

**Supplemental Watershed Plan-Environmental Assessment
for the
Pohick Creek Watershed**

Supplement No. 4 to the original watershed plan for the rehabilitation
of Pohick Creek Watershed Dam No. 3 (Woodglen Lake)

Fairfax County, Virginia

June 2008



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Fairfax County, Virginia

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Abstract

Pohick Creek Watershed Dam No. 3, Woodglen Lake, does not presently meet NRCS or Virginia safety standards for the stability and integrity of the auxiliary spillway. The recommended plan will rehabilitate the Woodglen Lake dam to meet current safety and performance standards. The plan provides for building earthen training dikes and armoring the auxiliary spillway and interior slope of the training dikes with articulated concrete blocks. There will be no change in the permanent pool elevation and no change in the current levels of flood protection downstream as a result of project activity.

Authority

The original work plan was prepared, and the works of improvement have been installed, under the authority of the Watershed Protection and Flood Prevention Act of 1954 (Public Law 83-566), as amended. The rehabilitation of Pohick Creek Watershed Dam No. 3 is authorized by the Watershed Protection and Flood Prevention Act (Public Law 83-566) as amended by the Small Watershed Rehabilitation Amendments of 2000 (Section 313 of Public Law 106-472).

Sponsors

Northern Virginia Soil and Water Conservation District
Fairfax County Board of Supervisors

Prepared By:

USDA – Natural Resources Conservation Service

To be considered, written comments must be sent by March 17, 2008 to:

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SUMMARY OF SUPPLEMENTAL WATERSHED PLAN

Project Name: Pohick Creek Watershed Dam No. 3 (Woodglen Lake)

County: Fairfax

State: Virginia

Sponsors: Fairfax County Board of Supervisors
Northern Virginia Soil and Water Conservation District

Description of Recommended Plan: The recommended plan is to rehabilitate the Woodglen Lake dam to meet current NRCS and State safety and performance standards. The plan provides for building earthen training dikes and armoring the auxiliary spillway and interior slope of the training dikes with articulated concrete blocks. There will be no change in the permanent pool elevation and no change in the current levels of flood protection downstream as a result of project activity.

Resource Information:

Size of the entire Pohick Creek Watershed = 23,595 acres
Drainage Area of Woodglen Lake = 740 acres

Land Use in Drainage Area by Type, Acres and Percentage

Residential/Business, 522 acres, 70.5%
Woodland, 118 acres, 15.9%
Transportation, 79 acres, 10.7%
Water, 13 acres, 1.8%
Grassland, 8 acres, 1.1%
Total = 740 acres
Floodpool of Woodglen Lake = 36 acres

Land Ownership:

Upstream of dam: 79% private, 21% public
Downstream of dam: 47% private, 53% public

Project Beneficiary Profile: The population for Fairfax County in 2006 was 1,010,443. The population diversity was approximately 68% White, 16.8% Asian, 13.9% Hispanic, 10% Black or African American, and 4% others. The median age of the population of Fairfax County was projected to be 38.4 in 2006 as compared to 36.9 for the State and 36.4 for the entire nation. Residents 65 years of age or older totaled 9.2% of the total population. This compares to 11.6% for the State and 12.4% for the entire nation.

The 2006 Census estimates indicate that there were 390,761 housing units within Fairfax County with 93% occupied, with 69.9% owner-occupied and 23.1% renter-occupied. The state-wide occupancy rate for Virginia as a whole in 2006 was 89.9% and the national figure was 88.4%. The local and state-wide rates for owner-occupancy, 69.9% and 62.8% respectively, are higher than the national figure of 59.5% in 2006. Residential property values for the land and associated buildings downstream of the dam range between \$305,000 and \$552,000 with an average of \$366,000. The total value of residential property (structures and contents only, excluding land values) at risk below the dam is an estimated \$56,916,000.

In 2006, per capita personal income for Fairfax County was \$46,499. That makes the County income 56% higher than the State level and 84% higher than the national figure.

Cultural Resources: A Phase I archaeological survey was completed in December 2007. No significant artifacts or other cultural resources were discovered. No additional work is needed.

Floodplains: The entire area of the 100-year floodplain has been zoned by Fairfax County to prevent development.

Land in Breach Inundation Zone by Type, Acres and Percentage

Residential/Business, 66.8 acres, 20%

Woodland, 244.9 acres, 73.5%

Transportation, 21 acres, 6.3%

Water, 0 acres, 0%

Grassland, 0.6 acres, 0.2%

Total = 333.3 acres

Highly Erodible Cropland: None exists in the watershed.

Threatened and Endangered Species: There are no federal listed threatened or endangered plant or animal species that are likely to occur within a two mile radius of the site. There are seven (7) State Threatened (ST) and one (1) State Endangered (SE) animal species known or likely to occur within a two mile radius of the Woodglen Lake dam. There are no confirmed sightings of these species. Four (4) of these are also Federal Species of Concern (FS).

Wetlands: There are 0.1 acres of jurisdictional wetlands immediately upstream of the dam. This wetland will not be impacted by construction activities. There are also 2.8 acres of jurisdictional wetland in the floodplain below the dam. Of the 2.8 acres, 0.56 acres are within the footprint of the proposed auxiliary spillway. During the design process, efforts will be made to exclude this area. If this is not possible, mitigation will be done to restore twice as much wetlands as will be impacted.

Problem Identification: Woodglen Lake does not meet current dam design and safety criteria. During the planning process, there were two primary problems identified by the NRCS Planning Team, the local Sponsors and the public. These are the primary issues addressed by the rehabilitation plan.

- The vegetated earth auxiliary spillway does not have the stability or integrity to carry the design flow without breaching.
- The training dike along the auxiliary spillway outlet is too low to contain the design flow.

The breach analysis indicates that a breach of the Woodglen Dam would jeopardize 157 homes and place approximately 435 residents and 440 workers/clients at a fatal risk. There are also 14 industrial sites, two public sites, four commercial sites, and two office sites located in the breach inundation zone. The breach zone also includes Roberts Parkway (13,000 vehicles per day), the Norfolk Southern Railway (9,000 passengers per day), and four important utilities (sewer, water, electrical and telecommunications cables). Vehicles on Premier Court (9,800), Guinea Road (16,000), and Sideburn Road (100), would also be affected.

Alternative Plans Considered: Several alternatives were considered during the planning process with the following two being evaluated in detail:

1. No Federal Action (Sponsors' Rehabilitation) – Rehabilitate the dam to meet current dam safety and design criteria without Federal assistance.
2. Rehabilitate the Dam – Rehabilitate the dam to meet current dam safety and design criteria using Federal assistance.

Project Purpose: This project will bring Woodglen Lake into compliance with the current dam design and safety criteria for NRCS and the Commonwealth of Virginia. It also provides for the continuation of existing flood control for another 72 years after completion. The rehabilitation project will address all needs identified during the planning process.

Principal Project Measures: The rehabilitation of the dam involves two primary actions:

- Armor the auxiliary spillway and training dikes with Articulated Concrete Blocks.
- Build elevated earthen training dikes to control flow direction.

Project Costs (Dollars):	<u>PL-106-472 Funds</u> 65%	<u>Other Funds</u> 35%	<u>Total</u> 100%
Structural Measures:	\$1,667,300	\$897,700	\$2,565,000

Project Benefits: Reduces potential for loss of life and maintains protection of existing infrastructure downstream of the dam and property values around the lake. Net average annual equivalent benefits between the Future with Federal Project (FWFP) and the Future without Federal Project (FWOFP) = \$0

Non-monetary Benefits:

- Minimizes the threat to loss of life to approximately 435 residents of the 157 single family homes and townhouses within the breach inundation zone.
- Minimizes the threat to loss of life to 440 people at 14 industrial facilities, two public sites, four commercial sites and two office sites.
- Provides protection for 38,900 vehicles on a daily basis that utilize Roberts Parkway (13,000 vehicles), Premier Court (9,800 vehicles), Guinea Road (16,000) and Sideburn Road (100 vehicles).
- Minimizes the threat of property damage to the 545 vehicles parked daily at the railroad parking lot.
- Provides protection for the Norfolk Southern / VRE and AMTRAK railroads downstream. They have an average daily count of more than 9,000 persons.
- Provide protection for four important utilities (sewer, water, electrical and telecommunications cables).
- Provides downstream flood protection for the scores of people living in the area, as well as those working, recreating, or traversing within the downstream floodplains for an additional 72 years.
- Eliminates the liability associated with continuing to operate an unsafe dam.
- Traps 0.77 acre feet of sediment annually, thereby improving downstream water quality.
- Maintains existing stream habitat downstream of the dam.

- Retains the existing fish and wildlife habitat around the lake.
- Leverages federal resources to install the planned works of improvement.
- Satisfactorily meet the dam design and safety criteria established by the Virginia Division of Dam Safety and Floodplain Management and NRCS.
- Preserve recreational opportunities for area residents.

Environmental Values Changed or Lost:

<u>Resource</u>	<u>Impact</u>
Air Quality	Short term impacts during construction.
Land Use Changes	Cut 3.4 acres of hardwood trees. Replant 1.4 acres of trees. Convert 2.0 acres of trees to grass. Plant 2.0 acres of trees in the watershed to mitigate for the loss on site.
Floodplains	Current floodplain would be protected and maintained.
Fisheries	Fish habitats would be maintained and/or protected.
Wildlife Habitat	Habitat will be maintained and protected in the watershed, except for 2.0 acres of woodland that will be permanently converted to grassland. There will be 1.4 acres of trees replanted on site.
Wetlands	No effect on upstream wetlands. Efforts will be made to avoid effects on downstream wetlands. Mitigation will occur, if needed.
Prime Farmland	N/A
Cultural Resources	No effect.
Threatened and Endangered Species	No effect.
Compensatory Mitigation	3.4 acres of trees removed from the Chesapeake Bay Resource Protection Area will be replanted elsewhere in the watershed. About 1.4 acres will be replanted on-site and 2.0 acres will be replanted elsewhere in the watershed. Wetland mitigation will be done as needed.

Major Conclusions: In order to bring this dam into compliance with State safety criteria, it is necessary to rehabilitate the auxiliary spillway and training dikes. The majority of the environmental impacts are short-term and existing conditions will be restored upon completion of construction. The permanent conversion of two acres of trees to grassland will require mitigation by replanting two acres of trees elsewhere in the watershed. Mitigation of wetland impacts may be required and will be done on a 2:1 ratio.

Areas of Controversy: None

Issues to Be Resolved: None

POHICK CREEK WATERSHED AGREEMENT

Supplemental Watershed Plan Agreement
(Supplement No. 4)

between the

Fairfax County Board of Supervisors
Northern Virginia Soil and Water Conservation District
(herein referred to collectively as "Sponsors")

and the

Natural Resources Conservation Service
United States Department of Agriculture
(herein referred to as "NRCS")

Whereas, the Watershed Work Plan Agreement for the Pohick Creek Watershed, Commonwealth of Virginia, authorized under the Watershed Protection and Flood Prevention Act (Public Law 83-566, 16 U.S.C. 1001 et seq.) and executed by the Sponsors named therein and the Soil Conservation Service (which is now NRCS, pursuant to section 246 of the Department of Agriculture Reorganization Act of 1994, 7 U.S.C. 6862), became effective the 1st day of April 1969; and

Whereas, Supplement No. 1, which modified the Watershed Plan Agreement, was developed through cooperative efforts of the Sponsors and the Soil Conservation Service and became effective on the 25th day of September 1970; and

Whereas, Supplement No. 2, which modified the Watershed Plan Agreement, was developed through cooperative efforts of the Sponsors and the Soil Conservation Service and became effective on the 18th day of October 1971; and

Whereas, Supplement No. 3, which modified the Watershed Plan Agreement, was developed through cooperative efforts of the Sponsors and NRCS and became effective on the 25th day of September 2006; and

Whereas, application has been made to the Secretary of Agriculture by the Sponsors for assistance in preparing a plan for rehabilitation of the works of improvement for the Pohick Creek Dam No. 3 located in Fairfax County, Commonwealth of Virginia, under the authority of Section 14 of the Watershed Protection and Flood Prevention Act (16 U.S.C. 1012); and

Whereas, through the cooperative efforts of the Sponsors and NRCS, a Supplemental Watershed Plan has been developed to rehabilitate the Pohick Creek Dam No. 3, which Plan is annexed to and made a part of this Supplemental Watershed Plan Agreement; and

Whereas, in order to provide for rehabilitation of Pohick Creek Dam No. 3, it has become necessary to modify the Supplemental Watershed Plan Agreement;

Now, therefore, in view of the foregoing considerations, the Secretary of Agriculture, through NRCS, and the Sponsors, hereby agree on this Supplemental Watershed Plan and that the works of improvement for this project will be installed, operated, and maintained in accordance with the terms, conditions, and stipulations provided for in this Agreement and including the following:

1. The name of the Soil Conservation Service is changed to Natural Resources Conservation Service (NRCS). All references to the Soil Conservation Service, SCS, or Service, now refer to the NRCS.
2. Fairfax County agrees to continue to participate in and comply with applicable federal and state floodplain management and flood insurance programs before construction starts.
3. Fairfax County will acquire all necessary land rights, easements, or right-of-ways in connection with the planned works of improvement.
4. No relocations are planned with this rehabilitation project. However, should it be determined later that relocation is needed, relocation costs will be cost-shared at following rate:

Sponsors	NRCS	Total Relocation Costs
35%	65%	100%

5. The Sponsors hereby agree that they will comply with all the policies and procedures of the Uniform Relocation Assistance and Real Property Acquisition Policies Act (42 U.S.C. 4601 et. seq., as implemented by 7 C.F.R. Part 21 and 49 C.F.R. Part 24) when acquiring real property interests for this federally assisted project. If the Sponsors are legally unable to comply with the real property acquisition requirements of the Act, they agree that, before any federal financial assistance is furnished, they will provide a statement to that effect, supported by an opinion of the chief legal officer of the state containing a full discussion of the facts and law involved. This statement may be accepted as constituting compliance. In any event, the Sponsors agree that they will reimburse owners for necessary expenses as specified in 49 C.F.R. Part 24.
6. The Sponsors will obtain all necessary federal, state, and local permits required by law, ordinance, or regulation for installation of the planned works of improvement. The costs of such permitting is not eligible as part of the Sponsors' cost-share requirement.
7. The Sponsors will be responsible for the costs of water, mineral and other resource rights, and will acquire or provide assurance that landowners or resource users have acquired such rights pursuant to state law as may be needed in the installation and operation of the works of improvement. The costs associated with the subject rights are not eligible as a part of the Sponsors' cost-share requirement.

8. NRCS will assist the Sponsors with the installation of planned works of improvement. The percentages of total rehabilitation project costs to be paid by the Sponsors and by NRCS are as follows:

Project Costs (Dollars)			
Works of Improvement	NRCS PL-106-472 Funds	Other Funds - Fairfax County's Responsibility	Total Estimated Cost
Cost Sharable Items (per PL-106-472 and NRCS policy)	---	---	---
Rehabilitation of the dam (construction costs):	\$1,667,000	\$273,000	\$1,940,000
Sponsor's Planning Costs:	n/a	\$140,000	\$140,000
Sponsor's Engineering Costs:	n/a	\$440,000	\$440,000
Sponsor's Project Administration Costs:	n/a	\$40,000	\$40,000
Land Rights Acquisition Costs (legal fees as no property is expected to be acquired):	n/a	\$5,000	\$5,000
Subtotals: Cost-Sharable Costs: Cost-Share Percentages:^{a/}	\$1,667,000 (65%)	\$898,000 (35%)	\$2,565,000 (100%)
Non Cost Sharable Items (per PL-106-472 and NRCS policy)^{b/}	---	---	---
NRCS Engineering and Project Administration Costs:	\$94,000	n/a	\$94,000
Federal, State and Local Permits:	n/a	\$0	\$0
Subtotals: Non Cost-Sharable Costs:	\$94,000	\$0	\$94,000
Total Estimated Costs:	\$94,000	\$0	\$94,000

a/ The maximum NRCS cost-share is 65% of the cost-sharable items not to exceed 100% of the construction cost. Total eligible project costs include construction, land rights, relocation, project administration, and planning services provided by the Sponsors. Not included are NRCS engineering technical assistance costs of \$85,000; NRCS project administration costs of \$9,000; and the local cost of permitting and ordinances.

b/ If actual non-cost-sharable item expenditures vary from these estimates, the responsible party will bear the change in costs.

9. The Sponsors will obtain agreements with landowners or operators of not less than 50 percent of the drainage area above Woodglen Lake. These agreements state that the owners will carry out conservation plans on their land and ensure that 50 percent of the land is adequately protected before rehabilitation of the floodwater retarding structure.

10. Fairfax County will be responsible for the operation, maintenance, and replacement of the works of improvement by actually performing the work or arranging for such work, in accordance with a new operation and maintenance agreement that will be entered into before issuing invitations to bid for construction work. The term of the operation and maintenance agreement will be for the 74 year evaluated life of the project (72 years plus 2 years for design and installation). The Operation and Maintenance Agreement shall be prepared in accordance with the NRCS National Operation and Maintenance Manual.
11. An Emergency Action Plan (EAP) currently exists for the Floodwater Retarding Structure included in this plan. The Sponsors will provide leadership in developing a new EAP that is appropriate for the rehabilitated condition of this structure and will update the EAP annually with assistance from the local emergency response officials. NRCS will provide technical assistance in preparation and updating of the EAP. The purpose of the EAP is to outline appropriate actions and to designate parties responsible for those actions in the event of a potential failure of a floodwater retarding structure. The NRCS State Conservationist will ensure that a current EAP has been prepared prior to the initiation of construction.
12. The costs shown in this plan are preliminary estimates. Final costs to be borne by the parties hereto will be based on the actual costs incurred in the installation of works of improvement and the cost-share percentages stated in this agreement.
13. This agreement is not a fund-obligating document. Financial and other assistance to be furnished by NRCS in carrying out the rehabilitation plan is contingent upon the fulfillment of applicable laws and regulations and the availability of appropriations for this purpose.
14. This agreement does not commit the NRCS to assistance of any kind beyond the 72-year project life.
15. A separate agreement will be entered into between NRCS and Fairfax County before either party initiates work involving funds of the other party. Such agreements will set forth in detail the financial and working arrangements and other conditions that are applicable to the specific works of improvement.
16. This rehabilitation plan may be amended or revised only by mutual agreement of the parties hereto, except that NRCS may de-authorize or terminate funding at any time it determines that the Sponsors have failed to comply with the conditions of this agreement. In this case, NRCS shall promptly notify the Sponsors in writing of the determination and the reasons for de-authorization of project funding, together with the effective date. Payments made to the Sponsors or recoveries by NRCS shall be in accord with the legal rights and liabilities of the parties when project funding has been de-authorized. An amendment to incorporate changes affecting a specific measure may be made by mutual agreement between NRCS and the Sponsors having specific responsibilities for the measure involved.
17. No member of, or delegate to, Congress, or resident commissioner, shall be admitted to any share or part of this Plan, or to any benefit that may arise therefrom; but this provision shall not be construed to extend to the agreement if made with a corporation for its general benefit.

18. By signing this agreement the recipient assures the Department of Agriculture that the program or activities provided for under this agreement will be conducted in compliance with all applicable Federal civil rights laws, rules, regulations, and policies.

19. Certification Regarding Drug-Free Workplace Requirements (7 CFR 3021).

By signing this watershed agreement, the Sponsors are providing the certification set out below. If it is later determined that the Sponsors knowingly rendered a false certification, or otherwise violated the requirements of the Drug Free Workplace Act, the NRCS, in addition to any other remedies available to the Federal Government, may take action authorized under the Drug-Free Workplace Act.

Controlled Substance means a controlled substance in Schedules I through V of the Controlled Substances Act (21 U.S.C. 812) and as further defined by regulation (21 CFR 1308.11 through 1308.15);

Conviction means a finding of guilt (including a plea of nolo contendere) or imposition of sentence, or both, by any judicial body charged with the responsibility to determine violations of the Federal or State criminal drug statutes;

Criminal drug statute means a Federal or non-Federal criminal statute involving the manufacturing, distribution, dispensing, use, or possession of any controlled substance;

Employee means the employee of a grantee directly engaged in the performance of work under a grant, including: (i) all direct charge employees; (ii) all indirect charge employees unless their impact or involvement is insignificant to the performance of the grant; and, (iii) temporary personnel and consultants who are directly engaged in the performance of work under the grant and who are on the grantee's payroll. This definition does not include workers not on the payroll of the grantee (e.g., volunteers, even if used to meet a matching requirement; consultants or independent contractors not on the grantees' payroll; or employees of sub-recipients or subcontractors in covered workplaces).

A. The Sponsors certify that they will or will continue to provide a drug-free workplace by:

(1) Publishing a statement notifying employees that the unlawful manufacture, distribution, dispensing, possession, or use of a controlled substance is prohibited in the grantee's workplace and specifying the actions that will be taken against employees for violation of such prohibition;

(2) Establishing an ongoing drug-free awareness program to inform employees about—
(a) The danger of drug abuse in the workplace;

(b) The grantee's policy of maintaining a drug-free workplace;

(c) Any available drug counseling, rehabilitation, and employee assistance programs; and

(d) The penalties that may be imposed upon employees for drug abuse violation occurring in the workplace;

(3) Making it a requirement that each employee to be engaged in the performance of the grant be given a copy of the statement required by paragraph (1);

(4) Notifying the employee in the statement required by paragraph (1) that, as a condition of employment under the grant, the employee will--

(a) Abide by the terms of the statement; and

(b) Notify the employer in writing of his or her conviction for a violation of a criminal drug statute occurring in the workplace no later than five calendar days after such conviction;

(5) Notifying the NRCS in writing, within ten calendar days after receiving notice under paragraph (4)(b) from an employee or otherwise receiving actual notice of such conviction. Employers of convicted employees must provide notice, including position title, to every grant officer or other designee on whose grant activity the convicted employee was working, unless the Federal agency has designated a central point for the receipt of such notices. Notice shall include the identification number(s) of each affected grant;

(6) Taking one of the following actions, within 30 calendar days of receiving notice under paragraph (4) (b), with respect to any employees who is so convicted--

(a) Taking appropriate personnel action against such an employee, up to and including termination, consistent with the requirements of the Rehabilitation Act of 1973, as amended; or

(b) Requiring such employee to participate satisfactorily in drug abuse assistance or rehabilitation program approved for such purposes by a Federal, State, or local health, law enforcement, or other appropriate agency.

(7) Making a good faith effort to continue to maintain a drug-free workplace through implementation of paragraphs (1),(2),(3),(4),(5),and (6)

B. The Sponsors may provide a list of the site(s) for the performance of work done in connection with a specific project or other agreement.

C. Agencies shall keep the original of all disclosure reports in the official files of the agency.

20. Certification Regarding Lobbying (7 CFR 3018).

(1) The Sponsors certify to the best of their knowledge and belief, that:

(a) No Federal appropriated funds have been paid or will be paid, by or on behalf of the Sponsors, to any person for influencing or attempting to influence an officer or employee of an agency, Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative

agreement.

- (b) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form – LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.
- (c) The Sponsors shall require that the language of this certification be included in the award documents for all sub-awards at all tiers (including subcontracts, sub-grants, and contracts under grants, loans, and cooperative agreements) and that all sub-recipients shall certify and disclose accordingly.

(2) This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by Section 1352, Title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.

21. Certification Regarding Debarment, Suspension, and Other Responsibility Matters - Primary Covered Transactions (7 CFR 3017).

- (1) The Sponsors certify to the best of their knowledge and belief, that they and their principals:
 - (a) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency.
 - (b) Have not within a three-year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State, or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;
 - (c) Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State, or local) with commission of any of the offenses enumerated in paragraph (1)(b) of this certification; and
 - (d) Have not within a three-year period preceding this application/proposal had one or more public transactions (Federal, State, or local) terminated for cause or default.
- (2) Where the primary Sponsors are unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this agreement.

Fairfax County Board of Supervisors

12000 Government Center Parkway, Suite 552
Fairfax, Virginia 22035-2531

By: Anthony H. Griffin
ANTHONY H. GRIFFIN

Title: County Executive

Date: 6/30/08

The signing of this supplemental watershed agreement was authorized by a resolution of the Fairfax County Board of Supervisors adopted at a meeting held on June 2, 2008.

Nancy Velms
County Clerk

12000 Government Center Parkway,
Suite 533
Fairfax, Virginia 22035-0072

Date: 6/30/08

**Northern Virginia Soil and Water
Conservation District**

12055 Government Center Parkway, Suite 905
Fairfax, Virginia 22035-5512
*Commonwealth of Virginia
County of Fairfax*

By: Jean R. Packard
JEAN R. PACKARD

Title: Chairperson

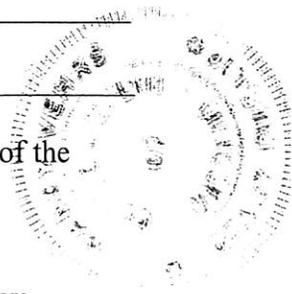
Date: 6/30/08

The signing of this supplemental watershed agreement was authorized by a resolution of the Northern Virginia Soil and Water Conservation District adopted at a meeting held on 5/20/08.

Nancy Velms
Notary
*The foregoing was affirmed before me on this
30th day of June 2008 by Jean R. Packard.
My commission expires 3/31/2012
Registration # 125802*

12000 Government Center Parkway,
Suite 533
Fairfax, Virginia 22035-0072

Date: 6/30/08



**Natural Resources Conservation Service
United States Department of Agriculture**

Approved by:

John A. Bricker Acting For
JOHN A. BRICKER
State Conservationist

Date: 6/30/2008



INTRODUCTION

NEED AND PURPOSE

This supplement only addresses the Pohick Creek Watershed Dam No. 3, known locally as Woodglen Lake. This dam was built in 1981. A supplement to the watershed plan is needed because this dam does not meet current NRCS or Virginia Department of Conservation and Recreation, Division of Dam Safety and Floodplain Management (referred to herein as the Virginia Division of Dam Safety) dam design, safety, and performance standards for auxiliary spillway integrity and stability. A conditional certificate for Operation and Maintenance of the structure has been issued by the Virginia Division of Dam Safety because the vegetated earthen auxiliary spillway will not pass the Probable Maximum Flood (PMF) without breaching the structure. For this reason, the dam does not meet the objectives of the Fairfax County Board of Supervisors and the Northern Virginia Soil and Water Conservation District (herein referred to as Sponsors), which are to continue to provide flood protection and to reduce the risk of loss of human life. This supplemental plan documents the planning process by which the USDA Natural Resources Conservation Service (NRCS) provided technical assistance to local Sponsors and the public in addressing resource issues and concerns within the Woodglen Lake Watershed.

With this need and purpose in mind, it should be noted that the local sponsors have done an outstanding job of maintaining the Pohick Creek dam sites, and Woodglen Lake is no exception. The Woodglen Lake dam, and associated recreational lands and facilities, have been taken care of very well since the dam was constructed. Indeed, in 1993, the Pohick Creek Watershed was recognized as the “Watershed Project of the Year” by the National Watershed Coalition. An aerial photograph of Royal Lake was featured on the cover of their national meeting brochure and the proceedings from their Jackson, Mississippi, convention.

In addition, Fairfax County should be praised for the overall high quality job that has been done to prevent development within the 100-year floodplain. Through local zoning and effective enforcement of the zoning rules, the County has effectively kept development out of the 100-year floodplain. This has allowed the floodplain to function as it should during storm events and has prevented untold amounts of damages from occurring.

PROJECT SETTING

ORIGINAL PROJECT

A plan for flood prevention and watershed protection was authorized in 1969 under the authority of Public Law 83-566, the Watershed Protection and Flood Prevention Act of 1954. The original work plan included the construction of seven single-purpose dams and one multi-purpose dam that were all high hazard dams designed for a 100-year life, an accelerated land treatment program for watershed protection, and 6.28 miles of stream channel improvement. Of the structures proposed in the plan, five of the single purpose dams and one multi-purpose dam were built from 1970 to 1985. Planned sites No. 6 and No. 10 and the channel work were deleted from the planned works of improvement. The project was closed out in January 1994.

PHYSICAL FEATURES

Project Location: The watershed for Woodglen Lake is located in Fairfax County, Virginia. Woodglen Lake drains to Pohick Creek, which empties into the Potomac River at Pohick Bay. The Woodglen Lake watershed is 740 acres (1.16 square miles). The drainage area was determined from topographic information derived from LIDAR provided by Fairfax County. The location map for this watershed is in Appendix D.

Topography: Woodglen Lake is located in the Piedmont Physiographic Province. The topography of the Piedmont is relatively flat and topographically featureless. The elevation in the watershed ranges from about 325 feet at the dam to 460 feet at the watershed divide.

Soils: The detailed soil survey for Fairfax County was used to develop the soils data. Since the digital data are not available from the NRCS Soil Data Mart, a digital soil data set was developed for the watershed. This data set was obtained from Fairfax County. Approximately 572 acres (77 percent) of the watershed soils are classified as hydrologic soil group B with moderate infiltration rates and fine to coarse textures, 103 acres (14 percent) as hydrologic soil group C with low infiltration rates, and 65 acres (9 percent) as hydrologic soil group D with very low infiltration rates.

The watershed consists primarily of Fairfax and Glenelg series soils. “Mixed Alluvial Land” and Glenville series soils exist along the majority of the streams within the watershed. Smaller areas of Manor, Beltsville, Worsham, and Meadowville series soils are also depicted in the Soil Survey. The Manor series consists of shallow, highly micaceous, somewhat excessively drained soils of the uplands. These soils have formed from quartz sericite schist, and are found on narrow, rolling ridgetops and steeper ridge slopes. The surface layer is yellowish brown and is directly over micaceous residuum. Some areas of the Manor soils have a very thin, weakly developed subsoil similar to that of the Glenelg soils. The Worsham series consists of wet, poorly drained soils. Worsham soils are found in low, flat, depressed areas. Worsham soils are derived from fine local colluvial and alluvial material that has washed from the associated soils.

At the project site, Mixed Alluvial Land is located along the stream channel. Fairfax, Manor, and Worsham soils are located along abutments of the dam, with Worsham soil in the vicinity of the inlet and Fairfax soil in the vicinity of the outlet of the existing auxiliary spillway.

Geology: The area drained by Pohick Creek lies within the Piedmont Physiographic Province that is underlain by metamorphic rocks of various origins that were folded during the Paleozoic era. It is located in the outer Piedmont area adjacent to the fall zone. This area is characterized by rolling upland, erosion, and deep weathering. According to the digital representation of the 1993 geologic map of Virginia, the bedrock at the dam site is Old Mill Branch Metasiltstone that is part of the Popes Head Formation, formed in the Ordovician-Cambrian period. A typical characteristic of the bedrock in the area is that it is covered in a saprolitic layer of clayey or silty sands that contains relic rock structure, formed by deeply weathered schist.

The boring logs performed during the original design and those performed by Gannett Fleming in 2001 indicate that this geology underlies micaceous sandy silts and clays.

Climate: The Piedmont Physiographic Province has a continental, humid, temperate climate, and is characterized by warm to hot summers and rather cold winters. The average annual

temperature is 58.2 degrees Fahrenheit, with an average minimum temperature in winter of 28.2 degrees Fahrenheit, and an average maximum temperature of 88.5 degrees Fahrenheit in the summer. The last frost of spring normally occurs in late April and the first frost in the fall occurs around late October. This provides a growing season of approximately 204 days.

The average annual precipitation is 39.34 inches, varying from about 33.65 inches in the driest years to about 44.5 inches in the wettest years. This precipitation is well distributed throughout the year with the highest monthly precipitation occurring in May, July and August. Snowfall averages about 14.8 inches annually, with appreciable snow cover on the ground an average of 12 days per year.

LAND USE

The drainage area upstream of Woodglen Lake is 740 acres. Land use in the drainage area was digitized using 2002 USGS Imagery and 2005 NAIP imagery for base maps. Table A lists the land use upstream of the dam. This table also lists the land use in the breach inundation zone below the dam. Appendix D contains the aerial photograph of the upstream watershed.

Table A - Land Use In Acres

Land Cover Type	Drainage Area of Woodglen Lake (ac.)	Percent Of Total	Breach Inundation Zone (ac.)	Percent of Total
Residential/ Business	522	70.5	66.8	20.0
Woodland	118	15.9	244.9	73.5
Transportation	79	10.7	21.0	6.3
Water	13	1.8	0	0
Grassland	8	1.1	0.6	0.2
Totals	740	100.0	333.3	100.0

THREATENED AND ENDANGERED SPECIES

According to the Virginia Fish and Wildlife Information Service, there are no federal listed threatened or endangered plants or animal species that are likely to occur within a two mile radius of the dam.

There is one federal species of concern (FS), state endangered (SE) animal species, the Brook Floater, Alasmidonta varicosa, a freshwater mussel likely to occur within a two mile radius of the project dam, although there have been no confirmed sightings of this species. Seven state threatened (ST) animal species, the Bald Eagle, Haliaeetus leucocephalus; the Henslow's Sparrow, Ammodramus henslowii; the Appalachian Grizzled Skipper, Pyrgus wyandot, a butterfly; the migrant Loggerhead Shrike, Lanius ludovicianus migrans; the Loggerhead Shrike, Lanius ludovicianus; the Wood turtle, Glyptemys insculpta; and the Upland Sandpiper, Bartamia longicauda, are likely to occur within two miles of the dam. However, there are no confirmed sightings of these species. There are no state listed threatened or endangered plant species in the project area.

Confirmed occurrence of a listed species in a project area requires consultation with the appropriate State or Federal agency. Since there are no confirmed occurrences of Federal or State listed threatened or endangered species, consultation with these agencies is not required. However, the U.S. Fish & Wildlife Service, Virginia Department of Game and Inland Fisheries, and the Natural Heritage Division of the Virginia Department of Conservation and Recreation were invited to the preliminary scoping meeting on March 8, 2007. None of the three agencies attended, but two agencies submitted comments by letter and email.

The DCR Natural Heritage Division responded in a February 27, 2007 letter that their “Biotics Data System does not document the presence of natural heritage resources in the project area.The current activity will not affect any documented state-listed plants or insects.”

The Virginia Department of Game and Inland Fisheries (VDGIF) responded by email on March 1, 2007. VDGIF stated “According to our current records, there have been no documented occurrences of threatened or endangered wildlife resources under our jurisdiction within the project area. Therefore, we currently do not anticipate a significant adverse impact upon those resources.”

The U.S. Fish & Wildlife Service (USFWS) did not provide comments.

Table B summarizes the potential occurrence of threatened and endangered species in the project area.

**Table B - Threatened and Endangered Animal Species
Likely to Occur Within 2 Miles of the Project Dam**

Animal Species	Scientific Name	Status*	Confirmed
Brook Floater	<u>Alasmidonta varicosa</u>	FS, SE	No
Henslow’s Sparrow	<u>Ammodramus henslowii</u>	FS, ST	No
Appalachian Grizzled Skipper	<u>Pyrgus Wyandot</u>	FS, ST	No
Migrant Loggerhead Shrike	<u>Lanius ludovicianus migrans</u>	FS, ST	No
Bald Eagle	<u>Haliaeetus leucocephalus</u>	ST	No
Loggerhead Shrike	<u>Lanius ludovicianus</u>	ST	No
Upland Sandpiper	<u>Bartramia longicauda</u>	ST	No
Wood Turtle	<u>Glyptemys insculpta</u>	ST	No

*- Species Legal Status: FT = Federally Threatened; FE = Federally Endangered; ST = State Threatened; SE = State Endangered; .FS = Federal Species of Concern

CULTURAL RESOURCES, NATURAL AND SCENIC AREAS, AND VISUAL RESOURCES

The National Register of Historic Places lists fifty-three sites in Fairfax County. Fifteen archaeological sites within one mile of the project area are listed in the State archaeological files; none will be affected by the proposed work. There are no architectural sites listed in the State architectural files within one mile of the project area.

The National Historic Landmarks Program lists 118 sites, buildings or structures in Virginia, eight of which are found in Fairfax County. None of the eight buildings, objects or districts are within one mile of the project area, or will be affected by the project activities.

There are no designated State Natural and Scenic Area Preserves or visual resources in the project vicinity that will be affected by the proposed changes to the dam.

The Virginia Department of Historic Resources (VADHR) was notified of the March 8, 2007 Scoping Meeting, but did not attend or submit comments.

In February 2007, the NRCS Cultural Resource Specialist and the Cultural Resources Coordinator conducted a preliminary survey of the dam area and the area downstream of the dam for indicators of archaeological and/or historical resources. This field review was conducted for the areas immediately adjacent to the dam, and for a distance of approximately 200 meters downstream. The ground cover is wooded with very little surface visibility. The topography is mostly level with a 0-3% slope. The ground surface and creek bed was searched for quartz and other natural material that could have been used for the manufacture of stone tools. None were noted. No previously recorded archaeological sites are present within the area to be rehabilitated.

Phase I investigations were conducted in December 2007 in the projected spillway area by professional archaeologists under contract to NRCS. A total of 32 shovel test pits (STPs) were excavated during the investigations. The excavations resulted in the recovery of six artifacts, including two quartz shatter, one middle stage quartz flake, and two quartz flake fragments which constitute site 44FXWG-1, and additionally, one middle stage quartz flake as an isolated find. The six artifacts were recovered from five STPs. The site is not considered to have the potential to contribute important information on prehistory or history and it is not considered eligible for the National Register of Historic Places. The Virginia Department of Historic Resources agreed with NRCS that no further work on this site was needed.

WATER QUALITY

Woodglen Lake Dam is located directly on Sideburn Branch which conflues with Rabbit Branch to form the mainstem of Pohick Creek which then flows into the Potomac River at Pohick Bay. Pohick Creek has a total stream length of 35.61 miles from the headwaters of Rabbit Branch to Pohick Bay.

The 2006 305(b)/303(d) Integrated Water Quality Assessment and Impaired Waters Report does not list any waters in the project area as "impaired". Citizen monitoring has been conducted on Rabbit Branch between the Royal Lake Dam and the confluence with Sideburn Branch. A

bioassessment of benthic macroinvertebrates was performed in three surveys from 2002 to 2004. All revealed poor stream conditions for stream biota. Sideburn Branch is expected to have similar conditions.

The Pohick Creek watershed is not considered a Public Drinking Water Source or Supply and is ranked low for nonpoint source impaired lakes. The watershed is, however, rated high for urban nitrogen, phosphorus and sediment contribution.

WETLANDS

The Woodglen Lake shoreline, inlet and outlet were visually surveyed in November, 2006, and February, 2007, for jurisdictional wetlands. One small wetland area, approximately one-tenth of an acre in size, is located on the east side of the lake, just above the dam. The U.S. Army Corps of Engineers has agreed with this delineation as a jurisdictional wetland.

There are 2.8 acres of jurisdictional wetlands in the floodplain area below the dam. The wetland area was delineated on December 12, 2007 by NRCS personnel. Approximately 0.56 acres of wetlands lie within the proposed spillway rehabilitation area. It seems feasible for these wetlands to be avoided during construction. The U.S. Army Corps of Engineers was informed of this delineation in December 2007 and accepted the delineation on February 12, 2008.

FOREST RESOURCES

An approximation of climax forest stands in this vicinity is indicated by remnant mature stands of American Beech, Fagus grandifolia, several oak (Quercus) species, and American Holly, Ilex opaca var. opaca. Chestnut Oak, Quercus montana, and Mountain Laurel, Kalmia latifolia, dominate parts of this region.

WILDLIFE RESOURCES

The Pohick Creek Watershed is considered to be part of the Mid-Atlantic Coastal Plain Ecoregion according to Virginia's Comprehensive Wildlife Conservation Strategy, 2005 (VDGIF). This Strategy lists 235 Species of Greatest Conservation Need in the Mid-Atlantic Coastal Plain. Twenty-three species are considered to be Tier I species, i.e. those species with a critical conservation need having an extremely high risk of extinction; 35 species are considered to be Tier II species, i.e. those species with a very high conservation need and a high risk of extinction; 39 species are considered to be Tier III species, i.e. those species with a high conservation need and face possible extinction; and 138 species are considered to be Tier IV species, i.e. those species with a moderate conservation need and have demonstrated a declining trend in population. The Tier I species include a single mammal, the Eastern Big-eared Bat, Corynorhinus rafinesquii macrotis; four fishes, the Shortnose sturgeon, Acipenser brevirostrum; the Blackbanded Sunfish, Enneacanthus chaetodon; the Bridle Shiner, Notropis bifrenatus; and the Roanoke Logperch, Percina rex. The Wood Turtle, Glyptemys insculpta; and the Chicken Turtle, Deirochelys reticularia are the included reptiles. Ten bird species are listed, including the Peregrine Falcon, Falco peregrinus. The potential exists for several of the Tier I fish species and turtle species to occur within the project watershed.

Several of the Tier II species that may occur in the project area include two aquatic mollusks, the Green Floater, Lasmigona subviridis and the Dwarf Wedgemussel, Alasmidonta heterodon; several amphibians including Mabee's Salamander, Ambystoma mabeei; the Tiger Salamander, Ambystoma tigrinum; the Oak toad, Bufo quercicus; and the Barking Treefrog, Hyla gratiosa; the Northern Diamond-backed terrapin, Malaclemys terrapin, a reptile; and 13 bird species, including the Little Blue Heron, Egretta caerulea; the Bald Eagle, Haliaeetus leucocephalus; and the Cerulean Warbler, Dendroica cerulea.

The Steelcolor shiner, Cyprinella whipplei, is the only Tier III fish species. Three aquatic mollusks, the Yellow Lance, Elliptio lanceolata; the Yellow Lampmussel, Lampsilis cariosa; and the Chesapeake Ambersnail, Oxyloma subeffusum are listed as Tier III species. Tier III Amphibian species include the Dwarf Waterdog, Necturus punctatus; the Carpenter Frog, Rana virgatipes; and the Lesser Siren, Siren intermedia. Reptilian species that may occur on the project area are the Spotted Turtle, Clemmys guttata; the Glossy Crayfish Snake, Regina rigida rigida; and the Eastern Box Turtle, Terrapene Carolina. Eleven Tier III bird species are listed including the Least Bittern, Ixobrychus exilis; and the Black-crowned Night Heron, Nycticorax nycticorax.

Some of the many Tier IV species that may occur within the project boundaries are the Lined Topminnow, Fundulus lineolatus; the Ironcolor shiner, Notropis chalybaeus; the Logperch, Percina caproides; the Eastern Mud Salamander, Pseudotriton montanus; and the Yellowbellied slider, Stereochilus marginatus, a turtle.

Wildlife species inhabiting these forests also include ruffed grouse, woodcock, various thrushes, and vireos, the scarlet tanager, several species of woodpeckers, gray and red squirrels, rabbits, gray fox, white-tailed deer, and raccoon. Ducks, geese, herons, birds, mink, otter, turtles, muskrat and beaver may be found along the shoreline of the reservoir.

CHESAPEAKE BAY AND COASTAL ZONE MANAGEMENT AREAS

The Pohick Creek Watershed drains into the Potomac River, a major tributary to the Chesapeake Bay. As such, the dam rehabilitation efforts must consider impacts as required by the Chesapeake Bay Preservation Act. The Bay Act is an element of Virginia's multifaceted response to the Chesapeake Bay Agreement. The Bay Act established a cooperative relationship between the Commonwealth and local governments aimed at reducing and preventing nonpoint source pollution. The Bay Act Program is designed to improve water quality in the Chesapeake Bay and its tributaries by requiring the use of effective conservation planning and pollution prevention practices when using and developing environmentally sensitive lands.

Fairfax County has adopted local land use plans and ordinances which incorporate water quality protection measures consistent with the Chesapeake Bay Act Regulations. The Regulations address non-point source pollution by identifying and protecting certain lands called Chesapeake Bay Preservation Areas. The lands that make up Chesapeake Bay Preservation Areas are those that have the potential to impact water quality most directly. Generally, there are two types of land features: those that protect and benefit water quality (Resource Protection Areas) and those that, without proper management, have the potential to damage water quality (Resource Management Areas). By carefully managing land uses within these areas, local governments

help reduce the water quality impacts of nonpoint source pollution and improve the health of the Chesapeake Bay. Woodglen Lake is located entirely within the Resource Protection Area for Pohick Creek.

Fairfax County is also included in Virginia's Coastal Zone Management Program, and is one of eight Planning District Commissions in the Coastal Zone Area. The Northern Virginia Regional Commission assists local governments in their review of federal, state and local activities within their jurisdictions for consistency with the provisions of the Coastal Zone Management Act. Any dam rehabilitation efforts must consider these regulations and comply with them during the planning, design, and construction phases of the project.

SOCIAL AND ECONOMIC CONDITIONS

Woodglen Lake has a watershed of 740 acres, all of which lie within Fairfax County. Thus, the entire population within the watershed resides within Fairfax County.

Population and Race: According to the 2006 Census Bureau projections for the population of the U.S., Fairfax County had a total population of a little over 1 million (1,010,443). Of the total population, about 68% (686,661) are white, 15.8% are Asian (159,544), and 9.5% (95,635) are Black or African American. Together these three groups make up 93.3% of the county's entire population. Hispanics of any race are the third largest minority group with 12.9%, or 130,753. "Other races" constitute 4.3% of the Fairfax County population with 43,481. Native Americans have a very small presence with only 0.2% of the population (1,620 having declined significantly from 2,561 counted in the 2000 Census).

Language Spoken at Home: The 2006 population projections of the Census Bureau indicate that a little over sixty-seven percent of the Fairfax County population, 5 years of age and over, speak only English at home. 32.9% of this same age group spoke languages other than only English at home. The single largest of this group, at 11.6%, speak Spanish at home (109,121). The next largest group, at 11.4%, speaks Asian and Pacific Island languages at home and 7.1% (66,846) speak Indo-European languages other than Spanish at home. Over 15% (141,769) speak English "less than very well."

Age: The 2006 Census projections of the U.S. population indicate that the median age (middle point with ½ above and ½ below) of the population of Fairfax County was 38.4 (up from 35.9 in 2000). The median age for the state of Virginia was somewhat lower at 36.9 years while it was 36.4 for the entire nation. Residents in Fairfax County that were 65 years old or older totaled 9.2% (92,662 as compared to 76,818 and 7.9% in 2000). These compare to 11.6% for the State and 12.4% of the nation. About 75% (756,460) of the County population was over the age of 18. The same statistic for the state as a whole projected for 2006 was 76.4%. Both the local and the state numbers are close to the national average estimated for 2006 at 75.4%.

Education: Almost 93% of the residents in the County had a high school education or higher while the state-wide and national percentages for this were 85.4% and 84.1% respectively. Approximately 14% of the residents in the county, 25 years of age or older, have only a high school diploma or have passed an equivalency test. Almost 77% of the County residents have some education beyond high school, including 30.6% with a bachelor's degree and 28.1% with graduate or professional degrees. Thus 58.7% of County residents have a bachelor's degree or

higher. An additional 14.2% in the County have completed at least some college level work with 5.5% having obtained an associate degree. All of these numbers are well above the state-wide and national averages.

Employment/Unemployment, Class of Worker and Commuter Status: The county's population who are 16 years of age or older numbered 785,314 according to the Census Bureau projections for 2006. Approximately 73% (573,154) of the residents who are 16 years of age or older are considered to be in the labor force pool. 96.5% of the civilian labor force in the County was employed according to the 2006 Census projections. About 3.5% of the civilian labor force in the County was unemployed according to the 2006 estimates. The unemployment figure is lower than the unemployment rate projected in 2006 for the state of Virginia as a whole which was 4.7%; and for the nation which was estimated to be 4.1%.

Fairfax County has a diverse and productive economy. According to the 2006 Census projections, three sub-sectors of the local economy employ about 90% of the workforce: management and related professional occupations (57.3%); sales and office occupations (20.8%); and service occupations (11.8%). Occupations in the construction, extraction and maintenance make up 5.8% and production, transportation and related occupations make up only 4.2% of area jobs.

According to the 2006 American Community Survey of the U.S. Census Bureau, private employment constitutes 71.6% of all employment in Fairfax County with 58.3% working in private for-profit businesses, 10.3% being self-employed and 9.1% working for private nonprofit organizations. Government workers constitute 22.3% of the Fairfax County workforce with 13.9% employed by the federal government, 1.5% employed by state government and 6.8% employed by local government.

Of all Fairfax County residents employed in 2006, 51.6% worked within Fairfax County, 25.3% commuted to another locale within Virginia and 23.1% commuted outside of the county and state (presumably to Washington, D.C. and Maryland).

Housing: 2006 Census estimates indicate that there were 390,761 housing units within Fairfax County with 93% occupied, with 69.9% owner-occupied and 23.1% renter-occupied. The state-wide occupancy rate for Virginia as a whole in 2006 was 89.9% and the national figure was 88.4%. The local and state-wide rates for owner-occupancy, 69.9% and 62.8% respectively, are higher than the national figure of 59.5% in 2006.

There are approximately 35 single family homes, with an average market value of \$621,000, that adjoin the frontage around the reservoir whose property values are directly affected by the presence of the dam and impounded water. Further upstream, there are an undetermined number of lots and homes that adjoin the upper watershed reaches along the wooded drainage-ways that feed water into the reservoir. An additional 157 homes and 20 business sites and two public buildings are located in the projected breach inundation zone below the dam. Residential property values for the land and associated buildings downstream of the dam range between \$305,000 and \$552,000 with an average of \$366,000. The total value of residential property (structures and contents only, excluding land values) at risk below the dam is an estimated \$56,916,000. An added \$49,012,000 of commercial property and \$16,175,000 worth of infrastructure (roads, bridges, rail lines, etc.) are below the dam within the breach inundation zone.

Income: Median household income (householder and all others, related or not) estimated for the county in 2006 was \$100,318. This compares to \$56,277 per year for the median household income calculated for the state of Virginia. The national figure for median household income per year estimated for 2006 was \$48,451. The median estimated household income in 2006 for Fairfax County was 178% of the state median and 207% of the national median household income.

Median family income (householder and all others that are related) in Fairfax County for 2006 was \$119,812 compared to \$92,146 per year for 1999¹. The current figure is significantly more, approximately 79% higher, than the \$66,886 in median family income for Virginia as a whole and almost 104% higher than the \$58,526 reported for the entire United States in 2006.

With respect to per capita incomes, Fairfax County residents are estimated to have had per capita incomes of \$46,499 in 2006 as compared to \$36,888 reported in 1999. Virginia reported per capita income of \$23,975 in 1999, and the estimated number for 2006 is \$29,899 while the same figure for the entire United States was \$21,587 in 1999 and \$25,267 in 2006. That makes the county figure 2006 55.5% higher than the State level and 84% above the national figure.

From a gender-specific perspective, males earn far more than females in the workplace at all levels. Full-time, year-round male workers in Fairfax County had a median income projected for 2006 of \$79,678, up from \$60,503 in 1999, while the same category of female workers in the county were estimated to earn \$56,192 in 2006, up from \$41,802 earned per year in 1999. Full-time, year-round male workers in Virginia had an estimated median income in 2006 of \$47,063, up from \$37,764, while the same category of females in Virginia earned an estimated \$36,062, up from \$28,035/year in 1999. The Virginia figures are very close to the national statistics of \$42,210 and \$32,649 for male and female full-time, year-round workers, respectively, up from \$37,057 and \$27,194.

Poverty: According to the 2006 Census projections, Fairfax County had 8,956 families living below the poverty level (3.6%), up from 7,507 families (2.9%) living below the poverty level in 1999. State-wide, 6.8% of Virginia's families had incomes below the poverty level in 2006, down slightly from 7% in 2000. At the national level, 9.8% of our families were estimated to live below the poverty level in 2006, up from 9.2% in 2000.

Recreation: Woodglen Lake provides recreation to homeowners and landowners in the area and is highly valued by the local community. Lake associated recreation includes some boating, fishing and bird watching. Recreational activities associated with the path across the dam include cycling, walking and jogging. The lake and adjoining green-space also serve as a visual amenity for the local community.

¹ Median family income is consistently higher than median household income. This is because the household universe includes people who live alone. Their income would typically be lower than family income because by definition, a family must have two or more people.

PLANNING ACTIVITIES

As part of the planning process, several engineering surveys were conducted. Valley cross-sections were developed using HEC-GeoRAS and supplemented with field survey data for the Norfolk Southern Railroad culvert and the Roberts Parkway Bridge. The hydraulic modeling program HEC-RAS (Hydrologic Engineering Center – River Analysis System) was used to determine the breach inundation zone and the water surface elevations at each cross-section. Information on impacted structures in the dam breach zone was obtained from GIS layers generated from post-processing HEC-RAS results using HEC-GeoRAS. These layers included a polygon defining the inundation extent and a grid containing information on the depth of water throughout the inundation polygon. The inundation extent polygon was used to extract appropriate cadastral (parcels) and planimetric (building footprints) data from Fairfax County's GIS datasets. All parcels in the inundation zone with buildings were identified and data on assessed value and type of structure in these parcels was compiled. The water depth grid was used to determine the mean inundation depth for each building footprint. A summary of parcels with multiple buildings was also compiled to avoid counting assessed values more than once, since assessment values are maintained by parcel and there may be several parcels with multiple buildings. The SITES (Water Resources Site Analysis) computer program was used with information from the geologic investigations to model the stability and integrity of the vegetated earthen auxiliary spillway.

Other planning activities included a land use inventory, natural resources inventories, wetland assessments, and the identification of threatened and endangered species and fish and wildlife resources. Cultural and historic resources were researched and a Phase I survey completed. Social and economic effects of the potential alternatives were evaluated for cost-effectiveness and for local acceptability. Both the benefits and the costs of the alternatives were computed and analyzed.

A. Morton Thomas & Associates, Inc. conducted the sediment survey, the hydrologic and hydraulic analysis for the Dam No. 3 existing condition, and the proposed repair alternatives under contract to Fairfax County. The basic data and technical support and review were provided by NRCS. The analysis was presented as Pohick Creek Watershed Dam No. 3 Woodglen Lake (Inventory Number: VA 05928) Hydrologic and Hydraulic Analysis, August 2007. Portions of the document were used in the development of this report.

WATERSHED PROBLEMS AND OPPORTUNITIES

WATERSHED PROBLEMS

The Virginia Division of Dam Safety has issued a conditional certificate for Woodglen Lake because the vegetated earthen auxiliary spillway cannot pass the Probable Maximum Flood (PMF) storm flows without breaching the structure. Also, the earthen training dike is too low to keep auxiliary spillway flow from eroding the dam.

Sponsor Concerns: The conditional certificate was issued to Fairfax County for Woodglen Lake in September 2005. The conditional permit requires the Sponsors to address the potential for severe head-cutting and erosion in the auxiliary spillway. The local Sponsors are very interested in resolving the issues raised by the Virginia Division of Dam Safety and complying with the Dam Safety regulations.

A conditional certificate serves as notification to the Sponsors that the dam no longer meets State requirements and must be modified as soon as possible to meet State law. The presence of an unresolved conditional certificate leaves the Sponsors vulnerable to liability suits should the dam breach and downstream damages result. In order to address these concerns, the Sponsors requested the assistance of NRCS to do the watershed planning and to identify the improvements necessary to obtain full dam safety certification.

Soil Erodibility: According to Gannett Fleming's May 2001 report entitled Pohick Creek Dam No. 3 Emergency Spillway Investigation, Project N00096 (DM03), four borings were drilled in Woodglen Lake's auxiliary spillway in February 2001. For each boring, 1.5 foot samples were taken at five foot intervals until bedrock was reached. Continuous cores were taken from that point. Two borings were advanced through the soil and rock substrate and two borings were advanced only into the soil substrate. The purpose of the borings was to evaluate the subsurface conditions within the auxiliary spillway. From the surface of the spillway, Boring 1A was advanced to a depth of 45.0 feet, Boring 1B was advanced to a depth of 11.5 feet, Boring 2A was advanced to a depth of 40.0 feet, and Boring 2B was advanced to a depth of 25.4 feet. The boring logs in the report identified the soil encountered in borings 1A and 1B as silty sand (SM) to a depth of 10.0 feet followed by sandy silt (ML). Boring 1A was advanced into weathered rock underlying the ML horizon. The boring logs in the report identified the soil encountered in borings 2A and 2B as sandy silt (ML). Boring 2A was advanced into weathered rock underlying the soil. From the results of the boring investigation and information from a previous subsurface investigation performed by SCS prior to the construction of Pohick Dam No. 3, Gannett Fleming developed a generalized subsurface profile within the auxiliary spillway. The substrate of the auxiliary spillway was divided into four layers; top soil, residual soil, saprolite, and weathered schist.

The subsurface profiles as well as the engineering properties of the soil/rock were utilized as input parameters for the SITES model. Gannett Fleming performed SITES analyses utilizing an estimate of the erosion resistance properties of all four layers indicated above for the 100-, 200-, 500-, 1,000-, 2,000-, 5,000-year, and both the PMF and ½ PMF spillway outflow events. The 100-year event was modeled by assuming there was no reservoir storage capacity available prior to the start of the precipitation event. This was necessary because the auxiliary spillway, as designed, would not flow during the 100-year event. When this analysis was performed in 2001,

Gannett Fleming did not verify the flood storage capacity of the reservoir. Gannett Fleming's report on their SITES analysis states, "For the 500-year flood event through the PMF, the analyses indicate that the emergency spillway would be breached."

Floodplain Management: The Sponsors have identified flooding in the floodplain downstream as a primary concern. Fairfax County has participated in the National Flood Insurance Program since 1972, and realizes the value that Woodglen Lake provides in flood protection benefits, particularly for the roads. Woodglen Lake controls 1.16 square miles (740 acres) of the watershed above the affected properties.

Fairfax County has been very proactive in the protection of the Pohick Creek floodplain. In the early 1970s, USGS identified the 100-year floodplain within the watershed. The entire area was then zoned to prevent development. The six NRCS flood control dams were installed after the zoning was complete. The post-construction 100-year floodplain is substantially smaller than the zoned area.

Erosion and Sedimentation: As of 2007, Woodglen Lake had reached about 26% of its planned service life. According to the 2007 sediment survey of the lake, the volume of sediment (both submerged and aerated) in the Woodglen Lake reservoir and its tributaries was about 15% of the available capacity. As expected, most of the sediment observed is present in the inlet channel area of the structure. This material is primarily deposited sediments plus leaf and other organic debris.

In the original design, 662 acres of the watershed were classified as 'subject to construction.' Currently, 601 acres of the watershed are either classified as having a land use of 'Residential/Business' or 'Transportation', with the majority being Residential/Business. The watershed area is predominantly "built-out." The increase in impervious surface area has increased the volume of runoff into the streams feeding the lake. However, in this watershed, streambank erosion does not seem to be contributing an excessive amount of sediment to the lake. Stormwater management, streambank erosion control, and general watershed erosion control in the watershed are the responsibility of the sponsors and will not be addressed in this plan.

Local Concerns: Woodglen Lake is used extensively by the local residents. The impacts to the walking trails and other facilities during construction, and the increased traffic along adjacent streets have sparked a number of concerns among local residents. Sediment accumulation in the lake is also an issue of concern. An additional issue centers on the possible loss of trees near the outlet of the auxiliary spillway. The aesthetic appearance of the proposed solution is critically important to local residents.

WATERSHED OPPORTUNITIES

The following is a general list of opportunities that will be recognized through the implementation of this dam rehabilitation plan. Some quantification of these opportunities will be provided in other sections of the report, as appropriate.

- Comply with dam design and safety criteria established by NRCS and the Virginia Division of Dam Safety.
- Minimize the potential for loss of life associated with a failure of this dam.
- Eliminate the sponsor liability associated with operation of an unsafe dam.
- Maintain the existing level of flood protection for downstream houses, businesses, and infrastructure.
- Protect real estate values around the lakes and downstream from the dam.
- Maintain existing fish and wildlife habitats around the dam.
- Preserve existing recreation opportunities.
- Protect water quality (the lake has trapped 20.0 acre-feet of sediment and attached nutrients in 26 years).

SCOPE OF THE ENVIRONMENTAL ASSESSMENT

A scoping process was used to identify issues of economic, environmental, cultural, and social importance in the watershed. Watershed concerns of Sponsors, technical agencies, and local citizens were expressed in the scoping meeting and other planning and public meetings. Factors that would affect soil, water, air, plant, animals, and human resources were identified by an interdisciplinary planning team composed of the following areas of expertise: engineering, biology, economics, resource conservation, water quality, soils, archaeology, and geology.

Specific resource concerns and their degree of significance to the decision making process were identified in a Scoping Meeting held on March 8, 2007, at Braddock Hall in Burke, Virginia. Input was provided by Fairfax County, the Northern Virginia SWCD, the Virginia Department of Game and Inland Fisheries, the Virginia Department of Forestry, the Virginia Department of Emergency Management, the Virginia Marine Resources Commission, the Virginia Department of Conservation and Recreation – Division of Natural Heritage, and the Virginia Division of Dam Safety & Floodplain Management. These concerns are listed in Table C.

**Table C - Scoping Meeting Results For Rehabilitation of
Pohick Creek Watershed Dam No. 3, Woodglen Lake
March 8, 2007**

Resource Concern	Degree of Concern ¹	Significance to Decision making ²	Remarks
Air Quality *	Low	Low	No open burning Emissions control on equipment Dust control during construction Loss of trees may affect air quality ** Stopped traffic impacts
Coastal Zone Management*	High	High	RPA-100 yr floodplain buffer RMA-All the rest of county
Economic and Social Effects	High	High	Positive
Erosion & Sedimentation - Dredge Material	High	High	Dredge material ** - Aesthetics - Materials tested for disposal - Truck traffic for hauling Possible forebay; Woodglen has a decanting basin
Fish & Wildlife Habitat; Fisheries *	Low	Low	
Floodplain Management;* Flooding	High	High	
Forestry and Parks	High	High	Harvest notification to DOF if offsite tree removal is required; onsite processing okay
Highly Erodible Cropland	High	Low	No cropland exists in the watershed.
Historic Resources *	Med	Med	
Land Use and Management	High	Med	Protect trees if possible
Prime & Unique Farmlands *	Low	Low	None present
Property Values around Lake	High	High	Positive
Public Recreation	High	High	Impacts to trails
Public Safety	High	High	Transportation - Passenger rail - Freight rail - Public roads Homes/Businesses
Sewer Utilities	High	High	Sewer lines near lake
Stormwater Management	High	High	
Threatened & Endangered Species *	Low	Low	
Transportation	High	High	Staging area – decanting basin
Water Quality *	High	Low	Benefits to environment Follow E&S ordinances/laws during construction
Wetlands *	Med	Med	
Wild & Scenic Rivers *	Low	Low	
Noise pollution	High	High	During construction (check zoning ordinance)
Aesthetics	High	High	Must look pleasing after rehab Supplemental landscaping

* Required by Law

** Consider during Construction

¹ Low, Medium or High

² High- must be considered in the analysis of alternatives; Medium - may be affected by some alternatives solutions; Low- consider, but not identified as important to decision making.

DESCRIPTION OF EXISTING DAM

Current Condition of the Dam: A visual inspection of the dam was conducted on March 5, 2007. The dam and auxiliary spillway have been well maintained with a good stand of grass and no woody vegetation on the embankment and auxiliary spillway. No erosion was observed on either the embankment or the auxiliary spillway. The exterior concrete of the principal spillway appears to be in good condition; however, the interior of the riser was not inspected. In 2006, Fairfax County completed a video inspection of the principal spillway conduit. A review of the video showed the conduit to be in good condition. The dewatering gate at the bottom of the riser was last activated on December 16, 2006.

Wet areas along the downstream groins were noted. Flow was observed in the right embankment drains, looking downstream, but not in the left drains. These wet areas have been observed in previous inspections after recent snowmelt and rainfall, but found to be dry during inspections during dry periods. Piezometer readings, taken by Fairfax County on a 3-month interval, indicate that the phreatic line is well below the embankment surface. Therefore, while this condition should continue to be monitored, it does not appear to be a problem needing repair or rehabilitation.

Potential Dam Safety Deficiencies: The Virginia Division of Dam Safety and Floodplain Management issued a conditional use certificate for Pohick Creek Watershed Dam No. 3 because the vegetated earthen auxiliary spillway would not pass the Probable Maximum Flood (PMF) storm flows without breaching the structure. Also, the earthen training dike is too low to prevent water flowing in the auxiliary spillway from eroding the embankment of the dam during passage of more than one half the PMF.

As-Built Dam Specifications: According to the As-Built drawings, the dam was constructed from October 1979 to December 1981. The earthfill used to construct the embankment was obtained from the surrounding floodplain and auxiliary spillway. This borrow area includes alluvium, some colluvium, and residual soils. The alluvium varies in certain locations between silty sand to sandy silt and silty sand to silty gravel. Colluvial soils overlay the alluvium and contain clayey silt. The residual soils, which borders the alluvium, consists of sandy silt. The embankment is comprised of two zones of earthfill. Zone 1, or “Core,” is made up of the clayey silts and Zone 2, or the “Shell,” covers the crest and downstream slope, consisting of silty sands. The top of the embankment is 14 feet wide with 2.5 horizontal to 1 vertical side slopes. There is a 10-foot wave berm on the upstream slope that is located slightly higher than the principal spillway crest. In 1988, rock riprap was added to the wave berm by the owners of the dam.

The top of dam was constructed 38.4 feet above the downstream toe of the embankment with an allowance of 0.9 foot of settlement for a settled top of dam 37.5 feet high. The 2007 field survey shows a dam height of 38.4 feet above the downstream toe. The crest of the dam extends approximately 630 feet from the right abutment to the auxiliary spillway.

The design flood pool for this reservoir was 268 acre–feet. Using the LIDAR data, the flood storage volume was estimated to be 210.8 acre-feet. The storm event that will fill the reservoir and cause flow in the auxiliary spillway is presently about a 62-year event.

Principal Spillway: The principal spillway consists of a 184-foot long, 30-inch-diameter, reinforced concrete pipe with a covered reinforced concrete riser and an impact basin outlet. The two-stage riser is 30'-2" high with interior dimensions of 2.5'x7.5'. The riser controls the normal pool with a 22"x19" orifice located in the upstream endwall and a second stage weir, 15 feet long, at the top of the riser. A 30-inch-diameter circular gate at the base of the riser, operated by crank, is provided for dewatering. The conduit discharges into an impact basin and flows into a riprap-lined stilling basin. The outlet works are in good condition including the downstream riprapped section. A pipe safety railing was added to the impact basin walls by Fairfax County in 1986.

According to the As-Built Drawings, a deep water release on the upstream face of the riser was altered by the owners in 1987 to relieve odor problems of stagnant water on the lake surface. This deep water release originally had a 3-inch diameter low water release one foot below the low stage orifice and a deep water inlet approximately 12 feet below the low stage orifice. Water now flows through a trash rack directly into the low stage orifice. Apparently, the purpose of this release was to provide cooler water downstream during low flows; however, there is no documentation in this regard in the design report. During the site inspection, no stagnant water was observed in the lake. Without this deep water release, the outlet water temperature would be slightly higher, depending on the temperature profile of the lake. This deep water release, or lack thereof, has no impact on the flood control provided by this dam.

Auxiliary Spillway: A 75-foot-wide earthen channel auxiliary spillway was constructed in the left abutment. The As-Built drawings show a 55-foot-long level section approximately 8.5 feet below the top of dam with a 100-foot-long, 2-percent inlet slope and a 75-foot-long, 3-percent outlet slope. The field survey shows no well-defined level section; however, it shows a 50-foot-long section that is within 0.1 foot of the highest surveyed elevation. The surveyed length of 50 feet is used for all calculations. The vegetation lining the spillway is well maintained. The spillway outlets into a wooded area that drains to a defined channel below the dam. No flow has been observed in the auxiliary spillway.

Internal Drain System: The As-Built drawings indicate that the trench drain is composed of a two-stage graded filter surrounding a perforated corrugated metal pipe. Two 8-inch-diameter CMP pipes exit the embankment into the side walls of the impact basin. The condition of the pipe is unknown. Fairfax County plans to conduct a video inspection of the pipe in the near future. Any deficiencies discovered during the inspection will be corrected during the rehabilitation.

Appurtenant Structures: A 5-foot wide asphalt footpath crosses the auxiliary spillway on the upstream side of the control section. The footpath extends across the top of the dam.

Baseline Survey: A field survey, conducted by AMT, referenced to NGVD 29 vertical datum (feet), indicates that the vertical datum used for design and construction is approximately 1.3 feet higher than NGVD 29. The differences are shown in Table D. Elevations used in this report are referenced to NGVD 29, the vertical datum used by Fairfax County.

Table D – Comparison of Dam Elevations			
	Elevations (feet)		
	As Built	2007 Survey (NGVD 29)	Difference
Principal Spillway Crest	335.3	334.0	1.3
High Stage Weir	345.0	343.8	1.2
Top of Riser	346.9	345.6	1.3
Top of Dam (Settled)	354.8	354.0	0.8
Auxiliary Spillway Crest	346.3	345.3	1.0
Top of Impact Basin Baffle	322.3	320.8	1.5
Principal Spillway Outlet Invert & Outlet Channel	317.3	315.6	1.7

The field survey data were used to develop the area of the normal pool. LIDAR data developed by the Joint Programs Sustainment and Development (JPSD) Project Office at the Topographic Engineering Center (TEC), Fort Belvoir, VA, were used to develop elevation-area data for the flood pool. The areas are less than those shown in the design report. The result is that there is less flood storage in the reservoir than was used for the original design. Using the storage shown in the design report, the floodwater retarding storage (water storage between the auxiliary spillway crest and sediment accumulation elevations) would be 268 acre feet. Using the LIDAR data, the floodwater retarding storage would be only 210.8 acre feet. All other factors held constant, the impact of this reduced storage would be an increased frequency of flow through the auxiliary spillway with higher volume and peak flows as well as an attendant decrease in floodwater retardation. The increase in rainfall volume would further increase flow through the auxiliary spillway; however, the reduction in runoff curve number and the increase in time of concentration would partially offset these impacts.

Precipitation Data: NRCS dams are designed to store the 100-year storm before water will flow through the auxiliary spillway. Precipitation data for the 100-year, 24-hour storm event collected by the National Oceanic and Atmospheric Administration (NOAA) was revised in 2004. The precipitation frequency estimates for Fairfax County released as part of NOAA Atlas 14, Volume 2, increased the rainfall from this storm event from 8.0 inches (as estimated when the design for the dam was completed in 1972) to 8.27 inches. With this change in rainfall and the reduced storage capacity, the elevation of the crest of the auxiliary spillway is now 0.8 feet lower than needed to store the 100-year, 24-hour storm. The existing dam can only store the runoff from a 62 year frequency storm event (1.6% chance of occurrence).

Sediment Volume: Woodglen Lake was designed with an original sediment storage capacity of 105.6 acre-feet (170,852 cubic yards) for 100 years of life. Aerated sediment accounts for 5.28 acre-feet of the designed sediment pool. Fairfax County conventionally dredged 0.64 acre-feet (1,040 cubic yards) of sediment from Woodglen Lake in 1986. Anecdotal evidence suggests that approximately another 4.34 acre-feet (7,000 cubic yards) were dredged from the impoundment at a later time.

As part of the rehabilitation planning process, a reservoir sediment survey was conducted in February and March 2007. The 2007 sediment survey revealed 15.07 acre-feet (24,316 cubic yards) of sediment deposited in the reservoir and its tributaries. When the dredged sediment

volume is added to the existing amount, the total volume of sediment accumulated since construction in 1981 is equal to 20.0 acre-feet (32,356 cubic yards). This equates to a sediment deposition rate of 0.77 acre-feet per year (1,244 cubic yards per year).

During the sediment survey process, the actual size of the entire sediment pool was delineated to be 99.88 acre-feet (161,139 cubic yards). Only 15% of the available sediment storage capacity is currently filled. The remaining sediment storage capacity of the structure totals 84.8 acre-feet (136,823 cubic yards). This is 85% of the available sediment storage capacity of the reservoir. At the 0.77 acre-feet per year historic rate of sediment deposition, there is enough sediment storage for approximately 110 years in the reservoir. In the event that Fairfax County decides to conduct any dredging operations in the future, samples of the sediment shall be taken and tested for Arsenic, Barium, Cadmium, Chromium, Lead, Mercury, Selenium, Silver, oil & grease, and pH.

Status of Operation and Maintenance

Operation and maintenance of the structure is the responsibility of Fairfax County. Fairfax County has done an excellent job of operating and maintaining this structure. The last inspection by a professional engineer was conducted on April 20, 2007 and an updated Operation and Maintenance Plan has been developed. The Emergency Action Plan was last updated in October 2007.

Structural Data

The as-built structural data for the dam and watershed is described in Table E.

Table E - Existing Structural Data for Woodglen Lake

Local Name	Woodglen Lake
Site Number	3
Year Completed	1981
Cost	\$356,484
Purpose	Flood control
Drainage Area, mi ²	1.16
Dam Height, feet	38.4
Dam Type	Earthen
Dam Volume, yds ³	60,170
Dam Crest Length, ft	630
Storage Capacity, ac-ft	310.7
Submerged Sediment, ac-ft	94.6
Aerated Sediment, ac-ft	5.3
Flood Storage, ac-ft	210.8
Principal Spillway	
Type	Concrete
Riser Height, ft	30.17
Conduit Size, inches	30
Stages, no.	2
Capacity, cfs	114
Energy Dissipater	Impact Basin
Auxiliary Spillway	
Type	Earthen
Width, ft	75
Capacity, % of PMF	50*
Normal Pool Elev.	334.0
Flood Pool Elev.	345.3
Top of Dam Elev.	354.0

* Based on Gannett Fleming report.

Breach Analysis and Hazard Classification

Breach Analysis: To determine the downstream inundation zones due to a dam breach, a breach analysis was performed using a sunny day breach with the water level at the top of the dam and with the existing principal spillway riser and earthen auxiliary spillway blocked.

The maximum breach discharge of 54,283 cfs was computed using the criteria in Technical Release No. 60, Earth Dams and Reservoirs. The As-Built drawings dated December 1981 and the field surveyed data obtained for Lake Woodglen were used to determine the maximum height used in the breach discharge. The As-Built data was used for determining the depth of water (H) of 38.4 feet at failure.

An analyses using HEC-RAS (unsteady/steady flow) was used to determine the inundation zone due to the breach of the dam. The river cross sections were developed using HEC-GeoRAS and supplemented with As-Built drawings and field survey data. Manning's roughness coefficient

“n” values ranging from 0.16 in the overbank to 0.08 in the channel were used. These values were selected to account for mud/trees/brush that would be disturbed and washed downstream due to a breach of the dam. Contraction and expansion values of 0.1 and 0.3, respectively, were used in the modeling. The extent of model limits were taken to a point where the depth of the inundation area was within 1 foot of the 100-year FEMA floodplain as determined from delineated Fairfax County DFIRM GIS data. Results of the breach analyses are shown in Table C-2 and on the Breach Inundation Map in Appendix C.

The breach inundation zone analysis will be used by the Sponsors to update the Emergency Action Plan (EAP) that currently exists for the dam. The purpose of an EAP is to outline appropriate actions and to designate parties responsible for those actions in the event of a potential failure of the dam. The Sponsors will update the EAP annually with assistance from local emergency response officials. As resources allow, NRCS will provide technical assistance with updating the EAP. The NRCS State Conservationist will ensure that a current EAP is prepared prior to initiation of construction.

Hazard Classification: Woodglen Lake was originally constructed in 1981 for the purpose of protecting downstream lands from flooding. It was built as a SCS class (c) (high hazard) structure with a 100-year design life. The hazard class of the structure remains high because failure may cause loss of life and serious infrastructure damage.

In Virginia, State dam safety regulations require that a high hazard dam must be able to safely pass the volume of water associated with the Probable Maximum Flood (PMF) without overtopping. The Virginia Division of Dam Safety definition of the PMF is “the flood that might be expected from the most severe combination of critical meteorologic and hydrologic conditions that are reasonably possible in the region”. NRCS is required to use the criteria established in NRCS Technical Release 60 (TR-60) to prepare rehabilitation designs. Under these criteria, the Probable Maximum Precipitation (PMP) is used to define the design requirements rather than the Probable Maximum Flood used by the State of Virginia. Since the Probable Maximum Flood is the result of the Probable Maximum Precipitation, the NRCS criteria meet the State criteria.

Current NRCS policy in TR-60 requires an evaluation of both the short duration (6-hour) and the long duration (24-hour) PMP storms to assess the capacity and integrity of the earthen auxiliary spillway. Only the short duration storm is used to check the stability of the spillway. Based on the results of these analyses, NRCS designs for the storm that has the potential to cause the most damage.

According to the most recent State Dam Safety conditional operation and maintenance certificate issued in September 2007, the auxiliary spillway of Woodglen Lake can only safely pass 50% of the runoff associated with the 6-hour PMP without breaching. The 6-hour PMP storm is 28.0 inches of water. The 6-hour storm event that would cause a failure of the auxiliary spillway is a storm with a frequency greater than once in a thousand years (more than 0.1% chance of occurring in a given year). This precipitation is about 12.6 inches. For the 24-hour storm event, this same amount of precipitation would occur once in about 667 years (about 0.15% chance of occurring in a given year). Storms with flood volumes exceeding these percentages of the PMP are likely to result in a breach of the structure.

Evaluation of Potential Failure Modes

Dams are built for the conditions that existed or could reasonably be anticipated during the time of design. Sometimes these conditions change, resulting in dam failure. Several potential modes of failure were evaluated for Woodglen Lake.

Sedimentation: The reservoir is designed to store sediment in the area below the elevation of the principal spillway orifice inlet and to detain floodwater in the area between the principal spillway orifice inlet and the crest of the auxiliary spillway. After the dam is completed, water accumulates below the crest of the principal spillway orifice to create a lake. As the lake fills with sediment, the amount of water in the lake decreases. When the sediment pool has filled to the elevation of the principal spillway orifice inlet, the pool no longer has permanent water storage, but the designed flood detention storage is still intact. If the actual sedimentation rate is greater than the designed sedimentation rate, the sediment storage area will be filled before the design life of the structure has been reached. The additional sediment would begin to fill the floodwater detention area above the principal spillway and reduce the available flood storage. Initially, sediment delivered to the reservoir would pass directly through the principal spillway orifice. Eventually, this orifice would be blocked by debris and sediment, and water would be impounded to the elevation of the second stage weir.

As the detention pool loses storage due to the increased rate of sediment deposition, the auxiliary spillway operates, or has flowage, more often. For a vegetated earthen auxiliary spillway, repeated flows would erode the soil material and eventually cause the spillway to breach. For a structural auxiliary spillway, only the topsoil material would erode, leaving the underlying armor intact but exposed. There would be no potential for a breach. The repair and re-vegetation of the spillway would be conducted under the Operation and Maintenance agreement.

The land use in the watershed above the dam is 70.5% Residential/Business, 15.9% Woodland, 10.7% Transportation (roads), 1.1% Grassland and 1.8% Water. These uses are not expected to change significantly. The future sediment accumulation rate in Woodglen Lake is expected to be the same as the historic rate over time. Based upon the historic sediment deposition rate of 0.77 acre-feet per year, the remaining sediment storage life of Woodglen Lake is 110 years and the potential for failure due to inadequate capacity is very low.

Hydrologic Capacity: Hydrologic failure of a dam can occur by breaching the auxiliary spillway or by overtopping and breaching the dam. The integrity and stability of the auxiliary spillway and dam embankment are dependent on the depth, velocity, and duration of the flow, the vegetative cover, and the resistance of the soil in the auxiliary spillway and dam embankment to erosion. Under the present Virginia criteria for high hazard dams, the auxiliary spillway must have sufficient capacity to pass the full PMF event without breaching the spillway or overtopping the dam. At the present time, Woodglen Lake can pass about 50% of the 6-hour PMF before the auxiliary spillway breach would occur. The overall potential for hydrologic failure of Woodglen Lake is considered to be high because it cannot pass the PMF without breaching the auxiliary spillway.

Seepage: Embankment and foundation seepage can contribute to failure of an embankment by removing (piping) soil material through the embankment or foundation. As the soil material is removed, the voids created allow even more water flow through the embankment or foundation, until the dam collapses due to the internal erosion. Seepage that increases with a rise in pool elevation is an indication of a potential problem, as is stained or muddy water or “sand boils”

(the up-welling of sediment transported by water through voided areas). Foundation and embankment drainage systems can alleviate the seepage problem by removing the water without allowing soil particles to be transported away from the dam.

According to the 2006 camera survey, the principal spillway pipe for Woodglen Lake does not exhibit signs of seepage. The camera survey of the sewer pipes under the embankment was completed on August 28, 2007. The survey found the lines to be in good condition. Wet areas along the downstream groins were noted. Flow was observed in the right embankment drain, but none in the left drain. The wet areas were noted in several inspections after recent snowmelt and rainfall, but found dry during inspections which occurred during dry periods. A piezometer was installed by Fairfax County at the downstream edge of the top of embankment, along the left side of the principal spillway pipe. Piezometer readings taken by Fairfax County on a 3 month interval indicate the phreatic line is well below the embankment surface. This condition will continue to be monitored, but slope failure due to saturation is unlikely. The potential for a seepage failure of Woodglen Lake is considered to be low.

Seismic: The integrity and stability of an earthen embankment are dependent upon the presence of a stable foundation. Foundation movement through consolidation, compression, or lateral movement can cause the creation of voids within an embankment, separation of the principal spillway conduit joints, or in extreme cases, complete collapse of the embankment. The Pohick Creek watershed is not located within an area of significant seismic risk; therefore, there is low potential for seismic activity to cause failure of the dam.

Material Deterioration: The materials used in the principal spillway system, the embankment drains, and the pool drainage system are subject to weathering and chemical reactions due to natural elements within the soil, water, and atmosphere. Concrete risers and conduits can deteriorate and crack, metal components can rust and corrode, and leaks can develop. Embankment failure can occur from internal erosion caused by these leaks. The camera survey of the principal spillway pipe show no material deterioration. Failure of the dam is not likely to occur through material failure.

Conclusion: At the present time, Woodglen Lake has the potential to fail due to a lack of hydrologic capacity since the soils in the auxiliary spillway do not have the structural integrity necessary to pass the required storm event. The sediment capacity is adequate, there are no signs of seepage, the site is not in a seismic activity area, and the material components are in satisfactory condition.

Consequences of Dam Failure for the Existing Auxiliary Spillway Condition

NRCS and the State of Virginia consider this dam to be an unsafe structure because it does not meet the criteria established for a high hazard dam and is at risk for catastrophic failure under extreme rainfall event conditions. This dam is unsafe, not because of imminent danger, but because the soil materials in the auxiliary spillway do not have the structural integrity necessary to resist the flows resulting from the PMP. The dam was designed to detain the rainfall from the 100-year, 10-day storm without releasing water through the auxiliary spillway. Since the dam was built, more rainfall data has been compiled. Because of additional rainfall data and the storage that is less than designed, the dam now stores less than the 100-year, 10-day storm volume. This means that the auxiliary spillway will flow more frequently. Until rehabilitation is complete, storm events with anticipated precipitation amounts greater than 10 inches should be

monitored closely in order to be able to implement the Emergency Action Plan (EAP) in a timely manner.

Currently Fairfax County's EAP will be triggered for a Stage II or III condition when they receive relatively conservative rainfall amounts at the dam. A Stage II condition is triggered by 3.0 inches of rain in 6 hours, 3.5 inches in 12 hours, and 4.0 inches in 24 hours. A Stage III condition is triggered by 5.4 inches of rain in 6 hours, 6.9 inches in 12 hours, and 8.4 inches in 24 hours. Fairfax County has also undertaken a project for the installation of monitoring equipment at all their PL-566 flood control dams. This instrumentation is expected to be installed in the summer of 2008 and will provide near real-time data on rainfall, flows, and lake water levels.

Storage in the reservoir will be about 402 acre-feet with a depth in the auxiliary spillway of approximately 2.9 feet when the breach is modeled to occur. The Norfolk Southern/VRE railroad line, and Roberts Parkway will be affected along with their associated utilities. Some businesses and residences downstream could experience some flood damages due to their proximity to the creek. Some residents may have loss of access to emergency services due to flooding on residential roads.

Consequences of Dam Failure by Overtopping

For the purposes of preparing the Emergency Action Plan, a worst-case scenario is assumed in the analysis of a possible dam failure. This scenario assumes a sunny day breach, with no advance warning. Dam failure is assumed to occur when water begins to overtop the embankment due to the unresolved blockage of the principal and auxiliary spillways. It is assumed that structural collapse would occur quickly and result in a release of 635 acre-feet of water and sediment, beginning with a wall of water that is about 38.4 feet high in the event of a dam failure.

The breach analysis indicates that the inundation zone due to the breach of the Woodglen Dam would jeopardize 157 homes and place approximately 875 residents, workers and clients at a fatal risk. Additionally, commuters on two major road (Roberts Parkway and Guinea Road) and one railroad (Norfolk Southern Railway) and people at fourteen industrial sites, two public sites, four commercial sites and two office sites would also be at a fatal risk. Approximately four important utilities (sewer, water, electrical, and telecommunications) would also be at risk. Vehicles on Premier Court and Sideburn Road would also be affected. In addition to the damage caused by the water, a significant volume of sediment will initially be flushed downstream in the event of a catastrophic breach. Highly erodible sediment remaining in the sediment pool will continue to cause persistent sediment deposition problems for the downstream channel and floodplain. This is a total distance of about two miles. Access to emergency services would be limited.

Traffic counts from VDOT indicate that an additional exposure to loss of life could occur as a result of the 13,000 vehicles that cross Pohick Creek at Roberts Parkway, and also the vehicles on Premier Court (9,800), Guinea Road (16,000), and Sideburn Road (100). About 9,000 passengers use the rail system each day and their commute would be disrupted for an estimated 9-10 months. Freight traffic would also be disrupted. The utilities associated with the transportation routes could also be destroyed.

The economic damages would include the damages to the homes, businesses, roads, rail lines, and utilities, the loss of business activity, and the loss of the lake and corresponding decreases in property values and recreational opportunities. The residences and business properties at risk in the area of the floodplain subject to a breach of Woodglen Lake have structure and content values estimated at over \$105.9 million. In addition, potentially impacted infrastructure is valued at over \$16.2 million. Infrastructure damage caused by a catastrophic breach would include the loss of the Norfolk Southern/VRE railroad, Roberts Parkway, several communication lines, electrical lines, sewer lines and water lines. Economic damages resulting from these losses would be approximately \$15.5 million. Longer-term costs of the loss of these infrastructure components would also be incurred due to the need for alternate routes during the replacement period. Other economic damages from a catastrophic breach would be: a) lost recreation opportunities with the lake gone; b) changes in real property values and the tax base associated with increased flooding in the future; and c) increased flood damages in the future for remaining properties due to the absence of the dam and its flood protection effects. A catastrophic breach of the Woodglen Lake dam would result in a total estimated \$49.8 million in damages.

The environmental damages of a dam failure would also be significant. In addition to the damage caused by the water, a significant volume of sediment would initially be flushed downstream in the event of a catastrophic breach. At its full capacity, Woodglen Lake has a sediment storage volume of 99.88 acre-feet. Highly erodible sediment remaining in the sediment pool would continue to cause persistent sediment deposition problems for the downstream channel and floodplain. The 0.1 acres of wetlands at the lower end of the lake would be removed if the water and sediment were released. Approximately two miles of stream channel downstream of the dam would be damaged by scouring or deposition. Sediment would be deposited in the floodplain. This would constrict the floodplain and cause additional flooding in subsequent storm events. Deposition of sediment in the floodplain would also restrict normal use of the land which may cause water quality problems in the future. It is unlikely that a catastrophic breach would remove all of the fill material used to build the dam. The embankment material remaining after a breach would also eventually erode into the stream, contributing to the downstream sediment deposition. The nutrients in the sediment could also cause water quality problems in the future. Over time, the sediment and attached nutrients would migrate downstream into the Potomac River, and eventually to the Chesapeake Bay.

There is also a potential for stream degradation upstream from the dam. The abrupt removal of the water and sediment would cause instability in the streams and stormwater drains feeding the reservoir. These channels would develop headcuts that would migrate upstream to the first culvert. The culverts will stop the headcutting from proceeding upstream. Downcutting and widening will continue to occur in the lake bed.

FORMULATION AND COMPARISON OF ALTERNATIVES

The stated objectives of the Woodglen Lake Rehabilitation Plan for the Sponsors are: 1) to bring the Woodglen Lake dam into compliance with current dam safety and design criteria; 2) to maintain the current level of flood protection provided by Woodglen Lake; and 3) to address the local residents' concerns rated as high. These objectives can be met by installing measures which will bring the dam into compliance with State and Federal regulations. Under the Watershed Rehabilitation Provisions of the Watershed Protection and Flood Prevention Act, NRCS is required to consider the technical, social, and economic feasibility of both the locally preferred solution and other alternatives identified through the planning process.

FORMULATION PROCESS

Formulation of alternative rehabilitation plans for Woodglen Lake followed procedures outlined in the NRCS *National Watershed Manual, Part 504.38*. Other guidance incorporated into the formulation process included the NRCS *National Planning Procedures Handbook, Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies*, and other NRCS watershed planning policies. Each alternative evaluated in detail used a 74 year period of analysis, which includes a two year installation period and 72 years of expected useful life. This period of analysis was chosen because 72 years is the remaining life of the project based on the original design and two additional years to complete implementation. The existing structure actually is estimated to have 110 years of remaining sediment storage capacity. All other components are sound, especially the principal spillway and riser, and were originally projected to have 100 year useful lives. Thus, it is anticipated that the dam will continue to be in service at least 72 years after rehabilitation, assuming proper maintenance, and could well last significantly longer. However, the sponsors did not want to lengthen the operation and maintenance agreement beyond the original expected useful life.

The formulation process began with formal discussions between the Sponsors, the Virginia Division of Dam Safety, and NRCS. The Virginia Division of Dam Safety conveyed state law and policy associated with a high hazard dam. NRCS explained agency policy associated with the Small Watershed Dam Rehabilitation Program and related alternative plans of action. As a result, alternative plans of action were developed based on NRCS planning requirements and the ability of the alternatives to address the initial objective of bringing the Woodglen Lake into compliance with current dam safety criteria.

Table F - Alternative Plans of Action

1. No Federal Action (Sponsors' Rehabilitation)
2. Decommission the Dam
3. Non-Structural – Relocate or Floodproof Structures in the Breach Zone
4. Rehabilitate the Dam

Alternative plans of action were presented to the public at a public meeting on November 28, 2007. Public meeting participants identified no additional viable alternative plans of actions to be considered during the planning process.

ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED STUDY

Some of the alternatives considered in the planning process were eliminated from detailed consideration because they did not meet the needs of the Sponsors.

Decommission Dam: Decommissioning is an alternative which includes a plan to remove the flood detention capacity of the dam by removing a portion (or all) of the existing embankment down to the valley floor and restoring the function and stability of the stream channel and the 100-year floodplain. Decommissioning may require grading of the sediment pool to remove accumulated sediment. The removal of the principal spillway riser and pipe is also necessary. These unneeded materials may be buried or hauled to an appropriate disposal site.

Decommissioning is a mandatory rehabilitation alternative under NRCS policy. However, since this alternative did not meet the identified purpose and need of the plan which was to provide continued flood protection, it was not considered as a viable option for detailed development. In addition, the costs for decommissioning would be more expensive than other alternatives studied in detail. Overall costs would include the necessary upgrades to downstream bridges affected by the increased volume of water. Table G lists some of the components of decommissioning.

Table G – Individual Components of Dam Decommissioning

Fill Removed, CY	60,170
Channel Restoration, mi.	0.75
Accumulated Sediment to be removed, CY	24,316
Forested Riparian Buffer to be created, acres	18.0
Critical Area Treatment, acres	7.0
Off-Site Disposal, tons	204
Cost of structure removal only*	\$3,254,200

* Other costs would include mitigation for induced damages, loss of recreation, and reduced property values.

Decommissioning would induce flooding downstream if the structure was removed. Federal policy requires that induced damages be mitigated. Since the floodplain boundaries were delineated prior to construction of the Pohick Creek dams, the present 100-year floodplain enforced by the county is slightly larger than the actual post-construction 100-year floodplain. However, there would still be the need to mitigate for damage to the roads, bridges, and utilities in the watershed. None of the roads, railroads, or utilities are currently damaged in the 100-year event because the presence of the dam regulates the release of the water.

Non-Structural - Relocation or Floodproof Structures in 100-year Floodplain: There are no homes located in the 100-year floodplain of Woodglen Lake. However, the VRE railroad station building and parking lot are located within the floodplain. It is not feasible to relocate or floodproof the roads, bridges, and utilities that are at risk in the 100-year floodplain. Since the homes, businesses, and public buildings located in the breach inundation zone are only around

the perimeter of the zone, it is not economically practical to relocate or floodproof these structures given the unlikely event of a dam breach.

DESCRIPTION OF ALTERNATIVE PLANS CONSIDERED

No Federal Action (Sponsors' Rehabilitation): With this alternative, no federal funds would be expended. Since the Woodglen Lake does not meet current safety and performance standards, it is considered to be "unsafe." The Virginia Division of Dam Safety has issued a conditional certificate of operation for the dam. It is reasonable and prudent to expect that the Virginia Division of Dam Safety will soon issue an Administrative Order requiring the Sponsors to bring the dam up to State standards by rehabilitation of the dam or remove the hazard by removing the storage function of the reservoir. The Sponsors would be totally responsible for the cost of rehabilitation of the dam. NRCS would still have the technical responsibility of approving the Sponsors' solution.

At the present time, the potential for an uncontrolled breach and resulting damage is present until such time as the existing dam safety issues are addressed and resolved.

Without NRCS assistance, the Sponsors would have the following options:

- Hire a consultant, prepare plans to meet the State of Virginia and NRCS standards, and rehabilitate the dam using their own resources.
- Do nothing. In this case, the Virginia Division of Dam Safety may choose to breach the dam and send the Sponsors the bill. This option is likely to be more expensive than if the Sponsors performed the breach. The end results would be the same as those for the next option. This option would not meet the Sponsors' goal of maintaining the existing level of flood protection.
- The Sponsors could remove the flood storage capacity of the dam by breaching the dam using a least cost method. This breach would be a minimum size hole in the dam from the top of the dam to the valley floor, which would eliminate the structure's ability to store water. Downstream flooding conditions would be similar to those that existed prior to the construction of the dam. The sediment would not be stabilized and would migrate downstream. This course of action would minimize the Sponsors' dam safety liability but would not eliminate all liability as it would induce flooding downstream. This option would not meet the Sponsors' goal of maintaining existing levels of flood control.

For the purposes of this evaluation, the Sponsors' Rehabilitation will be used as the No Federal Action alternative.

Rehabilitate dam: There were several solutions considered under the Rehabilitation alternative. The options had to address the following issues:

- 1) Prevent a breach of the auxiliary spillway.
- 2) Protect the dam embankment by raising the training dike.

Issue 1. Prevent a Breach of the Auxiliary Spillway: The only type of material that will withstand the velocities that will occur in the auxiliary spillway during the PMP storm event is concrete.

Option 1. Roller-compacted concrete (RCC) is a non-reinforced concrete that is durable and easy to install. It would be placed along the floor of the spillway from the level section to the valley floor. It is not practical for use at Woodglen Lake for several reasons. The primary reason is that RCC has a very limited window of installation time. Each batch of concrete must be installed within a time window of less than an hour. This would necessitate installation of a portable concrete mixing plant on site. Since the available working space on site is inadequate, this is not feasible.

A second reason for not choosing RCC is its aesthetic appearance. Although the concrete could be tinted to make it less conspicuous, it would not be practical to cover the RCC with soil and grass. Both would be eroded away every time there was flow in the auxiliary spillway due to the limited rooting depth of only one foot. This would have to be replaced after each flow event under the Operation and Maintenance plan. There would also be the added complication of polluting the downstream watershed with the eroded sediment.

Safety is the third concern. The relatively smooth surface of the concrete on the spillway floor could be attractive to skateboarders, roller skaters, bikers, etc. There is potential liability associated with these activities. There would also be the potential to attract vandalism in the form of graffiti.

Roller-compacted concrete is also the more expensive of the two options for armoring. It would cost about \$2,400,000 for installation alone (excluding technical assistance and project administration).

Option 2. Articulated Concrete Blocks (ACBs) are individually constructed concrete blocks that are cabled together to form a continuous erosion-resistant mattress (see Figures 1 and 2). This mattress would extend from the level section of the spillway to the valley floor. The proposed blocks are “open cell” which provides about 20% open space within and around the block. Geotextile fabric and six inches of gravel would be placed on the prepared subgrade to provide permeability and filtration while providing soil retention. The concrete mat would then be set over the geotextile fabric. Topsoil would be placed in the cells of the blocks and around the blocks. For the purpose of this plan, it is assumed that all of the ACBs will be covered with a foot of topsoil to allow more extensive vegetation of the site and to conceal the armoring. The rooting depth of the vegetation would include both the topsoil and the thickness of the ACBs. Small flows in the auxiliary spillway will do little damage to the site. Larger flows could erode the soil and grass downstream. Any necessary repairs would be addressed as part of the routine operation and maintenance of the site. Damage to the auxiliary spillway would be limited to just the topsoil and grass removal since the ACBs underneath the soil would provide the structural integrity necessary to prevent a breach. The vegetated surface would not be harmed by foot or bicycle traffic or by the vehicles used for maintenance around the lake, although care should be taken to avoid establishing ruts in the topsoil. The footpath to the top of the dam will need to be re-established in the inlet section or sufficiently downstream of the auxiliary spillway to avoid causing a discontinuity in the auxiliary spillway surface.

The ACBs would be placed at an elevation of 344.3 feet. With one foot of topsoil over the ACBs, the auxiliary spillway crest would remain at the existing elevation of 345.3 feet MSL. This would maintain the existing level of flood storage behind the dam. If flows in the auxiliary spillway cause the soils to be removed to the level of the ACBs, then the overall water storage below the crest will be reduced by a foot.

The ACBs can be manufactured off-site and trucked in for installation which reduces the amount of space needed for a staging area.

Installation of Articulated Concrete Blocks would cost about \$1,940,000. This includes building the training dikes.

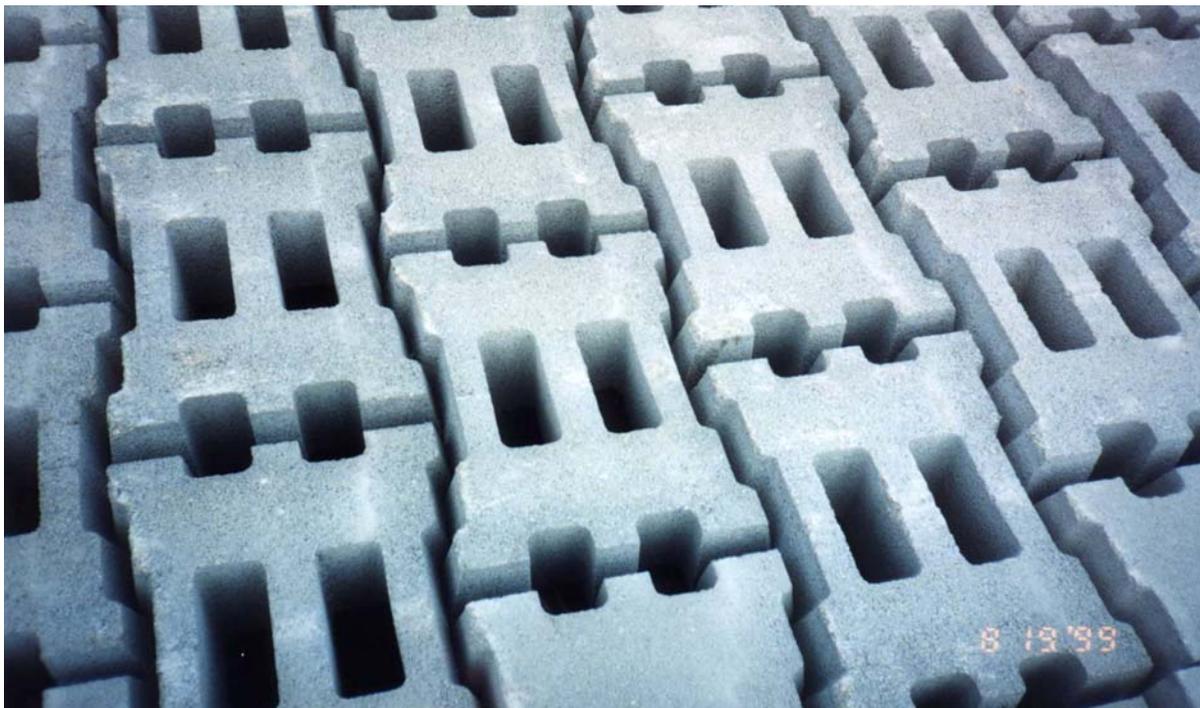


Figure 1. Open-Cell Articulated Concrete Blocks



Figure 2. Installation of Articulated Concrete Block Mattress

Issue 2. Protect the Dam Embankment by Raising the Training Dike: The purpose of a training dike is direct the flow of water. The existing training dike is meant to keep any water that might flow in the auxiliary spillway from eroding the embankment of the dam. Since the spillway length will be changed, it will also be necessary to put a training dike on the outside edge of the spillway to direct the water safely to the valley floor. Both training dikes will be about 10 feet high at the crest of the auxiliary spillway and will taper to a height of 6 feet at the lower end. The dikes would be about 440 feet long on both sides.

Option 1: Earthen training dikes would look a lot like the training dike that is presently on site but would be longer. The inside and outside side slopes would be graded on a 3:1 slope with a 12 foot wide top. Both the outside slope and the top would be vegetated earth. The inside slope of each training dike would be armored with the same material used to armor the spillway floor. If the ACBs are used, the inside slopes will be covered with a foot of topsoil. Because there is an embankment on both sides of the auxiliary spillway, the footprint on the ground would range from about 220 feet wide at the upstream end to about 170 feet wide at the downstream end.

Option 2: The training dikes could also be made with a vertical concrete wall. This wall would be about one foot wide and would take up very little space along the spillway. However, it is visually unappealing, would be difficult to keep people off of, and would be vulnerable to vandalism by graffiti. The Woodglen Lake Task Force determined that this option was undesirable.

SELECTED REHABILITATION ALTERNATIVE

The potential solutions were evaluated for cost and engineering feasibility. This information was presented to the Sponsors at a meeting on November 8, 2007, and to the public at a meeting on November 28, 2007. The selected alternative for Woodglen Lake is install earthen training dikes to control the flow direction of the water and to armor the spillway and interior slopes of the training dikes with ACBs. The construction cost for this solution would be \$1,940,000.

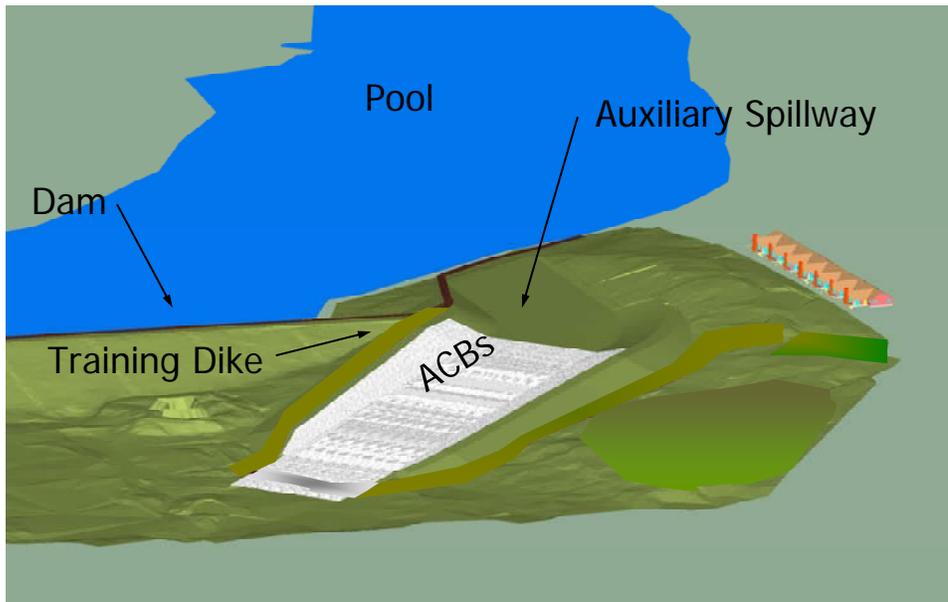


Figure 3. Perspective View of Recommended Alternative

EFFECTS OF ALTERNATIVE PLANS

Alternative plans of action can result in a multitude of effects on resources upstream and downstream of Woodglen Lake. This section describes anticipated effects on resource concerns identified by the Sponsors, the public, and agency personnel. Effects of alternative plans of action on resource concerns of national importance are also included.

There are two plans that will be considered and evaluated in detail: 1) No Federal Action (Sponsors' Rehabilitation) and 2) Rehabilitation of the dam with the selected alternative. The Sponsors have indicated that they will use the plan developed by NRCS to complete the rehabilitation of the dam in the event that Federal funding is not available. Therefore, the Sponsors' Rehabilitation is the same as the Federal rehabilitation and the effects of the rehabilitation will be the same.

Air Quality

Existing Condition: Air quality in the project area is satisfactory and below the Ambient Air Quality Standard for PM_{2.5} as measured at several monitoring stations in Fairfax County.

No Federal Action (Sponsors' Rehabilitation): During the rehabilitation of the auxiliary spillway, particulate matter (dust) from construction activities will increase. Since this will be temporary in nature, air pollution abatement requirements will be included in the design.

Rehabilitate Dam: Same as the No Federal Action (Sponsors' Rehabilitation).

Coastal Zone Management and Chesapeake Bay Act

Existing Conditions: Woodglen Lake is located in the Chesapeake Bay drainage area. As such, it is subject to the requirements of the Chesapeake Bay Preservation Act and the Virginia Coastal Zone Management Program.

No Federal Action (Sponsors' Rehabilitation): Rehabilitation of the auxiliary spillway of Woodglen Lake will be done in accordance with all of the requirements and restrictions that are necessary. Fairfax County is responsible for assuring compliance and for obtaining any necessary permits and certificates. Two acres of trees will be planted in the watershed to compensate for the permanent conversion of woodland to grassland in accordance with the requirements of the Chesapeake Bay Preservation Act.

Rehabilitate Dam: Same as the No Federal Action (Sponsors' Rehabilitation).

Erosion and Sedimentation

Existing Conditions: The Woodglen Lake dam has trapped 20.0 acre-feet (32,356 cubic yards) of sediment in its reservoir and tributaries since its construction in 1981. Parts of the lake have been dredged twice since 1985 with approximately 5.0 acre-feet of sediment being removed. Based on the 2007 sediment survey, there are 15.0 acre-feet of sediment in the reservoir and its tributaries. The sediment accumulation rate is 0.77 acre-feet per year. At this rate of sediment accumulation, there is enough storage available for an additional 110 years.

No Federal Action (Sponsors' Rehabilitation): The dam will continue to provide flood control for at least 72 years after rehabilitation. Sedimentation is expected to continue at its current rate of 0.77 acre-feet per year. Trapping this sediment will decrease sediment deposition in Pohick

Creek, the Potomac River, or the Chesapeake Bay. The Sponsors can also take measures to reduce the sediment loading to the reservoir. Additional erosion and sediment controls and sediment forebays are examples of steps that could be taken.

As an activity separate from the rehabilitation of the dam, Fairfax County may choose to dredge the lake to improve the aesthetic appearance and increase the sediment storage capacity. This would be the sole responsibility of the County and be funded and permitted as such.

Rehabilitate Dam: Same as the No Federal Action (Sponsors' Rehabilitation). Since adequate sediment storage is available to meet the minimum 50-year life established by the National Watershed Manual, Circular 7, Section 508.45, no federal funds would be used to remove sediment from this reservoir.

Fish and Wildlife Habitat/Fisheries

Existing Conditions: The lake was formerly managed by the Virginia Department of Game and Inland Fisheries as a recreational fishery in the past, but is no longer maintained due to periodic dredging of the lake. Some limited fishing opportunity exists. The lake continues to provide habitat for a number of cool and warm water fish species such as large and smallmouth bass, bluegills, sunfish, bullheads and a number of species of forage fish including shiners, minnows, dace and killifish. The terrestrial species, wading birds, and shore birds in the watershed are well-adapted to the fragmented environment around the dam.

No Federal Action (Sponsors' Rehabilitation): Rehabilitation of the dam would result in no major changes in wildlife habitat around the lake. Terrestrial habitats below the dam will be affected by the conversion of 2.0 acres of trees to grass. Two acres of trees will be planted elsewhere in the watershed to mitigate for this loss on site. There may be some short-term effects from the temporary removal of grasses on the embankment and auxiliary spillway areas of the dam. Habitat in the pool area would not change.

Rehabilitate Dam: Same as the No Federal Action (Sponsors' Rehabilitation).

Floodplain Management and Flooding

Existing Conditions: In the early 1970s, Fairfax County zoned the floodplain of Pohick Creek to restrict development in the 100-year floodplain. Since this work was done prior to construction of the six flood control dams built by NRCS, the zoned floodplain is more extensive than the post-construction floodplain. There will be little or no damage to the homes, businesses, or infrastructure from the 100-year storm event with the exception of the VRE railroad station.

No Federal Action (Sponsors' Rehabilitation): The flood reduction benefits currently provided by Woodglen Lake would be extended for a projected 72 years after construction. The rehabilitation of Woodglen Lake would result in a higher level of safety/reduced risk for catastrophic breach.

Rehabilitate Dam: Same as the No Federal Action (Sponsors' Rehabilitation).

Forestry and Parks

Existing Conditions: The land around the lake is forested and much of it is in a designated park.

No Federal Action (Sponsors' Rehabilitation): Any trees that are presently located within 25 feet of the dam will be removed in accordance with Virginia Dam Safety Regulations and the area will be planted to grass. Approximately 3.4 acres of trees will be removed to allow construction of the dikes and armoring. About 2.0 acres will be seeded to grass after construction is complete. Trees will be planted in the remaining disturbed area.

Rehabilitate Dam: Same as the No Federal Action (Sponsors' Rehabilitation).

Historic Resources

Existing Conditions: A field reconnaissance was conducted in February 2007 of the area below the dam downstream for approximately 200 meters. No previously recorded archaeological sites are present within the surveyed area. A Phase I archaeological investigation was completed in December 2007. Six artifacts were recovered from five shovel test pits (STPs) which allowed designation of Site 44FXWG-1. A recommendation of **not eligible** for the NRHP, and no further work required was made by the consultant, and accepted by DHR-SHPO.

No Federal Action (Sponsors' Rehabilitation): Same as Existing Conditions.

Rehabilitate Dam: Same as Existing Conditions.

Prime and Unique Farmlands

There are no prime or unique farmlands within the watershed.

Property Values Around the Lake

Existing Conditions: There are 35 homes located around the normal pool. They have an estimated average market value of \$621,000 and a total value of \$21,735,000.

No Federal Action (Sponsors' Rehabilitation): There are no anticipated changes to the existing property values as a result of the planned rehabilitation activities. Indeed, rehabilitation of the dam ensures that property values around the lake will maintain a premium over property away from the lake.

Rehabilitate Dam: Same as the No Federal Action (Sponsors' Rehabilitation).

Public Recreation

Existing Condition: There are multiple opportunities for recreation associated with Woodglen Lake. In addition to the lake-based activities such as boating and fishing, there are opportunities for cycling, jogging, walking, and environmental education. Bird watching is also a popular activity.

No Federal Action (Sponsors' Rehabilitation): There are no anticipated changes to the existing recreational opportunities as a result of the planned rehabilitation activities.

Rehabilitate Dam: Same as the No Federal Action (Sponsors' Rehabilitation).

Public Safety

Existing Conditions: The soil material in the existing earth auxiliary spillway does not have the integrity necessary to withstand the PMP event. It is projected that the auxiliary spillway would breach at a 6-hour precipitation event of approximately 13 inches. In addition to the amount of

water flowing through the auxiliary spillway, this event has the potential to release the entire amount of water and sediment stored upstream of the dam. This is a volume of approximately 402 acre-feet. Sideburn Road, Guinea Road, Roberts Parkway, Premier Court, the Norfolk Southern/VRE railroad tracks, and all the associated utilities will be damaged. There is the potential for loss of life in the event of a dam breach.

No Federal Action (Sponsors' Rehabilitation): Under this alternative, the dam would be structurally rehabilitated using current design and safety criteria in order to provide continued flood protection for 72 years after the two year rehabilitation period is complete. The downstream flooding levels would be the same as they are presently. The threat to loss of life from failure of the dam would be greatly reduced.

Rehabilitate Dam: Same as the No Federal Action (Sponsors' Rehabilitation).

Sewer Utilities

Existing Condition: A 10 inch sewer pipe passes under the right embankment of the dam and a 18 inch sewer pipe passes under the left embankment. The pipes were installed before the dam was constructed. Concrete bedding was placed under the pipes, beginning 50 feet upstream of the toe of the embankment and continuing 50 feet beyond the downstream toe of the embankment. Seven anti-seep collars were used along each pipe, spaced at equal distances under the embankment.

No Federal Action (Sponsors' Rehabilitation): There are no anticipated changes to the existing sewer pipes as a result of the planned rehabilitation activities. Any needed repairs would be the responsibility of Fairfax County and would be independent of the rehabilitation effort.

Rehabilitate Dam: Same as the No Federal Action (Sponsors' Rehabilitation).

Stormwater Management

Existing Condition: Woodglen Lake contributes to the management of stormwater in Fairfax County by providing detention of floodwater and its controlled release. It was designed to detain the volume of water that would run off the land in a 100-year frequency (1% chance of occurrence) storm event. Due to an increase in the rainfall for the area and a decrease in the available storage, the storm that will cause flow in the auxiliary spillway at its present elevation will occur with a statistical frequency of once in about 62 years (a 1.6% chance of occurrence in a given year).

No Federal Action (Sponsors' Rehabilitation): Rehabilitation of Woodglen Lake will continue to provide stormwater management control within the watershed at the existing level of floodwater detention. Should flow occur in the auxiliary spillway and remove the one foot of topsoil over the articulated concrete blocks, there will be slightly less detention capacity until the site is repaired.

Rehabilitate Dam: Same as the No Federal Action (Sponsors' Rehabilitation).

Threatened and Endangered Species

Existing Conditions: There are seven State Threatened (ST) and one State Endangered (SE) animal species known or likely to occur within a two mile radius of the Woodglen Lake dam.

There are no confirmed sightings of these species. Four of these are also Federal Species of Concern (FS).

No Federal Action (Sponsors' Rehabilitation): It is unlikely that rehabilitation of the dam would affect any of the state-listed threatened or endangered species or their habitat.

Rehabilitate Dam: Same as No Federal Action (Sponsors' Rehabilitation).

Transportation

Existing Conditions: There are three main roads which are in the breach zone below the dam, Roberts Parkway, Guinea Road, and Burke Lake Road. There are several streets in residential areas that would be affected. The Norfolk Southern/VRE railroad tracks would be inundated in much of the breach inundation zone. All of this infrastructure would be negatively affected by flood waters during a breach.

No Federal Action (Sponsors' Rehabilitation): The continuation of flood control for another 72 years after rehabilitation would provide continued access to transportation routes in the watershed that currently exist. Access to towns, shopping, schools, work places, medical services, and emergency services would be the same as under present conditions.

Rehabilitate Dam: Same as the No Federal Action (Sponsors' Rehabilitation).

Water Quality

Existing Conditions: Woodglen Lake and the Sideburn Branch on which it is located are not listed as impaired in the 2006 305(b)/303(d) Integrated Water Quality Assessment, although there are significant inputs of nitrogen, phosphorus and sediment from urban runoff.

No Federal Action (Sponsors' Rehabilitation): Rehabilitation of the dam will not significantly alter the present water quality in the watershed. With the required Erosion and Sediment Control Measures, there should be no impacts on water quality associated with construction. No long-term impacts are anticipated.

Rehabilitate Dam: Same as the No Federal Action (Sponsors' Rehabilitation).

Wetlands

Existing Conditions: The tributaries of Woodglen Lake have stable outlets but are transporting some sediment into the lake. A small wetland of approximately 0.1 acres exists on the east shore of the lake just above the dam area, and is considered a jurisdictional wetland by the U.S. Army Corps of Engineers. There are 2.8 acres of jurisdictional wetlands near the projected construction area for the extended auxiliary spillway and the construction access road. Of these, only 0.56 acres are in the area of the proposed spillway.

No Federal Action (Sponsors' Rehabilitation): Rehabilitation of the dam will have no effect on the Sideburn Branch, the upstream wetland, or the lake itself. During construction, the downstream wetlands near the auxiliary spillway will be avoided and impacts to them kept to a minimum. Mitigation will occur, as needed.

Rehabilitate Dam: Same as the No Federal Action (Sponsors' Rehabilitation).

Wild and Scenic Rivers

There are no wild and scenic rivers associated with Woodglen Lake.

Noise Pollution

Existing Condition: There is no noise pollution currently associated with the presence of the lake.

No Federal Action (Sponsors' Rehabilitation): During the rehabilitation of the auxiliary spillway, there will be some noise from the construction activities. Since this will be temporary in nature, practical remedies might consist of things like setting daily starting and stopping time requirements. There may be some additional costs associated this noise reduction practice.

Rehabilitate Dam: Same as the No Federal Action (Sponsors' Rehabilitation).

Aesthetics

Existing Condition: At the present time, the auxiliary spillway and training dike are grassed with trees located in the exit area and in the area immediately upstream of the dam.

No Federal Action (Sponsors' Rehabilitation): When the rehabilitation of the auxiliary spillway is complete, the part of the auxiliary spillway that is presently in grass will still be mostly in grass and there will be approximately 2.0 acres of grass in the exit channel where there used to be trees. By covering the articulated concrete blocks with soil and vegetation, there will be no visible armor. The two earthen training dikes will have a larger footprint than the single one that is there presently but will be grass-covered. The areas that are disturbed during construction but that are located outside of the rehabilitated spillway will be planted to trees.

Rehabilitate Dam: Same as the No Federal Action (Sponsors' Rehabilitation).

Economic and Social Effects

Existing Conditions: Woodglen Lake has provided flood protection since 1981. Under the existing conditions, there is the potential for loss of life because the dam does not meet current dam safety and design criteria. According to the SITES model, an uncontrolled breach of the Woodglen Lake auxiliary spillway would occur with approximately 2.9 feet of water flowing through it. This could release 402 acre-feet of water and sediment in a wall up to 32.6 feet high. This would cause substantial damages to the downstream properties and infrastructure. The Norfolk Southern/VRE railroad line and Roberts Parkway will be affected along with their associated utilities.

No Federal Action (Sponsors' Rehabilitation): Structural rehabilitation of the Woodglen Lake dam would provide continued flood protection to the residents of the watershed for 72 additional years. Property values around the lakes and downstream of the dam would be maintained. The existing opportunities for recreation would remain for the evaluated lives of the dam. Protection of the roads, bridges, and public utilities would be maintained at the present levels, as would the access to emergency services. In addition to the long-term economic benefits provided by the dam, there would also be short-term economic benefits from the construction activities. An estimate of the flood damage reduction benefits for this alternative as compared to the existing conditions was not made given the fact that this alternative is evaluated with the alternative that involves federal assistance and they are equal in scope, cost and effects.

Rehabilitate Dam: Same as the No Federal Action (Sponsors' Rehabilitation).

Land Use and Management

Existing Conditions: At the present time, the land use in the watershed above the dam is highly urbanized with mostly residential properties and scattered businesses throughout. Some "fill-in" development is occurring within the previously developed area. The 100-year floodplain has been protected from development.

No Federal Action (Sponsors' Rehabilitation): Rehabilitation of the Woodglen Lake dam would not significantly change the existing land use above or below the dam. Approximately 3.4 acres of trees will be cut immediately downstream of the existing auxiliary spillway. About 2.0 acres of this area will be converted to grass and 1.4 acres planted back to trees. An additional 2.0 acres of trees for mitigation will be planted upstream of the dam. Future development in the watershed above the dam could affect the service life of the dam if the erosion and sediment from any development is not adequately controlled.

Rehabilitate Dam: Same as the No Federal Action (Sponsors' Rehabilitation).

Cumulative Effects

The No Federal Action alternative calls for the Sponsors to rehabilitate the dam. The recommended alternative is to rehabilitate the dam with federal assistance. The effects of these two alternatives on the principal resources of concern, along with the social and economic effects, have been addressed in the previous pages and are essentially identical. The cumulative effects of the recommended alternative are to maintain the existing social, economic, and environmental conditions of the community. The cumulative effects of the Sponsors' rehabilitation would be the same. In both the recommended plan and rehabilitation by the local sponsors, the existing dams remain in place; the same level of flood protection is provided and existing emergency actions plans remain in force. The only difference of significance is the hardening of the auxiliary spillway which assures the sites will fulfill their intended functions and the threat to loss of life for area residents will be reduced.

COMPARISON OF ALTERNATIVE PLANS

Table H summarizes the effects of each alternative considered. Refer to the Effects of Alternative Plans section for additional information.

Table H - Summary and Comparison of Candidate Plans

Effects	Future Without Federal Project No Federal Action - Sponsors' Rehabilitation (NED Plan)	Future With Federal Project Structural Rehabilitation with Federal Assistance (Recommended Plan) (NED Plan)
Sponsor Goals	Continue to provide flood protection, reduces liability	Continue to provide flood protection, reduces liability
Structural	Upgrade dam to meet dam safety criteria	Upgrade dam to meet dam safety criteria
Total Project Investment - Woodglen Lake	\$2,519,000	\$2,519,000
National Economic Development Account		
Total Beneficial Annualized (AAEs*)	---	\$118,400
Total Adverse Annualized (AAEs*)	---	\$118,400
Net Beneficial	---	\$0
Benefit/Cost Ratios	---	1.0 to 1.0
Estimated OM&R**	---	\$2,500
Environmental Quality Account		
Coastal Zone Management	No effect.	No effect.
Erosion & Sedimentation	Trap 0.77 ac-ft of sediment annually	Trap 0.77 ac-ft of sediment annually
Forestry and Parks	No effect	No effect
Historic Resources	No effect	No effect
Threatened and Endangered Species	No effect	No effect
Wetlands	Upstream wetland will not be affected. Impacts on downstream wetlands will be mitigated if they cannot be avoided.	Upstream wetland will not be affected. Impacts on downstream wetlands will be mitigated if they cannot be avoided.
Fish & Wildlife Resources	Impacts to terrestrial habitats due to conversion of 2 acres of trees to grass. Two acres of trees will be planted for mitigation.	Impacts to terrestrial habitats due to conversion of 2 acres of trees to grass. Two acres of trees will be planted for mitigation.
Water Quality	No effect	No effect
Other Social Effects Account***		
Public Safety	Decrease potential for loss of life from dam breach	Decrease potential for loss of life from dam breach
Floodwater Damage	Maintains present level of flood protection; no induced damages downstream	Maintains present level of flood protection; no induced damages downstream
Property Values	Values protected	Values protected

Effects	Future Without Federal Project No Federal Action - Sponsors' Rehabilitation (NED Plan)	Future With Federal Project Structural Rehabilitation with Federal Assistance (Recommended Plan) (NED Plan)
Recreation	Opportunities maintained	Opportunities maintained
Sewer Utilities	No effect.	No effect.
Stormwater Management	No effect.	No effect.
Transportation	Access to emergency services maintained at present level; road maintenance continues at present level	Access to emergency services maintained at present level; road maintenance continues at present level
Land Use and Management	Cut 3.4 acres of trees in auxiliary spillway; Replant 1.4 acres of trees and convert 2.0 acres to grass. 2.0 acres of tree planting for mitigation will occur upstream of the dam.	Cut 3.4 acres of trees in auxiliary spillway; Replant 1.4 acres of trees and convert 2.0 acres to grass. 2.0 acres of tree planting for mitigation will occur upstream of the dam.
Noise Pollution	Construction methods will be chosen to minimize noise.	Construction methods will be chosen to minimize noise.
Aesthetics	No change to lake area. The lower end of auxiliary spillway is the only area altered.	No change to lake area. The lower end of auxiliary spillway is the only area altered.
Enhanced protection from future flood events	No added protection beyond that provided under the existing conditions	No added protection beyond that provided under the existing conditions
Exposure/Risk of a catastrophic breach as proxy for associated mental duress	Very low	Very low
Civil Rights Impacts:	Positive across all groups	Positive across all groups
Environmental Justice Impacts:	No disparate treatment	No disparate treatment
Anxiety, frustration and mental duress:	Decreased across all groups with flood storage retained	Decreased across all groups with flood storage retained

* Per 1.7.2 (a) (4) (ii) and 2.1.1(b)(2) of the “Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies” (P&G), U.S. Water Resources Council, March, 1983, allowing for abbreviated procedures, damage reduction and recreation benefits have not been estimated because they are the same for both alternatives and no net change in benefits occurs when comparing the two candidate plans to each other. The federally assisted alternative is displayed within a zero-based accounting context that credits local costs avoided (Total Adverse Annualized for the Future Without Federal Project scenario) as adverse beneficial effects (Total Beneficial Annualized) consistent with P&G 1.7.2(b)(3). Net benefits are zero because the total project cost is equal to the claimed benefits and the resulting B/C ratio is 1:1. “AAEs” stands for Average Annual Equivalents and all costs and benefits are based on a 4.875% discount rate and a 74 year period of analysis.

** OM&R – Operation, Maintenance and Replacement Costs include replacement of topsoil and vegetation over part of the Articulated Concrete Block lined auxiliary spillway once in the anticipated useful life of the structure.

*** Regional Economic Development account (RED) concerns were not identified during the scoping process.

Therefore, the RED account information is not included in the above display.

IDENTIFICATION OF NATIONAL ECONOMIC DEVELOPMENT (NED) PLAN

Detailed evaluation of the candidate plans to rehabilitate Woodglen Lake indicate that they have identical scope, substantially equivalent costs and equal effects. Therefore, both candidate plans are considered as NED plans. However, the rehabilitation alternative with federal assistance is the most locally acceptable alternative and best serves the local sponsors in achieving the needs and purpose of this rehabilitation and therefore is selected as the recommended plan. Per the Federal Principles and Guidelines document and NRCS national policy, when the future without federal project is the same as the future with federal project, the local costs avoided are credited as benefits. This renders the federally assisted alternative as having zero net benefits. Net benefits are zero because by policy the total project cost is equal to the claimed benefits and the resulting B/C ratio is 1:1. The results displayed in Table H are presented within a zero-based accounting context to highlight the costs and benefits associated with the recommended alternative alone. Within a zero-based accounting framework, the “Total Adverse Annualized” value associated with the Future Without Federal Project is displayed as the “Total Beneficial Annualized” in the Future With Federal Project column.

RISK AND UNCERTAINTY

Assessments, considerations, and calculations in this plan are based on a 74 year period of analysis. Associated monetary flooding impacts of downstream houses and businesses were based on the National Flood Insurance Program’s Actuarial Rate Review. National averages were used to identify the value of potential damages. Actual damages occurring from each storm event could realistically be higher or lower, depending on soil moisture conditions at the time of a given event, associated debris flows, future development, and other factors such as changes in precipitation from various storm events. Although potential climatic changes are not expected to alter calculation of the PMP events, they could increase the occurrence of low frequency, high intensity storm events and associated flood damages.

Property rights were procured to the crest of the auxiliary spillway at the time of construction. This meets current NRCS policy. Since no additional development is anticipated in the upstream watershed and there will be no changes made to the crest elevation of the auxiliary spillway, it is not necessary to obtain additional property rights.

No changes in wetlands or water quality are anticipated due to this project. If the wetlands in the auxiliary spillway area cannot be avoided, mitigation will be provided.

The objective of this project is to meet applicable NRCS and Virginia public health and safety standards associated with this watershed dam. From a financing and administrative standpoint, the Sponsors have committed to NRCS that they are able to fund 35 percent of the costs to complete installation of the selected alternative and to perform the required maintenance on the upgraded structure for 72 years after construction. Statistically, the auxiliary spillway should flow only one time during the anticipated life of the rehabilitated structure. However, it is possible for several events to occur during this time period. If the flow in the auxiliary spillway for a single event is assumed to remove all the topsoil and vegetation from the articulated concrete blocks with no damage to the blocks themselves or to any other component of the auxiliary spillway, the estimated repair cost would be about \$12,000. This includes transportation and installation of about 2,004 cubic yards of topsoil and revegetation of about

1.24 acres. It does not include any costs for off-site damages incurred. Lesser events will have smaller costs. Routine maintenance costs are included in the estimated annual O&M costs.

RATIONALE FOR PLAN SELECTION

The recommended plan is to rehabilitate the dam to meet current NRCS and the Commonwealth of Virginia safety and performance standards. The recommended plan meets the identified purposes and needs for the project and significantly reduces the potential risk to human life. The project Sponsors, local residents, and state and local government agencies all prefer the Recommended Plan because it:

- Minimizes the threat to loss of life to approximately 450 residents of the 157 single family homes and townhouses within the breach inundation zone.
- Minimizes the threat to loss of life to people at fourteen industrial facilities, two public sites, four commercial sites and two office sites.
- Provides protection for 38,800 vehicles on a daily basis that utilize Roberts Parkway (13,000 vehicles), Premier Court (9,800 vehicles), Guinea Road (16,000) and Sideburn Road (100 vehicles).
- Provides protection for the Norfolk Southern/VRE and AMTRAK railroads downstream. They have an average daily count of more than 9,000 persons.
- Minimizes the threat of property damage to the 545 vehicles parked daily at the railroad parking lot
- Provide protection for four important utilities (sewers, water, electrical and telecommunication)
- Provides downstream flood protection for the scores of people living in the area, as well as those working, recreating, or traversing within the downstream floodplains for an additional 72 years.
- Eliminates the liability associated with continuing to operate an unsafe dam.
- Traps 0.77 acre feet of sediment annually, thereby improving downstream water quality.
- Maintains existing stream habitat downstream of the dam.
- Retains the existing fish and wildlife habitat around the lake.
- Leverages federal resources to install the planned works of improvement.

When compared to the No Federal Action Alternative (Sponsors' Rehabilitation), the Recommended Alternative (Rehabilitation) better meets the public and technical advisory groups' identified purposes and needs and was subsequently recommended to the Sponsors. The structural alternative meets the Sponsors' objectives of bringing this dam into compliance with current dam design and safety criteria, maintaining the current 100-year floodplain, and addressing resource concerns identified by the public. Finally, the Selected Plan will utilize more federal funds and require less local funds than the No Federal Action alternative. The plan reasonably meets the following four criteria: completeness, effectiveness, efficiency, and acceptability. NRCS and the Sponsors are in agreement with the recommended plan.

CONSULTATION AND PUBLIC PARTICIPATION

Local sponsoring organizations are the Northern Virginia Soil and Water Conservation District and the Fairfax County Board of Supervisors. Fairfax County has been responsible for the operation and maintenance of the Woodglen Lake Dam since it was built. Interest and support for rehabilitating the dam began in the late 1990s when a study completed by a private engineering firm identified some potential problems with the soils in the auxiliary spillway. This was followed in September 2005 with the issuance of a Conditional Certificate by the Virginia Division of Dam Safety. Following the passage of Public Law 106-472 in November of 2000, federal funds became available to eligible applicants. NRCS received an application for dam rehabilitation assistance on May 20, 2002.

Local, State and Federal support for the rehabilitation of the Woodglen Lake Dam has been strong. Input and involvement of the public has been solicited throughout the planning of the project. Many meetings were held with representatives of the Northern Virginia SWCD and Fairfax County to ascertain their interest and concerns regarding the dam. The Sponsors have worked closely with the local landowners and residents to provide information on the planning activities and solicit their input on the pertinent issues considered during planning.

The NRCS National Water Management Center Staff from Little Rock, Arkansas, toured the Pohick Creek Watershed on October 18, 2005 and provided input and support to the ongoing planning efforts. A follow-up teleconference was held with NRCS and Sponsors the next day. Feedback was provided regarding the federal dam rehabilitation program and the completion of a supplemental plan and environmental assessment for the rehabilitation of the dam.

The first public meeting was held at Bonnie Brae Elementary School on December 6, 2006. Local, state and federal perspectives on the rehabilitation needs of the Woodglen Lake dam were provided to the 38 meeting attendees. The public were informed of the dam rehabilitation program and potential alternative solutions to bring the dam into compliance with current dam safety criteria. Meeting participants provided input on their issues and concerns to be considered during the planning process. A fact sheet was developed and distributed which addressed frequently asked questions regarding rehabilitation of the dam.

A scoping meeting was held on March 8, 2007 at Braddock Hall to identify issues of economic, environmental, cultural, and social concerns in the watershed. Input was provided by local, regional, state and federal agencies at the meeting or through letters and emails to NRCS. The SHPO and USFWS were informed of the scoping meeting but did not attend or supply comments.

An on-site visit of the Woodglen Lake dam was conducted for interested residents by NRCS and the Sponsors on March 28, 2007. The group walked over the dam and spillway and discussed how the potential alternatives could affect the various resources of the area.

A Woodglen Lake Task Force meeting was held on November 8, 2007. The planning information gathered and analyzed to date was shared with the community leaders and Sponsors. The recommended alternative was presented and accepted by the Task Force.

A second public meeting was held on November 28, 2007 at the Bonnie Brae Elementary School. Information provided to meeting attendees included a summary of the current situation

of the dam, planning efforts to date, the various alternatives considered during planning, and a detailed explanation of the recommended alternative for dam rehabilitation. There was favorable support and acceptance of the recommended alternative from those in attendance. The meeting attendance totaled about 30 people and included watershed residents, elected officials, Sponsors, and representatives from the county and NRCS.

A Draft Plan was distributed for interagency and public review on February 1, 2008. Copies of the document were placed in local libraries and news articles placed in local newspapers which solicited comments from the public during the comment period. After a 45-day review period, comments received on the draft were incorporated into the Final Plan. Letters of comment received on the draft plan and NRCS responses to the comments are included in Appendix A.

RECOMMENDED PLAN

SUMMARY AND PURPOSE

This supplemental plan documents the planning process by which the NRCS provided technical assistance to local Sponsors, technical advisors, and the public in addressing resource issues and concerns relative to the rehabilitation of Woodglen Lake.

The recommended plan is to rehabilitate the dam. By doing this, the present level of flood protection is maintained, property values are protected, and the threat to loss of life is reduced. The recommended plan of action for the dam is outlined below:

- Raise and lengthen the existing training dike to protect the dam embankment. Install a second dike to direct auxiliary spillway flow to the valley floor.
- Armor the auxiliary spillway and training dikes with articulated concrete blocks to prevent a breach of the auxiliary spillway.

After the implementation of these planned works of improvement, Woodglen Lake will meet all current NRCS and State of Virginia dam safety and performance standards.

Detailed structural data for the proposed rehabilitated dam can be found in Table 3.

EASEMENTS AND LANDRIGHTS

The Sponsors are responsible for obtaining any needed landrights and easements associated with the rehabilitation project. It is projected that no additional landrights will be needed in order to complete the rehabilitation project. Additional flood easements will not be required because the flood storage of the structure will not change. There are no relocations planned as a result of the installation of the project measures.

MITIGATION

The expected mitigation requirements for this project include two acres of tree planting. In addition, it may be necessary to mitigate for up to 0.56 acres of disturbed wetland. The required mitigation ratio for forested wetlands is two to one.

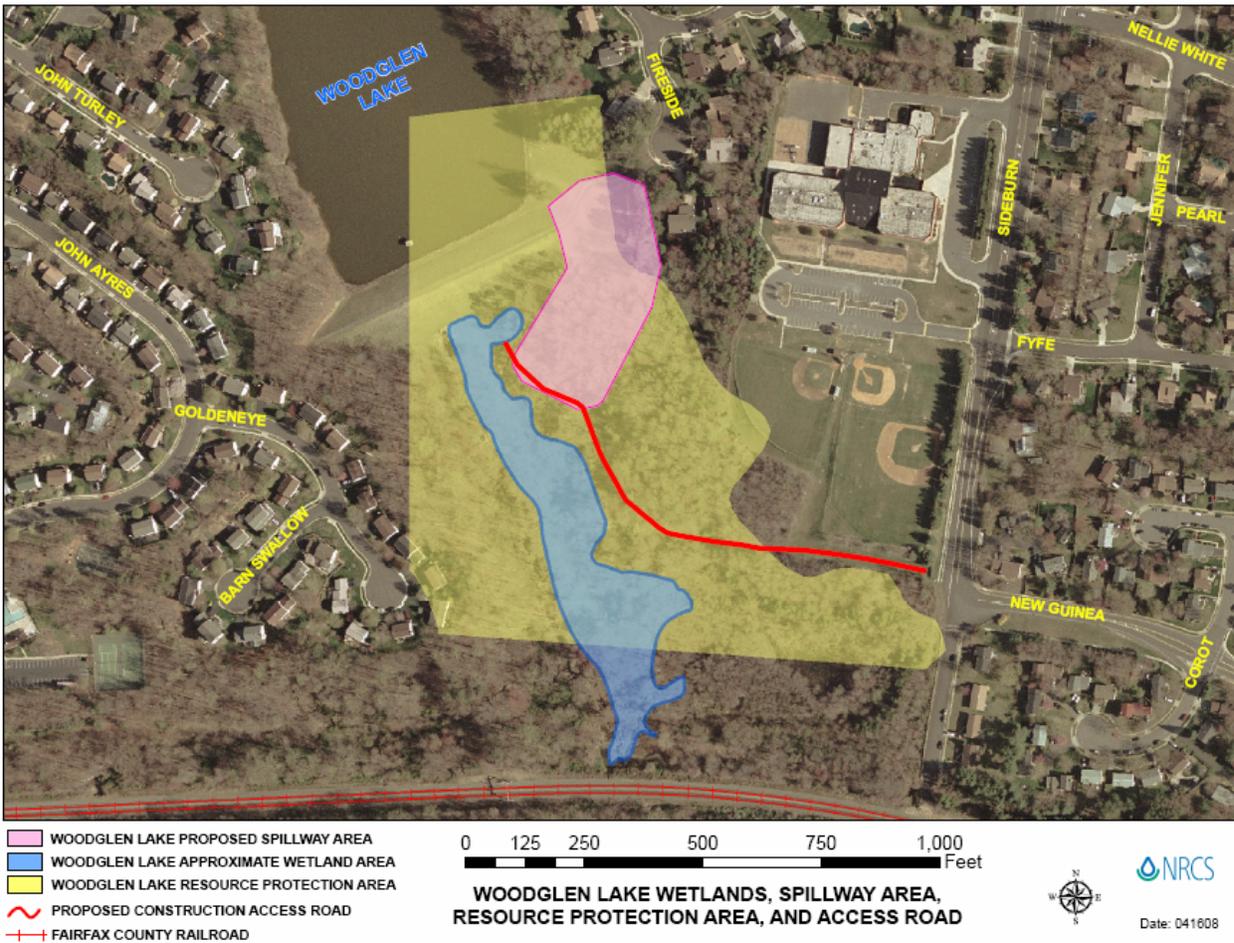
PERMITS AND COMPLIANCE

Installation of the recommended plan will bring the dam into compliance with current NRCS and Virginia dam safety criteria. Prior to construction, the Sponsors will be responsible for obtaining an alteration permit from the Virginia Soil and Water Conservation Board, a 404 permit from the Army Corps of Engineers, any needed subaqueous lands permits from the Virginia Marine Resources Commission, and any other required permits. During construction, the successful contractor will be required to develop a Stormwater Pollution Prevention Plan which includes applicable erosion and sediment control measures.

If cultural resources are discovered during installation, the work will be halted and the SHPO will be notified. Appropriate investigation procedures will be initiated.

Woodglen Lake lies entirely within the Resource Protection Area (RPA) of Pohick Creek, and thus falls under the Coastal Zone Management Act regulations. Therefore, prior to beginning any construction activities, Fairfax County must determine the extent of construction activities affecting Virginia's coastal resources or coastal uses with the Virginia Coastal Resources Management Program. Fairfax County must submit a consistency certification to the Virginia Department of Environmental Quality regarding their coordinated review and compliance with these regulations. The Sponsors will be responsible for obtaining the certification of compliance from the Virginia Division of Dam Safety upon completion of the project.

The map on page 47 depicts a section of the RPA which intersects with the proposed spillway area. In addition, the map shows the downstream wetlands and the location of the proposed access road for construction. The actual impacts to the forested areas, RPA, and wetlands, will be determined during final design of the project. Impacts to these important resources will be avoided, minimized or mitigated as required.



COSTS

As indicated in Table 1, the total project cost of the recommended plan is \$2,519,000. Of this amount, PL-106-472 funds will bear \$1,761,000 and nonfederal funds will bear \$758,000. Given that certain costs are excluded from calculation of the Sponsors' contribution (see the watershed agreement for complete details), the actual cash cost to the local Sponsors required for construction costs is an estimated \$273,000. Table 2 shows details of the costs and cost-share amounts by category. Total annualized costs are shown in Table 4 along with the estimated costs for operation and maintenance. Table 5 displays the average annual flood damage reduction benefits by flood damage categories, and Table 6 displays a comparison of annual costs and benefits. A 2007 price base was used and amortized at 4.875 percent interest for the 74 year period of analysis (including one year for design and one year for installation and an expected useful life of 72 years).

The planning costs for the proposed rehabilitation measures are estimated costs only. The fact that these costs are included in this plan does not infer that they are final costs. Detailed structural designs and construction cost estimates will be prepared prior to contracting for the work to be performed. Final construction costs will be those costs actually incurred by the contractor performing the work, including the cost of any necessary contract modifications.

INSTALLATION AND FINANCING

The project is planned for installation in one construction season. During construction, equipment will not be allowed to operate when conditions are such that soil erosion, and water, air, and noise pollution cannot be satisfactorily controlled.

The NRCS will provide assistance to the Sponsors with the Woodglen Lake Dam rehabilitation project. NRCS will be responsible for the following:

- Execute a project agreement with the Sponsors before either party initiates work involving funds of the other party. Such agreements will set forth in detail the financial and working arrangements and other conditions that are applicable to the specific works of improvement.
- Execute a Memorandum of Understanding with the Sponsors to provide a framework within which cost-share funds are accredited.
- Execute an updated Operation and Maintenance Agreement with Fairfax County for the dam. This agreement will be based on the NRCS National Operation and Maintenance Manual.
- Provide financial assistance equal to 65% of total eligible project costs, not to exceed 100% of actual construction costs.
- Verify that a current Emergency Action Plan is developed before construction is initiated.
- Provide consultative engineering support, technical assistance, and approval during the design and construction of the project.
- Certify completion of all installed measures.

Fairfax County will be responsible for the following:

- Secure all needed environmental permits, easements, and rights for installation, operation and maintenance of the rehabilitated structure.
- Prepare an updated Emergency Action Plan for the dam prior to the initiation of construction.
- Execute an updated Operation and Maintenance Agreement with NRCS for the dam. This agreement will be based on the NRCS National Operation and Maintenance Manual.
- Execute a Memorandum of Understanding with NRCS to provide a framework within which cost-share funds are accredited.
- Execute a project agreement with NRCS before either party initiates work involving funds of the other party. Such agreements will set forth in detail the financial and working arrangements and other conditions that are applicable to the specific works of improvement.
- Provide nonfederal funds for cost-sharing of the project at a rate equal to, or greater than, 35% of the total eligible project costs.
- Provide engineering services for the design, construction, and certification of the project.
- Provide local administrative and contract services necessary for installation of the project.
- Acquire a Safe Dam Permit from the State of Virginia upon completion of the planned measures.
- Participate in and comply with applicable Federal floodplain management and flood insurance programs.
- Enforce all associated project easements and rights-of-way.

OPERATION, MAINTENANCE, AND REPLACEMENT

Measures installed as part of this plan, and previously installed measures, will be operated and maintained by Fairfax County with technical assistance from federal, state, and local agencies in accordance with their delegated authority. A new Operation and Maintenance agreement will be developed for Woodglen Lake utilizing the NRCS National Operation and Maintenance Manual, and will be executed prior to signing a project agreement for the construction of the project. The term of the new O&M agreement will be for the projected life of the rehabilitated structure, plus two years of project installation, for a total of 74 years¹. The agreement will specify responsibilities of the Sponsors and include detailed provisions for retention, use, and disposal of property acquired or improved with PL-106-472 cost sharing. Provisions will be made for free access of district, state, and federal representatives to inspect all structural measures and their appurtenances at any time.

CIVIL RIGHTS AND ENVIRONMENTAL JUSTICE IMPACT ANALYSIS

Rehabilitation of the dam will have positive economic and social effects across all residents within the floodplain and above the dam. Since vehicle operators also are significant beneficiaries of the proposed rehabilitation, it is reasonable to conclude that protection of the roads and bridges will benefit all racial, ethnic, and socio-economic groups within the watershed. Avoiding a dam breach will directly benefit all residents within the watershed and taxpayers in general within Fairfax County and the Commonwealth of Virginia.

There are no known disparate impacts that the rehabilitation project could possibly have. It was explained to local residents that rehabilitation of the dam would not enhance their flood protection, but simply maintain the existing level of protection while reducing the risk to life and property that might occur from a dam breach.

EFFECTS OF RECOMMENDED PLAN ON RESOURCES

Table I lists the effects of the recommended plan on Resources of Principal National Recognition.

¹ The key determinant of the expected useful life was the number of years of design life remaining.

Table I - Effects of the Recommended Plan on Resources of Principal National Recognition

Types of Resources	Principal Sources of National Recognition	Measurement of Effects
Air Quality	Clean Air Act, as amended (42 U.S.C. 1857h-7 et seq.)	No change except during the construction period.
Areas of particular concern within the coastal zone	Coastal Zone Management Act of 1972, as amended, (16 U.S.C. 1451, et seq.)	The project area is located in a coastal zone. Erosion and sediment control practices will minimize project impacts.
Endangered and Threatened Species Critical Habitat	Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et seq.)	No confirmed occurrences of SE & ST species in the project area.
Fish and Wildlife Habitat	Fish and Wildlife Coordination Act (16 U.S.C. Sec. 661 et seq.)	2.0 acres of forested land converted to grass.
Floodplains	Executive Order 11988, Floodplain Management	Maintain current flood protection.
Historic and Cultural Properties	National Historic Preservation Act of 1966, as amended, (16 U.S.C. Sec. 470, et seq.)	None present in the project area.
Prime and Unique Farmland	CEQ Memorandum of August 1, 1980: Analysis of Impacts on Prime or Unique Agricultural Lands in Implementing the National Environmental Policy Act. Farmland Protection Policy Act of 1981, (7 U.S.C. 4201 et seq.)	None present in the project area.
Water Quality	Clean Water Act of 1977 (33 U.S.C. 1251 et seq.)	Improve downstream water quality by continuing to trap 0.77 acre feet of sediment each year.

Table I - Effects of the Recommended Plan on Resources of Principal National Recognition (Con't)

Types of Resources	Principal Sources of National Recognition	Measurement of Effects
Wetlands	Executive Order 11990, Protection of Wetlands; Clean Water Act of 1977 (42 U.S.C. 1857H-7, et seq.)	0.1 acres in the project area; no anticipated effects. Approximately 0.56 of the 2.8 acres downstream could be affected. Avoidance is expected but mitigation at a rate of 2:1 will occur as needed.
Wild and Scenic Rivers	Wild and Scenic Rivers Act, as amended, (16 U.S.C. U.S.C. 1271 et seq.)	None present in the project area.
Economic	NA	Maintain existing flood protection for downstream residents for another 72 years. Maintain existing recreation and property values.
Fisheries	Fish and Wildlife Coordination Act (16 U.S.C. Sec. 661 et seq.)	No effect.
Forestry	NA	Approximately 3.4 acres of trees will be removed during construction. About 1.4 acres will be replanted. Net loss of trees is 2.0 acres.
Recreation	NA	Existing benefits will be maintained.
Riparian Zone	NA	Riparian vegetation impacts will be minimal below existing dam.

Table 1 - Estimated Installation Cost
Pohick Creek Watershed Dam No. 3, Virginia
(Dollars)¹

Installation Cost Items	Estimated Costs		
	PL-106-472 Funds ²	Other Funds	Total
Structural measures to rehabilitate floodwater retarding dam: Woodglen Lake – Dam No. 3:	\$1,761,000	\$758,000	\$2,519,000
Total Project:	\$1,761,000	\$758,000	\$2,519,000

Price base: August 2007

Note: \$140,000 in local sponsor planning costs have been excluded from Table 1 and Table 2 per NRCS policy to exclude non-federal technical assistance for planning from the estimated installation cost. These costs are included in the watershed agreement for calculating cost-share between the NRCS and the local sponsors.

Table 2 - Estimated Cost Distribution – Structural Measures
Pohick Creek Watershed Dam No. 3, Virginia
(Dollars)

Installation Cost Items	Installation Cost: PL-106-472 Funds ³				Installation Cost: Other Funds ⁴				Total Project Cost
	Construction Costs	Engineering Technical Assistance Costs	Project Admin. Costs	Total PL-106-472 Cost	Construction Costs	Engineering Costs	Project Administration ⁵	Total Other Funds	
Pohick Creek Dam No. 3	\$1,667,000	\$85,000	\$9,000	\$1,761,000	\$273,000	\$440,000	\$45,000	\$758,000	\$2,519,000
Totals:	\$1,667,000	\$85,000	\$9,000	\$1,761,000	\$273,000	\$440,000	\$45,000	\$758,000	\$2,519,000

Price base: August 2007

¹ All tables have a price base of 2007;

² Paid by the USDA/NRCS – the Federal agency responsible for assisting in installation of improvements;

³ 65% of total project cost (the actual federal cost/share excludes technical assistance and permit costs and cannot exceed 100% of the estimated construction cost);

⁴ 35% of total project cost;

⁵ No real property costs are anticipated.

Table 3 – Structural Data for Rehabilitated Dam
Pohick Creek Watershed Dam No. 3, Virginia

ITEM	UNIT	AMOUNT
Hazard Class of Structure	-	C
Seismic Zone	-	1
Total Drainage Area	Sq. Mi.	1.16
Time of Concentration	Hours	0.88
Antecedent Moisture Condition II Runoff Curve Number	-	77
Elevation, Top of Dam	Feet, MSL	354.0
Elevation, Auxiliary Spillway Crest	Feet, MSL	345.3
Elevation, Principal Spillway Crest	Feet, MSL	334.0
Auxiliary Spillway Type	-	Structural ¹
Auxiliary Spillway Bottom Width	Feet	75
Auxiliary Spillway Exit Slope	%	3-13(varies)
Maximum Height of Dam	Feet	38.4
Volume of Fill (Rehabilitation)	Cu. Yd.	2,500 ²
Total Capacity	Ac.-Ft.	310.7
Sediment Submerged	Ac.-Ft.	94.6
Sediment Aerated	Ac.-Ft.	5.3
Floodwater Retarding Pool	Ac.-Ft.	210.8
Surface Area		
Sediment Pool	Acres	12.9
Floodwater Retarding Pool	Acres	26.1
Principal Spillway Design		
Rainfall Volume (1 day)	Inches	8.27
Rainfall Volume (10 day)	Inches	12.14
Runoff Volume (10 day)	Inches	6.84
Capacity at Crest of Auxiliary Spillway	CFS	114
Conduit Size	Inches	30
Conduit Type	-	Concrete
Frequency of Operation, Auxiliary Spillway	Annual % chance	Less than 2
Auxiliary Spillway Hydrograph		
Rainfall Volume	Inches	15.48
Runoff Volume	Inches	12.39
Storm Duration	Hours	24
Velocity of flow (V _c)	Ft/s	24.4
Maximum Surface Elevation	Feet, MSL	348.6
Freeboard Hydrograph (6-hr PMP)		
Rainfall Volume	Inches	28.0
Runoff Volume	Inches	24.71
Storm Duration	Hours	6
Maximum Surface Elevation	Feet, MSL	354.1
Capacity Equivalents		
Sediment	Inches	1.29
Floodwater Retarding	Inches	3.44
¹ ACB = Articulated Concrete Block system		
² No fill associated with raising the dam, only with lengthening and raising the training dikes		
Note: 6-hr and 24-hr PMP storms were evaluated. The 24-hr was the most critical for the SDH and the 6-hour was the most critical condition for the FBH.		

Table 4 - Average Annual National Economic Development (NED) Costs
Pohick Creek Watershed Dam No. 3, Virginia
(Dollars)

	Average Annual Equivalent Cost	Annual Operation and Maintenance Costs	Total Average Annual Equivalent Cost
Rehabilitation of Pohick Creek Dam No. 3	\$116,000	\$2,400	\$118,400
Totals:	\$116,000	\$2,400	\$118,400

Price base: August 2007

Note: The average annual equivalents are based on a 4.875% discount rate and a 74 year period of analysis (1 year for design, 1 year for project installation and 72 years of expected useful life).

Table 5 - Estimated Average Annual Flood Damage Reduction Benefits
Pohick Creek Watershed Dam No. 3, Virginia
(Dollars)

Flood Damage Category (All are non-agricultural categories. There is no agriculture in the watershed)	Estimated Average Annual Equivalent Damages		Damage Reduction Benefits
	Without Federal Project	With Federal Project	Average Annual Equivalents
Structure Damages:	\$8,190	\$8,190	\$0
Content Damages:	\$3,690	\$3,690	\$0
Private Clean-up Costs:	\$30	\$30	\$0
Public Clean-up Costs:	\$30	\$30	\$0
Private Business Income Losses:	\$20	\$20	\$0
Vehicle, Traffic and Emergency Service Disruption Costs:	\$3,980	\$3,980	\$0
Infrastructure Damages:	\$6,330	\$6,330	\$0
Public Admin. Costs:	\$80	\$80	\$0
Lost Recreation Value:	\$0	\$0	\$0
Lost Property Value:	\$0	\$0	\$0
Totals (rounded):	\$22,350	\$22,350	\$0

Price base: August 2007

Note: Damage reduction benefits resulting from the recommended plan equal zero as compared to the no federal action alternative because they are the same in scope, cost and effects, and therefore yield equivalent benefits. Positive benefits will accrue as a result of this project as compared to the existing conditions, but no attempt was made to compute an estimate of the difference between the future with project and the existing conditions because the existing conditions are not the most likely future conditions. In addition, the added details would not alter the recommended alternative and therefore wouldn't justify the added planning costs. Per 1.7.2 (a) (4) (ii), and 2.1.1(b)(2) of the "Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies" (P&G), U.S. Water Resources Council, March, 1983, allow for abbreviated procedures. The damage reduction and recreation benefits were not estimated because they are the same for both alternatives and no net change in benefits occurs when comparing the two candidate plans to each other. Net benefits are zero because the total project cost is equal to the claimed benefits and the resulting B/C ratio is 1:1.

Table 6 - Comparison of NED Benefits and Costs
Pohick Creek Watershed Dam No. 3, Virginia
(Dollars)

Evaluation Unit	Benefits		Total Average Annual Equivalent Benefits	Costs	Net Change	Benefit/ Cost Ratios
	Average Annual Equivalent Benefits			Average Annual Equivalent Costs	Net Average Annual Equivalent Benefits	
	Damage Reduction Benefits	Other Benefits ¹				
Pohick Dam No. 3	\$0	\$118,400	\$118,400	\$118,400	\$0	1.0 to 1.0
Totals:	\$0	\$118,400	\$118,400	\$118,400	\$0	1.0 to 1.0

Price base: August 2007

Note: The average annual equivalents are based on a 4.875% discount rate and a 74 year period of analysis (1 year for design, 1 year for project installation and 72 years of expected minimum useful life). Also note that all of the benefits claimed are non-agricultural given that there isn't any agriculture within the watershed.

¹ The costs and benefits of the Future With Project Plan are the same as those for the Future Without Project Plan. To maintain consistency with the display in Table 4, the costs associated with the No Action Alternative are tracked as a benefit of the preferred alternative.

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REPORT PREPARERS

The Pohick Creek Watershed Supplemental Plan and Environmental Assessment was prepared primarily by the NRCS Planning Team located in Richmond, Virginia. The document was reviewed and concurred in by state staff specialists having responsibility for engineering, resource conservation, soils, agronomy, biology, economics, geology, and contract administration. The in-house review was followed by a review by the NRCS National Water Management Center and then an interagency and public review.

The following table identifies and lists the experience and qualifications of those individuals who were directly responsible for providing significant input to the preparation of the Supplemental Plan/EA. Appreciation is extended to many other individuals, agencies and organizations for their input, assistance and consultation, without which this document would not have been possible.

NRCS NATURAL RESOURCES PLANNING TEAM

<u>Name</u>	<u>Present Title and Years in Current Position</u>	<u>Education</u>	<u>Previous Experience</u>	<u>Other</u>
R. Wade Biddix	Assistant State Conservationist for Water Resources – 5	M.S. Public Administration B.S. Agriculture	Supervisory District Cons. – 2 yrs. Planning Coordinator – 11 yrs. Area Resource Cons. - 2 yrs. District Conservationist - 4 yrs. Soil Conservationist - 4 yrs.	
Edward J. Fanning	Resource Conservationist – 4	B.S. Wildlife & Fisheries Management B.S. Range Management Graduate Course Work in Range Management	District Conservationist – 1.25 yrs. Soil Conservationist - 5 yrs. Sr. Environmental Analyst – 13 yrs.	
David L. Faulkner	Natural Resource Economist – 18	M.S. Ag. Economics B.S. Ag. Education	Ag. Economist (SCS) - 2.5 yrs. Ag. Economist (U.S.A.I.D.) - 4.5 yrs.	
Fred M. Garst	GIS Specialist – 9	B.S. Geology	GIS/Soil Scientist - 7 yrs. Soil Cons. Tech. - 7 yrs. Geologist (Private) – 4 yrs.	

<u>Name</u>	<u>Present Title and Years in Current Position</u>	<u>Education</u>	<u>Previous Experience</u>	<u>Other</u>
Alica J. Ketchem	Plng./Environmental Engineer – 14	M.S. Ag. Engineering B.S. Civil Engineering	Civil Engineer – 10 yrs.	PE
Bryan Lee	Cultural Resource Specialist – 3	M.A. Anthropology B.A. Anthropology	Archaeologist (Private) 10 years	
Mathew J. Lyons	State Conservation Engineer-5	B.S. Civil Engineering	Civil Engineer – 12 yrs.	PE
Jeffrey D. McClure	Geologist –2.5	B.A. Geology B.A. Biology B.S. Geology	NRCS Geologist – total 4 yrs. Geologist (WV Dept. of Env. Prot.) - 11 yrs. Geologist (Private) – 8.5 yrs.	CPG in KY, VA, DE and PA
Timothy Ridley	Hydraulic Engineer – 20	B.S. Civil Engineering	Civil Engineer (Private 8 yrs.)	PE, PS

EMPLOYEES FROM ARCHITECTURAL AND ENGINEERING FIRMS UNDER CONTRACT TO FAIRFAX COUNTY

<u>Company</u>	<u>Name</u>	<u>Degree</u>	<u>Years of Experience</u>
A. Morton Thomas & Associates, Inc.	Jerry Kavadias, P.E.	B.S. Civil Engineering	Civil Engineer – 14 years
A. Morton Thomas & Associates, Inc.	Stuart Robinson, P.E.	B.S. Civil Engineering	Civil Engineer – 27 years
A. Morton Thomas & Associates, Inc.	Peter Zitta	B.S. Civil Engineering	Civil Engineer – 8 years
Schnabel Engineering North, LLC	Donald L. Basinger, P.E.	B.S. Civil Engineering	NRCS Civil Engineer – 30 years Civil Engineer – 17 years
Schnabel Engineering North, LLC	Anthony W. Grubbs, EIT	B.S. Agricultural and Biosystems Engineering	Civil Engineer – 4 years

EMPLOYEES FROM ARCHITECTURAL AND ENGINEERING FIRMS UNDER CONTRACT TO FAIRFAX COUNTY (cont.)

<u>Company</u>	<u>Name</u>	<u>Degree</u>	<u>Years of Experience</u>
Schnabel Engineering North, LLC	Jay T. Halligan	B.A. Geographical Analysis	GIS Specialist - 2 years
Schnabel Engineering North, LLC	John P. Harrison, P.E.	B.S. Civil Engineering M.S. Civil Engineering	Civil Engineer – 16 years
Schnabel Engineering North, LLC	Matthew L. Marchisello, EIT	B.S. Civil Engineering M.S. Civil Engineering	Senior Staff Engineer – 2 years
Schnabel Engineering North, LLC	Paul I. Welle, P.E.	B.S. Agricultural Engineering	NRCS Civil Engineer – 4 years NRCS Hydraulic Engineer – 26 years Hydraulic Engineer – 8 years

Special acknowledgment goes to the following people who spent many hours in the Pohick Creek Watershed surveying, collecting data, meeting with landowners, and attending public meetings, or providing technical support.

- Fairfax County Staff: Christina Fullmer, Don Demetrius, and Dipmani Kumar.
- Northern Virginia Soil and Water Conservation District: Diane Hoffman and Robert Kohnke

APPENDIX A

**LETTERS OF COMMENT AND NRCS RESPONSES TO COMMENTS
RECEIVED ON DRAFT SUPPLEMENTAL PLAN – EA**

Comments were requested on the Draft Supplemental Plan – EA from the following agencies and organizations.

<u>Federal Agencies</u>	<u>Response Received on Draft Supplemental Plan/EA</u>
Environmental Protection Agency Region III, Philadelphia	No
U.S. Army Corps of Engineers, Baltimore District	No
Norfolk District	No
Northern Virginia Field Office	No
U.S. Department of the Interior Fish and Wildlife Service Annapolis, Maryland Office	No
Gloucester, Virginia Office	No
Federal Emergency Management Agency, Philadelphia	No
U.S. Department of Agriculture Forest Service	No
Farm Service Agency	No
Rural Development	No
<u>Virginia State Agencies</u>	
Virginia Department of Environmental Quality Office of Environmental Impact Review (State Clearinghouse)	Yes
Division of Waste	Yes
Division of Air Program Coordination	Yes
Northern Virginia Regional Office	No
Virginia Soil and Water Conservation Board (Governor’s Designated Agency)	No
Virginia Department of Emergency Management	No
Virginia Department of Conservation and Recreation, Division of Soil and Water Conservation	Yes
Division of Dam Safety and Floodplain Management	Yes
Division of Natural Heritage	Yes
Division of Planning and Recreation Resources	Yes

<u>Virginia State Agencies</u>	<u>Response Received on Draft Supplemental Plan/EA</u>
Virginia Department of Agriculture and Consumer Services	Yes
Virginia Department of Game and Inland Fisheries	Yes
Virginia Marine Resources Commission	Yes
Virginia Department of Historic Resources	Yes
Virginia Department of Transportation	Yes
<u>Other</u>	
Virginia Association of Soil and Water Conservation Districts	No
Northern Virginia Soil and Water Conservation District	Yes
Fairfax County Board of Supervisors	Yes
Fairfax County Park Authority	Yes
Fairfax County Stormwater Planning Division	Yes
Northern Virginia Regional Commission	Yes
Norfolk Southern Railroad	No

APPENDIX B

RECORD OF INVESTIGATION AND ANALYSIS

Appendix B. Investigation and Analysis Used in the Planning for the Rehabilitation of Pohick Creek Dam Site No. 3.

Threatened and Endangered Species: Identification of Federal and State listed threatened and endangered plant and animal species within a two mile radius of the project area was determined using the Virginia Fish & Wildlife Information Service computer program, a publication of the Virginia Department of Game and Inland Fisheries.

Cultural Resources, Natural and Scenic Areas, and Visual Resources: A pedestrian survey of the dam area downstream for 200 meters was conducted on Feb. 13, 2007. The channel area was also surveyed for quartz and other tool-making materials, but failed to reveal any of this type of material. No indications of archaeological or historical sites were uncovered during this survey. A Phase I survey was completed on December 6, 2007. Thirty-two shovel test pits (STPs) were dug, and 6 artifacts were uncovered from 5 STPs. The site was determined ineligible for the NRHP, and no further work was recommended.

The absence of Natural Heritage Resources, including Scenic Areas and Visual Resources, was determined by review of the Virginia Department of Conservation & Recreation Natural Heritage Resource Map for Fairfax County.

Water Quality: Impaired stream and lake listings and supporting information was taken from the Virginia DEQ 2006 305(b)/303(d) Integrated Water Quality Assessment and Impaired Waters Report.

Wetlands: There are 0.1 acres of jurisdictional wetlands upstream of the dam. There are also 2.8 acres of wetland downstream of the dam. Approximately 0.56 acres could be impacted by construction activities. Delineation of the wetland areas were made during field visits. These findings were concurred with by the Northern Virginia Regulatory Section of the Army Corps of Engineers.

Forest and Wildlife Resources: Information on the potential natural vegetation of northern Virginia and associated wildlife resources was obtained from The Natural Communities of Virginia Classification of Ecological Community Groups, VADCR, Natural Heritage Division, and the Virginia Comprehensive Wildlife Conservation Strategy, VDGIF, 2005.

Chesapeake Bay and /or Coastal Zone Management Areas: Information on the Chesapeake Bay Act and Coastal Zone Management Areas was taken from DEQ program literature.

Geology: Reference for this plan: The Geologic Map of Virginia, 1993, compiled by the Commonwealth of Virginia Department of Mines, Minerals, and Energy.

Sediment: For this project, Fairfax County completed a sediment survey in late February and early March 2007. That survey and dredging showed that 19% of the sediment originally predicted to flow into Woodglenn Lake had done so in the period from dam construction in 1981 to 2007 (26 years).

HYDRAULICS AND HYDROLOGY

Background: A May 2001 report on the integrity of the Pohick Dam No. 3 auxiliary spillway, prepared by Gannett Fleming, Inc. for Fairfax County, showed the stability and integrity of the soils were not sufficient to pass the PMP event without a breach of the dam. In 2006, Fairfax County commissioned the engineering firm of A. Morton Thomas & Associates, Inc. (AMT), to conduct an analysis of the existing auxiliary spillway, evaluate rehabilitation alternatives, and quantify the effects of a breach on the downstream watershed. Hydrologic and hydraulic investigations consisted of an analysis of rainfall runoff relationships of the watershed. The models were calibrated by comparing the output files to previous modeling.

Precipitation Data and Hydrologic Data: The precipitation data has changed since the original design was completed in 1974. The table below compares the design precipitation values to the NOAA-14 data from 2004. AMT used the 2004 NOAA-14 precipitation data in the evaluation.

Year	100-year, 6-hour event, inches	100-year, 24-hour event, inches	100-year, 10-day event, inches	6-hour PMP, inches	24-hour PMP, inches
1974	5.4	8	14	27.3	36
2004	5.31	8.27	12.14	28.0	36

The Hydrologic procedures in TR-55 were used to compute the runoff parameters. WinTR20 was used to route the 50, 100, 200 and 500-year, Type II, 24-hour storm discharges through the existing structure and the downstream floodplain. Land cover was determined from digital land use maps provided by Fairfax County and developed in conjunction with NRCS. A digital soil data set for the watershed was generated by NRCS, using the Fairfax County detailed soil survey.

SITES Analysis: The SITES model was used to evaluate the capacity, stability and integrity of the existing structure and the auxiliary spillway alternatives. Geotechnical information was taken from the Pohick Creek Dam Site No. 3 Emergency Spillway Investigation study by Gannett Fleming, Inc., dated May 2001, and from the original SCS drill hole data as shown on the As-Built drawings. The NRCS Standard rainfall distribution was used for the 6-hour PMP and the 24-hour PMP events. This is the dimensionless storm distribution from TR-60, Figure 2-4. The 5-point distribution was also used for evaluation of the 24-hour PMP event.

Armoring the auxiliary spillway will provide the necessary stability and integrity to meet NRCS and State dam safety criteria. The SITES program is intended for use on vegetated earth spillways. By giving artificially high numbers for the erodibility and hardness of the auxiliary spillway soil and rock materials, SITES can be used to estimate the effects of armoring the spillway. During the design process, other techniques may be used.

Water Surface Elevation Modeling: The HEC-RAS model was used to identify the water surface elevations within the downstream floodplain for the evaluation storms. The stream cross sections were developed using HEC-GeoRAS and supplemented with field survey data. The final “n” values for the channel and overbank flow were 0.033 and 0.08, respectively.

Breach Modeling: In accordance with the National Engineering Manual and instructions from the State Conservation Engineer, the breach zone was determined by a breach that could occur if both the principal and auxiliary spillways were blocked, the reservoir was full, and the dam failed under “sunny day” conditions. The criteria defined in TR-60, Earth Dams and Reservoirs, was used to determine the peak discharge of 54,283 cfs for the breach hydrograph.

The As-Built drawings dated 12/81 and field surveyed data obtained for Woodglen Lake were used to determine the maximum height used in the breach discharge. The As-Built data was used for determining the depth of water (H) of 38.4 feet at failure.

An analysis using HEC-RAS was used to determine the inundation zone due to the breach of the dam. The stream cross sections were developed using HEC-GeoRAS and supplemented with field survey data. Manning’s roughness coefficient “n” values ranging from 0.16 in the overbank to 0.08 in the channel were used. These values were selected to account for mud/trees/brush that would be disturbed and washed downstream due to a breach of the dam. Contraction and expansion values of 0.1 and 0.3 respectively were used in the modeling. The extent of model limits were taken to a point where the depth of the inundation area was within 1 foot of the 100-year FEMA floodplain as determined from delineated Fairfax County DFIRM GIS data.

SOCIAL AND ECONOMIC CONDITIONS

Sources for the data included in the social and economic conditions section of this supplement include the U.S. Census Bureau, Department of Commerce, 2000 Census and 2006 projections, and interviews conducted with local contacts.

Economic Analysis: The NRCS National Watershed Manual was used as a reference for the economic analysis along with two economic analysis guidance documents: “Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies” (P&G), U.S. Water Resources Council, March, 1983, and the “Economics Handbook, Part II for Water Resources”, USDA/Natural Resources Conservation Service, July, 1998. These guidance documents were used to evaluate potential flood damages, and estimate recreational use, project benefits and associated costs. P&G was developed to define a consistent set of project formulation and evaluation instructions for all federal agencies that carryout water and related land resource implementation studies. The basic objective P&G is to determine whether or not benefits from project actions exceed project costs. P&G also requires that the “National Economic Development” or NED alternative, which maximizes monetary net benefits, be selected for implementation unless there is an overriding reason for selecting another alternative based on federal, state, local or international concerns related to the social and environmental accounts. The allowance for exceptions to the NED plan recognizes the fact that not all project considerations or benefits can be quantified and monetized when it comes to some ecological system and social effects.

Basic data were obtained from field surveys, interviews with residents, businesses and local government officials within the watershed. Detailed data on the homes and other structures within the floodplain, breach inundation zone, and breach flood pool of the Woodglen Lake watershed were obtained either from field surveys or from the Fairfax County Department of

Public Works and Environmental Services, Stormwater Planning Division, Watershed Project Evaluation and Implementation Branch.

Flood damages were based on the results of the hydrology and hydraulics (H&H) simulation modeling carried out by AMT. The H&H data routed water for the storm events modeled establishing the extent of the floodplain as well as flood depths. This data was then used with water depth to damage functions developed by the Federal Emergency Management Agency (FEMA) to estimate damages by storm event for both the future without federal project (FWOFP) and future with federal project (FWFP) candidate plans.

These estimated damages formed the basis needed to construct damage frequency curves relating percent chance of storm occurrence with specific event damage estimates. The resulting functional relationships permit the prediction of damages for lesser and greater events than the storms of record and the simulated storm events. Annualized estimates of storm damages from all storm events for the FWOFP and FWFP scenarios is the end result of this analysis. Loss of recreation and property values, if applicable are added to the predicted annual damages to establish total average annual damages for both the FWOFP and FWFP alternatives.

All costs of installation, operation and maintenance were based on 2007 prices. One year was assumed for development, review and approval of the final Architectural and Engineering firm design. The costs of implementation of all structural measures were assumed to occur over a one-year installation period and to have a 72-year useful life. Thus, a 74 year period of analysis was used along with the mandated 4.875% discount rate for all federal water resource projects for FY08 to discount and amortize the anticipated streams of costs and benefits.

There has been no computation of damage reduction, nor recreation benefits associated with the two alternatives because these alternatives are the same, and therefore there are no net benefits. The basis for the assumptions concerning the FWOFP and FWFP conditions are covered in the plan under "Effects of Alternative Plans" and "Comparison of Candidate Plans".

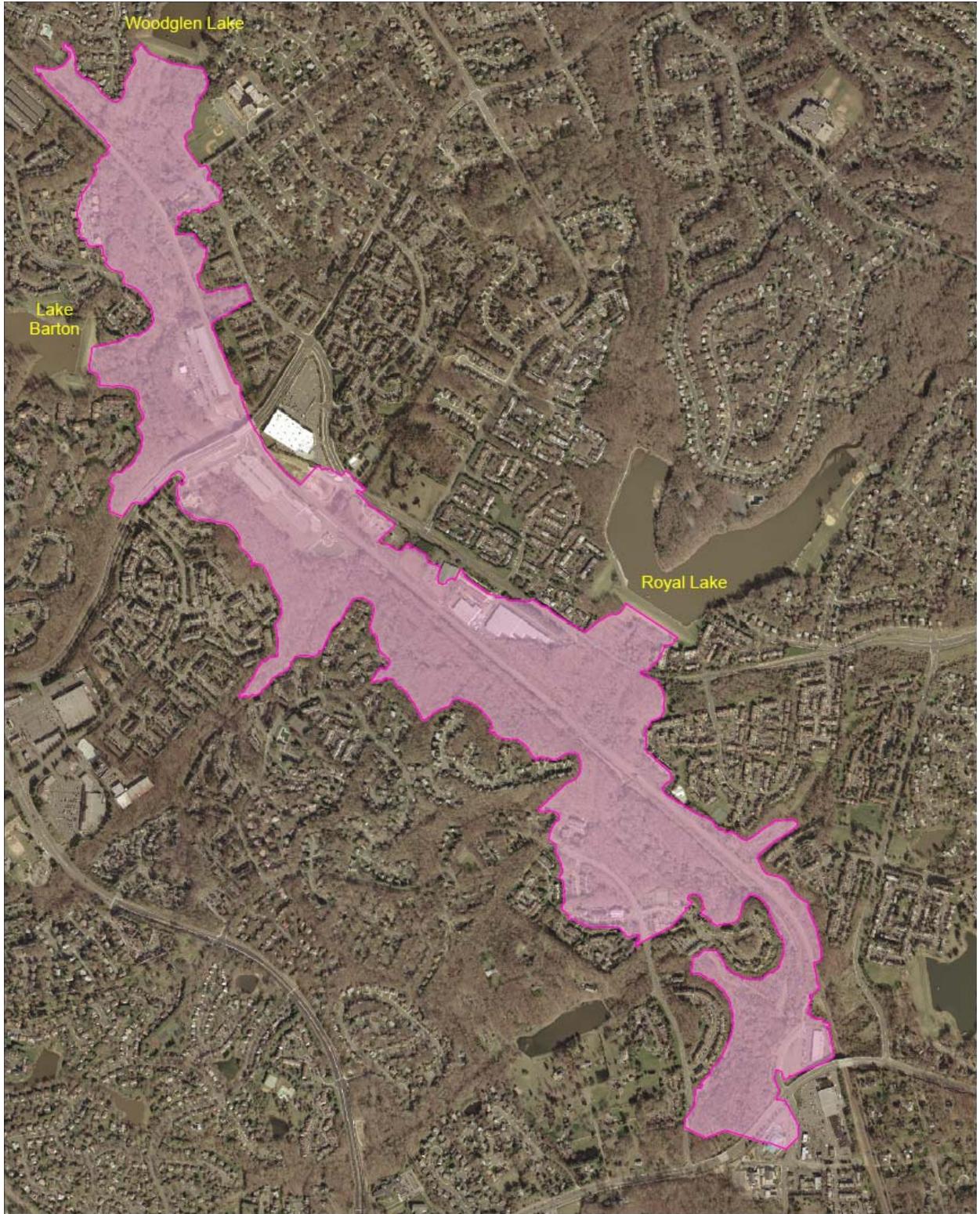
APPENDIX C

BREACH INUNDATION ZONE MAP,

WATER SURFACE ELEVATION DATA

AND

RESULTS OF BREACH ROUTING



**WOODGLEN LAKE - POHICK CREEK 3
BREACH INUNDATION ZONE FROM
AMT - ENGINEERING ANALYSIS**



Table C1 - Depth of Water Flow over Bridges during Flooding Events (feet)

Stream Crossing	100-year	200-year	500-year	Sunny Day Breach
Railroad	-	-	0.5 ft.	7.2 ft.
Roberts Parkway	-	-	1.1 ft.	10.4 ft.
Premier Court	-	-	7.1 ft.	16.4 ft.

Table C2 - Results of a Dam Breach Routing for Woodglen Lake

River Station (#)	Cross Section Location (feet)	Maximum Water Surface Elevation (feet)	Maximum Flow (cfs)
Woodglen Dam			
30218	0.00	345.2	54283
29220	28.54	343.2	51509
29170	50.06		Railroad Culvert
29119	50.05	333.0	51441
27012	123.92	326.1	48545
26900	111.92	325.5	48520
25554	63.53	322.4	47654
25341	212.3		Parkway Culvert
25129	212.29	310.9	47131
22858	119.10	299.1	45504
19425	54.06	285.4	43964
17614	32.86	283.8	34318
15813	180.39	269.1	28407
13889	117.41	256.9	23283
13563	325.41	252.8	22889

APPENDIX D

WATERSHED PROJECT MAPS

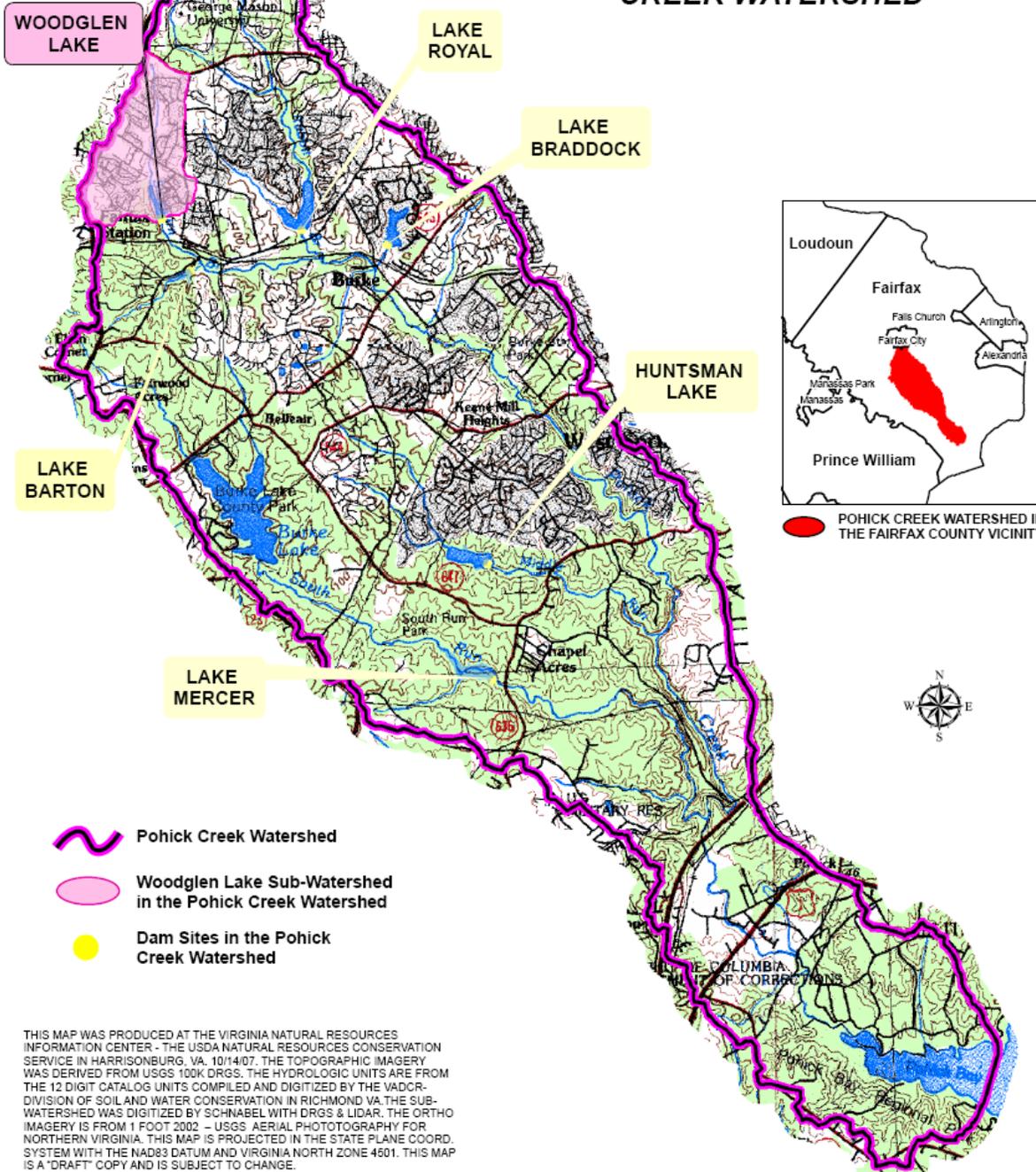


**WOODGLEN LAKE - POHICK CREEK 3
SUB-WATERSHED USGS 2002 AIR PHOTO**





WOODGLEN LAKE - POHICK CREEK 3 PROJECT AREA IN THE POHICK CREEK WATERSHED



POHICK CREEK WATERSHED IN THE FAIRFAX COUNTY VICINITY



THIS MAP WAS PRODUCED AT THE VIRGINIA NATURAL RESOURCES INFORMATION CENTER - THE USDA NATURAL RESOURCES CONSERVATION SERVICE IN HARRISONBURG, VA. 10/14/07. THE TOPOGRAPHIC IMAGERY WAS DERIVED FROM USGS 100K DRGS. THE HYDROLOGIC UNITS ARE FROM THE 12 DIGIT CATALOG UNITS COMPILED AND DIGITIZED BY THE VADCR-DIVISION OF SOIL AND WATER CONSERVATION IN RICHMOND VA. THE SUB-WATERSHED WAS DIGITIZED BY SCHNABEL WITH DRGS & LIDAR. THE ORTHO IMAGERY IS FROM 1 FOOT 2002 - USGS AERIAL PHOTOGRAPHY FOR NORTHERN VIRGINIA. THIS MAP IS PROJECTED IN THE STATE PLANE COORD. SYSTEM WITH THE NAD83 DATUM AND VIRGINIA NORTH ZONE 4601. THIS MAP IS A 'DRAFT' COPY AND IS SUBJECT TO CHANGE.

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