

REVIEW PLAN

**Whittier Narrows Dam, Los Angeles, California
Dam Safety Modification Study**

Los Angeles District

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**US Army Corps
of Engineers®**

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1. PURPOSE AND REQUIREMENTS

a. **Purpose.** This Review Plan defines the scope and level of peer review for the Whittier Narrows Dam, Los Angeles, California Dam Safety Modification Study (DSMS). This Review Plan is a component of the Project Management Plan (PMP).

b. References

- (1) Engineering Circular (EC) 1165-2-214, Civil Works Review Policy, 15 Dec 2012
- (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) ER 1110-2-1156, Safety of Dams – Policy and Procedures, 28 Oct 2011
- (6) Whittier Narrows Dam Safety Modification Study Project Management Plan, Sep 2011

c. **Requirements.** This review plan was 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 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 1165-2-214) 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 DSMS will be the RMC.

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 Los Angeles District is preparing a DSMS that will present investigation, documentation, and justification of modifications to address dam safety issues identified at the Whittier Narrows Dam. Consistent with ER 1110-2-1156, the DSMS will be prepared by the Los Angeles District under the direction of the South Pacific Division Dam Safety Production Center (SPD-DSPC) with support from the SPD-DSPC and RMC. The DSMS will be an integrated decision document that includes both the dam safety requirements per ER 1110-2-1156 and an Environmental Impact Statement (EIS). The report will be in compliance with the National Environmental Protection Act (NEPA), other Federal Laws, Executive Orders, and Corps' regulations. The DSMS will include an assessment of the baseline risk condition, development and selection of

alternative risk management plans, EA, and other documents as needed for approval. The alternative risk management plans aim to lower the risk of the dam and the EIS evaluates the environmental impacts on resources. However, if the impact analysis of the selected alternative risk management plan finds that the recommended plan has a relatively insignificant impact on resources, then an Environmental Assessment (EA) will be prepared, but is not anticipated at this time. Following HQUSACE approval of the DSMS, EIS, and a signature of the Record of Decision (ROD), the PDT will proceed into final design of the Whittier Narrows Dam Remediation Project.

- b. Study/Project Description.** Whittier Narrows Dam is located at a natural gap in the hills that form the southern boundary of the San Gabriel Valley, in Los Angeles County, California, approximately 7.5 miles downstream from the Santa Fe Flood Control Basin. The Rio Hondo and the San Gabriel River flow through this gap and flood flows are constrained by the dam. The construction of the dam was authorized by the Flood Control Act of 1941 for the primary purpose of flood control. Recreation is a secondary purpose, as authorized by the Flood Control Act of 1944. A third purpose of the dam was set forth by the Chief of Engineers in 1956 for water conservation. The U.S. Army Corps of Engineers (USACE) owns, operates, and maintains the dam and all associated flood control facilities. Construction began in March 1950 on the first major contract for the project, and the final major contract was completed in March 1957. The dam consists of an approximately 16,960-foot long earth embankment (designated west, central, and east) and two gated outlet structures. The outlet works discharge into the Rio Hondo, and the spillway discharges into the San Gabriel River. The reservoir is normally empty and a “crossover weir” within the reservoir diverts lower flows from the San Gabriel River to the Rio Hondo.

An Issue Evaluation Study (IES) completed in March 2011 confirmed safety issues at the Whittier Narrows Dam and recommended the study proceed to the DSMS phase. In accordance with the USACE commitment and responsibility to public safety, the Whittier Narrows DSMS will follow the requirements in ER 1110-2-1156 to select an alternative risk management plan to address failure modes identified in the IES. The final product will be an integrated Dam Safety Modification Report/ Environmental Assessment or Impact Statement that presents the planning, engineering, and implementation details of the recommended mitigation measures to allow final design and construction to proceed. The study will be conducted in accordance with the process and guiding principles outlined in ER-1110-2-1156. Study challenges include developing well-supported, reasonable failure modes, assessing the probabilities of failure in a complex geological environment and estimating reasonable consequences for extreme events.

- (1) Location: Whittier Narrows Dam is located at the southern limit of the San Gabriel Valley, near the intersection of Interstates 60 and 605, approximately 12 miles east of downtown Los Angeles. Figure 1 shows the location of the dam (designated by the “A” label).

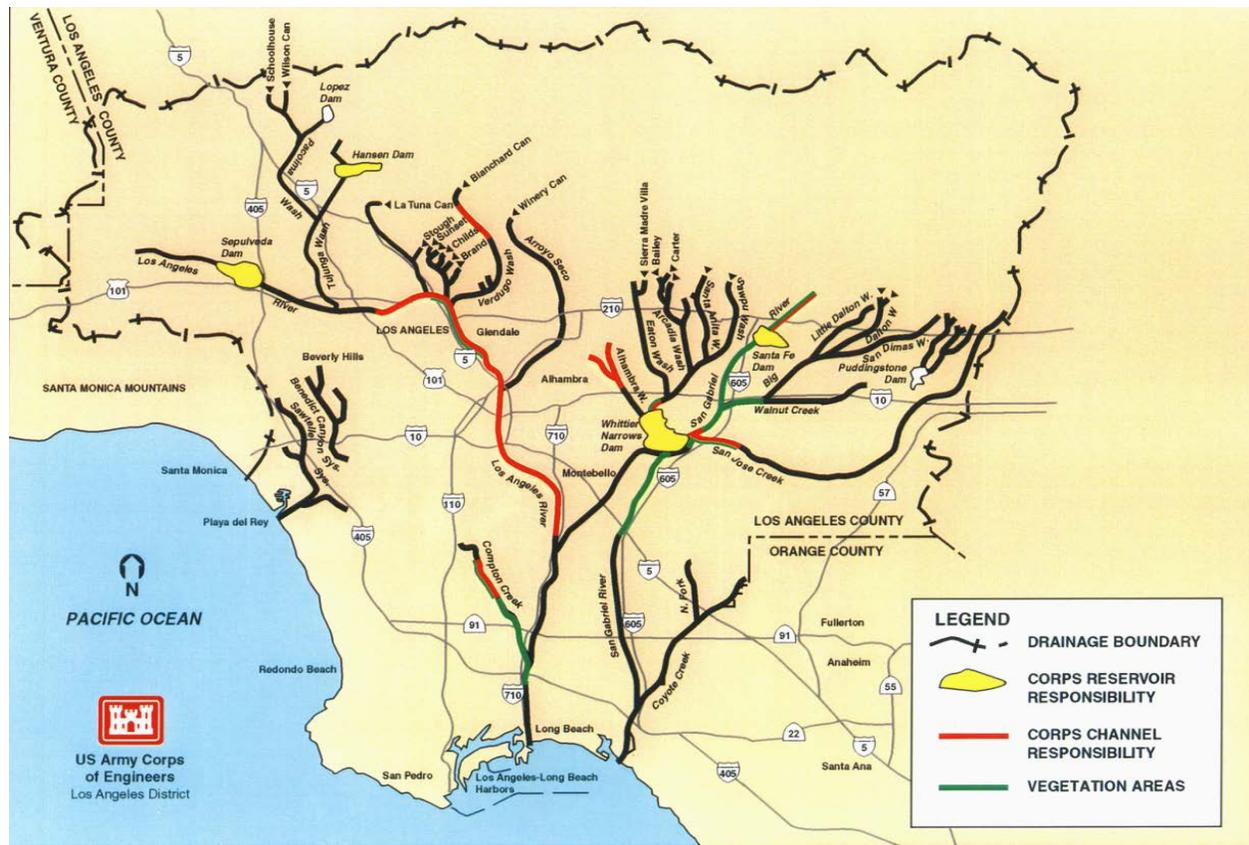


Figure 1: Location of Whittier Narrows Dam.

- (2) Dam Safety Action Classification (DSAC): Dam Safety Action Classification (DSAC) is a classification system that is used to categorize the safety level of dams. Whittier Narrows Dam is currently classified as DSAC-II, which is defined as being unsafe or potentially unsafe. Based on the definition, dams in this class are considered to have “failure initiation unforeseen.” Classification II means that failure could be initiated during normal operations or from a hydrologic or seismic event; or dams have a high risk with a combination of life or economic consequences with a high probability of failure. This DSAC rating was determined based on the FY 2006 Screening for Portfolio Risk Analysis (SPRA) and confirmed by the recently completed IES.
- (3) Issue Evaluation Study Findings: The results of an IES performed on the Whittier Narrows Dam confirmed dam safety issues and recommended that a dam safety modification study be performed to identify and evaluate alternatives to address them. Confirmed dam safety issues are manifested or obvious issues that impact the safe operation of a dam. Three failure modes were confirmed in the IES: backward erosion piping in the west foundation, backward erosion piping in the central foundation, and overtopping. The District is proposing that an additional failure mode identified in the IES, scour on the outlet works walls, be studied in the DSMS. See Figure 2 and Figure 3.

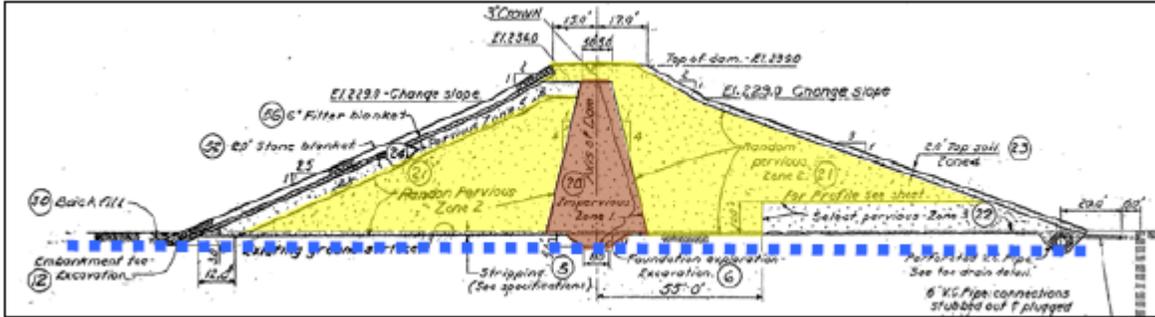


Figure 2: Failure Path for Backward Erosion Piping in the Central and West Foundations.



Figure 3: Failure Path for Scour of the Embankment Adjacent to the Outlet Works Wall.

c. **Factors Affecting the Scope and Level of Review.** Quality control will be achieved through DQC, ATR, Type I IEPR, QCC, Type II IEPR and ongoing coordination with RMC. Questions that were considered in determining the scope and level of review are identified in column 1 of Table 1. The PDT's assessment of these questions in relation to this study is listed column 2 of Table 1. The questions in Table 1 are from the EC 1165-2-214, Civil Works Review Policy, to determine the level of review required. Table 1 shows justification that a Type I IEPR is required for Whittier Narrows Dam. The PDT estimates that the implementation of the DSMS recommendations will range between \$10 to \$100 million.

Table 1: Factors Determining the Level of Review.

Questions to Determine Scope	Whittier Narrows Dam Safety Modification Study
Will parts of the study be challenging?	While the Study will require technical competence at all levels, the IES study indicated that the most challenging aspect will be the consequence evaluation.
Will the study report contain influential scientific information or be a highly influential scientific assessment?	At this time, we do not predict that the study will contain influential scientific information or be a highly influential scientific assessment.
Will the study have significant economic, environmental, and/or social effects to the Nation?	Yes. The IES indicates that there can be very significant loss of life and economic impacts associated with failure of this structure. Depending on the alternative risk management plan development, there may be low to significant environmental impacts that will need to be identified and evaluated as the study progresses.

Questions to Determine Scope	Whittier Narrows Dam Safety Modification Study
Will the study have significant interagency interest?	The study has local, state, and Federal interest.
Will the project/study have significant threat to human life/safety assurance?	The dam has been rated a DSAC-II, unsafe or potentially unsafe. The project itself presents a threat to human life/safety because of its considerable threat to human life in the event of a dam failure. The DSM study will not pose significant threat.
Will the study be highly controversial?	The study may become controversial depending upon the recommended risk reduction measures.
Will the information in the decision document be based on novel methods, present complex challenges for interpretation, contain precedent-setting methods or models, or present conclusions that are likely to change prevailing practices?	Not to the state of engineering practice. There may be novelty with respect to policy as it is among the first DSMS' to be prepared under the ER 1110-2-1156, Dam Safety – Policy and Procedures dated 28 October 2011.
What are the likely study risks and the magnitude of the risks?	Known risks associated with the DSMS are undetermined costs of obtaining real estate rights due to modifications to Whittier Narrows Dam, and resultant potential for delay. Depending on alternative plan selection ,risk is moderate to high. Risk of environmental impacts are also, depending on alternative plan selection, moderate to significant.

- d. **In-Kind Contributions.** Products and analyses provided by non-Federal sponsors as in-kind services are subject to DQC, ATR, and IEPR, however , there are no anticipated in-kind products at this time.

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. Please see Attachment 5 for a typical review schedule for a DSMS. Although DQC is not specifically noted, it shall be completed before submission for ATR.

- a. **Documentation of DQC.** The PDT suggests the use of internal seamless DQC during the development of the products. The PDT will document any major issues brought about during the DQC process and will be provided this to the ATR team at each review. The scope of the review includes: assumptions, methods, procedures, and material used in analyses, alternatives evaluated, the appropriateness of data used and level obtained, and reasonableness of the result, including whether the product is in compliance with existing Corps policy.

b. Products to Undergo DQC. The anticipated products from the following disciplines are expected to undergo DQC at this point are: planning, hydrology, hydraulics, real estate/lands, environmental resources, economics, geotechnical engineering, cost engineering, geology, civil design, structural design, and hazardous, toxic, and radioactive waste (HTRW). The products anticipated to undergo DQC for the DSMS may include, but are not limited to:

- (1) Alternatives Formulation Briefing to DSO and DST
- (2) Draft DSMS (including DSADS), Draft EIS, and Draft Technical Appendices
- (3) Draft Cost Estimate
- (4) Draft Real Estate Plan (REP)
- (5) Final Alternatives Formulation Briefing to DSO and DST
- (6) Final DSMS, Final EIS, and Final Technical Appendices
- (7) Final Cost Estimate
- (8) Final REP
- (9) Construction Design Plans

Review of additional specific disciplines may be identified, if necessary.

c. Required DQC Expertise. The required DQC expertise and team members are outlined in Table 13, and follow the disciplines outlined for product submittal as a part of the Whittier Narrows DSMS.

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 assigned by the RMC.

The DSMS will include a Dam Safety Action Decision Summary (DSADS), which is intended to be an extractable, stand-alone component of the DSMS that meets the information needs of senior USACE officials in making dam safety decisions. It would be a public document with unrestricted distribution, but is not designed to be a public communications document, per se.

During preparation of the DSMS for DSAC-I or –II dams, extensive and higher frequency of communication with approving authorities is required to assure a smooth and successful approval process. The MSC and HQUSACE will conduct agency policy compliance review. The RMC will review the risk estimate and verify that it is in compliance with the current policy for dam safety risk estimates. The RMC will review the risk management recommendations and verify the estimated risk reductions. . Please see Attachment 5 for a typical review schedule for a DSMS.

a. **Products to Undergo ATR.** The products anticipated to undergo ATR for the DSMS may include, but are not limited to:

- (1) Probable Maximum Flood Update Report
- (2) Alternatives Formulation Briefing to DSO and DST
- (3) Draft DSMS (including DSADS), Draft EIS, and Draft Technical Appendices
- (4) Draft Cost Estimate
- (5) Draft REP
- (6) Final Alternatives Formulation Briefing to DSO and DST
- (7) Final DSMS, Final EIS, and Final Technical Appendices
- (8) Final Cost Estimate
- (9) Final REP
- (10) Construction Design Plans

Review of additional specific disciplines may be identified, if necessary.

b. **Required ATR Team Expertise.** As the RMO, the RMC will identify the team lead and component members. The ATR team will be comprised of individuals from outside the home district that have not been involved in the development of the DSMS and will be chosen based on expertise, experience, and/or skills.

The name, organization, contact information, credentials, and years of experience of each member will be identified at the time the review is conducted. Once the RMC designates the ATR panel members, the review plan will be updated to reflect this selection. The types of expertise that may be required and represented are found in Table 2.

Table 2: ATR Team Descriptions

ATR Team Members/Disciplines	Expertise Required
ATR Lead	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 should also have experience with dam safety modifications, and should also serve as a reviewer for a specific discipline (such as geotechnical engineering, civil design, hydraulics, etc.).
Geotechnical Engineering	The geotechnical engineer shall have experience in the field of geotechnical engineering, analysis, design, and construction of embankment dams and dam safety engineering. The geotechnical engineer shall have experience in subsurface investigations, soil mechanics, internal erosion (seepage and piping), slope stability evaluations, erosion protection design, and earthwork construction. The geotechnical engineer shall have knowledge and experience in the forensic investigation of seepage, settlement, stability, and deformation problems associated with embankments constructed on similar geological formations.
Structural Engineering	The structural engineer team member shall have experience in the evaluation of outlet works and spillway features for dams and

	in seismic analysis of embedded control structures, buried conduits, tunnels, bridges, and gravity dam design.
Civil Design Engineer	The civil design member will have expertise in utility relocations, positive closure requirements, structural design, and non-structural flood damage reduction and knowledge of dam safety engineering.
Engineering Geologist	The engineering geologist shall have experience in assessing alluvial foundations and the conditions which could lead to internal erosion (seepage and piping) beneath embankment dams constructed on similar geologic formations. The engineering geologist shall be familiar with identification of geological hazards, exploration techniques, field and laboratory testing, and instrumentation.
Hazardous, Toxic and Radioactive Waste (HTRW)	An assessment for need will be made for hazardous, toxic, and radiological waste (HTRW) evaluation by the Geology and Investigations Section during Phase 1. If needed, team member will have expertise in assessment of HTRW to determine the nature and extent of HTRW materials within the project area.
Hydraulic Engineering	The hydraulic engineer shall have experience in the analysis and design of hydraulic structures related to embankment dams including the design and performance of tainter gates. The hydraulic engineer shall be knowledgeable and experienced with the routing of inflow hydrographs through multipurpose flood control reservoirs utilizing multiple discharge devices, Corps application of risk and uncertainty analyses in flood damage reduction studies, and standard Corps hydrologic and hydraulic computer models used in drawdown studies, dam break inundation studies, hydrologic modeling and analysis for dam safety investigations.
Hydrology	The hydrology team member will be an expert in the field of rainfall runoff models, flow-frequency analysis, hydrologic effects of flood control operations, and hydrologic analysis using HEC-HMS.
Hydraulic Engineering	The hydraulic engineer shall have experience in the analysis and design of hydraulic structures related to embankment dams including the design and performance of tainter gates. The hydraulic engineer shall be knowledgeable and experienced with the routing of inflow hydrographs through multipurpose flood control reservoirs utilizing multiple discharge devices, Corps application of risk and uncertainty analyses in flood damage reduction studies, and standard Corps hydrologic and hydraulic computer models used in drawdown studies, dam break inundation studies, hydrologic modeling and analysis for dam safety investigations.
Electrical/Mechanical Engineering	The electrical/mechanical engineer team member shall have broad experience in the evaluation of existing tainter gates and those elements which support their operation.

Cost Engineering	The cost engineering team member will have extensive Corps' 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. Reviewer needs certification from the Cost Engineering Center of Expertise.
Construction/Operations	The construction team member should have a solid background in dam construction and/or remediation practices. This team member will provide perspective on constructability of the alternative plans that are developed throughout the DSMS process and will provide a practical approach to designs.
Reservoir Control/Water Management	This team member will be have knowledge of real-time daily and flood operations, regulation decisions, gauging network and system infrastructure, national water control policy, water control data software, and systems operations.
Hazardous, Toxic and Radioactive Waste (HTRW)	An assessment for need will be made for hazardous, toxic, and radiological waste (HTRW) evaluation by the Geology and Investigations Section during Phase 1. If needed, team member will have expertise in assessment of HTRW to determine the nature and extent of HTRW materials within the project area.
Planning	The Planning reviewer should be a senior water resources planner with experience in the civil works process, watershed level projects, and current flood damage reduction planning and policy guidance. Team member will have experience in plan formulation for multi-purpose projects and planning in a collaborative environment, as it applies to dam safety studies following ER 1105-2-100 and 1110-2-1156.
Economics (or Consequence Specialist)	This team member shall be knowledgeable of policies and guidelines of ER 1110-2-1156 as well as experienced in analyzing flood risk management projects in accordance with ER 1105-2-100, the Planning Guidance Notebook. The economist shall be knowledgeable and experienced with standard Corps computer models and techniques used to estimate population at risk, life loss, and economic damages.
Environmental Resources Coordinator/Specialist	The environmental coordinator or specialist team member shall have knowledge of NEPA, Federal environmental laws, Executive Orders and Corps' environmental policies, including applicable Engineering Regulations and in accordance with the Planning Guidance Notebook, ER 1105-2-100, Implementing NEPA, ER 200-2-2, and others. The environmental reviewer shall have knowledge of implementing such areas regarding environmental justice, climate change, understanding of esthetic resources, and issues impacting public safety and welfare.
Cultural Resources	The cultural resources team member shall have knowledge of Section 106 of the National Historic Preservation Act, 36 CFR 800, NAGPRA, NEPA, Executive Orders regarding cultural resources and Tribal issues, and Corps' environmental policies as they relate

	to cultural resources, including applicable Engineering Regulations and in accordance with the Planning Guidance Notebook, ER 1105-2-100, Implementing NEPA, ER 200-2-2, and others.
Real Estate	The real estate team member will be experienced in federal civil works real estate laws, policies, and guidance. They will manage issues with modifications, borrow area right-of-ways, easements, and the gravel quarries.

c. 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 been 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 1165-2-214, 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. Please see Attachment 5 for a typical review schedule for a DSMS. There are two types of IEPR:

- **Type I IEPR.** Type I IEPR reviews are managed outside the USACE and are conducted on project studies. The requirement for Type II IEPR is based on Section 2034 of the Water Resources Development Act of 2007 (WRDA 2007), the OMB Peer Review Bulletin and other USACE policy considerations. 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 environmental impacts of the proposed alternative modifications for 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 1165-2-214.
 - **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 is conducted for decision documents if there is a vertical team decision that the covered subject matter meets certain criteria (described in EC 1165-2-214) where the risk and magnitude of the proposed project are such that a critical examination by a qualified team outside the USACE is warranted. EC 1165-2-214 requires a Type I IEPR whenever there is a significant threat to human life. Table 3 outlines the rationale on the decision of Type I IEPR for the

Whittier Narrows DSMS. The IES shows that Whittier Narrows poses that threat; accordingly, a Type I IEPR will be conducted.

Table 3: Factors Determining the Need for Type I IEPR.

Questions to Determine IEPR	Whittier Narrows Dam Safety Modification Study
Is there significant threat to human life?	The project has been determined to have a high life safety risk.
Is the total project cost more than \$45 million?	Project cost can not be estimated at this time as alternative risk management plans have not yet been developed.
Has the Governor of California requested a Type I IEPR?	The Governor has not requested a Type I IEPR.
Has the head of a Federal or state agency charged with reviewing the project/study requested a Type I IEPR?	No the head of a Federal or state agency charged with reviewing the project/study has not requested a Type I IEPR.
Will there be a significant public controversy as to 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 that are likely to change prevailing practices?	The study will not be based on information from novel methods, present complex challenges or interpretation, nor contain precedent-setting methods or models, or present conclusions that are likely to change prevailing practices.
What are the likely study risks and the magnitude of the risks?	Known risks associated with the DSMS are undetermined costs of obtaining real estate rights due to modifications to Whittier Narrows Dam, and resultant potential for delay. Depending on alternative plan selection, risk is moderate to high. Risk of environmental impacts are also, depending on the alternative plan selection, moderate to significant.

- b. Products to Undergo Type I IEPR.** The Type I IEPR will be performed for the draft and final reports, including NEPA/environmental compliance documentation and technical appendices. Type I IEPR panel 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. Required Type I IEPR Panel Expertise.** The Type I IEPR panel members will be comprised of individuals that have not been involved in the development of the decision document, meet the National Academy of Sciences guidelines for independence, and will be chosen by the OEO. The OEO will determine the final participants on the Type I IEPR panel. The name, organization, contact information, credentials, and years of experience of each member will be identified at the time the review is conducted. Once the OEO designates the IEPR panel members, the review plan

will be updated to reflect this selection. The types of expertise are anticipated to be similar to those required for ATR. A safety assurance review will be included in the Type I IEPR process.

Table 4: IEPR Team Descriptions

IEPR Panel Members/Disciplines	Expertise Required
Geotechnical Engineering Panel Member	It is preferred that the member(s) possess a PhD degree in geotechnical engineering, although an MS degree is acceptable with professional registration as a geotechnical engineer. Minimum 20 years experience in geotechnical seismic design, and embankment dam design and evaluation. Additionally, at least 10 years experience in and piping and seepage failure mode analysis, and risk analysis of embankment dams, familiarity with USACE dam safety assurance policy and guidance, as well as competency in seismic modeling (preferably the finite difference model FLAC v6 commercially available through ITASCA)
Geology Panel Member	The member(s) should be a registered professional engineer with a minimum MS degree or higher in geology. Member(s) should have 10-15 years experience in and knowledge of subsurface geology.
Reservoir Control/Water Management	This Member should have a minimum of 10 years experience directly related to water management and reservoir control. The member shall have expertise in real-time daily and flood operations, regulation decisions, gauging network and system infrastructure, national water control policy, water control data software, and systems operations
Hydraulic Engineer	The member(s) should be a registered professional engineer with a minimum MS degree or higher in engineering science. Member(s) should have 10-15 years experience in the analysis and design of outlet works and spillways for embankment dams and 5-10 years experience in physical and numerical modeling. The panel member(s) should be familiar with USACE application of risk and uncertainty analyses in flood risk management studies and a familiarity with standard USACE hydrologic and hydraulic computer models.
Structural Engineer Panel Member	It is preferred that this member possess a PhD degree in engineering science, although an MS degree acceptable with professional registration as a Civil Engineer or Structural Engineer. The member should have a minimum of 15 years experience in static and seismic design per industry code standards and USACE design regulations for Civil Works projects, dynamic site-specific response spectra analysis and evaluation, and soil-structure interaction evaluation and design.
Cost Engineer Panel Member	Member should have a BS degree or higher. This member should have a minimum of 15 years experience with dam construction cost estimating and a working familiarity of USACE cost estimating systems (presently MII, a second generation of M-CACES).
Economics Panel Member	The Economics Panel Member should possess a minimum MS

	degree or higher in economics. Member must have at least ten years experience directly related to water resource economic evaluation, review, and/or plan formulation. At least 5 years experience directly working for or with USACE is highly recommended. Five years experience directly dealing with HEC-FDA is required, and the Panel Member must have two years experience in reviewing federal water resource economic documents justifying construction efforts.
Environmental/NEPA Impact Assessment Panel Member	This Member should have a minimum of 10 years demonstrated experience in evaluating and conducting NEPA impact assessments, including cumulative effects analyses, for complex multi-objective public works projects with competing trade-offs. The Panel Member should have a minimum MS degree or higher in an appropriate field of study. This Member's experience should include multiple projects in which he/she was involved in the plan formulation process. Experience should encompass determining the scope and appropriate methodologies for impact assessment and analyses for a variety of projects and programs with high public and interagency interests and having project impacts to nearby sensitive habitats.
Real Estate Panel Member	The real estate team member will be experienced in federal civil works real estate laws, policies, and guidance. They will manage issues with modifications, borrow area right-of-ways, easements, and the gravel quarries.

d. Documentation of Type I IEPR. The IEPR panel will be selected and managed by an Outside Eligible Organization (OEO) per EC 1165-2-214, 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. TYPE II INDEPENDENT EXTERNAL PEER REVIEW

- a. **General.** Once the DSMS has been approved, during design and construction a Type II IEPR Safety Assurance Review (SAR) of design and construction activities for flood risk management or coastal storm damage reduction projects or for other activities that affect public safety, will be conducted for reviewing the relevancy and effectiveness of the Corps inspection of completed works and safety programs in promoting safety and competent performance. They are not required to be managed by OEO's and may be managed by the Corps MSC or by an outside organization. While aspects of the project may be included in this review, it will focus on the public safety aspects. This section will be updated once the project has reached the design and construction phase.

SAR applies to new projects and the major repair, rehabilitation, replacement, or modification of existing facilities. The requirement for Type II IEPR is based on Section 2035 of the Water Resources Development Act of 2007 (WRDA 2007), the OMB Peer Review Bulletin and other USACE policy considerations. External panels will conduct reviews of the design and construction activities prior to the 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. The Review Management Office for Type II IEPR reviews is the USACE Risk Management Center (RMC). Panel members will be selected using the National Academies of Science (NAS) policy for selecting reviewers. Type II IEPR is not exempted by statute from the Federal Advisory Committee Act (FACA).

- b. **Decision on Type II IEPR.** The decision to conduct Type II IEPR is based on guidance from the Engineering Circulation, EC 1165-2-214. Whittier Narrows Dam needs a Type II IEPR because potential hazards pose a significant threat to human life.
- c. **Products for Review.** External panels will conduct reviews of the design and construction activities prior to the 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. This review plan is a "living document" and will be updated to discuss Type II IEPR in more detail once design of the remediation is in process.
- d. **Type II IEPR Panel Expertise.** The Type II IEPR panel members will be comprised of individuals that have not been involved in the development of the decision document, meet the National Academy of Sciences guidelines for independence, and will be chosen by and outside organization. The types of expertise may be represented on the Type II IEPR team are described in Table 5.

Table 5: Type II IEPR Team Member Descriptions.

Type II IEPR Panel Members/Disciplines	Expertise Required
Civil Design Panel Member	The member(s) should be a registered professional engineer with a minimum MS degree or higher in civil or construction engineering. Member(s) should have 10-15 years experience in the embankment dam construction practices. The panel member(s) should be familiar with typical construction and construction management practices
Construction Management Panel Member	The member(s) should be a registered professional engineer with a minimum MS degree or higher in civil or construction engineering. Member(s) should have 10-15 year experience in the dam construction practices. The panel member(s) should be experienced with dam construction and best management practices.
Structural Engineer Panel Member	It is preferred that this member possess a PhD degree in engineering science, although an MS degree acceptable with professional registration as a Civil Engineer or Structural Engineer. The member should have a minimum of 15 years experience in static and seismic design per industry code standards and USACE design regulations for Civil Works projects, dynamic site-specific response spectra analysis and evaluation, and soil-structure interaction evaluation and design.
Geotechnical Engineering Panel Member	It is preferred that the member(s) possess a PhD degree in geotechnical engineering, although an MS degree is acceptable with professional registration as a geotechnical engineer. Minimum 20 years experience in geotechnical seismic design, and embankment dam design and evaluation. Additionally, at least 10 years experience in and piping and seepage failure mode analysis, and risk analysis of embankment dams, familiarity with USACE dam safety assurance policy and guidance, as well as competency in seismic modeling (preferably the finite difference model FLAC v6 commercially available through ITASCA).

Panel members identified in Table 5 are subject to change as the DSMS is in the initiation phase and this section will require update when the DSMS is approved and is ready for the pre-engineering and design (implementation) phase.

8. OTHER REVIEWS

- a. **MSC and HQ Policy and Legal Compliance.** Subsequent to ATR, the DSMS will be reviewed for compliance with law and policy. These reviews culminate in Washington-level determinations that the recommendations in the reports and the supporting analyses and coordination comply with law and policy, and warrant approval or further recommendation to higher authority by the Chief of Engineers. Guidance for policy and legal compliance reviews is addressed further in Appendix H of ER 1105-2-100. DQC and ATR augment complement the policy review process by addressing compliance with pertinent published Army policies, particularly policy review processes by addressing compliance on analytical methods and the presentation of findings in decision

documents. When policy and/or legal issues arise during DQC or ATR that are not readily and mutually resolved by the PDT and the reviewers, the District will seek issue resolution support from the MSC and HQUSACE in accordance with the procedures outlined in Appendix H, ER 1105-2-100. The home district Office of Counsel is responsible for the legal review of each decision document and certification of legal sufficiency.

- b. Office of Water Project Review.** The Whittier Narrows DSMS will undergo an Office of Water Project Review (OWPR) for concurrence and approval before submittal for HQ Review. Once the MSC review is complete, the DSMS will be submitted to HQ through OWPR. The PDT will address OWPR comments and coordinate the review through the SPD Regional Integration Team (RIT) member. The RIT acts as the liaison between the PDT, OWPR, HQ, and ASA(CW). If significant issues arise during the review process, the RIT will determine if a face-to-face or teleconference issue resolution conference is necessary for comment resolution.
- c. Value Engineering (VE).** A Value Engineering study will be conducted after the Alternative Formulation workshop as part of the DSMS. A report will be prepared to show the value engineering process that was used. The aim of the VE studies should be to ensure that the widest range of feasible and cost efficient engineering measures are considered and that alternatives formulated from those measures are not limited to those that first come to mind at the initiation of the study. Putting this step into the process ensures consideration of the fullest range of measures and alternatives. The results will be presented in the DSMS and integrated into the discussion of the formulation of alternatives.
- d. Senior Oversight Group (SOG) Review.** The SOG generally consists of the Special Assistant for Dam Safety, key Community of Practice leaders and various regional representatives as determined by the Special Assistant. The function of the SOG is to review dam safety risk assessment reports prepared by the RA cadres and other decision documents and make recommendations on dam safety modifications to the Special Assistant and the Corps DSO. The district will present the baseline risk assessment, risk management alternatives considered, and the recommended risk management plan to the dam safety Senior Oversight Group prior to the IEPR.

9. 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.

10. 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 planning models are anticipated to be used in the development of the decision document are described in Table 6.

Table 6: Anticipated Planning Models

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 (Flood Damage Analysis)	The Hydrologic Engineering Center’s Flood Damage Reduction Analysis (HEC-FDA) program provides the capability for integrated hydrologic engineering and economic analysis for formulating and evaluating flood risk management plans using risk-based analysis methods. The software developed by USACE provides the capability to perform an integrated hydrologic engineering and economic analysis during the formulation and evaluation of flood risk management plans. HEC-FDA computes the expected annual damages (EAD) corresponding to flood mapping.	Certified
HEC-FIA	The Hydrologic Engineering Center’s Flood Impact Analysis software (HEC-FIA) calculates post-flood or forecasted-flood impacts for a user-specified event. It is also used to determine flood damage reduction benefits attributed to individual flood-control projects (reservoirs, levees, and diversions) and for real-time response activities as part of the U.S. Army Corps of Engineers Water Management System. For the specified event, HEC-FIA computes urban and agricultural flood damage, area inundated, number of structures inundated, population at risk, and life loss. The life loss computation in HEC-FIA is based on the LifeSim methodology developed at Utah State University, and includes consideration of many factors including initial distribution of population for day and night, redistribution of that population base on dam failure warning, evacuation potential, and sheltering opportunities. Damage analysis of crops involves a complex series of factors and considerations including the type of crop, season, cropping patterns, duration and magnitude of flooding, and much more. Monetary damage values for agriculture is determined from investment losses, mature-crop price values, harvest costs, and may include secondary business losses.	Certified

Various Environmental modeling	Other models, such as regional Input-Output models, may be added as needed as the study progresses. The Ecosystem Restoration Planning Center of Expertise has responsibility for approving ecosystem output methodologies for use in ecosystem restoration planning and mitigation planning. The Ecosystem PCX will need to certify or approve for use each regionally modified version of these methodologies and individual models and guidebooks used in application of these methods. The PDT will coordinate with the Ecosystem PCX during the study to identify appropriate models and certification approval requirements.	TBD
IWR-Planning Suite	This software assists in the formulation and comparison of alternative plans. While IWR-PLAN was initially developed to assist with environmental restoration and watershed planning studies, the program can be useful in planning studies addressing a wide variety of problems. IWR-PLAN can assist with plan formulation by combining solutions to planning problems and calculating the additive effects of each combination, or “plan”. IWR-PLAN can assist with plan comparison by conducting cost-effectiveness and incremental cost analyses, identifying the plans which are best financial investments and displaying the effects of each on a range of decision variables.	Certified

b. Engineering Models. The engineering models are anticipated to be used in the development of the decision document are described in Table 7.

Table 7: Anticipated Engineering Models

Model Name and Version	Brief Description of the Model and How It Will Be Applied in the Study	Approval Status
HEC-HMS	By applying this model, the PDT is able to define the watersheds’ physical features, describe the meteorological conditions, estimate pertinent parameters, analyze simulations, and obtain GIS connectivity.	Certified
HEC-ResSim	This model predicts the behavior of reservoirs and to help reservoir operators plan release in real-time during day-to-day and emergency operations. ResSim includes the following features: graphical user interface, map-based schematic and rule-based operations.	Certified
HEC-RAS	This unsteady 1-D flow model will be used to simulate the channel hydraulics of the San Gabriel and Rio Hondo river channels.	Certified
FLO-2D	This unsteady 2-D flow model will be used to simulate wide alluvial fan floodplain inundation, and produce corresponding floodplain mapping.	Certified
UTEXAS4	This model is used to conduct slop stability analysis.	Certified
GeoSlope Suite	This program includes the Seep/W and Slope/W models for	Certified

	seepage and slope stability analyses. Both models are identified in SET and in wide use within the Corps and the A/E community.	
Groundwater Modeling System (GMS)	This model is used to conduct seepage analysis.	Certified
Cost Estimating Model MCACES	MCACES (MII) are cost estimating models. This model was developed by Building Systems Design Inc.	Certified
SAP2000	This is integrated software for structural analysis and design. It is used for Deformation Analysis, Multiple P-Delta, Eigen and Ritz Analyses, Cable Analysis, Tension or Compression Only Analysis, Buckling Analysis, Blast Analysis, Fast Nonlinear Analysis for Dampers, Base Isolators and Support Plasticity, Energy Methods for Drift Control and Segmental Construction Analysis	Certified
Dam Safety Risk Analysis Engine (DAMRAE)	The computer program <i>DAMRAE</i> (Dam Safety Risk Analysis Engine) Database was developed by the Utah Water Research Laboratory (UWRL) at Utah State University (Logan) for USACE, was used to perform risk analysis.	Not currently certified

11. REVIEW SCHEDULES AND COSTS

- a. **DQC Schedule and Cost.** DQC shall be performed and certified before ATR submittal and does not have a schedule, as it will be performed as the products are developed. The estimated DQC cost is \$40,000.
- b. **ATR Schedule and Cost.** The estimated ATR cost within the Los Angeles District is estimated to be \$20,000 and \$50,000 for the reviewers. This is an approximate total of \$70,000 for the ATR effort. Please see Table 9 for the estimated schedule for ATR. It is anticipated that once ATR is initiated, there will be a two week review period for the ATR members, a one week response period, followed by a final two week backcheck, finalization and certification period. These details will be worked out when the document reaches this milestone and the ATR lead is identified.
- c. **Type I IEPR Schedule and Cost.** The estimated Type I IEPR cost is \$20,000 for Los Angeles District and \$150,000 for the contracted effort. This is an approximate total of \$170,000 for the Type I IEPR effort. Please see Table 9 for the estimated schedule for IEPR. These details will be worked out when the document reaches this milestone and the Type I IEPR lead is identified. This Review Plan will require an update once the feasibility phase is complete and the project moves into implementation, which will include the Type II IEPR review cost and schedule.
- d. **Model Certification/Approval Schedule and Cost.** This section may be updated at a later date as the study progresses; however, no models require certification at this point. The budget estimate may need to be updated based on model certification if necessary.
- e. **Type II IEPR Schedule and Cost.** In planning for a Type II IEPR review, estimates will need to include the cost for the RMO to administer and manage the Type II review and the cost of the independent panel. The cost of a Type II review through completion of construction should be reasonable and

scalable, a function of complexity and duration, and managed as opposed to a carte-blanch approach. Table 8 provides as a guideline for scaling the Type II review. This section will be updated as a recommended alternative management plan is chosen and a project cost is identified.

Table 8: Cost Guidelines for Type II IEPR

Type II Review Cost Guideline	
<i>Total Project cost</i>	<i>Range</i>
\$0 to < \$15 million	0.90 to 1.50%
\$15 million to \$45 million	0.5 to 1.20%
> \$45 million	0.10 to 0.85%

Table 9: Overall Review Schedule and Milestones for the Whittier Narrows DSMS

Suggested/Actual Date	Milestone
May 2011	District Dam Safety Officer and RMC present final IES Report to Senior Oversight Group (SOG)
Nov 2011/Mar2012	Prepare DSMS PMP
Mar 2012	Submit Review Plan with DSMS inclusion
Nov 2012	Submit Revised Review Plan
Apr 2012	Kick Off Meeting
Sep 2012	Risk Management Measure Identification Meeting
Dec 2012	Review and approve revised DSMS PMP by district, MSC, and HQ
Jan 2013	ATR of PMF Update
Jan 2013	QCC of BRE update
Mar 2013	RMC In-progress review of Alternative Development
Jul 2013	Risk Management Plan Meeting
Aug 2013	Tentatively Recommended Plan Meeting
Sep 2013	Detailed Constructability Review
Oct 2013	In Progress Review
Nov 2013	Initiate Type I IEPR
Nov 2013	Draft DSMS/EIS
Dec 2013	DQC DSMS/EIS
Jan 2014	ATR DSMS/EIS
Feb 2014	Risk Management Plan Alternative Formulation Briefing
May 2014	Draft Final DSMS
Feb 2014	MSC and HQUSACE DSO Brief
May 2014	Policy Compliance Review
May 2014	SOG presentation
Jun 2014	Finish IEPR Type I*
Jun 2014	DSO Approval

*Note: Type II IEPR will commence after DSMS approval when funds are received for PED and construction.

12. PUBLIC PARTICIPATION

The USACE will conduct stakeholder meetings to present the results of investigations on the Whittier Narrows Dam deficiencies and the preliminary risk reduction measures that are being considered in the formulation of the remediation alternatives. There will be a discussion of the Issue Evaluation and Dam Safety Modification processes, Q&A, and opportunity to submit comments and solicit input regarding issues of concern. As part of the NEPA process it is anticipated that the project will require an EIS. The Public will be provided an opportunity to comment on the EIS. Additional meetings will be held as necessary.

The public review of necessary state or Federal permits will also take place. A formal State and Agency review will occur concurrently with the public review. Upon completion of the review period, comments will be consolidated in a matrix and addressed. A comment resolution meeting will take place, if needed, to decide upon the best resolution of comments. A summary of the comments and resolutions will be included in the decision and NEPA documents. A plan for future public participation will be developed, which might identify informal as well as additional formal forums for participation.

13. REVIEW PLAN APPROVAL AND UPDATES

The South Pacific Division Commander is responsible for approving this Review Plan. The Commander's approval reflects vertical team input (involving district, MSC, RMC, 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.

14. REVIEW PLAN POINTS OF CONTACT

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

Name	Position	Phone	Email
Kathy Anderson	Los Angeles District Project Manager	818-776-9049 ext. 106	Kathleen.s.Anderson@usace.army.mil
Quana Higgins	Los Angeles District Lead Planner	602-230-6905	Quana.N.Higgins@usace.army.mil
Douglas Chitwood	Los Angeles District Lead Engineer	213-452-3587	Douglas.E.Chitwood@usace.army.mil
Rick Britzman	South Pacific Division Dam Safety Program Manager	916-557-6607	Richard.A.Britzman@usace.army.mil
Mark Ahlstrom	Risk Management Center Civil Engineer	303-963-4546	Mark.E.Ahlstrom@usace.army.mil

ATTACHMENT 1: TEAM ROSTERS

Per U.S. Army Corps of Engineers Circular No. 1165-2-214, dated 15 December 2012, Appendix B, Section 6, "in posted documents, lists of the names of USACE reviewers should not be displayed".

ATTACHMENT 2: SAMPLE STATEMENT OF TECHNICAL REVIEW FOR DECISION DOCUMENTS

COMPLETION OF AGENCY TECHNICAL REVIEW

The Agency Technical Review (ATR) has been completed for the <type of product> for <project name and location>. The ATR was conducted as defined in the project’s Review Plan to comply with the requirements of EC 1165-2-214. 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 DrCheckssm.

SIGNATURE

Name
ATR Team Leader
Office Symbol/Company _____ Date

SIGNATURE

Name
Project Manager
Office Symbol _____ Date

SIGNATURE

Name
Architect Engineer Project Manager¹
Company, location _____ Date

SIGNATURE

Name
Review Management Office Representative
Office Symbol _____ 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.

SIGNATURE

Name
District Dam Safety Officer
Office Symbol _____ Date

SIGNATURE

Name
Chief, Planning Division
Office Symbol _____ Date

¹ Only needed if some portion of the ATR was contracted

ATTACHMENT 3: REVIEW PLAN REVISIONS

Revision Date	Description of Change	Page / Paragraph Number

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
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
ITR	Independent Technical Review	SAR	Safety Assurance Review
LRR	Limited Reevaluation Report	USACE	U.S. Army Corps of Engineers
MSD	Major Subordinate Command	WRDA	Water Resources Development Act

Dam Safety Glossary

Agency Technical Review (ATR) – an independent in-depth review to ensure the proper application of clearly established criteria, regulations, laws, codes, principles and professional practices. The ATR team reviews that various work products and assures that all the parts fit together in a coherent whole.

DSAC Class I (Urgent and Compelling) – Dams where progression toward failure is confirmed to be taking place under normal operations and the dam is almost certain to fail under normal operations within a time frame from immediately to within a few years without intervention; or, the combination of life or economic consequences with 8584 probability of failure is extremely high.

DSAC Class II (Urgent) – Dams where failure could begin during normal operations or be initiated as the consequence of an event. The likelihood of failure from one of these occurrences, prior to remediation, is too high to assure public safety; or, the combination of life or economic consequences with probability of failure is very high.

DSAC Class III (High Priority) – Dams that have issues where the dam is significantly inadequate or the combination of life, economic, or environmental consequences with probability of failure is moderate to high.

DSAC Class IV (Priority) – Dams are inadequate with low risk such that the combination of life, economic, or environmental consequences with a probability of failure is low and the dam may not meet all essential USACE engineering guidelines.

DSAC Class V (Normal) – Dams considered adequately safe, meeting all essential agency guidelines and the residual risk is considered tolerable.

Dam Safety Modification Study – The safety case that presents the investigation, documentation, and justification of modifications for dam safety at completed Corps of Engineers projects. The report presents the formulation and evaluation for a full range of risk reduction alternatives with preliminary level cost estimates. A detailed risk assessment is required to look at incremental risk reduction alternatives that together meet the tolerable risk guidelines and cost effectiveness of additional risk reduction below the minimum safety criteria. However, the level of detail should only be what is needed to justify the modification decision. Related NEPA (reference A-98) and ESA studies will be conducted during the Modification Study, in support of the recommended risk reduction measures. The resultant Dam Safety Modification Decision Document will present a comparison of alternatives and the recommended risk management plan to include actions, components, risk reduction by increments, implementation plan, detailed cost estimate, NEPA, and ESA determinations.

Dam Safety Officer (DSO) – A registered professional civil engineer with management abilities who is competent in the areas related to the design, construction, operation, inspection or evaluation of dams. They must understand adverse dam incidents and the potential causes and consequences of dam failure. The DSO is the highest-ranking Registered Professional Engineer in each level of the Corps of Engineers responsible for implementing the dam safety program of that organization. The

Commander shall ensure the DSO meets the technical qualifications and experience. The DSO is the Chair of the Dam Safety Committee.

Interim Risk Reduction Measure (IRRM) – Dam Safety Risk Reduction Measures that are to be formulated and undertaken for dams that are not considered to be tolerably safe and are intended as interim until more permanent remediation measures are implemented. Increased monitoring and reservoir restrictions are examples of interim measures that can be taken at a project.

Risk assessment – Risk assessment is a broad term that encompasses a variety of analytic techniques that are used in different situations, depending upon the nature of the risk, the available data, and needs of decision makers. A risk assessment is a systematic, evidence based approach for quantifying and describing the nature, likelihood, and magnitude of risk associated with the current condition and the same values resulting from a changed condition due to some action. Risk assessment includes explicit acknowledgment of the uncertainties in the risk. As applied to dam safety, the process of identifying the likelihood and consequences of dam failure to provide the basis for informed decisions on a course of action.

Risk Management Center (RMC) – An independent USACE Center assigned to the Institute of Water Resources, which is responsible for development and implementation of dam and levee safety policy, prioritization of national dam and levee safety projects and technical consistency of dam and levee safety products. The Center utilizes a combination of in-situ and virtual resources (district, contract, and Risk and Reliability Directory of Expertise, the Modeling, Mapping, and Consequence Production Center, and Policy and Procedures workgroups) to manage the program.

Safety Assurance Review (SAR) Team - Section 2035, Safety assurance review team, Public Law 110-114, the Water Resource Development Act of 2007, requires a safety assurance review of the design and construction of work effecting public safety. This review team is formed at the time pre-construction engineering and design starts and stays with the project until the completion of construction.

Type I IEPR – An Independent External Peer Review IEPR conducted for feasibility, reevaluation, modification, and assessment reports with an EIS and managed by an outside eligible organization (OEO) that is described in Internal Revenue Code Section 501(c) (3); as exempt from Federal tax under section 501(a), of the Internal Revenue Code of 1986; as independent; as free from conflicts of interest; does not carry out or advocate for or against Federal water resources projects; and has experience in establishing and administering IEPR panels. These reviews are exempt from the Federal Advisory Committees Act (FACA). The scope of review will address all the underlying planning, engineering, including safety assurance, economics, and environmental analyses performed, not just one aspect of the project.

Type II IEPR – A Safety Assurance Review (SAR) of design and construction activities for flood damage reduction or coastal storm damage reduction projects or for other activities that affect public safety, and will also be conducted for reviewing the relevancy and effectiveness of the Corps inspection of completed works and safety programs in promoting safety and competent performance. They are not required to be managed by OEO's and may be managed by the Corps MSC or by an outside organization. While all aspects of the project may be included in the review, it will focus on the public safety aspects.

