

REVIEW PLAN

**Paducah, KY
Flood Risk Management Project
Feasibility Study**

Louisville District

November 2009



**US Army Corps
of Engineers®**

REVIEW PLAN

**Paducah, KY
Flood Risk Management Project
Interim Feasibility Study**

TABLE OF CONTENTS

1. PURPOSE AND REQUIREMENTS 1

2. STUDY INFORMATION 3

3. AGENCY TECHNICAL REVIEW (ATR) 5

4. INDEPENDENT EXTERNAL PEER REVIEW (IEPR) 7

5. MODEL CERTIFICATION AND APPROVAL 9

6. REVIEW SCHEDULES AND COSTS 11

7. PUBLIC PARTICIPATION 12

8. PCX COORDINATION 12

9. MSC APPROVAL 12

10. REVIEW PLAN POINTS OF CONTACT 12

ATTACHMENT 1: TEAM ROSTERS 13

ATTACHMENT 2: ATR CERTIFICATION 15

ATTACHMENT 3: ACRONYMS AND ABBREVIATIONS 17

1. PURPOSE AND REQUIREMENTS

a. **Purpose.** This Review Plan defines the scope and level of peer review for the Paducah, KY Flood Risk Management Project Feasibility Study.

b. **References.**

- (1) Engineering Circular (EC) 1105-2-410, Review of Decision Documents, 22 Aug 2008
- (2) EC 1105-2-407, Planning Models Improvement Program: Model Certification, 31 May 2005
- (3) Engineering Regulation (ER) 1110-2-12, Quality Management, 30 Sep 2006
- (4) Project Management Plan (PMP) for Paducah, KY Feasibility Study & Certification of Levee

2. **Requirements.** This review plan was developed in accordance with EC 1105-2-410, which establishes the procedures for ensuring the quality and credibility of U.S. Army Corps of Engineers (USACE) decision documents through independent review. The EC outlines three levels of review: District Quality Control, Agency Technical Review, and Independent External Peer Review. In addition to these three levels of review, decision documents are subject to policy and legal compliance review and, if applicable, safety assurance review and model certification/approval.

(1) District Quality Control (DQC). DQC is the review of basic science and engineering work products focused on fulfilling the project quality requirements defined in the Project Management Plan (PMP). It is managed in the home district and may be conducted by staff in 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 Quality Management Plan 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. The Major Subordinate Command (MSC)/District quality management plans address the conduct and documentation of this fundamental level of review; DQC is not addressed further in this review plan.

(2) Agency Technical Review (ATR). ATR is an in-depth review, managed within USACE, and conducted by a qualified team outside of the home district that is not involved in the day-to-day production of the project/product. The purpose of this review is to ensure the proper application of clearly established criteria, regulations, laws, codes, principles and professional practices. The ATR team reviews the various work products and assure that all the parts fit together in a coherent whole. ATR teams will be comprised of senior USACE personnel (Regional Technical Specialists (RTS), etc.), and may be supplemented by outside experts as appropriate. To assure independence, the leader of the ATR team shall be from outside the home MSC.

(3) Independent External Peer Review (IEPR). IEPR is the most independent level of review, and is applied in cases that meet certain criteria where the risk and magnitude of the proposed project are such that a critical examination by a qualified team outside of USACE is warranted. IEPR is generally for feasibility and reevaluation

studies and modification reports with Environmental Impact Statements (EISs). IEPR is managed by an Outside Eligible Organization (OEO) that is described in Internal Revenue Code Section 501(c) (3), is exempt from Federal tax under section 501(a), of the Internal Revenue Code of 1986; is independent; is free from conflicts of interest; does not carry out or advocate for or against Federal water resources projects; and has experience in establishing and administering IEPR panels. The scope of review will address all the underlying planning, engineering, including safety assurance, economics, and environmental analyses performed, not just one aspect of the project.

- (4) Policy and Legal Compliance Review. Decision documents will be reviewed throughout the study process for their compliance with law and policy. These reviews culminate in Washington-level 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 Chief of Engineers. Guidance for policy and legal compliance reviews is addressed further in Appendix H, ER 1105-2-100, Planning Guidance Notebook. When policy and/or legal concerns arise during DQC or ATR that are not readily and mutually resolved by the PDT and the reviewers, the District will seek issue resolution support from the MSC and HQUSACE in accordance with the procedures outlined in Appendix H, ER 1105-2-100. IEPR teams are not expected to be knowledgeable of Army and administration policies, nor are they expected to address such concerns. The home district Office of Counsel is responsible for the legal review of each decision document and signing a certification of legal sufficiency.
- (5) Safety Assurance Review (SAR). In accordance with Section 2035 of Water Resources Development Act (WRDA) of 2007, EC 1105-2-410 requires that all projects addressing flooding or storm damage reduction undergo a safety assurance review of the design and construction activities prior to initiation of physical construction and periodically thereafter until construction activities are completed on a regular schedule sufficient to inform the Chief of Engineers on the adequacy, appropriateness, and acceptability of the design and construction activities for the purpose of assuring public health, safety, and welfare. The decision document phase is the initial design phase; therefore, EC 1105-2-410 requires that safety assurance factors be considered in all reviews for decision document phase studies. As part of the decision document phase a PMP covering the scope and schedule for PED and construction of any recommended plan will be developed along with an associated Review Plan for those phases of project development. Provisions for the SAR will be incorporated into this PMP/Review Plan, and a SAR team will be established for the PED and construction phase. The project manager will coordinate with the Review Management Organization (RMO) to develop the review requirements and to include them in the Review Plan. The RMO for SAR's is the USACE Risk Management Center. The SAR team shall perform reviews and site visits in accordance with milestones identified in the Review Plan. Milestones to consider for an SAR are at the record of final design in the Design Documentation Report; at the completion of the plans, specifications, and cost estimate; at the midpoint of construction for a particular contract, prior to final inspection, or at any critical design or construction decision milestones. The SAR panel may recommend to the RMO additional or alternate milestones. The MSC should approve these recommendations when they are warranted and reasonable.

(6) Model Certification/Approval. EC 1105-2-407 requires certification (for Corps models) or approval (for non-Corps models) of planning models used for all planning activities. The EC defines planning models 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 EC does not cover engineering models used in planning. Engineering software is being address under the Engineering and Construction (E&C) Science and Engineering Technology (SET) initiative. Until an appropriate process that documents the quality of commonly used engineering software is developed through the SET initiative, engineering activities in support of planning studies shall proceed as in the past. 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.

2. STUDY INFORMATION

- a. **Decision Document.** The authorized name of the study for the flood risk management project at Paducah, Kentucky is the Paducah, KY Feasibility Study. The level of approval for the document will be the Civil Works Review Board (CWRB). Authority for the Paducah, Kentucky Feasibility Study and rehabilitation are contained in Section 5077 of the Water Resources Development Act of 2007. This section reads as follows:

“SEC. 5077. PADUCAH, KENTUCKY.

The Secretary shall complete a feasibility report for rehabilitation of the project for flood damage reduction, Paducah, Kentucky, authorized by section 4 of the Flood Control Act of June 28, 1938 (52 Stat. 1217), and, if the Secretary determines that the project is feasible, the Secretary may carry out the project at a total cost of \$3,000,000.”

The above authority provides the Corps authority to review water resources issues concerning the City of Paducah, KY as related to the existing local protection project which began construction in August 1939 and was completed in January 1950.

The authority to conduct feasibility studies examining the reconstruction of structural flood damage reduction projects constructed by the Corps is Section 216 of the Flood Control Act of 1970 (Public Law 91-611) which states:

“The Secretary of the Army, acting through the Chief of Engineers, is authorized to review the operation of projects the construction of which has been completed and which were constructed by the Corps of Engineers in the interest of navigation, flood control, water supply, and related purposes, when found advisable due to significantly changed physical or economic conditions, and to report thereon to Congress with recommendations of the advisability of modifying the structures or their operation, and for improving the quality of the environment in the overall public interest.”

National Environmental Policy Act (NEPA) documentation will be prepared if applicable.

- b. **Study Description.** The Paducah Feasibility Study is a single-purpose study for flood risk management. The Paducah Local Flood Protection Project is an aging project. The project is in need of reconstruction/rehabilitation after nearly 50 years of operation. The type of measure to be studied is a reconstruction alternative versus a no action alternative. The

estimated cost of the project for the recommended plan has not been finalized at this point. The cost will be in the range of \$16M to \$20M. Several items, such as refurbishment and/or replacement of pumps and motors; a potential new pump plant (within the existing footprint) to alleviate ponding of water; slip-lining of deteriorating pipes; and an upgrade to Bee Branch will be included in the reconstruction cost estimate. These reconstruction items were not included in the costs estimates that were the basis of the current project authorization. Additional legislative language is in the draft phase to increase the authorization. The non-federal sponsor is the City of Paducah, KY.

The City of Paducah is located in the northern portion of McCracken County, Kentucky, on the left bank of the Ohio River, approximately 934 miles below Pittsburgh, immediately below the mouth of the Tennessee River. The City of Paducah is bounded on the north and northeast by the Ohio and Tennessee Rivers and lies within the alluvial valley of the Ohio River. A significant portion of its residential and commercial districts is situated on a level and relatively high flood plain terrace that extends to the low hills on the south. The average elevation of this alluvial terrace is about 337 feet, mean sea level (msl). Island Creek flows through the eastern part of the city to join the Ohio River and immediately below the mouth of the Tennessee River, and Perkins Creek is located along the western portion of the city. According to the U.S. Census Bureau, in 200 Paducah had a population of 26,275. Paducah, KY is the official county seat of McCracken County.

The existing project/study area contains approximately 10,850 acres. The existing local protection project consists of approximately 48,700 feet of earthen levee, 15,870 feet of concrete flood wall, 12 pumping plants, approximately 55 closure and service openings, 8 ramps, 5 diversion channels and other necessary appurtenances. The top elevation of the protection was designed to be at least three feet higher than the 1937 flood elevation, which included the impact of constructing the Brookport, Illinois levee/floodwall project on the opposite bank of the Ohio River at this location. In addition to these flood protection measures, Corps reservoirs were constructed throughout the Ohio River Basin, further reducing the impacts of flooding on the receiving streams of these reservoirs as well as along the Ohio River.

- c. **Proposed Level of Review.** This review plan will describe the anticipated review process and levels of review for the Paducah, Kentucky Interim Feasibility Study. This Review Plan is a standalone document to accompany the Project Management Plan. The DQC will be managed from within the district in accordance with the PMP and District Quality Management Plans. The ATR will be managed by the lead PCX. The ATR team members, identified by the PCX, will come from outside the home district and the ATR team lead will be selected from outside the MSC. At this time no IEPR is required. The following paragraphs correspond to paragraphs 4a through 4k in Appendix B of the Engineering Circular on the review of decision documents (EC 1105-2-410), which describe the content of Review Plans.

The City of Paducah, KY stated in a letter, in 1997, that they were interested in cost sharing a feasibility study of the Paducah, KY Local Protection Project with the U.S. Army Corps of Engineers. The signatures by the City and of Paducah, KY and Corps' executives of the Feasibility Cost Sharing Agreement (FCSA) on January 30, 2009 initiated this most-recent feasibility study. This feasibility study will culminate in an interim report (focusing on the Paducah, KY) under the broad authority of the Paducah.

The review plan (RP) presented below is a collaborative product of the project delivery team (PDT) and the USACE Flood Risk Management Planning Center of Expertise (FRMPCX). The FRMPCX shall manage the PRP, which for this study includes only an Agency Technical Review (ATR) and not an Independent External Peer Review (IEPR).

The Paducah, Kentucky, Interim Feasibility Study shall identify needs and opportunities (particularly regarding flood risks) within the study area. Since this project entails primarily reconstruction of aging equipment, it is not likely to create new influential scientific information or be a highly scientific assessment. The models, methodology and approach of the study do not deviate from the standards of Flood Risk Management studies and the study itself presents no extraordinary challenges. An Environmental Assessment will not be required. The project falls under the realm of a categorical exclusion because it was federally-constructed and will remain within the existing project footprint. All environmental requirements will be met. The Feasibility Study is unlikely to possess significant interagency interest, and does not involve any significant threats to human life or safety assurance issues. The consequences of project non-performance with and without the project are similar because it is a rehabilitation project. It is not likely that the project will have significant economic, environmental, or social effects to the nation, such as (but not limited to) more than negligible adverse impacts on scarce or unique cultural, historic, or tribal resources; substantial impacts on fish and wildlife species or their habitat, prior to implementation of mitigation; more than negligible adverse impact on species listed as endangered or threatened, or to the designated critical habitat of such species, under the Endangered Species Act, prior to implementation of mitigation. This project has been authorized by Congress, however, legislative language is being drafted to increase the authorized amount to include additional items needed for rehabilitating the project. It is not anticipated that this request for additional authorization would involve a project of a complex, controversial, or excessively costly nature. It is not expected that implementation costs will exceed the \$45 million cutoff for IEPR requirement. If in the future it would appear this report will identify costly, complex or controversial structural measures for implementation, the need for an IEPR will be reconsidered. At this time however, the interim reevaluation report shall be subjected to only an Agency Technical Review (ATR), and not an IEPR. This approach will be coordinated with LRD (and the PCX).

- d. **In-Kind Contributions.** In-kind contributions from the sponsor (City of Paducah, Kentucky) will primarily be administrative costs related to sponsor participation in all decision-point meetings regarding the screening / selection of alternatives, review of all versions of the AFB package and the draft and final reports, preparation of maps for use in the main report as well as GIS mapping for computational purposes, reproduction, assembling, and mailing of the draft and final reports. Peer review of in-kind contributions will be accomplished by having the sponsor provide documentation of in-kind services, followed by the applicable discipline providing estimates of the value of those contributions, and reconciling the documentation from the sponsor and that discipline.

3. AGENCY TECHNICAL REVIEW (ATR)

- a. **General.** ATR for decision documents covered by EC 1105-2-410 are managed by the appropriate Planning Center of Expertise (PCX) with appropriate consultation with the allied Communities of Practice such as engineering and real estate. The ATR shall ensure that the product is consistent with established criteria, guidance, procedures, and policy. The ATR

will assess whether the analyses presented are technically correct and comply with published USACE guidance, and that the document explains the analyses and the results in a reasonably clear manner for the public and decision makers. Members of the ATR team will be from outside the home district. Some members of the ATR will be nominated by the Louisville District, however, ultimately, the ATR lead will determine/approve the ATR members. The ATR lead will be from outside the home MSC. The leader of the ATR team will participate in milestone conferences and the Civil Works Review Board (CWRB) to address review concerns.

- b. Products for Review.** During the development of the Paducah, Kentucky Interim Feasibility Study report, the study team shall have an initial meeting with other Federal agencies, state agencies and interested stakeholders. Coordination will continue with the U.S. Fish and Wildlife Service, Kentucky agencies, and other interested parties throughout the course of the study process. The Feasibility Scoping Meeting (FSM), Alternative Formulation Briefing (AFB), Draft Report and Final Report products will be reviewed by the ATR team. The expected review dates are shown below in the study schedule:

Basic Study Schedule (Major Milestones as of December 2009)

Activity Name #	Description	Scheduled Date
	Feasibility Kick-Off Meeting	Feb 2009
	ATR FSM package	Feb 2010
	Complete Stage 1 Initial Screening & Formulation Scoping Meeting	Mar 2010
	Complete Stage 2 Optimization	Mar 2010
	ATR AFB package	Apr 2010
C14300	Alternative Formulation Briefing (AFB)	May 2010
C14500	DRAFT Report ATR + Revision	Jul 2010
C13600	Mail Draft Interim Report	Jul 2010
	Final Public Workshop	Aug 2010
	ATR Final Report	Aug 2010
C011200	Complete Washington-Level Review	Sep 2010
	Mail Final Interim Report	Nov 2010
	Division Commander's Notice of Report Completion	Nov 2010

These dates assume continuous and optimal Federal and Sponsor funding for the study.

- c. Required ATR Team Expertise.** The ATR team will be comprised of eleven technical experts. Those selected to date are listed in Exhibit B. The ATR team will be composed of individuals as follows: Senior Hydraulic Engineer with experience in interior flood hydrology; Senior Structural Engineer with knowledge about I-Walls, T-Walls and pumping stations founded on shallow foundations as well as design of levees and flood protection structures – should also have considerable experience with stability analyses of existing concrete structures and should also have an understanding of seismic evaluation of existing structures; real estate, economics, engineering, NEPA/ecosystem restoration and an ATR Team leader with flood risk management plan formulation expertise. Cost estimates, contingencies and construction schedules will be reviewed by the Cost Engineering Directory

of Expertise. In accordance with EC 110-2-410, the ATR team lead will come from outside the MSC.

- d. Documentation of ATR.** Dr. Checks review software will be used to document all ATR comments, responses and associated resolutions accomplished throughout the review process. Comments should be limited to those that are required to ensure adequacy of the product. 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 be 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 (cost), effectiveness (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 or to then assess whether further specific concerns may exist. The ATR documentation in Dr. Checks will include the text of each ATR concern, the PDT response, a brief summary of the pertinent points in any discussion, including any vertical coordination, and lastly the agreed upon resolution. The ATR team will prepare a Review Report which includes a summary of each unresolved issue; each unresolved issue will be raised to the vertical team for resolution. Review Reports will be considered an integral part of the ATR documentation 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.

ATR may be certified when all ATR concerns are either resolved or referred to Headquarters, U.S. Army Corps of Engineers (HQUSACE) for resolution and the ATR documentation is complete. Certification of ATR should be completed, based on work reviewed to date, for the AFB, draft report, and final report. A sample certification is included in ER 1110-2-12.

4. INDEPENDENT EXTERNAL PEER REVIEW (IEPR)

- a. General.** IEPR is conducted for decision documents if there is a vertical team decision (involving the district, MSC, PCX, and HQUSACE members) that the covered subject matter meets certain criteria (described in EC 1105-2-410) where the risk and magnitude of the proposed project are such that a critical examination by a qualified team outside the USACE is warranted. IEPR is coordinated by the appropriate PCX and managed by an Outside Eligible Organization (OEO) external to the USACE. IEPR panels shall evaluate whether the

interpretations of analysis and conclusions based on analysis are reasonable. To provide effective review, in terms of both usefulness of results and credibility, the review panels should be given the flexibility to bring important issues to the attention of decision makers; however, review panels should be instructed to not make a recommendation on whether a particular alternative should be implemented, as the Chief of Engineers is ultimately responsible for the final decision on a planning or reoperations study. IEPR panels will accomplish a concurrent review that covers the entire decision document and will address all the underlying engineering, economics, and environmental work, not just one aspect of the study. Whenever feasible and appropriate, the office producing the document shall make the draft decision document available to the public for comment at the same time it is submitted for review (or during the review process) and sponsor a public meeting where oral presentations on scientific issues can be made to the reviewers by interested members of the public. An IEPR panel or OEO representative will participate in the CWRB.

- b. **Decision on IEPR.** The Paducah, Kentucky, Interim Feasibility Study shall identify needs and opportunities (particularly regarding flood risks) within the study area. It's understood that there will always be a chance that the local flood protection project composed of levees and floodwalls can be overtopped by an extreme event. As such, any project, including Paducah, can have residual risks and public safety concerns that are significant during the occurrence of flood events exceeding the capacity of the levee/floodwall system. The consequences of project non-performance with and without the project are similar because it is a rehabilitation project. The following paragraphs describe the issues associated with potential overtopping and discuss specifically how those risks are being addressed for the Paducah local flood protection project.

For any overtopping event, there will always be an impact on floodplain residents, businesses, transportation systems, and other critical infrastructure systems. For example, Figure 1-1 shows the approximate inundation area protected by the project that would be impacted by levee failure with water to the top of protection. An overtopping flood event may show similar results. For the Paducah area protected by this flood control system, it's recognized from Figure 1-1 that there would be many routes for evacuation. With the flood warning forecasts that could predict levee overtopping many days in advance, there would be sufficient time for all residents, businessmen, vehicles, and person's belongings to be evacuated from the site. Direct loss of life from flood waters is not expected with people following this flood warning system.

The Paducah, Kentucky LFPP Flood Warning and Emergency Evacuation Plan is also a means of public safety assurance for the unlikely event of levee overtopping. *[Currently, Paducah is working on completing their FWEEP.]*



Figure 1-1 Paducah, Kentucky LFPP – Approximate Inundation Area Protected by the Project

- c. Since this project entails primarily reconstruction of aging equipment, it is not likely to create new influential scientific information or be a highly scientific assessment. The models, methodology and approach of the study do not deviate from the standards of Flood Risk Management studies and the study itself presents no extraordinary challenges. An Environmental Assessment will not be required. The project falls under the realm of a categorical exclusion because it was federally-constructed and will remain within the existing project footprint. All environmental requirements will be met. The Feasibility Study is unlikely to possess significant interagency interest, and does not involve any significant threats to human life or safety assurance issues. At this time it is also not anticipated that any request for project authorization from Congress would involve a project of a complex, controversial, or excessively costly nature. It is not expected that implementation costs will exceed the \$45 million cutoff for IEPR requirement. If in the future it would appear this report will identify costly, complex or controversial structural measures for implementation, the need for an IEPR will be reconsidered. At this time however, the interim reevaluation report shall be subjected to only an Agency Technical Review (ATR), and not an IEPR. This approach will be coordinated with LRD and the PCX. A Type II IEPR (safety Assurance Review) will be conducted during PED and construction phases.
- d. **Products for Review.** Not applicable.
- e. **Required IEPR Panel Expertise.** Not applicable.
- f. **Documentation of IEPR.** Not applicable at this time. However, a Type II IEPR (Safety Assurance Review) will be conducted during the PED and construction phases.

5. MODEL CERTIFICATION AND APPROVAL

a. General. The use of certified or approved models for all planning activities is required by EC 1105-2-407. This policy is applicable to all planning models currently in use, models under development and new models. The appropriate PCX will be responsible for model certification/approval. The goal of certification/approval is to establish that planning products are theoretically sound, compliant with USACE policy, computationally accurate, and based on reasonable assumptions. The use of a certified or approved model does not constitute technical review of the planning product. Independent review of the selection and application of the model and the input data and results is still required through conduct of DQC, ATR, and, if appropriate, IEPR. Independent review is applicable to all models, not just planning models. Both the planning models (including the certification/approval status of each model) and engineering models used in the development of the decision document are described below:

b. Planning Models. The following planning models are anticipated to be used:

The planning model used for economic analysis for the Paducah, Kentucky Interim Feasibility Study, which centers around the risk-based Flood Damage Analysis (FDA) software developed at the Hydrologic Engineering Center (HEC), is set to undergo the model certification process described in EC 1105-2-407. Version 1.2.4 was certified for use in April 2009 and has been in use by the Louisville District since June 2009. Earlier versions of the HEC-FDA software have been in widespread use since 1996.

c. Engineering Models. The following engineering models are anticipated to be used:

RAM AdvanSE: This is a proprietary software program that allows the user to model any structural element - whether structural steel or reinforced concrete - and simulate real loads, analyze the results and perform design based on the analysis. This software will be used to analyze the truss-type closures on the Paducah Feasibility study.

CWALSHT: This is a program developed for the USACE and administered through ERDC's Computer-Aided Structural Engineering (CASE) Program. CWALSHT is used to design or analyze sheet pile walls. This software will be used to analyze the I-Walls on the Paducah Feasibility study.

EXCEL: This is the well known Microsoft proprietary spreadsheet program. The user can perform calculations by inputting equations in cells, and by referencing other cells, perform chains of very complex analyses. This software will be used for many different purposes on the Paducah Feasibility study but is being used primarily for Pump Station stability analyses, simplified I-Wall analyses, and analyses of stoplog closures. Additionally, a special USACE Headquarters Risk & Reliability Task Group developed a special T-Wall analysis tool which was programmed in EXCEL – this tool will be used as well.

CTWALL: This is a program developed for the USACE and administered through ERDC's Computer-Aided Structural Engineering (CASE) Program. CTWALL is used to design or analyze T-Walls and L-Walls. This software will be used to analyze some of the T-Walls and all of the L-Walls on the Paducah Feasibility study.

MATHCAD: This is a proprietary software program that allows the user to perform calculations by inputting equations into a document, and by referencing defined values within that same document to perform chains of analyses. MATHCAD will be used primarily for Pump Station seismic analyses.

HEC-RAS 4.0. The Hydrologic Engineering Center's River Analysis System (HEC-RAS) program provides the capability to perform one-dimensional steady and unsteady flow river hydraulics calculations. The program for the Paducah Feasibility Study will be used for steady flow analysis to determine frequency flood elevations along the Ohio River.

HEC-HMS 3.3. The Hydrologic Engineering Center's Hydrologic Modeling System (HEC-HMS) program is designed to simulate the precipitation-runoff process for watershed systems. This program will be used to determine interior frequency ponding elevations based upon available storage, gravity structure and pump capacity data.

HEC-FDA 1.2. The Flood Damage Reduction Analysis (HEC-FDA) computer program developed by the Hydrologic Engineering Center provides analysis for formulating and evaluating flood damage reduction plans with risk-based analysis methods. This program will be used for the Paducah Feasibility Study to determine 95% assurance of the 1% chance not overtopping the flood protection project.

All of these models are standard models used by USACE or standard off-the-shelf software (Excel). Therefore, it is not anticipated that these models will require approval.

6. REVIEW SCHEDULES AND COSTS

- a. ATR Schedule and Cost.** Individual members of the ATR team shall review technical products as they are completed, submitting comments to the PDT (shown in Exhibit A), receiving responses, and resolving and certifying individual products, including the draft and final Paducah, Kentucky, Interim Feasibility Study reports. The FSM package, including surveying & mapping, hydraulics & hydrology, and average annual damage computations, shall be subject to ATR prior to the scoping meeting. The AFB package will also undergo ATR.

The draft report ATR review is planned for FY10, subject to availability of funds, as is the Final Report ATR. The AFB package ATR, Formulation Scoping Meeting ATR, draft report ATR, and final report ATR will use Dr. Checks software to facilitate review and documentation of revisions. A tentative cost estimate for the reviews including estimated durations, broken down by discipline, is provided below:

Review Cost Estimate

Review costs are expected to be approximately \$45,000 to \$70,000.

- b. IEPR Schedule and Cost.** Not applicable.

Model Certification/Approval Schedule and Cost. The planning model used for economic analysis for the Paducah, Kentucky Interim Feasibility Study, which centers around the risk-based Flood Damage Analysis software developed at the Hydrologic Engineering Center, is set to undergo the model certification process described in EC 1105-2-407. Version 1.2.4

was certified in April 2009 and has been in use by the Louisville District since June 2009. Earlier versions of the HEC-FDA software have been in widespread use since 1996.

7. PUBLIC PARTICIPATION

Throughout the course of the study, two general public meetings/workshops will be held as well as approximately six meetings with local officials/agencies, environmental interests, and other interested agencies. Public notices will also be prepared responding to inquiries from the general public. The public, including scientific and professional societies, will be given the opportunity to nominate potential external peer reviewers on the website.

During the public review period of the draft Paducah, Kentucky, Interim Feasibility Study report, comments will be provided to the ATR team as available. Public comments received throughout the course of the study will be provided to ATR reviewers, in complete or summary form, before the initiation of each scheduled ATR.

8. PCX COORDINATION

Review plans for decision documents and supporting analyses outlined in EC 1105-2-410 are coordinated with the appropriate Planning Center(s) of Expertise (PCXs) based on the primary purpose of the basic decision document to be reviewed. The lead PCX for this study is FRM-PCX. The e-mail address is:

FRM-PCX@usace.army.mil

9. MSC APPROVAL

The MSC that oversees the home district is responsible for approving the review plan. Approval is provided by the MSC Commander. The commander's approval should reflect vertical team input (involving district, MSC, PCX, and HQUSACE members) as to the appropriate scope and level of review for the decision document. Like the PMP, the review plan is a living document and may change as the study progresses. Changes to the review plan should be approved by following the process used for initially approving the plan. In all cases the MSCs will review the decision on the level of review and any changes made in updates to the project.

10. REVIEW PLAN POINTS OF CONTACT

Questions and/or comments on this review plan can be directed to the following points of contact:

- Project Manager, CELRL: 502-315-6875
- Chief, CELRD-FRMPCX: 502-315-6891
- Chief of Planning, CELRD: 513-684-3488

EXHIBIT A

ATTACHMENT 1: TEAM ROSTER

Product Delivery Team LEADERS LIST

as of Nov 2009

Primary Disciplines and Sub-teams	Leader	General Responsibilities	Address or Corps Mail Drop Code
	Project Manager		
Project Mgmt. Systems Support (as needed)	P2 Liaison	Maintenance of District's Project Mgt. Info Systems (P2 schedule data)	CELRL-PM
Local Sponsor		Local Coordination	City of Paducah
City of Paducah, KY	City Engineer	Coordinate City of Paducah products (Work In Kind)	
Engineering		Integration/execution of Engineering tasks	CELRL-ED-T-C
	Civil Engineer		
Geotechnical Engineering	Geotechnical Engineer	Soils and Foundations	CELRL-ED-T-G
Tech. Checker	Geotechnical Engineer		
Hydraulics and Hydrology	Hydraulic Engineer	Hydrologic & Hydraulic modeling and design	CEDLRL-ED-T-H
Tech. Checker	Hydraulic Engineer		
Hydraulics and Hydrology	Civil Engineer	Hydrologic & Hydraulic modeling and design	CEDLRL-ED-T-H
Tech. Checker	Hydraulic Engineer		
Civil Design (Plan Layouts)	Civil Engineer	Civil Engineering design, layouts, and cross sections;	CEDLRL-ED-T-C
Tech. Checker	Kathy Dorsch		
Structural Engineering	Civil Engineer	Structural Design and Analysis	CEDLRL-ED-DS
Tech. Checker	TBD		
Structural Engineering		Structural Design and	CEDLRL-ED-DS

	Civil Engineer	Analysis	
Tech. Checker	TBD		
Electrical Engineering	Electrical Engineer	Electrical Design and Analysis	CEDLRL-ED-DM
Tech. Checker	TBD		
Electrical Engineering	Electrical Engineer	Electrical Design and Analysis	CEDLRL-ED-DM
Tech. Checker	TBD		
Mechanical Engineering	Electrical Engineer	Mechanical Design and Analysis	CEDLRL-ED-DM
Tech. Checker	TBD		
Cost Engineering	Cost Estimator	Cost Analysis of Alternatives	CEDLRL-ED-MC
Tech. Checker	Cost Estimator		
Planning		Execute Planning Work per 1105-2-100 & other regs.	CELRL-PM-P-F
LRL Planning Exec. Mgt.	Chief, Planning	Planning Policy Review	CEDLRL-PM-P
Plan Formulation		Definition of Plans, Overall Data Integration for Comparison of Plans	CELRL-PM-P-F
Tech. Checker	Roger Setters		
Economics	Economist	Benefits/Costs + Social-Economic Impacts	CELRL-PM-P-E
Tech. Checker	TBD		
Environmental and HTRW	Biologist	Environmental Assessment and HTRW	CELRL-PM-P
Tech. Checker			
Cultural Resources	Archaeologist	Coordinate Cultural Resource Needs and Coordinate SHPO	CELRL-PM-P-E
Tech. Checker	Archaeologist		
Real Estate	Real Estate Specialist	Determine RE Interests, Requirements, and Costs; Relocation Cost Estimates	CELRL-RE-M
Office of Counsel	Attorney-at-Law	Legal Certification of Study Products	CELRL-OC
Construction	Civil Engineer	Review of Plans for Constructability	CELRL-CD-T-Q

EXHIBIT B

AGENCY TECHNICAL REVIEW TEAM

**Paducah Interim Feasibility Study
Paducah, Kentucky**

Primary Area of Review Responsibility	Name	Office Symbol	Unusual or Special Requirements Y/N
ITR Leader		CESPD-PDS-P	N
Civil/ Site Engineering	TBD		N
Cost Engineering		CELRH-ET-TC	N
Economics		CELRN-PM-P	N
Environmental and Cultural Resources		CELRN-PM-P	N
Geotechnical		CEMVS-EC-GB	N
HTRW	TBD		N
Hydraulics	TBD		N
Plan Formulation	TBD		N
Real Estate		CELRDOR	N
Structures		CENWK-ED-DS	N
Sponsor		Paducah, KY.	N

ATTACHMENT 2: ATR CERTIFICATION

**COMPLETION OF INDEPENDENT TECHNICAL REVIEW
AND QUALITY ASSURANCE REVIEW**

The District has completed the Interim Feasibility Study Report for the Flood Risk Management Project at Paducah, KY. Notice is hereby given that (1) a Quality Assurance review has been conducted as defined in the Quality Assurance Plan and (2) an independent technical review that is appropriate to the level of risk and complexity inherent in the project, has been conducted as defined in the Contractor Quality Control Plan. During the independent technical review, 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 result, including whether the product meets the customer’s needs consistent with law and existing Corps policy. The independent technical review was accomplished by *(an independent team)*. All comments resulting from QA and ITR have been resolved.

(Signature)
QA Review Team Leader

(Date)

(Signature)
Project Manager

(Date)

**CERTIFICATION OF INDEPENDENT TECHNICAL REVIEW
AND QUALITY ASSURANCE REVIEW**

Significant concerns and the explanation of the resolution are as follows:

(Describe the major technical concerns, possible impact, and resolution)

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

(Signature)
Chief, Engineering Division

(Date)

ATTACHMENT 3: ACRONYMS AND ABBREVIATIONS

<u>Term</u>	<u>Definition</u>	<u>Term</u>	<u>Definition</u>
AFB	Alternative Formulation Briefing	O&M	Operation and maintenance
ASA(CW)	Assistant Secretary of the Army for Civil Works	OEO	Outside Eligible Organization
ATR	Agency Technical Review	OMB	Office and Management and Budget
CWRB	Civil Works Review Board	OMRR &R	Operation, Maintenance, Repair, Replacement and Rehabilitation
DPR	Detailed Project Report	OSE	Other Social Effects
DQC	District Quality Control	PAC	Post Authorization Change
DX	Directory of Expertise	PCX	Planning Center of Expertise
EA	Environmental Assessment	PDT	Project Delivery Team
EC	Engineer Circular	PL	Public Law
EIS	Environmental Impact Statement	PMP	Project Management Plan
E&C	Engineering and Construction	QA	Quality Assurance
EO	Executive Order	QC	Quality Control
ER	Engineering Regulation	QMP	Quality Management Plan
FDA	Flood Damage Analysis	RED	Regional Economic Development
FDR	Flood Damage Reduction	RTS	Regional Technical Specialist
FEMA	Federal Emergency Management Agency	SET	Science and Engineering Technology
FRM	Flood Risk Management	USACE	U.S. Army Corps of Engineers
FRMPCX	Flood Risk Management Planning Center of Expertise	WRDA	Water Resources Development Act
FSM	Feasibility Scoping Meeting		
GRR	General Reevaluation Report		
HEC	Hydrologic Engineering Center		
HQUSACE	Headquarters, U.S. Army Corps of Engineers		
IEPR	Independent External Peer Review		
ITR	Independent Technical Review		
LRR	Limited Reevaluation Report		
MSC	Major Subordinate Command		
NED	National Economic Development		
NEPA	National Environmental Policy Act		
NER	National Ecosystem Restoration		