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ACTION: ENGINEERING
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DEPARTMENT OF THE A
SOUTH ATLANTIC DIVISION, CORPS O
ROOM 10M15, 60 FORSYTH ST., S.W.
ATLANTA, GA 30303-8801

REPLY TO
ATTENTION OF:

RECEIVED
11 Apr 11

CESAD-RBT

31 March 2011

MEMORANDUM FOR COMMANDER, WILMINGTON DISTRICT (CESAW-TS-E/ GREGORY L. WILLIAMS)

SUBJECT: Approval of Review Plan for Modification of Fish Passage at Lock and Dam No. 1, Cape Fear River Basin, Bladen County, NC Project

1. References:

a. Memorandum, CESAW-TS-E, 31 January 2011, Subject: Approval of Review Plan Revision Dated 11 Jan 2011 for Pre-construction and Engineering Phase of the Fish Passage at Lock & Dam No. 1, Cape Fear River Basin, Bladen County, North Carolina (Enclosure).

b. EC 1165-2-209, Civil Works Review Policy, 31 January 2010.

c. WRDA 2007 H. R. 1495 Public Law 110-114, 8 November 2007.

2. The enclosed revised Review Plan for the proposed modification to the Lock and Dam No. 1, Cape Fear River Basin, Bladen County, NC, modified 11 January 2011, has been reviewed by this office and is approved in accordance with references above.

3. We concur with the conclusion of the District Chief of Engineering that Type II Independent External Peer Review (Type II IEPR) is not required for this modification to the Fish Passage. This project does not have the factors stipulated in Section 2035 Safety Assurance Review, WRDA 2007 H. R. 1495 Public Law 110-114 that need addressing to assure public health, safety, and welfare. The primary basis for the concurrence that a Type II IEPR is not required is the determination that the failure of the Fish Passage and this proposed modification would not pose a significant threat to human life.

4. The district should take steps to post the Review Plan to its web site and provide a link to CESAD-RBT.

5. The SAD point of contact is Mr. James Truelove, CESAD-RBT, (404)-562-5121.

FOR THE DIRECTOR, REGIONAL BUSINESS:

Encl

CHRISTOPHER T. SMITH. P.E.
Chief, Business Technical Division

DEPARTMENT OF THE ARMY
WILMINGTON DISTRICT, CORPS OF ENGINEERS
69 DARLINGTON AVENUE
WILMINGTON, NORTH CAROLINA 28403-1343

REPLY TO
ATTENTION OF:

CESAW-TS-E

31 January 2011

MEMORANDUM FOR Commander, South Atlantic Division (CESAD-RBT)

SUBJECT: Approval of Review Plan Revision Dated 11 Jan 2011 for Pre-construction and Engineering Phase of the Fish Passage at Lock & Dam No. 1, Cape Fear River Basin, Bladen County, North Carolina

1. References.

a. EC 1165-2-209, Civil Works Review Policy, 31 Dec 09 draft

b. WRDA 2007 H. R. 1495 Public Law 110-114, 08 Nov 07

c. CESAD-RBT approval Memo of original Review Plan Dated 24 May 2010

2. I hereby request approval of the enclosed revised Review Plan covering the proposed modification to the design and concurrence with the conclusion that Type II Independent External Peer Review, Safety Assurance Review of this project is not necessary because it does not trigger criteria in references above. Approval of this plan is for the PED Phase of this project. The Review Plan complies with applicable policy and includes our DQC and ATR plans for this project. It is my understanding that non-substantive changes to this Review Plan, should they become necessary, are authorized by CESAD.

3. The District will post the CESAD approved Review Plan to its website and provide a link to the CESAD for its use. Names of Corps/Army employees are withheld from the posted version, in accordance with guidance.

FOR THE COMMANDER:

Encl

GREGORY L. WILLIAMS, Ph.D., P.E.
Chief, Engineering Branch

Review Plan

For

Pre-construction and Engineering Phase of the
Fish Passage at Lock & Dam No. 1
Cape Fear River Basin
Bladen County, North Carolina

U.S. Army Corps of Engineers
Wilmington District
Wilmington, North Carolina

7 May 2010
Modified 11 January 2011*

THE INFORMATION CONTAINED IN THIS REVIEW PLAN IS DISTRIBUTED SOLELY FOR THE PURPOSE OF PREDISSEMINATION REVIEW UNDER APPLICABLE INFORMATION QUALITY GUIDELINES. IT HAS NOT BEEN FORMALLY DISSEMINATED BY THE U.S. ARMY CORPS OF ENGINEERS, WILMINGTON DISTRICT. IT DOES NOT REPRESENT AND SHOULD NOT BE CONSTRUED TO REPRESENT ANY AGENCY DETERMINATION OR POLICY.

* Modifications to the original Review Plan are shown as bold text.

REVIEW PLAN

Pre-construction and Engineering Phase of the Fish Passage at Lock & Dam No. 1 Cape Fear River Basin Bladen County, North Carolina

TABLE OF CONTENTS

1. PURPOSE AND REQUIREMENTS

1.1 Purpose. This Review Plan defines the scope and level quality management activities and peer review for the Fish Passage at Lock and Dam No. 1, Cape Fear River Basin, Bladen County, North Carolina. Quality Management activities consist of District Quality Control, Agency Technical Review, and a Risk Assessment. As a result of the recommendations in the Risk Assessment, the Major Subordinate Command determined that a Type II Independent External Peer Review is not required for the Fish Passage at Lock and Dam No. 1. In addition, the Major Subordinate Command required a Risk Assessment and a simplified Potential Failure Mode Analysis be completed for this project. **A Value Engineering Study was also performed after the 95% Design Documents were submitted and review. As a result of the Value Engineering Study another Potential Failure Mode Analysis was performed and a modification of the design was requested. The Design Documents will undergo the quality management activities included in the District Quality Control and an Agency Technical Review.**

1.2 References.

- **Review Plan for Pre-construction and Engineering Phase of the Fish Passage at Lock & Dam No. 1, 7 May 2010**
- EC 1105-2-410, Review of Decision Documents, 22 Aug. 2008
- EC 1165-2-209, Civil Works Review Policy, 31 Jan. 2010
- WRDA 2007 H.R. 1495 Public Law 110-114, 8 Nov. 2007
- Biological Opinion on Wilmington Harbor, National Marine Fisheries Service, 3 Aug. 2000
- Finding of No Significant Impact for Preconstruction Modifications of Authorized Improvements for Wilmington Harbor, Aug. 2000
- SPRA Documentation for Screening for Lock & Dam No. 1 (NIDID: NC00182), 5 Mar. 2008
- Quality Control Plan: Engineering and Design for Fish Passage, Lock and Dam No. 1, Cape Fear River, North Carolina, 2009
- **ER 11-1-321, Value Engineering, 28 Feb. 2005**
- ER 1110-1-12, Engineering and Design Quality Management, 21 Jul. 2006
- ER 1110-2-12, Quality Management, 30 Sep. 2006

1.3 Requirements. This review plan was developed in accordance with EC 1105-2-410 and EC 1165-2-209, which establishes the procedures for ensuring the quality and credibility of U.S. Army Corps of Engineers (USACE) decision and implementation documents through independent review. The ECs outline three levels of review: District Quality Control, Agency Technical Review, and Independent External Peer Review.

(1) District Quality Control (DQC). DQC is the review of basic science and engineering work products focused on fulfilling the project quality requirements defined in the Project Management Plan (PMP). It is managed in the home district and may be conducted by staff in the home district as long as they are not doing the work involved in the study, or overseeing contracted work that is being reviewed. Basic

quality control tools include a Quality Control Plan providing for seamless review, quality checks and reviews, supervisory reviews, Project Delivery Team (PDT) review, etc. Additionally, the PDT is responsible for the overall integrity of the pre-construction and engineering design, technical appendices, and the recommendations before approval by the District Commander. The Major Subordinate Command (MSC)/District quality control plans address the conduct and documentation of this fundamental level of review.

(2) Agency Technical Review (ATR). ATR is an in-depth review, managed within USACE, 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 revises the various work products and assures that all the parts fit together in a coherent whole. ATR teams will be comprised of senior USACE personnel (Regional Technical Specialists (RTS), etc.), and may be supplemented by outside experts as appropriate. To assure independence, the leader of the ATR team shall be from outside the parent MSC.

(3) Type II 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. In accordance with Section 2035 of Water Resources Development Act (WRDA) of 2007, EC 1105-2-410 and EC 1165-2-209 all projects addressing flooding or storm damage reduction undergo a safety assurance review of the design and construction activities prior to initiation of physical construction and periodically thereafter until construction activities are completed. IEPR should occur 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.

2. PROJECT INFORMATION AND BACKGROUND

2.1 Project Description

Lock and Dam No.1 is located on the Cape Fear River in Bladen County, NC, about 39 miles upstream of Wilmington. The construction of the lock and dam was completed in 1915. Three locks and dams were built as part of the Cape Fear River above Wilmington, NC Federal project. The purpose of these locks and dams was to provide for commercial navigation between Wilmington and Fayetteville, NC.

Lock and Dam No. 1 is a rock filled timber crib structure with a 1-foot thick concrete cap. The dam crest is 275 feet long, and the base on the dam is about 50 feet wide. The upstream face of the dam is essentially vertical, but the downstream face of the dam has a slope of about 25% from the crest of the dam to downstream pool surface. The lock chamber is 200 feet long by 40 feet wide.

The dam crest is elevation +11.0 feet [NGVD 29 (Mean Sea Level, MSL)]. The water level below the dam is 0.0 feet MSL at low water. There is about a 2-foot lunar tide at the facility. Under low flow conditions, there is generally about 11 feet of head difference between the upstream and downstream water levels.

Since construction of Lock and Dam No.1 in 1915 and subsequent construction of the other locks and dams, passage of fish upstream, especially anadromous fish has been restricted. Anadromous fish are those species that spend most of their life in saltwater, but return to freshwater to spawn. Examples in North Carolina include striped bass, American shad, river herring, and sturgeon. Lock and Dam No. 1 is the first obstruction to fish passage on the Cape Fear River.

Attempts to improve passage of these fish by locking began in 1961. Several changes in these procedures have been made over the years with the latest changes being made in 1998. In addition, a steep pass fishway was installed in 1997. Since these changes, monitoring performed using sonic tags indicate that of those fish that approach Lock and Dam No. 1 with an apparent attempt to pass, about 50 to 65% percent of the American shad (*Alosa sapidissima*) and 50 to 77% of the striped bass (*Morone saxatilis)* pass upstream (Moser 2000; CZR 2002, 2003, 2004, Smith and Hightower 2009). According to Smith and Hightower 2009, of those fish attempting to pass Lock and Dam No. 1, 35% of the shad and 25% of the striped bass were able to pass upstream of Lock and Dam No 3. However, the success of passing other anadromous species is unknown.

2.2 ARRA Program Inclusion and Fish Passage Information

Funds from the American Recovery and Reinvestment Act of 2009 have been made available to the Wilmington District to design and construct fish passage facilities at Lock and Dam No. 1 on the Cape Fear River. The Wilmington Harbor Deepening was authorized by the Water Resources Development Act of 1986. In the August 2000 Finding of No Significant Impact (FONSI) for Preconstruction Modifications of Authorized Improvements for Wilmington Harbor (USACE 2000), a commitment was made by the U.S. Army Corps of Engineers, and the Wilmington Harbor project sponsor, the State of North Carolina, to construct a fish passage structure at Lock and Dam No. 1 on the Cape Fear River. This commitment was also included as Term and Condition No. 8 of the August 3, 2000 Biological Opinion (BO) on Wilmington Harbor from the National Marine Fisheries Service (NMFS 2000). This was required to mitigate the potential impacts on the endangered shortnose sturgeon due to blasting in the Wilmington Harbor navigation channel to remove rock.

Lock and Dam No. 1, as part of the Cape Fear River above Wilmington, NC project, is congressionally authorized for the purpose of navigation. Construction, operation, and maintenance of a rock arch rapids along the toe of the dam will not impact navigation and is therefore consistent with congressional authorized purposes. Over the years, construction of water supply facilities to support growing populations along the coast were built utilizing the water pool levels that remain consistent upriver due to the lock and dam. Maintaining water supply intakes is essential to ¼ million individuals that now rely on the water supply facilities. Not maintaining the pool would result in the need for alternate sources of water for this population, along with the associated costs and potential environmental impacts of developing those sources.

The type of fish passage structure was not specified, but would be the result of further investigation and coordination that led to the proposal of a rock arch rapids at Lock and Dam No. 1. Locking for fish passage had been previously maximized and is not an acceptable alternative.

Construction of the rock arch rapids would provide the need of greater access to historic spawning grounds utilized by the federally listed shortnose sturgeon and other anadromous fish without compromising congressionally authorized purposes or affecting water users.

3. DISTRICT QUALITY CONTROL

The Quality Control Plan (QCP, Attachment 3) for the Fish Passage at Lock and Dam No. 1 was developed by the A-E, SEPI Engineering/TetraTech and approved by the Wilmington District. As stated in the QCP, the objective of the QCP is to implement a set of procedures that will ensure the development of a high-quality product. The most important element for ensuring high quality is the assignment of high-quality personnel to both production and review activities. District Technical Staff will provide quality assurance reviews of the A-E submittals, which included the Concept Report, Geotechnical Report, Cost Estimates, and 35%, 65%, and 95% Design Documents. Status review meetings with the A-E and District Technical Staff are held weekly throughout the design process. These meetings are to discuss the previous weeks' progress and to assist with any problems or needs of the design team. The Biddability, Constructability, Operability, and Environmental (BCOE) Review will be performed by the Wilmington District.

A Value Engineering (VE) study was performed in accordance with ER 11-1-321, Value Engineering. Based on the results of the VE study several possible modifications to the project design were determined that could increase the overall value of the project. In addition to the VE study, the Wilmington District performed several *in situ* and laboratory tests to determine the condition of the concrete of the lock walls at Lock & Dam No. 1. A modification of 95% design was requested by the District. All the submittals from the modification will undergo the quality assurance reviews as stated in the QCP.

4. AGENCY TECHNICAL REVIEW

ATRs are performed at key points in the study process to ensure the proper application of appropriated regulations and professional procedures. Skilled and experienced personnel who have not been associated with the development of the Fish Passage design process will perform the ATR. All of the ATR team members reviewing the pre-construction and engineering design work for the St. Paul District in the Mississippi Valley Division of the U.S. Army Corps of Engineers (see 8.2 for a list of the personnel and their disciplines). **St. Paul District will also provide the ATR for the design modification.**

4.1 Required ATR Team Expertise

As stipulated in ER 1110-1-12, ATR members will be sought from the following sources: regional technical specialists (RTS); appointed subject matter experts (SME) from other districts;

senior level experts from other districts; Center of Expertise staff; appointed SME or senior level experts from the responsible district; experts from other U.S. Army Corps of Engineers Districts; contractors; academic or other technical experts; or a combination of the above. The ATR Team will be comprised of the following disciplines.

ATR Team Leader. The ATR Team Leader should have 10 or more years experience with Civil Works Projects and have performed as an ATR team member on other civil works projects. The team leader can also participate as a team member for any of the following disciplines.

Biology/Environmental Engineering. The Biology/Environmental Engineering Expert should be a professional with 15 or more years experience in either biology or environmental engineering. Experience needs to include fish migration and an understanding of the environmental impacts of construction projects. Active participation in related professional societies is encouraged.

Hydrology and Hydraulics (H & H). The H & H Expert should be a registered professional with 15 or more years experience in conducting and evaluating hydrologic and hydraulic analyses. Experience with 2D hydraulic modeling, 3D hydrologic and groundwater modeling, wind/wave analysis, and performance of risk assessments is required. Experience with Rock Rapids Fish Passage and Lock and Dams is desired. Experience with the Dam Safety Program is desired. Active participation in related professional societies is encouraged.

Geotechnical Engineering. The Geotechnical Engineering Expert should be a registered professional engineer with 15 years experience in conducting and evaluating geotechnical and geologic analyses for concrete and steel sheet pile retention walls and dams. Experience needs to include geotechnical evaluation of Lock and Dam structures. Experience needs to encompass static and dynamic slope stability evaluations; evaluation of the seepage through earthen embankments and underseepage through the foundation of the flood risk management structures, including dams, levee embankments, floodwalls, closure structures and other pertinent features; and settlement evaluations. Experience with the Dam Safety program is desired. Active participation in related professional societies is encouraged.

Structural Engineering. The Structural Engineering Expert should be a registered professional engineer with 15 years experience in conducting and evaluating structural analyses for concrete and steel sheet pile retention walls and dams. Experience needs to include structural evaluation of Lock and Dam structures. Experience with the Dam Safety program is desired. Active participation in related professional societies is encouraged.

Cost Engineering. The Cost Engineering Expert should be a registered professional with a minimum 15 years demonstrated experience in the preparation of cost estimates, cost risk analyses and cost engineering. Team member should be familiar with similar projects across US. Active participation in related professional societies is encouraged.

The ATRs will be performed on the 65% and 95% design submittals. **ATR of the design modification by H & H, Geotechnical, and Structural disciplines will also be performed.**

4.2 Documentation of ATR

DrChecks[sm] review software will be used to document all ATR comments, responses, and associated resolutions accomplished throughout the review process. Comments have been limited to those that are required to ensure adequacy of the product. The four key parts of a quality review comment will normally include:

(1) The review concern- identify the product's information deficiency or incorrect application of policy, guidance, or procedures;

(2) The basis for the concern- cite the appropriate law, policy, guidance, or procedure that has not be properly followed;

(3) The significance of the concern- indicate the importance of the concern with regard to its potential impact on the plan selection, recommended plan components, efficiency (cost), effectiveness (function/outputs), implementation responsibilities, safety, Federal interest, or public acceptability; and

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

In some situations, especially addressing incomplete or unclear information, comments may seek clarification in order to then assess whether further specific concerns may exist. The ATR documentation in DrChecks[sm] 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 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 ATR may be certified when all ATR concerns are either resolved or referred to U.S. Army Corps of Engineers South Atlantic Division (CESAD) for resolution and the ATR documentation is complete. Certification of ATR should be completed, based on work reviewed for the 65%, 95%, **and 95% design modification submittals**. A sample certification is included in ER 1110-2-12.

5. INDEPENDENT EXTERNAL PEER REVIEW (WRDA 2007 Section 2035 Safety Assurance Review)

A Risk Assessment (Attachment 2) recommending only District Quality Control and Agency Technical Review was sent to the MSC per the requirements of EC 1165-2-209, Civil Works Review Policy for approval. The Risk Assessment included the rationale supporting the District risk based decision not to pursue a Type II Independent External Peer Review (IEPR) for the Fish Passage at Lock & Dam No. 1, Cape Fear River Basin, Bladen County, North Carolina. A Type II IEPR was determined by the MSC to be not necessary for the Pre-construction and Engineering Phase (PED) of the Fish Passage based on the factors listed in WDRA 2007 Section 2035. However, the MSC has requested that the District performs a simplified Potential Failure Mode Analysis.

6. POTENTIAL FAILURE MODE ANALYSIS

6.1 Simplified Potential Failure Mode Analysis

A simplified Potential Failure Mode Analysis (PFMA) is required by the MSC to address the potential impacts of the Fish Passage to the hydraulics of the river and on the structural components of the lock and dam. The PFMA was performed during the PED Phase of the Fish Passage. The PFMA was performed to systematically examine the potential failure modes and impacts of the structure modifications.

The PFMA was to address the potential impacts to the existing dam and lock structures, as well as impacts on the nearby structures and the surrounding area due to changed hydraulics.

6.1.1 Simplified Potential Failure Mode Analysis Team Members

The PFMA team members are employees of the Wilmington District and members of the SEPI/TerraTech design team for the Fish Passage. The team was comprised of the following disciplines.

PFMA Facilitator. The PFMA Facilitator is a trained PFMA Facilitator with experience with handling a PFMA. The team leader can also participate as a team member for any of the following disciplines.

<u>PFMA District Team Members Disciplines</u>
Hydrology and Hydraulics Engineer
Geotechnical Engineer
Structural Engineer

<u>PFMA A-E Team Members Disciplines</u>
Hydrology and Hydraulics Engineer
Geotechnical Engineer
Structural Engineer

6.2 Modification Potential Failure Mode Analysis

Another PFMA was conducted in anticipation for including in the Review Plan for the modifications of the Fish Passage at Lock & Dam No. 1. The Modification PFMA was conducted in a slightly different manner. The four alternatives that were determined during the Value Engineering (VE) study were reviewed pertaining to five different modes of failure. The highest risk and lowest risk modes of failure were then put forth.

6.2.1 Modification Potential Failure Mode Analysis Team Members

The PFMA team members are employees of the Wilmington District. The team was comprised of the following disciplines.

PFMA Facilitator. The PFMA Facilitator is a trained PFMA Facilitator with experience with handling a PFMA. The team leader can also participate as a team member for any of the following disciplines.

<u>PFMA Team Members Disciplines</u>
Hydrology and Hydraulics Engineer
Geotechnical Engineer
Structural Engineer

6.3 Documentation of PFMA

The Simplified PFMA was included as part of the design documentation for the Fish Passage at Lock & Dam No. 1 and will be reviewed by the ATR team.

The Modification PFMA will be included with the documentation for the 95% modification submittal for the Fish Passage at Lock & Dam No. 1 and will be reviewed by the ATR team that reviews the 95% modification submittal.

7. ESTIMATED COSTS AND SCHEDULE

The estimated cost for the ATR is $17,000. **The ATR on the 95% modification submittal of the design is estimated to cost $13,000.**

The review plan schedule follows:

Design Contract Award – 17 March 2010

District Quality Control (weekly calls and reviews) – 17 March – 7 July 2010

District Review of 35% Submittal – 2 – 5 April 2010

ATR Kickoff – 27 April 2010

In-progress ATR – 27 April – 5 July 2010

District Review of 65% Submittal – 26 – 30 April 2010

ATR Review of 65% Submittal – 28 April – 10 May 2010

District Performs Potential Failure Mode Analysis – 10 May 2010

District Review of 95% Submittal – 27 – 31 May 2010

Value Engineering Study – 1 – 4 June 2010

ATR Review of 95% Submittal – 27 May – 4 June 2010

ATR & BCOE Review of Corrected Final – 28 May – 14 June 2010

ATR Certification – 14 June 2010

BCOE Certification Complete – 14 June 2010

Request for Proposal for Modification – 3 September 2010

Proposal Due for Modification – 10 September 2010

Construction Contract Award – 13 September 2010

District Performs Modification Potential Failure Mode Analysis – 23 September 2010

Award Task Order for Modification – 30 September 2010

35% Concept Design for Modification – 1 November 2010

District 35% Concept Design Review Comments Due – 8 November 2010

A-E Submits Report from the Lock Wall Non-Destructive Testing and Coring Investigation – Nov 2010

95% Design Submittal for Modification – 10 December 2010

District Review of 95% Design Submittal for Modification – 13 – 17 December 2010

ATR of Design Submittal for Modification – 6 – 14 January 2011

100% Plans and Specs with Comments – 21 January 2011

Issue Request for Proposal – 28 January 20101

Proposal Due – 14 February 2011

Award Modification – 22 February 2011

8. POINTS OF CONTACT

Contact information of the team members are not in the Internet Posting Version of this Review Plan per U.S. Army Corps of Engineers guidance.

9. MSC APPROVAL

The MSC that oversees the home district is the South Atlantic Division and it is responsible for approving the review plan. Approval will be provided by the MSC Commander. The commander's approval should reflect vertical team input (involving district, MSC, and HQUSACE members) as to the appropriate scope and level of review for the pre-construction and engineering design phase. Like a PMP, the Review Plan (RP) is a living document and may change as work progresses. Changes to the RP should be approved by following the process used for initially approving the RP. In all cases the MSCs will review the decision on the level of review and any changes made in updates to the project.

Attachment 1

ACRONYMS AND ABBREVIATIONS

ATR – Agency Technical Review
BCOE – Biddability, Constructability, Operability and Environmental
BO – Biological Opinion
CESAD – U.S. Army Corps of Engineers South Atlantic Division
DCP – District Control Plan
DQC – District Quality Control
DSAC – Dam Safety Action Class
EC – Engineer Circular
ER – Ecosystem Restoration
FONSI – Finding of No Significant Impact
IEPR – Independent External Peer Review
ITR – Independent Technical Review
LOL – Loss of Life
MLS – Mean Sea Level
MSC – Major Subordinate Command
NGVD – National Geodetic Vertical Datum
NIDID – National Inventory of Dams Identification
NMFS – National Marine Fisheries Service
PAR – Population at Risk
PED – Pre-construction and Engineering Phase
PDT – Project Delivery Team
PFMA – Potential Failure Mode Analysis
PMP – Project Management Plan
PRA – Portfolio Risk Assessment
RP – Review Plan
RTS – Regional Technical Specialists
SME – Subject Matter Expert
SPRA – Screening Portfolio Risk Analysis
USACE – U.S. Army Corps of Engineers
WRDA – Water Resources Development Act

Attachment 2

The Risk Assessment & SPRA Documentation for Screening for Lock & Dam No. 1 has been removed from the Internet Posting Version because it contains For Official Use Only information.

Attachment 3

Project Name: ENGINEERING AND DESIGN FOR FISH PASSAGE, LOCK AND DAM NO. 1, CAPE FEAR RIVER, NORTH CAROLINA

Project Location: Bladen, County, northwest of Wilmington, North Carolina

Contact Information:

End User: USACE-SAW
Wilmington District
69 Darlington Ave.
Wilmington, North Carolina 28403
Primary Contact:

Client: USACE-SAW
Wilmington District
69 Darling Avenue
Wilmington, NC 28403
Primary Contact:

Project Description:

Background: Funds from the American Recovery and Reinvestment Act of 2009 have been made available to the Wilmington District to design and construct fish passage facilities at Lock and Dam No. 1 on the Cape Fear River. The Wilmington Harbor Deepening was authorized by the Water Resources Development Act of 1986. In the August 2000 Finding of No Significant Impact (FONSI) for Preconstruction Modifications of Authorized Improvements for Wilmington Harbor (USACE 2000), a commitment was made by the U.S. Army Corps of Engineers, and the Wilmington Harbor project sponsor, the State of North Carolina, to construct a fish passage structure at Lock and Dam No. 1 on the Cape Fear River. This commitment was also included as Term and Condition No. 8 of the August 3, 2000 Biological Opinion (BO) on Wilmington Harbor from the National Marine Fisheries Service (NMFS 2000). This was required to mitigate the potential impacts on the endangered shortnose sturgeon due to blasting in the Wilmington Harbor navigation channel to remove rock.

Rock will be transported by truck and/or barge to the site and probably placed in the water from a barge. Rock may be temporarily stockpiled on an upland location near the site. Land access to the east bank side of Lock and Dam No. 1 is provided by a 2.5 mile wooded path from North Carolina Highway 11 with, 3 makeshift bridges (concrete) that are currently used by timber trucks. The A-E would need to make sure the bridges can handle trucks hauling rock.

Objective: The objective of this project is to provide a Concept Design Report, Construction Plans, Construction Specifications (Technical Sections), a Design Report, and Construction Cost Estimates for a rock arch rapids fish passage at Lock & Dam No.1 located in Bladen County on the Cape Fear River. The project will utilize granite fill stone (Class B) covered by a layer of larger wearing stone that will be placed near the top of the dam and continue downstream at a 1:25 (4 percent) slope. The slope of the rock arch rapids is generally at 5 percent or flatter to keep velocities low and rock placement is designed so that they would appear as a natural rapids to the migrating fish. Boulders, generally 3-4 feet in diameter are placed on the surface of the rapids in

parallel veins about 20 feet apart, which results in veins about every foot drop in elevation. These stones are sized such that they will not be moved by water velocity or debris such as downed trees. The center of the rapids is about 1-2 feet lower than the sides so that during low flow the water is concentrated in the middle in order that the fish can still pass.

Approximately 100,000 cubic yards of rock will be used in construction covering about 3.0acres of river bottom. This estimate includes stabilization of a scour hole, about 40 feet deep, that has developed below Lock and Dam No.1 as a result of water plunging over the dam. Stabilizing this scour hole is necessary first to ensure stability of the dam structure. Of the 100,000 cubic yards of rock indicated above, about 25,000 cubic yards is required to stabilize the scour hole covering about 1.0 acre of river bottom. The additional 75,000 cubic yards is required to complete the rock rapids along with placing a small volume of this rock along the upstream face of the dam to offset the weight of the rock rapids on the dam. This action would require about 2.0 acres of additional river bottom covered. Placement of this rock would require removal of the steeppass fishway previously constructed in 1997.

QCP Objective: The objective of Quality Control Plan is to implement a set of procedures that will ensure the development of a high-quality product. The most important element for ensuring high quality is the assignment of high-quality personnel to both production and review activities. An established set of independent technical review procedures is another important tool for achieving quality products. The independent technical review activities must be carried out in such a way that quality of the product is ensured while, at the same time, cost and time for completing a project are not unduly increased. Due to the fast track schedule required in this task order, the independent technical review will be performed by the Government in conjunction with the BCOE.

Independent Technical Review Process: Although the formal ITR will be conducted by the Government, the A-E will conduct informal reviews upon significant completion of technical tasks throughout the design development process and at the 95% pre-final documents submittal.

Technical Design Team (TDT):

Position	Name	Contact
Information removed.		

Independent Technical Review Team (ITRT): The USACE Wilmington District will conduct ITR of the Concept Report, Geotechnical Report, Cost Estimates, and 65% Design Documents. Additionally The USACE St. Paul District will conduct ATR of the 95% Design Documents during Biddability, Constructability, Operability and Environmental Review.

Milestone Dates:

Task	Start Date	End Date
Concept Design Report	18-March	1-April
Geotechnical Report	18-March	20-April
Cost Estimates	18-March	1-July
Design-65%	5-April	20-April
Design – 95%	23-April	27-May
BCOE Review	28-May	14-June
Design – 100%	15-June	1-July

Risk Assessment:

1. Loss of Life: There is some risk for loss of life during the design process. The topographic survey and geotechnical investigation involve working with equipment in locations with inherent potential hazards.
2. Property Damage: There is no risk for property damage during the design process. Some property damage may occur during the construction phase. A lock wall stability evaluation is included in the design of the project.
3. Complexity of the Project: This is a unique civil engineering project within the Wilmington District, with some significant challenges due to its location and environmental conditions.
    a. A problem when considering a rock rapids structure is that locks were not present when rock rapids were constructed at other dams. If rocks were to be placed adjacent to the river side lock wall, the lock wall may experience instability and structural damage. Therefore, a protective barrier or retaining wall, which may be a new sheet pile or similar structure, will be constructed near the lock wall to isolate placed rock without exerting additional damaging force against the lock. The new barrier will be parallel to and within about 12 feet of the lock which will leave a narrow strip of open water between the two structures. Any fish that may enter this area, however, can easily exit downstream. This space cannot be filled because the fill material may exert excessive pressure against the existing lock wall. The barrier configuration will not compromise fish passage since the rock rapids comprise greater than 95 percent of the 275 feet width of the dam.
    b. Available geotechnical data is limited. Additional geotechnical data will be collected to satisfy the government's design requirements. Due to budget and schedule constraints, the government has streamlined the geotechnical investigation efforts by establishing lines, grades and elevations known to satisfy foundation stability requirements. These have been used as basis of design.
    c. Due to the fast track nature of this project, and the lack of time before it needs to be awarded, the engineering analysis and design development documents are being prepared taking into consideration the experience and local knowledge of government engineers and the A-E. Proven designs previously implemented have been incorporated herein.

d. The work may be accomplished from land or water. Tidal currents and elevations changes can become a construction condition hazard. In addition, boat generated waves can also represent a hazardous situation during construction.

4. Magnitude of Cost: Every effort is being made to reduce expected costs of the project. The rock may be delivered to the worksite by land or water. Rock material demand, supply and route access limitations will affect the cost of the project.
5. Potential Effect on Health and Safety: There is no risk to local health and safety during the design process.
6. Potential for Environmental Impacts: Overall risk is low for design.
7. Liability of the Firm: The risk of liability to the firm is overall low considering that the technical input will be provided by a fish passage expert requested by the government. Localized failures are considered acceptable and repairable through maintenance efforts.

Items Furnished by USACE to the A-E:

a) 2009 bathymetric survey on USACE's website
b) The USACE has provided the A-E with previous design documents, plans and specs, cost data.

Unique, Sensitive or High Visibility Items: None during design.

Documents Reviewed by the ITRT:

1. Engineering Concept Design Report (35% Design)
   a. Project design criteria, engineering analysis and calculations for the fish passage
2. 65% Design Review Documents
   a. Basis of Design - Engineering Analysis and Design Report
   b. Preliminary plans
   c. Preliminary specification
   d. Preliminary cost estimate
3. 95% Final Review Documents
   a. Basis of Design - Engineering Analysis and Design Report
   b. Final review of plans
   c. Final review of cost estimate
   d. Final review of specifications

Partnering and Conflict Resolution: Each team member will be working under the A-E Standard Terms and Conditions contract. The A-E is committed to partnering with the Corps to resolve any conflict.

Constraints:

1. Time: There is a compressed timeline for this project because it is financed under ARRA. Bid solicitation is expected to be published by July 15, 2010 and awarded by September 13, 2010.

Key Project Personnel

Information Removed

Attachment 4

COMPLETION OF AGENCY TECHNICAL REVIEW

The _____ District has completed the (*type of product*) of (*project name and location*). Notice is hereby given that an Agency Technical Review, appropriate to the level of risk and complexity inherent in the project, has been conducted as defined in the project's Review Plan. During the Agency Technical Review, compliance with established policy principles and procedures, utilizing justified and valid assumptions, was verified. This included review of: assumptions, methods, procedures, 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 Corps policy. The review also assessed the DQC documentation and made the determination that the DQC activities employed appear to be appropriate and effective. The Agency Technical Review was managed by (*RMO*). All comments resulting from ATR have been resolved and the comments have been closed in DrChecks^{sm}.

(Signature) (Date) .
RMO representative

(Signature) (Date) .
ATR Team Leader

(Signature) (Date)
Project Manager

CERTIFICATION OF AGENCY TECHNICAL REVIEW

Significant concerns and the explanation of the resolution are as follows:

(*Describe the major technical concerns, possible impact, and resolution*)

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

(Signature) (Date)
Chief, Technical Services Division