed for the SQRA. Information from the SQRA should be used by all reviewers for both the draft and final Feasibility Study documents as the information becomes available. The ATR for the SQRA has been initiated and is scheduled for completion in August 2019. The Geotechnical member on the PDT is the same on both the Feasibility Study and SQRA, which helps assure incorporation of the SQRA results into the Feasibility Study.

**a. DISTRICT QUALITY CONTROL**

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 2 identifies the required expertise for the DQC team.

**Table 2: Required DQC Expertise**

| <b>DQC Team Disciplines</b>        | <b>Expertise Required</b>   |
|------------------------------------|---|
| DQC Lead / Planning                | 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                          | 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 flood risk management projects. |
| Environmental / Cultural Resources | The NEPA Compliance reviewer will be an expert in the field of environmental compliance (specifically with NEPA, the Endangered Species Act, the Clean Water Act, and the National Historic Preservation Act).  |
| Hydraulics & Hydrology             | The hydraulic engineering reviewer will be an expert in the field of hydraulics and hydrology and have a thorough understanding of open channel dynamics and/or computer modeling techniques that will be used such as HEC-RAS and Infoworks®.                                |
| Risk Reviewer                      | The risk analysis reviewer will be experienced 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.   |
| Geotechnical Engineering | Recognized expert in the field of geotechnical engineering analysis, design, and construction of flood damage reduction systems. The geotechnical engineer shall be a licensed professional engineer.   |
| Civil Design             | The Civil design reviewer will be knowledgeable in the field of engineering analysis, design, and construction of flood damage reduction systems.   |
| Structural Engineering   | The Structural design reviewer will be knowledgeable in the field of structural engineering analysis, design, and construction of hydraulic structures. Working familiarity with ACI 350 and the pertinent Corps' Engineering Manuals is required. Shall have a proven track record of design of structures used in flood damage reduction systems. |
| Mechanical Engineering   | The Mechanical design reviewer will be knowledgeable in the field of mechanical engineering analysis, design, and construction of flood damage reduction systems. Working familiarity with pumps is required.   |
| Electrical Engineering   | The Electrical design reviewer will be a recognized expert in the field of electrical engineering analysis, design, and construction of flood damage reduction systems. Working familiarity with switchgear and other electrical components is required.  |
| Cost Engineering         | The reviewer should have experience preparing cost estimates for design and construction of reconstruction projects consisting of portions of floodwalls, levees, closure structures, and pump stations. In addition the team member will be familiar with cost estimating for similar civil works projects using MCACES.                           |
| Real Estate              | The reviewer will be knowledgeable in the preparation of real estate documents and actions involving land acquisitions, easements, rights of entry and disposals.   |

**Documentation of DQC.** Quality Control should be performed continuously throughout the study. A specific certification of DQC completion is required at the draft and final report stages. Documentation of DQC will follow the District Quality Manual and the MSC Quality Management Plan. Reference ER 1110-1-12, Quality Management, dated 31 Mar 2011 and the LRD Regional Business Processes Manual, Section 08504 LRD – QC/QA Procedures for Civil Works, Engineering and Design Products.

Documentation of completed DQC will 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.

**b. AGENCY TECHNICAL REVIEW**

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. An RMO manages ATR. The review is conducted by an ATR Team whose members are certified to perform reviews. Lists of certified reviewers are maintained by the various technical Communities of Practice (see EC 1165-2-217, section 9(h)(1)). Table 3 identifies the disciplines and required expertise for this ATR Team.

**Table 3: Required ATR Team Expertise**

| <b>ATR Team Disciplines</b> | <b>Expertise Required</b>  |
|-----------------------------|--|
| ATR Lead                    | 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 professional with extensive experience preparing Civil Works decision documents and conducting ATR.   |
| Economics                   | 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 and benefits for flood risk management projects. Reviewer must be certified for FRM Economics. |
| Environmental Resources     | The NEPA Compliance reviewer will be an expert in the field of environmental compliance (specifically with NEPA, the Endangered Species Act, the Clean Water Act, and the National Historic Preservation Act) with certification as an ATR through the Planning Community of Practice.   |
| Hydraulics & Hydrology      | The hydraulic engineering reviewer will be an expert in the field of hydraulics and hydrology and have a thorough understanding of open channel dynamics and/or computer modeling techniques that will be used such as HEC-RAS and Infoworks®. The reviewer will be certified and listed in CERCAP, and be a certified risk reviewer.    |
| Risk Reviewer               | The risk analysis reviewer will be experienced 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.   |
| Geotechnical Engineering    | Recognized expert in the field of geotechnical engineering analysis, design, and construction of flood damage reduction systems. The geotechnical engineer shall be a licensed professional engineer. The reviewer will also be certified and listed in CERCAP.  |
| Civil Design                | Recognized expert in the field of civil engineering analysis, design, and construction of flood damage reduction systems. The civil  |

|                                     |  |
|-------------------------------------|--|
|                                     | design engineer shall be a licensed professional engineer. The reviewer will also be certified and listed in CERCAP.   |
| Structural Engineering              | Recognized expert in the field of structural engineering analysis, design, and construction of reconstruction projects consisting of portions of floodwalls, levees, closure structures, and pump stations. Working familiarity with ACI 350 and the pertinent Corps' Engineering Manuals is required. Shall have a proven track record of design of structures used in flood damage reduction systems. The Structural Engineer shall be a licensed professional engineer. The reviewer will also be certified and listed in CERCAP. |
| Mechanical Engineering              | Recognized expert in the field of mechanical engineering analysis, design, and construction of flood damage reduction systems. Working familiarity with pumps is required. The Mechanical Engineer shall be a licensed professional engineer. The reviewer will also be certified and listed in CERCAP.  |
| Electrical Engineering              | Recognized expert in the field of electrical engineering analysis, design, and construction of flood damage reduction systems. Working familiarity with switchgear and other electrical components is required. The Electrical Engineer shall be a licensed professional engineer. The reviewer will also be certified and listed in CERCAP.   |
| Cost Engineering                    | Cost MCX Staff or Cost MCX Pre-Certified. Professional as assigned by the Walla Walla Cost Engineering Mandatory Center of Expertise with experience preparing cost estimates for design and construction of reconstruction projects consisting of floodwalls, levees, closure structures, and pump stations. In addition the team member will be familiar with cost estimating for similar civil works projects using MCACES.   |
| Real Estate                         | The reviewer will be knowledgeable in the preparation of real estate documents and actions involving land acquisitions, easements, rights of entry and disposals.  |
| Climate Preparedness and Resilience | The reviewer will be a member of the Climate Preparedness and Resiliency Community of Practice. They will ensure the proper application of Climate Preparedness and Resiliency Tools and compliance with ECB 2018-14.  |

**Quality Control/Quality Assurance of Infoworks® Software Hydraulic Analysis.** The Infoworks Integrated Catchment Model (Infoworks) is a software product provided by Innovyze. The model is used for hydraulic and hydrologic (H&H) modeling of the Louisville Metro combined sewer network. This software is and has been utilized by the local sponsor, Louisville MSD, in planning, optimizing and sizing combined sewer projects for the Louisville Metro system. Because of the complex nature of the combined sewer network and the existence of a calibrated catchment model, Infoworks is utilized by the Louisville Metro PDT to assess alternatives for this study.

The existing conditions Infoworks model is used as the foundation for modeling any planned or proposed projects -- the branching and version control capabilities of the Infoworks software are used to modify the existing conditions model with any future modifications or updates to the sewer network associated with upcoming projects. Once construction of a project has been completed, the proposed project updates are merged into the existing conditions model to ensure that the model geometry remains an accurate reflection of "today's" sewer network. In addition, the existing conditions model is regularly calibrated to flow monitor data in order to account for changes in land use or urban development.

The Infoworks combined sewer system model contains all sewers within Louisville's combined sewer system that are 12" in diameter or greater, as well as smaller pipes in many areas. All major pumping stations and their associated force mains are depicted in the model, with the flood pump stations in particular draining to outfall nodes representing the Ohio River that can be controlled with water level boundary conditions to represent specific conditions both above and below McAlpine Lock and Dam. Where necessary, real-time controls (RTC) are used to automate pump on/off conditions and gate openings or closures that may be required based upon flood conditions or other triggers.

Due to the scale of the combined sewer system model, QC for the project will focus primarily on the sewer network around and immediately upstream of the flood pump stations. The existing conditions geometry and model parameters will be inspected to ensure that they reasonably represent the sewer network and surface water runoff conditions in the project area. Within the preferred conditions models, any updates to the sewer network geometry, RTC controls, or pump station configuration will be reviewed to confirm that they accurately reflect the changes proposed in the study. Model results for existing and preferred conditions simulations will be examined to verify that conveyance of flow to, through, and out of the pump stations and drainage structures is reasonably depicted by the model.

The following processes will occur for QA/QC of the model:

1. The primary modeler's work will be reviewed for quality by a senior modeler and adequately addressed.
2. The modeling outputs will be reviewed by the PDT hydrologic/hydraulic engineer and the Lead Engineer. Comments regarding any data which appears incorrect or is not consistent will be provided and addressed by the primary/senior modelers.
3. A USACE Senior Hydraulic Engineer with previous modeling experience with the software will physically examine the modeling analysis with the primary modeler. The Senior Hydraulic Engineer will provide a description of the model and comments to the PDT and modelers. Comments will be addressed and captured within DQC.
4. The H&H DQC team member will review the modeling output and how it was utilized for the study. Comments will be provided and addressed per the DQC review process.
5. The H&H ATR team member will review the modeling output and how it was utilized for the study. Comments will be provided and addressed per the ATR review process.

**Documentation of ATR.** DrChecks will be used to document all ATR comments, responses and resolutions. Comments should use the four part comment structure and be limited to those needed

to ensure product adequacy and conformance to policy or technical concerns. If a concern cannot be resolved by the ATR team and PDT, it will be elevated to the vertical team for resolution using the EC 1165-2-217 issue resolution process. Concerns can be closed in DrChecks by noting the concern has been elevated for resolution. The ATR Lead will prepare a Statement of Technical Review (see EC 1165-2-217, Section 9), for the draft and final reports, 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 REVIEW**

#### **(i) Type I IEPR.**

##### **Decision on Type I IEPR.**

The PDT has used a risk-informed process to recommend that an Independent External Peer Review (IEPR) Type I review is not necessary. The PDT is pursuing an exception to existing policy from Type I IEPR per the guidance on review of civil works products and the revised delegation of IEPR decisions to the MSC Commander. Based on a careful review of project risks (please refer back to the “Risk Identification” section and the “Factors Affecting the Levels of Review”), we have determined that the study may be excluded from IEPR, and would not significantly benefit from IEPR, because of the following reasons:

- a. The project does not represent a significant threat to human life;
- b. The Governor of Kentucky has not requested an independent peer review for the project;
- c. The project is not controversial 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;
- d. There are no novel methods used on this project;
- e. The Head of a Federal or State agency charged with reviewing the study has not requested an independent peer review for the project;
- f. The project does not include an Environmental Impact Statement (EIS); is not controversial; has no adverse impacts on scarce or unique tribal, cultural, or historic resources; has no adverse impacts on any fish or wildlife species or their habitat whether or not they are listed as endangered or threatened under the Endangered Species Act of 1973; and will not contain influential scientific information or highly influential scientific assessments.
- g. There are no other circumstances where the Chief of Engineers has determined that a Type I IEPR is warranted.

While the preliminary cost estimate exceeds \$200 million, the cost centers on reconstruction of an existing, functioning flood protection system. The proposed reconstruction of the Louisville Metro Flood Protection System will consist of addressing performance deficiencies caused by a long-term degradation of the foundation, construction materials, and engineering systems that have exceeded their expected service lives and the resulting inability of the project to perform its authorized project functions. Reconstruction will also consist of addressing system features that have exceeded their expected service life including, but not limited to pump motors, electrical systems, floodwalls, and gate closures. The study will not be based on novel methods, does not

present complex challenges for interpretation, does not contain precedent-setting methods or models, and will not present conclusions that are likely to change prevailing practices.

The limited scope of this action, use of well-established criteria, minimal anticipated environmental impacts, and low uncertainty, are all indicative of an action that would benefit little from further review by IEPR. If any of these factors change during the development of the study, the need for IEPR will be re-evaluated.

As discussed previously, the preliminary array of structural measures being considered for this study center on reconstruction of portions of floodwalls, closure structures, and pump stations. If these measures were to fail or not perform adequately, they would not create a higher risk to human life and safety than the risk that currently exists in the LMFPS. A Semi-Quantitative Risk Assessment (SQRA) is currently underway to update the rating, and major risk driving performance issues identified through that assessment may be considered as part of this study to address life safety and the resiliency of the current system. Current risk assessment efforts (SQRA) will inform the study in problem identification and alternative evaluation. An objective of the study is to reduce current risks to life, health and safety of residents in the study area for the 50 yr. period of analysis

Also, in accordance with the “Interim Guidance on Streamlining Independent External Peer Review (IEPR) for Improved Civil Works Product Delivery” dated 5 April 2019, this study meets certain conditions as outlined in paragraph 6.a where a Type I IEPR can be excluded. According to paragraph 6a,

A project study may be excluded from Type I IEPR if any of the following conditions apply:

a. If the project study does not include an EIS and is a project subject to peer review as described in paragraph 4a. of the guidance (costs greater than \$200M) and the Chief of Engineers determines that it:

- (1) is not controversial;
- (2) has no more than negligible adverse impacts on scarce or unique tribal, cultural, or historic resources;
- (3) has no substantial adverse impacts on fish and wildlife species and their habitat prior to the implementation of mitigation measures; and
- (4) has, before implementation of mitigation measures, no more than a negligible adverse impact on a species listed as endangered or threatened species under the Endangered Species Act of 1973 or the critical habitat of such species designated under such Act.

#### **(ii) Type II IEPR.**

The second kind of IEPR is Type II IEPR. These Safety Assurance Reviews are managed outside of the USACE and are conducted on design and construction for hurricane, storm and flood risk management projects or other projects where existing and potential hazards pose a significant threat to human life. A Type II IEPR Panel will be convened to review the design and construction activities before construction begins, and until construction activities are completed, and periodically thereafter on a regular schedule.

**Decision on Type II IEPR.** A Type II IEPR Panel will be convened to review the design and construction activities before construction begins, and until construction activities are completed.

**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, ATR, and IEPR.

**Table 5: Planning Models.** The following models may be used to develop the decision document:

| <b>Model Name and Version</b>         | <b>Brief Model Description and How It Will Be Used in the Study</b>   | <b>Certification / Approval</b> |
|---------------------------------------|---|---------------------------------|
| HEC-FDA 1.4.2 (Flood Damage Analysis) | The Hydrologic Engineering Center’s Flood Damage Analysis (HEC-FDA) program provides the capability for integrated hydrologic engineering and economic analysis for formulating and evaluating flood risk management plans using risk-based analysis methods. The program will be used to evaluate and compare the future without- and with-project plans to aid in the selection of a recommended plan to manage flood risk. | 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, ATR, and IEPR.

**Table 6: Engineering Models.** These models may be used to develop the decision document:

| <b>Model Name and Version</b> | <b>Brief Model Description and How It Will Be Used in the Study</b>   | <b>Approval Status</b>  |
|-------------------------------|---|---|
| InfoWorks ICM Version 9.0     | The Infoworks Integrated Catchment Model (Infoworks) is a software product provided by Innovyze. The model is used for hydraulic and hydrologic modeling of the Louisville Metro combined sewer network. This software is and has been utilized by the local sponsor, Louisville MSD, in planning, optimizing and | Pending<br><br>HEC<br><br>Per ES-08101, 7.5<br>Exception 1 – Software required by a USACE |



|               |   |   |
|---------------|---|---|
|               | sizing combined sewer projects for the Louisville Metro system. Because of the complex nature of the combined sewer network and the existence of a calibrated catchment model, Infoworks is utilized by the Louisville Metro PDT to assess alternatives for this study. | Stakeholder; a waiver is being requested to utilize this software for this particular project. A QA/QC plan is being developed. This software will be submitted for APPROVAL, per EC – 1105-2-412, Section 5.c. |
| HEC-SSP v 2.1 | Provides statistical analysis of hydrologic data. Will be used primarily for coincident frequency analysis of the interior ponding frequency of basins within the Lou Metro interior watershed system.  | HH&C COP preferred  |
| HEC-HMS v 4.2 | Software to simulate the hydrologic processes of the Lou Metro interior watershed system.   | HH&C COP preferred  |

**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.

**ATTACHMENT 1: TEAM ROSTERS**

| PROJECT DELIVERY TEAM |            |                    |              |
|-----------------------|------------|--------------------|--------------|
| Name                  | Office     | Position           | Phone Number |
|                       | LRL-PM-P   | Planning           | 502-315-6776 |
|                       | LRL-ED-D   | Lead Engineer      | 502-315-6495 |
|                       | LRL-ED-T-G | Risk/Geotechnical  | 502-315-6330 |
|                       | LRL-PM-C   | Project Manager    | 502-315-6780 |
|                       | LRL-PMC-PL | Economics          | 502-315-7456 |
|                       | LRL-PMC-PL | Economics          | 502-315-6796 |
|                       | LRL-PMC-PL | Environmental      | 502-315-6130 |
|                       | LRL-PMC-PL | Cultural Resources | 502-315-6480 |
|                       | LRL-REC    | Real Estate        | 502-315-6956 |
|                       | LRL-ED-T-G | Levee Safety       | 502-315-6237 |
|                       | LRL-ED-T-H | H&H                | 502-315-6311 |
|                       | LRL-ED-D-M | Mechanical         | 502-315-6264 |
|                       | LRL-ED-D-M | Mechanical         | 502-315-7458 |
|                       | LRL-ED-D-E | Electrical         | 502-315-6395 |
|                       | LRL-ED-D-E | Electrical         | 502-315-6395 |
|                       | LRL-ED-M-C | Cost Engineering   | 502-315-6294 |
|                       | LRL-ED-M-C | Cost Engineering   | 502-315-6268 |
|                       | LRL-ED-D-S | Structural         | 502-315-6795 |
|                       | LRL-ED-T-C | Civil              | 502-315-6261 |
|                       | LRL-ED-D-A | Architectural      | 502-315-7457 |
|                       | LRL-OC     | Office of Counsel  | 502-315-6645 |

| DISTRICT QUALITY CONTROL TEAM |            |                         |              |
|-------------------------------|------------|-------------------------|--------------|
| Name                          | Office     | Position                | Phone Number |
|                               | LRL-PMC-PL | DQC Lead / Planning     | 502-315-6900 |
|                               | LRL-PMC-PL | Economics / Risk Review | 502-315-6874 |
|                               | LRL-PMC-PL | Environmental           | 502-315-6119 |
|                               | LRL-RD     | Cultural Resources      | 502-315-6688 |
|                               | LRL-REC    | Real Estate             | 502-315-7017 |
|                               | LRL-ED-T-G | Geotechnical            | 502-315-6444 |
|                               | LRL-ED-T-H | H&H                     | 502-315-6456 |
|                               | LRL-ED-D-M | Mechanical              | 502-315-6269 |
|                               | LRL-ED-D-E | Electrical              | 502-315-6275 |
|                               | LRL-ED-M-C | Cost Engineering        | 502-315-6384 |
|                               | LRL-ED-D-S | Structural              | 502-315-6511 |
|                               | LRL-ED-T-C | Civil                   | 502-315-6495 |

| AGENCY TECHNICAL REVIEW TEAM |          |                                   |              |
|------------------------------|----------|-----------------------------------|--------------|
| Name                         | Office   | Position                          | Phone Number |
|                              | SAJ-PD-D | ATR Lead/Planning                 | 904-232-2050 |
|                              |          | Economics                         |              |
|                              |          | Environmental                     |              |
|                              |          | Real Estate                       |              |
|                              |          | Geotechnical                      |              |
|                              |          | H&H/Risk Analysis                 |              |
|                              | LRL-ED-T | H&H/Infoworks Specialist          |              |
|                              | LRH-EC-M | Mechanical                        |              |
|                              |          | Electrical                        |              |
|                              |          | Cost Engineering                  |              |
|                              |          | Structural                        |              |
|                              |          | Civil                             |              |
|                              |          | Climate Preparedness & Resilience |              |

| VERTICAL TEAM |           |                                    |              |
|---------------|-----------|------------------------------------|--------------|
| Name          | Office    | Position                           | Phone Number |
|               | SPD-PDP   | FRM-PCX Deputy Director            | 415-503-6852 |
|               | SPD-PDP   | FRM-PCX-Economics                  | 916-557-6711 |
|               | LRD-PDS-P | Planning                           | 513-684-3008 |
|               | LRD-RBM   | Chief, Program Support Div         | 513-684-3069 |
|               | LRD-PDC   | Chief, Civil Works Integration Div | 513-684-6211 |
|               | LRD-RB-W  | Hydraulics                         | 513-684-3073 |
|               | LRD-RBT   | Chief, Business Technical Div      | 513-684-2739 |

| POLICY REVIEW TEAM |           |                        |              |
|--------------------|-----------|------------------------|--------------|
| Name               | Office    | Position               | Phone Number |
|                    | CW-PC/LRD | Environmental          | 202-761-4700 |
|                    | CW-LRD    | Planning/HQ - RIT      | 202-761-4589 |
|                    | LRD-RB    | Chief, Planning Div    | 202-761-0115 |
|                    | LRD-PDS-P | Planning               | 513-684-6050 |
|                    | CC-LRD    | Office of Counsel      | 513-684-6241 |
|                    | LRD-RBT   | Engineering            | 513-684-3074 |
|                    | LRD-PDS-P | Economics              | 513-684-3598 |
|                    | LRD-PD    | Review Manager         | 513-684-3025 |
|                    | LRD-PDS-R | Chief, Real Estate Div | 513-684-6232 |

**ATTACHMENT 2: CERTIFICATION OF RISK INFORMED DECISION FOR TYPE I  
METRO LOUISVILLE, KY FEASIBILITY STUDY - SUPPLEMENTAL  
CERTIFICATION OF RISK INFORMED DECISION FOR TYPE I IEPR**

In accordance with EC 1165-2-217, the feasibility study, which consists primarily of a reconstruction project of the Louisville Metro Flood Protection System, was evaluated for life safety risks. At this time, the subject study does not meet the requirements for a mandatory IEPR, with the possible exception of one requirement involving the cost estimate. The project does not represent a significant threat to human life; is not controversial; and there has been no request for an IEPR by a governor or the head of a Federal or state agency. Preliminary analyses indicate that the project may have a cost estimate that is slightly greater than \$200 million (Class 4), but it is uncertain at this time whether final project costs will remain above this threshold. In addition, the project does not require an Environmental Impact Statement (EIS); has no adverse impacts on scarce or unique tribal, cultural, or historic resources; has no adverse impacts on any fish or wildlife species or their habitat whether or not they are listed as endangered or threatened under the Endangered Species Act of 1973; and will not contain influential scientific information or highly influential scientific assessments. In light of the risk-informed decision making process, I have determined that a Type I IEPR is not required for this project.

**BOCK.JOHN.R.123**  
**0461569**

Digitally signed by BOCK.JOHN.R.1230461569  
DN: c=US, o=U.S. Government, ou=DoD,  
ou=PKI, ou=USA, cn=BOCK.JOHN.R.1230461569  
Date: 2019.04.03 11:07:52 -0400

---

John R. Bock  
Chief, Engineering Division  
CELRL-ED

4/3/19

---

Date