



**US Army Corps
of Engineers®**

PROJECT REPORT



White River Basin, Arkansas Minimum Flows

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White River Basin, Arkansas, Minimum Flows Project Report

Executive Summary

Section 132(a) of the FY 2006 Energy and Water Development Appropriations Act (EWDAA) (Public Law 109-103) authorized and directs implementation of two of the Reallocation plans described in the July 2004 White River Minimum Flows Reallocation Report: BS-3 at Bull Shoals and NF-7 at Norfolk Lake. The authorization requires a determination by the Assistant Secretary of the Army for Civil Works (ASA(CW)) regarding reasonable continued use of lakeside facilities and the determinations by the Administrator of the Southwestern Power Administration (SWPA) regarding compensation for hydropower losses at the Federal Energy Regulatory Commission (FERC) Project License No. 2221 and the offset of Federal hydropower losses at Bull Shoals and Norfolk Lakes.

Plan BS-3 reallocates 5 feet of flood control storage at Bull Shoals Lake for the minimum flows release of 800 cfs. The top of the conservation pool elevation will be raised by 5 feet from 654.0 to 659.0; and the top of the seasonal pool held from May to July for water temperature releases will be raised by 5 feet from 657.0 to 662.0. The minimum flow releases will be made through the main turbine, so no new release facilities are required. However some modifications to the Corps operational facilities are required. These include modifying the computer language (SCADA) used to remotely operate Bull Shoals turbines and minor modifications to the existing monorail bulkheads.

Plan NF-7 reallocates 3.5 feet of storage at Norfolk Lake to be evenly divided (50:50) between the conservation and flood control pools to provide for the minimum flows release of 300 cfs. The top of the conservation pool elevation will be raised by 1.75 feet to from 552.0 to 553.75; and the top of the seasonal pool held from May to July for water temperature releases will be raised by 1.75 feet from 555.0 to 556.75.0. Plan NF-7 includes a siphon system that will be constructed at the dam and operated in concert with the existing Station Service Unit to make the minimum flows releases. The siphon system includes a knife valve, a 24-inch diameter steel pipe through and along the downstream face of the dam, and a multi-layered intake system on the lakeside. The siphon system provides the ability to remotely operate the discharge for the minimum flows releases. It does not affect other operations of the dam or powerhouse. Other modifications to lake project facilities include modifying the computer language (SCADA) used to remotely operate Norfolk turbines and installation of a new monorail bulkhead.

The Arkansas Game & Fish Commission (AGFC), the non-Federal sponsor, will provide relocations or modifications for public and private lake facilities to allow for reasonable continued use of those facilities at both Lakes. The estimated cost to provide modified or replacement lakeside facilities is approximately \$18,103,000.

At both lakes, there will be an offset to reduce SWPA's debt to the Treasury for the Federal hydropower purpose. The project at Bull Shoals Lake also includes the FERC licensee compensation, to be paid by the Corps. SWPA has calculated the energy and capacity losses, as well as the dollar value to be compensated. The compensation is determined by the Administrator of SWPA on the basis of present values of the estimated lifetime replacement cost of the electrical energy and capacity at the time of implementation. The current estimate for the Federal hydropower offset is \$86,712,100, and the estimate for the FERC Licensee compensation is \$33,935,100. Final dollar amounts will depend on the official date of implementation of Minimum Flows Project at each lake and the value of the specified parameters in effect at that time.

There are benefits and dis-benefits associated with the implementation of White River Minimum Flows Project. The accompanying Environmental Impact Statement (EIS) evaluated the effects of the Minimum Flows Project on the human and natural environment. The EIS concluded that the trout tailwater fishery below Bull Shoals and Norfork dams will benefit from the increased wetted perimeter and dissolved oxygen (DO) levels resulting from increased minimum flows. The downstream recreation benefits associated with the improved trout fishery are increased by over \$4 million annually. There will be no change to the water supply use of the two lakes. Negative effects to lakeside facilities will be minimized by relocating or modifying affected facilities to ensure reasonable continued use, in compliance with the authorizing language. The dis-benefits are to the hydropower and flood control purposes of the lakes. Negative impacts to hydropower will be compensated through the SWPA offset and FERC licensee compensation. The small reduction in flood control benefits were deemed to be insignificant when compared to the total flood damages the lakes are estimated to prevent.

The total cost for project design and construction and the FERC licensee compensation is estimated to be \$58,241,000. This is will be cost shared at approximately \$40,138,000 Federal and \$18,103,000 non-Federal. The Minimum Flows Project facilities will be provided by the Corps, and the estimated total cost is approximately \$6,203,000. The offset to the Federal hydropower debt at Bull Shoals and Norfork Lakes is estimated to be \$86, 712,100. The AGFC will serve as the non-Federal Sponsor and strongly supports the Minimum Flows Project.

White River Basin, Arkansas, Minimum Flows

Project Report

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WHITE RIVER BASIN, ARKANSAS, MINIMUM FLOWS PROJECT REPORT

1.0 BACKGROUND AND FORMULATION OF THE PROJECT

1.1 Introduction

This Project Report is the feasibility-level Corps of Engineers (Corps) decision document for the implementation of the White River Basin, Arkansas, Minimum Flows Project at Bull Shoals and Norfolk Lakes, as authorized by Section 132 (a) of the FY 2006 Energy and Water Development Appropriations Act (FY 06 EWDA) (Public Law 109-103). This Project Report provides information for the three determinations required by the authorizing legislation—the determination by the Assistant Secretary of the Army for Civil Works (ASA(CW)) regarding reasonable continued use of lakeside facilities and the determinations by the Administrator of the Southwestern Power Administration (SWPA) regarding compensation for hydropower losses at the Federal Energy Regulatory Commission (FERC) Project License No. 2221 and the offset of Federal hydropower losses at Bull Shoals and Norfolk Lakes. This Project Report also provides documentation that the Minimum Flows Project is technically sound and environmentally acceptable, as well information needed for the decision to execute a Project Partnership Agreement (PPA) for construction. The effects of the authorized Minimum Flows Project on environmental and social resources, as well as other project purposes, are addressed and evaluated in the accompanying Environmental Impact Statement.

In the decades during which the five Corps dams and lakes have been operated for flood control and hydropower in the White River Basin, the need for and the characteristics of minimum flows to support downstream trout fisheries have emerged and evolved through various studies and reports by state and Federal agencies. Most recently beginning in 1999, a series of legislative authorities guided and directed the planning and implementation of this Corps project. Because of this evolution, the White River Minimum Flows Project did not precisely follow the usual Corps planning and authorization process. Project information and the basis for some decisions are contained in documents prepared by and for other agencies, as well as the Corps. In regards to the Corps planning process, extensive basin-wide planning investigations, screening of alternatives, plan formulation, evaluation of impacts, and public/agency coordination for alternatives at all five basin lakes was accomplished and documented in the White River Minimum Flows Reallocation Study Report, dated July 2004. This current Project Report summarizes and updates information from the July 2004 Reallocation Report and other documents that are most relevant to the required determinations and the technical, environmental and implementation decisions for the Minimum Flows Project as authorized by the FY06 EWDA Section 132(a). Section 2 contains the Minimum Flows Project Description, Section 3 addresses Environmental Acceptability of the Project, Section 4 presents information on Technical Soundness of the Project, and Section 5 discusses the Determinations to be made by the Secretary (per the authorization), Section 6 addresses Implementation of the Project and Section 7 provides the Conclusion of the Project Report. An Environmental Impact Statement has been

prepared as a separate document to evaluate the environmental affects of the proposed action, and accompanies this Project Report.

1.2 Purpose and Need

1.2.1 Existing White River Basin Projects

Five existing Corps of Engineers lakes (Beaver Lake, Table Rock Lake, Bull Shoals Lake, Norfolk Lake and Greers Ferry Lake) were constructed between 1940 and 1970 in the White River Basin of Arkansas and Missouri. The five lakes are multi-purpose reservoirs authorized for the primary purposes of flood control and hydroelectric power generation. Other authorized purposes are water supply, recreation and fish and wildlife. A map of the White River Basin is shown in Figure 1.

Prior to the construction of the Corps lakes, a private hydroelectric dam already existed at Ozark Beach near Forsyth, Missouri. Construction of the Ozark Beach Dam began in 1911 in Taney County, Missouri and was completed in 1913. The Ozark Beach hydroelectric facility, owned by Empire District Electric Company, operates run-of-the river and creates Lake Taneycomo, which begins at the upper end of Bull Shoals Lake and extends upstream to Table Rock Lake dam.

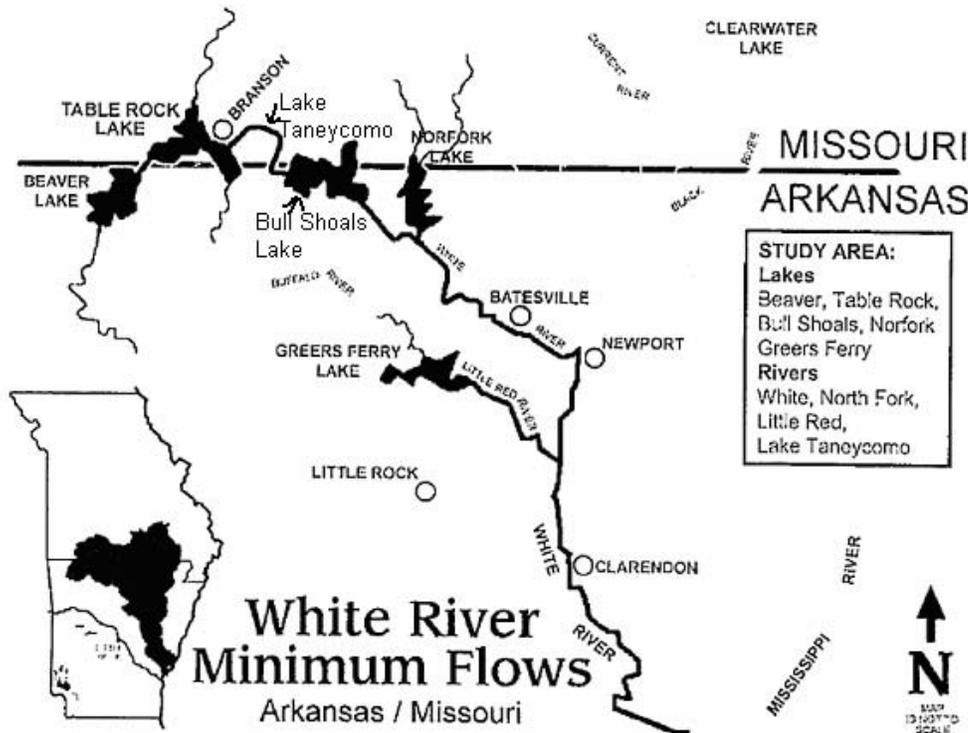


Figure 1: White River Basin Projects

The five Corps lakes are operated under the White River Basin Water Management Plan. This plan provides a comprehensive system of water control regulation which encompasses the entire White River Basin, incorporates all the basin projects and their many purposes, and provides seasonal flood control and hydropower releases based on the agricultural practices of the lower basin and other land uses downstream of the projects. The plan also addresses the needs of the downstream fishery by providing a mechanism to maintain cool water temperatures based on monitored and forecasted ambient air temperatures. The plan also provides a deviation procedure to respond to unforeseen and emergency conditions. The plan does not specifically manipulate lake levels for the benefit of recreation in the lakes or in the tailwaters.

Before the five lakes were built on the White, North Fork, and Little Red Rivers, these rivers provided world class warm-water fisheries. After construction of the dams, the tailwaters downstream of the dams could not sustain warm-water fisheries due to the cold water hydropower releases. To replace the lost warm-water fisheries, federally constructed fish hatcheries were built at Norfolk and Greers Ferry¹. Through programs of the U.S. Fish and Wildlife Service (USFWS) and the states of Arkansas and Missouri, put-and-take trout were introduced and continue to be stocked in the tailwaters, providing a world class cold-water fishery downstream of each of the five multipurpose Corps projects.

Today, the White River lakes support in-lake and downstream fisheries that provide an important economic base for tourism. The largest of the fisheries is below Bull Shoals in Arkansas, extending downstream about 89 miles along the White River. Norfolk Lake releases create a cold water fishery along about 5 miles of the North Fork River to the confluence with the White River where the flows join the cold water flows from Bull Shoals. Similar fisheries along the White River are below Beaver Lake and Table Rock Lake, they both extend into the upper reaches of downstream lakes. The Lake Taneycomo fishery in Missouri just downstream of Table Rock Lake is about 22 miles long and is the most densely used of the downstream fisheries. Below Greers Ferry Lake the cold water fishery extends about 25 miles along the Little Red River.

1.2.1.1 Bull Shoals Lake

Bull Shoals Lake, located in the upper White River Basin, is a multipurpose lake constructed for flood control and hydropower generation. Construction of the Bull Shoals Dam was started in 1947 and completed in 1951. The Dam is located seven miles north of Cotter, Arkansas. There is 6,036 square miles of drainage area above the dam. The powerhouse and switchyard were completed in 1953, with commercial generation having begun in 1952. With installation of the final two generating units, bringing the total to eight generating units, in 1963, construction was completed at a cost of about \$86 million. The lands and water of Bull Shoals Lake offer a variety of recreational experiences including boating, fishing, camping, picnicking, swimming, water skiing,

¹ Note: construction of the hatcheries was not part of the Corps White River projects. Rather, the hatcheries were funded under Department of Interior appropriations prior to the current concept of “mitigation”.

wildlife observing, hunting, and scuba diving. A detailed map of Bull Shoals Lake is located in Appendix F.

1.2.1.2 Norfolk Lake

Norfolk Lake, located in the upper White River Basin, is a multipurpose lake constructed for flood control and hydropower generation. Construction of the Norfolk Dam was started in 1941 and completed three years later, while construction of the powerhouse and switchyard were completed in 1949. The Dam is located four miles northeast of Norfolk, Arkansas. There is 1,806 square miles of drainage area above the dam. There are two generating units at Norfolk Lake that began commercial generation in 1944.

Construction of the dam and powerhouse was approximately \$28.6 million. The lands and water of Norfolk Lake also offer a variety of recreational experiences including boating, fishing, camping, picnicking, swimming, water skiing, wildlife observing, and hunting. A detailed map of Norfolk Lake is located in Appendix F.

1.2.2 Problems and Opportunities

Although the White River trout fisheries are popular and successful, Arkansas, Missouri and Federal agencies have identified tailwater habitat issues that if addressed would improve the cold-water ecosystem and the trout fisheries. These issues are quantity and consistency of downstream flows and resulting wetted area of tailwater habitat (amount of bottom substrate that is always covered), water temperature, and low dissolved oxygen in some dam releases. The purpose of the White River Minimum Flows Project is primarily to address the water quantity issue by reserving lake storage for water to make releases for minimum flows that will provide larger, more consistently wetted areas in the tailwater trout fisheries. The water temperature and low dissolved oxygen issues are being addressed through other initiatives, but the minimum flows releases can also contribute to small improvements in those concerns.

1.2.2.1 Quantity of Flows

Prior to the 1999, 2000 and 2006 authorizations discussed in Section 1.3 of this report, no specific storage was ever authorized for the White River lakes to provide water for the release of minimum flows that would maintain a healthy cold-water ecosystem in the tailwaters. The tailwater trout fisheries are dependent upon releases of cold water from the dams. With the exception of large releases during flood control operations and very small flows from other uses and leakage,² these cold water flows come from releases made for the generation of hydroelectric power. As a result, during periods in which no hydroelectric power is being generated, cold water releases are reduced drastically and the wetted perimeter of the tailwater is reduced resulting in a stressed ecosystem.

² In the context of water storage accounting, leakage is defined as a combination of flows passing through the dam past the wicket gates, through the foundation drainage system, past waterstops, and through natural cracks and fissures in the embankments and foundations. Leakage is treated as a loss and is prorated and distributed over each water supply user's storage. Leakage reduces the efficiency of reservoir storage and is taken into account during water supply yield evaluation.

1.2.2.2 Water Temperature

Due to the dependence of the trout fisheries upon hydropower releases to maintain cold water temperatures, SWPA and the Corps operate the lakes with seasonal pool elevations and water management plan criteria that consider downstream water temperatures when scheduling hydropower releases. During hot weather, hydropower releases are made when lakes are at specified elevations and certain monitored and forecasted ambient air temperatures are expected. These requirements are part of a Memorandum of Understanding (MOU) between the Corps and SWPA. The Corps regulator must monitor the temperature sensors; these sensors are located below each of the hydropower projects and near the towns of Fairview, Calico Rock, Sylamore, and Pangburn. The sensor readings guide supplementary releases or changes in timing of releases as needed to keep water temperatures from exceeding 75 degrees F.

This scheduling of hydropower releases for water temperature considerations helps maintain cold water habitat much of the time, but there are still instances when the lake elevation criteria are not met and no hydropower releases are made. The worst case scenario is a hot, dry 3-day weekend when hydroelectric generation requirements are at a minimum. At such times, pools in the river may be isolated by shoals and the fish may be unable to seek refuge in cooler waters.

1.2.2.3 Low Dissolved Oxygen (DO)

In deep reservoirs that stratify in the summer and fall, hydropower releases taken from the lower layer can have chronic low dissolved oxygen (DO) concentrations that are detrimental to the tailwater fish and aquatic organisms. In the White River Basin, the first 3 miles of the Bull Shoals tailwater and 4.2 miles of the Norfolk tailwater were listed on the 2004 Arkansas Water Quality Limited Waterbodies 303(d) list. The 303(d) list identifies DO as the pollutant and hydropower as the source. There is an ongoing effort by the Arkansas-Missouri Dissolved Oxygen Committee researching methods to correct the low DO conditions, as well as interagency cooperative efforts to increase oxygen levels while maintaining adequate hydropower production. The DO issue is associated with hydropower releases and is outside the scope of the White River Minimum Flows Project. However, opportunities for increasing DO levels in the small minimum flow releases will be considered.

1.3 Project Authorization

The following Congressional authorizations have provided the basis for development of the White River Minimum Flows Project.

1.3.1 Section 374 of the Water Resources Development Act (WRDA) of 1999

SEC. 374. WHITE RIVER BASIN, ARKANSAS AND MISSOURI 1999.

(a) IN GENERAL. - Subject to subsection (b), the project for flood control, power generation, and other purposes at the White River

Basin, Arkansas and Missouri, authorized by section 4 of the Act of June 28, 1938 (52 Stat. 1218, chapter 795), and modified by House Document 917, 76th Congress, 3rd Session, and House Document 290, 77th Congress, 1st Session, approved August 18, 1941, and House Document 499, 83rd Congress, 2^d Session, approved September 3, 1954, and by section 304 of the Water Resource Development Act of 1996 (110 Stat. 3711) is further modified to authorize the Secretary to provide minimum flows necessary to sustain tail water trout fisheries by reallocating the following amounts of project storage: Beaver Lake, 1.5 feet; Table Rock Lake, 2 feet; Bull Shoals Lake, 5 feet; Norfork Lake, 3.5 feet; and Greers Ferry Lake, 3 feet.

(b) REPORT. -

(1) IN GENERAL. - No funds may be obligated to carry out work on the modification under subsection (a) until completion of a final report by the Chief of Engineers finding that the work is technically sound, environmentally acceptable, and economically justified.

(2) TIMING. - The Secretary shall submit the report to Congress not later than July 30, 2000.

(3) CONTENTS. - The report shall include determinations concerning whether-

(A) the modifications under subsection (a) adversely affects other authorized project purposes; and

(B) Federal costs will be incurred in connection with the modification.

1.3.2 Section 304 of the Water Resources Development Act (WRDA) of 2000

SEC. 304. WHITE RIVER BASIN, ARKANSAS AND MISSOURI 2000.

(a) IN GENERAL. - Subject to subsection (b), the project for flood control, power generation, and other purposes at the White River Basin, Arkansas and Missouri, authorized by section 4 of the Rivers and Harbors Act of June 28, 1938 (52 Stat. 1218), and modified by House Document 917, 76th Congress, 3rd Session, and House Document 290, 77th Congress, 1st Session, approved August 18, 1941, and House Document 499, 83rd Congress, 2^d Session, approved September 3, 1954, and by section 304 of the Water Resource Development Act of 1996 (110 Stat. 3711) is further modified to authorize the Secretary to provide minimum flows necessary to sustain tail water trout fisheries by reallocating the following recommended amounts of project storage: Beaver Lake, 1.5 feet; Table Rock Lake, 2 feet; Bull Shoals Lake, 5 feet; Norfork Lake, 3.5 feet; and Greers Ferry Lake, 3 feet.

(b) REPORT. -

(1) IN GENERAL. - No funds may be obligated to carry out work on the modification under subsection (a) until the Chief of Engineers, through completion of a final report, determines that the work is technically sound, environmentally acceptable, and economically justified.

(2) TIMING. - Not later than January 1, 2002, the Secretary shall transmit to Congress the final report.

(3) *CONTENTS.* - *The report shall include determinations concerning whether-*

(A) *the modifications under subsection (a) adversely affects other authorized project purposes; and*

(B) *Federal costs will be incurred in connection with the modification.*

*1.3.3 Section 132 of the 2006 Energy and Water Development Appropriations Act (EWDAAs)*³

Sec 132. White River Basin, Arkansas.-

(a) Minimum Flows.-

(1) *IN GENERAL.— The Secretary is authorized and directed to implement alternatives BS–3 and NF–7, as described in the White River Minimum Flows Reallocation Study Report, Arkansas and Missouri, dated July 2004.*

(2) *COST SHARING AND ALLOCATION.— Reallocation of storage and planning, design and construction of White River Minimum Flows project facilities shall be considered fish and wildlife enhancement that provides national benefits and shall be a Federal expense in accordance with section 906(e) of the Water Resources Development Act of 1986 (33 U.S.C. 2283(e)). The non-Federal interests shall provide relocations or modifications to public and private lakeside facilities at Bull Shoals Lake and Norfolk Lake to allow reasonable continued use of the facilities with the storage reallocation as determined by the Secretary in consultation with the non-Federal interests. Operations and maintenance costs of the White River Minimum Flows project facilities shall be 100 percent Federal. All Federal costs for the White River Minimum Flows project shall be considered non-reimbursable.*

(3) *IMPACTS ON NON-FEDERAL PROJECT.— The Administrator of Southwestern Power Administration, in consultation with the project licensee and the relevant state public utility commissions, shall determine any impacts on electric energy and capacity generated at Federal Energy Regulatory Commission Project No. 2221 caused by the storage reallocation at Bull Shoals Lake, based on data and recommendations provided by the relevant state public utility commissions. The licensee of Project No. 2221 shall be fully compensated by the Corps of Engineers for those impacts on the basis of the present value of the estimated future lifetime replacement costs of the electrical energy and capacity at the time of implementation of the White River Minimum Flows project. Such costs shall be included in the costs of implementing the White River Minimum Flows project and allocated in accordance with subsection (a)(2) above.*

(4) *OFFSET.—In carrying out this subsection, losses to the Federal hydropower purpose of the Bull Shoals and Norfolk Projects shall be offset by a reduction in the costs allocated to the Federal*

³ Note that subsection 132(b) is not applicable to the Minimum Flows project and subsection 132(c) repealed the previous WRDA 1999 and 2000 authorities for Minimum Flows.

hydropower purpose. Such reduction shall be determined by the Administrator of the Southwestern Power Administration on the basis of the present value of the estimated future lifetime replacement cost of the electrical energy and capacity at the time of implementation of the White River Minimum Flows project.

(b) FISH HATCHERY.-In constructing, operating, and maintaining the fish hatchery at Beaver Lake, Arkansas, authorized by section 105 of the Water Resources Development Act of 1976 (90 Stat. 2921), losses to the Federal hydropower purpose of the Beaver Lake Project shall be offset by a reduction in the costs allocated to the Federal hydropower purpose. Such reduction shall be determined by the Administrator of the Southwestern Power Administration based on the present value of the estimated future lifetime replacement cost of the electrical energy and capacity at the time operation of the hatchery begins.

(c) REPEAL.-Section 374 of the Water Resources Development Act of 1999 (113 Stat. 321) and section 304 of the Water Resources Development Act of 2000 (Public Law 106-541) are repealed.

1.3.4 Section 906 of the Water Resources Development Act (WRDA) of 1986

The FY06 EWDA Section 132(a)(2) refers to cost-sharing in accordance with Section 906(e) of WRDA 1986 (33 U.S.C. 2283(e)). The pertinent provisions of section 906(e) are as follows:

SEC. 906. FISH AND WILDLIFE MITIGATION.

(e) In those cases when the Secretary, as part of any report to Congress, recommends activities to enhance fish and wildlife resources, the first costs of such enhancement shall be a Federal cost when--

(1) such enhancement provides benefits that are determined to be national, including benefits to species that are identified by the National Marine Fisheries Service as of national economic importance, species that are subject to treaties or international convention to which the United States is a party, and anadromous fish;

1.4 Prior Minimum Flows Studies

1.4.1 Arkansas Game and Fish Commission Studies

The Arkansas Game and Fish Commission (AGFC) has spent years studying the wetted perimeter in the tailwaters below the White River lakes that would most closely simulate healthy, natural trout fisheries. For each of the five dams, the studies identified optimum wetted perimeters obtained by certain target releases in cubic feet per second (cfs). The target releases identified were: Beaver Lake, 136 cfs; Table Rock Lake, 400 cfs; Bull Shoals Lake, 800 cfs; Norfolk Lake, 300 cfs and Greers Ferry Lake, 200 cfs.

1.4.2 White River Minimum Flow, Reallocation Study, Arkansas and Missouri, July 2004

The AGFC obtained Congressional sponsorship for Section 374 of the WRDA of 1999 and Section 304 of WRDA 2000, which modified the existing authorities of the five multipurpose White River Basin lakes to allow the Corps to change project operations to provide minimum flow releases necessary to sustain tail water trout fisheries and to reallocate a specified number of feet of storage in each lake to provide water for those minimum flows. The specified amount of reallocated storage at each lake was: Beaver Lake, 1.5 feet; Table Rock Lake, 2 feet; Bull Shoals Lake, 5 feet; Norfork Lake, 3.5 feet; and Greers Ferry Lake, 3 feet. The results of the study are documented in the White River Minimum Flows Reallocation Study Report, Arkansas and Missouri, dated July 2004, and in the accompanying Report of the Chief of Engineers, dated 31 July 2004. Both reports are provided in Appendix D.

Implementation of these modifications was contingent on the completion of a final report by the Chief of Engineers with findings that the work is technically sound, environmentally acceptable, and economically justified. The report of the Chief of Engineers identified many reallocation alternatives, determined the reallocations would adversely affect other authorized project purposes to varying degrees and identified the costs to the Federal government. However, the potential non-Federal Sponsor and other important stakeholders had concerns about cost-sharing requirements and how to handle effects on Lake recreation and hydropower, which could not be addressed through existing Corps authorities and policies. Therefore the Chief of Engineers did not recommend Corps implementation of the reallocation at that time.

1.5 Plan Formulation

1.5.1 July 2004 White River Minimum Flows Reallocation Study

The July 2004 White River Minimum Flows Reallocation Study was accomplished in accordance with standard Corps civil works planning principles, policies and regulations. The planning process, however, was applied within the constraints of the WRDA 1999 and 2000 legislation that specified the project action to be minimum flow releases to improve tailwater trout fisheries, and specified the number of feet of storage to be reallocated at each lake. In the unique evolution of the planning and authorization of the Minimum Flows Project, the reallocation study brought the project through step five of the Corps six-step planning process—Step 1, Identify Problems and Opportunities; Step 2, Inventory and Forecast Conditions; and Steps 3, 4, 5, Formulate, Evaluate and Compare alternative plans. Step 6, Select a Plan, was accomplished by the current authorization in the FY06 EWDA Section 132(a).

The study efforts identified and evaluated more than 1,000 alternatives for providing the minimum flows. For the feet of storage specified at each of the five lakes in WRDA 1999 and 2000, alternatives were developed for reallocating the storage from either the flood control pool, the conservation (hydropower) pool, or both pools 50/50.

Additionally, combinations of various methods for making the releases were applied to each of those pool scenarios. These release methods included using the main hydropower turbines, using the small station service units that provide electricity for lake project facilities, or using siphons that bypass all power generation. The alternatives also used the target minimum flow volumes identified by AGFC. However, it is important to note that the storage specified by WRDA 1999 and 2000 was not enough to sustain the minimum flow releases during extreme drought years if the AGFC target releases were maintained at a constant rate. Hydrologic and hydraulic analyses estimate the yield of the specified storage to be 80% to 90% “reliable” while meeting the proposed AGFC minimum flow target criteria.⁴ While the storage identified in the WRDAs did not yield the target flow identified by AGFC, WRDA 1999 and 2000 did not direct the Corps to optimize minimum flows releases to reflect the actual yield of the reallocated storage. Therefore, the alternatives used minimum flows released at the AGFC target rates that cease when the minimum flow storage becomes depleted.

Throughout the reallocation study process, the AGFC and the Missouri Department of Conservation (MDC) participated as project sponsors. SWPA, the USFWS and other Federal and state agencies and the public also participated in the study process and National Environmental Policy Act (NEPA) coordination, providing comments, expressing concerns or support and sharing information.

Analyses conducted for the reallocation study evaluated and compared the without-project operations and conditions to the with-project conditions. Analyses considered each of the five lakes individually and together as a basin-wide system. The Reservoir Regulation Computer Model (commonly referred to as SUPER) program developed by the Southwestern Division Corps of Engineers was used to simulate the hydrology and hydraulics for existing conditions and model storage reallocation and release scenarios. SUPER simulated the water management operations of the White River multipurpose reservoir system based upon a 64-year hydrological record. SUPER also contains modules that relate benefits and losses for project purposes to the hydrologic and hydraulic modeling scenarios. SUPER was used to simulate both in-lake and stream reach conditions, and predicted the with-project conditions related to the project uses of flood control, hydroelectric power generation, water supply, in-lake recreation. The changes to tailwater wetted perimeter and downstream recreation characteristics during minimum flow releases were identified through observations during test releases made at the AGFC target rates.

In accordance with Corps policy, the benefits of the minimum flow releases to the tailwater trout fishery are not considered ecosystem restoration because the pre-dam warm-water ecosystem is not being restored. Therefore benefits from the project accrue from improved trout fishing. The value of the improved recreational experience resulting from the Minimum Flows Project was captured using the Contingent Value Method (CVM) for downstream tailwater benefits.

⁴ Typically yield is defined as the constant release that can be sustained through a basin’s drought of record.

Studies to identify impacts, benefits and losses to other project uses also followed Corps civil works policies. The physical changes to hydroelectric generation, as well as the value of power benefits or losses, were coordinated with SWPA⁵. Environmental effects were identified through investigations and coordination with the USFWS, and with the natural resource and environmental agencies of Arkansas and Missouri. The effects on lake recreation were discussed with facility managers and owners and valued using the unit-day-value method. Numerous public workshops were held to explain the project and receive comments or concerns from the public.

The July 2004 White River Minimum Flows Reallocation Study presented impact and economic information for the alternative plans considered, and identified a National Economic Development plan (the plan that would provide the greatest net economic benefits) for each lake, as well as other economically justified plans. The plans were also technically sound, and considered environmentally acceptable. The Chief's Report determined the reallocations would affect other authorized purposes to varying degrees and determined Federal costs that would be incurred in connection with the modification. However, both reports made no recommendation for any alternative plan or implementation option, because the potential non-Federal sponsor and other important stakeholders had concerns which could not be addressed through existing authorities and Corps policy. With no recommended plan or recommendation to proceed with the project, NEPA coordination and public review were not completed. See the reports included in Appendix D for more detail on the findings.

The issues that could not be resolved within existing authorities and policies were cost sharing requirements and compensation for hydropower losses. Section 132 of FY06 EWDAAs repealed the previous WRDA 1999 and 2000 authorizations and provided a new authorization for the Minimum Flows Project which specified the project plan and resolved the cost share and hydropower issues.

1.5.2 Current Project Report

Following the July 2004 Reallocation Reports, Congress enacted Section 132 of the FY06 EWDAAs. Section 132(a) authorizes and directs implementation of two of the plans described in the July 2004 White River Minimum Flows Reallocation Study: BS-3 at Bull Shoals Lake and NF-7 at Norfolk Lake. The legislation identifies the purpose of the minimum flows project to be fish and wildlife enhancement in accordance with Section 906(e) of WRDA 1986, and sets the cost share at full Federal expense for the minimum flow facilities and operation and maintenance. Non-Federal interests are directed to provide (at non-federal expense) relocations or modification to public and private lakeside facilities at Bull Shoals and Norfolk Lakes to allow reasonable continued use of the facilities with the storage reallocation. Whether the proposed modifications fulfill that requirement is to be determined by the ASA(CW). Section 132(a) requires the Corps to compensate the replacement costs for hydropower losses at FERC Project No. 2221

⁵ It should be noted that costs and value of benefits and losses identified using Corps policies and procedures as in the reallocation study are generally lower than the amounts developed using SWPA methodologies.

caused by the storage reallocation at Bull Shoals Lake. Additionally, losses to the Federal hydropower at Bull Shoals and Norfolk Lakes are to be offset by a reduction in costs allocated to the hydropower purpose for those lake projects. The Administrator of SWPA is to determine the amount of hydropower losses and value of the compensation and offset. Section 132 did not authorize implementation of minimum flows at Beaver, Table Rock, or Greers Ferry Lakes. Section 132(c) also repealed the previous project authorities in WRDA 1999 and WRDA 2000, eliminating further consideration of alternative plans.

This Project Report will focus on the projects authorized by the FY06 EWDA Section 132(a) at Bull Shoals (BS-3) and Norfolk (NF-7) Lakes. In response to the FY06 EWDA Section 132(a), the two alternatives were brought forward from the July 2004 White River Minimum Flows Reallocation Study and studies conducted to complete feasibility-level analyses and environmental compliance for the two authorized plans. Analyses from the July 2004 study were updated to current conditions and the SUPER model scenarios were adjusted for implementing the minimum flows at the two specified lakes. Additional analyses were performed to meet the requirements of the three determinations required by the FY06 EWDA legislation. Additionally, NEPA and other environmental compliance were updated and completed for the authorized plans.

Section 2 of the accompanying Environmental Impact Statement presents the Alternatives that were considered and evaluated during this study. The alternatives included the No Action Alternative, and the Minimum Flows Alternatives BS-3 and NF-7, which are described in greater detail in Section 2 (Project Description) of this Project Report. The alternatives were developed to address the purpose and need for the Minimum Flows Project, comply with the Congressional directives, and to provide appropriate compensation to the hydropower users and affected lakeside facilities. The No Action alternative implies no change to the current minimum flow operations at both lakes. The No Action alternative does not satisfy the purpose and need for the project, but is required to comply with Corps Planning and Council on Environmental Quality (CEQ) NEPA regulations. The No Action Alternative serves as the basis from which the affects of all other alternatives are compared and it serves as the “without project condition” for planning purposes.

Section 2 of this Project Report will describe the features and operational changes for BS-3 and NF-7, the authorized plans. Furthermore it will describe the benefits of the Minimum Flows Project and present costs and implementation requirements for the Project. As previously mentioned this Project Report will present material for the three determinations required by Section 132(a), as well as how the project is technically sound and environmentally acceptable. This Project Report complies with all appropriate Corps guidance, policies, and procedures.

2.0 PROJECT DESCRIPTION

The White River Basin, Arkansas, Minimum Flows project authorized by Section 132(a) of the FY06 EWDAAs will implement two plans described in the July 2004 White River Minimum Flows Reallocation Study, BS-3 at Bull Shoals Lake and NF-7 at Norfolk Lake. The two lakes are separable elements as defined in ER 1105-2-100 paragraph E-3c(2), in that either one can operate and serve a useful function without the other. The Minimum Flows Project at each lake will be designed and implemented using consistent criteria and methods and operated in a coordinated manner. However, they may be implemented separately from each other to accommodate phasing for funding, design or other requirements.

The Minimum Flows projects at both lakes consist of three basic components:

- Minimum Flows Project Facilities. These are actions required at the Corps lakes necessary to provide the minimum flow releases, and include new or modified facilities, storage reallocation, changes to the lake and basin water management plan, and making the minimum flow releases. These are to be provided and funded by the Corps.
- Lakeside Facilities. These are relocations or modifications of public and private lakeside facilities to allow their reasonable continued use with the reallocated storage. These are to be provided and funded by the non-Federal sponsor, Arkansas Game and Fish Commission (AGFC).
- Compensation for hydropower losses. At both lakes, there will be an offset to reduce the Southwestern Power Administration (SWPA) debt to the Treasury for the Federal hydropower purpose. The project at Bull Shoals Lake also includes the FERC licensee compensation, to be paid by the Corps. Pursuant to Sections 132(a)(3) and (4) of the FY06 EWDAAs, SWPA has calculated the energy and capacity losses, as well as the dollar value to be compensated. The compensation is determined by the Administrator of SWPA on the basis of present values of the estimated lifetime replacement cost of the electrical energy and capacity at the time of implementation. Final dollar amount will depend on the official date of implementation of Minimum Flows Project at each lake and the value of the specified parameters in effect at that time.

2.1 Bull Shoals (BS-3)

Section 132(a) of the FY06 EWDAAs authorizes and directs the implementation of plan BS-3 at Bull Shoals for minimum flows. Plan BS-3 reallocates 5 feet of flood control storage at Bull Shoals Lake for the minimum flows release of 800 cfs. This target flow of 800 cfs will consist of 590 cfs of minimum flow releases through one of the main hydropower turbines, as well as 50 cfs of existing releases through the house hydropower Station Service Unit and existing flows of 160 cfs from normal leakage through the closed wicket gates. The top of the conservation pool elevation will be raised by 5 feet from 654.0 to 659.0; and the top of

the seasonal pool held from May to July for water temperature releases will be raised by 5 feet from 657.0 to 662.0. The top of the flood control pool will remain at the existing elevation of 695.0.

The minimum flow releases will be made through the main turbine, so no new release facilities are required. However some modifications to the Corps operational facilities are required. These include modifying the computer language (SCADA) used to remotely operate Bull Shoals turbines and minor modifications to the existing monorail bulkheads. The cost to modify SCADA, and design and construct the bulkhead modification cost is \$303,000. These are Minimum Flows Project Facilities that the Corps will design, construct, operate and maintain at full Federal expense. There will be an increase of \$68,000 in the annual O&M for the hydropower turbines related to their use for the minimum flows at Bull Shoals. That cost will be included as Federal O&M costs for the Minimum Flow Project Facilities and will be budgeted for on an annual basis.

The flood pool reallocation will result in a change to the Corps' flood operations. Once Minimum Flows is implemented, the Corps will continue to evacuate floodwaters as quickly as possible to provide maximum protection from future rainfall runoff. With the new minimum flows operation plan, once flood releases are concluded, at the top of the new conservation pool (659 ft), SWPA will either begin hydropower operations or the minimum flow releases will resume. SWPA and the Corps will continue the existing agreement to operate the Bull Shoals and Norfolk Lakes with seasonal pool elevations and water management plan criteria that consider downstream water temperatures when scheduling hydropower releases. During hot weather, combined hydropower releases from both lakes of 2,000 day-second-feet (DSF) 3-day running average are made when the lakes are at specified elevations and certain monitored and forecasted ambient air temperatures are expected. During droughts, a drought contingency plan will implement storage conservation efforts until the conservation pool is refilled by rainfall runoff. If the minimum flows storage is depleted in a drought year, the minimum flow releases will be halted until the minimum flows storage is refilled by inflows.

The Arkansas Game & Fish Commission (AGFC), the non-Federal sponsor, must provide relocations or modifications for public and private lake facilities to allow for reasonable continued use relative to the 5-foot pool raise and change of operations at Bull Shoals Lake. The Little Rock District, in coordination with AGFC and facility users developed criteria for reasonable continued use and evaluated all lakeside facilities. Table 9 in Section 5.1.1 lists the lakeside facilities that qualified for modification to ensure reasonable continued use. At Bull Shoals, public facilities at 12 recreation sites will be relocated or modified. The public facilities are all owned and operated by the Corps and include 11 boat ramps, 6 swim beaches, lighting, 9 parking lots, and 3 Corps roads. There will also be relocations and modifications to 2 county roads located on Corps project lands. Evaluations determined that all private facilities at the lake, such as marinas, concessions, docks could accommodate the pool raise and operational changes and maintain reasonable continued use without any modifications or relocations. The cost to design and construct these Lakeside Facilities is estimated to be \$12,494,000, and

is a non-Federal cost. Operation and maintenance of the completed Lakeside Facilities is expected to require the current level of effort and cost, and will continue to be accomplished and funded by the parties that currently perform those actions.

Because of the reallocation and releases for minimum flows, there will be losses to the Federal hydropower generated at Bull Shoals. Section 132(a) requires the Administrator of Southwestern Power Administration (SWPA) to determine the losses and the costs of replacing that energy. At Bull Shoals the minimum flows release is large enough to generate a small amount of marketable hydropower with the existing main turbine. However, with the reallocation, there is still a net loss of hydropower energy, because the turbine will be operating at a low, inefficient rate. SWPA calculated a loss of energy to Federal hydropower of 23,855 megawatt-hours (MWh) per year of off-peak energy. There is no loss of capacity because the minimum flow storage is reallocated from flood storage and includes HYPO storage to maintain yield for hydropower during drought conditions. In the June 2008 SWPA Determination Report included in Appendix C, the value of the offset of the Treasury debt was calculated to be \$48,622,900. However, that amount includes \$68,000 annual O&M costs for the main turbines that are Minimum Flow Project costs that should be removed from the final calculation of the offset. This is to be a one time adjustment at the time Minimum Flows Project is implemented at Bull Shoals.

Section 132(a) also requires the Administrator of SWPA to determine the hydropower losses and the costs of replacing that energy for the holder of FERC Project License No. 2221. This license is for the non-Federal Ozark Beach hydroelectric project, which is owned and operated by Empire District Electric Company and lies at the upstream end of the existing Bull Shoals conservation pool. The 5-foot raise in conservation pool will result in a reduction in gross head causing a total annual energy loss of 8,998 MWh and a loss of capacity of 3.00MW. SWPA calculated the one-time payment for replacement of these hydropower losses to be \$33,935,100, to be paid by the Corps at the time Minimum Flows Project is implemented at Bull Shoals. This compensation requirement only applies to the Minimum Flows reallocation at Bull Shoals Lake, the project at Norfolk Lake has no effect on the FERC No. 2221 (Ozark Beach) hydroelectric project.

Table 1: Bull Shoals Lake Cost Summary

	Project Cost	Treasury Offset
Minimum Flows Facilities	\$ 303,000 (Fed)	
Lakeside Facilities	\$12,494,000 (non-Fed)	
Federal Hydropower Offset		\$48,622,900
FERC No. 2221 Compensation	\$33,935,100 (Fed)	

No additional lands, easements and rights-of-way are required for the Minimum Flows Project. All lands and facilities affected by the lake raise and change in operation for minimum flows are located on Bull Shoals Lake project lands owned in fee by the Corps of Engineers. Modifications to Lakeside Facilities located at leased areas can be accommodated through the existing outgrant documents, so additional real estate instruments will not be needed. Any disposal activities for the Lakeside facilities will be

further defined during the design phase and will be accomplished in accordance with State regulations regarding the transport and disposal of waste.

There are no adverse environmental effects associated with the minimum flows or the pool raise at Bull Shoals Lake, and no environmental mitigation is required. The dissolved oxygen (DO) concentrations in the immediate tailwaters are expected to increase somewhat during the minimum flow releases because through previous joint efforts with SWPA, “vents” have been placed in the turbines at Bull Shoals which allow ambient air to be added to the water thereby increasing the DO in releases. As part of normal lake project operation and maintenance (O&M) activities, the Corps in coordination with AGFC will monitor minimum flow releases and apply adaptive management techniques to achieve predicted and desired results in the tailwaters.

2.2 Norfork (NF-7)

Section 132(a) of the FY06 EWDA authorizes and directs the implementation of plan NF-7 at Norfork Lake for minimum flows. Plan NF-7 reallocates 3.5 feet of storage at Norfork Lake to be evenly divided (50:50) between the conservation and flood control pools to provide for the minimum flows release of 300 cfs. This target flow of 300 cfs will consist of 185 cfs of minimum flow releases through a new siphon system, as well as 20 cfs of existing releases through the house hydropower Station Service Unit, 40 cfs of existing releases for the downstream trout hatchery, and existing flows of 55 cfs from normal leakage through the closed wicket gates. The top of the conservation pool elevation will be raised by 1.75 feet to from 552.0 to 553.75; and the top of the seasonal pool held from May to July for water temperature releases will be raised by 1.75 feet from 555.0 to 556.75.0. The top of the flood control pool will remain at the existing elevation of 580.0.

A siphon system will be constructed at the dam and operated in concert with the existing Station Service Unit to make the minimum flows releases. The siphon system includes a knife valve, a 24-inch diameter steel pipe through and along the downstream face of the dam, and a multi-layered intake system on the lakeside. The siphon system provides the ability to remotely operate the discharge for the minimum flows releases. It does not affect other operations of the dam or powerhouse. Other modifications to lake project facilities include modifying the computer language (SCADA) used to remotely operate Norfork turbines and installation of a new monorail bulkhead. The cost to modify SCADA, and design and construct the siphon and bulkhead is \$5,900,000. The Corps will design, construct, operate and maintain the facilities at full Federal expense. There is no expected increase to Corps O&M practices to operate Norfork Lake for the minimum flow releases or to maintain the minimum flows facilities.

The flood pool portion of the reallocation results in a change to the Corps’ flood operations. Once Minimum Flows is implemented, the Corps will continue to evacuate floodwaters as quickly as possible to provide maximum protection from future rainfall runoff. With the new minimum flows operation plan, once flood releases are concluded, at the top of the new conservation pool (553.75 ft), SWPA will either begin hydropower

operations or the minimum flow releases will resume. SWPA and the Corps will continue the existing agreement to operate the Bull Shoals and Norfolk Lakes with seasonal pool elevations and water management plan criteria that consider downstream water temperatures when scheduling hydropower releases. During hot weather, combined hydropower releases from both lakes of 2,000 day-second-feet (DSF) 3-day running average are made when the lakes are at specified elevations and certain monitored and forecasted ambient air temperatures are expected. During droughts, a drought contingency plan will implement storage conservation efforts until the conservation pool is refilled by rainfall runoff. If the minimum flows storage is depleted in a drought year, the minimum flow releases will be halted until the minimum flows storage is refilled by inflows.

The Arkansas Game & Fish Commission (AGFC), the non-Federal sponsor, must provide relocations or modifications for public and private lake facilities to allow for reasonable continued use relative to the reallocation of flood pool and conservation pool and change of operations at Norfolk Lake. The Little Rock District, in coordination with AGFC and facility users developed criteria for reasonable continued use and evaluated all lakeside facilities. All of the modifications identified are required to accommodate the 1.75-ft lake raise. There are no modifications required to accommodate drawdowns, because the depth and frequency will be reduced since 1.75 feet of storage will no longer be released for hydropower. Table 10 in Section 5.1.2 lists the lakeside facilities that qualified for modification to ensure reasonable continued use. At Norfolk, public facilities at 9 sites will be relocated or modified. The public facilities are all owned and operated by the Corps and include 3 boat ramps, 7 swim beaches, and 2 parking lots. Evaluations determined that all private facilities at the lake, such as marinas, concessions, docks could accommodate the pool raise, reallocation and operational changes and maintain reasonable continued use without any modifications or relocations. The cost to design and construct these Lakeside Facilities is estimated to be \$5,609,000, and is a non-Federal cost. Operation and maintenance of the completed Lakeside Facilities is expected to require the current level of effort and cost, and will continue to be accomplished and funded by the parties that currently perform those actions.

Because of the reallocation and releases for minimum flows, there will be losses to the Federal hydropower generated at Norfolk Lake. Section 132(a) requires the Administrator of SWPA to determine the losses and the costs of replacing that energy. At Norfolk Lake, a portion of the minimum flows release will pass through the existing Station Service Unit, enough to generate a small amount of marketable hydropower. Releases through the siphon system, however, will not generate any hydropower, so overall there will be a loss of Federal hydropower energy. There is no loss of capacity associated with the 1.75 feet of storage reallocated from flood storage, because that minimum flow storage includes HYPO storage to maintain yield for hydropower during drought conditions. The reallocation of the 1.75 feet of conservation (hydropower) storage will reduce the yield available to hydropower and will directly impact the marketable capacity and on-peak energy available at Norfolk. SWPA calculated a total loss of combined peak and off-peak energy for Federal hydropower of 13,524 MWh per year. SWPA also calculated the marketable capacity loss as 3.93 megawatts (MW).

SWPA determined the value of the offset to the Treasury debt to be \$38,089,200. This is to be a one time adjustment at the time Minimum Flows Project is implemented at Norfolk Lake.

Table 2: Norfolk Lake Cost Summary

	Project Cost	Treasury Offset
Minimum Flows facilities	\$5,900,000 (Fed)	
Lakeside Facilities	\$5,609,000 (non-Fed)	
Federal Hydropower Offset		\$38,089,200

No additional lands, easements and rights-of-way are required for the Minimum Flows Project. All lands and facilities affected by the lake raise and change in operation for minimum flows are located on Norfolk Lake project lands owned in fee by the Corps of Engineers. Any disposal activities for the Lakeside facilities will be further defined during the design phase and will be accomplished in accordance with State regulations regarding the transport and disposal of waste.

There are no adverse environmental effects associated with the minimum flows, the pool rise or the reallocation of conservation pool hydropower storage at Norfolk Lake. No environmental mitigation is required. The dissolved oxygen (DO) concentrations in the immediate tailwaters will increase during the minimum flow releases because water discharged through the knife valve will be aerated much more than normal hydropower releases through the turbines. Also when the lake stratifies, the multi-layered intake allows releases to be pulled from upper layers, which have more oxygen. As part of normal lake project operation and maintenance (O&M) activities, the Corps in coordination with AGFC will monitor minimum flow releases and apply adaptive management techniques to achieve predicted and desired results in the tailwaters.

2.3 Benefits/Outputs

Economic analyses and recommendation of a National Economic Development (NED) plan are not required; however the Project Report is formulated using sound judgment, prudent analytic approaches and Corps engineering standards, including Value Engineering requirements. The values and attributes to be attained by the Minimum Flows Project, including the NED costs, benefits and dis-benefits are identified and described in the following sections. All NED costs and benefits are expressed in Fiscal Year 2009 price levels. The project life and period of analysis is 50 years with the appropriate operation, maintenance, replacements, and interest during construction. The project interest rate used to discount future NED benefits and costs is 4.625 percent with a project base year of 2010.

2.3.1 *Hydropower*

The impact upon the Federal and non Federal hydropower purposes that will be affected by the authorized reallocation of storage for minimum flows releases at Bull Shoals and Norfolk Lakes were calculated by SWPA using SUPER model output provided by Little

Rock District. The hydropower valuation analysis included losses of electric energy and capacity, and cost of replacement power.

2.3.2 Flood Control

Flood control impacts were calculated by SUPER model. All stage damage curves were updated with the latest crop and property values. The benefits gained or forgone at the downstream index station for each reallocation alternative was distributed to the participating projects by prorating downstream impacts based upon historic flood damage prevention ratios. Hydraulic Engineering Center-Project Benefit Accomplishment (HEC-PBA) package is a program that generates distribution ratios used to account for flood damages prevented with respect to contributing projects. The actual distribution ratios calculated for the years 1996 through 2001 for the White River Basin were averaged and used to distribute flood control impacts associated with the White River Minimum Flows SUPER runs.

2.3.3 Water Supply

The White River Minimum Flows (WRMF) Project is not expected to have adverse affect to existing water supply users due to the DYMS operations (explained in Section 4.2.5.3). Existing water supply storage will become more efficient as a result of the minimum flows operations because losses previously debited to all conservation pool allocations will now be debited exclusively to the minimum flows storage.

2.3.4 Recreation

The incremental impact to recreation was considered for both lake recreation and tailwater recreation for each reallocation scenario. The tailwater recreation calculation was not part of the SUPER model analysis.

2.3.4.1 Tailwater Recreation

The contingent valuation method (CVM) and statistical inference to determine respondent's willingness-to-pay was used to estimate the economic benefits of increased minimum flows. Since the CVM focused only on Bull Shoals Lake, it was necessary to allocate the benefits to Norfolk Lake. This was accomplished by assigning the aggregate benefit according to the miles of downstream trout fishery. The trout stream miles below Bull Shoals and Norfolk Lakes are shared and were computed by splitting the river miles below the confluence of the North Fork and White Rivers. Table 3 displays the miles of tailwater, the percentage allocation applied, and the average annual benefit.

Table 3: Trout Stream Benefits by Project

Project	Downstream Trout Fishery Miles	Percent of Total Fishery	Benefits
Bull Shoals Lake	66	0.695	\$3,458,678
Norfolk Lake	29	0.305	\$1,519,722
Total	95	1.000	\$4,978,400

2.3.4.2 Lake Recreation

The impact to lake recreation was calculated using SWD’s SUPER model. SUPER uses seasonal visitor day curves to calculate recreation benefits with respect to pool elevation. The SUPER model analyzes historical information to estimate damages based on changes to stage and duration levels. There is a negative correlation between high-water conditions and visitor accessibility. SUPER model used the historical data and unit day values to determine the change in recreation benefits.

The unit day value estimate was based on a point scale where points were assigned, by informed opinion, to five different categories: Recreation Experience, Availability of Opportunity, Carrying Capacity, Accessibility, and Environmental Quality. This value was used in conjunction with the SUPER model’s stage duration and visitor data to determine the change in recreation benefits due to a change in stage and duration from the implementation of minimum flows.

Table 4 shows the change in recreation benefits without and with the proposed Lakeside Facility relocation/modifications, and costs to construct those modifications. Without the modifications, some campsites and day use facilities would be inundated by water due to increased stage and duration,, however the annual loss to lake recreation benefits is actually low (Bull Shoals -\$139,000; Norfolk -\$26,000), because there is little noticeable change from the inundations already experienced under current lake operations. However, with the Minimum Flows Project, relocation and modifications to Lakeside Facilities are proposed to allow “reasonable continued use” of the affected facilities, so there will be no loss of lake recreation benefits. The recreation facility costs include relocating roads, parking lots, restrooms, picnic areas, boat ramps, and electrical facilities.

Table 4: Recreation Facility Costs and Benefits Foregone

	Number of Campsites & Day Use Facilities Affected	If Facilities were Not Modified or Relocated	With Facilities Modified or Relocated	
		Change in Recreation Benefits	Change in Recreation Benefits	Fully Funded Cost to Relocate or Modify Lakeside Facilities
Bull Shoals	106	\$ (139,000)	\$ 0	\$ 12,494,000
Norfolk	42	\$ (26,000)	\$ 0	\$ 5,609,000

The following Table 5 displays the benefit and cost aspects of the minimum flow plans for BS-3 and NF-7.

Table 5: Lake Benefit Summary*

	First Costs	Annual Costs²	Hydropower Benefits³	Flood Benefits¹	Tailwater & In-Pool Rec. Benefits	Total Annual Benefits	Net Benefits
BS-3	\$ 12,306,600	\$ 635,400	\$ (1,169,100)	\$ (62,000)	\$ 3,441,700	\$ 2,210,600	\$ 1,575,200
NF-7	\$ 10,628,596	\$ 548,800	\$ (977,500)	\$ (6,000)	\$ 1,511,700	\$ 528,200	\$ (20,600)

¹ Includes Downstream Flood Benefits Only

² Annual Costs are the annualized first costs. First costs are comprised of construction costs, O&M, and interest during construction.

³ Energy and capacity losses, as calculated by SWPA. BS-3 hydropower benefit losses include hydropower losses associated with Empire Electric (FERC Lic. # 2221.)

* This table summarizes the benefit and cost tables shown in Appendix A.

2.4 Cost

The cost estimate for the White River Minimum Flows Project has been developed through the Corps MII, Cost Estimating software, prepared in the October 2008 (FY 2009) price level, with a base year of 2010. The cost estimate includes contingencies and escalation to the mid-point of construction. The cost estimate by lake and for the total Project is as follows:

Table 6: Estimated Project Cost
(Fully Funded, \$1,000s; Price Level – Oct 2008)

ITEM	Norfolk Federal	Norfolk Non-Federal	Norfolk Total
Lakeside Facilities			
Private	0	0	0
County Roads	0	0	0
Federal	<u>0</u>	<u>5,609</u>	<u>5,609</u>
SUBTOTAL	0	5,609	5,609
Minimum Flows Facilities			
Bulkhead, SCADA, etc.	4,853	0	4,853
Siphon	<u>1,047</u>	<u>0</u>	<u>1,047</u>
SUBTOTAL	5,900	0	5,900
Norfolk Construction Totals	5,900	5,609	11,509
ITEM	Bull Shoals Federal	Bull Shoals Non-Federal	Bull Shoals Total
Lakeside Facilities			
Private	0	0	0
County Roads	0	2,713	2,713
Federal	<u>0</u>	<u>9,781</u>	<u>9,781</u>
SUBTOTAL	0	12,494	12,494
Minimum Flows Facilities			
Bulkhead, SCADA, etc.	303	0	303
Bull Shoals Subtotal	303	12,494	12,797
FERC Licensee #2221*	33,935	0	33,935
Bull Shoals TOTALS	34,238	12,494	46,732
ITEM	Total Federal	Total Non-Federal	Total Project
Lakeside Facilities			
Private	0	0	0
County Roads	0	2,713	2,713
Federal	<u>0</u>	<u>15,390</u>	<u>15,390</u>
SUBTOTAL	0	18,103	18,103
Minimum Flows Facilities			
Bulkhead, SCADA, etc.	5,156	0	5,156
Siphon	<u>1,047</u>	<u>0</u>	<u>1,047</u>
SUBTOTAL	6,203	0	6,203
Construction Totals	6,203	18,103	24,306
FERC Licensee #2221*	33,935	0	33,935
WRMFS TOTALS	40,138	18,103	58,241

*Amount based upon current SWPA calculations.

2.5 Policy Adjustments

The White River Minimum Flows Project is not consistent with Corps of Engineers policies for cost-sharing and for determining and providing compensation for hydropower losses. As such, the project is not eligible for inclusion in the Army Civil Works annual budget requests and implementation will be limited to the work that can be accomplished within funds provided by Congress. The Project Partnership Agreement (PPA) will include language to this effect.

Because of the unique authorization and the implementation considerations associated with the Minimum Flows Project, a number of items related to the project require adjustments to standard Corps policies or procedures. These adjustments generally fall into two categories: those that are not the normal process or policy, but have been agreed to through development of implementation guidance for the project authorization; and those that require specific approval which can be accomplished by way of approval of this Project Report.

2.5.1 *Covered by Implementation Guidance*

Included in the first category are a number of features relating to the special provisions of the authorization. Special guidance for implementing those provisions was issued by Corps Headquarters in the *White River Basin, Arkansas, Minimum Flows, Section 132(a) Implementation and Procedural Guidance*, dated May 18, 2007.

2.5.1.1 Section 902 Limit

Section 132(a) does not state a specific project cost nor does it identify a cost limit. Because there is no authorized cost, the limits of Section 902 of WRDA 1986 do not apply.

2.5.1.2 Federal Cost-Share

Federal share of project costs will follow the FY06 EWDA Section 132(a) which identifies the purpose of the minimum flows project to be fish and wildlife enhancement and sets the cost share at full Federal expense for the construction, as well as operation and maintenance (O&M), of the minimum flows facilities. The FERC licensee compensation is also specified as full Federal expense, and the offset for Federal hydropower losses will reduce SWPA's required payments to the Treasury. Under standard authorities and Corps policies, the reallocation and minimum flow releases would have been treated as recreation, and the costs of facilities and O&M would be shared 50 percent Federal and 50 percent non-Federal. Additionally, updated cost of the reallocated storage would have been shared 50/50, and with the income from the non-Federal sponsor payment for storage, the Corps would have credited SWPA for revenue losses, thereby covering the required payments to the Treasury.

2.5.1.3 Non-Federal Cost-Share

The non-Federal share of project costs will follow the FY06 EWDAA requirement that the non-Federal interests provide 100 percent of costs for relocations or modifications to public and private lakeside facilities at Bull Shoals Lake and Norfolk Lake to allow “reasonable continued use”. As discussed above, costs for these relocations/modifications would have been shared 50/50 under standard policies and the need for relocations/modifications would have to be economically justified. Additionally, Corps policy and real estate outgrant instruments state that modifications to private recreation facilities are the sole responsibility of the owner or stakeholder. The “reasonable continued use” provision allows a more flexible method of justifying the need, and under the FY06 EWDAA, relocations/modifications can also be made to privately owned lakeside facilities.

2.5.1.4 FERC Licensee Compensation

The FY06 EWDAA directs the Administrator of SWPA to calculate future lifetime replacement costs for losses at the private hydroelectric project FERC License No. 2221 (owned and operated by Empire District Electric Company) due to the minimum flows storage reallocation at Bull Shoals Lake. The FY06 EWDAA also requires the Federal Government to compensate the licensee for those losses at the time of implementation of the Minimum Flows Project. Under standard policy, no compensation would have been provided for the private hydropower losses. FERC License No. 2221 is a “run-of-river” license. The license and Corps policy clearly state that typically the Corps reservoir operations are not required to consider the licensee when operating Bull Shoals Lake (and/or Table Rock Lake.)

2.5.1.5 Federal Hydropower Offset

For the Federal hydropower purpose, SWPA’s debt to the Treasury for costs allocated to hydropower at Bull Shoals and Norfolk Lakes will also be reduced. As noted above, under the FY06 EWDAA, this will be an offset of the debt rather than crediting hydropower using income from the user of the reallocated storage. Additionally, the FY06 EWDAA directs a method of calculating the amount of the offset that is different than would be used under standard Corps policies. The Administrator of SWPA is to determine reduction on the basis of present values of the estimated lifetime replacement cost of the electrical energy and capacity at the time of implementation. Corps policy calls for calculation of marketable capacity using an average year method. SWPA determines the marketable capacity based on the critical drought period. SWPA’s method is more conservative and results in slightly higher losses to revenues foregone.

2.5.1.6 Plan Formulation

The FY06 EWDAAs directed implementation of specific plans (BS-3 and NF-7) from the July 2004 White River Minimum Flows Reallocation Study that were not necessarily fully optimized as the National Economic Development (NED) plans through the final analyses usually conducted in the Feasibility Phase. Additionally, the FY06 EWDAAs authorized lakeside facility modifications and hydropower compensation and offsets that have not been evaluated for economic justification in accordance with the Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies. Because of the way project plan components were specified in the FY06 EWDAAs, economic justification and NED plan formulation analysis are not required for the Minimum Flows Project and were not conducted for the final plan.

2.5.2 Requiring Approval via this Project Report

The second category of non-standard implementation issues includes those items requiring specific approval through approval of this Project Report.

2.5.2.1 Level of Design

Due to the evolving Congressional authorization of the project, design of the minimum flows facilities and the lakeside facilities was performed for alternatives screening instead of a more traditional feasibility phase design process. Additional design meeting Corps standards will be performed during the construction phase. This modified procedure is consistent with the provisions of Paragraph 6 as contained in ER 1110-2-1150 Engineering and Design for Civil Works Projects and forms the basis of addressing the project's technical soundness. As stated under sub-paragraph 6.1 Policy Structure, "when the normal authorization process is not followed, one or more of the project phases may be modified or deleted and report titles may change". Thus, the design does not completely meet the requirements of ER 1110-2-1150 for a feasibility phase study; however, the preliminary design does provide a basis to evaluate the technical soundness of the project and conformance to USACE guidance. It is recognized that more traditionally detailed design formats as required by ER 1110-2-1150 will be developed as subsequent phases of the project are undertaken. This Project Report provides an assessment of the project's technical soundness, given the existing level of design. Approval of this Project Report is envisioned to constitute acceptance of the current level of detail for the engineering analyses. Additional design work expected to be performed prior to contract solicitation for construction, and the mechanisms by which the Corps will ensure that technical soundness will be maintained therein are addressed in Section Four.

2.5.2.2 No proportional Federal/non-Federal Contributions

Because the FY06 EWDAAs identified separate Federal and non-Federal responsibilities, there will not be a requirement for proportional Federal/non-Federal contributions as is the usual policy for cost-shared projects. The implementation plan and Project Partnership Agreements will describe any phasing, sequencing or prerequisites required before specific

action may be accomplished, but generally, Corps and sponsor actions may proceed as their respective funds are available.

2.5.2.3 FERC License No. 2221 Facilities

Upon further consideration of the authorizing language, physical changes to Ozark Beach hydroelectric facilities because of the reallocation of storage at Bull Shoals are not part of the compensation for generation and capacity, but rather would be provided as the lakeside facility relocations or modifications, if the proposed physical changes meet the “reasonable continued use” criteria applied for other lakeside facilities.

The FERC licensee, Empire District Electric Company, requested modification to an existing, un-maintained road that they use to visually inspect the downstream face of their dam. The road in question was originally constructed by the Corps of Engineers, but was abandoned and not maintained since 1985. Empire Electric has no Right of Entry or Permit with regards to the road. Therefore, the subject road did not qualify for modification with regards to reasonable continued use.

3.0 ENVIRONMENTAL ACCEPTABILITY

The accompanying Environmental Impact Statement (EIS) evaluated the effects of the Minimum Flows Project on the human and natural environment. The EIS concluded that the trout tailwater fishery below Bull Shoals and Norfolk dams will benefit from the increased wetted perimeter and dissolved oxygen (DO) levels resulting from increased minimum flows. Negative impacts to hydropower will be compensated through the offset. Negative affects to lakeside facilities will be compensated in a manner to ensure reasonable continued use, in compliance with the authorizing language.

Target flows for the Project will result in wetted area consisting of 3,366 acres at Bull Shoals and 83 acres at Norfolk, which is a 33 percent increase in Bull Shoals tailwater and a 53.7 percent in Norfolk tailwater. In both tailwaters the Minimum Flows benefits include: Increased food production from increased continual riffle coverage; large scale trout habitat increases; potential trout reproduction; an increase in trout growth rates, and navigation improvements from mean depth increases. Increases in wetted area (amount of bottom substrate that is covered) and duration will increase at each tailwater. The wetted area is important but the duration increase of this area is a critical component of increased ecological function. The wetted area (primarily riffle areas) is the source of aquatic invertebrate production. Increased wetted area would substantially increase the area available for aquatic invertebrate (particularly aquatic insects) production. Increased aquatic insect production would not only provide a direct increase in forage available for trout but also for organisms such as sculpins, dace, stonerollers, and crayfish that are essential forage species. The increase in abundance of primary forage levels should translate to increased growth rates for trout.

During the Minimum Flows releases, the Norfolk tailwater water quality should improve from the siphon releases which should result in dissolved oxygen (DO) increases. Selective withdrawal from the multi-level intake for the siphon releases should also allow for selection of better DO concentrations while maintaining temperature requirements of the outflow. An aeration mechanism would be used with a siphon release to increase the DO concentration. In addition to the DO concentration upon release, the shear volume of the proposed minimum releases will result in reaeration to increase as the flow passes through riffle/shoal areas. Reaeration rates will be more efficient in the upper areas of both tailwaters. Maintenance of more optimum temperatures will improve in the both tailwaters by avoiding periods of non-release. The plan for Bull Shoals (BS-3) involves releasing minimum flows through the main turbines which does not have the flexibility of a siphon to select water at levels of higher DO concentrations. However, in the past, through joint efforts with the Southwestern Power Administration, “vents” have been placed in the turbines at Bull Shoals which allows ambient air to be added to the water thereby increasing the DO.

3.1 Bull Shoals

There are no adverse environmental effects associated with the minimum flows at Bull Shoals Lake, and no environmental mitigation required. As part of and funded by normal

lake project O&M activities, the Corps in coordination with AGFC will monitor minimum flow releases and apply adaptive management techniques to achieve predicted and desired results in the tailwaters.

3.2 Norfork Lake

There are no adverse environmental effects associated with the minimum flows at Norfork Lake, and no environmental mitigation is required. As part of normal lake project O&M activities, the Corps in coordination with AGFC will monitor minimum flow releases and apply adaptive management techniques to achieve predicted and desired results in the tailwaters.

3.3 NEPA Process

The accompanying EIS was initiated as part of the July 2004 White River Minimum Flows Project. A Notice of Intent was published in the Federal Register on May 30, 2000 announcing the Corps intent to prepare an EIS. The Corps held numerous public forums and made presentations regarding the details of the White River Minimum Flow Study as part of the scoping process to notify the public of the study and to gather input. Additional briefings were given throughout the study and EIS process in 2001 to 2003.

A Notice of Availability (NOA) of the Draft EIS, which addressed White River Minimum Flow alternatives at all five basin lakes, appeared in the Federal Register on June 2, 2006. Subsequent to the passage of the FY06 EWDA Section 132, the Draft EIS was not finalized. The Draft EIS was supplemented to focus on effects of the two authorized alternatives, BS-3 and NF-7. A new Notice of Availability (NOA) for the Supplemental Draft EIS appeared in the Federal Register on September 19, 2008 for a 45-calendar day public review period that ended on November 3, 2008. The comments received did not alter the analysis or conclusions of the EIS. Therefore the Final White River Basin, Arkansas, Minimum Flows EIS was prepared in November 2008 for filing with EPA.

The EIS has been prepared in accordance with the procedural provisions of NEPA, the CEQ's Regulations for Implementing the Procedural Provisions of NEPA (40 CFR Part 1500), and the Corps' regulation ER 200-2-2, Environmental Quality: Policy and Procedures for Implementing NEPA (33 CFR Part 230). All impacts to existing resources of concern have been identified and appropriate mitigation if applicable have been proposed. The White River Minimum Flows Project complies with all governing Federal Statutes and Executive Orders. Documentation of this compliance is included in the EIS accompanying this Project Report.

3.4 Environmental Operating Principles

In assessing the environmental impacts and determining mitigation requirements any impacts, the study team ensured compatibility with the Corps' Environmental Operation Principles (EOP's) as part of formulating the Minimum Flows Project:

Environmental Sustainability: Attempted to avoid and/or minimize direct and indirect impacts to all valuable fish and wildlife and their associated habitats during the plan formulation process. Developed mitigation measures such as identifying lake facilities that have significantly impacted with corresponding facility modifications to maintain “reasonable continued use”.

Seek Balance Between Development and Natural Systems: Looked for alternatives that would support the multiple project purposes of flood control, hydropower, water supply, recreation, and fish & wildlife while minimizing the adverse impacts to authorized purposes and the natural systems in the project area. This was accomplished by screening out alternatives that would most negatively impact authorized purposes, was technically unsound, or would be detrimental to the environment.

Build and Share an Integrated Scientific, Economic and Social Knowledge: Several resource agencies worked together as an “Environmental Team” to share knowledge of the study area and develop the necessary studies and data collection required for this study. Some of the scientific studies include a Biological Assessment of the Tumbling Creek Cave Snail, Gray Bat, and Indiana Bat, an Arkansas Game and Fish Commission White River Mussel Survey in transition zones, and Congressionally mandated plans to compensate losses to lake recreation and hydropower. The Corps is also committed to developing a long-term monitoring program through normal lake project O&M activities, which would continually add information to the knowledge base of the study area.

Respect the Views of Individuals and Groups Interested in Corps Activities: The Corps has met numerous times with the resource agencies, navigation industry, and environmental interests through scoping, teleconference calls and impact/mitigation meetings and attempted to be responsive in addressing all of their concerns. All interested agencies were asked to participate as “Cooperating Agencies” in the development of the accompanying Environmental Impact Statement (EIS) and the U.S.G.S., National Park Service (Buffalo River Office), U.S. Fish and Wildlife Service, and Arkansas Game and Fish Commission have assumed these roles. All problems were addressed as they arose and solutions were developed. The Corps agrees with the resource agencies that some long-term monitoring and adaptive management would be required to ensure no unforeseen impacts resulting from the project.

4.0 TECHNICAL SOUNDNESS

4.1 July 2004 White River Minimum Flows Reallocation Report

The basic plan components and performance criteria of the Minimum Flows Project plans BS-3 at Bull Shoals and NF-7 at Norfolk Lakes were developed in conjunction with other alternatives during the July 2004 White River Minimum Flows Reallocation Study. Extensive basin-wide technical investigations, as well as project-specific analyses, were conducted and are documented in the July 2004 Reallocation Report. The main report is attached in Appendix D. The primary investigations were hydrological and hydraulic analyses. SUPER was used to model reservoir, release and downstream scenarios and project effects. HEC modeling and on-site observations were also used for downstream flow conditions. Civil and structural design work, environmental analyses, and tailwater recreation benefit studies were also conducted. The technical soundness of all the investigations was evaluated through reviews by Corps and other agencies as the Reallocation Study progressed. Based upon the level of information in that stage of the planning process and the technical review procedures in place at that time, the July 31, 2004 Chief's Report concluded the alternatives identified in the 2004 Reallocation Report were technically sound. These included the BS-3 and NF-7 Minimum Flow plans.

4.2 Current Project Report and EIS

This Project Report and accompanying EIS document the results of investigations specific to the Minimum Flows Project as authorized by the FY06 EWDA Section 132(a), that were conducted since the 2004 Reallocation Report. Downstream HEC modeling, tailwater recreational benefits and environmental resources information from the 2004 Reallocation Report have been brought forward and results were updated as applicable. The information forms the basis of the project descriptions in Section 2 of this Project Report and many of the impact evaluations in Section 4 of the accompanying EIS. The following technical work was undertaken for this Project Report to provide the evaluations for the three determinations required by the FY06 EWDA Section 123(a),

4.2.1 Cost Estimate

The Corps prepared cost estimates for construction of the Minimum Flows project facilities as well as relocations and modifications of lakeside facilities. The cost estimate was prepared in the October 2008 (FY 2009) price level. The MCACES estimate is attached as Appendix E. The Corps Cost Engineering Center of Expertise, located in Walla Walla District (NWW) conducted a technical review of the cost estimate. SWPA prepared the cost estimates used in their calculations for the compensation and offset determinations for hydropower losses.

4.2.2 Dam Safety

Both Bull Shoals (analysis conducted in 2005) and Norfolk (analysis conducted in 2007) dams currently have Dam Safety Action Class (DSAC) IV ratings (Marginally Safe), per

EC 1110-2-6064. The analysis conducted for this study does not anticipate a change to this rating under the foreseeable conditions with implementation of the White River Minimum Flows Project.

The Probable Maximum Flood (PMF) water levels are not affected by White River Minimum Flow project at Norfolk Lake. Bull Shoals PMF is scheduled to be evaluated during FY09, but it is not expected that the Minimum Flows Project would affect the PMF stability analysis. Complete stability analyses have not been performed for projected PMF levels. Preliminary estimates indicate that the monoliths are stable. However formalized calculations will be performed as funds are made available. The White River Minimum Flow project has no affect on monolith stability during the PMF load condition. All of these structures are due to have updated analysis performed, as funding is available.

4.2.3 Hydrology and Hydraulics Evaluations

Bull Shoals and Norfolk Lakes are multipurpose projects. Each project has flood control, hydropower, water supply, recreation, and fish & wildlife purposes. For both the 2004 Reallocation Study and evaluations of BS-3 and NF-7 for this Project Report, Little Rock District used the existing Southwestern Division Reservoir Regulation Computer Model (commonly referred to as SUPER) reservoir routing model to simulate 64 years of experienced rainfall runoff and model the storage reallocation scenarios to determine the impacts of the proposed minimum flows operations to other authorized purposes. Output from the SUPER model was used to identify impacts to flood control, hydropower, water supply, and in-lake recreation (including lakeside facilities). SUPER output was sent to the Corps of Engineers Northwestern Division's Hydropower Analysis Center (HAC) and Southwestern Power Administration (SWPA) to quantify impacts to the Federal hydropower purposes as well as impacts to the non-Federal FERC License No. 2221 Ozark Beach hydroelectric project owned and operated by Empire District Electric Company. HAC devised non-power and power producing release alternatives, and the U.S. Geological Survey (USGS) performed minimum flows test release flow measurements. The Corps SUPER model runs are discussed in Appendix B, and SWPA's use of SUPER in the hydropower determinations is presented in Appendix C.

From the hydrological and hydraulic perspective, the Minimum Flows Project will have slightly higher flood pool elevations with minimum impacts to the duration that the pools are above conservation pool at both Bull Shoals and Norfolk Lakes when considering operations during extreme events. During droughts it is expected that Bull Shoals will have less severe minimums and Norfolk will have slightly lower minimum pool elevations. At both lakes it is expected that it will take longer to refill the lakes to conservation pool. It is expected that the increase in the maximum stages downstream from the lakes for extreme events will be minor, but there is no expected increase in the duration of the events above flood stage.

Data regarding the effects of the reallocation and operational changes to other project purposes of the Bull Shoals and Norfolk projects are presented in this Project Report

and the EIS as follows: Section 4 of the EIS presents information regarding effects on of the White River Minimum Flows Project on flood control, water supply, environmental resources (including the tailwater trout fishery ecosystem) and recreational facilities; Section 5.1 and Appendix F of this Project Report provides effects and plans for reasonable continued use of lakeside facilities; and Section 5.2 and Appendix C of the Project Report contains SWPA's evaluations and determinations for Federal and FERC License No. 2221 hydropower power losses.

4.2.4 Flood Control

The SUPER model estimated downstream flood damages related to the minimum flows' operation to be \$62,000 at Bull Shoals and \$6,000 at Norfolk. These estimated damages are due to the proposed changes in the operational plan at each reservoir. The small reductions to flood benefits are due to the flood pool reallocations related to BS-3 and NF-7. The proposed reallocations raise the top of conservation pools and reduce flood control storage. Therefore, there is the potential for a small decrease in flood damage benefits downstream of Bull Shoals and Norfolk Dams.

The SUPER model analyzed the incremental change in flood storage capability, over 64-years of record, and simulated future conditions along downstream river reaches. The annual losses are the incremental difference in flood damages for the "with" and "without" minimum flows project conditions. The reaches downstream of Bull Shoals and Norfolk reservoirs are very rural and consist primarily of farmland and forests. The flood damages estimated at Bull Shoals and Norfolk consist of potential damages to crops, such as corn, cotton, rice, soybeans, and pastures. There are several small communities within close proximity to the White River; the largest are Batesville and Newport, Arkansas. SUPER model stage damage curves contain a code for "other damages" representing the few fences, barns, and other structures. The H&H analysis indicated no new areas will be flooded.

The amount of downstream flood damage associated with implementation of the White River Minimum Flows Project is considered to be insignificant when compared to the total flood damages the reservoirs are estimated to prevent. For comparison, in FY 2007 Bull Shoals Reservoir is estimate to have prevented \$3,000,000 in flood damages. The \$62,000 in downstream flood damages estimated by SUPER represents 2% of the total flood damages prevented. Also, in FY 2007, Norfolk Reservoir is estimate to have prevented \$1,200,000 in flood damages. The \$6,000 in downstream flood damages estimated by SUPER represents 0.5% of the total flood damages prevented.

4.2.5 SUPER Model

The SUPER program simulates, on a daily basis, the regulation of a system of multipurpose reservoirs based on a specified plan of regulation including seasonal pools as defined by the operation guide curve. The White River Minimum Flows SUPER model runs include the reallocated minimum flow conservation pools at Bull Shoals and Norfolk, as well as the seasonally higher conservation pools for the cold

water temperature releases. The hydrologic output is presented in average daily values such as average daily lake level elevations. Project releases and river flows are given as daily average flows. Pool elevations are given as midnight elevations. For the White River Minimum Flows analyses, Little Rock District modified the SUPER model algorithm to include a function that allowed SUPER to stop minimum flows releases when the FY06 EWDAAs authorized storage was depleted and restart releases once storage was recharged. Consistent with other Little Rock District uses of SUPER, for both the 2004 study and this Project Report, the impacts of White River Minimum Flows operations were simulated over a 64-year period of record of historic rainfall and inflow, from 1940 – 2003.

4.2.5.1 Current Conditions Run

For this Project Report, the White River “Current Conditions” model was updated to reflect reservoir system operational changes since 2004. The “Current Conditions” model used by the Corps is SUPER run W01X01. SWPA’s “Current Condition” run, W08X01, contains additional updates, but the output, frequency and duration data are not measurably different.

4.2.5.2 Minimum Flows Run

The Little Rock District SUPER model run that simulates scenarios for BS-3 and NF-7 is run W06X03 and SWPA’s run is W08X02. Both model runs include water supply accounting to ensure that minimum flows are not released when the FY06 EWDAAs authorized storage have been depleted.

The Corps and SWPA simulations both contain Hydropower Yield Protection Operation (HYPO) and Dependable Yield Mitigation Storage (DYMS). See the discussion in Section 5.2.1.c below, DYMS is the storage required to keep existing water supply users whole and HYPO lessens the adverse Hydropower impacts. Table 2, below, contains DYMS-HYPO storage used in both Corps and SWPA’s SUPER runs.

The existing house releases, leakage rates, and hatchery discharges were subtracted from the minimum flows target flows in order to identify the additional releases needed to meet the minimum flows criteria. Leakage, existing house release, and hatchery discharge in the “current conditions” runs are considered losses and prorated as losses to all users’ yields. The losses reduce water supply and hydropower yields. The incremental portions of the minimum flows shown below were used by the Corps and SWPA.

Table 7: Incremental Discharges

Project	House	Leakage	Hatchery	Increase Req'd	Min Flow Release
	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
Bull Shoals	50	160	0	590	800
Norfolk	20	55	40	185	300

However, the Corps and SWPA runs differ as follows:

1. SWPA run W08X02 contains the changes made for run W08X01, while the Corps' run does not.
2. SWPA run W08X02 contains withdrawals for pending water supply reallocations while the Corps' run does not.
3. In Corps run W06X03 the losses from leakage, existing house release, and hatchery discharge, listed above, are 100% debited against the minimum flows storage, resulting in an improved yield for all other users. SWPA's run W08X02 still considers the leakage, existing house release, and hatchery discharge as losses to hydropower yield. SWPA's calculation of hydropower losses, then are somewhat larger than expected losses under the Corps proposed Minimum Flows operating plan. This results in a small but measurably higher dollar value for the FY06 EWDA Federal hydropower offset at Bull Shoals and Norfolk Dams.

4.2.5.3 HYPO/DYMS Yield Protection

Expanding conservation storage into the flood control pools will reduce the critical period dependable yield (which is produced from storage and inflow) per unit of storage. This occurs because, even though there is more conservation storage available from which to draft water, the inflow into the reservoir remains the same. Since existing water users will be sharing the same inflow, the yield per unit of storage decreases even though the total yield of the project increases. To avoid such negative impacts, sufficient storage will be reallocated to maintain the dependable yield of the existing water users while supplying water for fishery needs. This additional storage required to keep existing users whole is termed Dependable Yield Mitigation Storage (DYMS). This was applied to all water supply users. However, for hydropower the amount of time and or reliability of the storage assigned to the WRDA (Minimum Flows) specified storage, was reduced in order to lessen the adverse hydropower impacts. This operation is called Hydropower Yield Protection Operation (HYPO).

In order to supply the minimum flow fishery flow, the FY06 EWDA Section 132(a) authorized the Corps to reallocate 5 feet of storage from Bull Shoals flood pool. At Norfolk Lake, 3.5 feet of storage was authorized to be reallocated, 1.75 feet from flood pool and 1.75 feet from conservation pool. Below is a table of the reallocated storage

including the DYMS and HYPO storage to maintain the yield of the water supply users and the storage needed to minimize impacts to hydropower yield.

HYPO is applied for flood pool reallocations only. For Bull Shoals, BS-3 includes a flood control storage reallocation. Norfolk’s NF-7 scenario includes a 50/50 reallocation scenario (50% from flood pool, and 50% from conservation pool). The input data for the reservoir routing model “SWD-SUPER”, with the fishery storage accounting, was revised to include the DYMS & HYPO storage amounts, reducing the storage for the minimum flows storage account.

Table 8: HYPO-DYMS Data

100% FLOOD POOL REALLOCATION			
Project	WRDA Storage (Acre-Feet)	DYMS - HYPO (Acre-Feet)	Trout Storage (Acre-Feet)
Bull Shoals	233,000	111,271	121,729
50% FLOOD POOL 50% CONSERVATION POOL REALLOCATION			
Project	WRDA Storage (Acre-Feet)*	DYMS - HYPO (Acre-Feet)	Trout Storage (Acre-Feet)
Norfolk	29,200	17,019	46,219

4.2.6 Value Engineering

Value Engineering initiatives were considered during the study phase for the Minimum Flows facilities as well as the Lakeside facilities. The method for facilitating the minimum flows’ required facilities testing using a collaborative process for identifying cost effective, safe, and environmentally sound solutions. In June 2001, Little Rock District in coordination with the Arkansas Game and Fish Commission (AGFC), Missouri Department of Conservation (MDC), SWPA, and the U.S. Geological Survey (USGS) conducted minimum flows test releases. Investigations were conducted to determine existing release capabilities at each dam to meet the minimum flows criteria. USGS took flow measurements to calibrate the main turbines, as well as measure leakage, existing station service unit discharge, and hatchery outflow. The test releases produced a low flow-rating curve for the existing main turbines. Biologists measured the conditions produced by the target releases confirming that the releases did produce the favorable biological conditions predicted by the AG&FC. Local fishermen, landowners, and outfitters participated in the test release by observing and commenting on conditions produced by the target minimum flows release. The river conditions produced by the target flows were favorable to most wade fishermen, boat fishermen, outfitters, and landowners. With the exception of Bull Shoals, the participating dams could not generate hydropower with their main turbines while making the minimum flow releases. Bull Shoals could generate a small amount of power while discharging the target flows but the other four facilities had to pull power from the grid and run the turbines like motors in order to produce the target flows. The target releases through the Bull Shoals turbine did not produce noticeable cavitations. The tests also concluded that the target discharge could not be made with existing station service (SS) units. Therefore before minimum

flows can be implemented, facility modification must be made to each participating facility, with the exception of Bull Shoals. The Little Rock District Corps of Engineers and North Pacific Division Hydropower Design Center (HDC) devised 1 non-power and 3 power producing release alternatives to be evaluated. See Appendix D, July 2004 Report, for Hydropower Design Center analysis and recommendations. Also, implementation features used to facilitate the minimum flows releases were closely coordinated with the State of Arkansas-Missouri Dissolved Oxygen (DO) Committee. The DO committee is made up of the Arkansas Department of Environmental Quality, Arkansas Department of Parks & Tourism, AGFC, Arkansas Natural Resources Commission, Little Rock District Corps of Engineers, Missouri Department of Conservation, Missouri Department of Natural Resources, Southwestern Power Administration, U.S.G.S (AR & MO), and the U.S. Fish & Wildlife Service.

The proposed lakeside facility modifications and relocations will be designed during construction and will include specifications that include standard materials and design. The required work is repetitive. Numerous contractors exist, including the identified non-Federal sponsor, that perform the proposed work thus extensive open and fair competition is expected, to include a viable potential for a Value Engineering Contractor Proposal (VECP) during contract performance if recent industry advances render the current contract's specifics as un-economical. The Corps of Engineers coordinated with the AGFC, the 4 Arkansas and 2 Missouri Counties affected, as well as the Missouri Department of Conservation and Missouri Department of Natural Resources in identifying impacted lake facilities.

The proposed minimum flows project requires modification of the existing bulkhead at Bull Shoals and the new bulkhead at Norfolk. The specifications for the bulkheads address standard materials and designs of existing bulkheads within the system. The Project Development Team patterned design and quantities on recent construction of a new bulkhead at Greers Ferry Lake within the White River Basin. The required work is repetitive since all of the system's gates are structurally similar due to similar dam designs. Structural repair of damaged steel fabricated members is likewise, routine and repetitive. Numerous contractors exist that perform the required work thus extensive open and fair competition is expected, to include a viable potential for a Value Engineering Contractor Proposal (VECP) during contract performance if recent industry advances render the current contract's specifics as un-economical.

4.2.7 SUPER Model Technical Review

The Southwestern Division Reservoir Regulation Computer Model, SUPER, is a suite of computer programs written for use in the Southwestern Division (SWD) Corps of Engineers to model multipurpose reservoir system regulation. It was developed at SWD, and has been used by the Fort Worth, Little Rock, and Tulsa Districts for over 30 years and has been updated on a regular basis during that time. Bull Shoals and Norfolk Lakes are operated under individual and system-wide regulation plans. SUPER provides a historical simulation of what has happened in the White River Basin over the period of record (1940-2003) of the lakes.

The model can perform period-of-record analysis to evaluate changes in operational scenarios and can simulate flood control operations and conservation pool operations including hydropower, water supply, water quality, diversions and returns. In addition to period-of record analysis, it has the capability to perform conservation pool yield analysis and firm energy analysis. The SUPER model can perform the following functions:

- Evaluate flood control, recreation, and hydropower effects due to alternative regulation plans for multiple and individual reservoirs;
- Evaluate the effects caused by deviations from existing regulation plans;
- Evaluate risk in emergency situations;
- Hydrologic analysis and economic screening of storage reallocations at existing reservoirs; and
- Determination of critical data for evaluating hydropower.

Both SWD and the SWPA, a power marketing agency for the Department of Energy, use SUPER for reservoir regulation and in the development of hydropower energy and capacity losses. In the minimum flows study, a water-accounting algorithm was also added to the SUPER model to track the daily "fishwater" (target) releases and remaining "fishwater" storage volume. The algorithm allows for fishwater releases to be halted when the allocated storage is depleted, and to be resumed when the increased inflows recharge the target "fish" storage. This is described in detail in Appendix B, Hydrologic and Hydraulic Report.

In accordance with EC 1105-2-407, Planning Models Improvement Program: Model Certification, it was necessary to consider the use of the SUPER model in the study to confirm technical soundness of the model. The SWD Water Management and Reallocation Studies PCX lead reviewed the document *Protocols for Certification of Planning Models*, dated July 2007, and determined that the SUPER model meets the definition of an engineering model, "Models that represent engineering systems such as models used to perform hydrologic and hydraulic analyses are engineering models and not Planning Models."

In the guidance presented in the Engineering and Construction Bulletin No. 2007-6, "Model Certification Issues for Engineering Software in Planning Studies", dated 10 April 2007, it requires the Engineering Community of Practice to ensure that the application and proper use of the software is documented in the Independent Technical Review process. Accordingly, the PCX requested a review of the model by the Division's Water Management Team Lead to ensure its technical soundness. The PCX reviewed the main report, Appendix B of the report on hydrologic and hydraulic analyses and reviewed the agency technical review comments from the Nashville District and concluded that the SUPER model was the appropriate model to use in the study; that indeed the model was used appropriately and that the analysis of the results from the model are based on technically sound engineering principles.

4.2.8 Peer Review

Per EC 1105-2-410, a Review Plan was prepared for this study and approved by the SWD Commander. Peer Review that was conducted for this study included Agency Technical Review (ATR) which was staffed in coordination with the Ecosystem Restoration and Water Management Planning Centers of Expertise. The ATR was performed by Nashville District and Walla Walla District. During development of the Review Plan, the vertical team discussed the review requirements and concluded that the Independent External Review was not required for this study.

4.2.9 Other Analysis

Analysis specific for the required determinations (Lakeside facilities and Hydropower compensation) are presented in Section 5.

4.3 Chief of Engineer's Actions for Change

The Minimum Flows Project Report is consistent with the Chief of Engineer's Actions for Change as follows:

- i) Theme 1, Comprehensive Systems Approach, was met with the use of the SUPER reservoir routing model. The SUPER model was used to analyze “with project” and “without project” impacts to the entire White River system for all authorized purposes.
- ii) Theme 2, Risk Informed Decision Making, was met by including input from the Little Rock Dam Safety Officer in the evaluation of storage reallocation. Also, the H&H analysis included a comparative evaluation of “with project” and “without project” impacts from 3 historic flood events and 2 historic drought events to Bull Shoals and Norfolk's lake levels and releases. A post implementation, real-time water supply storage accounting program will be used by the Corps to ensure proper use of storage.
- iii) Theme 3, Communication of Risk to the Public, was met through public scoping meetings, agency coordination, and stakeholder meetings including a 45-day public comment period on a Draft Environmental Impact Statement during the summer of 2006 and a 45-day public comment period on the Supplemental Draft Environmental Impact Statement during the summer of 2008.
- iv) Theme 4, Professional and Technical Expertise, was met through the use of a the Project Management Business Process (PMBP) with a Project Delivery Team concept including Economists, Biologists, Archeologists, Hydraulic Engineers, Structural Engineers, Civil Engineers, Mechanical Engineers, Electrical Engineers. Input from agencies such as the Nature Conservancy, the Corps' Hydropower Center of Expertise, and Tennessee Valley Association, were used to identify ecologically sustainable, technically sound reallocation and release alternatives. The University of Arkansas at Fayetteville (UAF) was contracted to estimate the economic benefits of

increased minimum flows in the White, Norfolk Rivers. A Vertical Team, including representatives from Corps Headquarters (HQUSACE), Southwestern Division (SWD), and Little Rock District (SWL) developed and followed detailed EWDA Section 132(a) Implementation Guidance for the completion of the Project Report and Environmental Impact Statement. Finally, an Agency Technical Review (ATR), using Dr. Checks, was conducted by Corps staff from Nashville (LRN) and Walla Walla (NWW) Districts.

4.4 Collaborative Planning

Planning of the Minimum Flows Project incorporated collaborative planning techniques with other resource agencies in the early study effort conducted under the WRDA 1999 & 2000 authorization, and are proceeding with the implementation of the current Minimum Flows Project being conducted under the FY06 EWDA authorization. The Corps will continue to coordinate with the AGFC, the four Arkansas and two Missouri Counties affected, as well as the Missouri Department of Conservation (MDC) and Missouri Department of Natural Resources (MDNR) in the mitigation to lake facilities. Also, implementation features used to facilitate the minimum flows releases are being closely coordinated with the States of Arkansas and Missouri Dissolved Oxygen (DO) Committee. Additionally, the University of Arkansas supported the Minimum Flows Project through their study of potential economic benefits associated with implementation of the Project.

5.0 DETERMINATIONS

5.1 Lakeside Facilities Reasonable Continued Use Evaluation

Section 132(a) of the FY06 EWDA requires a determination by the Assistant Secretary of the Army for Civil Works (ASA(CW)) regarding “reasonable continued use” of lakeside facilities. The Arkansas Game & Fish Commission, for the State of Arkansas, as the non-Federal interests, must provide relocations or modifications for public and private lake facilities to allow for reasonable continued use relative to the change of operations at both Lakes. Lakeside facilities are defined as any man-made improvements, including but not limited to structures, roads, and utilities, which are located in, at the shoreline or within an area of project effect adjacent to the Lakes. The study team visually inventoried all lakeside facilities at the Lakes, using aerial photography and site visits. Evaluations of project effects, existing use of facilities and proposed modifications were coordinated with state, county and local representatives through meetings and site visits, and they are satisfied with the resulting Lakeside Facilities Plan.

In the context of implementing White River Minimum Flows, all Corps, private and public lake facilities, including but not limited to structures, roads, and utilities within the lake level elevations of 660 and below at Bull Shoals and 554.5 and below at Norfolk qualified for modification or relocation if they were significantly impacted. Under utilized, non-maintained, facilities with the availability of substantively equal alternative facilities, or abandoned facilities were not eligible for modification or relocation. The Corps (the Little Rock District) and stakeholders decided on a case by case basis if modification or relocation was appropriate based on significance of the impact. Significance was defined using the visitation data (VERS 2007), potential impacts to O&M costs, incremental loss of visitation days, regional loss of recreation opportunity, and safety at the lakeside facilities. Replacement, modified, or relocated facilities were envisioned to allow for current visitation levels.

5.1.1 *Bull Shoals Lake*

There are 11 marinas, 48 private resorts, and 20 Corps parks at Bull Shoals Lake. The marinas are all located on Corps parks. There are 687 private boat docks permitted on Bull Shoals Lake. Around Bull Shoals Lake, 183 county, state, and, Federal roads were evaluated. A complete list of parks, marinas, roads, and boat docks evaluated during the study process are included in Appendix F Lakeside Facility Appendix. The Table 9 contains lakeside facilities that qualified for modification to ensure reasonable continued use.

The lakeside facility evaluation also considered impacts to recreation from a regional perspective. Following the compilation of the existing lakeside facility inventory, the study team identified two sites at Bull Shoals Lake that could meet the requirements of providing reasonable continued use on a regional basis. The two sites, Theodosia, MO and Point Return, AR could have multi-lane boat ramps (mega ramps), and corresponding parking capacity to provide compensation for lost recreation opportunity at the adversely

impacted existing lakeside facilities. The proposed mega ramps could be constructed instead of modifying the existing lakeside facilities at Corps parks that are regionally close. During construction of the mega ramps the Corps facilities would be able to remain open, allowing for storage to be captured prior to completion of the mega ramps. Part of the design during construction phase, will include negotiations between the non-Federal sponsor, the Corps of Engineers, and local stakeholders to determine if the mega ramp proposal is a viable alternative.

Table 9: Bull Shoals Lake Facility Modifications
BULL SHOALS LAKE

PARK	FEATURE	LENGTH	AREA	CONDITION	COMMENT	FIGURE
BEAVER CREEK	BOAT RAMP	30 FT	1308 sq ft	MODIFICATION		F-1
BUCK CREEK	SWIM BEACH		17482 sq ft	RELOCATION		F-2
BUCK CREEK	PARKING		1501 sq ft	MODIFICATION		F-2
BUCK CREEK	PARKING LOT		5221 sq ft	MODIFICATION		F-2
BUCK CREEK	BOAT RAMP	20 FT	589 sq ft	MODIFICATION		F-2
DAM SITE	BOAT RAMP	30 FT	1285 sq ft	MODIFICATION		F-4
HIGHWAY 125	PARKING		10830 sq ft	MODIFICATION		F-5
HIGHWAY 125	SWIM BEACH		25749 sq ft	RELOCATION		F-5
HIGHWAY 125	BOAT RAMP		1044 sq ft	MODIFICATION		F-5
HIGHWAY K	ROAD		1053 sq ft	MODIFICATION		F-6
LAKEVIEW	ROAD	140 FT	2248 sq ft	MODIFICATION		F-7
LAKEVIEW	ROAD	275 FT	9662 sq ft	MODIFICATION		F-7
LAKEVIEW	SWIM BEACH		27891 sq ft	MODIFICATION		F-7
LAKEVIEW	BOAT RAMP	30 FT	914 sq ft	MODIFICATION		F-7
LEAD HILL	BOAT RAMP		4888 sq ft	MODIFICATION		F-8
LEAD HILL	HANDICAP ACCESS		453 sq ft	MODIFICATION		F-8
LEAD HILL	SWIM BEACH		53642 sq ft	RELOCATION		F-8
LEAD HILL	PARKING LOT		12484 sq ft	MODIFICATION		F-8
LEAD HILL	BOAT RAMP	40 FT	1178 sq ft	MODIFICATION		F-8
MARION CO ROAD 143	ROAD	192.928 ft	4101 sq ft	MODIFICATION		F-16
OAKLAND	BOAT RAMP	40 FT	1536 sq ft	MODIFICATION		F-9
OAKLAND	PARKING LOT		2595 sq ft	MODIFICATION		F-9
OAKLAND	PARKING		7299 sq ft	MODIFICATION		F-9
POINT RETURN	PARKING LOT		13628 sq ft	MODIFICATION		F-10
POINT RETURN	SWIM BEACH		18979 sq ft	RELOCATION		F-10
POINT RETURN	BOAT RAMP	15 FT	254 sq ft	MODIFICATION		F-10
POINT RETURN	PARKING /LAUNCH		38569 sq ft	RELOCATION	PROPOSED MEGA RAMP	F-10
POINT RETURN	WATER BORNE TOILET		1018 sq ft	RELOCATION	PROPOSED MEGA RAMP	F-10
POINT RETURN	PARKING		118304 sq ft	RELOCATION	PROPOSED MEGA RAMP	F-10
POINT RETURN	BOAT RAMP	300 FT	38943 sq ft	RELOCATION	PROPOSED MEGA RAMP	F-10
POINT RETURN	STAGING AREA		5911 sq ft	RELOCATION	PROPOSED MEGA RAMP	F-10
POINT RETURN	PAVILION		2338 sq ft	RELOCATION	PROPOSED MEGA RAMP	F-10
PONTIAC	BOAT RAMP	50 FT	2024 sq ft	MODIFICATION		F-11
PONTIAC	PARKING		5070 sq ft	MODIFICATION		F-11
RIVER RUN	LIGHT POLE		NA	RELOCATION	LOCATE ABOVE 653	F-12
SLOUGH HOLLOW ROAD	ROAD	721.701 ft	17775 sq ft	MODIFICATION		F-17
SLOUGH HOLLOW ROAD	ROAD	1024.028 ft	25030 sq ft	MODIFICATION		F-17
THEODOSIA	PARKING LOT		9301 sq ft	MODIFICATION		F-14
THEODOSIA	SWIM BEACH		14284 sq ft	RELOCATION		F-14
THEODOSIA	BOAT RAMP		13700 sq ft	MODIFICATION	PROPOSED MEGA RAMP	F-14
THEODOSIA	ROAD		8664 sq ft	MODIFICATION	PROPOSED MEGA RAMP	F-14
THEODOSIA	PARKING LOT		32639 sq ft	MODIFICATION	PROPOSED MEGA RAMP	F-14
TUCKER HOLLOW	BOAT RAMP	50 FT	1677 sq ft	MODIFICATION		F-15
TUCKER HOLLOW	ROAD		3063 sq ft	MODIFICATION		F-15

At Bull Shoals, public facilities at 12 recreation sites will be relocated or modified, including: 11 boat ramps, 6 swim beaches, 1 light pole, 9 parking lots, and 3 Corps roads, and 2 County roads. Evaluations determined that all private facilities at the lake, such as marinas, concessions, docks could accommodate the pool raise and operational changes and maintain reasonable continued use without any modifications or relocations. The cost to relocate roads and park facilities is estimated to be approximately \$12,494,000, and is a non-Federal cost.

5.1.2 Norfolk Lake

There are 10 marinas, 21 private resorts, and 21 Corps parks at Norfolk Lake. The marinas are all located on Corps parks. There are 314 private boat docks permitted on Norfolk Lake. Around Norfolk Lake, 125 county, state, and, Federal roads were evaluated. A complete list of parks, marinas, roads, and boat docks evaluated during the study process are included in Appendix F Lake Facility Appendix. The Table 10 contains lakeside facilities that qualified for modification to ensure reasonable continued use.

Table 10: Norfolk Lake Facility Modifications
NORFORK LAKE

PARK	FEATURE	LENGTH	AREA	CONDITION	COMMENT	FIGURE
BIDWELL POINT	SWIM BEACH		32536 sq ft	RELOCATION		F-18
CRANFIELD	SWIM BEACH		110327 sq ft	RELOCATION		F-19
GAMALIEL	SWIM BEACH		22669 sq ft	RELOCATION		F-20
GEORGES COVE	BOAT RAMP		1752 sq ft	MODIFICATION		F-21
JORDAN	SWIM BEACH		34226 sq ft	RELOCATION		F-22
PANTHER BAY	SWIM BEACH		48248 sq ft	RELOCATION		F-23
PANTHER BAY	PARKING		3040 sq ft	MODIFICATION		F-23
QUARRY	SWIM BEACH		37890 sq ft	RELOCATION		F-24
ROBINSON POINT	SWIM BEACH		28736 sq ft	RELOCATION		F-25
ROBINSON POINT	BOAT RAMP		1042 sq ft	MODIFICATION		F-25
UDALL	PARKING		50164 sq ft	MODIFICATION		F-26
UDALL	BOAT RAMP		25831 sq ft	MODIFICATION		F-26

At Norfolk Lake, public facilities at 9 recreation sites will be relocated or modified, including: 3 boat ramps, 7 swim beaches, and 2 parking lots. Evaluations determined that all private facilities at the lake, such as marinas, concessions, docks could accommodate the pool raise and operational changes and maintain reasonable continued use without any modifications or relocations. The construction cost to relocate park facilities is estimated to be approximately \$5,609,000, and is a non-Federal cost.

5.2 Determinations for Hydropower Losses and Compensation

5.2.1 *SWPA Draft Determinations*

Section 132(a) of the FY06 EWDA requires identification and compensation for the loss of Federal and private hydropower generation due to the Minimum Flows Project. The Corps is to compensate the lifetime replacement costs for losses to hydropower energy and capacity at FERC Project License No. 2221 caused by the storage reallocation at Bull Shoals Lake. Additionally, lifetime energy and capacity losses to Federal hydropower at Bull Shoals and Norfolk Lakes are to be offset by a reduction in costs allocated to the hydropower purpose for those lake projects. The Administrator of the Southwestern Power Administration (SWPA) is to determine the amount of the hydropower losses and the dollar value of the compensation and offset. The FERC licensee compensation payment and Federal hydropower offset are one time actions, to occur at the time the Minimum Flows Project is implemented at each lake. At that time, the SWPA Administrator will determine the final dollar amounts in effect at the time of project implementation. The evaluations and report prepared by SWPA for the hydropower determinations is located in Appendix C. Appendix C also contains a white paper peer review by the Corps of SWPA methodology and findings. SWPA's findings and the Corps review comments are summarized below.

SWPA used scenarios run with the Corps SUPER model to determine the losses to the Federal hydropower purpose at Bull Shoals and Norfolk hydroelectric projects and to the non-Federal Ozark Beach hydroelectric project in Missouri due to the implementation of White River Minimum Flows as authorized in Section 132 of Public Law 109-103 (2005). Energy and capacity losses were developed for the Federal and non-Federal projects, and additional losses related to the reallocations for minimum flows were included as appropriate. Southwestern published a "Notice of Public Review and Comment" in the Federal Register on February 5, 2008, concerning its Draft Determination Report dated January 2008. There was a 30-day public comment period which ended on March 6, 2008. The incorporation of the public comments received resulted in this Proposed Determination Report.

5.2.1.1 Energy Calculations - Bull Shoals Lake

Section 132 of Public Law 109-103 (2005) authorized alternative BS-3 at Bull Shoals, as described in the White River Minimum Flows Reallocation Study Report, Arkansas and Missouri, dated July 2004. Under the authorized plan for the Bull Shoals project, five feet of storage for minimum flows will be reallocated from the flood control pool with provisions to provide a portion of the reallocated storage for hydropower's use to maintain the yield of the current hydropower storage. The current seasonal pool plan will be superimposed on the new top of conservation pool. As a result, both the conservation and seasonal pool levels at Bull Shoals will be raised five feet. The additional downstream releases for minimum flows will be accomplished by generating with one of the main units at a low, inefficient rate. Since the current hydropower yield will be maintained, there will be no loss of marketable capacity or peaking energy at Bull Shoals.

The energy loss, 23,855 megawatt-hours (MWh) per year of off-peak energy, will be the result of making the required minimum downstream releases by generating energy at a much lower plant efficiency than normal generation. Since the energy that is produced from the minimum flow releases will be generated at a time when the energy is not needed to fulfill Federal peaking energy contracts, it is similar in value to the off-peak energy normally generated during flood control operations.

Operating a main unit at the lower efficiency will also increase the average maintenance costs at the Bull Shoals Dam by an estimated \$68,000 per year. Because minimum flow releases at Bull Shoals will be through a main turbine, the main turbines will require additional maintenance due to additional run times. Also, running the units at the very low outputs required for the minimum flow releases will cause additional cavitation damage to the turbines. The Corps has estimated that additional maintenance at Bull Shoals for operating the hydropower turbine units for minimum flows will cost \$68,000 annually. That cost is used in the SWPA analysis; however, that amount should be removed from the final calculation of the offset, because these would be O&M activities for the Minimum Flow Project and would be a Corps cost.

5.2.1.2 Energy Calculations - Norfolk Lake

Section 132 of Public Law 109-103 (2005) authorized alternative NF-7 at Norfolk, as described in the White River Minimum Flows Reallocation Study Report, Arkansas and Missouri, dated July 2004. Under the authorized plan for the Norfolk project, 3.5 feet of storage will be reallocated for minimum flows. One-half of the storage for minimum flows will be reallocated from the flood control pool and the other half from hydropower storage. The reallocation portion from the flood control storage is similar to the storage reallocation at Bull Shoals in that the hydropower storage yield for that portion will be maintained and the existing seasonal pool plan will be superimposed on the new top of conservation pool. As a result, both the conservation and seasonal pool levels at Norfolk will be raised 1.75 feet. Unlike Bull Shoals, all minimum flow releases at Norfolk, whether from reallocated flood or hydropower storage, will be spilled through a siphon with no energy generated from the water. Although there will be no marketable capacity loss associated with the flood control storage portion of the reallocation, there will be an off-peak energy loss. The portion of the reallocation from the hydropower storage will reduce the yield available to hydropower and will directly impact the marketable capacity and on-peak energy available at Norfolk. The annual energy loss at Norfolk associated with the reallocation will be 6,762 MWh of off-peak energy and 6,762 MWh of on-peak energy, for a total annual energy loss of 13,524 MWh. The marketable capacity loss will be 3.93 megawatts (MW).

5.2.1.3 Energy Calculations - FERC No. 2221

Federal Energy Regulatory Commission (FERC) Project No. 2221, the non-Federal Ozark Beach hydroelectric project owned and operated by Empire District Electric Company, will be directly affected by the authorized minimum flow plan. Ozark Beach is on the White River and impounds Lake Taneycomo between Table Rock Dam and Bull

Shoals Lake. The implementation of the authorized plan will result in a reduction of the amount of gross head (headwater elevation minus the tailwater elevation) available for generation at the non-Federal project at Ozark Beach. The reduction in gross head will result in an annual energy loss of 6,029 MWh of on-peak energy and 2,969 MWh of off-peak energy, or an annual total energy loss of 8,998 MWh. Also associated with the loss of gross head, there will be a capacity loss of 3.00 MW at the project.

5.2.1.4 Value of Replacement Costs

Having calculated the losses, SWPA used the Platts “High Fuel Value” case energy cost projections from Platts Power Outlook Research Service to identify the costs for replacement energy. On-peak and off-peak energy values are inflated at the selected rate of inflation for the years beyond the Platts twenty-year forecast. The hydropower compensation and offset calculations are considered estimates for the purposes of this Project Report. The actual replacement costs will be re-calculated at the time Minimum Flows will be implemented at each lake.

Currently, the calculated value of the offset for losses to Federal hydropower is \$86,712,100; \$48,622,900 at Bull Shoals and \$38,089,200 at Norfolk. The calculated value of the compensation for losses to the non-Federal hydropower project at Bull Shoals is \$33,935,100. The loss values were calculated on the basis of the present value of the estimated future lifetime (50 years assumed by Southwestern) replacement cost of the electrical energy and capacity assuming an implementation date of January 1, 2011, for the White River Minimum Flows Project. The final calculation will depend on the official date of implementation as specified by the Corps of Engineers and the value of the specified parameters in effect at that time.

5.2.2 Corps Peer Review of SWPA Draft Determination

The Corps’ Northwestern Division, Hydropower Analysis Center (HAC) conducted a Peer Review of the SWPA calculation. The Hydropower Peer Review assesses the methods and assumptions used by SWPA in determining the impacts to the Federal and non-Federal hydropower purposes affected by the proposed White River Minimum Flows project. Generally the procedures used by SWPA in calculating the generation impacts are sound. While this review does recommend some changes in the method of calculating financial impacts, it is not implied that SWPA’s current calculations will change substantially with application of these changes. Rather, these recommendations are generally oriented toward increasing the transparency and clarity of the calculations.

The SWD SUPER model adequately assessed generation loss, and generation losses appear to be reasonable and appropriate. The valuation of those generation losses is not unreasonable, and is based substantially in work performed by the USACE, but the review produced some recommendations that could improve the process.

Use of Platts Power Outlook Research Service, (Platts) market-clearing price forecast for electrical energy has been agreed by Ozark Beach Hydroelectric Project, (Empire District

Electric Company FERC licensee No. 2221), and SWPA as a reasonable basis for assessing current and future market prices. However, SWPA's use of the Platts High-Fuel Cost scenario causes bias in long-term forecasts, and SWPA's worst-case approach for determining marketable capacity and the value of capacity also contribute to an assessment that appears to minimize potential risk to the Federal and non-Federal hydropower purposes. During Design phase, it is recommended that additional project-specific Platts model runs be produced to directly assess the actual role of the impacted projects in the system and the associated costs of replacing that power.

SWPA is encouraged to use the Platts constant-dollar forecast. Discounting should continue to be done using a real interest rate at the time of the actual calculation.

Finally, SWPA is encouraged to provide a robust presentation of the risks and uncertainties inherent in the calculations. While the final calculations will ultimately result in a single most-likely case, there are a variety of factors which can influence the value of the lost generation.

Additionally, as mentioned in Section 5.2.1.1, the increased annual O&M due to inefficient use of the turbines at Bull Shoals should be Corps-funded Minimum Flows project costs, and not part of the offset calculations.

6.0 IMPLEMENTATION

This section of the Project Report documents the implementation requirements of the Minimum Flows Project. The Bull Shoals Lake and Norfolk Lake are separable elements and will be implemented in a coordinated manner. In order to achieve some benefits as quickly as possible within funding constraints, Norfolk Lake will be implemented first. Each phase will be implemented in a manner that provides a functional increment of the Project and accomplishes all related incremental mitigation and compensation components.

6.1 Project Activities/Sequence/Schedule

6.1.1 *Report Approval and Agreements*

Following approval of this Project Report by the ASA(CW), the District will negotiate separate Project Partnership Agreements (PPA) for Bull Shoals Lake and Norfolk Lake with the non-Federal sponsor, the Arkansas Game and Fish Commission (AGFC), and coordinate with SWPA and the FERC licensee for compensation and debt offset, subject to review and approval of the agreements at the Washington level.

6.1.2 *Construction*

6.1.2.1 **Norfolk Lake**

The Norfolk Lake Project has three major actions:

- (1) Non-Federal sponsor provided relocations or modifications to lakeside facilities at Norfolk Lake to allow reasonable and continued use with the storage reallocation; and
- (2) Corps planning, design, construction, operation and maintenance of the reallocated storage and minimum flows facilities at this lake; and
- (3) A reduction in costs allocated to the Federal Hydropower purpose at Norfolk as determined by SWPA in accordance with the authorizing language.

(a) PPA for Norfolk Lake. The PPA covers relocations or modifications to lakeside facilities. The PPA may not be executed until Congress has appropriated funds for the Federal design and construction costs of the Project at Norfolk Lake.

- (1) Non-Federal Lakeside Facilities. The non-Federal sponsor is responsible for relocations or modifications to public and private lakeside facilities. At Norfolk Lake, no relocations or modification to private or non-Federal public facilities are required.
- (2) Federal Lakeside Facilities. The non-Federal sponsor shall pay for Corps design and construction of Federal lakeside facilities to be relocated or modified prior to the Government undertaking the work.
 - (i) Existing Federal lakeside facilities shall remain in operation until the Corps completes construction of replacement facilities in order to ensure continued public

access in the period before the minimum flows reallocation is implemented.

- (ii.) The Corps shall operate and maintain the modified or replacement Federal lakeside facilities.

(b) Norfolk Lake Minimum Flows Project Facilities. New facilities or modification to existing project facilities that are necessary to provide the minimum flow releases will be fully Federally funded.

- (1) The Project at Norfolk Lake requires design and construction of a siphon system and monorail bulkhead.
- (2) The Corps will amend the operating plan for Norfolk to provide for the Minimum Flow Releases.
- (3) The automated remote computer operating language (SCADA) will be modified to remotely operate turbines.
- (4) Changed operations shall not occur until all Federally and non-Federally funded construction is completed.

(c) Debt Offset for Hydropower Losses. The losses to hydropower at Norfolk Lake determined by SWPA shall be reported to the Treasury to reduce the amount owed on the costs previously allocated to the Federal Hydropower purpose.

6.1.2.2 Bull Shoals Lake

Compensation of the FERC licensee is only associated with this separable element of the Project and must be the first construction activity undertaken at this lake. The Project has four major actions:

- (1) Non-Federal sponsor provided relocations or modifications to lakeside facilities at Bull Shoals lake to allow reasonable and continued use with the storage reallocation; and
- (2) Corps planning, design, construction, operation and maintenance of the reallocated storage and minimum flows facilities at this lake; and
- (3) Corps payment to FERC Licensee 2221 to compensate for hydropower losses from storage reallocations at Bulls Shoals Lake; and
- (4) A reduction in costs allocated to the Federal Hydropower purpose at Bull Shoals as determined by SWPA in accordance with the authorizing language.

(a) PPA for Bull Shoals Lake. The PPA may not be executed until Congress has appropriated funds for compensation of the FERC licensee and for the Federal design and construction costs of the Project at Bull Shoals. The PPA shall be executed prior to Federal payment of the FERC Licensee compensation.

- (1) Non-Federal Lakeside Facilities. The non-Federal sponsor is responsible for relocations or modifications to lakeside facilities. No private lakeside facilities at Bull Shoals Lake require relocation or modification. Two public, non-Federal roads require relocation or modification.

- (i.) The non-Federal sponsor is responsible for relocations or modifications to Slough Hollow Road, Taney County, Missouri, and shall enter into an agreement with the County to provide or to pay the County to perform the needed modifications.
 - (ii.) The non-Federal sponsor is responsible for relocations or modifications to Marion County Road 143, Marion County, Arkansas, and shall enter into an agreement with the County to provide or to pay the County to perform the needed modifications.
 - (iii.) The Corps will provide such entry permits and licenses as are necessary for the non-Federal sponsor and the County to perform the needed modifications on Federal land at no cost except for administrative costs.
- (2) Federal Lakeside Facilities. The non-Federal sponsor shall pay for Corps design and construction of Federal lakeside facilities to be relocated or modified prior to the Government undertaking the work.
- (i.) Existing Federal lakeside facilities shall remain in operation until the Corps completes construction of replacement facilities in order to ensure continued public access in the period before the minimum flows reallocation is implemented.
 - (ii.) The Corps shall operate and maintain the modified or replacement Federal lakeside facilities.

(b) FERC Licensee 2221 Compensation. An estimate of Hydropower compensation has been prepared as described in Section 5.2 of this Project Report, and contained in Appendix C. At the time of implementation of the Minimum Flows Project, the compensation estimate will be reassessed using current fuel value as of that date, and the amount of required compensation will be set. The Corps will execute a release of claims agreement with Licensee 2221 and make the payment.

(c) Bull Shoals Minimum Flow Project Facilities. New facilities or modification to existing project facilities that are necessary to provide the minimum flow releases will be fully Federally funded.

- (1) At Bull Shoals, design and modification to an existing bulkhead is required.
- (2) The Corps will amend the operating plan for Bull Shoals to provide for the Minimum Flow Releases.
- (3) The automated remote computer operating language (SCADA) will be modified to remotely operate turbines.
- (4) Changed operations shall not occur until all Federally and non-Federally funded construction is completed and the FERC licensee compensation payment has been made.

(d) Debt Offset for Hydropower Losses. The losses to hydropower at Bull Shoals Lake determined by SWPA shall be reported to the Treasury to reduce the amount owed on the costs previously allocated to the Federal Hydropower purpose.

6.2 Real Estate

The real estate requirements for the project are described in detail in Appendix G and are summarized in the paragraphs that follow.

All lands, easements and rights-of-way required for the minimum flows project at Bull Shoals and Norfolk Lakes are owned by the US Government and managed by the Little Rock District Corps of Engineers. None of the land for the project is owned by the non-Federal sponsor, the Arkansas Game and Fish Commission. There are no non-standard estates and there is no mineral activity in the vicinity of either lake.

On Bull Shoals Lake, the 654-foot and 659-foot contours are the tops of the existing and proposed conservation pools, respectively, and the 695-foot contour is the top of the flood pool for both the existing and with-project conditions. On Norfolk Lake, the 552-foot and 553.75-foot contours are the tops of the existing and proposed conservation pools, and the 580-foot contour is the top of the existing and with-project flood pool. The conservation and the flood pool storage elevations are below the fee acquisition elevations at both lakes. No induced flooding of privately owned land will occur with the project; however, the Arkansas Game and Fish Commission, (AGFC) as the non-Federal sponsor, will provide relocations or modifications of public and private lake facilities to maintain reasonable continued use with the proposed reallocations of water at the two lakes.

6.3 Cost Share

The estimated costs for modifications at Norfolk and Bull Shoals Lakes, as well as the overall project costs, are shown in Table 11 with allocations to Federal and non-Federal responsibilities. These tables are based on the MCACES estimate included in Appendix E of this report.

Table 11: Estimated Project Cost Share
(Fully Funded by Cost Account, \$1,000s)

ITEM	Norfolk Federal	Norfolk Non-Federal	Norfolk Total
01 Lands and Damages	0	0	0
02 Relocations	0	0	0
04 Dams	3,775	0	3,775
06 Fish & Wildlife Facilities	818	0	818
14 Recreation Facilities	0	4,254	4,254
30 Plg., Eng., and Design	852	930	1,782
31 Construction Management	455	425	880
Norfolk TOTAL	5,900	5,609	11,509
	Bull Shoals Federal	Bull Shoals Non-Federal	Bull Shoals Total
01 Lands and Damages	0	0	0
02 Relocations	0	2,108	2,108
04 Dams	238	0	238
06 Fish & Wildlife Facilities	0	0	0
14 Recreation Facilities	0	7,319	7,319
30 Plg., Eng., and Design	42	2,125	2,167
31 Construction Management	23	942	965
Bull Shoals Subtotal	303	12,494	12,797
FERC License 2221*	33,935	0	33,935
Bull Shoals TOTAL	34,238	12,494	46,732
	Total Federal	Total Non-Federal	Total Project
01 Lands and Damages	0	0	0
02 Relocations	0	2,108	2,108
04 Dams	4,013	0	4,013
06 Fish & Wildlife Facilities	818	0	818
14 Recreation Facilities	0	11,573	11,573
30 Plg., Egrg., and Design	894	3,055	3,949
31 Construction Management	478	1,367	1,845
Subtotal	6,203	18,103	24,306
FERC Licensee*	33,935	0	33,935
WRMFS TOTAL	40,138	18,103	58,241

*Amount based upon current SWPA calculations.

6.4 Items of Local Cooperation

The White River Minimum Flows Project consists of implementing two plans, one for Bull Shoals Lake and one for Norfolk Lake. Each plan involves operational changes for the purpose of raising the conservation pools to provide the required minimum flows, as well as minor construction, and the relocation or modification of public or private lakeside facilities to allow for reasonable continued use of such facilities. The necessary operational changes and construction will be at 100 percent Federal expense, and the relocation or modification to the lakeside facilities will be at 100 percent non-Federal expense. The non-Federal Sponsor may request the Corps to assist with design or construction using their funds. This will be determined as part of the Design and Construction phase of the project.

The preponderance, if not all, of the relocations and modifications to lakeside facilities will involve property at the respective lakes whose underlying fee ownership is in the Government. The Government will allow appropriate entry to the Non-Federal Sponsor or its contractors for the performance of the lakeside facility work. Due to the different circumstances at Bull Shoals Lake and Norfolk Lake, the Government and the Non-Federal Sponsor will enter into separate Project Partnership Agreements (PPAs) for each Lake.

Federal implementation of the recommended project will be subject to the Non-Federal Sponsor agreeing in the PPA to comply with applicable Federal laws and policies, including but not limited to:

- a. Provide any lands, easements, and rights-of-way not currently owned or possessed by the Government necessary for the construction, operation, and maintenance of the project features;
- b. Perform all relocations of, and modifications to, public and private lakeside facilities to allow reasonable continued use of the facilities;
- c. Shall not use funds from other Federal programs to meet any of the non-Federal obligations for the project unless the Federal agency providing the Federal portion of such funds verifies in writing that expenditure of such funds for such purpose is authorized by Federal law;
- d. Prevent obstructions or encroachments at Bull Shoals Lake and Norfolk Lake in the course of performing relocations and modifications to lakeside facilities, which might reduce the outputs produced by these Lakes, hinder operation and maintenance of the Lakes, or interfere with the Lakes' proper function;
- e. Hold and save the United States free from all damages arising from the construction of project features and from the performance of relocations and modifications to public and private lakeside facilities, except for damages due to the fault or negligence of the United States or its contractors;

- f. Keep and maintain books, records, documents, or other evidence pertaining to costs and expenses incurred pursuant to the project, for a minimum of 3 years after completion of the accounting for which such books, records, documents, or other evidence are required, to the extent and in such detail as will properly reflect total project costs, and in accordance with the standards for financial management systems set forth in the Uniform Administrative Requirements for Grants and Cooperative Agreements to State and Local Governments at 32 CFR Section 33.20;
- g. Comply with all applicable Federal and State laws and regulations, including, but not limited to: Section 601 of the Civil Rights Act of 1964, Public Law 88-352 (42 U.S.C. 2000d) and Department of Defense Directive 5500.11 issued pursuant thereto; Army Regulation 600-7, entitled "Nondiscrimination on the Basis of Handicap in Programs and Activities Assisted or Conducted by the Department of the Army"; and all applicable Federal labor standards requirements including, but not limited to, 40 U.S.C. 3141- 3148 and 40 U.S.C. 3701 – 3708 (revising, codifying and enacting without substantial change the provisions of the Davis-Bacon Act (formerly 40 U.S.C. 276a *et seq.*), the Contract Work Hours and Safety Standards Act (formerly 40 U.S.C. 327 *et seq.*), and the Copeland Anti-Kickback Act (formerly 40 U.S.C. 276c *et seq.*);
- h. In the case of item a. above, perform, or ensure performance of, any investigations for hazardous substances that are determined necessary to identify the existence and extent of any hazardous substances regulated under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), Public Law 96-510, as amended (42 U.S.C. 9601-9675), that may exist in, on, or under lands, easements, or rights-of-way that the Federal Government determines to be required for the project. However, for lands that the Federal Government determines to be subject to the navigation servitude, only the Federal Government shall perform such investigations unless the Federal Government provides the non-Federal sponsor with prior specific written direction, in which case the non-Federal sponsor shall perform such investigations in accordance with such written direction;
- i. In the case of item a. above, assume, as between the Federal Government and the Non-Federal Sponsor, complete financial responsibility for all necessary cleanup and response costs of any hazardous substances regulated under CERCLA that are located in, on, or under lands, easements, or rights-of-way that the Federal Government determines to be required for the project.
- j. In the case of item a above, comply with all applicable provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, Public Law 91 646, as amended (42 U.S.C. 4601-4655), and the Uniform Regulations contained in 49 Code of Federal Regulations (CFR) Part 24, in acquiring lands, easements, and rights of way required for construction, operation, and maintenance of the project, including those necessary for relocations, the

borrowing of materials, or the disposal of dredged or excavated material; and inform all affected persons of applicable benefits, policies, and procedures in connection with said Act;

6.5 Project Financing

The non-Federal Sponsor, AGFC, has indicated their willingness and financial capability to participate in the construction of the Minimum Flows Project, and to implement their requirements for Lakeside Facility modifications to ensure reasonable continued use, as required by law. The AGFC will fund their portion of the project through the execution of the PPA and project implementation.

6.6 Agreements

This Project Report serves as the decision document to support the decision to execute Project Partnership Agreements (PPA's) for construction of the Minimum Flows Project. In addition, this Project Report and supporting Real Estate Plan (Appendix G) presents information to be used for executing any needed Agreements. At this time it is anticipated that no modifications to existing lease agreements are needed between the lessees and the US Government. The necessary rights-of-entry permits will be issued to the non-federal sponsor for construction involving this project upon US Government owned land.

There will be no modification to the existing Corps of Engineers and SWPA MOA for seasonal pool operations and cold water release. During Design during Construction phase, and upon completion of SWPA's final hydropower determination for a one time buyout of non-Federal hydropower FERC licensee no. 2221, a Release of Claims will be developed and signed by Ozark Beach hydroelectric project.

Prior to Construction, the Corps will execute a PPA for construction with the non-Federal sponsor. The PPA will describe the Federal and non-Federal responsibilities for the construction and operation and maintenance of the relocations or modification of lakeside facilities. Subject to current design standards and appropriate concurrence/oversight of the Corps, the non-Federal sponsor will fund and accomplish all construction phase actions for relocation/modifications of public and private lakeside facilities, including: plans and specifications; preparation and award of construction contracts; physical construction; any new or modified lands, easements, rights-of-way, relocations, and disposal areas (LERRD) required for the lakeside facilities; and administrative costs for lakeside LERRD.

6.7 Remaining Implementation Activities

With the completion of this Project Report and EIS, the feasibility planning activities for the Minimum Flows Project will be completed. Subsequent design, construction and other implementation activities will be carried out and cost-shared according to the Federal/non-Federal and agency responsibilities specified in EWDA Section 132(a) as

previously described. Corps activities will proceed within the funds appropriated for the Project.

6.8 O&M

The Little Rock District Corps of Engineers will perform operation, maintenance, repair, replacement and rehabilitation (OMRR&R) for the White River Minimum Flows project facilities and will continue existing OMRR&R requirements for Corps-owned features at Bull Shoals and Norfolk Lake projects. The Corps will operate the lakes to provide the minimum flows releases in accordance with the revised Operating Manuals for each lake project.

7.0 CONCLUSION

Section 132(a) of the FY06 EWDAAs authorized and directs implementation of two of the Reallocation plans described in the July 2004 White River Minimum Flows Reallocation Report: BS-3 at Bull Shoals and NF-7 at Norfolk Lake. The authorization requires a determination by the Assistant Secretary of the Army for Civil Works (ASA(CW)) regarding reasonable continued use of lakeside facilities and the determinations by the Administrator of the SWPA regarding compensation for hydropower losses at the Federal Energy Regulatory Commission (FERC) Project License No. 2221 and the offset for Federal hydropower losses at Bull Shoals and Norfolk Lakes.

This Project Report and accompanying EIS document the results of investigations specific to the Minimum Flows Project as authorized by the FY06 EWDAAs Section 132(a), that were conducted since the July 2004 White River Minimum Flows Reallocation Report. Downstream HEC modeling, tailwater recreational benefits and environmental resources information from the 2004 Reallocation Report have been brought forward and results were updated as applicable. Technical work undertaken in the preparation of this Project Report included the Lakeside Facilities impact assessment and modification plans, MII Cost Estimate, Dam Safety Analysis, Technical Review of the SUPER Model, and Peer Reviews of the work.

The Corps will provide the Minimum Flows Project facilities at Bull Shoals and Norfolk Lakes, including a new siphon system at Norfolk, modifications to dam bulkheads at both lakes, and modifications to the SCADA computer operating system for both lakes. The estimated cost to provide the Minimum Flow facilities is approximately \$6,203,000.

The Arkansas Game and Fish Commission (AGFC), the non-Federal sponsor, will provide relocations or modifications for public and private lake facilities to allow for reasonable continued use of those facilities at both Lakes. Currently, the estimated cost to provide modified or replacement lakeside facilities is approximately \$18,103,000.

Currently, SWPA's calculated value of the offset for losses to Federal hydropower is \$86,712,100; \$48,622,900 at Bull Shoals and \$38,089,200 at Norfolk. The calculated value of the compensation for losses to the non-Federal hydropower project (FERC License 2221) at Bull Shoals is \$33,935,100. SWPA's final calculation will be based on the official date of implementation as specified by the Corps of Engineers and the value of the specified parameters in effect at that time.

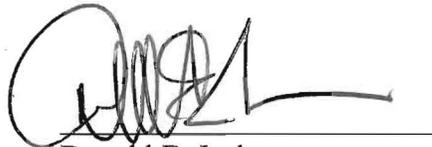
There are benefits and dis-benefits associated with the implementation of White River Minimum Flows Project. The accompanying Environmental Impact Statement (EIS) evaluated the effects of the Minimum Flows Project on the human and natural environment. The EIS concluded that the trout tailwater fishery below Bull Shoals and Norfolk dams will benefit from the increased wetted perimeter and dissolved oxygen (DO) levels resulting from increased minimum flows. The downstream recreation benefits associated with the improved trout fishery are increased by over \$4 million

annually. There will be no change to the water supply use of the two lakes. Negative effects to lakeside facilities will be minimized by relocating or modifying affected facilities to ensure reasonable continued use, in compliance with the authorizing language. The dis-benefits are to the hydropower and flood control purposes of the lakes. Negative impacts to hydropower will be compensated through the SWPA offset and FERC licensee compensation. The small reduction in flood control benefits were deemed to be insignificant when compared to the total flood damages the lakes are estimated to prevent.

The total cost for project design and construction and the FERC licensee compensation is estimated to be \$58,241,000. This is will be cost shared at approximately \$40,138,000 Federal and \$18,103,000 non-Federal. The offset to the Federal hydropower debt at Bull Shoals and Norfolk Lakes is estimated to be \$86, 712,100. The AGFC will serve as the non-Federal Sponsor and strongly supports the Minimum Flows Project.

8.0 RECOMMENDATION

I recommend approval of the White River Basin, Arkansas, Minimum Flows Project, as authorized by Section 132(a) of the FY 2006 Energy and Water Development Appropriation Act (Public Law 109-103) and described in this Project Report. This Project Report and accompanying EIS have fully evaluated the environmental, economic, and engineering requirements and have put forth a plan to address the purpose and need for the White River Minimum Flows Project, comply with the Congressional directives, and provide appropriate compensation to the hydropower losses and affected lakeside facilities.

A handwritten signature in black ink, appearing to read 'D. E. Jackson', written over a horizontal line.

Donald E. Jackson
Colonel, Corps of Engineers
District Engineer