REVIEW PLAN
for
DOVER DAM SAFETY ASSURANCE PROJECT
TUSCARAWAS RIVER
Design and Construction Activities
Huntington District

January 2011

US Army Corps
of Engineers ®

REVIEW PLAN

DOVER DAM SAFETY ASSURANCE PROJECT
Design and Construction Activities

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1. PURPOSE AND REQUIREMENTS

a. Purpose. This Review Plan defines the scope and level of peer review for the design and construction activities of the Dover Dam Safety Assurance Project.

b. References

(1) Engineer Circular (EC) 1165-2-209, Civil Works Review Policy, 31 January 2010
(2) Engineer Regulation (ER) 1110-1-12, Quality Management, 31 July 2006
(3) Dover Dam Safety Assurance Project, Project Management Plan
(4) Draft ER 1110-2-1156 Chapter 9, Dam Safety Modification Studies and Documentation, 16 July 2009

c. Requirements. This review plan was developed in accordance with EC 1165-2-209, which establishes an accountable, comprehensive, life-cycle review strategy for Civil Works products by providing a seamless process for review of all Civil Works projects from initial planning through design, construction, and Operation, Maintenance, Repair, Replacement and Rehabilitation (OMRR&R). It provides the procedures for ensuring the quality and credibility of U.S. Army Corps of Engineers (USACE) decision, implementation, and operations and maintenance documents and work products. The EC outlines three levels of review: District Quality Control, Agency Technical Review, and Independent External Peer Review.

(1) District Quality Control (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). Basic quality control tools include a Quality Management Plan providing for seamless review, quality checks and reviews, supervisory reviews, Project Delivery Team (PDT) reviews, etc. It is managed in the home district. Quality checks may be performed by staff responsible for the work, such as supervisors, work leaders, team leaders, designated individuals from the senior staff, or other qualified personnel. However, they should not be performed by the same people who performed the original work, including managing/reviewing the work in the case of contracted efforts. Additionally, the PDT is responsible for a complete reading of any reports and accompanying appendices prepared by or for the PDT to assure the overall coherence and integrity of the report, technical appendices, and the recommendations before approval by the District Commander.. The Major Subordinate Command (MSC)/District Quality Management Plans address the conduct and documentation of this fundamental level of review. DQC is not addressed further in this review plan.

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

(3) Independent External Peer Review (IEPR). IEPR is the most independent level of review, and is applied in cases that meet certain criteria where the risk and magnitude of the proposed

project are such that a critical examination by a qualified team outside of USACE is warranted. For clarity, IEPR is divided into two types, Type 1 is generally for decision documents and Type II is generally for implementation documents.

A Type II IEPR (SAR) shall be conducted on design and construction activities for hurricane and storm risk management and flood risk management projects, as well as other projects where potential hazards pose a significant threat to human life. This applies to new projects and to the major repair, rehabilitation, replacement, or modification of existing facilities. External panels will review the design and construction activities prior to initiation of physical construction and periodically thereafter until construction activities are completed. The review shall be on a regular schedule sufficient to inform the Chief of Engineers on the adequacy, appropriateness, and acceptability of the design and construction activities for the purpose of assuring that good science, sound engineering, and public health, safety, and welfare are the most important factors that determine a project's fate.

2. PROJECT INFORMATION

a. Project. Periodic inspections of the Dover Dam by the Corps have revealed significant dam safety concerns which have grown over the life of dam. The Corps has determined the dam cannot safely accommodate flooding from theoretical Probable Maximum Flood (PMF) events. The dam is also believed to be unstable against sliding under conditions below the PMF due to known faulting and uncertain foundation bedrock quality. These concerns contributed to its classification by the USACE Screening for Portfolio Risk Assessment (SPRA) as a Dam Safety Action Class II – Urgent (unsafe or potentially unsafe) project. Rehabilitation is needed to correct these instability issues and to minimize the potential for catastrophic failure of the dam. The project is considered to be single purpose. The Dover DSA Evaluation Report was approved on 12 June 2008. This project does not require Congressional authorization. An Environmental Impact Statement (EIS) has been prepared. A Cost and Schedule Risk Analysis was conducted June 2007 by the Walla Walla District. A Value Engineering Study was conducted in February 2008 by Strategic Value Solutions, Inc. The DDR was completed September 2009. The objectives of this project is to develop the most cost effective, environmentally sound plan to upgrade Dover Dam to meet current hydrologic design standards and to address stability issues associated with inadequate bedrock foundation.

b. General Site Location and Description. The Dover Dam Safety Assurance Project as originally constructed was completed on 29 November 1937 at a cost of $7,755,300, which included study costs. Dover Dam is situated on the Tuscarawas River approximately 3.5 miles upstream of Dover, OH, 5 miles upstream of New Philadelphia, OH and 62.5 miles upstream of its confluence with the Muskingum River. State Route 800 passes over the right (North) abutment. There are three structures located upstream of Dover; Bolivar Dam, Leesville Dam, and Atwood Dam.

Dover Dam is a concrete gravity structure with an overall top length of 824 feet. The dam consists of two distinct cross sections. These sections include non-overflow sections and a spillway section. The top elevation of the non-overflow sections is 931.0 (NGVD29). The top elevation of the spillway section is 916.0 (NGVD29).

The non-overflow sections consist of 14 non-overflow monoliths. The design top elevation of the non-overflow sections is approximately 931.0 (NGVD29) with the actual low point on the concrete curb of 931.34 (NGVD29). However, the transition monolith on the left (South) abutment, monolith 23, has a low point of 928.5 (NGVD29) to allow for the relocation of a railroad which has since been abandoned. This area has been backfilled to an approximate elevation of 934.0 (NGVD29). The non-overflow sections are 17 feet wide at the top with an 8.5 feet wide slab cantilevered to the

downstream and supported by concrete arches and columns making the top surface of the dam 25.5 feet wide. The foundation widths and elevations vary.

The spillway sections consist of 9 spillway monoliths. The spillway is uncontrolled and has a crest elevation of 916.0 (NGVD29). The outlet works consist of 18 gated sluices in sets of six at differing invert elevations. The right (North) set of sluices are 5' x 10' with an invert elevation of 862.0 (NGVD29). The center and left (South) sets of sluices are 7' x 7' with invert elevations of 872.0 (NGVD29) and 867.0 (NGVD29), respectively. The spillway monoliths are 75.25 feet wide at the base and the stilling basin extends 124.75 feet from the toe of the dam. The founding elevation of the spillway monoliths varies across the width of the dam with a minimum founding elevation of 830.0 (NGVD29).

The stilling basin consists of three distinct sections as well. These are separated by dividing walls which extend approximately two-thirds of the length of the stilling basin. The sides of the stilling basin are also lined with concrete gravity training walls which have a top elevation of 885.0 (NGVD29).

An operating house is located on monolith 5 of the right (North) non-overflow section and an entrance house is located on monolith 18 of the left (South) non-overflow section. Both of these structures allow access to the operating gallery which runs the full distance through the dam at elevation 882.25 (NGVD29) for the left (South) portion and 886.25 (NGVD29) for the center and right (North) portions. The foundation drains are located in this operating gallery.

c. Factors Affecting the Scope and Level of Review. Major construction features include:

1. **Parapet Wall.** A parapet wall is required to avoid overtopping of the non-overflow sections of the dam since the stability of these monoliths rely on the earthen embankment downstream remaining intact. The top elevation of the wall was set at 940.0. Floodwalls on both banks are required to tie-in to high ground. The floodwall on the left bank includes a 12 ft. wide stoplog closure for operational and pedestrian access. The floodwall on the right bank includes an abutment at the end of the wall adjacent to State Route 800. A sandbag closure will be used across State Route 800 to provide the necessary freeboard. The parapet wall on the non-overflow monoliths will consist of precast concrete panels anchored to the upstream face of the monoliths. The floodwalls on both banks will consist of cast-in-place concrete wall segments. Modifications to the existing Operations house's upstream wall are necessary to serve as part of the parapet wall.
2. **Monolith Anchors.** Stability analyses showed that all 9 spillway monoliths and 5 non-overflow monoliths would not meet current criteria for all load cases considered. The failure mode for these monoliths is deep seated sliding. Based on the analyses, the spillway monoliths require four rows of anchors, with each monolith having 2 anchors in the first row and 1 anchor in the remaining rows for a total of 45 anchors in the spillway monoliths. These anchors range from 19 to 47 strand and will be angled at 30 degrees in the upstream direction. The non-overflow monoliths require 5-54 strand anchors in Monolith 6, 4-54 strand anchors in Monolith 16, 2-48 strand anchors in Monolith 17 and 1-19 strand anchor in Monolith 18. These anchors will be angled from 15 to 30 degrees in the upstream direction. All anchors are to be locked off at a prestress of 70% of the ultimate tensile strength.
3. **Stilling Basin Anchors.** Analysis of the dam showed that the stilling basin does not meet criteria for all load cases. The primary failure mode for the stilling basin is floatation. Prestressed 2 ½ inch diameter bar anchors are utilized to add vertical force to

the stilling basin and bring it up to current criteria. Bar anchors were chosen over strand anchors to allow for installation in the wet and better distribute the load.

4. **Training Wall Extensions.** Analyses and modeling showed that the existing spillway training walls would be overtopped with increased spillway flows from a PMF event. The training walls will be raised 4 ft. with cast-in-place concrete.
5. **Stone Slope Protection.** Increased spillway flows from a PMF event are likely to cause erosion downstream of the stilling basin with the existing project conditions. To protect project park lands and State Route 800, bank protection is necessary. The design requires replacement of existing stone slope protection with larger 24 inch limestone and extend the protection up the bank to a higher elevation and farther downstream.

d. Recommended Plan. Major construction features of the recommended plan include:

1. **Phase I.** Phase I consists of the installation and prestressing of 36 multistrand anchors within holes drilled at an inclination of 30 degrees upstream in the spillway monoliths.
2. **Phase II.** Phase II consists of the installation and prestressing of 9 multistrand anchors within holes drilled at an inclinations of 30 degrees upstream in the spillway monoliths as well as 12 multistrand anchors within holes drilled at an inclinations ranging from 15 to 30 degrees upstream in the non-overflow monoliths. Phase II also includes the construction of the Parapet Wall, Bar Anchors in the Stilling Basin, Training Wall Extensions and Stone Slope Protection.

e. In-Kind Contributions. The Non Federal Cost Share Sponsor for this project is the Muskingum Watershed Conservancy District (MWCD). There are no in kind services anticipated as part of the cost share.

3. RMO COORDINATION

The review management organization will be the USACE Risk Management Center (RMC).

4. DISTRICT QUALITY CONTRL (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). Basic quality control tools include a Quality Management Plan providing for seamless review, quality checks and reviews, supervisory reviews, and Project Delivery Team (PDT) reviews throughout the life of the project. DQC efforts will include the necessary expertise to address compliance with published Corps policy.

5. AGENCY TECHNICAL REVIEW (ATR)

a. General. ATR will be managed and performed outside of the Huntington District. EC 1165-2-209 requires the USACE Risk Management Center (RMC) to serve as the RMO for Dam Safety Modifications projects. At this time the RMC isn't staffed or organized to support ATR. In the interim, the Great Lakes & Ohio River Division will manage the ATR. There shall be appropriate coordination and processing through CoPs; relevant PCXs, and other relevant offices to ensure that a review team with appropriate independence and expertise is assembled and a cohesive and comprehensive review is accomplished. The ATR shall ensure that the product is consistent with established criteria, guidance, procedures, and policy. The ATR will assess whether the analyses presented are technically correct and comply with published USACE guidance, and that the document

explains the analyses and the results in a reasonably clear manner for the public and decision makers. Members of the ATR team will be from outside the Huntington District. The ATR lead will be from outside the Great Lakes & Ohio River Division.

b. Products for Review. The ATR team will be reviewing the Phase I and Phase II Plans & Specifications.

c. Required ATR Team Expertise. ATR teams will comprise senior USACE personnel (Regional Technical Specialists (RTS), etc.), and may be supplemented by outside experts as appropriate. The disciplines represented on the ATR team will reflect the significant disciplines involved in the planning, engineering, design, and construction effort. These disciplines include civil, geology, structural, hydraulics and hydrology, and construction. To assure independence, the leader of the ATR team is Mark Summers from CENWW. A list of the ATR members and disciplines is provided in ATTACHMENT 1. The chief criterion for being a member of the ATR team is knowledge of the technical discipline and relevant experience.

d. 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, ASA (CW)/USACE 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 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 coordination, and lastly the agreed upon resolution. The ATR team will prepare a Review Report which includes a summary of each unresolved issue; each unresolved issue will be raised to the vertical team for resolution. Review Reports will be considered an integral part of the ATR documentation.

ATR may be certified when all ATR concerns are either resolved or referred to HQUSACE for resolution and the ATR documentation is complete. Certification of ATR should be completed, based on work reviewed to date, for the draft and final report. See ATTACHMENT 2.

6. INDEPENDENT EXTERNAL PEER REVIEW (IEPR)

a. General. Type I and Type II IEPRs are conducted in accordance with the guidance promulgated in EC 1165-2-209. Type I IEPRs are conducted on project studies. It is of critical importance for those decision documents and supporting work products where there are public safety concerns, significant controversy, a high level of complexity, or significant economic, environmental and social effects to the nation. However, it is not limited to only those cases and most studies should undergo Type I

IEPR. In accordance with EC 1165-2-209 a Type II IEPR (SAR) shall be conducted on design and construction activities for hurricane and storm risk management and flood risk management projects, as well as other projects where potential hazards pose a significant threat to human life. This applies to new projects and to the major repair, rehabilitation, replacement, or modification of existing facilities. WRDA 2007, Section 2035, Safety Assurance Review, requires a review of the design and construction activities prior to initiation of physical construction and periodically thereafter until construction activities are completed. This review will be on a regular schedule sufficient to inform the Chief of Engineers on the adequacy, appropriateness, and acceptability of the design and construction activities for the purpose of assuring public health, safety and welfare. SARs will be conducted on the Design Documentation Report (DDR) and during the Plans and Specifications (P&S) phases and intermittently throughout the construction phases. The purpose of the SAR is to ensure that good science, sound engineering, and public health, safety and welfare are the most important factors that determine a project's fate. The SAR shall focus on whether the assumptions made for hazards remain valid as additional knowledge is gained and the state-of-the-art evolves. Additionally, the SAR team shall advise whether project features adequately address redundancy, robustness, and resiliency; and findings during construction reflect the assumptions made during design.

b. Decision on Type II IEPR. In accordance with EC 1165-2-209 a Type II IEPR (SAR) shall be conducted on design and construction activities for flood risk management projects. This applies to new projects and to the major repair, rehabilitation, replacement, or modification of existing facilities.

c. Products for Review. Type II IEPR will be performed on the 100% Design Documentation Report (DDR), the 90% Plans & Specifications (Phases I & II), during the first anchor installation of the multi-strand rock anchors in the dam (Phase I), during the midpoint of the construction (Phase II), and before substantial completion of construction (Phase II).

d. IEPR Review Team. Type II IEPR Review Team will be established, in consultation with the RMC, through a contract with Battelle that is administered by the Army Research Organization (ARO). The public, scientific or professional societies will not be asked to nominate potential reviewers. The Review Team will be selected based on their technical qualifications and experience. The Review Team should be independent of USACE and free of conflicts of interests. The Review Team will be able to evaluate whether the interpretation of analysis and conclusions based on analysis are reasonable. The Review Team will be given the flexibility to bring important issues to the attention of decision makers. However, the Review Team will be instructed to not make a recommendation on whether a particular alternative should be implemented, as the Chief of Engineers is ultimately responsible for the final decision on a planning or reoperations study. The Review Team may, however, offer their opinion as to whether there are sufficient analyses upon which to base a recommendation. The Review Team will have experience in design and construction of projects similar in scope to the Dover Dam Safety Assurance Project. The Review Team shall be registered professional engineers in the United States, or similarly credentialed in their home country. The Review Team must also have an engineering degree. A Master's degree in engineering is preferable, but not required, as hands-on relevant engineering experience in the listed disciplines is more important. The Review Team shall have a minimum of 15 years experience and responsible charge of engineering work. See ATTACHMENT 1 for the required experience in the required disciplines.

e. Documentation of IEPR. Dr Checks review software will be used to document IEPR comments and aid in the preparation of the Review Report. Comments 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 3. The Contractor (Battelle) will be responsible for compiling and entering comments into

DrChecks. The IEPR team will prepare a Review Report that will accompany the publication of the final report for the project 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 prepared by the Contractor (Battelle);
- 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.

f. Decision on Type I IEPR. The current Review Plan addresses the design and construction activities for the Dover DSA project. The Dover Dam Safety Assurance Program Evaluation Report, Environmental Impact Statement and Record of Decision approval from the Assistant Secretary of the Army (Civil Works) was received 30 January 2008. All of these documents were prepared and approved before EC 1105-2-410, Review of Decision Documents dated 22 August 2008 and EC 1165-2-209 Civil Works Review Policy dated 31 January 2010, took effect. If at a later date it becomes necessary to conduct planning activities for this project it will be necessary to modify and update the current Review Plan to accommodate the policy compliance requirements identified in EC 1165-2-209 for a Type I IEPR.

7. REVIEW SCHEDULES AND COSTS

a. DQC Schedule and Cost. The cost for DQC is included in the costs for PDT activities and is not broken out separately. DQC will occur seamless during throughout the DDR and the P&S. Quality checks and reviews occur during the development process and are carried out as a routine management practice. Multiple PDT Reviews of the DDR where completed in 2008 and 2009. PDT Review of the Phase I P&S is complete. PDT Review of the Phase II P&S is scheduled to occur in late FY 2010 and early FY2011.

b. ATR Schedule and Cost. The estimated cost for ATR is $180,000. ATR will occur during key stages in the P&S. The ATR team is invited to take part in weekly team meetings and monthly vertical team meetings. ATR of the Phase I 90% P&S is complete. ATR of the Phase II 70% P&S and 100% P&S is scheduled to occur in FY2011. Face-to-Face comment resolution meetings will be scheduled with the ATR team, if required.

ATR Milestones	
90% Phase I P&S Review	Complete
70% Phase II P&S Review	TBD
100% Phase II P&S Review	TBD

c. IEPR Schedule and Cost. The estimated cost for Type II IEPR (SAR), including the cost for the RMO to administer and manage the review, is in the range of $500,000 to $600,000. The Type II IEPR (SAR) that is currently underway for the DDR and Phase I P&S and Construction (including a site visit) is approximately $400,000. This is through an ARO contract with Battelle. Type II IEPR (SAR) for the Phase II P&S and Construction (including site visits) has not been scheduled at this time, but will occur in FY2011. Face-to-Face comment resolution meetings will be scheduled with the IEPR team for the Phase II P&S and Construction.

IEPR (SAR) Milestones

100% DDR Review (Ph 1)	Complete
100% DDR Review (Ph 2)	Ongoing
90% Phase I P&S Review	Complete
Phase I Construction before substantial completion of construction to coincide with the construction of the multi-strand rock anchors in the dam	TBD
100% Phase II P&S Review	TBD
Phase II Construction Midpoint	TBD
Phase II Construction before substantial completion of construction	TBD

8. PUBLIC PARTICIPATION

Since initiation of the Dover Dam Safety Assurance Program Evaluation Report in February 2006, numerous public meetings have been conducted. Public meetings were conducted to inform the public of the current condition of Dover Dam, the study efforts and the schedule for implementing the Dam Safety Assurance Project on 6 April 2006 and 24 May 2006. On 18 January 2007, a public meeting was conducted to inform the public of the current condition of Dover Dam, the progress and status of the Dam Safety Assurance Program Evaluation Report, the entire implementation schedule for the project and to solicit public review and comment on the Draft Environmental Impact Statement and Dam Safety Assurance Program Evaluation Report. Close coordination with Tuscarawas County officials regarding the current condition of Dover Dam, the study efforts and implementation of interim risk reduction measures has occurred. As a result, Tuscarawas County updated their Emergency Evacuation Plan in June 2007. Portions of the Plan were utilized in March 2008 as a result of significant precipitation in the region. Additional public meetings will be conducted, as necessary, through the plans and specifications and construction phases. Information will also be conveyed to the public through the use of press releases and media interviews as necessary and through the use of posting information to the Huntington District's web site. The project manager will also schedule office hours at the project site after construction is initiated. There is no formal public review for the DDR, plans and specifications and construction phases. However, the cost share partner, Muskingum Watershed Conservancy District, will have opportunities to review the DDR, plans and specifications and construction phases as part of the PDT. Upon MSC approval of this Review Plan, the Review Plan will be posted on the Huntington District Internet for Public Review (http://www.lrh.usace.army.mil/approved_review_plans_rps).

9. MSC APPROVAL

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

10. REVIEW PLAN POINTS OF CONTACT

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

- [redacted], Huntington District Project Manager
- [redacted], Huntington District Lead Engineer
- [redacted], Huntington District Chief, Quality Management
- [redacted], Great Lakes and Ohio River Division Dam Safety Program Manager
- [redacted], Risk Management Center

ATTACHMENT 1: TEAM ROSTERS

TABLE 1: Product Delivery Team		
Functional Area	**Name**	**Office**
Project Manager	[redacted]	CELRH
Lead Engineer / Structural	[redacted]	CELRH
Structural	[redacted]	Stantec, Inc.
Real Estate	[redacted]	CELRH
Contracting	[redacted]	CELRH
Operations	[redacted]	CELRH
Public Affairs	[redacted]	CELRH
Geology	[redacted]	CELRH
Plan Formulation	[redacted]	CELRH
Cost Engineering	[redacted]	CELRH
Hydrology and Hydraulics	[redacted]	CELRH
Civil Site	[redacted]	CELRH
Dam Safety	[redacted]	CELRH
Geotechnical	[redacted]	CELRH
Specifications	[redacted]	CELRH
Construction	[redacted]	CELRH
Environmental	[redacted]	CELRH
HTRW	[redacted]	CELRH

TABLE 2: Agency Technical Review Team		
NAME	**DISCIPLINE**	**OFFICE**
[redacted]	Structural / Team Leader	CENWW
[redacted]	Civil / Site	CELRP
[redacted]	Hydrology & Hydraulics	CELRP
[redacted]	Construction	CELRP
[redacted]	Engineering Geology	CELRP
TBD	Cost **	TBD
TBD	O&M **	TBD

** Added for the Phase II P&S

TABLE 3: Independent External Peer Review Team		
NAME	**DISCIPLINE**	**EXPERIENCE**
TBD	Geotechnical Engineer	Recognized expert in the field of geotechnical engineering analysis, design and construction of embankment dams and levees on alluvial foundations with extensive experience in subsurface investigations, soil mechanics, retaining wall design, erosion protection design and construction and earthwork construction. The Geotechnical Engineer shall be a licensed professional engineer.
TBD	Structural Engineer	Senior-level nationally recognized expert in the field of stabilizing large mass concrete structures. The Structural Engineer should be proficient in performing stability analysis using limit equilibrium analysis and in the design of post tensioned high strength steel anchors to stabilize mass concrete gravity dams and structures. The Structural Engineer should be experienced in the stability analysis and structural design of mass concrete scour protection and stilling features including the design of baffles, endsills, and training walls. The Structural Engineer shall be experienced in modeling procedures impacting dam designs to include: hydrostatic pressures, uplift, measures for hydraulic forces in dam structural criteria as appropriate. The Structural Engineer should have a working knowledge of applicable Corps of Engineers design criteria as well as industry design criteria. The Structural Engineer shall be a licensed Professional Engineer.
TBD	Hydraulic Engineer	Extensive experience in the analysis and design of hydraulic structures and design of stone slope protection related to flood control reservoirs. (The emphasis is focused on flood control reservoirs only, not on navigation structures, open river/subcritical flow conditions such as are associated with levee/floodwall designs, highway drainage, culverts, storm/sanitary sewers, open/closed conduits, or water distribution systems.) The Hydraulic Engineer must have performed work in hydrologic analysis and design of hydraulic structures including spillways, outlet works, and stilling basins. (The emphasis is focused on flood control reservoirs only, not on navigation structures, open river/subcritical flow conditions such as are associated with

		levee/floodwall designs, highway drainage, culverts, storm/sanitary sewers, open/closed conduits, or water distribution systems. Experience should emphasize spillways, outlet works, and stilling basins related to flood control reservoirs, particularly stilling basins for large dams.) The Hydraulic Engineer must demonstrate knowledge and experience with physical modeling and the application of data from physical model testing to the design of stilling basins and scour protection, and in the ability to coordinate, interpret, and explain testing results with other engineering disciplines, particularly structural engineers, geotechnical engineers, and geologists. (The emphasis is focused on flood control reservoirs only, not on navigation structures, open river/subcritical flow conditions such as are associated with levee/floodwall designs, highway drainage, culverts, storm/sanitary sewers, open/closed conduits, or water distribution systems. Experience should emphasize spillways, outlet works, and stilling basins related to flood control reservoirs, particularly stilling basins for large dams. Emphasize experience with complex designs that deal with high velocity in excess of 90 feet per second. Demonstrate ability to coordinate, interpret, and explain testing results with other engineering disciplines by describing the complexity of the model and results, and provide the challenges and how resolution was achieved in reaching an accurate and successful understanding of the results by the other disciplines.) In regard to hydrologic analysis, the Hydraulic Engineer must demonstrate knowledge and experience with the routing of inflow hydrographs through multipurpose flood control reservoirs utilizing multiple discharge devices, including gated sluiceways and gated spillways. (The emphasis is focused on flood control reservoirs only, not on navigation structures, open river/subcritical flow conditions such as are associated with levee/floodwall designs, highway drainage, culverts, storm/sanitary sewers, open/closed conduits, or water distribution systems. Experience should emphasize spillways, outlet works, and stilling basins related to flood control reservoirs, particularly stilling basins for large dams. Demonstrate experience in

		dealing with three or more different discharge devices being utilized at the same time for the individual flood control reservoir during a large flood event such as the Probable Maximum Flood (PMF).) The Hydraulic Engineer should be a licensed professional engineer.
TBD	Materials Engineer	Registered professional engineer or professional geologist with a minimum of a Master's Degree in Materials Engineering. The Materials Engineer must have extensive knowledge in mix designs and materials for mass concrete placements. The engineer shall also have experience in preparing plans and specifications and field applications of mass concrete placements.
TBD	Engineering Geologist	Recognized expert in the field rock mechanics with extensive experience in the type of work being performed. The Engineering Geologist shall be proficient in assessing rock strengths and evaluating uplift for performing stability analyses using limit equilibrium. The Engineering Geologist shall be experienced in the design of post tensioned high strength steel anchors to stabilize mass concrete gravity dams and structures. The Engineering Geologist shall have a working knowledge of applicable Corps of Engineers design criteria as well as industry design criteria. The Engineering Geologist shall be a licensed Professional Geologist.
TBD	Civil Engineer	experience in the design, layout, and construction of flood control structures including dams and levees. The Civil Engineer should have a demonstrated knowledge regarding hydraulic structures, erosion control, earthwork, concrete placement, design of access roads, and relocation of underground utilities. The Civil Engineer shall be a licensed Professional Engineer, familiar with USACE regulations and industry building codes.

Vertical Team

The Vertical Team consists of members of the HQUSACE, Risk Management Center, and Great Lakes & Ohio River Division Offices. The Vertical Team plays a key role in facilitating execution of the project in accordance with the PMP. The Vertical Team is responsible for providing the PDT with Issue Resolution support and guidance as required. The Vertical Team will remain engaged seamlessly throughout the project via monthly telecons as required and will attend In Progress Reviews and other key decision briefings as required. The District Liaison Robert Iseli, CELRD-PDS-H, is the District PM's primary Point of Contact on the Vertical Team.

ATTACHMENT 2: ATR CERTIFICATION TEMPLATE

COMPLETION OF AGENCY TECHNICAL REVIEW

The Huntington District has completed the 90% Plans and Specifications for Dover Dam, Dam Safety Assurance Phase I, Dover, OH. Notice is hereby given that an agency technical review has been conducted as defined in the Review Plan that is appropriate to the level of risk and complexity inherent in the project. During the agency technical review, compliance with established policy principals and procedures, utilizing justified and valid assumptions, was verified. This included review of: assumptions; methods, procedures, and material used in analysis; alternatives evaluated; the appropriateness of data used and level obtained; and reasonableness of the result, including whether the product meets the customer's needs consistent with law and existing Corps policy. The design was accomplished by a District team along with an Architect/Engineer firm. The agency technical review team members were from outside the home district with members from CELRP and CENWW. The ATR team leader was from outside the home MSC.

Design Team

_____
[redacted], CELRH-EC-DS
Lead Engineer/Structural

_____
[redacted], Stantec, Inc.
Senior Project Engineer/Structural

_____
[redacted], CELRH-EC-GG
Geology

_____
[redacted], CELRH-EC-WH
Hydraulics

_____
[redacted], CELRH-EC-DC
Civil Site

_____
[redacted], CELRH-EC-CM
Construction

_____
[redacted], CELRH-EC-Q
Specifications

_____
[redacted], CELRH-PM-PP-P
Project Manager

ATR

_____
[redacted], CENWW-EC-D-T
ATR Lead/Structural

_____
[redacted], CELRP-TS-DS
Geology

_____
[redacted], CELRP-EC-CM
Construction

_____
[redacted], CELRP-TS-DT
Hydraulics

_____
[redacted], CELRP-EC-NC
Civil Site

CERTIFICATION OF AGENCY TECHNICAL REVIEW

As noted above, all concerns resulting from the agency technical review of the project have been considered.

_____ _____
[redacted], P.E, Ph.D. Date
Chief, Engineering & Construction Division
LRH Dam Safety Officer