



REPLY TO
ATTENTION OF

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS, NORTHWESTERN DIVISION
PO BOX 2870
PORTLAND OR 97208-2870

CENWD-PDD

13 December 2012

MEMORANDUM FOR Commander, Kansas City District (CENWK-PM-PF/Brian Rast)

SUBJECT: Review Plan (RP) Approval for the Upper Turkey Creek, Merriam Kansas Feasibility Report

1. Reference EC 1165-2-209, Civil Works Review Policy, 31 January 2012.
2. The enclosed RP for the Upper Turkey Creek, Merriam Kansas Feasibility Report has been prepared in accordance with the reference guidance.
3. The RP has been revised to address NWD review comments. All comments have been back-checked and closed out.
4. I hereby approve this RP, which is subject to change as study circumstances require, consistent with study development under the Project Management Business Process. Subsequent revisions to this RP or its execution will require review by CENWD-PDD and approval by this office.
5. The RP should be posted to the internet and available for public comment.
6. Please contact Jeremy Weber, at 503 808-3858, if you have further questions regarding this matter.

Encl

ANTHONY C. FUNKHOUSER, P.E.
COL, EN
Commanding

REVIEW PLAN

Upper Turkey Creek, Merriam, Kansas Feasibility Report

Kansas City District

MSC Approval Date: 20 Mar 2009
Last Revision Date: 1 November 2012



**US Army Corps
of Engineers** ®

REVIEW PLAN

TABLE OF CONTENTS

1. PURPOSE AND REQUIREMENTS	1
2. REVIEW MANAGEMENT ORGANIZATION (RMO) COORDINATION	1
3. STUDY INFORMATION	1
4. DISTRICT QUALITY CONTROL (DQC).....	5
5. AGENCY TECHNICAL REVIEW (ATR)	6
6. INDEPENDENT EXTERNAL PEER REVIEW (IEPR).....	10
7. POLICY AND LEGAL COMPLIANCE REVIEW	13
8. COST ENGINEERING DIRECTORY OF EXPERTISE (DX) REVIEW AND CERTIFICATION	13
9. MODEL CERTIFICATION AND APPROVAL.....	15
10. REVIEW SCHEDULES AND COSTS	16
11. PUBLIC PARTICIPATION	17
12. REVIEW PLAN APPROVAL AND UPDATES.....	17
13. REVIEW PLAN POINTS OF CONTACT	18
ATTACHMENT 1: TEAM ROSTERS.....	Error! Bookmark not defined.
ATTACHMENT 2: SAMPLE STATEMENT OF TECHNICAL REVIEW FOR DECISION DOCUMENTS.....	Error! Bookmark not defined.
ATTACHMENT 3: REVIEW PLAN REVISIONS.....	19
ATTACHMENT 4: ACRONYMS AND ABBREVIATIONS	20

1. PURPOSE AND REQUIREMENTS

a. **Purpose.** This Review Plan defines the scope and level of peer review for the feasibility report on the Upper Turkey Creek Basin (UTC) Study, Johnson and Wyandotte Counties, Kansas.

b. References

- (1) Engineering Circular (EC) 1165-2-209, Civil Works Review Policy, 31 Jan 2010
- (2) EC 1105-2-412, Assuring Quality of Planning Models, 31 Mar 2011
- (3) Engineering Regulation (ER) 1110-1-12, Quality Management, 30 Sep 2006
- (4) ER 1105-2-100, Planning Guidance Notebook, Appendix H, Policy Compliance Review and Approval of Decision Documents, Amendment #1, 20 Nov 2007
- (5) Upper Turkey Creek Project Management Plan, originally 28 May 2002
- (6) Kansas City District Quality Management System Program Management Plan, 3 Jan 2011
- (7) Northwestern Division Quality Management System Program Management Plan, 28 Sep 2010
- (8) Review Plan, Upper Turkey Creek, Flood Risk Management Project, Feasibility Phase, 6 Feb 2008
- (9) Review Plan, Upper Turkey Creek, Flood Risk Management Project, Feasibility Phase, 23 Mar 2009

c. **Requirements.** This review plan was developed in accordance with EC 1165-2-209, which establishes an accountable, comprehensive, life-cycle review strategy for Civil Works products by providing a seamless process for review of all Civil Works projects from initial planning through design, construction, and operation, maintenance, repair, replacement and rehabilitation (OMRR&R). The EC outlines four general levels of review: District Quality Control/Quality Assurance (DQC), Agency Technical Review (ATR), Independent External Peer Review (IEPR), and Policy and Legal Compliance Review. In addition to these levels of review, decision documents are subject to cost engineering review and certification (per EC 1165-2-209) and planning model certification/approval (per EC 1105-2-412).

2. REVIEW MANAGEMENT ORGANIZATION (RMO) COORDINATION

The RMO is responsible for managing the overall peer review effort described in this Review Plan. The RMO for decision documents is typically either a Planning Center of Expertise (PCX) or the Risk Management Center (RMC), depending on the primary purpose of the decision document. The RMO for the peer review effort described in this Review Plan is the Flood Risk Management PCX.

The RMO will coordinate with the Cost Engineering Directory of Expertise (DX) to ensure the appropriate expertise is included on the review teams to assess the adequacy of cost estimates, construction schedules and contingencies. The RMO will be the Risk Management Center in Design Phase when Type II IEPR begins.

3. STUDY INFORMATION

a. **Decision Document.** The review plan is for the Upper Turkey Creek Basin feasibility study. The project will produce a feasibility report. The feasibility report will require MSC, HQUSACE, and Chief of Engineers approval. The report will require Congressional authorization to move forward to a

federal cost share in design and construction. Regarding the National Environmental Policy Act (NEPA), this document is anticipated to not require an environmental impact statement (EIS), although an environmental assessment (EA) has been integrated into the feasibility report.

b. Study/Project Description. The U.S. Army Corps of Engineers Kansas City District (USACE NWK) along with the local project sponsor, Merriam, Kansas, are conducting a feasibility study of the Upper Turkey Creek (UTC) watershed to examine measures for flood risk management. The Study was authorized by Resolution of the Committee on Transportation and Infrastructure of the House of Representatives dated February 16, 2000 for Flood Damage Reduction. The project delivery team is using a systems approach, a watershed perspective (per ER 1105-2-100), and collaborative planning to ensure a complete plan formulation process. The PDT is formulating flood risk management alternatives with the main purpose being to examine the full range of structural and nonstructural measures that address the flood risk management authorization, under National Economic Development plans. Ecosystem restoration and recreation measures were formulated, but there was no local interest in cost sharing, so these were considered secondary mission areas compatible with local initiatives for addressing urban streambank erosion, best management practices (BMPs), and issues addressed in the Feasibility Scoping Meeting. These measures were not carried past the preliminary screening phase.

The CENWK undertook a reconnaissance study at the request of the City and completed a reconnaissance investigation, signed by the District 31 July 2001. The subsequent 905(b) document was approved in 4 Oct 2001 by CENWD.

The Turkey Creek watershed has a history of USACE involvement. Currently, Lower Turkey Creek has an active construction project. One component is to repair an aging tunnel that conveys all flow from the Turkey Creek watershed through a bluff to the Kansas River. Channel widening has also been done. Figure 1 shows Upper and Lower Turkey Creek, labeled in purple. A purple line divides the two. The watershed, encompassing parts of Johnson and Wyandotte Counties in Kansas, consist almost exclusively of highly developed urban areas.



Several areas of concern are highlighted in the reconnaissance study. Two primary damage reaches (Merriam and Roe Lane) are pointed out on Figure 1. The entire Interstate-35 corridor is a third reach for potential loss of life.

The study area covers about 20 square miles comprising the Turkey Creek watershed in Wyandotte and Johnson Counties, Kan., from the headwaters to the upstream limits of the authorized Turkey Creek flood risk management project in the lower watershed. The Turkey Creek channel through the

upper segment of the fully urbanized watershed is about 15 miles long. The watershed lies in the southwestern part of the Kansas City metropolitan area.

Severe flash flooding has occurred in the Turkey Creek Watershed in 1977, 1993 and 1998. The October 4, 1998 flood caused over \$12 million in flood damages in Merriam, overtopped Interstate 35 and threatened lives in several areas of Johnson and Wyandotte Counties. The study is evaluating the feasibility of flood risk management measures to address the flood threat. The UTC watershed is centrally located in a metropolitan region that is conducting bi-state coordination focused on comprehensive watershed planning. The Lower Turkey Creek watershed involves both Kansas City, MO and the Unified Government of Wyandotte County and Kansas City, Kansas (UG). The UTC watershed involves Merriam, KS, and the UG expressed no interest in the project and formulation of plans in UG were dropped prior to finalization of plan formulation. The watershed planning approach that we have taken provides an opportunity to promote interagency cooperation, multipurpose project planning, and the protection of existing federal flood protection investment. The City of Merriam, Kansas, entered into a Feasibility Cost Sharing Agreement and is funding the non-federal share of the study in cooperation with Johnson and Wyandotte Counties. The UG represents Wyandotte County and Kansas City, KS, and has dropped out from study cost sharing and consideration of a project.

The Feasibility Study PDT formed measures into three overarching themes of alternatives for solving the flooding in the damage reaches, as described in the bullets below. The total investment cost, estimated in millions at a 2008 price level for screening purposes, is as follows:

- Alternative 1, Channel Widening \$10.4 to \$27.9
- Alternative 2, Levees and Floodwalls \$11.6 to \$21.9
- Alternative 3, Combination \$15.1 to \$32.3
- Alternative 4, Non-Structural (Buyout) \$63.6

c. Factors Affecting the Scope and Level of Review. This section points out significant elements of the project that will affect the review of the decision document.

- A flood risk management consideration: The project is located in the upper reaches of an urban watershed, without a gage, which means dynamic and destructive flash flooding with very short time to peak stage, and uncertainty associated with an ungaged watershed. The kind of inundation and saturation of levees found on the larger rivers with long duration flooding is not as significant of a risk on Turkey Creek..
- The Merriam Reach has a state authorized drainage district, the Merriam Drainage District (MDD), which has become an institutional and social challenge for the USACE and the sponsor. MDD is not an official sponsor of the feasibility study. The sponsor, the City of Merriam, KS, has had some trouble partnering at all with MDD in the past. MDD owns property intermittently along the reach which adds some complexity to sponsorship arrangements. The organizations have given indications of closer cooperation and mutual support for the Corps project in recent months.
- A flood risk management consideration, residual risk: The project team has emphasized residual risk of property damage and loss of life associated with levees and floodwalls, and will continue to do so.
- A flood risk management consideration: The PDT developed structural plan formulation for the

Merriam Reach, however flood risk will remain for the Interstate-35 (I-35). The PDT will continue to engage the Kansas Department of Transportation (KDOT) to participate in flood risk management measures. Public involvement has been and will be designed to address remaining risk on I-35 not able to be addressed by this project.

- A flood risk management consideration: The I-35 is under construction upstream of 75th Street, which are the southern limits of Merriam. The PDT will have to remain vigilant regarding potential effects on the project.
 - A flood risk management consideration, bank stabilization: Current techniques MDD has used for erosion control along existing stream banks of Turkey Creek have proved unsustainable, affected Regulatory permitting, and specifically do not use vertical rebar pinnings to prevent hydraulic shear forces from moving the large limestone blocks. Proposed alternatives in the feasibility report address sustainable (more durable) bank stabilization methods needed for a better, system-wide process for bank stabilization for enhanced project life and reduced maintenance costs.
 - Regarding loss of life, there is a significant risk to loss of life. The project will address risk to life safety in Merriam, KS, however, the primary justification is found in the National Economic Development plan. The Merriam Reach is composed of commercial and industrial land use, where, should a flood event occur **during business hours**, loss of life could be higher. The October 1998 storm peaked in the late evening on Sunday night. A flood peak occurring during **rush hour** would have a high chance of loss of life along Interstate-35. The USACE Kansas City District Chief of Engineering concurs with the life safety assessment.
 - Life safety may be affected by anyone of these flood related variables: depth of water, velocity, proximity of population, and warning time (rate of rise). The Turkey Creek stakeholders face all of these. Warning time for a USGS gage on the adjacent and similar Brush Creek has shown a rate of rise of 7 feet per hour.
 - Governor of Kansas has not and likely will not make a request for a peer review by independent experts;
 - The project has not yet and should not cause a public dispute. Thus far public meetings have indicated support for the project.
 - For environmental considerations, another institutional and social challenge for the Corps and the sponsor is the fact that the EPA has scrutinized this watershed over the past ten years. EPA proposed a Special Area Management Plan (SAMP). Phase I of the SAMP was awarded to the Watershed Institute, who prepared a short document describing the environmental degradation and need for improvements. The PDT has therefore taken environmental restoration opportunities very seriously, to the extent that part of the budget early in the study went to formulating ecosystem restoration plans, but none were carried past preliminary screening. The FRM project as proposed has minimal effects on the natural environment and will be an EA.
 - No novel methods are used in the flood risk management purpose, although the planners have accommodated the sponsors request to include the novel best management practices, such as bioengineering in stabilizing the stream, although local sponsor will be sole implementer. These “green solutions” or BMPs are not being justified in the study for federal cost share.
 - This feasibility report is not anticipating a design that will require redundancy, resiliency, or robustness. No unique construction sequencing is anticipated.
- d. **In-Kind Contributions.** Products and analyses provided by non-Federal sponsors as in-kind services are subject to DQC, ATR, and IEPR. The in-kind products and analyses to be provided by the non-Federal sponsor include:

- The sponsor, Merriam, relied on the county, Johnson County, Kansas to provide one in-kind product. This included the existing conditions hydraulic model, HEC-RAS, and the hydrologic model, HEC-1 for the project. The hydrologic and hydraulic models used for this study were part of Johnson County's FEMA FIRM updates and are sponsor in-kind contributions. The University of Kansas provided engineering expertise to review the models for the FEMA submittal that served as the basis for the in-kind work. This modification provided a contiguous model for developing existing and future without project conditions, and for evaluating with-project alternatives. Finally, the CENWK consultant for plan formulation has reviewed and applied these models in the with project condition. CENWK has provided two separate technical reviews of the existing conditions model used as the basis for the project hydrology and hydraulic modeling, first when certified for in-kind credit, then later prior to developing the report documentation. The PDT will coordinate with the ATR Team to be sure models were used appropriately.

4. DISTRICT QUALITY CONTROL (DQC)

All decision documents (including supporting data, analyses, environmental compliance documents, etc.) shall undergo DQC. DQC is an internal review process of basic science and engineering work products focused on fulfilling the project quality requirements defined in the Project Management Plan (PMP). The home district shall manage DQC. Documentation of DQC activities is required and should be in accordance with the Quality Manual of the District and the home MSC.

- a. Documentation of DQC.** The DQC team used the standard USACE tool and internet-based DrChecks to comment, evaluate, and resolve issues identified during reviews at all levels. The review by the DQC team will be available to the ATR team to reference.
- b. Products to Undergo DQC.** The DQC team reviewed the alternatives in the final screening of the planning process. The PDT provided a preliminary review document with layout of features, hydraulic analysis, and cost estimates, prior to AFB Documentation. The respective products for that DQC were a large MS Word report, GIS shape files and PDF maps, HEC-RAS output, and MS Excel spreadsheets. AFB Documentation will include the draft report, Chapters 1-7, and will undergo DQC. All review products will be available to the ATR team. A DQC will be done for the draft and final feasibility report. ATR will conclude with the draft feasibility report. All previous reviews will be viewable in DrChecks by the ATR and IEPR teams.
- c. Required DQC Expertise.** The following disciplines were involved in DQC in the year before this June 2012 revision to this review plan.

(1) Hydrology & Hydraulics

(2) Structural

(3) HTRW

(4) Geotechnical

(5) Economics

- (6) Plan Formulation
- (7) Civil / Site Engineer
- (8) Cost Estimating

5. AGENCY TECHNICAL REVIEW (ATR)

ATR is mandatory for all decision documents (including supporting data, analyses, environmental compliance documents, etc.). The objective of ATR is to ensure consistency 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 results in a reasonably clear manner for the public and decision makers. ATR is managed within USACE by the designated RMO and is conducted by a qualified team from outside the home district that is not involved in the day-to-day production of the project/product. ATR teams will be comprised of senior USACE personnel and may be supplemented by outside experts as appropriate. The ATR team lead will be from outside the home MSC.

a. Products to Undergo ATR. This section lists the specific products that will undergo ATR.

- (1) Plan formulation process and engineering analysis and Alternative Formulation Briefing (AFB) Document
- (2) Selected plan cost estimate
- (3) Draft of the integrated feasibility report and environmental assessment

b. Required ATR Team Expertise. The following disciplines were used on the PDT and therefore require similar roles to review the work products under ATR.

ATR Team Members/Disciplines	Expertise Required
ATR Lead – May be combined with Plan Formulation	The ATR lead should be a senior professional with extensive experience in preparing Civil Works decision documents and conducting ATR. The lead should also have the necessary skills and experience to lead a virtual team through the ATR process. The ATR lead may also serve as a reviewer for a specific discipline (such as planning, economics, environmental resources, etc).
Plan Formulation	The Planning reviewer should be a senior water resources planner with experience in current flood risk management planning and policy guidance, and have experience in plan formulation for multipurpose projects, specifically integrating measures for flood risk management, ecosystem restoration, recreation, a watershed approach, and planning in a collaborative environment. Minimum years of experience needed is 10 years.
Economics	Team member will have extensive experience in related flood risk management multipurpose projects, and have a thorough understanding of HEC-FDA. This team member should be able to provide guidance on cost effective / incremental cost analysis (CE/ICA) and trade-off analysis. A team member able to review

	<p>the ecosystem restoration alternatives as applicable for an urban watershed is preferred, specifically in terms of applying IWR-PLAN on a watershed-wide basis. In the early stages of the feasibility study, the economics ATR reviewer assisted from Portland District. This team member should have at least 10 years experience. This team member can also serve as the risk reviewer.</p>
Environmental Resources	<p>This Environmental Resource specialist needs to be familiar with the Clean Water Act (CWA) compensatory mitigation per the Habitat Evaluation Procedures. Also, this ATR team member will be a biologist or ecologist familiar with CWA compensatory mitigation per the Habitat Suitability Index Models for flood risk management. This team member should be familiar with use of the watershed perspective. In addition, this team member should be familiar with best management practices and stream corridor restoration techniques, as applicable within urban watersheds between 30 to 100 square miles in area. The team member should be familiar with the standard Habitat Evaluation Procedure habitat model and the NRCS field assessment. Minimum years experience will be a minimum of 10 years. For the UTC project, a biologist from Omaha District was involved in review of the existing conditions phase, however this SME has retired.</p>
Cultural Resources	<p>Team member will be familiar with cultural resource management but may not be necessary depending on the PDT member's findings with the Kansas SHPO.</p>
Hydrology	<p>Team member will be an expert in the field of urban hydrology & hydraulics, have a thorough understanding of the dynamics of the both open channel flow systems, enclosed systems, application of detention / retention basins, effects of best management practices and low impact development on hydrology, approaches that can benefit water quality, application of levees and flood walls in an urban environment with space constraints, non-structural measures especially as related to multipurpose alternatives including ecosystem restoration, non-structural solutions involving flood warning systems, and non-structural alternatives related to flood proofing. The team member will have an understanding of computer modeling techniques that will be used for this project (HEC-1, HEC-RAS). A certified floodplain manager is recommended but not required. Required years of experience will be a minimum of 10 years. This team member can also serve as the risk reviewer.</p>
Hydraulic Engineering	<p>See above hydrologist. This role may be consolidated.</p>
Geotechnical Engineering	<p>Team member will have extensive experience in levee & floodwall</p>

	design, post-construction evaluation, and rehabilitation. This is a critical ATR team member, and a certified professional engineer is recommended with a minimum of 10 years experience.
Risk Analysis	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.
Civil Engineering	Civil / Site / Utilities / Relocations: This discipline may require a dedicated team member, or may be satisfied by structural or geotechnical reviewer, depending on individual qualifications. Team member will have experience in utility relocations, positive closure requirements and internal drainage for levee construction, and application of non-structural flood risk management, specifically flood proofing. A certified professional engineer is suggested. Minimum years of experience needed is 10 years.
Structural Engineering	Team member will have a thorough understanding of non-structural measures, levee, flood wall, and retaining wall design, and structures typically associated with levees (pump stations, gatewell structures, utility penetrations, stoplog & sandbag gaps, and other closure structures). Experience with internal drainage structures similar to flap gates is preferred. Minimum years of experience for this team member is 10 years. A certified professional engineer is recommended though not required.
Electrical/Mechanical Engineering	<p>Mechanical (if deemed necessary by team leader): Team member shall be familiar with levee pump station and closure structure design. Team member should have 10 years minimum experience. Engineering disciplines other than Mechanical may be acceptable for review of this area of work subject to meeting the experience requirement stated above.</p> <p>Electrical (if deemed necessary by team leader): Team member shall be familiar with levee pump station and electrical utilities design. Electrical ATR requirements for this study are very minimal. Team member should have 10 years minimum experience.</p>
Cost Engineering	Team member will be familiar with cost estimating for similar projects. Team member will review only on the selected plan, not the entire suite of formulated alternatives, as presented by the PDT in the latest version of MCACES, which is MII. Team member will be a Certified Cost Technician, Certified Cost Consultant, or Certified Cost Engineer. These efforts will be coordinated with

	Cost Engineering Directory of Expertise at the Walla Walla District. Minimum years of experience needed is 10 years.
Real Estate	Team member should be familiar with necessary components in a real estate plan for a flood risk management project involving structural and nonstructural approaches. An understanding of the difference of a gross appraisal from screening methods is essential for the plans formed.
Hazardous, Toxic and Radioactive Waste (HTRW)	Only if deemed necessary by team leader. A memo on HTRW review is available and could be reviewed by the team leader.
Other disciplines/functions	The team leader will make a decision on the need for these disciplines. The notable disciplines that need ATR by subject matter experts (SMEs) on this project include the disciplines of Water Quality, Environmental/NEPA, Cultural Resources, Hazardous/Toxic Waste, and Legal. These disciplines should have a minimum of 10 years experience each. Legal review is not under the purview of the ATR Team Leader but is instead responsible to the Corps of Engineers Office of Counsel chain-of-command.

a. Documentation of ATR. DrChecks 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 order to then assess whether further specific concerns may exist.

The ATR documentation in DrChecks will include the text of each ATR concern, the PDT response, a brief summary of the pertinent points in any discussion, including any vertical team coordination (the vertical team includes the district, RMO, MSC, and HQUSACE), and the agreed upon resolution. If an ATR concern cannot be satisfactorily resolved between the ATR team and the PDT, it will be elevated to the vertical team for further resolution in accordance with the policy issue resolution process described in either ER 1110-1-12 or ER 1105-2-100, Appendix H, as appropriate. Unresolved concerns can be closed in DrChecks with a notation that the concern has been elevated to the

vertical team for resolution.

At the conclusion of each ATR effort, the ATR team will prepare a Review Report summarizing the review. Review Reports will be considered an integral part of the ATR documentation and shall:

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

ATR may be certified when all ATR concerns are either resolved or referred to the vertical team for resolution and the ATR documentation is complete. The ATR Lead will prepare a Statement of Technical Review certifying that the issues raised by the ATR team have been resolved (or elevated to the vertical team). A Statement of Technical Review should be completed, based on work reviewed to date, for the AFB, draft report, and final report. A sample Statement of Technical Review is included in Attachment 2.

6. INDEPENDENT EXTERNAL PEER REVIEW (IEPR)

IEPR may be required for decision documents under certain circumstances. 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. A risk-informed decision, as described in EC 1165-2-209, is made as to whether IEPR is appropriate. IEPR panels will consist of independent, recognized experts from outside of the USACE in the appropriate disciplines, representing a balance of areas of expertise suitable for the review being conducted. There are two types of IEPR:

- Type I IEPR. Type I IEPR reviews are managed outside the USACE and are conducted on project studies. Type I IEPR panels assess the adequacy and acceptability of the economic and environmental assumptions and projections, project evaluation data, economic analysis, environmental analyses, engineering analyses, formulation of alternative plans, methods for integrating risk and uncertainty, models used in the evaluation of environmental impacts of proposed projects, and biological opinions of the project study. Type I IEPR will cover the entire decision document or action and will address all underlying engineering, economics, and environmental work, not just one aspect of the study. For decision documents where a Type II IEPR (Safety Assurance Review) is anticipated during project implementation, safety assurance shall also be addressed during the Type I IEPR per EC 1165-2-209.
- Type II IEPR. Type II IEPR, or Safety Assurance Review (SAR), are managed outside the USACE and are conducted on design and construction activities for hurricane, storm, and flood risk management projects or other projects where existing and potential hazards pose a significant threat to human life. Type II IEPR panels will conduct reviews of the design and construction activities prior to initiation of physical construction and, until construction activities are

completed, periodically thereafter on a regular schedule. The reviews shall consider the adequacy, appropriateness, and acceptability of the design and construction activities in assuring public health safety and welfare.

- a. **Decision on IEPR.** Type I IEPR will be required during Feasibility phase for the draft Feasibility Report. A Type I IEPR contract will be coordinated through the PCX. Planning team anticipates that Type II IEPR will be required during PED phase. Type II IEPR Safety Assurance considerations should be addressed during Type I IEPR per EC 1165-2-209 para 2.c.(3).
- b. **Products to Undergo Type I IEPR.** The draft integrated feasibility report and environmental assessment will undergo Type I IEPR.
- c. **Required Type I IEPR Panel Expertise.** The IEPR panel would likely be six individuals. The panel expertise should be mustered specifically to evaluate the plan formulated for urban storm drainage, where primarily suburban development has built out within a watershed under 30 square miles. Timing of drainage is generally complete within 12 hours, so geotechnical and structural engineers do not have to focus on wet soil analysis needed for riverine areas that can face sustained wet periods and saturated soils. However, those disciplines may still be necessary, although no closure structures, so the structural engineer is a low priority. With the prominence of the levee/floodwall alternative, the hydrologist and hydraulic engineer can both offer perspective on interior drainage features. Consider combining the civil engineer, HTRW, and the cost estimator.

IEPR Panel Members/Disciplines	Expertise Required
Economics	This panel member should have extensive experience in related flood risk management multipurpose projects, and have a thorough understanding of risk analysis procedures, such as within HEC-FDA. This team member should be able to provide guidance on cost effective / incremental cost analysis (CE/ICA) and trade-off analysis among a wide set of multi-purpose plans formulated under a watershed perspective (approach). While this project focus is flood risk management, a team member able to review the ecosystem restoration alternatives as applicable for an urban watershed is preferred, specifically in terms of applying IWR-PLAN on a watershed-wide basis. This team member should have at least 10 years experience.
Environmental	This environmental resource specialist is one of the more optional team members, because the PDT has spent extraordinary amounts of additional time adding environmental features that complement the flood risk management features. If engaged on this IEPR panel, this specialist needs to be familiar with CWA compensatory mitigation per the Habitat Suitability Index Models. Also, this panel member would be a biologist or ecologist familiar with urban ecosystem restoration, and shall also be specifically familiar with ecosystem restoration for multipurpose projects focused on flood risk management. This team member should be familiar with use of the watershed perspective. In addition, this team member should be familiar with best management practices and stream corridor restoration techniques, as applicable within

	urban watersheds between 30 to 100 square miles in area, specifically associated with ecologies located in the Midwest. The team member should be familiar with the standard Habitat Evaluation Procedure habitat model and the NRCS field assessment. Minimum years experience will be a minimum of 10 years.
Hydrologist / Hydraulic Engineering	Team member will be an expert in the field of urban hydrology & hydraulics, have a thorough understanding of the dynamics of the both open channel flow systems, enclosed systems, application of detention / retention basins in an urban watershed of 20-30 square miles, effects of best management practices and low impact development on hydrology, approaches that can benefit water quality, application of levees and flood walls in an urban environment with space constraints, non-structural measures especially as related to multipurpose alternatives including ecosystem restoration, non-structural solutions involving flood warning systems (important), and non-structural alternatives related to flood proofing. The team member will have an understanding of computer modeling techniques that will be used for this project (HEC-HMS, HEC-RAS). Professional engineer registration is recommended. Required years of experience will be a minimum of 10 years.
Hydraulic Engineering	See above hydrologist. This role may be consolidated.
Geotechnical Engineering	Panel member will have extensive experience in levee and floodwall design, post-construction evaluation, and rehabilitation. This is a critical IEPR team member, and a registered professional engineer is recommended with a minimum of 10 years experience. This role may be consolidated with structural engineering and civil engineering.
Civil Engineering	Civil / Site / Utilities / Relocations: This discipline may possibly be satisfied by structural or geotechnical reviewer, depending on individual qualifications, or better, combined with the suggested cost engineer panel member discipline. Team member will have experience in utility relocations, positive closure requirements and internal drainage for levee construction, and application of non-structural flood risk management, specifically flood proofing. A registered professional engineer is suggested. Minimum years of experience needed should be 10 years.
Structural Engineering	Panel member will have a thorough understanding of non-structural measures, levee, flood wall, and retaining wall design, and structures typically associated with levees (floodwalls). Experience with internal drainage structures similar to flap gates is preferred. Minimum years of experience for this team member should be 10 years. A registered professional engineer is recommended though not required. This role may be consolidated with geotechnical engineering and civil engineering.
Cost Engineering	Panel member will be familiar with cost estimating for similar

	<p>projects, and could be combined with the civil engineer. Panel member will review only on the selected plan, not the entire suite of formulated alternatives, as presented by the PDT in the latest version of cost estimating software, which is MII. Team member will be a Certified Cost Technician, Certified Cost Consultant, or Certified Cost Engineer. Minimum years of experience needed should be 10 years. This role may be consolidated with civil engineering.</p>
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d. Documentation of Type I IEPR. The IEPR panel will be selected and managed by an Outside Eligible Organization (OEO) per EC 1165-2-209, Appendix D. Panel comments will be compiled by the OEO and should address the adequacy and acceptability of the economic, engineering and environmental methods, models, and analyses used. IEPR comments should generally include the same four key parts as described for ATR comments in Section 4.d above. The OEO will prepare a final Review Report that will accompany the publication of the final decision document and shall:

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

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

7. POLICY AND LEGAL COMPLIANCE REVIEW

All decision documents will be reviewed throughout the study process for their compliance with law and policy. Guidance for policy and legal compliance reviews is addressed in Appendix H, ER 1105-2-100. These reviews culminate in determinations that the recommendations in the reports and the supporting analyses and coordination comply with law and policy, and warrant approval or further recommendation to higher authority by the home MSC Commander. DQC and ATR augment and complement the policy review processes by addressing compliance with pertinent published Army policies, particularly policies on analytical methods and the presentation of findings in decision documents.

8. COST ENGINEERING DIRECTORY OF EXPERTISE (DX) REVIEW AND CERTIFICATION

All decision documents shall be coordinated with the Cost Engineering DX, located in the Walla Walla District. The DX will assist in determining the expertise needed on the ATR team and Type I IEPR team (if required) and in the development of the review charge(s). The DX will also provide the Cost Engineering DX certification. The RMO is responsible for coordination with the Cost Engineering DX.

9. MODEL CERTIFICATION AND 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, for the purposes of the EC, are defined as any models and analytical tools that planners use to define water resources management problems and opportunities, to formulate potential alternatives to address the problems and take advantage of the opportunities, to evaluate potential effects of alternatives and to support decision making. The use of a certified/approved planning model does not constitute technical review of the planning product. The selection and application of the model and the input and output data is still the responsibility of the users and is subject to DQC, ATR, and IEPR (if required).

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 and the professional practice of documenting the application of the software and modeling results will be followed. As part of the USACE Scientific and Engineering Technology (SET) Initiative, many engineering models have been identified as preferred or acceptable for use on Corps studies and these models should be used whenever 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 (if required).

- a. **Planning Models.** The following planning models are anticipated to be used in the development of the decision document:

Model Name and Version	Brief Description of the Model and How It Will Be Applied in the Study	Certification / Approval Status
HEC-FDA 1.2.4	The Hydrologic Engineering Center’s Flood Damage Reduction Analysis (HEC-FDA) software provides the capability to perform an integrated hydrologic engineering and economic analysis during the formulation and evaluation of flood risk management plans. HEC-FDA is designed to assist USACE PDT members in using risk analysis procedures for formulating and evaluating flood risk management measures (EM 1110-2-1619, ER 1105-2-101).	Certified.
IWR-PLAN 1.0.11.0	The Institute for Water Resource’s (IWR) Planning Suite is a model that assists with formulating plans, cost-effectiveness, and incremental cost analysis, which are required in compensatory mitigation formulation. The tool may not be needed if mitigation is a simple formulation.	Certified.
Habitat Suitability Index Models: Green Sunfish	For use in doing cost effectiveness and incremental cost analysis of the Clean Water Act compensatory mitigation for the affected stream.	Approved for use.
Habitat Suitability Index Models: Fox Squirrel	For use in doing cost effectiveness and incremental cost analysis of the Clean Water Act compensatory mitigation for the affected forested area.	Approved for use.

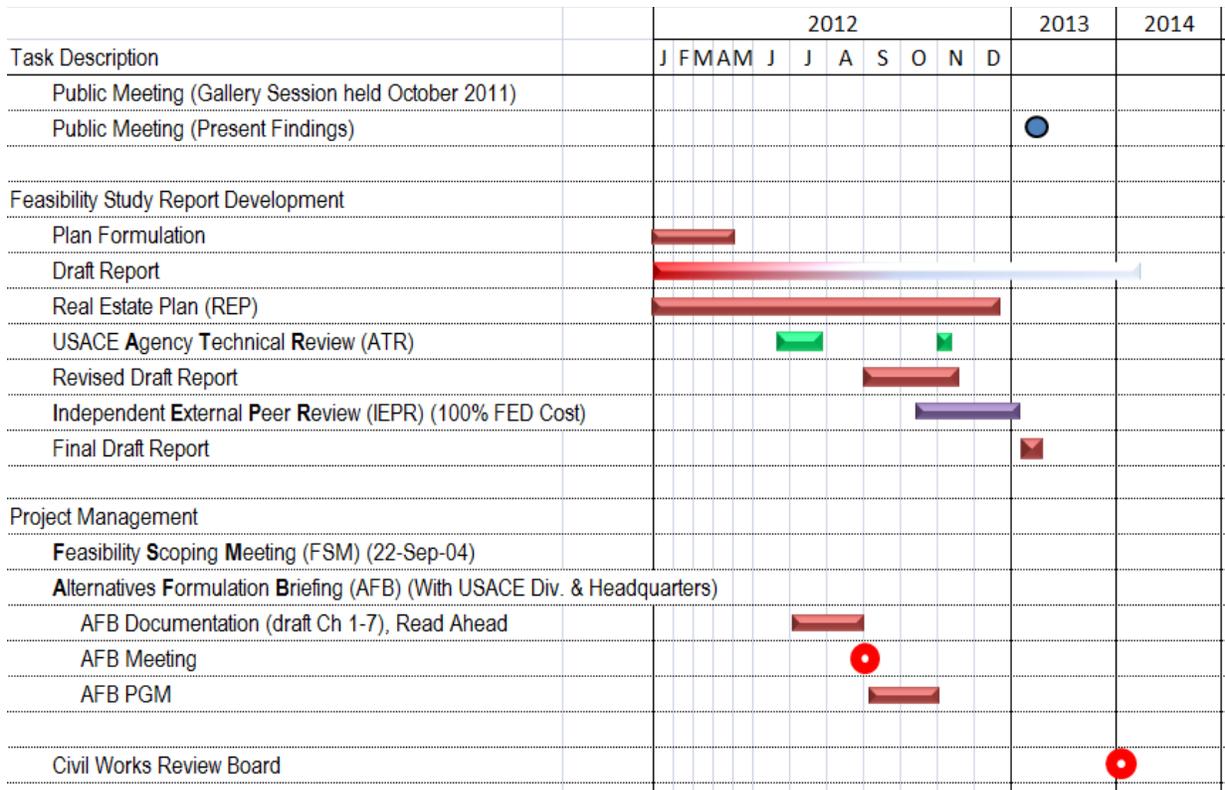
- b. **Engineering Models.** The following engineering models are anticipated to be used in the

development of the decision document, and approval from Hydraulics, Hydrology, and Coastal Engineering Community of Practice (HHC CoP) (SharePoint site at <https://kme.usace.army.mil/NTCT/HHC/default.aspx>):

Model Name and Version	Brief Description of the Model and How It Will Be Applied in the Study	Approval Status
HEC-1 version 4.1	The PDT used the USACE Hydrologic Engineering Center's used to reevaluate peak flows of Turkey Creek at specified locations, screen out detention basins as possible features in alternatives as a means as reducing peak discharges and resultant water surface elevations; use for the load points to HEC-RAS existing conditions analysis and proposed improvements	HH&C CoP Allowed for Use
HEC-RAS 4.0	The PDT used the USACE Hydrologic Engineering Center's River Analysis System to establish peak water surface elevations for a range of probabilities (8-profiles) for existing and proposed alternatives, input HEC-FDA (see below).	HH&C CoP Preferred.

10. REVIEW SCHEDULES AND COSTS

- a. **ATR Schedule and Cost.** The estimated schedule for ATR including any milestone reviews is in the figure at the end of this section. ATR will end after the review of the draft feasibility report. The estimated cost for ATR is \$70,000.
- b. **Type I IEPR Schedule and Cost.** The estimated schedule for IEPR including any milestone reviews is in the figure at the end of this section. The estimated cost for IEPR is \$100,000.
- c. **Model Certification/Approval Schedule and Cost.** All models used on this study are already certified and approved. Therefore, no work element is presented in this section.



11. PUBLIC PARTICIPATION

Public involvement has occurred for this project during both the reconnaissance and the feasibility phases. The first public meeting indicated a need to focus on a watershed perspective. The second public meeting in October of 2011 presented a menu of flood risk management measures. The outcomes of these meetings is summarized well in the documentation for the August 2012 Alternative Formulation Briefing. These public comments will be available for all reviewers. The feasibility report will be available for comment in mid-2013. The final decision document, review reports, and responses to reviewer comments will all be available to the public, on request to the Kansas City District.

12. REVIEW PLAN APPROVAL AND UPDATES

The USACE Northwestern Division Commander is responsible for approving this Review Plan. See Attachment 3 for a list of revisions. The Commander's approval reflects vertical team input (involving district, MSC, RMO, 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. The home district is responsible for keeping the Review Plan up to date. Minor changes to the review plan since the last MSC Commander approval are documented in Attachment 3. Significant changes to the Review Plan (such as changes to the scope and/or level of review) should be re-approved by the MSC Commander following the process used for initially approving the plan. The latest version of the Review Plan, along with the Commanders' approval memorandum, should be posted on the Home District's webpage. The latest Review Plan should also be provided to the RMO and home MSC.

13. REVIEW PLAN POINTS OF CONTACT

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

- Project Manager, USACE Kansas City District, 816-389-3337.
- District Support Planner, USACE Northwestern Division, Missouri River Basin, 503-808-3858.
- Program Manager, USACE Flood Risk Management National Planning Center of Expertise South Pacific Division, 415-503-6852.

ATTACHMENT 3: REVIEW PLAN REVISIONS

Revision Date	Description of Change	Page / Paragraph Number
Nov 2012	Update No. 2 per EC 1165-2-209.	Reformatted into approved USACE template
June 2011	Update No. 1 per EC 1165-2-209.	Reformatted previously approved document
Jan 2009	Updated per EC 1105-2-410. Approved by MSC General Rapp 23 Mar 2009.	Entirely revised
Feb 2008	Updated per EC 1105-2-408. Approved by MSC Colonel Miles 14 Mar 2008.	Entire document

ATTACHMENT 4: ACRONYMS AND ABBREVIATIONS

Term	Definition	Term	Definition
AFB	Alternative Formulation Briefing	NED	National Economic Development
ASA(CW)	Assistant Secretary of the Army for Civil Works	NER	National Ecosystem Restoration
ATR	Agency Technical Review	NEPA	National Environmental Policy Act
CENWK	Kansas City District, US Army Corps of Eng.	NWD	Northwestern Division
CoP	Community of Practice	NWK	Kansas City District
CSDR	Coastal Storm Damage Reduction	O&M	Operation and maintenance
CWA	Clean Water Act		
CWRB	Civil Works Review Board	OMB	Office and Management and Budget
DPR	Detailed Project Report	OMRR&R	Operation, Maintenance, Repair, Replacement and Rehabilitation
DQC	District Quality Control/Quality Assurance	OEO	Outside Eligible Organization
DX	Directory of Expertise	OSE	Other Social Effects
EA	Environmental Assessment	OWPR	Office of Water Project Review
EC	USACE Engineer Circular	PCX	Planning Center of Expertise
EIS	Environmental Impact Statement	PDT	Project Delivery Team
EO	Executive Order	PAC	Post Authorization Change
EM	USACE Engineer Manual	PMP	Project Management Plan
ER	USACE Engineer Regulation	PL	Public Law
ER	Ecosystem Restoration	QMP	Quality Management Plan
FDR	Flood Damage Reduction	QA	Quality Assurance
FEMA	Federal Emergency Management Agency	QC	Quality Control
FRM	Flood Risk Management	RED	Regional Economic Development
FSM	Feasibility Scoping Meeting	RMC	Risk Management Center
GRR	General Reevaluation Report	RMO	Review Management Organization
Home District/MSD	The District or MSD responsible for the preparation of the decision document	RTS	Regional Technical Specialist
HQUSACE	Headquarters, U.S. Army Corps of Engineers	SAR	Safety Assurance Review
IEPR	Independent External Peer Review	UG	Unified Government of Kansas City, Kansas and Wyandotte County, Kansas
IPR	In-Progress Review	USACE	U.S. Army Corps of Engineers
IRC	Issue Resolution Conference	UTC	Upper Turkey Creek
ITR	Independent Technical Review	WRDA	Water Resources Development Act
LRR	Limited Reevaluation Report		
MDD	Merriam Drainage District		
MSC	Major Subordinate Command		