



DEPARTMENT OF THE ARMY  
CORPS OF ENGINEERS, NORTHWESTERN DIVISION  
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CENWD-RBT

MEMORANDUM FOR Commander, Kansas City District (CENWK-PM-CJ /Anthony Hall)

SUBJECT: Review Plan Approval for the Tuttle Creek Stilling Basin Wall Drain Repair Project.

1. References:

- a. Tuttle Creek Stilling Basin Wall Drain Repair, Manhattan, Kansas Review Plan
- b. EC 1165-2-214 Civil Works Review, 15 December 2012.

2. Reference 1.a. above has been prepared in accordance with reference 1.b. above.

3. The RP has been coordinated with the Business Technical Division, Northwestern Division, U.S. Army Corps of Engineers which is the Review Management Organization for this project. The Review Plan includes District Quality Control and Agency Technical Review.

4. I hereby approve this RP, which is subject to change as circumstances require, consistent with the study development process and the Project Management Business Process. Subsequent revisions to this RP or its execution will require written approval from this office.

5. For further information, please contact Mr. Douglas Putman, P.E. at (503) 808-3883.

Encl

KELLETT.JOSEP  
H.P.1231299269

Digitally signed by  
KELLETT.JOSEPH.P.1231299269  
DN: c=US, o=U.S. Government,  
ou=DoD, ou=PR, ou=USA,  
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Date: 2016.06.02 11:19:28 -07'00'

Joseph P. Kellett, PE  
Chief, Regional Business Technical  
Northwestern Division, USACE



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CENWK-ED

18 March 2016

MEMORANDUM FOR Commander, Northwestern Division, US Army Corps of Engineers, 1125 NW Couch, Suite 500, Portland, Oregon 97209; ATTN: Mr. Douglas Putman

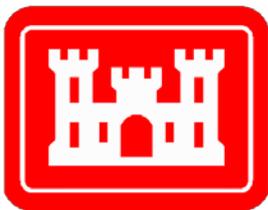
SUBJECT: Tuttle Creek Stilling Basin Wall Drain Repair (P2#456497)

1. The review plan for the Tuttle Creek Stilling Basin Wall Drain Repair is attached for Northwestern Division's review and approval. The review plan was prepared in accordance with EC\_1165-2-214 and uses RMC's review plan template for ATR for implementation documents and other work products in accordance with the EC policy memo dated 15 December 2012.
2. The point of contact for this memorandum is the project manager, Anthony Hall at (816) 389-2406.

 4/27/16  
DAVID L. MATHEWS, P.E.  
Chief, Engineering Division  
Kansas City District

**Review Plan  
U.S. Army Corps of Engineers  
Northwestern Division  
Kansas City District**

**Tuttle Creek Stilling Basin Wall  
Drain Repair  
Manhattan, Kansas**



**US Army Corps  
of Engineers®**

*March 2016*

## **1. PURPOSE AND REQUIREMENTS**

### **1.1 PURPOSE**

This Review Plan is intended to ensure a quality-engineering project is developed by the U.S. Army Corps of Engineers – Kansas City District (NWK) and is developed for the Tuttle Creek Stilling Basin Wall Drain Repair. This Review Plan was prepared in accordance with Engineering Circular (EC) 1165-2-214, “Civil Works Review Policy” and provides a value added process that assures the correctness of the information shown. It is imperative that vertical teaming efforts are proactive and well-coordinated to assure collaboration of the report findings, conclusions, and recommendations, and that there is consensus at all levels of the organization with the recommended path forward. This Review Plan describes the scope of review for this project and is included in the Project Management Plan (P2 #456497). All appropriate levels of review are included in this Review Plan and identifies the skill sets needed in the reviews and the objective of the review and the specific advice sought, thus setting the appropriate scale and scope of review for the individual project.

### **1.2 GUIDANCE AND POLICY REFERENCES**

- ER 5-1-11, USACE Business Processes
- EC 1165-2-214, Civil Works Review Policy, 15 DEC 2012
- ER 1110-2-1156, Safety of Dams – Policy and Procedure, 31 MAR 2014
- ER 1110-1-12, Quality Management, 31 MAR 2011

### **1.3 REQUIREMENTS**

This Review Plan is developed in accordance with EC 1165-2-214, 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.

### **1.4 REVIEW MANAGEMENT ORGANIZATION**

The U.S. Army Corps of Engineers – Northwest Division (NWD) is the Review Management Organization (RMO) for this project.

## **2. PROJECT DESCRIPTION AND INFORMATION**

The project is located at mile 10 on the Big Blue River, 6 miles north of Manhattan in Riley County, Kansas. Tuttle Creek is an 7,500 feet long earth and rock-fill dam with a crest about 166 feet above the original streambed, gated outlet works, and gated concrete spillway. The reservoir storage capacity is 2,141,300 acre-feet. The project provides flood protection, navigation flow support on the Missouri River, water quality, and recreation benefits to the State of Kansas and the region.

A sinkhole adjacent to the left (east) stilling basin wall was observed by Tuttle Creek Lake (OF-TC) personnel at approximately 1700 on 9 July 2015. The sinkhole was located in the parking area adjacent to the left stilling basin wall, approximately 150 feet downstream of the dam toe. When first observed, the sinkhole measured approximately 8 feet deep and 15 feet in diameter. The sinkhole is shown in Figures 1 and 2. The sinkhole location correlates with the location of the stilling basin wall drain system and a previous sinkhole that was observed in 1987. The 1987 sinkhole was caused by a defect in the stilling basin wall drain system, and was repaired with a grout plug and a screen at the drain outlet to prevent material from leaving the system. Sustained, high releases through Gates 3 and 4 (left conduit) during summer of 2015 removed the screen from the drain outlet and pulled backfill material through pipe defects causing the recent sinkhole. After the sinkhole was observed, releases were transferred to the right conduit; the condition was classified as a Non-Failure Emergency in accordance with the Emergency Action Plan. After the initial Engineering Division site visit, the sinkhole was backfilled with granular material as a temporary measure for public safety. Video inspection of the drain during the fall 2015 periodic inspection showed several defects in the left wall drain system. A temporary patch was installed on the largest defect, however, other defects were not accessible for repair. There is unrepaired damage near the junction of the lateral pipes and discharge pipe that will continue to allow backfill material into the system. The screen that was installed in 1987 was replaced and an additional retainer bar has been added to reduce likelihood of the screen being removed during high flows.

The project scope includes the replacement of the wall drains on both sides of the stilling basin. Maintenance access via a manhole will be provided at the intersection of the new wall drains and providing a redundant screen at the interface as necessary. To address the stilling basin wall stability concerns, post-tensioned anchors will be installed. Some additional work related to constructability, may occur to prevent seepage or other excess water from disrupting construction activities. Maximum excavation depths behind the walls are expected to be approximately 17 feet, or one third of the total stilling basin height. Roadway and parking pavement will be replaced as necessary after work is completed. The scope includes design for the generation of construction drawings, plans, specifications, design documentation report, an updated OMRR&R manual and record drawings for the work. All items will be reviewed in accordance with this Review Plan.

Refer to Figures 1 and 2 below.



Figure 1 – Aerial View of Stilling Basin



Figure 2 – Sinkhole on July 10 2015 (Looking SE)

### **3. REVIEW REQUIREMENTS**

#### **3.1 DISTRICT QUALITY CONTROL**

District Quality Control (DQC) consists of quality assurance reviews, in-progress reviews, and chiefs' reviews. Peer reviews will be conducted by an engineering peer within each discipline for all design products. DQC will be conducted on calculations, conceptual analysis, system designs, decision documentation, risk determinations, completeness of the plans and specifications, ensure all aspects of the project are included in the documentation, etc. Interdisciplinary reviews will be conducted by the PDT to ensure cross coordination between disciplines. All team members will review all products to ensure it accurately accounts for all discipline specific aspects and the documents collectively correlate with each other.

The Dam Safety Program Manager (DSPM) will provide a review of all submittal packages and be invited to all pertinent project meetings to ensure he is fully aware of the improvements and decision process.

Select section, branch, and division level chiefs in Engineering, Construction, Operations and Project Management will review the documentation, analysis, and decision-making process in the documentation to verify the plans, specifications, and design documentation are correct and accurately reflect current policy and guidance in accordance with Engineering Regulation (ER) 415-1-11.

#### **3.2 AGENCY TECHNICAL REVIEW**

An Agency Technical Review (ATR) is mandatory for all implementation 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.

The four key parts of a quality review comment will normally include:

- The review concern. Identify the product's information deficiency or incorrect application of policy, guidance, or procedures;
- The basis for the concern. Cite the appropriate law, policy, guidance, or procedure that has not been properly followed;
- 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

- The probable specific action needed to resolve the concern. Identify the action(s) that the reporting officers must take to resolve the concern.

At the conclusion of the 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.

### **3.2.1 ATR TEAM EXPERTISE**

The ATR team shall be chosen based on each individual's qualifications and experience with similar projects. Specifically for this project, the reviewers should be familiar with the design and operation of stilling basins, wall drains and wall stability. Therefore, this ATR team shall consist of a structural engineer, geotechnical engineer and civil engineer. All members are required to have a minimum of five years of experience in design of similar projects, and be a licensed engineer.

The ATR for this project is to be conducted by the St Paul District (MVP). The reviewer team is identified and listed below. The ATR will be in compliance with EC 1165-2-214. Comments from the ATR team will be captured, resolved, and backchecked via DrChecks. After resolution of the comments, and in accordance with NWK BQP 7.3.01, an ATR Certification will occur. Certification requires that the reviewers have witnessed the resolution of their comments sufficiently and accurately addressed on the contract documents. Disputes and significant unresolved ATR concerns will be handled in accordance EC 1165-2-214. A site visit will not be scheduled for the ATR team.

The ATR reviewers from MVP include the following:

- ATR Lead/Structural Engineer – Duane Perkins (in process of registering in CERCAP)
- Civil Engineer – Greg Fischer \*
- Geotechnical – Doug Crum (Dam Safety Program Manager) \*

\*Certified in CERCAP

### **3.2.2 ATR LEAD**

The ATR team lead shall be a senior professional with extensive experience in preparing Civil Works documents and conducting ATRs. The lead shall have the necessary skills and experience to lead a virtual team through the ATR process.

The ATR lead for this review is Duane Perkins. Mr. Perkins is a licensed Professional Engineer in the state of Minnesota with over ten years of experience designing transportation and hydraulic concrete structures including bridges, retaining walls, navigation walls and, most recently, a spillway for a large gated control structure on the Fargo Moorhead Metro Diversion project. Mr. Perkins will serve as the structural reviewer as well as the ATR team lead. He is currently in the process of registering and becoming certified in CERCAP.

### **3.3 INDEPENDENT EXTERNAL PEER REVIEW DETERMINATION**

An Independent External Peer Review (IEPR) is required for some implementation 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 1165-2-214, is made as to whether an IEPR is appropriate.

The stilling basin wall drain repair project does not include the use of innovative materials or techniques, does not present complex challenges, does not contain precedent-setting methodology, or present conclusions that differ from prevailing practices. The project does not include any unique construction sequencing or scheduling challenges. Based on the 2010 periodic assessment, the risk associated with the most pertinent non overturning failure mode of seepage along the conduit will not be increased by this project because of the relatively limited excavation depths. Even though release capacity may be further reduced during construction, or limited during certain stages of construction, overtopping risks are not increased significantly because of the large capacity gated spillway. There is some increased frequency of higher pools and spillway use with the reduced outlet works capacity. However, the dam performed well during the historical record pool during 1993, and would be expected to have good performance during future high pools. Spillway use is expected to induce significant erosion downstream of the gated spillway, but spillway erosion leading to dam failure is not a likely scenario. Overall, construction of this project does not represent a dam safety risk requiring IEPR.

Construction of this project does not involve public life safety risks as the stilling basin area access will be closed to the public. Excavation behind the training walls with the option selected will be half of what was expected previously (+/-17-feet). With nominal

outlet works discharge, tailwater will not seep to the level of the excavation. If higher releases are necessary, construction may have to stop, but could be coordinated in time to allow for the safe evacuation of personnel. It is possible that there could be a high release required during the estimated 18-month construction timeframe; however, to reduce risk, the project will be staged such that only one training wall will be excavated at a time, and most of the area can be brought back up to grade to be completely in the dry prior to completing a large portion of the work (installation of post-tensioned anchors).

The probability of a dam failure caused by this project is unlikely. Therefore, the total risk to the threat to human life is low.

The NWK Chief of Engineering has determined that a Type II IEPR is not necessary for this project. The decision process is documented in Attachment 2 of this Review Plan. However, the NWD Dam Safety Production Center will be engaged to provide outside the district guidance and oversight.

### **3.4 POLICY AND LEGAL COMPLIANCE REVIEW**

All documents will be reviewed throughout the project for their compliance with current 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.

## **4. REVIEW SCHEDULE AND COSTS**

To the extent practical, reviews should not extend the design schedule but should be embedded in the design process. Reviewers should be involved at key decision points and are encouraged to provide timely over the shoulder comments.

### **4.1 ATR COST**

The anticipated cost for the ATR is \$15,000. There will be two ATR reviews at the 35% and 95% level with a 100% backchecks document. A site visit is not anticipated.

### **4.2 REVIEW SCHEDULE**

Peer reviews, ATRs, and BCOES reviews will be completed at the 35% and 95% submittals and all comments will be closed out with the final 100% submittal. The current schedule for the reviews is listed below. The Project Delivery Team (PDT) and ATR team have agreed to this schedule.

35% Design Complete	Mar 2016
35% Design Review(ATR)	Mar 2016
95% Design Complete	May 2016
95% Design Review(ATR)	May 2016
100% Design Complete/Backcheck	May 2016
BCOES Review	Jun 2016
RTA	Jun 2016

## **5. PUBLIC PARTICIPATION**

As required by EC 1165-2-214, the approved Review Plan will be posted on the District public website ([http://www.nwk.usace.army.mil/Missions/CivilWorks/CivilWorksPrograms and Projects/CivilWorksReviewPlans.aspx](http://www.nwk.usace.army.mil/Missions/CivilWorks/CivilWorksProgramsandProjects/CivilWorksReviewPlans.aspx)). Information will be conveyed to the public through the use of press releases and media interviews, as necessary, and through the use of posting information to the Kansas City District's website. There is no formal public review planned for the plans and specifications.

## **6. REVIEW PLAN APPROVAL AND UPDATES**

The MSC for this project is NWD. The MSC Commander is responsible for approving this Review Plan. The Commander's approval reflects vertical team input as to the appropriate scope and level of review for the study. Like the PMP, the Review Plan is a living document and may change as the study progresses. NWK is responsible for keeping the Review Plan up to date. Minor changes to the review plan since the last MSC Commander approval will be documented. Significant changes to the Review Plan (such as changes to the scope and/or level of review) will 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, will be posted on the Kansas City District's webpage and linked to the HQUSACE webpage. The latest Review Plan will also be provided to the MSC.