



REPLY TO  
ATTENTION OF

DEPARTMENT OF THE ARMY  
US ARMY ENGINEER DIVISION, SOUTHWESTERN  
1100 COMMERCE STREET, SUITE 831  
DALLAS TX 75242-1317

CESWD-RBT-W

07 DEC 2012

MEMORANDUM FOR Commander, Tulsa District

SUBJECT: Pine Creek Lake Dam Safety Modification Study, Pine Creek Lake, Oklahoma,  
Review Plan Approval

1. References:


- a. EC 1165-2-209, Civil Works Review Policy, 31 January 2010; and Change 1, 31 January 2012.
- b. Memorandum, CEIWR-RMC, 26 November 12, subject: Risk Management Center Endorsement – DSMS Review Plan for Pine Creek Lake, Oklahoma (Encl 1).
- c. Final Review Plan for Pine Creek Lake Dam Safety Modification Study (Encl 2).

2. In accordance with 1.a., I hereby approve the enclosed Review Plan (RP) for the subject project study. An Independent External Peer Review is required and public comments received will be incorporated into the plan as the study progresses.

3. Please post the final approved RP with a copy of this memorandum to the District's public internet website. Prior to posting to the District website, the names of USACE employees should be removed.

4. The SWD point of contact for this action is Mr. Michael Southern, CESWD-RBT-W, at 918-669-7148.

2 Encls  
as

  
THOMAS W. KULA  
Brigadier General, USA  
Commanding

CF:  
CESWT-EC-S/ Morris (w/encls)

# REVIEW PLAN

## PINE CREEK LAKE McCurtain County, Oklahoma

### DAM SAFETY MODIFICATION STUDY



MSC Approval Date: 7 December 2012

Last Revision Date: 21 November 2012

*TULSA DISTRICT*



US Army Corps  
of Engineers ®

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**REVIEW PLAN**  
**Pine Creek Lake, Oklahoma**  
**Dam Safety Modification Study**

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## 1. PURPOSE AND REQUIREMENTS

a. **Purpose.** This Review Plan defines the scope and level of peer review for the Pine Creek Lake, Oklahoma, Dam Safety Study and Dam Safety Modification Report.

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) Pine Creek Lake, Oklahoma, Dam Safety Modification Study, Project Management Plan, 27 January 2011
- (6) ER 1110-2-1156, Safety of Dams – Policy and Procedures, Chapter 9, 28 October 2011

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). The RMC will certify that the risk assessment was completed in accordance with the USACE current guidelines and best risk management practices. As per ER1110-2-1156, a Quality Control and Consistency (QCC) review will be conducted including the district, MSC, and RMC. The district and the risk assessment cadre present the risk assessment, findings, conclusions, and recommendations for review to the QCC panel. After resolution of ATR and QCC review comments, the MSC and HQUSACE will complete quality assurance and policy compliance review. Then the district will present the report findings and recommendations to the Senior Oversight Group (SOG). Once any SOG comments are resolved the district DSO, MSC DSO, and the SOG Chair will sign a joint memorandum approving the findings and recommendations of the report.

## 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 this decision document is the Risk Management Center (RMC). The RMO POC for the peer review effort described in this Review Plan is *name removed*.

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.

### 3. STUDY INFORMATION

a. **Decision Document.** The intended outcome of this document is approval to initiate risk reduction action at Pine Creek Lake Dam.

In April 2011, the HQUSACE Safety Officer approved reclassification of Pine Creek Dam from a Dam Safety Action Class (DSAC) classification of II to a DSAC of 1, based on the recommendation of the Senior Oversight Group (SOG). A dam with this classification is considered to have extremely high risk. Since no additional authorization by Congress is required to address the dam safety issues a Dam Safety Modification (DSM) Report will be prepared in accordance with ER 1110-2-1156.

During review, the Risk Management Center will review the risk estimate and verify that the risk estimate is in compliance with the current policy for dam safety risk estimates. The Risk Management Center will review the risk management recommendations and verify the estimated risk reductions. The DSM Report will be signed by the District Commander after completion of all DQC, ATR, QCC and IEPR. The DSM report will then be submitted to CESWD, the Risk Management Center, and HQUSACE for concurrent Policy Compliance Review.

The District DSO, CESWD DSO and the Chairman, HQUSACE Dam Safety Senior Oversight Group will sign the approval memorandum once all policy compliance review comments are resolved. This approval memorandum will state that all agency requirements, certifications, and reviews have been completed and the Environmental Assessment and signed Finding of No Significant Impact been satisfactorily completed and signed. The DSM Report will then be sent to the HQUSACE DSO for concurrence, approval and transmittal to the Assistant Secretary of the Army for Civil Works indicating that the design phase of the project will be initiated.

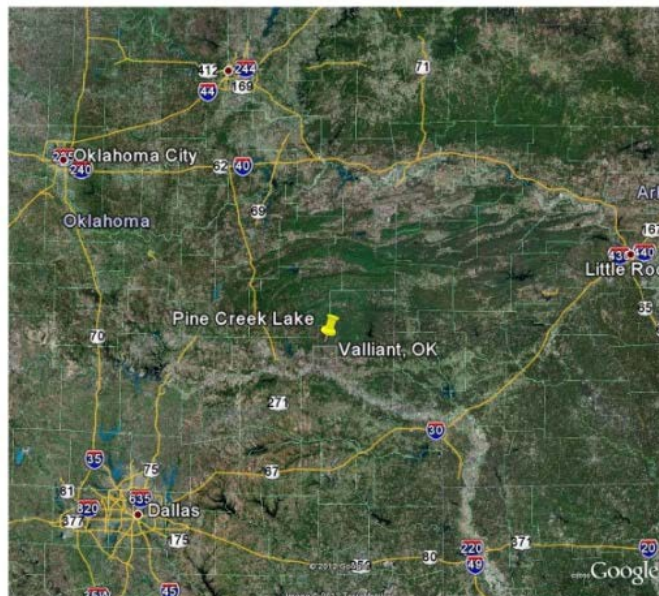
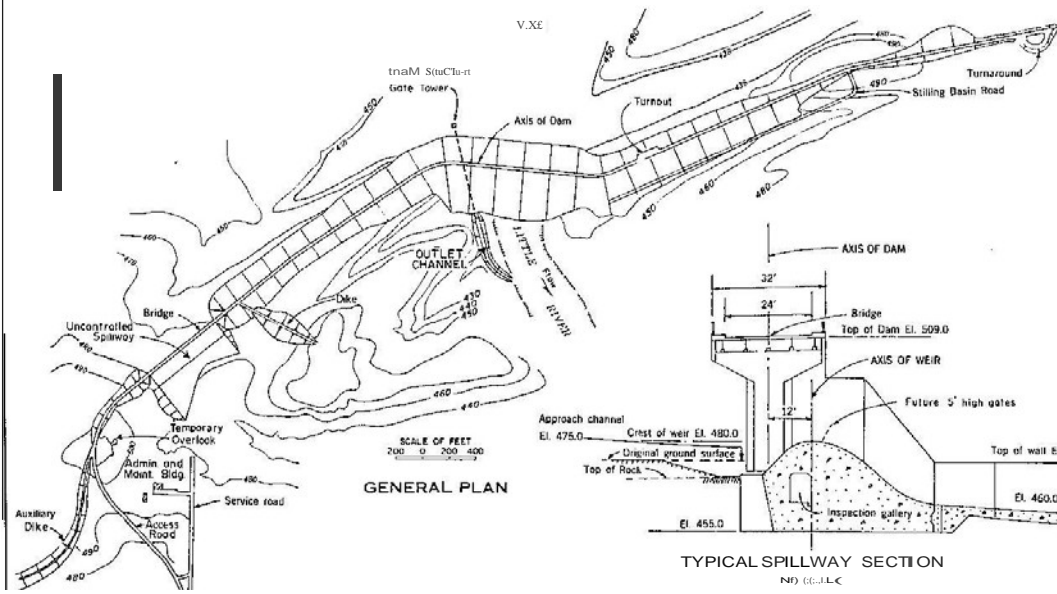
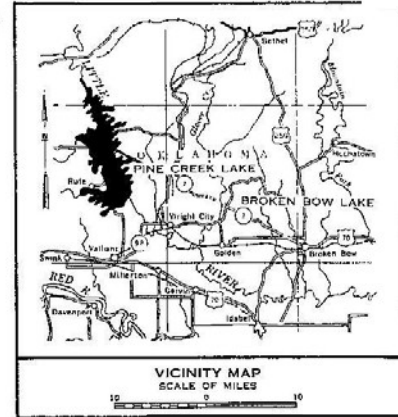


Figure 1. Pine Creek Reservoir, Project Location Map

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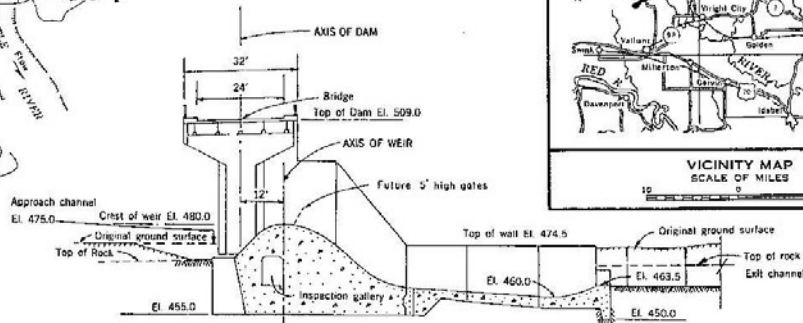


GENERAL PLAN



VICINITY MAP

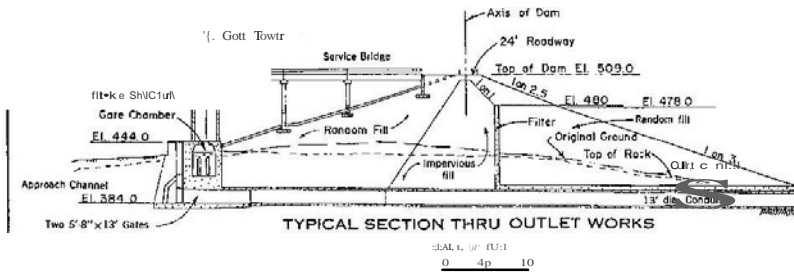
SCALE OF MILES



TYPICAL SPILLWAY SECTION

NO. 00-11-C

1" = 40' 0"



TYPICAL SECTION THRU OUTLET WORKS

SCALE OF FEET  
0 40 10

This drawing is a reproduction of the original drawing and is not to be used for any other purpose. The original drawing is the property of the U.S. Army and is loaned to you for your information only. It is to be returned to the U.S. Army when you are finished with it.

TYPICAL EMBANKMENT SECTION

FLOOD CONTROL PROJECT  
RED RIVER BASIN

**PINE CREEK DAM**  
**LITTLE RIVER, OKLAHOMA**

U. S. ARMY ENGINEER DISTRICT, TULSA, COOPER ENGINEERS  
30 JUN 1971





**Figure 3. Aerial View of Embankment and Outlet Structure**

**b. Study/Project Description.** Pine Creek Lake was authorized for construction by the Flood Control Act approved July 3, 1958, House Document 170, 85<sup>th</sup> Congress, 1<sup>st</sup> Session. The Pine Creek Lake Dam is located on the Little River at river mile 145.3, which is about 5 miles northwest of Wright City in McCurtain County, Oklahoma. Pine Creek Lake was built for the purposes of flood control, water supply, water quality, fish and wildlife, and recreation. Construction of the dam began in February 1963. The project became operational in June 1969. The conservation pool filled to elevation 438.0 on January 7, 1970. The embankment is a rolled impervious earth fill, 7,510 feet long rising 124 feet above the streambed. The dike extends southwest from the right side of the spillway and is 14,150 feet long, 38 feet in maximum height, with a crest width of 10 feet. The embankment includes a spillway weir with a gross width of 608 feet. The outlet works include an intake structure, 13 foot conduit, a 48 inch water supply and water quality bypass, and a 36 inch water supply static head line. Flow through the conduit is controlled by two 5 foot 8 inch by 13 foot hydraulic slide gates operating in tandem.

There is an existing water supply storage agreement, DACW56-71-C-0033, that went into effect on August 21, 1970 between the United States of America and the Weyerhaeuser Company. The total cost of the construction of the Pine Creek Lake project was \$5,119,307. The actual construction costs were finalized in 1978, but for some reason were not applied to this agreement until 2006. The Weyerhaeuser Company chose to put 14,700 acre-feet into immediate use (Space No.1), activated 2,940 acre-feet soon after (Space No.2), and has 11,160 acre-feet of future use storage. The costs for Space No. 1 are \$1,523,505.76, and for Space No. 2 \$307,579.78. The Weyerhaeuser Company transferred and assigned water supply storage agreement DACW56-71-C-0033 to the



International Paper Company on August 10, 2009. The International Paper Company continues to make payments on Space No. 1 and Space No. 2, and has not yet activated their future use storage.

A primary reason for the DSAC I classification was concern over the seepage and piping along and into the outlet conduit. Internal erosion of embankment materials into or along the outlet conduit appears to pose unacceptably high risks at the Pine Creek Dam. The outlet conduit was constructed in a trench with steep side slopes, which raises the possibility that low stress areas may exist within the embankment due to arching action along the outlet conduit. Low stress areas can result in embankment cracking and the development of seepage paths. Seepage emanates from the downstream toe near the outlet work outfall structure. Seepage through the joints in the outlet conduit have been observed. Voids up to ten cubic yards have been discovered in an area surrounding the conduit, and dye tests have shown a fairly rapid response. Seepage carrying material has been observed at the downstream end of the outlet conduit. The physical evidence suggests that relatively open and continuous seepage paths exist along the outlet conduit.

The objective of the DSM Study is to reduce risk at Pine Creek Lake to below tolerable risk guidelines or as low as reasonably practicable and to provide adequate information to determine what permanent dam modifications are necessary for the Corps to operate Pine Creek Lake for the foreseeable future. Structural and non-structural risk reduction measures will be identified and used to formulate and evaluate alternatives for varying degrees of permanent risk reduction; and to ultimately recommend a cost effective, technically feasible alternative that minimizes adverse environmental, economic and social effects, which will allow the project to operate for the foreseeable future as originally authorized within tolerable risk guidelines. Primary evaluation factors of annual probability of failure, life safety tolerable risk guidelines, As Low As Reasonable Practicable considerations, and essential USACE guidelines form the basis for plan selection. This study will incorporate, where available, Corps methodology to confirm these findings.

Non- Structural measures to be considered are advanced warning systems, real estate buyout within inundation areas, and permanent pool restriction.

Structural measures to be considered are new chimney filter, cutoff wall, permanent downstream filter, upstream to downstream embankment and filter replacement, downstream embankment replacement, and permanent joint repair.

The estimated cost to reduce risk at the Pine Creek Lake Dam within tolerable risk guidelines to allow continued operation in the foreseeable future as originally authorized could be in the range of \$50 to \$100M.

### **c. Factors Affecting the Scope and Level of Review.**

(1) Five failure modes were considered to be significant and credible and were estimated in the risk assessment process: Overtopping induced failure of the dike, overtopping induced failure of the main embankment, internal erosion of embankment material along the conduit, internal erosion of the embankment materials into the foundation, and foundation/embankment interface piping at station 30+00 of the main embankment.

The following factors will affect the project study and level of review:

- A. Hydrology/Hydraulics
- B. Soil Properties
- C. Environmental/Societal Impact
- D. Development of Remedial Measures
- E. Probabilistic versus Deterministic Design
- F. Non-Failure Risks

(2) Environmental, health and safety, economic, societal and recreational impacts, while expected to be minimal, are yet to be determined pending decision on the nature and scope of the modification. This review plan is a living document and will be updated whenever possible throughout the decision document cycle.

(3) The study has local, state and Federal interest. The reservoir is owned and managed by the Tulsa District of the Corps of Engineers.

(4) The project presents a threat to human life/safety because of its high risk of failure under an extreme event and the population downstream.

(5) The project has potential for public controversy due to reservoir management for water supply agreement, flood control, and recreation.

(6) There are risks associated with the evaluation of the seepage and internal erosion problems. The methods used to investigate and analyze these two areas in the Dam Safety Modification Study could be controversial and have impacts to the project design, cost estimates, and schedule.

(7) Pine Creek lake is not located in a seismically active region. Due to water supply and flood risk mitigation purposes of the dam the sequencing of construction operations and adequate preparation of the subsurface to prevent dam failure during construction must be thoroughly reviewed.

**d. In-Kind Contributions.** Products and analyses provided by non-Federal sponsors as in-kind services are subject to DQC, QCC, ATR, and IEPR. No in-kind products or analyses will be provided by the non-Federal sponsor.

#### **4. PRODUCTS TO UNDERGO DQC, ATR, QCC, AND IEPR.**

- a. Baseline Risk Assessment Report
- b. Baseline Risk Technical Appendices
- c. Dam Safety Modification Report
- d. Dam Safety Modification Report Appendices
- e. MCACES and Risk Based Cost Estimates
- f. Draft Environmental Assessment for interim Water Control Plan
- g. Draft Environmental Assessment for the Recommended Risk Reduction Measure Plans
- h. Plans and Specifications for Alternative Risk Reduction Measures
- i. Screening Level Cost Estimates of Alternative Risk Reduction Measure Plans
- j. Geotechnical Reports

k. Final Draft Environmental Assessment

**5. 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 shall be in accordance with the Quality Manual of the District and the Southwestern Division.

**Documentation of DQC.** The DQC will be managed by the Tulsa District in accordance with ER 1110-1-12, and the Southwestern Division /Tulsa District Quality Management Plans. The DQC will be documented using DrChecks. The DQC roster is provided in Attachment 1. The DQC team members represent the following disciplines: Geotechnical Engineering, Construction, Hydraulic and Hydrology Engineering, Structural and Civil Engineering, Cost Estimating, Planning and Economics, Real Estate, Environmental Planning/National Environmental Policy Act (NEPA).

**6. 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. 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:

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

**b. Table 1: Required ATR Team Expertise.**

<b>ATR Team Members/Disciplines</b>	<b>Expertise Required</b>
ATR Lead/Construction	The ATR lead should be a senior registered professional with a minimum of 15 years experience in preparing large scale Civil Works decision documents and conducting ATR on similar dam safety projects. The ATR lead should also have prior experience leading a multi-disciplined team through the ATR process, and extensive experience in the design and construction of embankment modification, excavation, cutoff walls, and filter construction. The ATR lead may also serve as a reviewer for a specific discipline (such as geotechnical engineering, planning, economics, environmental resources, etc).
Geotechnical Engineering	The Geotechnical Engineering team member should have at least 10-15 years of experience in the general field of soils or geotechnical engineering or related field; demonstrated experience in the specific field of dams engineering in evaluating, designing, and constructing large embankment dams (>150 feet

	<p>high) for water storage and large levees embankments. The Geotechnical team member should also have dam safety experience through participation in dam safety expert panels, risk evaluation/mitigation studies or similar experience with embankment design and modification. Direct experience with embankment structure rehabilitation projects as either designer or construction project engineer; be adroit with the USACE risk informed approach to dam risk decision making. The Geotechnical team member should have familiarity with preparing plans and specifications for USACE projects, knowledge of USACE design and construction procedures and policies, and USACE dam safety assurance policy and guidance.</p>
Civil / Structural Engineering	<p>The Civil/Structural Engineering team member should have at least 10 years of experience and expertise in the design and construction of large civil works projects utilizing steel, concrete and composite materials utilizing state-of-the-art computer modeling of both static and dynamic loading. The Civil/Structural team member should also have extensive experience in the design and construction of hydraulic structures for large and complex civil works projects including spillways, outlet works, and flood walls. The Civil/Structural team member should be proficient in performing stability analysis using limit equilibrium analysis. The Civil/Structural panel member should also have familiarity with preparing plans and specifications for large civil works projects; knowledge of USACE design and construction procedures and policies; USACE dam safety assurance policy and guidance; and experience in evaluating risk reduction measures for dam safety assurance projects.</p>
Environmental, Planning, and NEPA Compliance	<p>The Environmental, Planning, and NEPA Compliance team member should have at least 5-10 years of experience directly related to water resource environmental evaluation or review, implementation of the NEPA compliance process and Endangered Species Act requirements. The Environmental, Planning, and NEPA Compliance team member should have extensive demonstrated experience in the environmental assessment process with knowledge of the NEPA process, cultural surveys, biological assessments, and endangered species, working with coastal and estuarine ecosystems, and evaluating and conducting NEPA impact assessments, including cumulative effects analyses, for complex multi-objective public works projects with competing trade-offs. The Environmental, Planning, and NEPA Compliance team member should be familiar with USACE calculation and application of environmental impacts and benefits, determining the scope and appropriate methodologies for impact assessment and analyses for a variety of projects, potential project impacts to nearby sensitive habitats, programs with high public and interagency interests.</p>
Hydrology and Hydraulic	<p>The Hydrology and Hydraulic Engineering should have at least 10</p>

Engineering	<p>years experience of hydrology and hydraulic engineering with an emphasis on large public works projects, with extensive background in hydraulic theory and practice, and river geomorphology, and water management especially with managing water outflows from a reservoir. The H&amp;H team member should have experience with characterizing surface water flows in a watershed using inundation mapping inundation mapping software, HEC-HMS, HEC-ResSim, HEC-RAS and other water-flow scenario development techniques. The H&amp;H team member should have direct design or experience with dam rehabilitation projects especially with regard to conduits, spillways, stilling basins and drainage pipes.</p> <p>The H&amp;H panel member shall have familiarity with preparing plans and specifications for USACE projects, knowledge of USACE design and construction procedures and policies, and USACE dam safety assurance policy and guidance. The H&amp;H panel member shall have experience in evaluating risk reduction measures for dam safety assurance projects.</p>
Economics/Consequences	The Economics/Consequences should have at least 10 years of extensive experience working with risk models and disaster scenarios with regard to economic impacts for flood risk management projects.
Cost Engineering	Cost Engineer should have at least 5-10 years of experience in the application of scientific principles and techniques to problems of cost estimating, cost control, business planning and management science, profitability analysis, project management, and planning and scheduling.
Real Estate	The Real Estate reviewer should have 10-15 years experience in reviewing dam/reservoir projects. The Panel member should hold at minimum, a B.S. degree.

**7. QUALITY CONTROL AND CONSISTENCY REVIEW (QCC)**

Quality Control and Consistency (QCC) review will be conducted by the Tulsa district, Southwestern Division, and RMC. The district and the risk assessment cadre present the baseline risk assessment, risk management alternatives considered, and the recommended risk management plan for review.

**a. Documentation of QCC.** The QCC is managed by the Tulsa District in accordance with ER 1110-2-1156 and the Southwestern Division and Tulsa District Quality Management Plans. The QCC roster is provided in Attachment 1. The QCC team members represent the following disciplines: Geotechnical Engineer, Engineering Geologist, Civil/Structural Engineer.

**b. Table 2: Required QCC Team Expertise**

QCC Team Members/Disciplines	Expertise Required
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<p>QCC Lead/ Geotechnical Engineering</p>	<p>The QCC lead should be a senior registered professional with 15 plus years experience in the general field of soils or geotechnical engineering or related field; demonstrated experience in the specific field of dams engineering in evaluating, designing, and constructing large embankment dams (&gt;150 feet high) for water storage and large levee embankments. The lead should have the necessary skills and experience in embankment modification, cut and cover conduits, excavation, cutoff walls, and filter construction to lead a team through the QCC process. The Geotechnical engineer should have 15 plus years of experience or equivalent education in soils engineering or related field; dam safety experience through participation in dam safety expert panels, risk evaluation/mitigation studies or similar experience with dam/embankment design, modifications, cut and cover conduits, excavation, cutoff walls, and filter construction. In addition, member should have direct experience with embankment structure rehabilitation projects as either designer or construction project engineer. Team member should be adroit with the USACE risk informed approach to dam risk decision making. The Geotechnical team member should have familiarity with preparing plans and specifications for USACE projects, knowledge of USACE design and construction procedures and policies, and USACE dam safety assurance policy and guidance.</p>
<p>Engineering Geologist</p>	<p>The geologist should have a minimum of 15 years experience with in soils engineering or related field; dam safety experience through participation in dam safety expert panels, risk evaluation/mitigation studies or similar experience with dam/embankment design, modifications, cut and cover conduits, excavation, cutoff walls, and filter construction.</p>
<p>Civil/Structural Engineering</p>	<p>Team member should have a minimum of 15 years of experience and expertise in the design and construction of large civil works projects utilizing steel, concrete and composite materials utilizing state of the art Computer modeling of both static and dynamic loading. The Civil/Structural panel member should also have familiarity with preparing plans and specifications for large civil works projects; knowledge of USACE design and construction procedures and policies; USACE dam safety assurance policy and guidance; and experience in evaluating risk reduction measures for dam safety assurance projects.</p>

**8. 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.** Based on factors from EC 1165-2-209 (see Table 3 below), a risk-based decision has been made to perform a Type 1 IEPR for the Pine Creek Reservoir Dam Safety modification project.

**b. Table 3: IEPR Decision Factors**

<b>EC 1165-2-209 Criteria</b>	<b>Pine Creek Dam Safety Modification</b>
Is there a significant risk to human life?	The project has the potential to pose a significant threat to human life.
Is the total project cost more than \$45M?	The estimated project cost is more than \$45M.
Has the Governor or Oklahoma requested a Type 1 IEPR?	The Governor has not requested a Type 1 IEPR.
Has the head of a Federal or State agency charged with reviewing the project study requested a Type 1 IEPR?	Yes, per USACE ER 1165-2-209 a Type 1 IEPR has been requested.
Will there be a significant public controversy as to the size, nature, or effects of the project?	Yes, the project has potential for public controversy.
Will there be a significant public controversy as to the economic or environmental cost or benefit of the project?	Yes, the project has potential for public controversy regarding the economic and environmental cost/benefit of the project.
Will the study be based on information from novel methods, present complex challenges or interpretation, contain precedent-setting	The study will not be based on information from novel methods; however the study may present complex challenges or interpretation, and also

methods or models, or present conclusions that are likely to change prevailing practices?	may contain precedent setting methods or models.
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Type 1 IEPR members will be provided with ATR documentation and significant public comments made during public meetings and on the products under review. Arising issues between PDT and reviewers should be resolved with face-to-face resolution.

**c. Selection Criteria for Type I IEPR Panel Members.** Type 1 IEPR panel members will be comprised of individuals that have not been involved in the development of the document. All IEPR members shall be registered professionals in their discipline in the United States or similarly credentialed in their home country. Reviewers will have college degree in their discipline. Graduate engineering degrees are preferred but not required as hands-on relevant engineering experience is more important. Reviewers shall not have any financial or litigation association with the USACE; the A/E, their engineering teams, subcontractors or construction contractors. For all disciplines the following experience level requirements apply:

- 1) Level 1 reviewers shall have a minimum of 7 years of general experience
- 2) Level 2 reviewers shall have a minimum of 10 years of specialized experience
- 3) Level 3 reviewers shall have a minimum of 15 years of specialized experience and are considered to a recognized expert in their field
- 4) Level 2 and 3 reviewers shall also have relevant dam and levee experience and experience in failure mode analysis and risk assessment of large complex systems with emphasis on dam and levee safety issues.

**d. Table 4: Required Type I IEPR Panel Expertise.**

<b>IEPR Panel Members</b>	<b>Expertise Required</b>
Outside Eligible Organization (OEO) Project Manager	The IEPR lead shall be level 3 qualified senior registered professional with 15 years or more experience in preparing civil works decision documents and leading peer review processes. The lead should have the necessary skills and experience to provide a review of the technical basis for the economic, engineering and environmental methods, models, data and analyses, and assumptions supporting the DSM report on remediation of Pine Creek dam. The OEO may also serve as a reviewer for a specific discipline (such as geotechnical, economics, environmental, etc).

Economics/Planning	The Economics/Planning member shall be level 3 qualified registered professional from an Architect-Engineer or consulting firm, a public agency, a non-governmental entity or academia with 15 or more years of experience directly related to water resource economic evaluation or review and should possess a Bachelors degree or higher in economics. Direct experience with USACE is highly preferred but not required. The panel member should be familiar with USACE and National Economic Development analysis procedures specifically related to risk reduction projects.
Environmental Planner /NEPA Impact Assessment	The Planning reviewer shall be level 3 qualified senior water resources planner with extensive experience in plan formulation. The environmentalist should have 15 or more years of experience and understand the requirements for and have experience with NEPA documentation.
Geotechnical Engineering	The geotechnical engineer shall be level 3 qualified senior registered professional with 15 plus years of experience or equivalent education in soils engineering or related field; dam safety experience through participation in dam safety expert panels, risk evaluation/mitigation studies or similar experience with dam/embankment design, modifications, cut and cover conduits, excavation, cutoff walls, and filter construction. In addition, member should have direct experience with embankment structure rehabilitation projects as either designer or construction project engineer.
Geologist	The geologist shall be level 3 qualified registered professional with a minimum of 15 years experience with in soils engineering or related field; dam safety experience through participation in dam safety expert panels, risk evaluation/mitigation studies or similar experience with dam/embankment design, modifications, cut and cover conduits, excavation, cutoff walls, and filter construction.
Hydrology and Hydraulic Engineering	The Hydrologist / Hydraulic engineer shall be level 3 qualified registered professional with 15 plus years experience in water management especially with managing water outflows from a reservoir. Panel member will also have experience with characterizing surface water flows in a watershed using inundation mapping software, HEC-HMS, HEC-ResSim, and other water-flow scenario development techniques. Panel member will have direct design or experience with dam rehabilitation projects especially with regard to cut and cover conduits, spillways, stilling basins and drainage pipes and shall also have modeling experience with Flo-2D models and HECRAS

**e. 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 will be entered into the DrChecks systems. The OEO will compile comments which 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.

**9. 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.

**10. 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.

**11. MODEL CERTIFICATION AND APPROVAL.**

**a.** 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.

**b. Table 5: Planning Models.** The following models are anticipated to be used in the development of the decision document:

<b>Model Name</b>	<b>Model Description</b>	<b>Model Type</b>
HEC-FIA	Economic model used to calculate estimated economic damages and loss of life corresponding to floodplain mapping.	Planning
HEC-HMS By applying this model the PDT is able to:	<ul style="list-style-type: none"> <li>a. Define the watersheds’ physical features</li> <li>b. Describe the metrological conditions</li> <li>c. Estimate parameters</li> <li>d. Analyze simulations</li> <li>e. Obtain GIS connectivity</li> </ul>	Engineering
HEC-ResSim	<p>This model predicts the behavior of reservoirs and to help reservoir operators plan releases in real-time during day-to-day and emergency operations. The following describes the major features of HEC-ResSim</p> <ul style="list-style-type: none"> <li>a. Graphical User Interface</li> <li>b. Map-Based Schematic</li> <li>c. Rule-Based Operations</li> </ul>	Engineering
HEC-RAS	Unsteady 1-dimensional flow model used to simulate the channel hydraulics	Engineering
FLO-2D	Unsteady 2-dimensional flow model used to simulate wide alluvial fan floodplain inundation, and produce corresponding floodplain mapping.	Engineering
Groundwater Modeling System (GMS)	This model is used to conduct seepage analysis	Engineering
UTEXAS4	This model is used to conduct slope stability analysis	Engineering
FLAC-UBCSAND	This is a numerical deformation model used for seismic stability and deformation analysis	Engineering
SEEP2D for seepage	This is a finite element model used analyses for earth embankments and foundations.	Engineering
DAMRAE (Dam Safety Risk Analysis Engine)	This is a generalized event tree analysis tool that includes a graphical interface for developing and populating an event tree, and a tool for calculating and post-processing an event tree risk model for dam safety risk assessment.	Engineering
MCACES or MII	These are cost estimating models. This is a cost estimating	Cost



	model that was developed by Building Systems Design Inc. Crystal Ball risk analysis software will also be used.	Estimating
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**12. REVIEW SCHEDULES AND COSTS**

**a. DQC Cost and Schedule.**

The Tulsa District will coordinate for and provide labor funding for district personnel to conduct the DQC. DQC review costs are estimated to be \$80,000.

**b. Table 6: DQC Schedule.**

<b>Task</b>	<b>Date</b>
DQC Team Identified	18 September 2012
Draft Report submitted to DQC Team for review	8 October 2012
DQC review complete – All comments entered into DrChecks	21 October 2012
PDT/DQC Team Meeting to Review Comments and Proposed Responses	22,23 October 2012
Draft Report Revisions to DQC Team for DQC back check	26 October 2012
DQC Review Complete (All comments back checked & resolved)	8 November 2012

**c. ATR Cost and Schedule.**

The Tulsa District will provide labor funding by cross charge labor codes and/or MIPR. Funding for travel will be provided through government order, if needed. The Project Manager will work with the ATR team leader to ensure that adequate funding is available and is commensurate with the level of review needed. Any funding shortages will be negotiated on a case by case basis and in advance of a negative charge occurring.

The ATR team leader shall provide organization codes for each team member and a responsible financial point of contact (CEFMS responsible employee) for creation of labor codes. Reviewers will monitor individual labor code balances and alert the ATR team leader to any possible funding shortages. ATR review is estimated to be \$130,000 for the study.

**d. Table 7: ATR Schedule.**

<b>Task</b>	<b>Date</b>
ATR team identified	17 August 2012
ATR charge developed	17 September 2012
Site visit – ATR team	2 October 2012
DQC revised report delivered to ATR team for review	11 November 2012
Share comments in .docx format	16 November 2012
Face-to-face ATR meeting (Ft Worth)	19,20 November 2012
Enter comments in DrChecks	26 November 2012
PDT/ATR team resolve DrChecks comments	4-7 December 2012
ATR complete (All comments back checked & resolved)	7 December 2012

**e. QCC Cost and Schedule.**

The Tulsa District will provide labor funding by cross charge labor codes and/or MIPR. Funding for travel will be provided through government order, if needed. The Project Manager will work with the QCC team leader to ensure that adequate funding is available and is commensurate with the level of review needed. Any funding shortages will be negotiated on a case by case basis and in advance of a negative charge occurring.

The QCC team leader shall provide organization codes for each team member and a responsible financial point of contact (CEFMS responsible employee) for creation of labor codes. Reviewers will monitor individual labor code balances and alert the QCC team leader to any possible funding shortages. QCC review is estimated to be \$50,000 for the study.

**f. Table 8: QCC Schedule.**

<b>Task</b>	<b>Date</b>
QCC team identified	7 November 2012
ATR package available from PDT, QCC panel begins review	11 November 2012
QCC briefing (Denver)	11-15 December 2012

**g. Type I IEPR Cost and Schedule.**

The full type I IEPR panel will receive the DSM report, environmental assessment, and all technical appendices following review by the RMC’s Senior Oversight Group (SOG) in January 2013. The DSM report and technical appendices will be updated with review comments from the SOG review prior to the IEPR review. The final report to be submitted by the Type 1 IEPR panel must be submitted to the PDT within 60 days of the conclusion of the review. The PM will coordinate with RMC and MSC DSO before any document is released for public review. IEPR review costs are estimated to be approximately \$300,000.

**h. Table 9: IEPR Schedule**

<b>Task</b>	<b>Date</b>
PDT prepares draft SOW/IGE/Charge questions	9 November 2012
IEPR SOW/IGE/Charge questions finalized	16 November 2012
Coordinate contract for IEPR panel services	21 November 2012
IEPR Team Identified	TBD
SOG review of DSMR complete	17 January 2013
Deliver Report to IEPR	1 February 2013
IEPR Complete	15 March 2013

**13. PUBLIC PARTICIPATION**

The public has been and will continue to be kept informed of the project. Beginning in late 2009 the U.S. Army Corps of Engineers (USACE) Tulsa District began a campaign to inform the local public about the Pine Creek Dam Safety program. Since that time a series of stakeholder meetings have been held, most recently on 24 July, 2012 to provide updates and answer questions and concerns from the local public. At that time, the Tulsa District provided project information and opportunities for public feedback. Public participation will continue to occur as part of the NEPA process. Public comments will be consolidated in a matrix and addressed, if needed. A summary of the comments and resolutions will be included in the document.

**14. REVIEW PLAN APPROVAL AND UPDATES**

The Southwestern Division Commander or his designated representative is responsible for approving this Review Plan. The Commander’s approval reflects vertical team input (involving district, MSC, RMO, 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. 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.

## 15. REVIEW PLAN CORPS OF ENGINEERS POINT OF CONTACT

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

- Lisa Lawson, Program Manager, Tulsa District, (918) 669-7551,  
[lisa.k.lawson@usace.army.mil](mailto:lisa.k.lawson@usace.army.mil)

## ATTACHMENT 1: TEAM ROSTERS

**1. Pine Creek Product Delivery Team (PDT)** The current risk assessment teams conducting the base line risk assessment at the dams include:

Project Title	Name	Organization
Dam Safety Program Manager	<i>name removed</i>	SWT
Lead Project Engineer	<i>name removed</i>	SWT
Lead Structural	<i>name removed</i>	SWT
Lead H&H	<i>name removed</i>	SWT
Lead Planner	<i>name removed</i>	SWT
Project Manager	<i>name removed</i>	SWT
Technical Manager	<i>name removed</i>	SWT
Geotechnical Engineer	<i>name removed</i>	SWT
Geotechnical Engineer	<i>name removed</i>	SWT
Geotechnical Engineer	<i>name removed</i>	SWT
Geotechnical Engineer	<i>name removed</i>	SWT
Geologist	<i>name removed</i>	SWT
GIS/Geologist	<i>name removed</i>	SWT
Environmental	<i>name removed</i>	SWT
Mechanical Engineer	<i>name removed</i>	SWT
Lead Cost Engineer	<i>name removed</i>	NWW
Cost Engineer	<i>name removed</i>	SWT
Cost Engineer	<i>name removed</i>	SWT
Cost Engineer	<i>name removed</i>	SWT
Real Estate	<i>name removed</i>	SWT

### 2. District Quality Control (DQC) Team Roster

Position	Name	Organization
DQC Lead/Geotechnical	<i>name removed</i>	SWT
Geotechnical/Construction	<i>name removed</i>	SWL
Hydrology & Hydraulics	<i>name removed</i>	SWT
Civil/Structural Engineer	<i>name removed</i>	SWL
Planning/Economics	<i>name removed</i>	SWT
Cost Engineer	<i>name removed</i>	NWW
Environmental/NEPA	<i>name removed</i>	SWT
Real Estate	<i>name removed</i>	SWT

### 3. Agency Technical Review (ATR) Team Roster

Position	Name	Organization
ATR Lead/Construction	<i>name removed</i>	RMC
Geotechnical Engineering	<i>name removed</i>	SWF
Construction	<i>name removed</i>	RMC
Structural	<i>name removed</i>	RMC

Cost Engineer	<i>name removed</i>	RMC
Hydrology & Hydraulics	<i>name removed</i>	SWT
Economist/Consequences	<i>name removed</i>	SWF
Environmental Planning / NEPA Compliance	<i>name removed</i>	SWL
Real Estate	<i>name removed</i>	TBD

#### 4. QCC panel

Position	Name	Organization
Geotechnical Engineering	<i>name removed</i>	RMC
Engineering Geologist	<i>name removed</i>	RMC
Civil/Construction	<i>name removed</i>	RMC

#### 5. Type I Independent External Peer Review (IEPR) Panel

Discipline	Name	Years of Experience/Credentials
OEO Project Manager	<i>TBD</i>	>15 years experience /registered professional
Geotechnical Engineering	<i>TBD</i>	>15 years experience /registered professional
Engineering Geology	<i>TBD</i>	>15 years experience /registered professional
Hydrology & Hydraulic Engineering	<i>TBD</i>	>15 years experience /registered professional
Civil / Structural Engineering	<i>TBD</i>	>15 years experience /registered professional
Environmental Planning/ NEPA Compliance	<i>TBD</i>	>15 years experience /registered professional
Economics/Consequences	<i>TBD</i>	>15 years experience /registered professional



**ATTACHMENT 2: STATEMENT OF TECHNICAL REVIEW**

**COMPLETION OF AGENCY TECHNICAL REVIEW**

The Agency Technical Review (ATR) has been completed for the Dam Safety Modification Study for Pine Creek Reservoir, McCurtain County, Oklahoma. The ATR was conducted as defined in the project’s Review Plan to comply with the requirements of EC 1165-2-209. During the ATR, compliance with established policy principles and procedures, utilizing justified and valid assumptions, was verified. This included review of: assumptions, methods, procedures, and material used in analyses, alternatives evaluated, the appropriateness of data used and level obtained, and reasonableness of the results, including whether the product meets the customer’s needs consistent with law and existing US Army Corps of Engineers policy. The ATR also assessed the District Quality Control (DQC) documentation and made the determination that the DQC activities employed appear to be appropriate and effective. All comments resulting from the ATR have been resolved and the comments have been closed in DrChecks<sup>sm</sup>.

_____ <i>name removed</i> ATR Team Leader CEIWR-RMC-WD	_____ Date
_____ <i>name removed</i> Project Manager CESWT-PP-C	_____ Date
_____ <i>name removed</i> Lead Engineer CESWT-EC-S	_____ Date
_____ <i>name removed</i> Director, Risk Management Center CEIWR-RMC	_____ Date

**CERTIFICATION OF AGENCY TECHNICAL REVIEW**

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

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

_____ <i>name removed</i> Chief, Engineering Division CESWT-EC	_____ Date
_____ <i>name removed</i> Chief, Planning Division CESWT-PE	_____ Date

**ATTACHMENT 3: REVIEW PLAN REVISIONS**

<b>Revision Date</b>	<b>Description of Change</b>	<b>Page / Paragraph Number</b>

**ATTACHMENT 4: ACRONYMS AND ABBREVIATIONS**

<b><u>Term</u></b>	<b><u>Definition</u></b>	<b><u>Term</u></b>	<b><u>Definition</u></b>
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
CSDR	Coastal Storm Damage Reduction	O&M	Operation and maintenance
DPR	Detailed Project Report	OMB	Office and Management and Budget
DQC	District Quality Control/Quality Assurance	OMRR&R	Operation, Maintenance, Repair, Replacement and Rehabilitation
DX	Directory of Expertise	OEO	Outside Eligible Organization
EA	Environmental Assessment	OSE	Other Social Effects
EC	Engineer Circular	PCX	Planning Center of Expertise
EIS	Environmental Impact Statement	PDT	Project Delivery Team
EO	Executive Order	PAC	Post Authorization Change
ER	Ecosystem Restoration	PMP	Project Management Plan
FDR	Flood Damage Reduction	PL	Public Law
FEMA	Federal Emergency Management Agency	QMP	Quality Management Plan
FRM	Flood Risk Management	QA	Quality Assurance
FSM	Feasibility Scoping Meeting	QC	Quality Control
GRR	General Reevaluation Report	RED	Regional Economic Development
Home District/MSD	The District or MSD responsible for the preparation of the decision document	RMC	Risk Management Center
HQUSACE	Headquarters, U.S. Army Corps of Engineers	RMO	Review Management Organization
IEPR	Independent External Peer Review	RTS	Regional Technical Specialist
LRR	Limited Reevaluation Report	SAR	Safety Assurance Review
MSC	Major Subordinate Command	USACE	U.S. Army Corps of Engineers
		WRDA	Water Resources Development Act