

**Norfork Lake, Arkansas**

**US Army Corps  
of Engineers  
Little Rock District**

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# **Draft WATER SUPPLY STORAGE REALLOCATION REPORT**

**Reallocation of Storage at Norfork Lake,  
Arkansas for the  
City of Mountain Home, Arkansas**

**August 2007**

# Executive Summary

## City of Mountain Home Draft Water Supply Storage Reallocation from Norfork Lake, Arkansas

This report presents the results of a study to reallocate storage in Norfork Lake to the City of Mountain Home in Arkansas for municipal and industrial (M&I) water supply. This reallocation study comes at the request of the City of Mountain Home for an increase in yield to 5 mgd, approximately 2.841 mgd. This report includes an environmental assessment as directed by the National Environmental Policy Act.

This report concludes that 3,158 acre-feet (AF) of storage in the conservation pool be reallocated to water supply for the City of Mountain Home. This storage represents 0.45% of the current 707,000 AF of conservation storage in the lake or 0.22% of the current 1,438,800 AF of useable storage in the lake. The top of the conservation pool will remain unchanged and yield for hydropower operations will decrease.

To provide the requested yield for the City of Mountain Home, a new water supply storage agreement between the water district and the United States Government will be required. An unexecuted copy of the agreement is included with this report. This report and the agreement are being submitted to Corps Headquarters in Washington D.C. for approval. Upon approval the agreement will be executed and the reallocation of the immediate need storage will be made.

The conclusion for this water supply storage reallocation report is to reallocate the water storage from the conservation pool at an annual cost of \$37,074, which includes annual O&M costs of \$1,789. A conservation pool reallocation was determined based on National Economic Development (NED) methodology. A reallocation from the conservation pool will have the least impacts to benefits.

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## LIST OF TERMS, REFERENCES, AND ACRONYMS

AF or Acre-Foot - a unit for measuring the volume of water. It is equal to the quantity of water required to cover 1.0 acre to a depth of 1.0 foot and is equal to 43,560 cubic feet. It is used in measuring volumes of water used or stored.

Authorized Project - A project specifically authorized by Congress for construction, generally, through language in an authorization or appropriation act, or a project authorized pursuant to Section 201, of the 1965 Flood Control Act.

Construction Cost - The total expenditures to physically build the project including the cost of lands, relocations, engineering, design, administration, and supervision. This cost is sometimes referred to as the "first cost."

Cost Allocation - A systematic distribution of costs among the project purposes of a multipurpose project.

Cost Sharing - The division of cost among various entities which gain benefit including Federal, state, local, or private interests.

CWCCIS or Civil Works Construction Cost Index System - This refers to the cost index used to inflate construction costs to present day values.

DYMS or dependable yield mitigation storage or mitigation storage - is defined as the storage necessary to keep existing users whole to compensate for the reduction in the dependable yield which occurs when the conservation pool is expanded into the flood pool.

EA - Environmental Assessment

EC 1105-2-216 - Reallocation of Flood Control Storage to Municipal and Industrial Water Supply – Compensation Considerations

ENR - Engineering News Record is used to inflate construction costs to present day values.

ER 1105-2-100 - Policy and Planning Guidance For Conducting Civil Works Planning Studies, 22 April 2000

Financial Feasibility - Criterion of project acceptability, based upon the financial value of the returns to the sponsoring entity exceeding the financial value of the costs to the sponsoring entity.

Government fiscal year - October 1 to September 30

HQUSACE or Headquarters United States Army Corps of Engineers.

Immediate need - is that storage that the local sponsor must begin payment on immediately upon final approval of the water supply agreement whether or not it is needed.

Investment or investment cost - The construction cost plus interest during construction. In water supply agreements, this is the construction cost allocated to that portion of the water supply storage space plus interest during construction for those projects paid out over time, but does not include (if there is any) interest on the unpaid balance.

Joint-use Costs - Total project costs less all specific costs.

MAPS or Methodology for Area wide Planning Studies

mgd or million gallons per day - a unit for measuring the flow or discharge of a volume of water over a period of time.

M&I or municipal and industrial - while not defined in legislative history, the term has been defined by the Corps to mean supply for uses customarily found in the operation of municipal water systems and for uses in industrial processes. Industrial processes can include thermal power generation and mining operations.

NED or National Economic Development Plan - is defined as the plan with the greatest excess benefits over costs.

O&M - operation and maintenance.

PBF - "Power Benefits Foregone Due to Water Supply Withdrawals White River Projects": This report was prepared by the Power Branch, Water Management Division, Northwestern Division, Corps of Engineers, dated September

10, 1997. It assesses the impacts that water supply withdrawals have on hydropower generation in the White River Basin

Period of Analysis - The period determined by the estimated point in time at which the combined effect of physical depreciation, obsolescence, changing requirements for project services, and time and discount allowances will cause the cost of continuing the project to exceed the benefits to be expected from continuation. It may be equal to or greater than the amortization period and may be equal to, but is generally less than, the physical life.

PMA's - Power Marketing Agencies

Public Law 85-500, Title III, Water Supply Act of 1958, as amended - 1958 River and Harbor Act, 3 July 1958. Title III of this act is entitled The Water Supply Act of 1958. Section 301 provided that storage may be included for present and future municipal or industrial water supply in Corps or Bureau of Reclamation projects, the costs plus interest to be repaid by non-Federal entities within the life of the project but not to exceed 50 years after first use for water supply. No more than 30 percent of total project costs may be allocated to future demands. An interest-free period, until supply is first used, but not to exceed ten years, was permitted (72 Stat. 319, 43, U.S.C. 390b). These provisions were modified by Section 10 of Public Law 87-88 and Section 932 of Public Law 99-662.

Safe, dependable or critical period yield - is defined as the maximum quantity of water reliably available throughout the most severe drought of record.

Storage - the volume in a reservoir project between two different elevations. The normal unit of storage space is acre-feet. There may or may not be any water available within this space.

SUPER model - or SWD-SUPER computer simulation model as modified by CESWD-ED-WH to perform hydrologic yield analyses.

SWPA or Southwestern Power Administration

Water Supply Handbook - IWR Report 96-PS-4 (Revised)

WRDA or Water Resource Development Act - is an annual Act to provide for the conservation and development of water and related resources.

Yield - The quantity of water which can be taken, continuously, for any particular economic use. For municipal and industrial water supply purposes, this is normally taken as the flow which can be guaranteed during the 50-year drought on a 98% dependability.

# **DRAFT WATER SUPPLY STORAGE REALLOCATION REPORT AT NORFORK LAKE FOR THE CITY OF MOUNTAIN HOME, ARKANSAS**

## **1. PURPOSE**

### **A. Requesting Entity**

The City of Mountain Home, in a letter dated 19 September 2000, requested a reallocation of storage from Norfolk Lake to increase the City's yield to 5 mgd. The City is located in Northern Arkansas in Baxter County. The City was notified, in a letter dated 30 August 2000, that it was exceeding its current agreement of 3 mgd. The City's average water usage has averaged 3.47 mgd over the past 6.5-years, with withdrawal rates as high as 5.10 mgd. Baxter County and the City of Mountain Home have experienced population growth that is greater than the average for Arkansas, and their populations are expected to continue to increase, thus putting increased demand on the City's current yield.

### **B. Reallocation Authority**

Authority for the Corps to reallocate existing storage space to M&I water supply is contained in Public Law 85-500, Title III, Water Supply Act of 1958, as amended. The Secretary of the Army is authorized to cooperate with local interests in providing storage space for M&I water supply in U.S. Army Corps of Engineers projects as long as the local interests agree to pay the costs associated with the storage space. The Corps has the discretionary authority to reallocate up to 50,000 acre feet (AF) of the total storage capacity in Norfolk Lake provided the reallocation has no severe effect on other authorized purposes and will not involve major structural or operational changes.

## **2. PROJECT BACKGROUND**

### **A. Project History**

The authority for the Norfolk Dam and Reservoir project is contained in the Flood Control Act approved 28 June 1938 (Public, No. 761, 75<sup>th</sup> Congress, 3d session). This act also provided that penstocks or other similar facilities adapted to possible future use in the development of hydroelectric power shall be installed when approved by the Secretary of War upon the recommendation of the Chief of Engineers and the Federal Power Commission. The Norfolk project became authorized for the dual purposes of flood control and hydropower with the Flood Control Act approved 18 August 1941 (Public, No. 228, 77<sup>th</sup> Congress, 1<sup>st</sup> session).

Construction for the Norfolk project was initiated on 17 October 1940 when construction of an access railroad, housing facilities for government employees, and an access highway was begun. Flood control and power generation were available for service on 01 July 1944, 01 April 1945 (Power unit No. 1), and 01 March 1950 (Power unit No. 2),

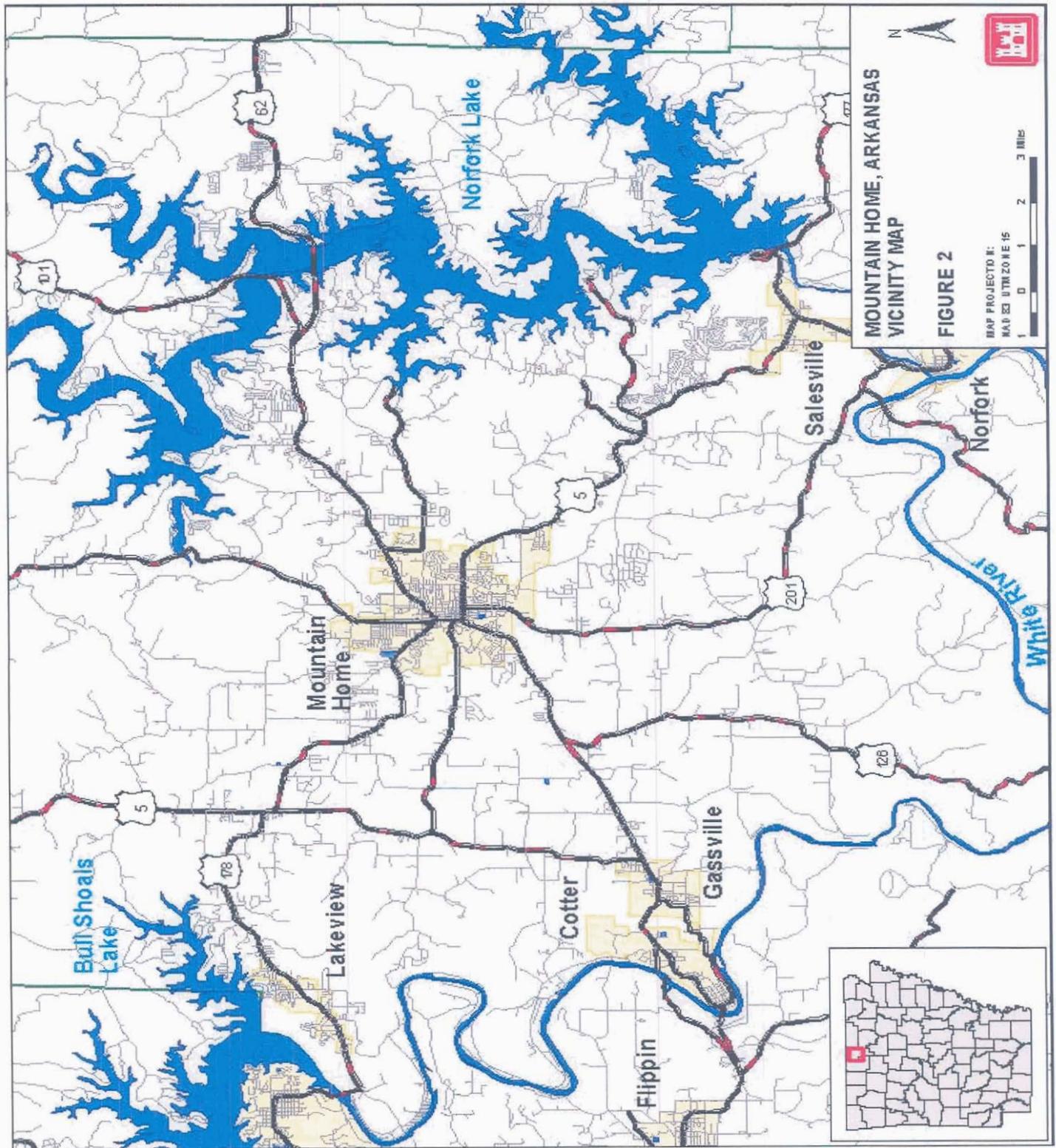
respectively. The main dam is a concrete gravity-type dam. It is 2,624 feet long and 222 feet in height above the streambed. The dam consists of a spillway section 568 feet long located above the river channel and two non-overflow sections. The spillway is controlled by 12 radial crest gates 28 feet high and 40 feet long. The reservoir captures runoff from 1,806 square miles. It has a total storage capacity of 1,983,000 acre-feet; of which 731,800 is for flood control, 707,000 is for conservation storage, and 544,200 is dead storage. The surface area of the reservoir at the top of the power pool is 22,000 acres and the shoreline is approximately 510 miles long. Current project physical features are shown in Table 1.

Feature	Elevation <sup>[1]</sup>	Area (acres)	Storage Volume (AF)	Equiv. Runoff <sup>[2]</sup> (inches)
Top of dam	590.00	---	---	
Top of flood control pool	580.00	30,700	1,983,000	20.6
Top of conservation pool	552.00	22,000	1,251,200	13.0
Top of inactive pool	510.00	12,300	544,200	5.6
Flood control storage:	552.00 - 580.00	---	731,800	
Conservation Storage	510.00 - 552.00	---	707,000	
Inactive storage	Below elev. 510.00	---	544,200	
<sup>[1]</sup> Above the National Geodetic Vertical Datum (NGVD29).				
<sup>[2]</sup> From 1,806 square miles of drainage area upstream from dam.				

**B. Project Location and Purposes**

The Norfolk Reservoir and Dam is located 4.8 miles above its confluence with the White River near Norfolk, Arkansas in Baxter County. The reservoir collects drainage from 1,806 square miles of area upstream of the dam. Currently the project is being operated for flood control and hydropower purposes. A map of the area is shown in Figure 1.

Figure 1: Norfolk Lake and Surrounding Communities



### **C. Water Reallocations**

The first and only water supply reallocation for M&I purposes from Norfolk Lake was contracted in April 1967 for 2,400 acre-feet. The reallocation came from Norfolk's conservation pool, was thought to provide a safe yield of 3 mgd, and was for the City of Mountain Home.

However, analysis indicated that Norfolk's storage-yield efficiency was incorrect. This error was primarily due to two different critical droughts in the region. Originally, the drought of the 1950's was used to compute Norfolk's storage-yield capability, but a more severe drought occurred in the 1960's. The drought of the 1960's, May 1961 through December 1968, occurred after the initial design of the project as well as the City of Mountain Home's original water supply request.

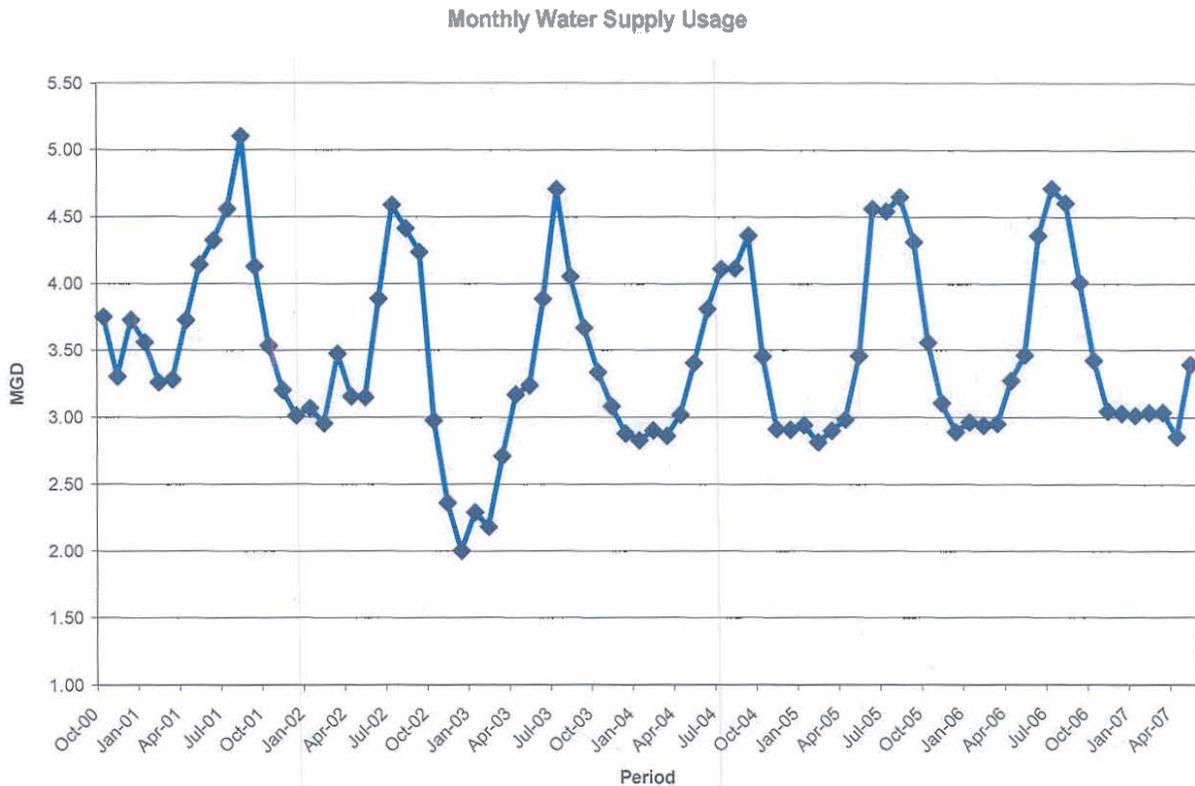
Therefore, the City of Mountain Home's yield was overstated. Based on the new drought of record, their contracted storage of 2,400 acre-feet yielded 2,159 acre-feet. The City of Mountain Home's current reallocation request will require enough storage to correct their 1967 contract as well as to provide them with a total yield of 5 mgd. This reallocation is requested by the City of Mountain Home and will impact the Corps reallocation limit of 50,000 AF. While the Corps reallocation authority is for storage and not safe yield the intent and actual calculations are based on using the safe yield requested by the customer to determine the amount of storage that will provide that yield. As stated in the Water Supply Handbook, IWR Report 96-PS-4 (Revised), page 2-3, "*Repayment agreements for storage space will base the amount of storage to be provided on the yield required by the non-Federal sponsor.*"

## **3. Economic Analysis**

### **A. Water Supply Demand Analysis**

Mountain Home's average water supply withdrawal over the past 6.5 years has been 3.47 mgd. Their current contracted yield is for 3 mgd. Since December 2000, Mountain Home has withdrawn a total of 8.440 billion gallons and peak usage has occurred during the June to August timeframes. Mountain Home's current reallocation request would bring their total yield up to 5 mgd. The City of Mountain Home and Baxter County are areas of growth and development. As population in the area continues to increase, manufacturing and service industries will most surely follow. The increase in yield to 5 mgd for the City should be sufficient for its short run needs. Figure 2 displays a graph of Mountain Home's historical water usage.

**Figure 2: City of Mountain Home Historical Water Usage**



### **B. Analysis of Water Supply Alternatives**

The Benton/Washington County Water Association Water Supply Storage Reallocation Report for Beaver Lake, dated August 1995, had several alternatives developed for the reallocation of water storage. These alternatives included developing a new lake, stream withdrawal, and underground water sources. The alternatives developed in the Benton/Washington report will be used as a baseline for the evaluation of alternatives in this report.

A new lake in the vicinity of Benton and Washington Counties was considered in the August 1995 Water Supply Storage Reallocation Report for the Benton/Washington County Water Association. It is assumed that the costs of a new lake in the vicinity of Mountain Home would be comparable. Table 2 outlines the new lake and pipeline costs from the August 1995 report and the updated costs. Based on updated costs for construction of a new lake and pipeline and in comparison to reallocation of water storage, it is not considered financially feasible to investigate this alternative further. A comparison of this financial feasibility is later discussed in this report.

There are no streams or underground aquifers in the area capable of sustaining the requested yield.

**TABLE 2  
NEW LAKE AND PIPELINE ALTERNATIVE**

	Aug-95 Report	Updated Cost
Interest Rate	0.0775	0.04875
Period of Analysis (years)	50	50
<b>Project First Costs:</b>		
New Dam and Lake <sup>1</sup>	\$ 10,200,000	\$ 14,871,000
Treatment plant, pipeline and storage tank <sup>1</sup>	\$ 31,870,000	\$ 46,463,000
<b>Total</b>	\$ 42,070,000	\$ 69,111,000
<b>Annual Cost:</b>		
Interest & Amortization <sup>2</sup>	\$ 3,340,000	\$ 3,713,000
Operation & Maintenance <sup>3</sup>	\$ 642,000	\$ 1,055,000
<b>Total</b>	\$ 3,982,000	\$ 4,768,000

<sup>1</sup> Updated with the CWCCIS composite index from FY95 and FY07.

<sup>2</sup> Includes \$7,776,508 of IDC, based 4.875% interest rate and 5 year construction period.

<sup>3</sup> Updated O&M is based on the ratio of O&M to Total project costs of 1995 Estimate, 1.526%.

## **4. DERIVATION OF USER COST**

### **A. YIELD/STORAGE ANALYSIS**

#### **1) General**

Two options will be evaluated for reallocation of storage in Norfolk Lake. The effects of reallocating storage from current flood control, or hydropower storage will be considered. These are the only usable storage spaces in Norfolk Lake.

Current storage and yields are based on a conservation pool located between elevations 510 and 552, which contains 707,000 acre-feet of storage. The safe yield of this storage during the drought of record is about 636 mgd.

#### **2) Conservation Pool**

When storage is reallocated from the conservation pool there is no change in the yield of the pool. The reallocation is made directly from hydropower storage causing both a reduction in their existing storage and a reduction in their yield.

#### **3) Flood Pool**

As the storage in the conservation pool is increased by reallocation from the flood pool, the yield/storage relationship changes. This occurs because a flood pool reallocation requires raising the conservation pool into the flood pool. To determine the yield as the storage is increased it is necessary to reference the yield/storage curve for Norfolk Lake. The new safe yield was determined by using the SUPER model. This method determined

3,171 acre-feet of storage to provide a yield of 2.841 mgd and would raise the top of the conservation pool less than 2 inches, from 552 to 552.167.

When storage is taken from the flood pool, the amount of storage allocated to each existing water supply user must be increased to maintain their expected yield. This additional storage is called "dependable yield mitigation storage" or DYMS. As stated in EC 1105-2-216, Reallocation of Flood Control Storage to Municipal and Industrial Water Supply – Compensation Considerations, *"It is Corps policy not to provide DYMS for hydropower as is done for existing water supply users."* Therefore, no DYMS is added to hydropower, which results in their storage remaining constant and their yield decreasing. Each time additional storage is requested for reallocation from the flood pool a calculation is made estimating the requested safe yield, and the DYMS for existing users. The cost of the DYMS is the responsibility of the water supply requestor, as stated in EC 1105-2-216, *"All costs associated with DYMS will be paid for by the new user of the new water supply storage space (i.e., the water supply requestor)."*

## **B. HYDROPOWER BENEFITS FOREGONE**

Hydropower benefits are based on the cost of the most likely alternative source of power. When storage is reallocated for water supply and an impact occurs to hydropower, the power benefits foregone are equivalent to the cost of replacing the lost power with the most likely alternative source of power.

The power benefits foregone can be divided into two components: lost energy benefits and lost capacity benefits. In the case of water supply withdrawals, there is usually a loss of energy benefits, and lost energy benefits are based on the loss in generation (both at-site and downstream) as a result of water being diverted from the reservoir for water supply rather than passing through the hydro plant.

In addition, there could be a loss of capacity benefits as a result of a loss in dependable capacity at the project. Dependable capacity could be lost as a result of;

- a loss in head due to lower post-withdrawal reservoir elevations.

- a reduction in the usability of the capacity due to inadequate energy to support the full capacity during low-flow periods.

The hydropower benefits foregone due to the reallocation of storage are listed in Table 3.

**TABLE 3  
HYDROPOWER BENEFIT LOSSES DUE TO WATER WITHDRAWALS**

	Benefits Foregone	
	Flood Pool	Conservation Pool
Reduction in streamflow (mgd)	2.84	2.84
Annual energy losses (MWh) <sup>1</sup>	500	493
Energy value (mills/kwh) <sup>2</sup>	44.53	44.53
Annual energy benefits foregone	\$ 22,266	\$ 21,975
Capacity losses (kilowatts) <sup>1</sup>	79.55	143.47
Capacity value (\$/kw-yr) <sup>2</sup>	\$ 105	\$ 105
Annual capacity benefits foregone	\$ 8,372	\$ 15,099
<b>Annual benefits foregone</b>	<b>\$ 30,637</b>	<b>\$ 37,074</b>

<sup>1</sup> Power Benefits Foregone Due To Water Supply Withdrawals  
White River Basin Projects, Power Branch, Water Management Division,  
Northwestern Division, Corps of Engineers, Portland, Oregon,  
September 1997, Pages 3-8, 4-26, and 4-27.

<sup>2</sup> Hydropower Analysis Center computed using Platts Power Outlook Research Service,  
2007. Reference Central Arkansas Water Supply Greers Ferry Update. Value assumed  
commensurate with what would be calculated at Norfolk Lake.

### C. HYDROPOWER REVENUES FOREGONE

Hydropower revenues foregone are based on the value of the lost power based on the power marketing agency's rates. Southwestern Power Administration rates as of 14 July 2004 (October 2006) are:

Energy charge: 14.90 mills/kWh  
Capacity charge: \$42.34/kW-year

The energy charge is applied to the average annual energy losses and the capacity charge is applied to the loss in marketable capacity. The hydropower revenues foregone due to the storage reallocation are listed in Table 4.

**TABLE 4**  
**HYDROPOWER REVENUE LOSSES DUE TO WATER WITHDRAWALS**

	Revenues Foregone	
	Flood Pool	Conservation Pool
Reduction in streamflow (mgd)	2.84	2.84
Annual energy losses (MWh) <sup>1</sup>	500	493
Energy value (mills/kwh) <sup>2</sup>	14.90	14.90
Annual energy revenues foregone	\$ 7,450	\$ 7,353
Capacity losses (kilowatts) <sup>1</sup>	111.65	173.87
Capacity value (\$/kw-yr) <sup>2</sup>	\$ 42.34	\$ 42.34
Annual capacity revenues foregone	\$ 4,727	\$ 7,362
<b>Annual revenues foregone</b>	<b>\$ 12,178</b>	<b>\$ 14,714</b>

<sup>1</sup> Power Benefits Foregone Due To Water Supply Withdrawals  
White River Basin Projects, Power Branch, Water Management Division,  
Northwestern Division, Corps of Engineers, Portland, Oregon,  
September 1997, Pages 3-8, 4-26, and 4-27.

<sup>2</sup> Southwest Power Administration, October 2006.

#### **D. HYDROPOWER REPLACEMENT COST**

The replacement cost of power as used for computing the cost of reallocated storage is an economic or National Economic Development (NED) cost. In the case of hydropower, the NED cost of replacement power is, by definition, identical to the power benefits foregone. Power benefits foregone are based on the cost of the most likely alternative, which in fact is the cost of replacement power. Therefore, the replacement cost of power is the value of the power benefits foregone as shown in Table 3.

#### **E. FLOOD CONTROL BENEFITS FOREGONE**

##### **1) Lost Flood Control Benefits**

If water storage is reallocated from the flood control pool for water supply there will be flood control benefits foregone. An estimate of the flood control benefits foregone is made using historical data and annual flood losses prevented. These values are factored to current price levels and then averaged over the period of record. A reallocation of 3,171 acre-feet would cause an incremental reduction of approximately \$7,500 in flood control benefits.

To-date, no flood control storage has been reallocated to M&I water supply storage. If 3,171 acre-feet is reallocated from the flood pool for Mountain Home the cumulative effects of this reallocation would be identical to the latter paragraph, \$7,500.

Calculations of lost flood control benefits are included in Appendix D.

**2) Lost Hydropower Benefits**

A flood pool reallocation will have an effect on hydropower benefits. Although no water is being reallocated from the power pool, a change in the volume of the power pool, caused by raising the power pool to reallocate water from the flood pool, will cause capacity and energy losses. The lost hydropower benefits from a flood pool reallocation are listed in Tables 3 and 4.

**3) Other Costs**

No associated costs are anticipated with a flood pool reallocation.

**4) Total Costs**

The total cost associated with a flood pool reallocation is summarized in Table 5.

TABLE 5	
TOTAL COST WITH REALLOCATION FROM FLOOD CONTROL STORAGE	
ITEM	COST
Lost Flood Control Benefits	\$ 7,500
Lost Hydropower Benefits	\$ 30,637
Other Costs	-
<b>TOTAL</b>	<b>\$ 38,137</b>

#### E. NATIONAL ECONOMIC DEVELOPMENT PLAN

National Economic Development Plan methodology is used to determine from which pool the reallocation will be made. Table 6 presents the project benefits that are impacted with a reallocation in Norfolk Lake. By comparison, a conservation pool reallocation is the NED Plan because it is the least impacted by the water supply reallocation.

Conservation Pool	
-Hydropower	\$ 37,074
Total Conservation Pool	\$ 37,074
Flood Pool	
-Flood Damages	\$ 7,500
-Hydropower	\$ 30,637
Total Flood Pool	\$ 38,137

#### F. UPDATED COST OF STORAGE

The Norfolk Lake project came online for flood control and power in 1944 and 1945, respectively, and deliberate impoundment of the reservoir was initiated in June 1943. All recorded costs, however, were based on actual project costs through 1956. Total and joint updated project costs are \$290,290,000 and \$218,151,000, respectively. The updated costs were based on the costs of the project as presented in the final cost allocation report. The costs were then inflated to present day price levels by use of the Engineering News Record (ENR) Construction Cost Index and the Corps of Engineers Civil Works Construction Cost Index System (CWCCIS). Tables 7 and 8 detail the updated costs of the project and the updated cost of storage. The updated cost of storage is based on a 30-year repayment period at 4.875% interest.

NORFORK LAKE, ARKANSAS  
UPDATED PROJECT COST ESTIMATE

Categories	Initial Project Cost: 1956 Prices	Index at Time of Const.	Jul 67 ENR Index	Jul 67 CWCCIS Index	FY 07 CWCCIS Index 1	FY 07 Project Cost	
Land and Damages:	1,190,000	692	1,074	100	659.42	12,179,000	J
Relocation:	1,602,800	692	1,074	1,074	7,865.00	18,217,000	J
Reservoir & Pool Preparation:	1,552,700	692	1,074	100	700.59	16,883,000	J
Dams:							
Main Dam	16,192,800	692	1,074	100	656.69	165,037,000	J
Outlet works (exclusive of power)	586,200	692	1,074	100	656.69	5,975,000	FC
Power Intake Works	464,600	692	1,074	100	656.69	4,735,000	P
Powerhouse, Switchyard, and Equip.:	6,421,000	692	1,074	100	610.89	60,878,000	P
Roads, RR's, & Bridges	235,500	692	1,074	100	665.11	2,431,000	J
Reservoir development:	192,600	692	1,074	100	700.59	2,094,000	J
Buildings, Grounds, & Utilities:	115,300	692	1,074	1,074	7,865.00	1,310,000	J
Permanent Operating Equipment:	48,500	692	1,074	1,074	7,865.00	551,000	P
<b>TOTAL</b>	<b>28,602,000</b>					<b>290,290,000</b>	
<b>SUMMARY</b>							
Specific Costs:							
Flood Control	586,200					5,975,000	FC
Power	6,934,100					66,164,000	P
SUBTOTAL	7,520,300					72,139,000	
Joint-Use Cost	21,081,700					218,151,000	
<b>TOTAL PROJECT COST</b>	<b>28,602,000</b>					<b>290,290,000</b>	

<sup>1</sup> CWCCIS factors are taken from EM1110-2-1304, dated 30 March 2007. Other values are taken from the McGraw Hill Engineering Record, <http://enr.construction.com/>

**TABLE 8  
UPDATED COST OF STORAGE  
CONSERVATION POOL REALLOCATION**

ITEM	Amount
Storage Required, (AF)	3,157.95
Water Supply Yield, (mgd)	2.841
Interest Rate, (percent)	4.875%
Repayment Period, (years)	30
Usable Project Storage	
Flood Control (AF)	731,800
Power Drawdown and Water Supply, (AF)	707,000
<b>TOTAL</b>	<b>1,438,800</b>
Joint-Use Project Cost	
Initial Construction (FY07 Prices)	\$ 218,151,000
O&M (FY06)	\$ 815,301
<b>Storage Cost</b>	<b>\$ 478,809</b>
Annual Cost of Storage	
Investment <sup>[1]</sup>	\$ 29,278
O&M <sup>[2]</sup>	\$ 1,789
<b>TOTAL</b>	<b>\$ 31,067</b>

<sup>1</sup> Based on 4.875% interest rate and 30-year repayment period

<sup>2</sup> Based on 0.22% of the actual FY06 joint-use O&M cost.

### G. USERS COSTS

The users cost is the higher of the preceding calculations that are associated with a conservation pool reallocation; lost hydropower benefits, lost hydropower revenues, replacement cost of hydropower, and updated cost of storage. Table 9 lists these costs.

**TABLE 9  
COMPARISON OF ALTERNATIVES TO OBTAIN  
USER COST FROM A CONSERVATION POOL REALLOCATION**

ITEM	Capital Cost (Annual \$'s)	O&M Cost (Annual \$'s)	User Cost (Annual \$'s)
Lost Hydropower Benefits	\$ 37,074	\$ 1,789	\$ 38,863
Lost Hydropower Revenues	14,714	1,789	16,503
Replacement Cost of Hydropower	37,074	1,789	38,863
Updated Cost of Storage	29,278	1,789	31,067

Based on the costs calculated in the latter portion of this report, the users annual cost will be that which is associated with the lost hydropower benefits, \$38,863.

## 5. TEST OF FINANCIAL FEASIBILITY

As a test of financial feasibility, the annual cost of the reallocated storage, (determined in paragraph 4f), is compared to the annual cost of the most likely, least costly, alternative that would provide an equivalent quality and quantity of water which the local interests would undertake in absence of utilizing the Federal project. Table 10 presents the cost of water supply storage space from Norfolk Lake expressed as an annual charge using a 4.875 percent interest rate amortized over a 30-year repayment period plus annual operation and maintenance. The table also presents the estimated annual cost for the most likely non-Federal alternative; a new water supply lake. The cost is expressed as an estimated annual charge using a 4.875 percent interest rate and a 50-year period of analysis. As depicted in Table 10, reallocation from Norfolk Lake is financially feasible compared with the most likely non-Federal alternative.

Alternative	Capital Cost	Annual Capital Cost	Annual OM&R Cost	Total Annual Cost
Norfolk Lake, Hydropower Benefits Foregone	\$ 606,307	\$ 37,074	\$ 1,789	\$ 38,863
New Lake & Pipeline	\$ 49,226,000	\$ 3,398,000	\$ 751,000	\$ 4,149,000

## 6. COST ACCOUNT ADJUSTMENTS

A water supply reallocation from Norfolk Lake will have an adverse affect on Southwestern Power Administration. Therefore, a credit to the accounting records should be made based on the estimated loss of power outputs and the current rates charged by Southwestern Power Administration. The period of analysis for the Norfolk Lake project will end in the 2043. At the writing of this report there were 37 years remaining in this period. The estimated annual credit to the accounting records is \$28,492. This credit is based on capacity credits and energy credits. The capacity credits are based on capacity benefits through 2015, \$15,099, and capacity revenues, \$7,362, from 2016 to 2064. The energy credits are based on energy benefits through 2015, \$21,975, and energy revenues, \$7,353, from 2016 to 2043. All figures were brought to a present value using a 4.875-percent interest rate and a 37-year time horizon.

## 7. OTHER CONSIDERATIONS

### A. NEPA DOCUMENTATION

The proposed storage reallocation will not change the Norfolk Lake project. Storage currently allocated to the power pool will be reallocated to municipal and industrial water supply; therefore, the current size of the conservation pool and flood pool will not change. This is considered to have no significant impact on the natural or cultural resources listed as being present. A preliminary determination of "no significant impacts"

is made and a finding to that effect was prepared as part of the National Environmental Policy Act documentation. The completed Environmental Assessment (EA) is attached.

## **B. PUBLIC COMMENT**

Public law and engineering regulations require a 30-day public comment period for this reallocation of storage. The public review and comment is a requirement by the National Environmental Policy Act and Section 5 of Public Law 100-676.

## **C. VIEWS OF FEDERAL, STATE, AND LOCAL INTERESTS**

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## **8. CONCLUSIONS**

The City of Mountain Home is requesting enough storage to increase their yield to 5 mgd. This is the equivalent of 3,158 acre-feet from the conservation pool, 2.841 mgd. Norfolk Lake is a Corps operated project and is located in Northern Arkansas. Construction of the Lake started in 1940 and ended in 1950 when the project's 2<sup>nd</sup> power unit went on-line. Norfolk Lake collects the runoff from 1,806 square miles, has total usable storage of 1,438,800 acre-feet, of which 707,000 acre-feet is for conservation storage, and its authorized purposes are flood control and hydropower.

The first water supply allocation from Norfolk Lake was for 2,400 acre-feet for the City of Mountain Home. This has been the only reallocation. Mountain Home's current average daily water supply needs are approximately 3.50 mgd, but their current contract is for 3 mgd, hence their request for enough storage to bring their yield to 5 mgd. The annual cost of an additional 3,158 acre-feet is \$37,074; this is the cost associated with the lost hydropower benefits and includes \$1,789 for O&M. Also, it is estimated that the annual credit to the accounting records should be \$28,492.

The cost of reallocating storage from Norfolk Lake was compared to the most likely and least costly alternative, building a new water supply lake. This comparison was made to determine the feasibility of the reallocation, which it is.

An environmental assessment was conducted to determine the environmental impacts of the water supply alternatives. The EA is located in Appendix A.

APPENDIX A  
NEPA DOCUMENTATION

**DRAFT**  
**Finding of No Significant Impact (FONSI)**  
**Reallocation of Water Storage**  
**Norfolk Lake, Arkansas**

Pursuant to the Council on Environmental Quality (CEQ) Regulations (40 CFR Parts 1500 – 1508) for implementing the procedural provisions of the National Environmental Policy Act (42 USC 4321 et seq.) and US Army Corps of Engineers regulations (32 CFR 230), US Army Corps of Engineers, Little Rock District, prepared an environmental assessment (EA) to evaluate the potential environmental effects of reallocating water from Norfolk Lake for Municipal and Industrial water supply to the City of Mountain Home, Arkansas.

**Proposed Action.** Little Rock District proposes to reallocate storage from Norfolk Lake in order to increase the existing water supply allocation for the City of Mountain Home, Arkansas, from 3 million gallons per day (mgd) to 5 mgd.

**Purpose and Need.** The purpose of the proposed reallocation is to provide the City of Mountain Home with sufficient water storage in Norfolk Lake to meet their existing usage. The need for the proposed action is that the City of Mountain Home's existing contract for 3 mgd from Norfolk Lake is not sufficient. Over the past 6.5 years, the City's average water withdrawal rate has been 3.47 mgd with rates as high as 5.10 mgd.

**Alternatives.** Two alternatives that would achieve the purpose and need of the proposed action and the no-action alternative were evaluated in this EA.

Alternative 1, the "preferred alternative" would reallocate 3,158 acre-feet (AF) of storage from the conservation pool of Norfolk Lake. A storage reallocation from the conservation pool would not change the elevation of the pool or the operation of the project. Storage for hydropower would be decreased. Implementation of this alternative would result in an increase in the water supply storage at Norfolk Lake from 2,400 AF to 5,558 AF and a decrease in hydropower storage from 541,600 AF to 538,442 AF.

Alternative 2, would reallocate 3,171 AF of storage from the flood control pool of Norfolk Lake. A storage reallocation from the flood pool would increase the conservation pool elevation by an estimated 0.167 inches, reduce the available hydropower yield, and have a small (\$7,500.00) impact on flood damage reduction benefits.

Little Rock District evaluated and eliminated from further analysis a number of alternatives that were determined not to be reasonable: stream withdrawal, construction of new reservoir, use of neighboring water systems, and groundwater withdrawal.

**Factors Considered in Determining that No Environmental Impact Statement is Required.** The EA, which is incorporated by reference into this draft Finding of No Significant Impact (FONSI), examined the potential effects of both alternatives that

would achieve the purpose and need for the proposed action and the no-action alternative on several resources.

Implementing the proposed action would have minor beneficial impacts on socioeconomic resources because the City of Mountain Home would have been provided a sufficient amount of storage in Norfolk Lake to meet their existing need. There would be some impact to the availability of storage for hydropower regardless of the alternative selected to implement the proposed action. Should lost hydropower be made up through the purchase of power from regional combustion generation facilities, there would be some impact to air quality from plant emissions. Flood damage reduction benefits would be impacted but to a small degree. None of these impacts would be considered significant. No impacts are expected on Biological Resources, Environmental Justice, Geology and Soils, Cultural Resources, or Land Use.

**Conclusion.** Based on the analysis in this EA, implementing either alternative 1 or alternative 2 would not have the potential to cause any significant effect, beneficial or adverse, direct, indirect, or cumulative on the quality of the natural or human environment. Alternative 1, reallocation from the conservation pool has been assessed to have the least effects on the natural or human environment.

**Public Comment.** Subject to review and consideration of comments submitted by individuals, organizations, or agencies during the comment period, Little Rock District intends to issue a final FONSI at the conclusion of the comment period and proceed with the implementation of Alternative 1, reallocation from the conservation pool.

**Mountain Home, Arkansas**

**Norfolk Lake, Arkansas**

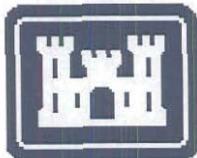
**Water Supply Storage Reallocation**

**ENVIRONMENTAL ASSESSMENT**

**Prepared June, 2002**

**Updated December 15, 2004**

**Revised August, 2007**



**US Army Corps  
of Engineers  
Little Rock District**

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## **1.0 INTRODUCTION**

The United States Army Corps of Engineers, Little Rock District is preparing this Environmental Assessment (EA) to address the environmental effects associated with the proposed reallocation of water storage in Norfolk Lake to Municipal and Industrial Water Supply for the City of Mountain Home, Arkansas.

This EA has been prepared pursuant to: the National Environmental Policy Act (NEPA) of 1969 (as amended), 42 US Code (USC) Section 4321 et seq.; the Council on Environmental Quality (CEQ) regulations for implementing NEPA, 40 CFR Parts 1500 – 1508; and Corps of Engineers Procedures for Implementing NEPA, 33 CFR 230.

### **1.1 Project Location**

The Norfolk Dam is located in Baxter County, Arkansas, on the North Fork of the White River, about 4.8 miles upstream from its confluence with the White River. The dam is approximately 12 miles southeast of Mountain Home, and two miles east of the town of Salesville, Arkansas. The lake extends in a northerly direction upstream from the dam in Baxter County, eastward into Fulton County, Arkansas and northward into Ozark County, Missouri.

### **1.2 Purpose and Need for the Proposed Action**

The city of Mountain Home, Arkansas has requested that its water supply allocation from Norfolk Lake be increased from 3 million gallons per day (mgd) to 5 mgd to meet the current needs of the municipal and industrial water users. The contract for the first water supply allocation from Lake Norfolk was enacted on April 28, 1967 for the city of Mountain Home. This allocation was for 2,400 acre-feet, which was determined to yield about 3 million gallons per day. (A recalculation corrected that to yield only 2.16 mgd.) The City's average water usage for the past 6.5 years has been 3.47 mgd with withdrawal rates as high as 5.10 mgd.

The Little Rock District Corps of Engineers has prepared a storage reallocation report to determine the amount of storage required to provide the requested water volume and to determine whether an alternative source of water is available.

### **1.3 Project Authority and Regulatory Requirements**

Authority for the Corps to reallocate existing storage space to M&I water supply is contained in Public Law 85-500, Title III, Water Supply Act of 1958, as amended. The Secretary of the Army is authorized to cooperate with local interests in providing storage space for M&I water supply in U.S. Army Corps of Engineers projects as long as the local interests agree to pay the costs associated with the storage space. The Corps has the discretionary authority to reallocate up to 50,000 acre feet (AF) of the total storage capacity in Norfolk Lake provided the reallocation has no severe effect on other authorized purposes and will not involve major structural or operational changes.

## **1.4 Scope and Organization of the Document**

This EA considers two alternatives that would accomplish the purpose and meet the need, and the no action alternative. The no-action alternative, as required by the Council on Environmental Quality (CEQ) serves as a benchmark against which project alternatives can be evaluated.

The EA identifies, evaluates and documents the environmental effects of two alternatives that would fulfill the requirements of the proposed action. Existing resource conditions in the Norfolk Lake area are described in the Affected Environment Section. Due to the reasons set forth in the section, expanded discussion is limited to Air Quality, Water Resources, and Socioeconomics.

Environmental impacts resulting from implementation of the alternatives that would fulfill the requirements of the proposed action are described in the Environmental Consequences Section.

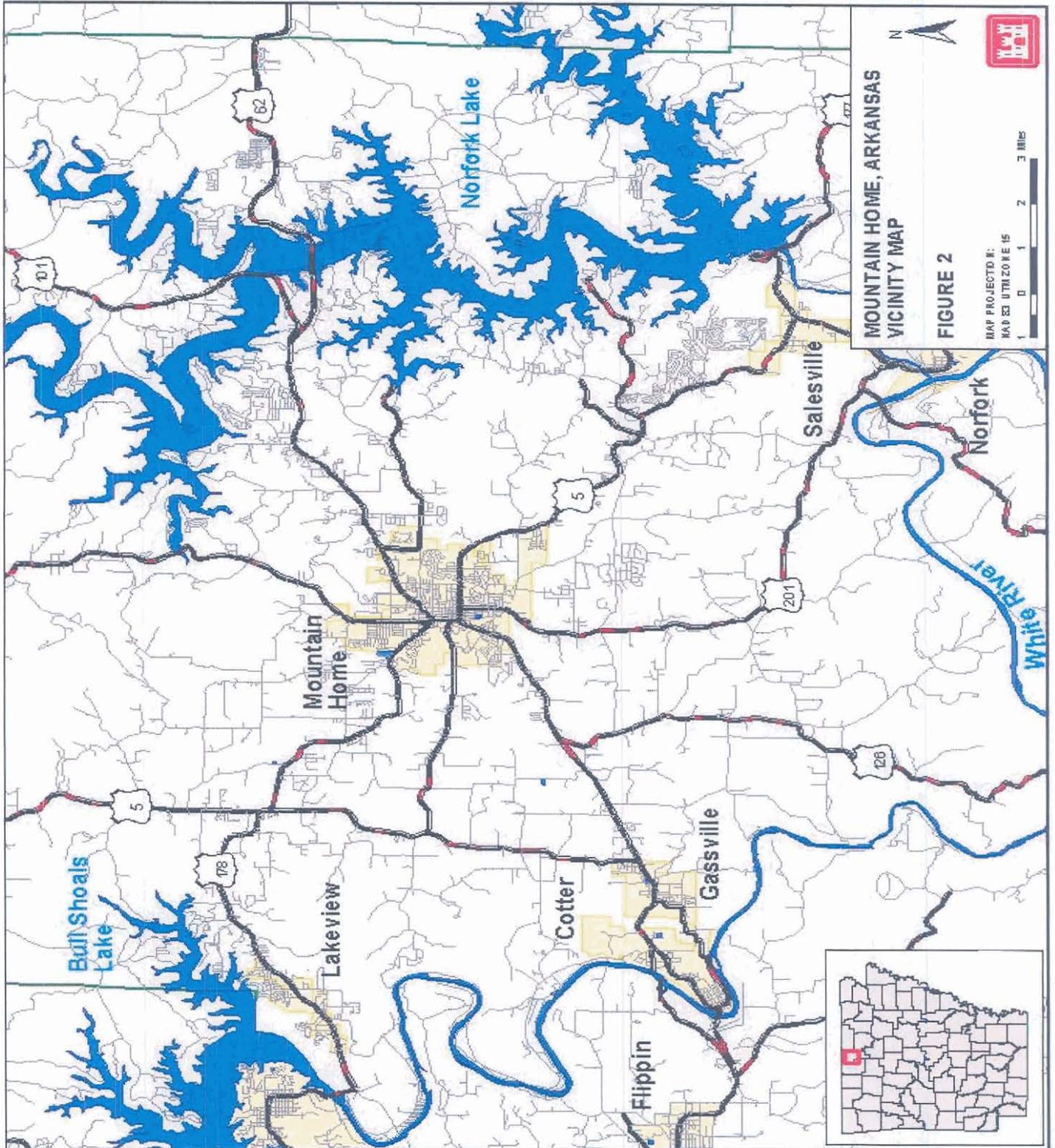
Determinations are found in the Findings Section.

## **1.5 Public Involvement**

The Little Rock District provides opportunities for the public to participate in the NEPA process in order to promote open communication and improve the decision-making process. All persons and organizations having potential interest in the proposed project – including minority, low income, and Native American Organizations – are encouraged to participate in the environmental analysis process. The formal opportunity to comment involves a 30-day period for public review of the final EA and draft Finding of No Significant Impact (FNSI).

A news release is distributed to local newspapers so that interested persons and organizations can be notified. Copies of the final EA and draft FNSI are provided to local libraries and notification of availability is mailed to interested individuals, organizations, Native American Organizations, and government agencies, if requested. Following an assessment of the comments received during the public review period, the Little Rock District will determine whether implementation of the action would have a significant effect on the human environment. If significant effects are identified, a Notice of Intent (NOI) to prepare an Environmental Impact Statement (EIS) may be published in the Federal Register. If it is determined that significant effects would not result from implementation of the proposed action, the Little Rock District will finalize and sign the FNSI and the action will be implemented.

Figure 1. Norfolk Lake and surrounding area.



## 2.0 DESCRIPTION OF THE PROPOSED ACTION AND ALTERNATIVES

### 2.1 Description of the Proposed Action

Provide water to the City of Mountain Home from Norfolk Lake to meet their current average need of 3.47 mgd and peak withdrawals of 5.10 mgd.

### 2.2 Alternatives to accomplish the Proposed Action

Alternative 1: Reallocation of Storage from conservation storage (Preferred Alternative). The current conservation pool in Norfolk Lake consists of hydropower, water supply, and conservation storage between elevations 510.00 ft. and 552.00 ft., which is estimated to contain 1,251,000 AF of storage. This consists of the 707,000 AF of conservation storage, 541,600 AF of hydropower storage, and 2,400 AF of water supply storage. The total yield of the conservation pool is estimated to be 636.041 MGD. Reallocation of 3,158 AF in the 1,251,000 AF of the conservation storage from hydropower to water supply storage in Norfolk Lake would not change the storage of the conservation pool. When storage is reallocated in the conservation pool there is no change in the yield of the pool. A reallocation in the existing conservation pool for the city of Mountain Home of 3,158 AF of hydropower storage to M&I water supply purposes is estimated to provide a safe yield of 2.84 mgd. Therefore the water supply would increase by 3,158 AF from 2,400 AF to 5,558 AF. The hydropower storage will decrease by 3,158 AF from 541,600 AF to 538,442 AF.

The city of Mountain Home would reimburse the Government for a proportionate share of Norfolk Lake construction, and operation and maintenance (O&M) costs which are calculated to be \$31,990 annually for 30 years.

Alternative 2: Reallocation of Storage from Flood Control Pool. The current flood control storage in Norfolk Lake is between elevations of 552 ft. and 580 ft., and is estimated to contain 732,000 AF of storage. If the flood control storage were decreased from 732,000 AF to 728,829 AF, a change of 3,171 AF (Equivalent to 3,158 AF of conservation storage), and the conservation storage were increased from 707,000 AF to 710,150 AF, the safe yield would increase from 636.041 mgd to 637.035 mgd. The top of the current conservation pool would increase from elevation 552.00 feet to 552.167 feet, and there would be a slight increase in the average head available for hydropower generation. According to the Water Supply Storage Reallocation Report, this change would produce a 0.994 mgd increase in the yield and a 1.846 mgd reduction in the hydropower yield. Combined, these changes create the 2.84 mgd that was requested by the city of Mountain Home.

No Action Alternative: The No Action alternative would not supply the requested amount of water from Norfolk Lake that is necessary for the municipal and industrial needs of the city of Mountain Home.

## **2.3 Alternatives considered but eliminated from Further Analysis**

A requirement of using a Government project as a water supply source is that the use of the Government project be the least cost alternative. In addition to the proposed alternative of reallocating conservation storage to water supply storage, a series of other alternatives were considered as solutions to the Mountain Home water supply problems. These alternatives included construction of a new water supply lake and pipeline for Mountain Home, reallocation of storage in Norfork Lake from the Flood Control Pool, stream withdrawal, purchase from a neighboring municipal system, and groundwater sources. Stream withdrawal, purchase from a neighboring municipal system, and groundwater sources were quickly determined to be unviable options and were therefore not analyzed in detail within this EA.

### 2.3.1. Stream Withdrawal.

The area around Mountain Home was examined using U.S. Geological Survey data. There are no streams around Mountain Home that can dependably yield 2.84 mgd. Therefore, this alternative was eliminated.

### 2.3.2. New Lake for Mountain Home

The water supply needs of Mountain Home could be met with the construction of a new water supply lake, pump station, and pipeline. A new lake site approximately 5 miles west of the city was considered for this alternative. The dam would contain an estimated 600,000 cubic yards of earth fill with a maximum height of 100 feet. The lake would impound over 6,000 acre-feet of water with a surface area of about 300 acres. A 4.5-mile pipeline would be required to convey the water to the city of Mountain Home and connect with their existing system. According to the Water Supply Storage Reallocation Report, the construction costs for this proposed project would be approximately \$49,200,000 and the annual costs for operation would be approximately \$751,000. Based on the costs for construction of a new lake and pipeline and in comparison to reallocation of water storage, it is not considered financially feasible to investigate this alternative further.

### 2.3.3. Neighboring Water System.

The only city near enough to Mountain Home large enough for consideration is Yellville. This alternative was eliminated because the city's treatment plant is operating at capacity. It would be cost prohibitive to distribute water from another city in this area.

### 2.3.4. Groundwater Sources.

U.S. Geological Survey data has shown that there is no aquifer in the Mountain Home area capable of yielding 2.84 mgd dependably.

## **3.0 AFFECTED ENVIRONMENT**

This section describes the environmental components that could reasonably affect or be affected by implementation of the alternatives selected for consideration. The

information serves as a baseline from which to identify and evaluate environmental changes that could result from the reallocation of 3,158 AF of water from Norfolk Lake.

### 3.1 Issues Studied in Detail

In accordance with CEQ regulations (40 CFR, 1500.4 and 1501.7), the Little Rock District has identified the following water reallocation related issues to be addressed:

Water Resources

Air Quality

Socioeconomics

Reallocation of water from either the flood pool or the conservation (power) pool could have some affect on Water Resources. The loss of hydropower yield at the Lake could result in Southwestern Power Association generating additional power from combustion plants, thereby potentially affecting Air Quality. Socioeconomic affects could result from a loss of flood damage reduction benefits in the downstream areas protected by Norfolk Lake.

#### 3.1.2 Issues Eliminated from Further Analysis

CEQ regulations (40 CFR 1501.7) state that the lead agency shall identify and eliminate from detailed study the issues that are not important or that have been covered by prior environmental review, narrowing the discussion of these issues in the document to a brief presentation of why they would not have dramatic effect on the human environment. An EA should provide only information and analysis sufficient to determine whether an action has no significant environmental effect or whether a more detailed analysis is required (40 CFR 1508.9).

The Little Rock District has determined that implementation of the proposed action would not involve any physical activities that would affect the following resource issue areas:

Land Use

Topography and Soils

Cultural Resources

Biological Resources

Environmental Justice

Therefore, detailed descriptions of the affected environment and environmental consequences for these resource topics have not been presented in this EA. Table 3-1 lists resource topics that were excluded from further analysis and the rationale for their exclusion.

**Table 3-1. Resource Areas Considered But Excluded from Further Analysis**

Resource Area	Proposed Action	No Action
Land Use	Reallocation of water in Norfolk Lake for Municipal and Industrial Use would not involve any new activities that would change the surrounding land use.	Not reallocating water in Norfolk Lake would not change the surrounding land use.
Topography and Soils	Reallocation of water in Norfolk Lake would not involve any activities that would affect existing topography and soils because lake operations and current pool elevations would be relatively unchanged..	Not reallocating water in Norfolk Lake would have no additional affect on existing Topography and Soils.
Cultural Resources	Reallocation of water in Norfolk Lake would not change (increase or decrease) the number of known or unkown cultural sites in the area. Cultural Resources would continue to be addressed in accordance with federal and state law	Not reallocating water in Norfolk Lake would have no affect on cultural resources.
Biological Resources	Reallocation of water in either the flood pool or the conservation pool of Norfolk Lake would not involve any physical activities that would affect biological resources, i.e., fish and wildlife populations, endangered species, shoreline vegetation, or wetlands because the respective pool elevations would be relatively unchanged.	Not reallocating water in Norfolk Lake would have no additional affects on Biological resources i.e., fish and wildlife populations, endangered species, shoreline vegetations, or wetlands because current activities would not change.
Environmental Justice	Reallocation of water in Norfolk Lake would not have any disproportionate	Not reallocating water in Norfolk Lake would not result in any changes in existing

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effects on low-income or minority populations. conditions.

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### 3.2 Water Resources

The drainage area above Norfork Dam is approximately 1,806 square miles. At the top of the conservation pool, elevation 552 ft. Mean Sea Level (m.s.l.), Norfork Lake has a surface area of 21,990 acres and a shoreline length of 380 miles. At the top of the flood control pool, elevation 580 ft. m.s.l., the lake has a surface area of 30,700 acres and a shoreline length of 510 miles. The lake is fed by the North Fork of the White River and by numerous small clear-water creeks. The lake is 43 miles long at elevation 552 ft. m.s.l., and 47 miles long at elevation 580 ft. m.s.l.

Tributary streams are rather short, averaging about five-miles in length, and carry very little silt or industrial or municipal wastes. Water quality is excellent for all types of water sports.

### 3.3 Air Quality

Norfork Lake is located in the Ozark Mountains, remote from heavy smoke-producing industry or large mining operations. The air is very clean and smog is virtually unknown in this region.

The Clean Air Act of 1977 as amended requires Federal facilities to comply with all Federal, state, interstate, and local requirements regarding the control and abatement of air pollution in the same manner as any non-government entity, including any requirements for permits. No particular Federal requirements are involved that are not already incorporated in Arkansas State law. According to ADEQ, the entire state of Arkansas is in compliance with all EPA ambient air quality standards. Only ozone concentrations occasionally approach the limit of the standard. The "Conformity Rule" of the Clean Air Act of 1977 (CAA), as amended states that all Federal actions must conform to appropriate State Implementation Plans (SIP's). This rule took effect on January 31, 1994, and at present applies only to Federal actions in non-attainment areas (those not meeting the National Ambient Air Quality Standards (NAAQS) for the criteria pollutants in the CAA). The State of Arkansas, including Norfork and the vicinity of Mountain Home, is considered an "attainment area" and is therefore exempt from the "Conformity Rule" of the CAA.

### 3.4 Socioeconomics

The populations of Baxter and Fulton Counties in Arkansas and Ozark County, Missouri are largely rural. Because of the scenic nature of the area as well as the proximity of nearby lakes, a large number of people have retired to the region in recent years. All three counties are projected to experience some population growth through 2010.

However, the Arkansas counties are projected to grow the most. Baxter County's 2006 population estimate is 41,307. The population estimate for Fulton County is 11,756. The U.S. Census Bureau 2006 estimate for Baxter County indicates a 7.6% population increase over the 2000 census. The Fulton County estimate is an increase of 1.0%.

## **4.0 ENVIRONMENTAL CONSEQUENCES**

### **4.1 Water Resources**

In evaluating the effects of the proposed action, reallocating water in Norfolk Lake to Municipal and Industrial water supply would be considered to have a significant effect on Water Resources if it would result in any of the following effects:

- a. the proposed action would expose people or property to water related hazards, including severe flooding or altered drainage patterns;
- b. the proposed action would extensively alter surface water quality or quantity; or
- c. the proposed action would extensively alter ground water quality or quantity.

Reallocation of conservation pool storage in Norfolk Lake (Alternative 1) would not change the volume of water in the conservation pool. Reallocation of flood pool storage in Norfolk Lake (Alternative 2) would require raising the conservation pool into the flood pool. Modeling of Alternative 1 determined that providing the requested 3,171 acre-feet of storage would raise the top of the conservation pool less than 2 inches, from 552 ft msl to 552.167 ft msl.

The No Action alternative would not have any additional effects on Water Resources.

### **4.2 Air Quality**

In evaluating the effects of the proposed action, reallocating water in Norfolk Lake to Municipal and Industrial water supply would be considered to have a significant effect on Air Quality if it would result in the violation or contribute to the violation of any Federal, state, or local air quality standard.

Reallocation of water from either the conservation pool or the flood pool in Norfolk Lake could cause an increase in fossil fuel emissions if the lost power was purchased from a fossil fuel energy production plant. This assessment assumes that the weight of pollutants emitted by a fossil fuel generation plant are proportional to power production. The following tables reflect information from U.S. EPA, eGRID 2006, Version 2.1, April 2007.

**Year 2004 Regional Emissions  
(lbs/MWh)**

	<u>SO<sub>2</sub></u>	<u>NO<sub>x</sub></u>	<u>CO<sub>2</sub></u>
South East Reliability Corp	6.369	2.144	1,387
Southwest Power Pool	4.636	3.017	1,830
National	5.436	2.103	1,363

Source: eGRID2006 Version 2.1, April 2007

The average annual energy losses at Norfolk Lake resulting from the 2.84 mgd reduction in hydropower yield from the conservation pool would be approximately 493 MWh and the flood pool reduction would be approximately 500 MWh. Taking the national emissions averages from combustion power plants for comparison purposes, the following table reflects the increase in emissions that would occur because of the reallocations, if the potential loss of power were generated by combustion power generation.

**Table 4-1**

	<b>SO<sub>2</sub></b> <b>(5.436 lbs/MWh)</b>	<b>NO<sub>x</sub></b> <b>(2.103 lbs/MWh)</b>	<b>CO<sub>2</sub></b> <b>(1,363 lbs/MWh)</b>
	5.436	2.103	1,363
<b>Flood Control Pool</b>	2718 lbs	1051.5 lbs	681,500 lbs
500 MWh	1.36 tons	0.53 tons	341 tons
<b>Conservation Pool</b>	2680 lbs	1036.8 lbs	671,959 lbs
493 MWh	1.34 tons	0.52 tons	336 tons

Data from the EPA's eGRID2006 Version 2.1, April 2007 database includes this emission information for the states of Arkansas and Missouri.

**Table 4-2**

	<b>Annual SO<sub>2</sub></b> <b>(tons)</b>	<b>Annual NO<sub>x</sub></b> <b>(tons)</b>	<b>Annual CO<sub>2</sub></b> <b>(tons)</b>	<b>Ozone Season NO<sub>x</sub></b> <b>(tons)</b>
<b>Arkansas</b>	87,555	44,717	33,174,715	20,883
<b>Missouri</b>	288,669	128,865	82,049,736	43,345

The following table shows what the approximate percentage of increase in emissions from alternative 1 and alternative 2 for the states of Arkansas and Missouri.

**Table 4-3** Percent Annual Increase in Emissions

REALLOCATION SOURCE	Percent Annual Increase in Emissions ARKANSAS			Percent Annual Increase in Emissions MISSOURI		
	SO2	NOx	CO2	SO2	NOx	CO2
<b>Flood Control Pool</b>	0.00155	0.00118	0.00102	0.00047	0.00041	0.00041
<b>Conservation Pool</b>	0.00153	0.00116	0.00101	0.00046	0.00040	0.00040

Production of the power lost from the implementation of either alternative 1 or 2, would not violate or contribute to the violation of any Federal, state, or local air quality standard.

Implementation of the No Action alternative would have no additional effect on air quality.

### 4.3 Socioeconomics

In evaluating the effects of the proposed action, reallocating water in Norfork Lake to Municipal and Industrial water supply would be considered to be a significant effect on Socioeconomics if it would result in any of the following effects:

- a. the proposed action would result in a major increase in population growth; or
- b. the proposed action would result in a major increase in the demand for housing, school, or community facilities; or
- c. the proposed action would result in the displacement of large numbers of people caused by a decrease in local employment.

All alternatives that supply the city of Mountain Home with an additional contracted water supply would benefit the local economy by providing sufficient water to meet the city's current and peak withdrawal need.

As described below, there would be a small decrease in the amount of electricity that could be generated from the waters of the lake if some of the water is used for water supply. Reallocation of water from the flood control storage (Alternative 2) would cause less impact on power generation than a reallocation from the conservation storage (Alternative 1), since most of the hydropower is generated utilizing water from conservation storage.

Flood Control Benefits Forgone. A reallocation from the flood control pool (Alternative 2) would decrease the flood control benefits during the rare, low-frequency flood events, because high-frequency events can be held by the remaining flood control storage and released in a fashion that will not cause flooding downstream. At the top of the flood control pool, the lake has a surface area of 30,700 acres. At the bottom of the flood pool the surface area would be approximately 22,000 acres. A reallocation of 3,171 AF (Approximately equivalent to 3,158 AF of Conservation Storage) would reduce the amount of flood control storage by 0.14 feet at the top of the flood pool.

An estimate of flood control benefits forgone using annual flood losses prevented since the project was completed has been used in the preparation of the Request for Reallocation of Storage at Norfork Lake, Arkansas for the city of Mountain Home, Arkansas. Appendix D of the reallocation report lists annual flood damages prevented factored to year 2006 price levels using the Index of Prices Received by Farmers for all farm products. This Index was used because the flood damages prevented were predominately agricultural in nature. Based on the data from Appendix D, Table 4 of the Reallocation Report shows that there will be an estimated flood damage reduction benefit of \$7,500.00 because of the reallocation of 3,171 AF from flood control storage.

Effects on Hydropower Generation. Reallocating storage from either the conservation or flood control pool will have an effect on hydropower generation, based on the September 10, 1997, Power Benefits Foregone (PBF) report prepared by the Power Branch, Water Management Division, Northwestern Division, Corps of Engineers. The hydropower firm yield would be reduced by 2.84 mgd because of the proposed reallocation. The results presented in the PBF report were used to estimate the effects of reallocating 3,171 AF from flood control storage.

The calculations in Table 3 of the reallocation report quantify the losses because of water withdrawals. Based on the reallocation report, a reduction in yield of 2.84 mgd would result in annual energy and capacity benefit losses of 500 MWh from the flood pool and 493 MWh from the conservation pool per year. According to the reallocation report, the benefits that would be foregone if reallocation were made from the flood control pool would be \$30,637.00, and the revenues foregone from reallocation from the conservation pool would be \$37,074.00

Based on the reallocation report, combining the hydropower benefits forgone (\$30,637.00) and the flood control benefits forgone (\$7,500.00) results in a net reduction in benefits of \$38,137.00 because of the reallocation of flood control storage to water supply storage. Benefits forgone because of the reallocation of conservation storage to

water supply storage were estimated to be \$37,074.00, since this alternative would have no impact on the flood control benefits of Norfolk Lake.

Hydropower revenues foregone are based on the value of the lost power based on the power marketing agency's rates. Southwestern Power Administration rates as of October, 2006 are:

Energy charge: 14.90 mills/kWh  
Capacity charge: \$42.34/kW-year

The energy charge is applied to the average annual energy losses and the capacity charge is applied to the loss in marketable capacity. The hydropower revenues foregone due to the storage reallocation are listed in Table 4 of the reallocation report

If hydropower revenues are reduced as a result of a reallocation, the power marketing agency would be credited for the amount of revenues to the Treasury forgone as a result of the reallocation assuming uniform annual repayment. In instances where existing contracts between the power marketing agency and its customer would result in a cost to the Federal Government to acquire replacement power to fulfill the obligations of contracts, an additional credit to the power marketing agency can be made for such costs incurred during the remaining period of the contracts. Such credits can be made for replacement costs when the costs are incurred and documented by the power marketing agency.

Implementation of either alternative would not result in a major population increase, a major increase in the need for housing or public facilities, or the displacement of a large number of people due to a decrease in employment.

Selection of the no action alternative could result in the continuation of instances where the City of Mountain Home exceeds its contracted amount of water from Norfolk Lake. At that time, a decision would need to be made regarding the availability of other sources for Municipal and Industrial water supply. The no action alternative would not result in a major population increase, a major increase in the need for housing or public facilities, or the displacement of a large number of people due to a decrease in employment.

## **5.0 CUMULATIVE EFFECTS**

Cumulative effects are the direct and indirect effects of a proposed action's incremental impacts when combined with other past, present, and reasonable foreseeable actions, regardless of who carries out the action. The region of influence and timeframe for the analysis of these effects are the lake area including the City of Mountain Home and the period 1967 through 2010.

### **5.1 Water Resources**

The proposed action is to reallocate 3,158 AF of conservation storage in Norfolk Lake. The contract for the first M&I water supply reallocation from Norfolk Lake was enacted

on April 28, 1967 for the city of Mountain Home. This reallocation was for 2,400 AF, which was determined to yield about 3 mgd. This 2,400 AF allocation has not been changed and is the present allocation. The proposed allocation would increase the total M&I water supply storage in Lake Norfolk to 5,558 AF for the city of Mountain Home. There are currently no other requests to reallocate water for Municipal and Industrial uses. However, the continued growth of the Norfolk Lake area at the rate of approximately 2% per year could result in an eventual request for additional water outside the timeframe of this analysis. Implementation of the proposed action along with other past or future water reallocations the proposed action would not expose people or property to water related hazards, including severe flooding or altered drainage patterns; extensively alter surface water quality or quantity; or extensively alter ground water quality or quantity.

## **5.2 Air Quality**

Implementation of either alternative 1 or alternative 2 would not result in a noticeable change in the air quality of the region. Other activities, such as construction and vehicle emissions would continue under the guidelines of the states of Arkansas and Missouri.

## **5.3 Socioeconomics**

Cumulative impacts to hydropower production could result from future water reallocations as a result of decreased storage. A significant effect depends upon the size of future reallocations and is in fact regulated by the authority given to the Chief of Engineers in paragraph 4-32d(1) of ER 1105-2-100, Policy and Planning, which states that the Commander, USACE is authorized to reallocate up to 15 percent or 50,000 AF, which ever is less, of the total storage capacity allocated to all authorized project purposes, provided the reallocation has no severe effect on other authorized purposes and will not involve major structural or operational changes. Any request to reallocate water in excess of the Chief's authority would require additional NEPA documentation.

As population increases, in the region more water is expected to be needed. However, if the population growth remains steady over the time period of this cumulative effects analysis, the 5 mgd should be sufficient to meet the demands of the City of Mtn Home.

## **6.0 FINDINGS**

This EA has evaluated the proposed action of reallocating storage from Norfolk Lake to water supply. The alternatives included: reallocation of storage from the conservation pool (Alternative 1), the flood control pool (Alternative 2), and no action alternative to meet the additional M&I needs of the city of Mountain Home, Arkansas.

The no action alternative would not meet the M&I needs of the city of Mountain Home because past water usage is an average of 3.47 mgd, whereas their contracted amount is for 3.0 mgd.

Alternative 1, the reallocation of storage from the conservation pool, results in fewer impacts to the human environment than Alternative 2. This alternative would have a slight hydropower generation benefit reduction, but that reduction is not significant. Alternative 2, the reallocation of storage from the flood pool would slightly reduce flood damage reduction benefits and have a small hydropower generation reduction. Neither of these impacts would be significant.

There have been no significant impacts to the human environment identified in this assessment because of the proposed action.

## **7.0 COORDINATION**

Arkansas Game and Fish Commission – A letter was sent to this agency on March 15, 2001. Arkansas Game and Fish Commission biologists reviewed the information. Based on fish and wildlife resource impacts in Norfolk Lake, there were no objections and no further comments to the proposed reallocation.

Arkansas Department of Environmental Quality – A letter was sent to this agency on March 15, 2001. No comments were received.

U.S. Department of the Interior, U.S. Fish and Wildlife Service – A letter was sent to this agency on March 15, 2001. The U.S. Fish and Wildlife Service reviewed the proposal. They stressed the need to insure that the reallocation would not affect the habitat of threatened and endangered species such as the bald eagle and gray bat, and that wetland loss should be kept to a minimum.

Arkansas Department of Health – A letter was sent to this agency on March 15, 2001. The Arkansas Department of Health fully supported the reallocation request from the city of Mountain Home, and testified that the high quality water of Norfolk Lake has helped to ensure that Mountain Home has complied with all requirements of the Safe Drinking Water Act, and that this reallocation will also help the city to plan future expansions of their system and supply safe water to the surrounding areas.

Arkansas Soil and Water Conservation Commission (Arkansas Natural Resources Commission) – A letter was sent to this agency on March 15, 2001. The Arkansas Soil and Water Conservation Commission identified no significant environmental impacts associated with the proposal and supported the proposal.

Environmental Protection Agency – A letter was sent to this agency on March 15, 2001. No comments were received.

Southwestern Power Administration – A letter was sent to this agency on March 15, 2001. No comments were received.

Southwestern Power Resources Association – A letter was sent to this agency on March 15, 2001. No comments were received.

Arkansas Natural Heritage Commission – A letter was sent to this agency on March 15, 2001. No comments were received.

Arkansas Historic Preservation Program – A letter was sent to this agency on March 15, 2001. No comments were received.

## **8.0 LIST OF PREPARERS**

Max Frauenthal, Engineer, Planning, Environmental and Regulatory Division, Planning Branch, Environmental Section, U. S. Army Corps of Engineers, Little Rock District

Mike Rodgers, Biologist, Planning, Environmental and Regulatory Division, Planning Branch, Environmental Section, U. S. Army Corps of Engineers, Little Rock District

Joel Ward, Biologist, Planning, Environmental and Regulatory Division, Planning Branch, Environmental Section, U. S. Army Corps of Engineers, Little Rock District

Edwin Hargis, Biologist, Planning and Environmental Office, U.S. Army Corps of Engineers, Little Rock District

APPENDIX B  
PERTINENT CORRESPONDENCE

(501) 324-5018 □ FAX: 501-324-5605 □ <http://www.swl.usace.army.mil>  
August 24, 2007

Planning & Environmental Office

Dear Mr.:

Enclosed for your review is a compact disc containing a copy of the Draft Water Supply Storage Reallocation Report, Environmental Assessment (EA) and Draft Finding of No Significant Impact (DFONSI) for the reallocation of water in Norfolk Lake to Municipal and Industrial Water Supply. The documents have been prepared in accordance with the National Environmental Policy Act (NEPA) and U.S. Army Corps of Engineers Engineer Regulation ER-200-2-2. The documents can also be reviewed on the internet at <http://www.swl.usace.army.mil/planning/index.html>

Your comments are requested as part of a 30-day public review period and should be received **no later than September 30, 2006**. Comments should be addressed to Mr. Win Hargis, U.S. Army Corps of Engineers, Little Rock District, Planning & Environmental Office, P.O. Box 867, Little Rock, Arkansas 72203-0867, telephone number (501) 324-5018, email:[edwin.c.hargis@usace.army.mil](mailto:edwin.c.hargis@usace.army.mil)

Sincerely,

Roger C. Hicklin, P.E.  
Deputy Chief  
Planning & Environmental Office

Enclosure

(501) 324-5751 □ FAX: 501-324-5605 □ <http://www.swi.usace.army.mil>  
March 15, 2001

Planning, Environmental and Regulatory Division  
Planning Branch

«fn» «ln»  
«title»  
«agency»  
«office»  
«add1»  
«add2»  
«city», «state» «zip»

Dear «salutation» «ln»:

The city of Mountain Home, Arkansas has requested that the U.S. Army Corps of Engineers, Little Rock District, reallocate enough storage in Norfolk Lake to provide an additional 1,660,000 gallons of water per day to be used for municipal and industrial purposes. Approximately 1,193 acre-feet (AF) of storage in Norfolk Lake are required to consistently provide the requested water supply. The April 28, 1967 agreement between the city of Mountain Home and the U.S Army Corps of Engineers allocates enough storage in the lake (2,400 AF) to provide 3,000,000 gallons of water per day. The requested storage reallocation will increase the total municipal and industrial water supply storage in Norfolk Lake by 1,193 AF to a total of 3,593 AF.

Please submit any information from your agency that would assist us in the preparation of the Environmental Assessment for this water supply reallocation by April 15, 2001. If comments are not received by this date, we will assume your agency has no comments on the proposed action. Comments and questions about this reallocation should be addressed to Mr. Max Frauenthal, U.S. Army Corps of Engineers, Little Rock District, Planning Branch, P.O. Box 867, Little Rock, Arkansas 72203-0867, telephone number (501) 324-5197.

Sincerely,

Roger C. Hicklin, P.E.  
Chief, Planning Branch

Enclosure

**APPENDIX C**  
**PAST WATER SUPPLY REALLOCATIONS**

Requesting Entity	Agreement (Contract) Number	Contract Date	Water Supply Storage (Acre-Feet)	Estimated Yield (mgd)	Discretionary / Congressional Reallocation
City of Mountain Home	DA03-67-C-0076	April 1967	2,400	3	Discretionary: Conservation

Total Discretionary Storage Used Or Requested: 2,400



APPENDIX D  
FLOOD DAMAGE CALCULATIONS

**AVERAGE ANNUAL FLOOD DAMAGES PREVENTED  
CURRENT PRICE LEVELS**

	Year	Flood Damages Prevented	Prices Recv'd by Farmers <sup>(1)</sup>	Factor of Increase	FDP at Current Prices
1	1962	24,000	243	3.539	84,938
2	1963	178,000	243	3.539	629,959
3	1964	127,000	237	3.629	460,844
4	1965	51,000	245	3.510	179,020
5	1966	212,000	264	3.258	690,606
6	1967	73,000	250	3.440	251,120
7	1968	225,000	255	3.373	758,824
8	1969	159,000	268	3.209	510,224
9	1970	56,000	274	3.139	175,766
10	1971	356,000	281	3.060	1,089,537
11	1972	661,000	313	2.748	1,816,166
12	1973	818,000	447	1.924	1,573,781
13	1974	710,000	481	1.788	1,269,439
14	1975	395,000	466	1.845	728,970
15	1976	621,000	475	1.811	1,124,337
16	1977	196,000	462	1.861	364,848
17	1978	328,000	529	1.626	533,233
18	1979	485,000	600	1.433	695,167
19	1980	423,000	624	1.378	582,981
20	1981	130,000	634	1.356	176,341
21	1982	1,099,000	598	1.438	1,580,502
22	1983	4,674,000	625	1.376	6,431,424
23	1984	876,000	641	1.342	1,175,289
24	1985	6,322,000	579	1.485	9,390,190
25	1986	5,885,000	554	1.552	9,135,560
26	1987	245,000	563	1.528	374,245
27	1988	1,438,000	627	1.372	1,972,376
28	1989	264,000	659	1.305	344,522
29	1990	2,570,960	660	1.303	3,350,039
30	1991	1,247,900	632	1.361	1,698,092
31	1992	1,412,130	626	1.374	1,939,987
32	1993	1,088,120	643	1.337	1,455,339
33	1994	3,223,840	634	1.356	4,373,032
34	1995	2,417,900	646	1.331	3,218,876
35	1996	2,431,000	712	1.208	2,936,320
36	1997	688,900	678	1.268	873,826
37	1998	965,300	644	1.335	1,289,065
38	1999	670,000	607	1.417	949,259
39	2000	897,500	611	1.408	1,263,257
40	2001	226,200	649	1.325	299,741
41	2002	1,460,400	621	1.385	2,022,454
42	2003	475,200	677	1.270	603,651
43	2004	5,330,100	757	1.136	6,055,332
44	2005	1,073,000	736	1.168	1,253,777
45	2006	154,700	860	1.000	154,700
<b>Total</b>		<b>\$53,364,150</b>			<b>\$77,837,000</b>
<b>Avg. Annual</b>		<b>\$1,186,000</b>			<b>\$1,730,000</b>

(1) The Index of Prices Received by Farmers was used because the flood damages prevented were largely agricultural. The index is for All U.S. Farm Products and was obtained from the National Agricultural Statistic Service.

FLOOD DAMAGE BENEFIT REDUCTION DUE TO  
REALLOCATION FROM FLOOD CONTROL STORAGE

$$\frac{\text{Cumulative Damages Prevented}}{\text{Years in Operation}} = \text{Avg Annual Damage Prevented}$$

$$\frac{\$77,837,000}{45} = \$1,730,000 \text{ Yrs}$$

$$\text{Incremental Annual Benefit Reduction} = \$1,730,000 \times \frac{\text{Reallocated Storage}}{\text{Flood Control Storage}}$$

$$\text{Incremental Annual Benefit Reduction} = \$1,730,000 \times \frac{3,171.0}{731,800} \text{ AF}$$

$$\text{Incremental Annual Benefit Reduction} = \$7,500$$

$$\text{Cumulative Annual Benefit Reduction} = \$1,730,000 \times \frac{\text{Cum. Reallocated Storage}}{\text{Flood Control Storage}}$$

$$\text{Cumulative Annual Benefit Reduction} = \$1,730,000 \times \frac{3,171.0}{731,800} \text{ AF}$$

$$\text{Cumulative Annual Benefit Reduction} = \$7,500$$