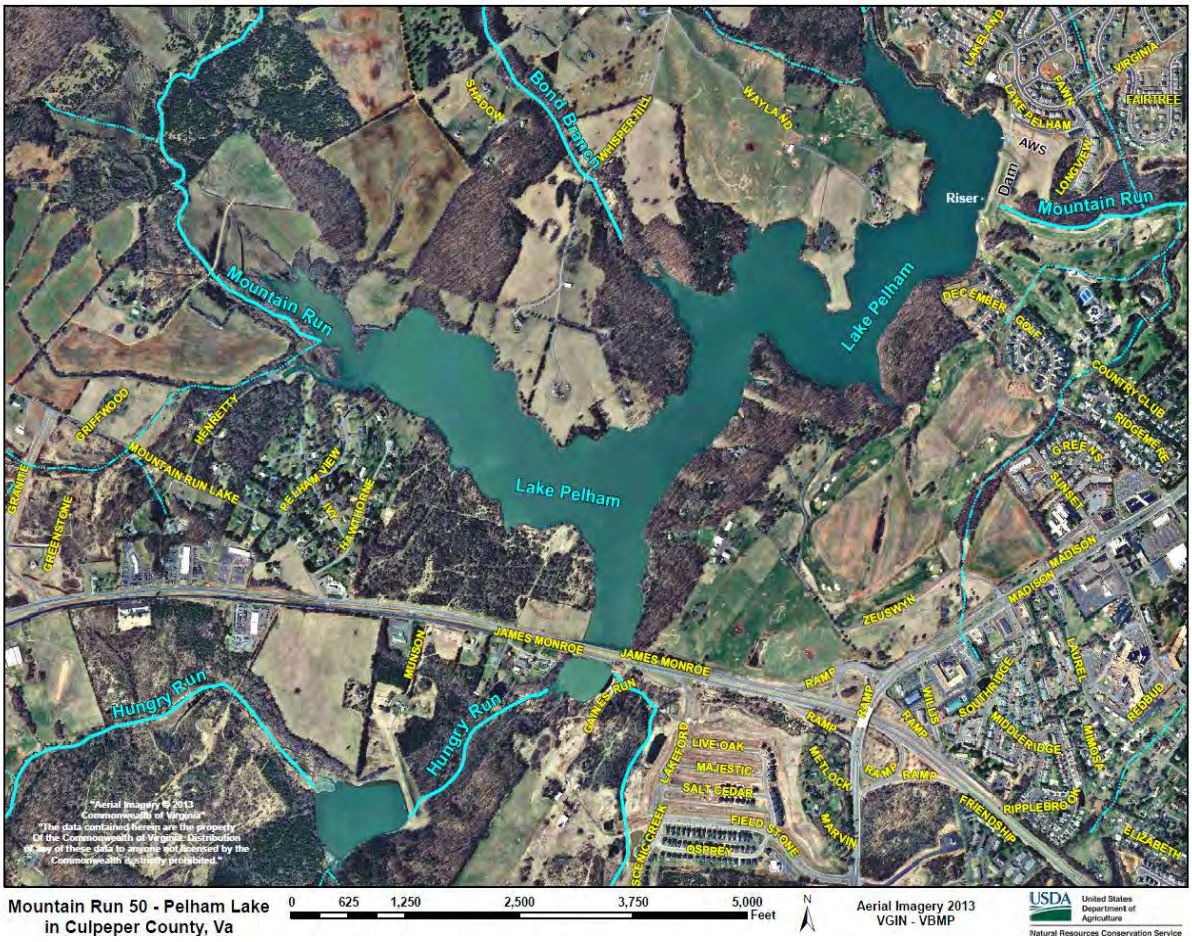
FINAL
Supplemental Watershed Plan No. 5 and Environmental Assessment

for the

Rehabilitation of Floodwater Retarding Structure No. 50 (Lake Pelham)

of the Mountain Run Watershed

Culpeper County, Virginia



PREPARED BY

USDA Natural Resources Conservation Service

IN COOPERATION WITH
Town of Culpeper
Culpeper Soil and Water Conservation District

August 2016

Non-Discrimination Statement

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FINAL

Supplemental Watershed Plan No. 5 & Environmental Assessment for the Rehabilitation of Floodwater Retarding Structure No. 50 of the Mountain Run Watershed Culpeper County, Virginia

Prepared By:
USDA – Natural Resources Conservation Service

In Cooperation With:
Town of Culpeper
Culpeper Soil and Water Conservation District

Authority

The original watershed work plan was prepared, and the works of improvement were installed, under the authority of the Watershed Protection and Flood Prevention Act of 1954 (Public Law 83-566) as amended. The rehabilitation of Mountain Run Dam No. 50 is authorized under Public Law 83-566 (as amended), and as further amended by Section 313 of Public Law 106-472.

Abstract

Mountain Run Dam No. 50, Lake Pelham, is a high hazard dam that was built for flood control and water supply. It does not presently meet Natural Resources Conservation Service (NRCS) or Virginia Division of Dam Safety standards for integrity, stability and capacity for a vegetated auxiliary spillway. The recommended plan is to rehabilitate Mountain Run Dam No. 50 dam to meet current Virginia Division of Dam Safety and NRCS criteria. The plan provides for installing a 198-foot wide, 6-cycle structural concrete labyrinth spillway over the embankment, installing an 800-foot-long earthen berm across the existing auxiliary spillway, and upgrading the water intake structure. There will be no change in the current levels of flood protection downstream. There will be no significant change in the water resource operations or recreational uses of the lake as a result of project activity. Project installation cost is estimated to be $11,110,400 of which $7,612,100 will be paid from the Small Watershed Rehabilitation funds and $3,498,300 from local funds.

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MOUNTAIN RUN WATERSHED AGREEMENT

Supplemental Watershed Plan Agreement
(Supplement No. 5)

between the

Town of Culpeper
Culpeper Soil and Water Conservation District
(herein referred to collectively as "Sponsors"),
Commonwealth of Virginia

and the

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

Whereas, the Watershed Work Plan Agreement for the Mountain Run Watershed, Commonwealth of Virginia, authorized under the Watershed Protection and Flood Prevention Act (Public Law 83-566, as amended) 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 24th day of April 1958; 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 29th day of June 1967; 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 20th day of March 1972; and

Whereas, Supplement No. 3, which modified the Watershed Plan Agreement, was developed through cooperative efforts of the Sponsors and the Soil Conservation Service and became effective on the 14th day of February 1979; and

Whereas, Supplement No. 4, which modified the Watershed Plan Agreement, was developed through cooperative efforts of the Sponsors and NRCS and became effective on the 14th day of April 2016; and

Whereas, application has heretofore 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 Mountain Run Dam No. 50 located in Culpeper County, Commonwealth of Virginia, under the authority of the Watershed Protection and Flood Prevention Act, as amended (16 U.S.C. Section 1001 to 1008, 1010, and 1012); and

Whereas, the responsibility for administration of the Watershed Protection and Flood Prevention Act, has been assigned by the Secretary of Agriculture to NRCS; and

Whereas, through the cooperative efforts of the Sponsors and NRCS, a Supplemental Watershed Plan and Environmental Evaluation has been developed to rehabilitate the Mountain Run Dam No. 50, Commonwealth of Virginia, hereinafter referred to as the Watershed Project Plan or Plan, which Plan is annexed to and made a part of this agreement; and

Whereas, in order to provide for rehabilitation of the Mountain Run Dam No. 50, 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 Supplemental Watershed Agreement and including the following:

1. **Term.** The term of this agreement is for 50 years after construction is completed and does not commit the NRCS to assistance of any kind beyond the end of the agreement.

2. **Costs.** The costs shown in this plan are preliminary estimates. Final costs to be borne by the parties hereto will be the actual costs incurred in the installation of works of improvement.

3. **Real property.** The Town of Culpeper will acquire such real property as will be needed in connection with the works of improvement. The amounts and percentages of the real property acquisition costs to be borne by the Town of Culpeper and NRCS are as shown in the Cost-Share table in Section 5 hereof **.** NRCS policy regarding minimum land rights for potentially flood-pool impacted areas upstream of the dam require the local Sponsors to acquire an easement for all areas below the top of dam, unless the plan explicitly allows for a lower elevation. An economic and risk analysis was conducted to inform the Sponsors. The existing easement is set at 2.5 feet above the crest of the auxiliary spillway. It provides protection up to 0.42 of the Probable Maximum Precipitation (PMP) event which is greater protection than for the 1,000 year storm event (2 feet above the crest). They have lived for almost 48 years with the existing easements and have accepted their associated potential for risk of flood damages. The auxiliary spillway has never experienced a flood flow and the local Sponsors have determined that acquisition of additional easement area to meet current NRCS policy to the top of dam would require a significant added cost without an equally significant benefit. Therefore, the Town acknowledges the potential risk of flood damages for the real property between the flowage rights elevation and the top of dam elevation.

4. **Uniform Relocation Assistance and Real Property Acquisition Policies Act.** The Town of Culpeper hereby agrees to comply with all of the policies and procedures of the Uniform Relocation Assistance and Real Property Acquisition Policies Act (42 U.S.C. 4601 et. seq. as further implemented through regulations in 49 C.F.R. Part 24 and 7 C.F.R. Part 21) when acquiring real property interests for this federally assisted project. If the Town of Culpeper is

legally unable to comply with the real property acquisition requirements, 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.

5. **Cost-share for Rehabilitation Project.** The following table will be used to show cost-share percentages and amounts for Watershed Project Plan implementation.

Works of Improvement	**NRCS**		**Sponsors**		**Total**
Cost-Sharable Items	**Percent**	**Cost**	**Percent**	**Cost**	**Cost**
Rehabilitation of the dam (construction costs):	66%	$6,537,600	34%	$3,320,300	$9,857,900
Relocation, Replacement in-kind:	0%	$0	0%	$0	$0
Relocation, Required Decent, Safe, Sanitary:	0%	$0	0%	$0	$0
Sponsors' Planning Costs:	n/a	n/a	100%	$25,000	$25,000
Sponsors' Engineering Costs:	n/a	n/a	100%	$157,500	$157,500
Sponsors' Project Administration Costs:	n/a	n/a	100%	$17,500	$17,500
Land Rights Acquisition Costs:	n/a	n/a	100%	$0	$0
Subtotals: Cost-Sharable Costs: Cost-Share Percentages:[a/]	(65%)	**$6,537,600**	(35%)	**$3,520,300**	**$10,057,900** (100%)
Non Cost-Sharable Items (per PL-83-566 and NRCS policy)[b/]	---	---	---	---	---
NRCS Engineering and Project Administration Costs:	100%	$1,074,500	n/a	n/a	$1,074,500
Natural Resource Rights:	n/a	n/a	0%	$0	$0
Federal, State and Local Permits:	n/a	n/a	100%	$3,000	$3,000
Relocation, Beyond Required Decent, Safe, Sanitary	n/a	n/a	0%	$0	$0
Subtotals: Non-Cost-Sharable Costs:	**100%**	**$1,074,500**	**100%**	**$3,000**	**$1,077,500**
Total Cost-Sharable Cost:	**n/a**	**$6,537,600**	**n/a**	**$3,520,300**	**$10,057,900**
Total Installation Cost:	**n/a**	**$7,612,100**	**n/a**	**$3,523,300**	**$11,135,400**

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.

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

6. **Land treatment agreements.** Approximately 40% of the drainage area above Mountain Run Dam No. 50 is wooded with another 40% in pasture and hayland. Therefore, there is no need

for additional erosion control measures in the watershed. Thus, there is no requirement for the Sponsors to obtain agreements for protection of the upstream watershed.

7. **Floodplain Management.** Before construction of any project for flood prevention, the Town of Culpeper must agree to participate in and comply with applicable Federal floodplain management and flood insurance programs.

8. **Water and mineral rights.** The Town of Culpeper will acquire or provide assurance that landowners or resource users have acquired such water, mineral, or other natural resources rights pursuant to State law as may be needed in the installation and operation of the works of improvement. Any costs incurred must be borne by the Town of Culpeper and these costs are not eligible as part of the Sponsors' cost-share.

9. **Permits.** The Town of Culpeper will obtain and bear the cost for all necessary Federal, State, and local permits required by law, ordinance, or regulation for installation of the works of improvement. These costs are not eligible as part of the Sponsors' cost-share.

10. **NRCS assistance.** 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.

11. **Additional agreements.** A separate agreement will be entered into between NRCS and the Town of Culpeper 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.

12. **Amendments.** This 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 or when the program funding or authority expires. In this case, NRCS must 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 must be in accordance 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.

13. **Prohibitions.** No member of or delegate to Congress, or resident commissioner, may be admitted to any share or part of this plan, or to any benefit that may arise therefrom; but this provision may not be construed to extend to this agreement if made with a corporation for its general benefit.

14. **Operation and Maintenance (O&M).** The Town of Culpeper will be responsible for the operation, maintenance, and any needed replacement of the works of improvement by actually performing the work or arranging for such work, in accordance with an O&M agreement. An O&M agreement will be entered into before Federal funds are obligated and continue for the

project life (50 years after construction). Although the Town of Culpeper's responsibility to the Federal Government for O&M ends when the O&M agreement expires upon completion of the evaluated life of measures covered by the agreement, the Town of Culpeper acknowledges that continued liabilities and responsibilities associated with works of improvement may exist beyond the evaluated life.

15. **Emergency Action Plan.** Prior to construction, the Town of Culpeper must prepare an Emergency Action Plan (EAP) for this dam where failure may cause loss of life, as required by state and local regulations. The EAP must meet the minimum content specified in NRCS Title 180, National Operation and Maintenance Manual (NOMM), Part 500, Subpart F, Section 500.52, and meet applicable State agency dam safety requirements. An EAP is required prior to the execution of fund obligating documents for rehabilitation of the structure. The EAP must be reviewed and updated by the Town of Culpeper annually.

16. **Nondiscrimination provisions.** In accordance with Federal civil rights law and U.S. Department of Agriculture (USDA) civil rights regulations and policies, the USDA, its Agencies, offices, and employees, and institutions participating in or administering USDA programs are prohibited from discriminating based on race, color, national origin, religion, sex, gender identity (including gender expression), sexual orientation, disability, age, marital status, family/parental status, income derived from a public assistance program, political beliefs, or reprisal or retaliation for prior civil rights activity, in any program or activity conducted or funded by USDA (not all bases apply to all programs). Remedies and complaint filing deadlines vary by program or incident.

    Persons with disabilities who require alternative means of communication for program information (e.g., Braille, large print, audiotape, American Sign Language, etc.) should contact the responsible Agency or USDA's TARGET Center at (202) 720-2600 (voice and TTY) or contact USDA through the Federal Relay Service at (800) 877-8339. Additionally, program information may be made available in languages other than English.

    To file a program discrimination complaint, complete the USDA Program Discrimination Complaint Form, AD-3027, found online at How to File a Program Discrimination Complaint and at any USDA office or write a letter addressed to USDA and provide in the letter all of the information requested in the form. To request a copy of the complaint form, call (866) 632-9992. Submit your completed form or letter to USDA by: (1) mail: U.S. Department of Agriculture, Office of the Assistant Secretary for Civil Rights, 1400 Independence Avenue, SW, Washington, D.C. 20250-9410; (2) fax: (202) 690-7442; or (3) email: program.intake@usda.gov. USDA is an equal opportunity provider, employer, and lender.

    By signing this agreement, the recipient assures the U.S. 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.

17. **Certification Regarding Drug-Free Workplace Requirements** (7 CFR Part 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. Section 812) and as further defined by regulation (21 CFR Sections 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).

Certification:

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 must --

(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 must 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 will keep the original of all disclosure reports in the official files of the agency.

18. Certification Regarding Lobbying (7 CFR Part 3018)

A. The Sponsors certify to the best of their knowledge and belief, that:

(1) 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.

(2) 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 must complete and submit Standard Form – LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

(3) The Sponsors must 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 must certify and disclose accordingly.

B. 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, of the 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.

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

A. The Sponsors certify to the best of their knowledge and belief, that they and their principals:

(1) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency;

(2) 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;

(3) 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 (A)(2) of this certification; and

(4) 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.

B. Where the primary Sponsor is unable to certify to any of the statements in this certification, such prospective participant must attach an explanation to this agreement.

20. Clean Air and Water Certification

A. The project Sponsoring organizations signatory to this agreement certify as follows:

(1) Any facility to be utilized in the performance of this proposed agreement is (__), is not (_X_) listed on the Environmental Protection Agency List of Violating Facilities.

(2) To promptly notify the NRCS Assistant State Conservationist for Management and Strategy prior to the signing of this agreement by NRCS, of the receipt of any communication from the Director, Office of Federal Activities, U.S. Environmental Protection Agency, indicating that any facility which is proposed for use under this agreement is under consideration to be listed on the Environmental Protection Agency List of Violating Facilities.

(3) To include substantially this certification, including this subparagraph, in every nonexempt subagreement.

B. The project Sponsoring organizations signatory to this agreement agree as follows:

(1) To comply with all the requirements of section 114 of the Clean Air Act as amended (42 U.S.C. Section 7414) and section 308 of the Federal Water Pollution Control Act (33 U.S.C. Section 1318), respectively, relating to inspection, monitoring, entry, reports, and information, as well as other requirements specified in section 114 and section 308 of the Air Act and the Water Act, issued there under before the signing of this agreement by NRCS.

(2) That no portion of the work required by this agreement will be performed in facilities listed on the EPA List of Violating Facilities on the date when this agreement was signed by NRCS unless and until the EPA eliminates the name of such facility or facilities from such listing.

(3) To use their best efforts to comply with clean air standards and clean water standards at the facilities in which the agreement is being performed.

(4) To insert the substance of the provisions of this clause in any nonexempt subagreement.

C. The terms used in this clause have the following meanings:

(1) The term “Air Act” means the Clean Air Act, as amended (42 U.S.C. Section 7401 et seq.).

(2) The term “Water Act” means Federal Water Pollution Control Act, as amended (33 U.S.C. Section 1251 et seq.).

(3) The term “clean air standards” means any enforceable rules, regulations, guidelines, standards, limitations, orders, controls, prohibitions, or other requirements which are contained in, issued under, or otherwise adopted pursuant to the Air Act or Executive Order 11738, an applicable implementation plan as described in section 110 of the Air Act (42 U.S.C. Section 7414) or an approved implementation procedure under section 112 of the Air Act (42 U.S.C. Section 7412).

(4) The term “clean water standards” means any enforceable limitation, control, condition, prohibition, standards, or other requirement which is promulgated pursuant to the Water Act or contained in a permit issued to a discharger by the

Environmental Protection Agency or by a State under an approved program, as authorized by section 402 of the Water Act (33 U.S.C. Section 1342), or by a local government to assure compliance with pretreatment regulations as required by section 307 of the Water Act (33 U.S.C. Section 1317).

(5) The term "facility" means any building, plant, installation, structure, mine, vessel, or other floating craft, location or site of operations, owned, leased, or supervised by a Sponsor, to be utilized in the performance of an agreement or subagreement. Where a location or site of operations contains or includes more than one building, plant, installation, or structure, the entire location will be deemed to be a facility except where the Director, Office of Federal Activities, Environmental Protection Agency, determines that independent facilities are collocated in one geographical area.

21. Assurances and Compliance. As a condition of the grant or cooperative agreement, the Sponsors assure and certify that they are in compliance with and will comply in the course of the agreement with all applicable laws, regulations, Executive orders and other generally applicable requirements, including those set out below which are hereby incorporated in this agreement by reference, and such other statutory provisions as specifically set forth herein.

State, Local, and Indian Tribal Governments: OMB Circular A-87, A-102, A-129, and A-133; 7 CFR Parts 3015, 3016, 3017, 3018, 3021, and 3052.

Nonprofit Organizations, Hospitals, Institutions of Higher Learning: OMB Circular A-110, A-122, A-129, and A-133; and 7 CFR Parts 3015, 3017, 3018, 3019, 3021, and 3052.

22. Examination of Records. The Sponsors must give the NRCS or the Comptroller General, through any authorized representative, access to, and the right to, examine all records, books, papers, or documents related to this agreement, and retain all records related to this agreement for a period of three years after completion of the terms of this agreement in accordance with the applicable OMB Circular.

Town of Culpeper
400 South Main Street
Culpeper, Virginia 22701

By: /S/ Christopher D. Hively
CHRISTOPHER D. HIVELY
Title: Town Manager

Date: August 2, 2016

The signing of this supplemental watershed agreement was authorized by the governing body of the Town of Culpeper at a meeting held on April 12, 2016.

/S/ Kimberly D. Allen
Clerk or Notary

Town of Culpeper
400 South Main Street
Culpeper, Virginia 22701

Date: August 2, 2016

Culpeper Soil and Water Conservation District
351 Lakeside Drive
Culpeper, Virginia 22701

By: /S/ Lynn Graves
LYNN GRAVES
Title: Chairman

Date: August 2, 2016

The signing of this supplemental watershed agreement was authorized by the governing body of the Culpeper Soil and Water Conservation District at a meeting held on August 2, 2016.

/S/ JoAnn M. Neal
Administrative Secretary

Culpeper SWCD
351 Lakeside Drive
Culpeper, VA 22701

Date: August 2, 2016

Natural Resources Conservation Service
United States Department of Agriculture

Approved by:

/S/ John M. Bricker
JOHN A. BRICKER
State Conservationist

Date: August 3, 2016

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APPENDICES

SUMMARY OF SUPPLEMENTAL WATERSHED PLAN NO. 5 AND ENVIRONMENTAL ASSESSMENT
for the
Rehabilitation of Mountain Run Watershed Dam No. 50
Culpeper County, Virginia
7th Congressional District

Prepared by: United States Department of Agriculture, Natural Resources Conservation Service (NRCS).

Authorization: The original work plan was prepared, and the works of improvement were installed, under the authority of the Watershed Protection and Flood Prevention Act (Public Law 83-566, as amended (16 U.S.C. Section 1001 et. seq.), 1954. The rehabilitation of Mountain Run Dam No. 50 is authorized under Public Law 83-566 (as amended), and as further amended by Section 313 of Public Law 106-472.

Sponsors: Town of Culpeper
Culpeper Soil and Water Conservation District

Proposed Action: Rehabilitate Mountain Run Watershed Dam No. 50, Lake Pelham, to meet current NRCS safety and performance standards for a high hazard dam.

Purpose and Need for Action: The Mountain Run Dam No. 50, Lake Pelham, does not presently meet NRCS or Virginia Division of Dam Safety standards for integrity, stability and capacity for a vegetated auxiliary spillway. The recommended plan is to rehabilitate Mountain Run Dam No. 50 dam to meet current Virginia Division of Dam Safety and NRCS criteria. There are lives and property downstream of this structure that need flood protection. The purposes for federal action are to meet current safety and performance standards for a high hazard dam and maintain water supply and flood protection for downstream properties.

Description of Preferred Alternative: The recommended plan will rehabilitate Mountain Run Dam No. 50 to meet current safety and performance standards for a high hazard dam, provide sediment storage for an additional 50 years after construction, and maintain the existing water supply storage and current level of flood protection downstream. The plan provides for installing a 198-foot wide, 6-cycle structural concrete labyrinth spillway over the embankment, installing an 800-foot-long earthen berm across the existing auxiliary spillway, and upgrading the water intake structure. There will be no change in the current levels of flood protection downstream. There will be no significant change in the water resource operations or recreational uses of the lake as a result of project activity.

Resource Information:

Location: Latitude: 38.46895901 Longitude: -79.01811071

8-Digit Hydrologic Unit Number: 02080103

Climate: In Culpeper County, which is located in the Piedmont Physiographic Province, the average temperature is 37° F in the winter and 76° F in the summer. The last frost of spring normally occurs in middle to late April and the first frost in the fall occurs in mid to late October. This provides a growing season of approximately 157 days. The average annual

precipitation is about 42 inches. This precipitation is fairly well distributed through the year with slightly larger amounts (over 4 inches) occurring in the months of May through September. The average total snowfall is 17.6 inches.

Watershed Size: Mountain Run Watershed = 58,160 acres

Drainage Area of Lake Pelham = 16,726 acres

Land Use:
Woodland: 6,704 acres, 40.1%
Cropland: 71 acres, 0.4%
Developed: 2,558 acres, 15.3%%
Hay/Pasture: 6,725 acres, 40.2%
Water: 532 acres, 3.2%
Wetlands: 128 acres, 0.8%
Other: 8 acres: <0.1%

Land Ownership: Upstream of dam: 99.7% private and 0.3% public
Downstream of dam: 89.4% private, 10.6% public

Population and Demographics: According to the U.S. Census Bureau, the population of the Town of Culpeper was 16,968 (2010-2014 American Community Survey 5-Year Estimate). Of the total population in the 2010-2014 American Community Survey 5-year estimates, 68.4% (11,613) were White and 20.2% (3,431) were Black or African American. All other racial groups individually were 1.8% of the total population or less. Together, Whites and Blacks made up 88.6% of the Town's entire population. Hispanics of any race are the second largest minority group with 16.7%, or 2,827.

The median age of the population of the Town of Culpeper is 32.8. Residents in the Town of Culpeper that were 65 years old or older totaled 10.3% (1,751). Of the Town population, 69.5% was over the age of 18.

Approximately 82.3% of the residents in the Town had a high school education or higher. Of the residents in the Town that are 25 years of age or older, 31.6% have a high school diploma or have passed an equivalency test. About 50.7% of the Town residents have some education beyond high school, including 16.8% with a bachelor's degree or higher and 7.1% with graduate or professional degrees.

There are 12,348 Town of Culpeper residents who are 16 years of age or older according to the 2010-2014 ACS. Approximately 67.8% (8,369) of the residents 16 years of age or older are considered in the labor force pool. About 4.9% of the civilian labor force in the Town was unemployed according to the same source.

The Town of Culpeper has a diverse economy. According to the 2010-2014 ACS, five sub-sectors of the local economy employ the civilian workforce: management, business, science, and arts occupations (38.3%); sales and office occupations (20.4%); production, service occupations 20.4%, natural resources, construction, and maintenance occupations (11.1%); and production, transportation, and material moving occupations (9.8%). Private wage and salary employment constitutes 75.6% of all employment in the Town of Culpeper.

Median household income estimated for the Town for the 2010-2014 period was $54,791. This compares to $64,792 per year for the median household income calculated for Virginia. The national figure for median household income per year estimated for the same period was $53,482.

With respect to per capita incomes, Town of Culpeper residents are estimated to have had per capita income of $26,357 for the 2010-2014 period. Virginians reported per capita income of $33,958 for the 2010-2014 period, while the same figure for the entire United States was $28,555 for same time period. That makes the Town per capita income figure for 2010-2014 77.6% of the state's level and 92.3% of the national figure.

According to the 2010-2014 Census estimates, the Town of Culpeper had 490 families living below the poverty level (11.6%). That compares to 8.2% for State and 11.5% for the Nation.

The 2010-2014 Census estimates indicate that 91.7% of the 6,586 housing units within the Town of Culpeper were occupied. Of the occupied housing units, 55.1% were owner-occupied and 44.9% renter-occupied.

A majority of the 3,992 people at risk from a breach event live within the Town of Culpeper. There are 984 properties within the breach inundation zone. A total of 887 homes (691 single family homes, 149 townhomes, 34 multi-family homes, and 13 condominiums) are located in the projected breach inundation zone below the dam. There are also 80 commercial buildings, 6 religious buildings, 4 charitable organization buildings, 6 local government buildings and 1 educational building within the breach inundation zone. Most of the residential property downstream of the dam ranges between $50,000 and $400,000 in total value with an average of about $200,000. The total value of residential property (structures and contents only, excluding land values) at risk below the dam is an estimated $194,640,000.

Mountain Run Site 50 provides recreation for mainly fishermen and boaters. An estimated average of 560 fishing permits and 320 boating permits are issued every year by the Town of Culpeper. Fishing permits generate approximately $8,900/year and boating permits generate an estimated $4,650/year.

Cultural Resources: None present.

Highly Erodible Cropland: None present.

Threatened and Endangered Species: None present.

Resource Concerns Identified Through Scoping:

Item/Concern	Rationale
SOILS	
Land Use	Concern for future development upstream of the dam and surrounding the dam and in the breach zone downstream.
WATER	
Floodplain Management	Maintain current flood protection. Flooding concerns for downtown areas. Concern for impacts to downstream roads and crossings.
Sewer Line	Existing sewer line located along edge of auxiliary spillway.
Streams, Lake and Wetlands	Lake fringe wetlands and linear riparian wetlands associated with base floodplain flows.
Water quality	Erosion and sediment during construction, dissolved oxygen during drawdown of water level.
AIR	
Air Quality	Temporary effects during construction.
PLANTS	
Invasive species	Ensure none are introduced during construction.
Riparian areas	Impacts during construction. Concern for Yowell Park downstream during construction.
ANIMALS	
Endangered and Threatened Species	Potential habitat for Dwarf Wedgemussel.
Fish and Wildlife	Temporary effects during construction for fish, aquatic organisms and wildlife that use riparian areas. Lake Pelham is a top largemouth bass fishery.
Invasive Species	Introduction during construction.
Migratory birds/Bald eagles/Golden eagles	Bald eagle and osprey nesting sites around lake. Consider time of year restrictions during construction to avoid nesting season.
HUMAN	
Communication with Public	Inform public of proposed project and potential impacts of dam failure. Continue existing flood control and reduce likelihood of catastrophic breach.
Costs/ National Economic Development (NED)	Net Economic Development must be considered.
Drought	Potential for impacts to water supply and golf course irrigation. Town has initiated studies and drilling 3 more groundwater wells in the area. Town currently has 3 wells that supplement existing surface water supply.
Local and Regional Economy	Temporary positive effect during construction for local and regional construction companies. Temporary reduction in income due to loss of local bass fishery during construction activities.
Public Health and Safety	Concern with construction equipment in neighborhoods; safety and public access to lake during construction; noise ordinance restrictions due to close proximity to houses and golf course; need good traffic control during construction due to local buses and children.
Public Recreation	Top largemouth bass fishery in area. May be disrupted during construction.
Scenic Beauty	Aesthetics need to be considered for structural alternatives. May have issues with graffiti on concrete.
Social Issues	Concern for change in aesthetics with structural alternative. Concern for impacts to private golf course during construction.
Water Supply	Minimize impacts to water supply during construction activities. Also minimize impacts to irrigation water for golf course.

Alternative Plans Considered: There are two plans that were considered and evaluated in detail:

1) *No Federal Action (Sponsors' Rehabilitation)* - 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. The *No Federal Action (Sponsors' Rehabilitation)* alternative would be the same or involve the same components as the *Structural Rehabilitation with Federal Assistance*.

2) *Structural Rehabilitation with Federal Assistance* – Install a 198-foot-wide, 6-cycle structural concrete labyrinth spillway over the embankment, install an 800-foot-long earthen berm across the existing auxiliary spillway, and upgrade the water intake structure. There will be no change in the current levels of flood protection downstream. There will be no significant change in the water resource operations or recreational uses of the lake as a result of project activity (NED Alternative).

The preferred alternative maximizes net benefits with a benefit/cost ratio of 1:1, and is the rehabilitation alternative preferred by the Sponsors.

Project Costs (Dollars)

	PL-83-566 Funds		Other Funds		Total	
Category	**Dollars**	**%**	**Dollars**	**%**	**Dollars**	**%**
Construction	$6,537,600	66.3%	$3,320,300	33.7%	$9,857,900	100%
Engineering	$1,017,000	86.6%	$157,500	13.4%	$1,174,500	100%
Relocation	n/a	n/a	n/a	n/a	n/a	n/a
Real Property Rights	n/a	n/a	$0	100%	$0	100%
Project Administration	$57,500	76.7%	$17,500	23.3%	$75,000	100%
Other (permits)	$0	0%	$3,000	100%	$3,000	100%
TOTAL COSTS	**$7,612,100**	**68.5%**	**$3,498,300**	**31.5%**	**$11,110,400**	**100%**
Annual O&M (non-Federal)	n/a	n/a	$7,000	100%	$7,000	100%

Project Benefits: Rehabilitation reduces the potential for loss of life and maintains protection of existing infrastructure downstream of the dam as well as property values around the lake and associated recreational opportunities. Net average annual equivalent benefits between the Future with Federal Project (FWFP) and the Future without Federal Project (FWOFP) = $0. This is due to the fact that the candidate plans to rehabilitate Lake Pelham are identical in scope, substantially equivalent costs and equal effects.

Number of Direct Beneficiaries/Population at Risk: 3,992

Other beneficial effects:

- Reduces the threat to loss of life to approximately 3,992 people that live and/or work in the 984 structures within the breach inundation zone.
- Provides protection for a significant number of vehicle occupants who utilize 10 major roads and 94 secondary roads in the breach inundation zone.
- Provides recreational benefits (primarily boating and fishing) to approximately 1,500 people annually.

- Reduces the threat of loss of access and loss of emergency services for 984 residences, business structures, organizations, and churches.
- Provides downstream flood protection for the residents in the area, as well as those working, recreating, or traversing within the downstream floodplains, for an additional 50 years.
- Eliminates the liability associated with continuing to operate an unsafe dam.
- Maintains existing stream habitat downstream of the dam.
- Retains the existing aquatic and terrestrial habitat in and around the lake.
- Leverages federal resources to install the planned works of improvement.
- Will meet current NRCS safety and performance standards for a high hazard dam.

Benefit to Cost Ratio (current rate): 1.0 to 1.0

Net beneficial effects (NED): $0

Funding Schedule: The most likely scenario is for the project to be implemented over two years including the design and construction.

Federal funds: Year 1 - $630,000 for engineering and project administration; **Year 2** - $444,500 for construction supervision and project administration and $6,537,600 for construction;

Non-Federal funds: Year 1 - $114,000 for engineering and administration and $3,000 for permitting costs; **Year 2** - $61,000 for engineering and project administration and $3,320,300 for construction;

Period of Analysis: 52 years (includes 1 year for design and 1 year for construction)

Project Life: 50 years

Environmental Effects/Impacts:

Resource	Impact
Air Quality	Temporary increase in particulate matter on site during construction.
Land Use Changes	One acre converted from trees to grass and one acre from trees to auxiliary spillway outlet.
Floodplains	Current floodplain would be maintained.
Fisheries	The current lake level will be lowered by a few feet for 6-8 months during construction. No negative effects are expected to the fisheries as a result of this action.
Forest Resources	Approximately 2 acres of trees will be removed during construction.
Wetlands	Temporary effects during construction on 220 acres of open water wetlands and 10 acres of emergent wetlands at the inflow. Approximately 1.0 acre of forested wetland below principal spillway outlet along Mountain Run to be permanently impacted.
Wildlife Habitat	Permanent loss of approximately 2 acres of forest habitat.
Prime Farmland	N/A.
Cultural Resources	No effect.
Threatened and Endangered Species	No effect.
Mitigation	There will be mitigation for the one acre of forested wetland removed below the dam.

Major Conclusions: In order to bring this dam into compliance with NRCS safety and performance standards for a high hazard dam and State safety criteria, it is necessary to rehabilitate the dam. The preferred alternative is to install a 198-foot-wide, 6-cycle structural concrete labyrinth spillway over the embankment, install an 800-foot-long earthen berm across the existing auxiliary spillway, and upgrade the water intake structure. There will be no change in the current levels of flood protection downstream. There will be no significant change in the water resource operations or recreational uses of the lake as a result of project activity. The majority of the environmental impacts are short-term (only during construction) and existing conditions will be restored upon completion of construction.

Areas of Controversy: None

Issues to be Resolved: None

Evidence of Unusual Congressional or Local Interest: No

Is this report in compliance with executive orders, public laws, and other statutes governing the formulation of water resource projects? Yes _X_ No ___

CHANGES REQUIRING PREPARATION OF A SUPPLEMENT

This supplement only addresses Mountain Run Dam No. 50, known locally as Lake Pelham. This dam was built in 1972 as a high hazard dam. Due to changes in evaluation criteria, this dam does not meet current USDA Natural Resources Conservation Service (NRCS) safety and performance standards for the integrity, stability, or capacity of a high hazard dam. It also does not meet 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 capacity. A conditional certificate for Operation and Maintenance of the structure was issued by the Virginia Division of Dam Safety because the vegetated earthen auxiliary spillway cannot pass the Probable Maximum Flood (PMF) without overtopping the dam. For this reason, the dam does not meet the objectives of the Town of Culpeper and the Culpeper Soil and Water Conservation District (Culpeper SWCD) (herein referred to as Sponsors), which are to continue to provide flood protection and water supply and to reduce the risk of loss of human life.

This supplemental Plan-EA documents the planning process by which NRCS provided technical assistance to the Sponsors and the public in addressing resource issues and concerns within the Lake Pelham watershed and complied with the requirements of the National Environmental Policy Act (NEPA).

The recommended plan is to rehabilitate Mountain Run Dam No. 50 dam to meet current Virginia Division of Dam Safety and NRCS criteria by installing a 198-foot-wide, 6-cycle structural concrete labyrinth spillway over the embankment, installing an 800-foot-long earthen berm across the existing auxiliary spillway, and upgrading the water intake structure. There will be no change in the current levels of flood protection downstream, water supply, or recreational uses of the lake as a result of project activity.

PURPOSE AND NEED FOR ACTION

The Mountain Run Dam No. 50, Lake Pelham, is a high hazard dam that was built to provide flood protection and water supply to the Town of Culpeper. It does not presently meet Natural Resources Conservation Service (NRCS) or Virginia Division of Dam Safety standards for a vegetated auxiliary spillway. There are lives and property downstream of this structure that need flood protection. The purpose of this action is to continue to provide water supply and 100-year flood protection in a manner that reduces risk of loss of human life and is both cost effective and environmentally acceptable.

ORIGINAL PROJECT

In 1958, the original watershed work plan for flood prevention and watershed protection was prepared under the authority of the Watershed Protection and Flood Prevention Act (Public Law 83-566). The works of improvement were subsequently installed under the same authority. The Town of Culpeper and the Culpeper SWCD were the local Sponsors. The original watershed work plan included the construction of two single-purpose flood control dams and one multi-purpose dam that would include flood control and water supply storage, an accelerated land treatment

program for watershed protection, and 6.5 miles of stream channel improvement. In 1967, the plan was supplemented to include one more flood control dam, one more multi-purpose dam and 3.45 additional miles of channel improvement. In 1972, the plan was supplemented to add water supply as a purpose to Catalpa Lake. In total, two floodwater retarding structures, three multi-purpose (flood protection and water supply), and 4.7 miles of channel improvement were constructed. All construction was completed by September of 1973. A supplemental watershed plan which eliminated all uncompleted works of improvement and closed out the project was executed on February 14, 1979.

The Town of Culpeper owns and operates Mountain Run Lake (#11) and Lake Pelham (#50). The Culpeper SWCD owns and operates Catalpa Lake (#18), Merrimac Lake (#13) and Caynor Lake (#8A). The Sponsors applied for NRCS assistance with dam rehabilitation of Mountain Run Lake and Lake Pelham on November 14, 2012. The rehabilitation of Mountain Run Dam No. 50 is authorized by the Public Law 83-566, (as amended), and as further amended by the Small Watershed Rehabilitation Amendments of 2000 (Section 313 of Public Law 106-472).

WATERSHED PROBLEMS

The Sponsors were aware of potential problems with the Lake Pelham dam in 2007 when the Virginia Division of Dam Safety issued the first Conditional O&M Certificate to the Town of Culpeper. In addition, there were changes in the Virginia Division of Dam Safety Regulations in 2008. The conditional certificate for Lake Pelham was issued because the auxiliary spillway did not have sufficient capacity to pass the PMF without overtopping the dam embankment.

Sponsor Concerns: A conditional certificate serves as notification to the Sponsors that the dam no longer meets State requirements and must be modified to meet State law. The presence of an unresolved conditional certificate leaves the Sponsors vulnerable to liability should the dam breach and downstream damages result. In November 2012, the Sponsors requested NRCS assistance to prepare a watershed plan that would identify the improvements necessary to obtain full dam safety certification.

Soil Erodibility: In 2012, the Town of Culpeper, Virginia, commissioned Hazen and Sawyer to identify the issues associated with bringing Mountain Run No. 50 up to current dam safety criteria. Although the vegetated earth auxiliary has performed satisfactorily for 44 years, it does not meet the current criteria for capacity. Further analysis indicated that the soil materials in the auxiliary spillway would be vulnerable to erosion in the PMF event. Therefore, the vegetated earth auxiliary spillway does not meet NRCS criteria for integrity or stability.

Floodplain Management: The Sponsors have identified flooding in the floodplain downstream as a primary concern. Culpeper County and the Town of Culpeper have participated in the National Flood Insurance Program since 1987 and 1989, respectively. Both realize the value that Lake Pelham provides in flood protection benefits, particularly for the roads. Lake Pelham controls 26.13 square miles (16,726 acres) of the watershed above the affected properties and benefitted area for frequent flood events.

Erosion and Sedimentation: As of 2014, Lake Pelham had reached 42 years (42%) of its planned 100-year service life. The designed submerged sediment capacity was 877 acre-feet but the as-built volume was 962 acre-feet due to the removal of extra borrow removal from the pool area. As of 2014, there were 253 acre-feet of sediment in the pool area which is about 26% of the as-

built sediment storage volume. This material is primarily deposited sediments plus leaf and other organic debris. The sediment delivery is less than anticipated during the original design.

Local Concerns: The five Mountain Run Watershed dams were planned and constructed in response to the concerns of the residents after the extensive flooding that occurred in the 1940's and 1950's. The Sponsors also wanted a reliable source of water and included water supply storage in three of the dams. The possibility of decommissioning the dam at Lake Pelham was mentioned at the first public meeting in June 2015 since decommissioning must be considered under the federal rehabilitation legislation. The Sponsors and local residents were adamantly opposed to decommissioning because of their concern that flooding would increase in the absence of the dam and they would lose their water supply. The dam has performed as designed and constructed. Several documented storm events have filled the flood pool but none of the events have caused the auxiliary spillway to flow. All five dams in this watershed have performed well and provided needed flood protection for downstream residents during the floods that followed their installation.

The townhomes immediately adjacent to the auxiliary spillway have an elevation that is lower than the top of the dam and are vulnerable to flooding in an auxiliary spillway flow event. These townhomes were built after the dam was constructed.

The golf course adjacent to the dam utilizes lake water to irrigate the golf course and would like to continue this practice during and after rehabilitation.

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 high hazard dam safety and performance standards established by NRCS and the Virginia Division of Dam Safety.
- Reduce the potential for loss of life associated with a failure of this dam.
- Reduce the sponsor liability associated with operation of an unsafe dam.
- Maintain the existing water supply for area residents.
- Maintain the existing level of flood protection for downstream homes and infrastructure.
- Protect real estate values downstream from the dam.
- Maintain aquatic and terrestrial habitats around the lake.
- Preserve existing recreation opportunities.

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 in 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.

On June 10, 2015, a Scoping Meeting was held at the Culpeper Police Department Community Room in Culpeper, Virginia with 22 people attending. Table A lists the specific concerns and their relevance to the proposed action to the decision-making process.

The citizens at the first Public Meeting, also held on June 10, 2015, expressed concerns similar to those at the Scoping Meeting.

Table A - Scoping Meeting Results For Rehabilitation of Lake Pelham Dam
June 10, 2015

Item/Concern	Relevant to the Proposed Action		Rationale
	Yes	No	
SOILS			
Prime and Unique Farmland and farmland of statewide significance		X	None present.
Soil Resources		X	No concerns expressed.
WATER			
Floodplain Management	X		Maintain current flood control. Flooding concerns exist for downtown areas. Concern for increased impacts to downstream roads and crossings.
Regional water resources plans (including coastal zone plans)		X	Watershed is in Chesapeake Bay drainage but not in a coastal zone management area. Local ordinances are in place to protect the Bay.
Sewer utilities	X		Existing sewer line along edge of auxiliary spillway.
Sole source aquifers		X	None present.
Streams, Lakes, and Wetlands	X		Lake fringe wetlands and linear riparian wetlands associated with base floodplain flows.
Water quality	X		Erosion and sediment during construction, dissolved oxygen during drawdown of water level.
Water resources		X	No concerns expressed.
Wild & Scenic rivers		X	None present.
AIR			
Air Quality	X		Temporary effects during construction.
Clean Air Act		X	No concerns expressed.
PLANTS			
Endangered and Threatened Species		X	None present.
Forest Resources		X	No concerns expressed.
Invasive Species	X		Ensure none are introduced during construction.
Natural Areas		X	None present.
Riparian areas	X		Temporary during construction. Concern for Yowell Park downstream during construction.
ANIMALS			
Coral reefs		X	None present.
Ecologically critical areas		X	None present.

Item/Concern	Relevant to the Proposed Action		Rationale
Endangered and Threatened Species	X		Potential habitat for Dwarf Wedgemussel. Consultation with U.S. Fish and Wildlife Service will be conducted.
Essential fish habitat		X	None present.
Fish and wildlife	X		Temporary effects during construction for fish, aquatic organisms and wildlife that use riparian areas. Lake Pelham is a top largemouth bass fishery.
Invasive Species		X	No concerns expressed.
Migratory birds/Bald eagles/Golden eagles	X		Bald eagle and osprey nesting sites around lake. Consider time of year restrictions during construction to avoid nesting season.
HUMANS			
Communication With Public	X		Inform public of proposed project and potential impacts of dam failure. Continue existing flood control and reduce likelihood of catastrophic breach.
Costs/ National Economic Development (NED)/P&G	X		Net Economic Development must be considered.
Cultural Resources		X	No adverse impacts to cultural resources.
Drought	X		Potential for impacts to water supply and golf course irrigation. Town has initiated studies and drilling for 3 more groundwater wells in the area. Town currently has 3 wells that supplement existing surface water supply.
Environmental Justice and Civil Rights		X	No disparate treatment is anticipated.
Land Use	X		Concern for future development upstream of the dam and surrounding the dam and in the breach zone downstream.
Local and Regional Economy	X		Temporary positive effect during construction for local and regional construction companies. Temporary reduction in income due to impacts on local bass fishery during construction activities.
Park Lands		X	Accessibility to boat ramp during construction. Structural auxiliary spillway may reduce long-term O&M.
Public Health and Safety	X		Concern with construction equipment in neighborhoods; safety and public access to lake during construction; noise ordinance restrictions due to close proximity to houses and golf course; need good traffic control during construction due to local buses and children.
Public Recreation	X		Top largemouth bass fishery in area. May be disrupted during construction.
Scenic Beauty	X		Aesthetics need to be considered for structural alternatives. May have issues with graffiti on concrete.
Scientific Resources		X	There are no scientific resources/studies identified in this area.
Social Issues	X		Concern for change in aesthetics with structural alternative. Concern for impacts to private golf course during construction.
Water Supply	X		Minimize impacts to public water supply during construction activities. Also minimize impacts to irrigation water for golf course.

AFFECTED ENVIRONMENT

PLANNING ACTIVITIES

Geologic and engineering investigations and analyses were conducted by NRCS with assistance from Schnabel Engineering and the Town of Culpeper. This work included the sediment survey, the hydrologic and hydraulic analysis, and the Water Resources Site Analysis Program (SITES) analysis of the dam characteristics. Both the existing conditions and proposed rehabilitation alternatives were evaluated with these tools.

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. Potential alternatives were evaluated for cost-effectiveness and for local acceptability. Both the benefits and the costs of the alternatives were computed and analyzed.

PHYSICAL FEATURES

Project Location: The watershed for Lake Pelham is located entirely within Culpeper County, Virginia. The total Lake Pelham watershed is 16,726 acres (26.13 square miles). Appendix B shows the location map for this watershed. Mountain Run No. 11 (Mountain Run Lake), Mountain Run No. 8A (Caynor Lake), and Mountain Run No. 13 (Merrimac Lake) are upstream of Lake Pelham and control about two-thirds of the drainage area.

Topography: Lake Pelham is located in the Piedmont Physiographic Province. The topography of the Piedmont is characterized by gently rolling hills and valleys. The elevation in the watershed ranges from about 370 feet at the dam to 705 feet on an unnamed knob on the watershed divide near the small town of Norman.

Soils: The major soils in the portion of the watershed below Mountain Run Lake, Caynor Lake, and Merrimac Lake are the Edgemont-Culpeper complex, and the Culpeper sandy loam, (http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm). The Edgemont-Culpeper complex covers 24.2% of the watershed with 1,638 acres. The Edgemont-Rixeyville complex covers 759 acres (11.2%) of the watershed; Culpeper sandy loam soils cover 730 acres (10.8%); Fauquier silt loam covers 645 acres (9.5%); Codorus and Meadowville soils cover 652 acres (9.2%); Glenelg silt loam covers 590 acres (8.7%); and Rhodhiss-Mine Run complex covers 523 acres (7.7%). Approximately 66.4% of the soils in the watershed are on slopes greater than 7%.

Geology: The digital representation of the 1993 Geologic Map of Virginia shows that the sub-watershed controlled by Mountain Run Site No. 50 is underlain by rocks of the Cambrian Period and the late Proterozic. The formation with the largest areal extent in the sub-watershed is the Lynchburg Group – Charlottesville Formation. That same map shows the embankment itself is underlain by the same formation. However, in the original Geology Report, and in the as-built drawings, the drill holes along the centerline of the embankment all encountered greenstone, which is probably the Catoctin greenstone. Berquiest et al (1993) do not describe any greenstone members of the Charlottesville Formation. Therefore, it appears that the Geologic Map of Virginia (1993) has the boundary between the Catoctin greenstone and the Lynchburg Group – Charlottesville Formation a little too far to the east in the area of Mountain Run 50.

Climate: In Culpeper County, which is located in the Piedmont Physiographic Province, the average temperature is 37° F in the winter and 76° F in the summer. The last frost of spring normally occurs in middle to late April and the first frost in the fall occurs in mid to late October. This provides a growing season of approximately 157 days. The average annual precipitation is about 42 inches. This precipitation is fairly well distributed through the year with slightly larger amounts (over 4 inches) occurring in the months of May through September. The average total snowfall is 17.6 inches.

LAND USE

The total drainage area upstream of Lake Pelham is 16,726 acres. This area was derived using the ArcGIS Hydrologic Analysis Tools. The Land Cover/Land Use was extracted from the 2011 National Land Cover Dataset (NLCD). Table B lists the land use upstream of the dam. This table also lists the land use in the Sunny Day Breach inundation zone below the dam. The land use in the Sunny Day Breach Zone was derived from the NLCD 2011 dataset. Appendix B contains the land use map of the watershed.

Table B - Land Use

Land Cover Type	Drainage Area of Lake Pelham (ac.)	Percent of Total	Sunny Day Breach Inundation Zone (ac.)	Percent of Total
Developed	2,558	15.3	634	53.7
Cropland	71	0.4	34	2.9
Woodland	6,704	40.1	201	17.0
Hay/Pasture	6,725	40.2	274	23.2
Water	532	3.2	2	0.2
Wetlands	128	0.8	25	2.1
Other	8	<0.1	11	0.9
Total	**16,726**	**100.0**	**1,181**	**100.0**

THREATENED AND ENDANGERED SPECIES

NRCS staff first consulted informally with the U.S. Fish and Wildlife Service (USFWS) in January 2013 thru their online Information for Planning and Conservation (IPaC) system. At that time, the only T&E species reported was the Dwarf wedgemussel (*Alasmidonta heterodon*) that was potentially in Mountain Run downstream of Mountain Run Dam No. 50. In the summer of 2015, NRCS contracted with an approved USFWS surveyor to survey 800 meters downstream of Mountain Run Dam No. 50 per USFWS protocol. In August 2015, the final report for the survey was submitted to NRCS. The report indicated that after a thorough survey for the Dwarf wedgemussel, none were found (report available in administrative record).

In November 2015, NRCS again informally consulted with the USFWS through their IPaC system to analyze any updated information. At that time, the Dwarf wedgemussel was no longer listed as

potentially in the vicinity of the proposed project and no designated or proposed federally designated Critical Habitat for any species was identified. However, a new T&E species, the Northern long-eared bat (Myotis septentrionalis), was identified as potentially living in the proposed project area.

According to USFWS species range maps, all of Virginia is within the range of the Northern long-eared bat. However, after reviewing the map depicting "known" hibernacula and maternity roost trees, no "known" Northern long-eared bat hibernacula or maternity roost trees have been designated or recorded within ¼ mile of the project area. As stated in the Final 4(d) rule on the Northern long-eared bat, since no "known" maternity roost trees or hibernacula have been designated within a ¼ mile of the proposed project, any incidental take that may result from the project is exempted by the 4(d) rule and no further action is necessary to comply with the Endangered Species Act prohibitions to protect Northern long-eared bats.

NRCS has concluded that the proposed project will have "no effect" on any federally listed or proposed species or their designated or proposed critical habitat. Likewise, primarily because there are no sensitive species or habitat present, the project will have no impact to any other identified sensitive species. Supporting consultation information and data can be found in the administrative record.

CULTURAL RESOURCES, NATURAL AND SCENIC AREAS, AND VISUAL RESOURCES

The National Register of Historic Places lists fifty sites in Culpeper County. Five archaeological sites within one mile of the project area are listed in the State archaeological files. However, 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 119 sites, buildings or structures in Virginia, none of which are found in Culpeper County. Therefore, none will be affected by the project activities. There are three designated State Natural and Scenic Area Preserves in Culpeper County. However, none are within the project vicinity.

NRCS cultural resources staff completed database searches for any known cultural resources and ground-surveyed the project area for evidence of archaeological and/or historical resources that had the potential to be impacted. A pedestrian survey was conducted throughout the entire project area in February 2015. No cultural resources were found in the areas of potential new disturbance associated with rehabilitation measures at Mountain Run No. 50, and overall, there appears to be low potential for intact subsurface cultural deposits in these areas. A search of the Virginia Department of Historic Resources' Archeological and Architectural Sites database was completed in November 2015, did not reveal any recorded archeological or historic sites in the vicinity of the proposed project. Consultation with the Virginia Department of Historic Resources (VDHR) was initiated in November 2015 by NRCS thru their online Electronic Project Information Exchange (ePIX) website pertaining to the proposed Lake Pelham Dam rehabilitation project. On December 18, 2015, the VDHR indicated their finding of "*no historic properties affected"* for the proposed Lake Pelham dam project and indicated no additional studies or consultation would be necessary (see Appendix D).

A search of the Native American Consultation Database (NACD) was conducted in November 2015 to determine if there were any Indian tribes that might attach religious or cultural significance to historic properties that could be located in the proposed project area. An additional search of the Tribal Directory Assessment Tool (TDAT) v2.0 was conducted in November 2015 to determine if there were any Indian tribes that might attach religious or cultural significance to historic properties that could be located in the proposed project area. This was done in accordance with 36 CFR 800.2 (c)(i) of the Advisory Council on Historic Preservation Regulations. Neither database identified any tribes to have a claimed interest or consultation contact in Culpeper County, Virginia (NPS 2015) (HUD 2015).

The NRCS has determined pursuant to 36 CFR 800.4(d) that there are no properties included in or eligible for the National Register of Historic Places within the area of potential effect of the alternative resulting in rehabilitation of Mountain Run No. 50. This determination was reported to the SHPO in November 2015 for review and concurrence, and the SHPO concurred in the determinations on December 18, 2015 (both letters are available in the administrative record).

It should be noted that additional cultural resources investigations would be necessary should the decommissioning or relocation alternatives be selected. At this time, areas of potential effect for alternatives other than rehabilitation have not been specifically identified.

WATER QUALITY

Lake Pelham is located on Mountain Run which confluences with the Rappahannock River at the Culpeper/Fauquier County line approximately 24.5 miles downstream of the dam. The 2012 305(b)/303(d) Integrated Water Quality Assessment and Impaired Waters Report listed Mountain Run as Category 5 waters needing a Total Maximum Daily Load (TMDL) Study addressing both aquatic life and recreation (VDEQ 2012). The Commonwealth of Virginia currently has no plans for TMDL development within the next six years. The impaired segment mentioned above is not included on the 6-year prioritization list.

STREAMS, LAKES, AND WETLANDS

Mountain Run is a tributary to Rappahannock River. The Rappahannock River drains into the Chesapeake Bay. Mountain Run has an average base flow of about 15.8 cubic feet per second immediately below the dam. The stream is approximately 10 feet wide and less than two feet deep. The substrate of the streambed consists of sands and gravels. The riparian areas adjacent to Mountain Run and Lake Pelham are predominately forested.

The Lake Pelham shoreline, inlet, and outlet were visually surveyed in April 2014 for wetlands. Approximately 10 acres of freshwater emergent wetlands were identified at the inflow of the lake. The 220 surface acres of the lake are considered to be open water wetlands. Approximately 1.0 acres of forested wetlands were identified downstream of the principal spillway outlet pipe adjacent to Mountain Run. No other wetlands were identified upstream or downstream of the dam. Data found at the USFWS wetland mapper website: www.fws.gov/wetlands/Data/Mapper.html concurred with the field investigation.

Additional documentation regarding the methods used to make the field investigation can be found in Appendix D.

AIR QUALITY

According to the Virginia Department of Environmental Quality, Culpeper County is located within a non-attainment area for ozone. Special consideration must be given to fugitive dust or open burning during land-disturbing and construction activities.

FOREST RESOURCES

The surrounding watershed is part of the Southern Appalachian Piedmont. An approximation of climax forest stands in Culpeper County are dominated by mature stands of oak-hickory forests and containing other species like American beech (*Fagus grandifolia*), American holly, (*Ilex opaca var. opaca*). Chestnut oak, (*Quercus montana*), and Mountain laurel, (*Kalmia latifolia*). Due to the age of the forest, understory vegetation is limited to shade tolerant ground cover and young saplings of the above mentioned tree species.

FISH AND WILDLIFE RESOURCES

The Virginia Department of Game and Inland Fisheries (VDGIF) stocks Lake Pelham with crappie, channel catfish, largemouth bass, pumpkinseed sunfish, and yellow perch.

The Mountain Run Watershed is considered to be part of the Southern Appalachian Piedmont Ecoregion according to Virginia's Comprehensive Wildlife Conservation Strategy, 2005 (VDGIF). This Strategy lists 157 Species of Greatest Conservation Need in the Piedmont. While completing field surveys, the NRCS staff observed many animals and animal signs commonly found in such habitats, including various thrushes and vireos, the scarlet tanager, several species of woodpeckers, gray squirrels, rabbits, white-tailed deer, box turtles, opossums, and raccoons. Ducks, geese, herons, birds, otter, muskrat, and beaver may be found along the shoreline of the lake.

MIGRATORY BIRDS

Lake Pelham is on the Atlantic Flyway - the migratory path of waterfowl, shorebirds, pelagic birds, and songbirds of the North American East Coast. Each fall, the Atlantic Flyway is filled with ducks, geese, brant, swans, hawks, eagles, and other migratory birds. Waterfowl and other birds make several stops on the flyway to rest, feed and drink before continuing their southern migration. In early spring, birds follow this path northward to their traditional nesting grounds.

According to The Center for Conservation Biology's bald eagle nest locator at http://www.ccbbirds.org/maps/#eagles, there are no known roost nests in the vicinity of Lake Pelham. A visual assessment showed no nests of bald eagles or ospreys within a quarter mile of the dam.

CHESAPEAKE BAY AND COASTAL ZONE MANAGEMENT AREAS

The Mountain Run Watershed drains into the Rappahannock 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. Culpeper County and the Town of Culpeper have adopted local

land use plans and ordinances which incorporate water quality protection measures consistent with the Chesapeake Bay Act Regulations. The Mountain Run Watershed is not located within the Virginia Coastal Zone Management Area.

SOCIAL AND ECONOMIC CONDITIONS

The entire watershed of Lake Pelham lies within Culpeper County. A majority of the population at risk from a breach event live within the Town of Culpeper. There are 984 properties within the breach inundation zone.

Population and Race: According to the U.S. Census Bureau, the population of the Town of Culpeper was 16,968 (2010-2014 American Community Survey 5-Year Estimate). Of the total population, 68.4% (11,613) were White and 20.2% (3,431) were Black or African American. All other racial groups individually were 1.8% of the total population or less. Together, Whites and Blacks made up 88.6% of the Town's entire population. Hispanics of any race are the second largest minority group with 16.7%, or 2,827.

Age: The 2010-2014 Census projections from the American Community Survey (ACS) of the U.S. Census Bureau, indicate that the median age (middle point with ½ above and ½ below) of the population of the Town of Culpeper was 32.8. The median age for Virginia was somewhat higher at 37.6 years (37.4 for the entire nation). Residents in the Town of Culpeper that were 65 years old or older totaled 10.3% (1,751). These statistics compare to 13% for the State and 13.7% for the nation. Of the Town population, 69.5% was over the age of 18. The same statistic for the state as a whole was 77.2% and the national number was 76.5%.

Education: Approximately 82.3% of the residents in the Town had a high school education or higher while the state-wide and national percentages for this were 87.9% and 86.3% respectively. Of the residents in the Town that are 25 years of age or older, 31.6% have a high school diploma or have passed an equivalency test. State-wide and nationally, 25.0% and 28.0% respectively, of this population have a high school diploma or equivalency. About 50.7% of the Town residents have some education beyond high school, including 16.8% with a bachelor's degree or higher and 7.1% with graduate or professional degrees. In the state, 62.8% of the population has some education beyond high school and 58.4% have the same level of education for the nation (15.0% with graduate or professional degrees at the state level; 11.0% for the same statistic at the national level). An additional 21.1% in the Town have completed at least some college level work with 5.7% having obtained an associate degree. The same statistics at the level of the state and nation are 20.0% and 21.2% and 7.1% and 7.9%, respectively.

Employment/Unemployment, Class of Worker and Commuter Status: There are 12,348 Town of Culpeper residents who are 16 years of age or older according to the 2010-2014 ACS. Approximately 67.8% (8,369) of those residents are considered in the labor force pool. About 4.9% of the civilian labor force in the Town was unemployed according to the same source. The unemployment figure is higher than the unemployment rate projected from the 2010-2014 estimates for Virginia as a whole which was 4.5%, and lower than the same statistic for the nation at 5.8%.

The Town of Culpeper has a diverse economy. According to the 2010-2014 ACS, five sub-sectors of the local economy employ the civilian workforce: management, business, science, and arts occupations (38.3%); sales and office occupations (20.4%); production, service occupations

20.4%, natural resources (225 individuals in agriculture, forestry, fishing and hunting, and mining), construction, and maintenance occupations (11.1%); and production, transportation, and material moving occupations (9.8%). In the same 2010-2014 period, private wage and salary employment constitutes 75.6% of all employment in the Town of Culpeper.

Income: Median household income (householder and all others, related or not) estimated for the Town for the 2010-2014 period was $54,791. This compares to $64,792 per year for the median household income calculated for Virginia with the national figure at $53,482. The median estimated household income for 2010-2014 for the Town of Culpeper was 84.5% of the state median and 102.4% of the national median household income.

Median family income (householder and all others that are related) in the Town of Culpeper for the 2010-2014 period was $63,772. The current figure is significantly less, approximately 81.8%, than the $77,939 in median family income for Virginia as a whole and almost 97.4% of the $65,443 reported for the entire United States for 2010-2014. Median family income is consistently higher than median household income 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.

With respect to per capita incomes, Town residents are estimated to have had per capita income of $26,357 for the 2010-2014 period. Virginians reported per capita income of $33,958 for the 2010-2014 period, while the entire United States had $28,555 for same time period. That makes the Town per capita income figure for 2010-2014 77.6% of the state's level and 92.3% of the national figure.

Poverty: According to the 2010-2014 Census estimates, the Town of Culpeper had 490 families living below the poverty level (11.6%). State-wide, 8.2% of Virginia's families had incomes below the poverty level during that period. At the national level, 11.5% of the families were estimated to live below the poverty level for the period 2010-2014.

Housing: The 2010-2014 Census estimates indicate that 91.7% of the 6,586 housing units within the Town of Culpeper were occupied. Of the occupied housing units, 55.1% were owner-occupied and 44.9% renter-occupied. The state-wide occupancy rate for Virginia as a whole reported in the 2010-2014 estimates was 87.5% and the national figure was also 87.5%. The state-wide rates for owner- and renter-occupancy were 64.4% and 35.6%, respectively, and the national rates were the same as for the state.

A total of 887 homes (691 single family homes, 149 townhomes, 34 multi-family homes, and 13 condominiums) are located in the breach inundation zone below the dam. Most of the homes are located in or near the Town of Culpeper. There are also 80 commercial buildings, six religious buildings, four charitable organization buildings, six local government buildings and one educational building within the breach inundation zone. Most of the residential property downstream of the dam ranges between $50,000 and $400,000 in total value with an average of about $130,000. The total value of residential property (structures and contents only, excluding land values) at risk below the dam is an estimated $194,640,000.

Recreation: Mountain Run Site 50 provides recreation for mainly fishermen and boaters. An estimated average of 620 fishing permits and 320 boating permits are issued every year by the Town of Culpeper. It is a highly valued resource by the local community. Fishing permits generate approximately $8,900/year and boating permits generate approximately $4,650/year in

local government revenue. Local fishing organizations often hold bass fishing tournaments at the lake (Figure 1). Other lake-based recreation activities associated with the reservoir include bird watching.

Figure 1. Public use of Lake Pelham during fishing tournament.

DESCRIPTION OF EXISTING DAM

Current Condition of the Dam: The dam and auxiliary spillway have been well maintained with a good stand of grass and no significant woody vegetation on the embankment and auxiliary spillway. Some brush and other woody vegetation have been noted growing along the waterline. No erosion was observed on either the embankment or the auxiliary spillway. In addition, no significant seepage or evidence of stability issues have been observed. The camera survey of the principal spillway pipe was completed on September 24, 2014, and showed no material deterioration. The structural components of the dam were inspected by underwater divers and professional engineers on November 19, 2015. They were found to be in good condition with only minor issues to be addressed during construction.

Potential Dam Safety Deficiencies: The Virginia Division of Dam Safety issued a conditional use certificate for Lake Pelham because the vegetated earthen auxiliary spillway does not have the capacity to pass the required spillway design flood for a high hazard dam. The conditional O&M certificate is valid until September 30, 2017. During the planning process, NRCS verified this condition. NRCS further determined that the auxiliary spillway also does not have the capacity to pass the Freeboard Hydrograph without overtopping the dam. In addition, NRCS found that the dam does not meet the 10-day drawdown requirement during the Principal Spillway Hydrograph event.

As-Built Dam Specifications: The dam was constructed in 1972 and "As-Built" drawings are available. The embankment was constructed in two zones. The earthfill used to construct Zone 1 was described as clayey silt and sandy silt and was obtained from the auxiliary spillway. The material used to construct Zone 2 was described as sand and gravel from borrow areas and weathered siltstone from the auxiliary spillway. A 12-foot-wide core trench was constructed at the centerline of the dam an average of about 15 feet below natural ground. According to the original geology report, the auxiliary spillway excavation (borrow) included clayey silt, sandy silt and silty sand to a depth of about six to ten feet, overlying weathered greenstone. The floodplain borrow area soils were variable with silts, clays, and sands and gravel.

The dam is approximately 38 feet tall and 850 feet long. The upstream and downstream slopes of the dam are approximately 2.5 feet horizontal to 1 foot vertical with the upstream slope below the wave berm at 3 feet horizontal to 1 foot vertical. The top width of the structure is approximately 14 feet. Riprap wave protection is located on the upstream slope of the embankment and is supported by a bench in the embankment. The riprap is present approximately five feet below and five feet above the normal pool elevation of 384.2 feet.

The site was surveyed in 2014. All elevations are given in feet using NAVD88 vertical datum. The top of dam was surveyed at elevation 402.2; the normal pool at elevation 384.2 and the auxiliary spillway crest at elevation 390.3.

Principal Spillway: The principal spillway is a 192-foot-long, 66-inch diameter, reinforced concrete pipe with a 16.5 foot by 5.5 foot (interior dimensions), 25.75-foot-high, reinforced concrete riser discharging into a chute spillway outlet structure. The riser controls the normal pool with two weirs, 16.5-foot-long each, at elevation 384.2 feet. A 30-inch diameter circular gate located 15 inches above the base of the riser is provided for dewatering. The outlet works, including the downstream chute spillway, are in generally good condition (Figures 2-4). A raw water line with two 18-inch diameter intakes is present in the principal spillway structure.

Auxiliary Spillway: A 300-foot-wide vegetated channel auxiliary spillway was excavated into earth and rock at the left abutment. The as-built drawings show a grassed inlet section sloping at 5-percent for a distance of about 125 feet from the reservoir, transitioning to a 2-percent slope for a length of about 145 feet to the control section, a 30-foot-wide level control section, and an outlet section sloping at 2.9 percent for about 600 feet, transitioning into the original ground. The vegetation lining the spillway is well maintained. The spillway outlets into a vegetated natural slope leading to the defined outlet channel. The boring logs recorded by Hazen and Sawyer and the test pits recorded by Harza Engineering indicate the soil in the auxiliary spillway to be comprised of silts and clays underlain by weathered greenstone.

The NRCS Hydrology and Hydraulics Study (2015) verified that the auxiliary spillway does not provide adequate capacity to pass the Freeboard Hydrograph or have the integrity needed to pass the design storm without breaching. The principal spillway does not meet the 10-day drawdown requirement for the Principal Spillway Hydrograph event.

Internal Drain System: A trench drain was installed along a centerline located 10 feet downstream of the toe of the Zone 1 fill. Drain fill was also placed as a diaphragm surrounding the principal spillway conduit approximately 20 feet wide and extending 70 feet downstream from the centerline of the trench drain. The drain fill was graded as aggregate base material with no additional filter. Ten-inch diameter perforated collector pipes were installed. The toe drains exit through the sidewalls of the principal spillway outlet structure.

Figure 2. Principal spillway outlet pipe, chute spillway, and drains below dam.

Figure 3. Looking downstream from top of dam.

Figure 4. Looking downstream during flood event.

Figure 5. Water intake building during flood event.

Appurtenances: A golf course is located immediately downstream and to the right of the dam and spillway system. A tee box is located on the crest of the dam near the right abutment. The golf course has a water intake for irrigation about 15 feet below the water surface near the right abutment.

A residential neighborhood is located on the left side of the existing auxiliary spillway. In the topographic survey performed by NRCS in 2014, the ground elevations of the three groups of town homes located to the left of the auxiliary spillway were observed to be 400.2 feet, 397.5 feet, and 394.7 feet, respectively. With Mountain Run Dam No. 50's dam crest at approximate elevation 402.2 feet, these homes would be subject to inundation during the design storm event in the existing spillway configuration.

The water intake components for the public water supply are accessed by a walkway that extends from the top of the dam to the principal spillway riser (Figure 5).

The Town of Culpeper owns the sewer line located along the outside edge of the auxiliary spillway.

Baseline Survey: A ground run topographical survey performed by NRCS in 2014 was the basis for critical elevations and the design of rehabilitative measures. The NRCS Hydrology and Hydraulics Report includes the differences between the NGVD27 elevations contained in the as-built drawings and NAVD88 elevations. A 2014 NRCS sediment study bathymetric survey, a ground-run topographical survey performed by Hazen and Sawyer (2013), and 2-foot GIS contours were used to produce the conceptual figures in Appendix C.

Sedimentation: Lake Pelham was designed to store 100 years of sediment in the pool area. The designed submerged sediment storage capacity was 877 acre-feet at a planned sediment accumulation rate of 8.77 acre-feet per year. Based upon earlier sediment studies, the original submerged sediment storage capacity was actually 962 acre-feet. The volume of submerged sediment in the pool in 2014 was 253 acre-feet. The total submerged sediment volume accumulated between 1972 and 2014 was approximately 253 acre-feet. The sedimentation rate from 1972 to 1987 was 9.02 acre-feet per year. From 1987 to 2014, the sedimentation rate was 4.2 acre-feet per year. As of 2014, the remaining capacity of the sediment pool was 709 acre-feet (Figure 6). About a third of the land cover within the watershed is forested and has not changed since the dam was constructed. The future sedimentation rate is projected to be the same as the rate for the past 27 years. In 2014, there were 169 years of submerged sediment pool life remaining.

There were 65 acre-feet of aerated sediment storage planned. Aerated sediment is sediment that is deposited above the normal pool during high flows. The designed deposition rate for the aerated sediment was 0.65 acre-feet per year. There was very little evidence of aerated sediment at Mountain Run 50 in the fall of 2014 and no visible gravel bars at the inlets to the lake. Since the average deposition rate for submerged sediment was only 65% of what was originally predicted, the deposition of aerated sediment in the flood pool should have been at a similar reduced rate. Sixty-five percent of the original predicted aerated sediment deposition rate is 0.42 acre-feet per year of aerated sediment or a total over the 42 years prior to 2014 of 17.75 acre-feet. Since the original design allowed for 65 acre-feet of aerated sediment to be deposited in the flood pool, there should be approximately 46 acre-feet of capacity for aerated sediment remaining. At 0.42 acre-feet of aerated sediment per year, there is room for over 100 more years of aerated sediment deposition.

Figure 6. Sediment survey, in progress.

GENERAL DESCRIPTION OF HOW A DAM FUNCTIONS

The main components of a flood control dam are the earthen embankment; the normal or sediment pool; the floodpool; the principal spillway; and the auxiliary spillway. The principal spillway riser and pipe controls the day-to-day elevation of the water in the lake and it provides a controlled release of the water in the floodpool. The floodpool, which is the water storage area between the principal spillway crest and the auxiliary spillway crest, is designed to detain the water that would accumulate behind the dam in events equal to or smaller than an event with a 100-year annual recurrence interval. This storm is the event that has a one percent chance of occurring in any given year. In a bigger flood event, the water level will be higher than the crest of the auxiliary spillway and the excess water will pass around the dam embankment through the auxiliary spillway.

Sediment pool. The reservoir is designed to store sediment in the area below the elevation of the lowest principal spillway inlet and to detain floodwater in the area between the lowest principal spillway inlet and the crest of the auxiliary spillway. After the dam is completed, water accumulates below the lowest principal spillway inlet 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 lowest principal spillway inlet, the pool no longer has permanent water storage, but the designed floodwater detention storage is still intact. If the actual sedimentation rate is greater than the designed sedimentation rate, the sediment storage volume will be filled before the design life of the structure has been reached. The additional sediment would begin to fill the floodwater detention volume above the lowest principal spillway inlet and reduce the available flood storage. Initially, sediment delivered to the reservoir would pass directly through the lowest principal spillway inlet. Eventually, this inlet would be blocked by debris and sediment and the level of the water would rise to the crest of the auxiliary spillway.

As the flood pool loses storage due to sediment deposition, the auxiliary spillway operates, or has flowage, more often. For a vegetated earthen auxiliary spillway, repeated flows could erode the soil material and eventually cause the spillway to breach. Repeated flows increase the operation and maintenance costs for the Sponsor.

In the case of a water supply reservoir, the sediment pool would fill the water supply storage before it would start filling the floodpool.

Principal spillway: A principal spillway has three main parts: the riser, the pipe, and the outlet. The riser is typically a concrete tower that controls the level of water in the lake. Most risers have a drain gate at the bottom of the riser that allows the lake to be completely drained. The elevation of the water in the lake is established by calculating the amount of sediment that has to be stored over the life of the dam and then adding the desired water supply volume. For a two-stage riser, the water flows through the first-stage inlet in the riser until the water rises to the elevation of the second-stage inlet. Then, it flows through both inlets. The water falls to the bottom of the riser before exiting through the principal spillway pipe. The principal spillway pipe conveys water through the dam safely. The water exits into an outlet structure, typically called a stilling basin. Its purpose is to slow the velocity of the water leaving the pipe so it doesn't cause erosion in the stream channel.

Auxiliary spillway: There are four parts of an auxiliary spillway. The inlet section is on the side closest to the lake. It has a gentle upward slope toward the middle of the auxiliary spillway. The water that reaches the inlet section has little or no velocity and, therefore, does not cause erosion to occur. The level center section is called the control section. The control section is usually located where the auxiliary spillway crosses the centerline of the top of the dam. The purpose of the control section is to make the water in the auxiliary spillway spread out evenly rather than concentrate into little channels. The third section is called the constructed outlet. Its purpose is to keep the water flowing out of the auxiliary spillway in a controlled manner until the water gets far enough away that it will not cause erosion on the earthen embankment itself. Once this point is reached, the water is free to go on downstream. The fourth component of an auxiliary spillway is the training dikes. Training dikes are used in conjunction with the outlet section to direct the flow of the water away from the back side of the dam embankment. Training dikes can also be used in the inlet section to direct water into the auxiliary spillway.

STATUS OF OPERATION AND MAINTENANCE

Operation and maintenance of the structure is the responsibility of the Town of Culpeper and they have done an excellent job of operating and maintaining this structure in accordance with the operation and maintenance agreement. This has been verified through site assessments. The most recent inspection was conducted November 2, 2015. The principal spillway (riser, outlet pipe, and stilling basin) is in good condition and should remain structurally serviceable for 50 more years.

STRUCTURAL DATA

The structural data for the as-built condition of the dam and watershed is described in Table C. The sediment data is based upon the 2014 sediment survey.

Table C – As-Built and Existing Structural Data for Lake Pelham

	As-Built	Existing
Local Name	Lake Pelham	
Site Number	50	
Year Completed	1972	
Cost	$260,620	
Purpose	Flood control and water supply	
Drainage Area, mi^2	26.2	
Dam Height, feet	38	
Dam Type	Earthen	
Dam Volume, yds^3	136,917	
Dam Crest Length, ft.	850	
Storage Capacity, ac-ft. [2/]	4,122	3,658
Submerged Sediment, ac-ft.	962	709
Aerated Sediment, ac-ft.	65	46
Beneficial Use (M&I water)	1,000	
Flood Storage, ac-ft.	2,095	1,903
Surface Area, ac.	254	220
Principal Spillway		
Type	Concrete	
Riser Height, ft.	25.75	
Conduit Size, inches	66	
Stages, no.	1	
Riser crest elev.	384.1	
Capacity, cfs	770	
Energy Dissipater	Plunge Pool	
Auxiliary Spillway		
Type	Vegetated Earth	
Width, ft.	300	
Capacity, % of PMF	100	90
Normal Pool Elev.	384.2	
Flood Pool Elev.	390.4	390.3
Top of Dam Elev.	402.5	402.2
Datum[1/]	NAVD88	NAVD88

[1/] Original elevation based on NGVD29 but all data shown based on NAVD88.
[2/] As-built volumes based on original design and as-built information. Existing volumes calculated from 2014 sediment survey.

BREACH ANALYSIS AND HAZARD CLASSIFICATION

Breach Analysis: To determine the downstream inundation zone due to a dam breach, a breach analysis was performed for a sunny day breach with the water level at the existing auxiliary spillway crest. The peak breach discharge criteria in Technical Release No. 60, Earth Dams and Reservoirs (TR-60) was used. A "sunny day breach" is a dam failure that occurs unexpectedly.

The Sponsors contracted for the work needed to determine the inundation zone due to the breach of the dam. Results of the breach analyses are shown in Appendix C on the Breach Inundation Map. The breach analysis terminated five miles downstream of the dam.

The Sponsors have current breach inundation zone maps for the dam that comply with the Virginia Impounding Structures Law and Regulations for high hazard dams. These maps show the breach inundation zone that would occur if the dam failed when the water level was at the top of the dam. The Virginia Impounding Structures Regulations requires owners of high hazard dams to provide a dam breach inundation zone map to determine hazard classification and develop the Emergency Action Plan (EAP). 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 must update the EAP annually with assistance from local emergency response officials. The NRCS State Conservationist will ensure that a current EAP is prepared prior to initiation of construction.

Hazard Classification: Lake Pelham was originally constructed in 1972 for the purpose of protecting downstream lands from flooding and to provide water supply. It was designed as a Soil Conservation Service (SCS) class C (high hazard) structure with a 100-year design life. The hazard class of the structure is high because failure may cause loss of life and serious infrastructure damage. Currently, the Virginia Division of Dam Safety has designated Lake Pelham as a high hazard structure. The breach analysis completed for this Watershed Plan concurs with the original and current hazard class of the structure as high.

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 Lake Pelham.

Sedimentation: The major land uses in the watershed above the dam are 40.2% Hayland/Pasture, 40.1% Forest, 15.3% Developed/Open Space, and 3.2% Water. These uses are not expected to change significantly. The future sediment accumulation rate in Lake Pelham is expected to be the same as the historic rate for the past 27 years. Based upon the future sediment deposition rate of 4.2 acre-feet per year, the remaining sediment storage life of Lake Pelham in 2014 was 169 years. Therefore, the potential for failure due to inadequate sediment storage capacity is low.

Hydrologic Capacity: Hydrologic failure of a dam occurs when the auxiliary spillway is breached or when the dam is overtopped and fails. Under present NRCS criteria for high hazard dams, the auxiliary spillway must have sufficient integrity and capacity to completely pass the full PMF event. The auxiliary spillway at Lake Pelham does not have sufficient integrity to withstand the flows from the PMF event and could breach before the dam overtopped. If the auxiliary spillway did not breach, the dam would be overtopped. The water in the reservoir would flow over the top of the embankment and could cause it to erode and collapse. For this reason, the overall potential for hydrologic failure of Lake Pelham dam is considered to be high.

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. There are no signs of seepage at the Lake Pelham dam. Therefore, the potential for a seepage failure of Lake Pelham dam is considered to be low.

Seismic: The structural integrity of an earthen embankment is 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 Mountain Run 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 embankment.

Riser failure could have two different results. If the riser fails in a way that does not block the principal spillway pipe, then all of the water would drain out of the lake. This would eliminate the pool area but the dam would continue to provide flood storage. If a riser failure blocked the principal spillway pipe, the water would fill up to the crest of the auxiliary spillway and then flow through it. There would be no stormwater detention and no downstream flood protection. The potential for a seismic failure of the riser is low.

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. A camera survey of the principal spillway pipe was conducted in September of 2014. No problems were observed with any of the material components. As of 2016, the principal spillway system had reached 44% of its planned 100-year service life. There is a reasonable expectation that it will continue to function as planned for the next 56 years. Therefore, there is low potential for failure due to material deterioration.

Conclusion: At the present time, the two mostly likely ways that the Lake Pelham dam could fail during the PMP event are that the auxiliary spillway could breach or the dam could overtop. Either of these types of failure could occur at any time during the remaining life of the structure. There is adequate sediment capacity, there is no evidence of seepage, the site has minimal risk for failure due to material deterioration, and the risk of seismic failure of the embankment or riser is low.

CONSEQUENCES OF DAM FAILURE

A sunny day breach analysis was performed in accordance with the peak breach discharge criteria in Technical Release No. 60, Earth Dams and Reservoirs (TR-60). It was assumed that structural collapse would occur with the water level at the existing auxiliary spillway crest and would result in a release of 57,100 acre-feet of water and sediment, beginning with a wall of water that is 26 feet high. A maximum breach discharge of 118,730 cfs was computed using the criteria in TR-60.

The population at risk is approximately 3,992 people. The properties and infrastructure potentially affected by a breach of the Lake Pelham Dam includes 887 homes, 80 business structures, four charitable organizations, six churches, six local government buildings, and one education building.

Ten major roads (Routes 229, 522, 667, 799, 29, 15/29, 15/29 Bus, 29 Bus, 719 and 641) and 94 secondary roads are impacted by a potential dam failure.

A breach event would cause significant economic damages to the homes, business structures, roads and bridges below the dam. In addition, the loss of the lake would result in a loss of water supply. The residences and business properties at risk in the area of the floodplain subject to a breach of Lake Pelham have structure and content values estimated at $265,000,000. A catastrophic breach would result in an estimated $153,000,000 in economic damages to existing buildings and their contents. The potentially impacted major bridge, culvert, and road embankment infrastructure is valued at $9,472,000. Approximately $8,510,000 in damages to road crossings could occur in this event. A catastrophic breach of the Lake Pelham dam would result in a total estimated $161,500,000 in damages to homes, businesses, and infrastructure.

Other economic damages from a catastrophic breach would be associated public and private clean-up costs, damages to vehicles, lost water supply with the reservoir gone, and increased flood damages in the future for remaining properties due to the absence of the dam and its flood protection effects.

The environmental damages from a dam failure would be significant. In addition to the damage caused by the water, the sediment stored in the pool area would be flushed downstream in the event of a catastrophic breach. Approximately five 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. Over time, the sediment could migrate downstream from Mountain Run into the Rappahannock River and then into the Chesapeake Bay.

There is also a potential for stream degradation upstream from the dam site. The abrupt removal of the water and sediment would cause instability in the stream feeding the reservoir. This channel could develop headcuts that would migrate upstream. If a bedrock ledge or other hardened point is encountered in the stream, the headcut would stop proceeding upstream. Downcutting and widening would continue to occur in the lake bed.

FORMULATION AND COMPARISON OF ALTERNATIVES

The stated objectives of the Sponsors for the Lake Pelham Rehabilitation Plan are: 1) to bring the dam into compliance with current dam safety and design criteria; 2) to maintain the current level of flood protection; 3) maintain the water supply; and 4) to address the local residents' concerns. 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 the locally preferred solution and other alternatives identified through the planning process. In addition, NEPA and the National Watershed Program Manual (NWPM) requires the consideration of all reasonable alternatives to the proposed federal action.

FORMULATION PROCESS

Formulation of the alternative rehabilitation plan for Lake Pelham followed procedures outlined in the NRCS *National Watershed Program Manual*. Other guidance incorporated into the formulation process included the NRCS *Principles and Guidelines for Water and Land Related Resources Implementation Studies (P&G)*, and the *Economics Handbook, Part II for Water Resources*, and other NRCS watershed planning policies. Several alternatives were considered. Only one federal action alternative was carried through for detailed study. It had a 52-year period of analysis, which included a two-year design and installation period and 50 years of 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 Lake Pelham into compliance with current dam safety and design criteria. The National Economic Development (NED) Alternative is the federally assisted alternative with the greatest net economic benefits. The alternative plans that must be considered include:

- No Federal Action
- Decommission the Dam
- Non-Structural – Relocate or Floodproof Structures in the Breach Zone
- Rehabilitate the Dam
- National Economic Development (NED) Alternative

ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED STUDY

Some of the alternatives considered in the planning process were eliminated from detailed consideration because these alternatives either did not meet the proposed purpose or need for federal action or they were logistically impractical to implement.

Decommission Dam: Decommissioning is a mandatory alternative that must be considered under NRCS policy for dam rehabilitation. This option describes an alternative which requires removing the flood detention capacity of the dam by cutting a 100-feet-wide notch in the existing embankment down to the valley floor. If the dam is removed, the 984 homes, churches, clubs, and businesses in the breach zone will no longer be at risk from flooding caused by a breach of Lake Pelham. However, they would be at risk of frequent, uncontrolled flooding during storm events. Federal policy requires that induced damages be mitigated so that there would be no increase in the amount of damaged sustained during a 100-year flood event. Mitigation of induced damages to the buildings includes relocation or floodproofing the impacted structures. The downstream bridges and utilities would also have to be protected. The Town would no longer have the public water supply. About 1,000 acre-feet of water supply would have to be developed.

Notching the dam embankment would require removal of about 16,625 cubic yards of material. The submerged sediment would be stabilized or removed. The function and stability of the stream

channel would be restored. The removal of the principal spillway riser and pipe would also be necessary. These unneeded materials could be buried on site or hauled to an appropriate disposal site. About 255 acres of grass would be planted over the dam, pool, and spoil site. Table D lists some of the major components of decommissioning the dam.

Table D – Major Components of Decommissioning the Dam

Items of Work	Quantities	Unit cost	Cost
Fill removal and disposal	16,625 CY	$8.00/CY	$133,000
Spoil spreading	54,335 CY	$9.09/CY	$493,900
Topsoil spreading	76,230 SY	$1.43/SY	$109,010
Pollution control	Lump Sum	$125,000	$125,000
Seeding and mulching	255.2 Acres	$3,678/acre	$938,625
Removal of principal spillway pipe and riser	Lump Sum	$240,350	$240,350
Water removal	Lump Sum	$141,700	$141,700
Reservoir reclamation	Lump Sum	$1,181,500	$1,181,500
Surveys, Quality Assurance, and other miscellaneous items	Various		$1,173,469
Total cost of structure removal*			$4,536,554

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

The estimated cost of removing the storage capacity of the dam and all appurtenant structures ($4.5 million, replacing the water supply ($14.5 million), and mitigating for induced damages ($4.54 million at a minimum) is $23,540,000. This solution would meet the Sponsor requirements but at an exorbitant cost.

Rehabilitation Alternative – *Modify existing auxiliary spillway*. In order to increase the capacity, it would be necessary to raise the dam, widen the auxiliary spillway, or a combination of the two methods. Due to the location of the townhouses adjacent to the dam, there is no room to widen the auxiliary spillway. Removal of the 24 townhouses would add at least $6 million to the cost of the rehabilitation. Raising the top of the dam would require acquisition of the land rights to the new top of the dam. This would add significantly to the Sponsor cost because of the number of homes impacted. It would be also be considered a "taking" under Virginia law and would generate substantial legal action. Raising the dam 1.8 feet with a parapet wall, widening the auxiliary spillway, removing the townhouses, and installing a cutoff wall and Articulated Block Armor would have a construction cost of $13.4 million. This solution would meet the Sponsor requirements but would have very high social, legal, and financial consequences. Therefore, this alternative was not considered further.

Rehabilitation Alternative - *Construct a Roller-compacted Concrete (RCC) spillway over the top of the dam.* The existing earthen auxiliary spillway would be replaced by an RCC structure with an Ogee control section at the same elevation as the existing structure. The water would drop over a series of steps from the spillway crest to the concrete stilling basin. The earthen spillway

would be filled in with an earthen berm that has a minimum crest width of 12 feet and 3H:1V side slopes.

An RCC overtopping spillway with an Ogee control section would have a construction costs approximately $900,000 more than the alternative of a labyrinth spillway over the embankment. The entire length of dam to the left of the principal spillway outlet works would have overtopping protection. This alternative requires significant excavation into the left abutment and significant disturbance below the dam to train the spillway flows back towards the natural stream channel. Because the only access to the dam is through the large residential community immediately adjacent to the dam, the impact to the residential community during RCC construction was considered a very significant factor in the evaluation of the best alternative. Over 3,000 round trips for the delivery of aggregate, cement, and fly ash for the RCC mixture would be via the residential streets. Conflicts with children playing and school buses would occur. The potential for noise and dust from aggregate handling activities and the mixing of the RCC would be significant. For summer temperature control of the RCC mix, working at night is an industry standard which would create sleep disturbance issues with the townhomes adjacent to the dam. RCC production and placement is a high energy activity that can create undesirable situations in and around residential areas.

This alternative was not developed further because the intensity of the construction operation would cause adverse effects in the adjacent community.

Non-Structural - Relocation or Floodproof Structures: Elevating, floodproofing, or relocating the 984 homes, businesses, church buildings, charitable organization buildings, government buildings, and education facility in the breach zone of the dam would cost in excess of $ 4,540,000 and will not change the need for rehabilitation of the dam. Therefore, this alternative was not considered in further detail.

DESCRIPTION OF ALTERNATIVE PLANS CONSIDERED

Alternatives Without Federal Assistance

One of the alternatives that must be included in the plan is the “No Action” alternative. For the purposes of the rehabilitation program, the No Action alternative describes the action that the Sponsors will take if no federal funds are provided. Since the Lake Pelham dam is a high hazard dam that does not meet current safety and performance standards, 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 or removal of the dam. NRCS would still have the technical responsibility of approving the Sponsors’ solution because the floodwater retarding structure is under an Operation & Maintenance Agreement between the local Sponsors and NRCS until 2072.

At the present time, the potential for an uncontrolled breach and resulting damages is present and will continue until 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 NRCS and Virginia 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 reduce the Sponsors' dam safety liability but would not eliminate all liability since it would induce flooding downstream. This option would not meet the Sponsors' goal of maintaining existing levels of flood control and water supply.

No Federal Action (Sponsor's Rehabilitation): In the absence of federal assistance, the Sponsors have indicated that they will rehabilitate the dam to meet the required dam safety and design criteria at their own expense using the alternative proposed by NRCS. For the purposes of this evaluation, the Sponsors' Rehabilitation will be the same as the No Federal Action alternative. The estimated total construction cost would be $9,857,900. The total project cost would be $11,110,400.

Alternative With Federal Assistance

Rehabilitation Alternative: Install a 198-foot-wide, 6-cycle structural concrete labyrinth spillway over the embankment and an 800-foot-long earthen berm across the existing auxiliary spillway, and upgrade the water intake structure. The capacity and integrity deficiency will be addressed by installing a 198-foot-wide, 6-cycle structural concrete labyrinth weir over the dam embankment (Figure 7). The elevation of the weir will be the same as the existing auxiliary spillway crest elevation. Maintaining the existing auxiliary crest elevation and principal spillway hydraulics will maintain the current level of flood control. The vegetative earthen auxiliary spillway will be filled by an earthen berm about 800-foot-long with an elevation the same as the crest of the dam. This earthen berm will extend past the auxiliary spillway to tie into natural ground at the elevation of the top of dam. This earthen berm would have a minimum 12 foot crest width with 3H:1V side slopes. The maximum height of the earthen berm would be approximately 15 feet. This earthen berm will be designed to meet the NRCS standards for a typical dam. The concept layout is shown on the maps in Appendix C.

In order to maintain the existing flood protection, the principal spillway will not be rehabilitated. This means that the principal spillway is not adequate to empty the flood pool within 10 days. The intent of the 10-day principal spillway drawdown and hydrograph criteria is to minimize the frequency that an earthen/vegetated auxiliary spillway is activated. The proposed rehabilitation alternative is to install a structural spillway that will maintain existing elevations and reservoir storage. A structural auxiliary spillway can be operated more frequently than a vegetated

auxiliary spillway. This approach is acceptable under the new, draft TR-60 criteria (June 2016). For final design, the new criteria will be employed or a variance to the 10-day drawdown criteria will be requested.

Figure 7. Example of a 5-cycle labyrinth weir.

It is estimated that there will be 62,000 cubic yards of excavation required for the proposed labyrinth spillway and stilling basin. Of this quantity, it is expected that at least 30,000 cubic yards will be fill suitable for the construction of the earthen berm across the auxiliary spillway. It is estimated that approximately 18,000 cubic yards of fill will be required. The remainder of the excavated soils will be wasted within the current limits of the existing auxiliary spillway.

The principal spillway riser is in good condition and does not need rehabilitation. It had an original design life of 100 years and is expected to be functional for its remaining life. However, the riser tower also houses the pre-treatment facility for the municipal water supply. At the present time, access to the service building is by a walkway from the embankment. This walkway will be removed during the construction of the structural auxiliary spillway. The only access to the riser will be by boat. As part of the rehabilitation, the Sponsors propose to upgrade the 18-inch raw water intake structure by removing the existing service building and installing a new intake location on the left side of the new auxiliary spillway. Pretreatment of the water will occur at a location to be determined. Two unseating head gates would be installed such that water can be drawn from the same elevation as it is in the current configuration. The gates would discharge into a 24-inch diameter concrete-encased ductile iron pipe which would carry raw water from the reservoir under the proposed auxiliary spillway and tie into the existing system via the 18-inch diameter raw water line located to the right of the principal spillway outlet.

Since the existing boat ramp will be removed during construction, a minimal boat ramp will be constructed near the intersection of U.S. 29 and Country Store Drive. The Sponsors would be responsible for any improvements needed to make the ramp accessible to the public. There will be a new public boat ramp upstream of the earthen berm.

The water intake for the golf course is submerged 12-15 feet in the lake and will not be affected by the proposed three-foot drawdown during construction.

The townhomes and associated roads adjacent to the existing auxiliary spillway that are currently vulnerable to flooding in the design event will be protected by the extension of the dam embankment.

There is no anticipated impact to the sewer line adjacent to the left side of the auxiliary spillway. However, this will be evaluated further during design. The Town owns the sewer line and will be responsible for any needed changes.

Approximately one acre of forested wetland downstream of the dam will be removed as a result of these changes. Another acre of trees will be removed to allow the extension of the dam embankment. Mitigation for the loss of the forested wetland will be done at a 2:1 ratio.

Preferred Rehabilitation Alternative: The preferred alternative is to install a 198-foot-wide, 6-cycle structural concrete labyrinth spillway over the embankment, install an 800-foot-long earthen berm across the existing auxiliary spillway, and upgrade the water intake structure.

NATIONAL ECONOMIC DEVELOPMENT (NED) ALTERNATIVE

The Alternative, as described above, is the NED plan. For purposes of the rehabilitation program, the NED plan is defined as the federally assisted alternative with the greatest net economic benefits.

The Sponsors have indicated that, in the absence of federal assistance, they would rehabilitate the dam to meet the required dam safety and design criteria at their own expense using the alternative proposed by NRCS. The Sponsors' Rehabilitation is used as the No Federal Action alternative. The No Federal Action - Sponsor's Rehabilitation alternative would be the same in scope, cost, and effects as the Future with Federal Project alternative. The rehabilitation with federal assistance is the most locally acceptable alternative and best serves the Sponsors in achieving the needs and purpose of this rehabilitation. Therefore, installing a 198-foot-wide, 6-cycle structural concrete labyrinth spillway over the embankment, installing an 800-foot-long earthen berm across the existing auxiliary spillway, and upgrading the water intake structure is the NED plan and the preferred alternative. 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 benefit/cost ratio is 1:1. The results displayed in Table F 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.

COMPARISON OF ALTERNATIVE PLANS

Table E summarizes the effects of each alternative considered. Refer to the Environmental Consequences section for additional information.

Table E - Summary and Comparison of Alternative Plans

Effects	**Future Without Federal Project** **No Federal Action - Sponsors' Rehabilitation**	**Future With Federal Project** **Rehabilitation with Federal Assistance –** Installing a 198-foot-wide, 6-cycle structural concrete labyrinth spillway over the embankment, installing an 800-foot-long earthen berm across the existing auxiliary spillway, and upgrading the water intake structure**.** **Recommended Plan – (NED Plan)**
Sponsor Goals	Continue to provide flood protection; reduce liability.	Continue to provide flood protection; reduce liability.
Structural	Upgrade dam to meet dam safety and design criteria.	Upgrade dam to meet dam safety and design criteria.
Total Project Investment Lake Pelham	$11,110,400	$11,110,400
Total Beneficial Annualized (AAEs*)	---	$439,000
Total Adverse Annualized (AAEs*)	---	$439,000
Net Beneficial	---	$0
Benefit/Cost Ratio	---	1.0 to 1.0
Estimated OM&R**	---	$7,000
Floodplain Management	No change from existing condition.	No change from existing condition.
Sewer utilities	No effect.	No effect.
Streams, lakes, and wetlands	Temporary drawdown of lake. Temporary Impact on 10 acres of emergent wetlands during construction. One acre of forested wetlands will be removed downstream of the dam.	Temporary drawdown of lake. Temporary Impact on 10 acres of emergent wetlands during construction. One acre of forested wetlands will be removed downstream of the dam.
Water quality	No long-term change; minimal short-term effect during construction.	No long-term change; minimal short-term effect during construction.
Air quality	Temporary effect during rehabilitation.	Temporary effect during rehabilitation.
Invasive plant species	Care will be taken during construction to Avoid Introduction of invasive species.	Care will be taken during construction to Avoid Introduction of invasive species.
Riparian areas	Removal of one acre of riparian forest.	Removal of one acre of riparian forest.
Endangered and Threatened Species	None present.	None present.
Fish and wildlife	No effect.	No effect.

Effects	Future Without Federal Project **No Federal Action - Sponsors' Rehabilitation**	Future With Federal Project **Rehabilitation with Federal Assistance –** Installing a 198-foot-wide, 6-cycle structural concrete labyrinth spillway over the embankment, installing an 800-foot-long earthen berm across the existing auxiliary spillway, and upgrading the water intake structure**.** **Recommended Plan – (NED Plan)**
Migratory birds	Temporary effect during construction.	Temporary effect during construction.
Communication with the public	A public participation plan was developed and followed.	A public participation plan was developed and followed.
Drought	No effect on water supply or golf course Irrigation as a result of rehabilitation. Short-term drawdown of lake during construction limited to three feet.	No effect on water supply or golf course Irrigation as a result of rehabilitation. Short-term drawdown of lake during construction limited to three feet.
Environmental Justice and Civil Rights	No disparate treatment.	No disparate treatment.
Land Use	About one acre of trees will be converted to Grass in construction of the earthen berm.	About one acre of trees will be converted to Grass in construction of the earthen berm.
Local and Regional Economy	Temporary positive effect on local and/or regional construction companies. Temporary negative effect due to loss of existing access to the lake during construction.	Temporary positive effect on local and/or regional construction companies. Temporary negative effect due to loss of existing access to the lake during construction.
Public health and safety	Decrease potential for loss of life from dam breach. Safety and noise concerns will be addressed during construction.	Decrease potential for loss of life from dam breach. Safety and noise concerns will be addressed during construction.
Public recreation	Short-term loss of access during construction. Replacement of existing boat ramp.	Short-term loss of access during construction. Replacement of existing boat ramp.
Scenic beauty	Permanent change from grassed auxiliary spillway to concrete labyrinth weir over dam. Sponsors will address potential graffiti issues.	Permanent change from grassed auxiliary spillway to concrete labyrinth weir over dam. Sponsors will address potential graffiti issues.
Social issues	No effect on golf course during construction. View of dam will be permanently changed.	No effect on golf course during construction. View of dam will be permanently changed.
Water supply	No change to water supply due to construction. Temporary changes to water treatment access during construction.	No change to water supply due to construction. Temporary changes to water treatment access during construction.

* Per 1.7.2 (a) (4) (ii) 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 displayed 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). Although the average annual benefits of rehabilitation are $439,000, net benefits are zero because the total project cost is equal to the claimed benefits and the resulting benefit/cost ratio is 1:1. "AAEs" stands for Average Annual Equivalents which are based on a 3.125% discount rate and a 52 year period of analysis (1 year to design, 1 year to install and a 50 year expected useful life).

** "Estimated OM&R" stands for Operation, Maintenance and Replacement Costs.

Note: Regional Economic Development account (RED) concerns were not identified during the scoping process. Therefore, the RED account information is not included.

ENVIRONMENTAL CONSEQUENCES

Alternative plans of action can result in a multitude of effects on resources upstream and downstream of Lake Pelham. This section describes anticipated effects on resource concerns identified by the Sponsors, the public, and agency personnel in the Scoping meeting and the public meetings. Topics are listed in the same categories as listed in Table E.

Two alternative plans were considered and evaluated in detail. Decommissioning the dam was not considered a viable alternative because of the exorbitant cost to flood-proof or relocate a large number of properties and to develop a new water supply.

1) *No Federal Action (Sponsors' Rehabilitation)* or
2) *Rehabilitation with Federal Assistance (NED 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. The *No Federal Action (Sponsors' Rehabilitation)* alternative would be the same or involve the same components as the *Rehabilitation with Federal Assistance (NED Alternative).* This alternative maximizes net benefits with a benefit/cost ratio of 1:1, and is the rehabilitation alternative preferred by the Sponsors.

ENVIRONMENTAL EVALUATION WORKSHEET (NRCS-CPA-52)

An Environmental Evaluation Worksheet, NRCS-CPA-52 form, was completed for the Mountain Run Dam No. 50 rehabilitation project. The, NRCS-CPA-52 provides information on the effects of the various alternatives on the individual resource concerns in the watershed.

Initially it was thought that the preferred alternative for the Mountain Run Dam No. 50 project would be covered by categorical exclusions (NWPM Part 501.38(A)) and a Plan-Environmental Evaluation would be applicable. However, as planning progressed, it was determined that portions of proposed activities may be outside the limits of NRCS categorical exclusions, and therefore an Environmental Assessment would be appropriate.

SOILS

There are no identified concerns with Prime and Unique Farmlands and farmland of statewide significance or soil resources.

WATER

There are no identified concerns with regional water resources plans (including coastal zone resource plans), sole source aquifers, water resources, or Wild and Scenic Rivers.

Floodplain Management

Existing Conditions: The Mountain Run floodplain is managed by both the County of Culpeper and the Town of Culpeper. Each locality has a local floodplain ordinance, which imposes zoning restrictions within the flood zones that is consistent with FEMA and state regulations. Culpeper

County joined the National Flood Insurance Program in July 1987 and the Town of Culpeper joined in March 1989. The flood zone above the dam is within Zone A in the County, below the dam are Zone A and Zone AE within the Town. Zone A designates a special flood hazard area that has no base flood elevation data or floodway. Zone AE designates a special flood hazard zones that has base flood elevation data (100-yr flood elevations). The Flood Insurance Rate Maps (FIRM) for Lake Pelham are found in Appendix C. They designate both Zone A and Zone AE for Mountain Run and do not include the 0.2% annual chance of flooding area (500-year). The existing FIRM and Floodplain Ordinances are based upon the dam providing frequent flood protection.

No Federal Action (Sponsors' Rehabilitation): Rehabilitation of the Lake Pelham dam will be done in accordance with all necessary requirements and restrictions. The existing level of flood protection will be maintained. Existing floodplain management zoning restrictions will not be changed. The Town and County does not currently have the 500-year floodplain mapped on the FIRM or have zoning restrictions within the 0.2% annual chance flood. If the Town or the County decide to have the 500-year floodplain mapped in the future, the rehabilitated dam and appurtenances will need to be considered.

Rehabilitation with Federal Assistance (NED Alternative): Same as the No Federal Action (Sponsors' Rehabilitation).

Sewer Utilities

Existing Conditions: There is a sewer line that is owned by the Town located adjacent to the left side of the auxiliary spillway.

No Federal Action (Sponsors' Rehabilitation): Preliminary investigations show that construction will have no impact on the sewer line. However, a complete evaluation will be performed during the design process. The Town would be responsible for any needed changes.

Rehabilitation with Federal Assistance (NED Alternative): Same as the No Federal Action (Sponsors' Rehabilitation).

Streams, Lakes, and Wetlands

Existing Conditions: The main stream associated with Lake Pelham is Mountain Run. Approximately 10 acres of freshwater emergent wetlands were identified along the lake inflow. The 220 acres of the lake are considered to be open water wetlands. About 1 acre of seasonally flooded palustrine (freshwater) forested wetland was identified downstream of the outlet. The trees are approximately 40 years old. The dominant species are river birch, red maple, sweet gum, sycamore, and pin oak. This type of wetland is relatively common in the watershed.

No Federal Action (Sponsors' Rehabilitation): Rehabilitation of the dam will have no permanent adverse effects on Lake Pelham. The lake will be drawn down about 3 feet for approximately six months during the summer construction season. This will result in the temporary loss of 10 acres of surface water. The fringe wetlands around the lake will also be temporarily impacted during this time. About 1 acre of riparian forested wetlands will be lost as a result of the installation of the labyrinth weir. This will be replaced at a 2:1 ratio by construction of a similar wetland or by purchase from an approved mitigation bank.

Rehabilitation with Federal Assistance (NED Alternative): Same as the No Federal Action (Sponsors' Rehabilitation).

Water Quality

Existing Conditions: Mountain Run has been identified as Category 5 water needing a TMDL Study addressing both aquatic life and recreation.

No Federal Action (Sponsors' Rehabilitation): There may be a temporary impact on downstream water quality due to a sediment release when the water is drawn down prior to construction. However, construction will have no impact water quality. Erosion and sediment control measures will be in place and water releases from the project area are expected to meet the appropriate water quality standards.

Rehabilitation with Federal Assistance (NED Alternative): Same as the No Federal Action (Sponsors' Rehabilitation).

AIR

Air Quality

Existing Conditions: According to DEQ, Culpeper County is within a non-attainment area for ozone. Special considerations must be given to fugitive dust or open burning during land disturbing and construction activities.

No Federal Action (Sponsors' Rehabilitation): During the rehabilitation of the dam, particulate matter (dust) will increase during construction activities. Air pollution abatement actions will minimize any potential temporary dust problems during construction, and the proposed work is not expected to violate any federal, state, or local air quality standards. Open burning of vegetative debris may require a permit.

Rehabilitation with Federal Assistance (NED Alternative): Same as the No Federal Action (Sponsors' Rehabilitation).

PLANTS

There are no identified concerns with endangered and threatened plant species, forest resources, or natural areas.

Invasive Plant Species

Existing Conditions: At the present time, there are no known invasive species on the site.

No Federal Action (Sponsors' Rehabilitation): Rehabilitation of the Lake Pelham dam would not change the existing conditions for invasive species. Care will be taken during construction to avoid the introduction of invasive species and comply with Executive Order 13112. All disturbed areas will be reestablished to grass or existing species.

Rehabilitation with Federal Assistance (NED Alternative): Same as the No Federal Action (Sponsors' Rehabilitation).

Riparian Areas

Existing Conditions: There are riparian areas around the lake and along Mountain Run.

No Federal Action (Sponsors' Rehabilitation): There will be no long-term change to the riparian areas around the lake. About one acre of forested riparian wetland will be removed downstream of the dam for installation of the outlet channel of the labyrinth weir.

Rehabilitation with Federal Assistance (NED Alternative): Same as the No Federal Action (Sponsors' Rehabilitation).

ANIMALS

There are no identified concerns with coral reefs, ecologically critical areas, essential fish habitat, or invasive animal species.

Endangered and Threatened Species

Existing Conditions: After a thorough survey for Dwarf wedgemussel, none were found to exist in the project area. There is potential habitat in the watershed for the Northern long-eared bat but there have been no known recorded roost trees or hibernacula within a quarter mile of the project area.

No Federal Action (Sponsors' Rehabilitation): Rehabilitation of the dam will have no effect on endangered or threatened species.

Rehabilitation with Federal Assistance (NED Alternative): NRCS has determined that the proposed federal action will have "No Effect" on listed species or their critical habitat.

Fish and Wildlife

Existing Conditions: The Virginia Department of Game and Inland Fisheries currently stocks Lake Pelham with crappie, channel catfish, largemouth bass, pumpkinseed sunfish, and yellow perch. Wildlife in the area includes gray squirrels, rabbits, white-tail deer, box turtles, opossums, and raccoons.

No Federal Action (Sponsors' Rehabilitation): Because the lake is used for municipal water supply, the lake will only be drawn down about 3 feet during construction. Short-term impacts will include a slight increase in difficulty of access to water and some loss of fish habitat around the perimeter of the lake. There will be no long term impacts to the fish and wildlife that use the lake. One acre of forested wetland and one acre of upland forest will be lost.

Rehabilitation with Federal Assistance – (NED Alternative): Same as the No Federal Action (Sponsors' Rehabilitation).

Migratory Birds

Existing Conditions: Lake Pelham could potentially be utilized by several species of migratory birds for feeding, nesting, or resting. No bald eagle or osprey nests are located within a quarter mile of the project area.

No Federal Action (Sponsors' Rehabilitation): Since the lake will only be drawn down about 3 feet during construction, there will be little to no impact to migratory birds during the construction. There are similarly-sized bodies of water throughout the region which could be used also.

Rehabilitation with Federal Assistance (NED Alternative): Same as the No Federal Action (Sponsors' Rehabilitation).

HUMAN

There are no identified concerns with cultural resources, parklands, or scientific resources.

Communication with the Public

Existing Conditions: The Sponsors have been aware of the need for rehabilitation.

No Federal Action (Sponsors' Rehabilitation): A public participation plan was developed and will continue to be followed.

Rehabilitation with Federal Assistance (NED Alternative): Same as the No Federal Action (Sponsors' Rehabilitation).

Drought

Existing Conditions: Lake Pelham is used for public water supply and for irrigating the adjacent golf course.

No Federal Action (Sponsors' Rehabilitation): There will be no decrease in the water supply as a result of the rehabilitation. The water will be drawn down about three feet during construction but this will have no adverse effect on the water supply or the golf course irrigation.

Rehabilitation with Federal Assistance (NED Alternative): Same as the No Federal Action (Sponsors' Rehabilitation).

Environmental Justice and Civil Rights

Existing Conditions: There is an estimated population of 3,992 people in the breach zone below the dam. EPA's EJSCREEN tool was used to identify environmental justice groups within the benefited area downstream of the dam. Thirty-four percent of the benefitted downstream population are minorities (14% of the benefitted residents are black, 19% Hispanic and 1% Asian). Thirty percent of the beneficiaries have household incomes at or below $25,000 which is below the $28,440 poverty level for households with 4 individuals for the 48 contiguous states (per the Federal Register notice from 1/25/16 from the US Department of Health and Human Services).

No Federal Action (Sponsors' Rehabilitation): Rehabilitation of the dam will have positive economic and social effects across all residents within the floodplain and above the dam. There will be no disparate treatment. 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 and below the dam.

Avoiding a dam breach will directly benefit all local residents and taxpayers in general within Culpeper County, the Town of Culpeper, and the Commonwealth of Virginia.

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

Approximately 3,992 people would benefit directly from the rehabilitation of the dam. There are indirect benefits for the estimated 1,500 more people who use the area around the lake for recreation during the year.

There would also be downstream benefits to the occupants of thousands of vehicles/day. This is primarily those people affected by impacts to the roads and bridges and includes others who would lose access to emergency services or would be cut off from their residences or jobs.

Rehabilitation with Federal Assistance (NED Alternative): Same as the No Federal Action (Sponsors' Rehabilitation).

Land use

Existing Conditions: The land use in the upstream watershed has remained fairly constant for the life of the dam. However, the residents have expressed some concern about development in the watershed and around the lake and in the breach zone downstream of the lake. Changes to zoning could affect land use.

No Federal Action (Sponsors' Rehabilitation): Rehabilitation of Lake Pelham will have no effect on development in the watershed. There will be no change to the water surface elevation that would affect development around the lake. It will provide increased protection against the breach. One acre of forested upland will be replaced by the extension of the dam embankment. One acre of forested wetland will be replaced by the outlet channel of the labyrinth weir.

Rehabilitation with Federal Assistance (NED Alternative): Same as the No Federal Action (Sponsors' Rehabilitation).

Local and Regional Economy

Existing Conditions: The recreational use of the lake, the many local businesses, and the roads used for commuting to work sites contribute significantly to the local economy.

No Federal Action (Sponsors' Rehabilitation): There would be a temporary positive effect on the local economy during the construction period. This may be offset by the temporary loss of revenue associated with recreation.

Rehabilitation with Federal Assistance (NED Alternative): Same as the No Federal Action (Sponsors' Rehabilitation).

Public Health and Safety

Existing Conditions: The existing vegetated earth auxiliary spillway does not have the integrity or capacity necessary to withstand the Probable Maximum Precipitation event. A breach of the auxiliary spillway could cause a release of the water and sediment stored behind the dam. Overtopping the dam could cause the dam to erode and collapse. Approximately 3,992 people are at risk for loss of life. There are 984 homes, businesses, church buildings, government buildings, charitable organizations, and education facilities in the breach zone of this dam. There are also 24 townhouses immediately adjacent to the auxiliary spillway that are currently at risk of flooding during an auxiliary spillway flow event.

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 50 years after the rehabilitation project is complete. The downstream flooding levels would be the same as they are presently except that the townhouses will no longer be at risk of flooding. The dam embankment extension will provide the needed protection. The threat to loss of life from failure of the dam would be greatly reduced. Access to the site will be restricted during construction.

Rehabilitation with Federal Assistance (NED Alternative): Same as the No Federal Action (Sponsors' Rehabilitation).

Public Recreation

Existing Condition: Lake Pelham provides opportunities for lake-based activities such as boating, bird watching and fishing.

No Federal Action (Sponsors' Rehabilitation): There are no anticipated permanent changes to the existing recreational opportunities as a result of the planned rehabilitation activities. During the 18 month construction period, the lake will be drawn down about 3 feet but the lake will still be accessible for boating and fishing. There will be temporary boat access provided for accessing the water treatment facility on the riser. There are a number of other lakes in the area that could also be used for fishing during the construction period. A new access road, parking area and boat ramp will be constructed upstream of the new dam embankment extension.

Rehabilitation with Federal Assistance (NED Alternative): Same as the No Federal Action (Sponsors' Rehabilitation).

Scenic Beauty

Existing Condition: At the present time, the dam embankment, the auxiliary spillway and training dikes are in grass. The area surrounding Lake Pelham is mostly residential or a mix between hay/pasture and forest.

No Federal Action (Sponsors' Rehabilitation): The plan provides for installing a 198-foot wide, 6-cycle structural concrete labyrinth spillway over the embankment and installing an 800-foot-long earthen berm across the existing grass auxiliary spillway. The weir is a massive concrete structure that will permanently change the appearance of the dam. There will be temporary impacts to the scenic beauty of the area while the lake is lowered and construction is underway.

Rehabilitation with Federal Assistance (NED Alternative): Same as the No Federal Action (Sponsors' Rehabilitation).

Social Issues

Existing Condition: Lake Pelham has provided value to the community since 1972 by providing flood protection, recreation, and water supply. At the public meeting, the main concern expressed by the local citizens was the need to maintain the flood protection and water supply provided by the structure.

No Federal Action (Sponsors' Rehabilitation): When rehabilitation of the dam is complete, the dam will provide flood protection and water storage for an additional 50 years.

Rehabilitation with Federal Assistance (NED Alternative): Same as the No Federal Action (Sponsors' Rehabilitation).

Water Supply

Existing Conditions: The primary purposes of the lake are for water supply storage and flood protection. There is a small access bridge that connects the dam with a building attached to the riser (Figure 8). This system for providing chemical pretreatment has been difficult to operate and maintain.

No Federal Action (Sponsors' Rehabilitation): Since the sediment accumulation in the lake is less than anticipated during design, an additional 486 acre-feet of water is available to supplement the planned 1,000 acre-feet of water supply. To address the water treatment issues, the Sponsors plan to upgrade the 18-inch raw water intake structure by removing the existing service building and installing a new intake location on the left side of the new auxiliary spillway. Two unseating head gates will be installed such that water can be drawn from the same elevation as it is in the current configuration. The gates will discharge into a 24-inch diameter concrete-encased ductile iron pipe which will carry raw water from the reservoir under the proposed auxiliary spillway and tie into the existing system via the 18-inch diameter raw water line located to the right of the principal spillway outlet. All work done within the bounds of the earth embankment would be considered to be part of the project. Components constructed outside of the embankment would not be a project cost.

Rehabilitation with Federal Assistance (NED Alternative): Same as the No Federal Action (Sponsors' Rehabilitation).

Figure 8. Riser and water intake building.

CUMULATIVE EFFECTS

NRCS has constructed two flood control dams and three multi-purpose (flood control and water supply) dams in this watershed; Caynor Lake and Merrimac Lake are the single purpose dams and Mountain Run Lake, Lake Pelham, and Catalpa Lake are the multi-purpose dams. Mountain Run Lake Dam and Lake Pelham Dam are currently operating under conditional certificates due to a need for rehabilitation. The No Federal Action alternative for Lake Pelham calls for the Sponsors to rehabilitate the dam. The proposed rehabilitation alternative would have the same effect on the environment as the No Federal Action alternative. The cumulative effects of the other projects on the principal resources of concern, along with the social and economic effects, are to maintain the existing social, economic, and environmental conditions of the community. The cumulative effects of rehabilitating Lake Pelham would also maintain the existing social, economic and environmental conditions of the community. In both the recommended plan and the rehabilitation by the local Sponsors, all of the existing dams in the watershed stay in place, essentially the same level of water supply storage and flood protection is provided, and the existing emergency action plan remains in force.

RISK AND UNCERTAINTY

Assessments, considerations, and calculations in this plan are based on a 52-year period of analysis. Associated monetary flooding impacts on 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.

The Town of Culpeper procured easements that are 2.5 feet above the crest of the auxiliary spillway prior to the original construction. This is 8.7 feet below the top of the dam. After an analysis was completed to compare the benefits and costs of maintaining the existing easements versus procuring the easements to the top of dam, the Town decided to continue with their existing easements and accept the risk associated with not owning the easements to the top of dam. The elevation of 2.5 feet above the crest of the auxiliary spillway is approximately the same as the water surface elevation of the 0.42 PMP flood event. (The 1,000 year event has a water surface elevation 2.0 feet above the crest of the auxiliary spillway.)

The projected sediment life of the lake is 169 years. This information is based on multiple sediment surveys that were conducted throughout the life of the dam. Very large storm events, deforestation by fire, or increased construction of residential sites could cause an increased rate of erosion, sedimentation and deposition. At the present time, there are no known plans for land use changes in this watershed that would affect the rate of sediment deposition in the reservoir.

The limiting factor for the expected useful life of the Future with Federal Assistance Alternative (Preferred Alternative) is based on the remaining expected life of the principal spillway and associated components. Thus a 52-year period of analysis was used for this structure.

The objective of this project is to meet applicable NRCS and Virginia safety and performance standards for a high hazard dam. From a financing and administrative standpoint, the Sponsors have committed to NRCS that they are able to fund the required 35% of the total project costs to complete installation of the preferred alternative and can perform the required maintenance on the upgraded structure for 50 years after construction.

If an auxiliary flow event occurs, there should be no resulting damages to the structural concrete labyrinth spillway. The estimates do not include any costs for offsite damages incurred during this event. Routine maintenance is not included in these amounts. This project plan assumes that such an event will likely occur once within the expected useful life.

CONSULTATION AND PUBLIC PARTICIPATION

The sponsoring organizations are the Culpeper SWCD and the Town of Culpeper. The Town of Culpeper is the owner and operator of Lake Pelham. The Town received their first Conditional Operation and Maintenance Certificate to operate and maintain the dam from the Virginia Division of Dam Safety in 2007. The certificate was issued because of problems identified with the auxiliary spillway.

The Town began studying the dam in 2010 by issuing a contract to The Timmons Group for a Breach Inundation Study. In 2012, the Town also hired Hazen and Sawyer to study various alternatives for rehabilitation. NRCS received an application for federal assistance in November 2012 from the local Sponsors for the rehabilitation of the Lake Pelham Dam. The Town retained

Schnabel Engineering in 2015 to assist with the engineering analyses of the dam during planning, design and construction of the project.

Local, state and federal support for the rehabilitation of the Lake Pelham Dam has been strong. Input and involvement of the public has been solicited throughout the planning of the project. At the initiation of the planning process, many meetings were held with representatives of the Town of Culpeper and the Culpeper Soil and Water Conservation District to ascertain their interest and concerns regarding the dam. A Public Participation Plan was developed and approved for the project and has been followed during the planning process.

The Sponsors have worked closely with the local landowners and residents to provide information on the planning activities and to solicit their input on the pertinent issues to be considered during planning. The Sponsors worked to provide all residents, including minorities, with information on the planning effort and intended works of improvement.

A scoping meeting was held on June 10, 2015, in the Community Room of the Culpeper Police Department in Culpeper, Virginia, 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. There were 22 people in attendance.

The first public meeting for Lake Pelham was held in the Community Room of the Culpeper Police Department in Culpeper, Virginia on June 10, 2014. Local, state and federal perspectives on the rehabilitation needs of the Lake Pelham Dam were provided. The attending members of public were informed of the dam rehabilitation program and potential alternative solutions to bring the dam into compliance with current dam safety and design 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. There were 9 people in attendance.

A Lake Pelham Steering Committee meeting was held on November 19, 2015 in Culpeper with 14 people attending. 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. Attendees understood the need for the rehabilitation. The audience included elected officials, representatives from town, county and federal agencies, and watershed residents.

A second public meeting was held on December 8, 2015 as part of the Culpeper Town Council meeting. About 60 people attended the meeting. A summary of the findings, alternatives considered, and the preferred alternative were presented. The Town Council had some discussion and gave a “Thumbs Up” to continue with the plan development using the preferred alternative.

A Draft Plan was distributed for interagency and public review on June 17, 2016. Copies of the document were placed in local libraries and news articles were placed in local newspapers to solicit comments from the public during the comment period. After the interagency and public 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.

PREFERRED ALTERNATIVE

RATIONALE FOR PLAN SELECTION

The recommended plan is to rehabilitate the dam to meet current NRCS and Virginia safety and performance standards for high hazard dams. 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:

- Reduces the threat to loss of life to approximately 3,992 people that live, work and play in the 984 structures and utilize the 10 major roads and 94 secondary roads within the breach inundation zone.
- Provides protection for thousands of vehicles per day that utilize the many roads below the dam.
- Maintains the existing water supply storage that services approximately 17,000 users in the area.
- Upgrades the raw water intake for the existing water supply system.
- Provides onsite benefits to approximately 1,500 recreational users annually.
- Reduces the threat of loss of emergency service for a significant number of residences, several businesses, and three churches.
- Provides downstream flood protection for the people living in the area, as well as those working, recreating, or traversing within the downstream floodplains, for an additional 50 years.
- Eliminates the liability associated with continuing to operate a non-compliant dam.
- Maintains existing stream habitat downstream of the dam.
- Retains the existing aquatic and terrestrial habitat around the lake.
- Leverages federal resources to install the planned works of improvement.

The preferred alternative meets the Sponsors' objectives of bringing this dam into compliance with current dam design and safety criteria, maintaining the existing water supply, maintaining the current 100-year floodplain, and addressing resource concerns identified by the public. The selected plan is the NED Alternative. The plan reasonably meets the following four criteria: completeness, effectiveness, efficiency, and acceptability. NRCS and the Sponsors are in agreement on the recommended plan.

SUMMARY AND PURPOSE

The recommended plan of action for the dam is outlined below:

- Install a 198-foot-wide, 6-cycle structural concrete labyrinth spillway over the dam embankment.

- Install an 800-foot-long earthen berm across the existing auxiliary spillway.
- Upgrade the 18-inch raw water intake structure by installing a new intake location on the left side of the new auxiliary spillway.
- Maintain current levels of flood protection downstream.
- Maintain 1,000 acre-feet of water supply storage.
- Maintain recreational uses of the lake.

After the implementation of these planned works of improvement, Lake Pelham will meet all current NRCS and Virginia Division of Dam Safety performance standards.

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

EASEMENTS AND LANDRIGHTS

Landrights for the structure currently exist for the floodpool at an elevation 2.5 feet above the crest of the auxiliary spillway based on the original easements procured for the project. The elevation of the crest of the auxiliary spillway will not change for implementation of the recommended alternative. The elevation of 2.5 feet above the crest of the auxiliary spillway is approximately the same as the water surface elevation of the 0.42 PMP flood event. Additional landrights will not be procured because the Town of Culpeper accepts the risk associated with any flood flows that may result above their existing easements to the top of dam elevation.

MITIGATION

During construction, site mitigation measures will include erosion and sediment control, seeding of denuded areas, dust control, and other practices identified during the design process. About 1 acre of riparian forested wetlands will be lost as a result of the installation of the labyrinth weir. This will be replaced at a 2:1 ratio by construction of a similar wetland or by purchase from an approved mitigation bank.

PERMITS AND COMPLIANCE

Prior to construction, the Sponsors will be responsible for obtaining an alteration permit from the Virginia Soil and Water Conservation Board, and, as needed, a 404 permit from the Army Corps of Engineers, subaqueous lands permits from the Virginia Marine Resources Commission, and any other required permits. During construction, the successful contractor is required to develop a Stormwater Pollution Prevention Plan which includes applicable erosion and sediment control measures.

If cultural resources are discovered during installation, work will cease and the State Historic Preservation Officer will be notified. Appropriate investigations procedures will be initiated.

The Sponsors will be responsible for obtaining a regular O&M Certificate from the Virginia Division of Dam Safety upon completion of the project.

COSTS

As indicated in Table 2, the total installation cost of the recommended plan is $11,110,400. Of this amount, PL-83-566 funds will bear $7,612,100 and nonfederal funds will bear $3,498,300. 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 2015 price base was used and amortized at 3.125 percent interest for the 52 year period of analysis (including a design and installation period of two years and an expected useful life of 50 years).

The cost projections for the proposed rehabilitation measures are estimated costs only for the purpose of planning. 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 about 18 months. 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.

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

- Execute an updated Operation and Maintenance Agreement with the Sponsors that extends the O&M responsibilities for another 50 years following construction. 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.

The Town of Culpeper 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.
- Provide engineering services for the design, construction, and certification of the project.
- Provide local administrative and contract services necessary for the installation of the project.
- Provide nonfederal funds for cost-sharing of the project at a rate equal to, or greater than, 35% of the total eligible project costs.
- Acquire a regular Operation and Maintenance certificate from the Virginia Division of Dam Safety upon completion of the planned measures.
- Participate in and comply with applicable Federal floodplain management and flood insurance programs.
- Enforce all associated easements and rights-of-way for the safe operation of the dam.

OPERATION, MAINTENANCE, AND REPLACEMENT

Measures installed as part of this plan, and previously installed measures, will be operated and maintained by the Town of Culpeper 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 Lake Pelham and will be executed prior to construction of the project. The term of the new O&M agreement will be for 50 years following the completion of rehabilitation. The agreement will specify responsibilities of the Sponsors and include detailed provisions for retention, use, and disposal of property acquired or improved with PL 83-566 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.

Table 1 - Estimated Installation Cost
Mountain Run Dam No. 50, Virginia
(Dollars)

Installation Cost Items	Estimated Costs		
Structural measures to rehabilitate floodwater retarding dam:	PL-83-566 Funds[1]	Other Funds	Total
Rehab. Mountain Run Dam No. 50:	$7,612,100	$3,498,300	$11,110,400
Total Project:	$7,612,100	$3,498,300	$11,110,400

Price base: October, 2015 Prepared: October 2015

Table 2 - Estimated Cost Distribution – Structural Measures
Mountain Run Dam No. 50, Virginia
(Dollars)

	Installation Cost: PL-83-566 Funds[2]				Installation Cost: Other Funds[3]						
Installation Cost Items	Construction Costs	Engi-neering Technical Assistance Costs	Project Admin-istration Costs	Total PL-83-566 Cost	Construction Costs	Engineer-ing Costs	Real Property Landrights	Permits	Project Admin-istration Costs	Total Other Funds	Total Project Cost[4]
Rehab. No. 50:	$6,537,600	$1,017,000	$57,500	$7,612,100	$3,320,300	$157,500	$0	$3,000	$17,500	$3,498,300	$11,110,400
Totals:	$6,537,600	$1,017,000	$57,500	$7,612,100	$3,320,300	$157,500	$0	$3,000	$17,500	$3,498,300	$11,110,400

Price base: October, 2015. Prepared: October, 2015

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[1] Paid by the USDA/NRCS – the Federal agency responsible for assisting in installation of improvements.

[2] 65% of total eligible project cost (The actual federal cost/share excludes technical assistance and permit costs and cannot exceed 100% of the estimated construction cost).

[3] 35% of total eligible project cost. Per NRCS policy, $25,000 in local sponsor planning costs were excluded from Tables 1 and 2. These sponsor costs are included in the calculation of cost/share as shown in the watershed agreement.

[4] As per the NRCS National Watershed Manual, Part 508.44, the actual federal cost/share amount will be calculated based on a total eligible project cost that excludes federal technical assistance costs, water, mineral and other resource rights, and all federal, state and local permits. However, for the purposes of planning, all of these costs are included in the benefit/cost analysis and are displayed as part of the public record of this analysis.

Table 3 – Structural Data—Dams with Planned Storage Capacity Lake Pelham – Mountain Run Dam No. 50 Culpeper County, Virginia		
Item	**Unit**	**Structure**
Class of structure		High
Seismic zone		2
Uncontrolled drainage area	mi^2	10.6
Controlled drainage area	mi^2	15.6
Total drainage area	mi^2	26.2
Runoff curve no. (1-day) (AMC II)		75
Time of concentration (Tc); uncontrolled drainage area only	hours	1.4
Elevation top dam [1/]	feet	402.2
Elevation crest auxiliary spillway	feet	390.3
Elevation crest high stage inlet	feet	384.1
Elevation crest low stage inlet	feet	NA
Auxiliary spillway type		Structural
Auxiliary spillway bottom width	feet	198
Auxiliary spillway exit slope	percent	3.33
Maximum height of dam	feet	38
Volume of fill	yd^3	>150,000
Total capacity [2/]	acre-feet	3,658
Sediment submerged	acre-feet	709
Sediment aerated	acre-feet	46
Beneficial use (M&I water)	acre-feet	1,000
Floodwater retarding	acre-feet	1,903
Between high and low stage	acre-feet	N/A
Surface area		
Sediment pool	acres	170
Beneficial use pool (M&I water)	acres	220
Floodwater retarding pool [2/]	acres	690
Principal spillway design		
Rainfall volume (1-day)	inches	4.8
Rainfall volume (10-day)	inches	5.7
Runoff volume (10-day)	inches	6.2
Capacity of low stage (max.)	ft^3/sec	76
Capacity of high stage (max.)	ft^3/s	770
Dimensions of conduit	inches	66
Type of conduit		circular RCP

Table 3 – Structural Data—Dams with Planned Storage Capacity (cont.)		
Item	**Unit**	**Structure**
Frequency operation-auxiliary spillway	percent chance	1.0
Auxiliary spillway hydrograph		
Rainfall volume	inches	Structural Spillway
Runoff volume	inches	
Storm duration	hours	
Velocity of flow (V_e)	feet/sec.	
Max. reservoir water surface elev.	feet	
Freeboard hydrograph		
Rainfall volume	inches	36.0
Runoff volume	inches	32.3
Storm duration	hours	24
Max. reservoir water surface elev.	feet	402.2
Capacity equivalents		
Sediment volume	inches	0.16
Floodwater retarding volume	inches	1.35
Beneficial volume (M&I water)	inches	1.06

[1/] All elevations are recorded in North American Vertical Datum 1988 (NAVD88).

[2/] Crest of auxiliary spillway.

Table 4 - Average Annual National Economic Development (NED) Costs
Mountain Run Dam No. 50, Virginia
(Dollars[1])

	Average Annual Equivalent Cost	Average Annual Equivalent Operation and Maintenance Costs	Total Average Annual Equivalent Cost
Rehabilitation of Mountain Run Dam No. 50	$432,500	$6,500	$439,000
Totals:	$432,500	$6,500	$439,000

Price base: October, 2015 Prepared: October, 2015

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[1] The average annual equivalents are based on a 3.125% discount rate and a 52-year period of analysis (2 years for project design/installation and 50 years of expected useful life).

Table 5 - Estimated Average Annual Flood Damage Reduction Benefits
Mountain Run Dam No. 50, Virginia
(Dollars)

Flood Damage Category	Estimated Average Annual Equivalent Damages		Damage Reduction Benefits
	Without Federal Project	With Federal Project	Average Annual Equivalents
Crops and Pasture	$62,750	$5,225	$57,525
Other Agricultural	$49,690	$12,330	$37,360
Roads and Bridges	$18,570	$1,760	$16,810
Urban (structures and content damages)	$259,270	$430	$258,840
Erosion – floodplain scour	$8,920	$1,765	$7,155
Other (miscellaneous damages)	$66,720	$5,675	$61,045
Totals:	$465,920	$27,185	$438,735

Note: Updated original Table 5 project benefits.
Price base: October, 2015 Prepared: October, 2015

Table 6 - Comparison of National Economic Development (NED) Benefits and Costs
Mountain Run Dam No. 50, Virginia
(Dollars)

Evaluation Unit	Average Annual Equivalent Benefits[1]		Costs	Net Change	Benefit/ Cost Ratios
	Damage Reduction Benefits	Total Average Annual Equivalent Benefits[2]	Average Annual Equivalent Costs	Net Average Annual Equivalent Benefits	
Mountain Run Dam No. 50	$438,735	$438,735	$438,735	$0	1.0 to 1.0
Totals:	$438,735	$438,735	$438,735	$0	1.0 to 1.0

Price base: October, 2015 Prepared: Oct. 2015

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[1] The average annual equivalents are based on a 3.125% discount rate and a 52-year period of analysis (2 years for project design/installation and 50 years of expected useful life).

[2] 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 Mountain Run Watershed Supplemental Plan and Environmental Assessment was prepared primarily by the Virginia NRCS Planning Team located in Richmond, Virginia; Verona, Virginia; and Morgantown, West Virginia; and staff from Schnabel Engineering. 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 project sponsors, and then an interagency and public review.

The 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.

Name	Present Title and Years in Current Position	Education	Previous Experience	Other
R. Wade Biddix	Watershed Program Specialist (ACES) - 1	M.S. Public Administration B.S. Agriculture	Assistant State Conservationist for Water Resources - 13 yrs. Supervisory District Cons. – 1.5 yrs. Planning Coordinator – 10.5 yrs. Area Resource Cons. – 2 yrs. District Conservationist – 4 yrs. Soil Conservationist – 4 yrs.	
Rebecca M. Evans	Civil Engineering Technician - 6	B.S. Natural Resources Recreation	Conservation Specialist – 2 yrs.	
David L. Faulkner	Natural Resource Economist - 27	M.S. Ag. Economics B.S. Ag. Education	Ag. Economist (SCS) - 2.5 yrs. Ag. Economist (U.S.A.I.D.) - 4.5 yrs. Ag. Teacher (Peace Corps) – 2 yrs.	
Fred M. Garst	GIS Specialist - 21	B.S. Geology	GIS/Soil Scientist - 7 yrs. Soil Cons. Tech. - 7 yrs. Geologist (Private) – 4 yrs.	
Jeffray Jones	State Biologist - 3	B.S. Natural Resources Management	Ecologist - 22 yrs.	
Alica J. Ketchem	Environmental Engineer - 22	B.S. Civil Engineering M.S. Agricultural Eng.	Civil Engineer – 10 yrs.	P.E. (VA)
Mathew J. Lyons	State Conservation Engineer- 13	B.S. Civil Engineering	Civil Engineer – 12 yrs.	P.E. (VA)
Jeffrey D. McClure	Geologist - 10	B.A. Geology B.A. Biology B.S. Geology	NRCS Geologist – 11.5 yrs. Geologist (WV Dept. of Environmental Protection) - 10 yrs. Geologist (Private) – 8.5 yrs.	CPG in VA, DE and PA
Matthew Pyle	Project Engineer – 1	B.S. Civil Engineering	Civil Engineer – 14 yrs.	P.E. (WV)
Kelly Ramsey	Hydraulic Engineer - 10	B.S. Biological Systems Engineering	Civil Engineer – 7 yrs.	P.E. (VA)
A&E Consultants				
Randy Bass, Schnabel Engineering	Principal Engineer – 12	B.S. Civil Engineering M.S. Civil Engineering	Civil Engineer – 44 yrs.	P.E. in VA, GA, MA
Paul Welle, Schnabel Engineering	Hydraulic Engineer – 16	B.S. Agricultural Engineering	NRCS Civil Engineer – 4 yrs. NRCS Hydraulic Engineer - 26 yrs.	P.E. in VA, WV, MD, NJ, PA

DISTRIBUTION LIST

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

	Response Received on Draft Supplemental Plan/EA
Federal Agencies	
Environmental Protection Agency Region III, Philadelphia	No
U.S. Army Corps of Engineers Warrenton Field Office	No
U.S. Department of the Interior Fish and Wildlife Service Gloucester, Virginia Office	No
Federal Emergency Management Agency Philadelphia	No
U.S. Department of Agriculture Farm Service Agency Rural Development	 No No
Virginia State Agencies	
Virginia Department of Environmental Quality Office of Environmental Impact Review (State Clearinghouse)	Yes
Virginia Department of Conservation and Recreation	Yes
Virginia Marine Resources Commission	No
Virginia Department of Game and Inland Fisheries	No
Virginia Department of Historic Resources	Yes
Virginia Department of Forestry	No
Virginia Department of Transportation	No

	Response Received on Draft Supplemental Plan/EA
Other	
Virginia Association of Soil and Water Conservation Districts	No
Culpeper Soil and Water Conservation District	Yes
Town of Culpeper	Yes
Rappahannock-Rapidan Planning District Commission	No
Culpeper County Board of Supervisors	No
Culpeper County Planning Department	No
Culpeper County Parks and Recreation Department	No
Culpeper County Service Authority	No
Country Club of Culpeper	No
Lakeview Homeowners Association	No
Pelham's Reach Homeowners Association	No
Redwood Lakes Homeowners Association	No

INDEX OF KEY WORDS AND PHRASES

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APPENDIX A

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

TOWN OF CULPEPER

400 S. Main St., Suite 101 • Culpeper, VA 22701
(540) 829-8250 • FAX (540) 829-8249
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July 11, 2016

Mr. Jack Bricker
State Conservationist
USDA Natural Resources Conservation Service
1606 Santa Rosa Road, Suite 209
Richmond, VA. 23229

Re: Letter of Support for Mountain Run No. 50 Environmental Assessment (EA)

Dear Mr. Bricker:

We express support for the Mountain Run No. 50 (Lake Pelham) draft Environmental Assessment (EA) that is now being considered by the U.S. Department of Agriculture Natural Resources Conservation Service (NRCS). This EA identifies the potential impacts and controls that are necessary to implement the proposed solution for rehabilitating the earthen dam at Lake Pelham.

We look forward in working with NRCS in delivering this critical project.

Sincerely,

Christopher D. Hively, P.E.
Town Manager

cc: Jim Hoy, P.E., Director of Public Services
Linda Skinner, Administrative Support Office

USDA

United States Department of Agriculture

July 18, 2016

Mr. Christopher Hively
Culpeper Town Manager
400 South Main Street, Suite 101
Culpeper, VA 22701

RE: Draft Supplemental Plan-Environmental Assessment (EA) for the Rehabilitation of Mountain Run Dam No. 50, Lake Pelham, Culpeper County, Virginia

Dear Mr. Hively:

Thank you for your timely response to the referenced Draft Plan/EA and for your support of the recommended alternative. We appreciate the excellent partnership we have with the Town of Culpeper and the Culpeper Soil and Water Conservation District on this project.

If questions or concerns arise as the project proceeds to design and construction, please direct them to David Kriz, Assistant State Conservationist for Water Resource Operations, at David.Kriz@va.usda.gov or by phone at 804-287-1646.

Sincerely,

JOHN A. BRICKER
State Conservationist

cc: Jim Hoy, Director of Public Services, Culpeper, VA
Rex Rexrode, District Conservationist, Culpeper, VA
Kathy Holm, Assistant State Conservationist (Field Operations), Harrisonburg, VA

NATURAL RESOURCES CONSERVATION SERVICE
1606 Santa Rosa Road, Suite 209 ♦ Richmond, Virginia 23229
Phone: (804) 287-1691 ♦ Fax: (855) 627-9827

Culpeper Soil & Water Conservation District
Serving Culpeper, Greene, Madison, Orange, & Rappahannock

351 Lakeside Drive
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July 11, 2016

John A. Bricker, State Conservationist
USDA – Natural Resources Conservation Service
1606 Santa Rosa Road, Suite 209
Richmond, Virginia 23229-5014

Dear Mr. Bricker:

The Culpeper Soil and Water Conservation District has reviewed Supplemental Watershed Plan No. 5 and Environmental Assessment for the rehabilitation of Floodwater Retarding Structure No. 50 (MR-50) in Mountain Run Watershed, Culpeper County. The District has no specific comments on the plan or environmental assessment; we found the documents both accurate and thorough in our assessment. The District is encouraged by the progress being made by the Natural Resources Conservation Service towards the rehabilitation of this project and for Mountain Run No. 11 and look forward to full design and implementation. Property owners in Culpeper County will be afforded many more years of flood water control by these timely projects.

We appreciate the opportunity to review the project plans.

Sincerely,

Lynn Graves,
Chairman CSWCD

USDA
United States Department of Agriculture

July 18, 2016

Mr. Lynn Graves, Chairman
Culpeper Soil and Water Conservation District
351 Lakeside Drive
Culpeper, VA 22701

RE: Draft Supplemental Plan-Environmental Assessment (EA) for the Rehabilitation of Mountain Run Dam No. 50, Lake Pelham, Culpeper County, Virginia

Dear Mr. Graves:

Thank you for your timely response to the referenced Draft Plan/EA and for your support of the planning efforts to date. We appreciate the excellent partnership we have with the Town of Culpeper and the Culpeper Soil and Water Conservation District on this project. We are pleased to be able to assist the sponsors and the local residents with a project that will continue to provide flood protection, water supply and recreation for many years to come.

If questions or concerns arise as the project proceeds to design and construction, please direct them to David Kriz, Assistant State Conservationist for Water Resource Operations, at David.Kriz@va.usda.gov or by phone at 804-287-1646.

Sincerely,

JOHN A. BRICKER
State Conservationist

cc: Greg Wichelns, District Manager, Culpeper SWCD, Culpeper, VA
Rex Rexrode, District Conservationist, Culpeper, VA
Kathy Holm, Assistant State Conservationist (Field Operations), Harrisonburg, VA

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Molly Joseph Ward
Secretary of Natural Resources

David K. Paylor
Director

(804) 698-4000
1-800-592-5482

July 18, 2016

Mr. John A. Bricker
Natural Resources Conservation Service
U.S. Department of Agriculture
1606 Santa Rosa Road, Suite 209
Richmond, Virginia 23229

RE: Draft Supplemental Watershed Plan No. 5 and Environmental Assessment for the Rehabilitation of Floodwater Retarding Structure No. 50 (Lake Pelham) of the Mountain Run Watershed, Culpeper County, (DEQ 16-142F).

Dear Mr. Bricker:

The Commonwealth of Virginia has completed its review of the June 2016 Draft Supplemental Watershed Plan (SWP) No. 5 and Environmental Assessment (EA) (received June 20, 2016) for the above referenced project. The Department of Environmental Quality is responsible for coordinating Virginia's review of federal environmental documents and responding to appropriate federal officials on behalf of the Commonwealth. DEQ is also responsible for coordinating Virginia's review of federal consistency documents submitted pursuant to the Coastal Zone Management Act (CZMA) and providing the state's response. The following agencies participated in the review of this proposal:

Department of Environmental Quality
Department of Conservation and Recreation
Department of Health

In addition, the Department of Game and Inland Fisheries, Marine Resources Commission, Department of Agriculture and Consumer Services, Department of Historic Resources, Culpeper County, and Rappahannock-Rapidan Regional Commission were invited to comment on the proposal.

PROJECT DESCRIPTION

The U.S. Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS) is providing federal funding to Town of Culpeper and the Culpeper Soil

and Water Conservation District (project sponsors) for the proposed rehabilitation of floodwater retarding structure (dam) No. 50 at Lake Pelham in the Mountain Run watershed in Culpeper County. Mountain Run Dam No. 50, Lake Pelham, is a high hazard dam that was built for flood control and water supply. It does not presently meet NRCS or Virginia Division of Dam Safety standards for integrity, stability and capacity for a vegetated auxiliary spillway. The recommended plan is to rehabilitate Mountain Run Dam No. 50 dam to meet current Virginia Division of Dam Safety and NRCS criteria. The plan provides for installing a 198-foot wide, 6-cycle structural concrete labyrinth spillway over the embankment, installing an 800-foot-long earthen berm across the existing auxiliary spillway, and upgrading the water intake structure. There will be no change in the current levels of flood protection downstream. There will be no significant change in the water resource operations or recreational uses of the lake as a result of project activity.

CONCLUSION

Provided activities are performed in accordance with the recommendations which follow in the Impacts and Mitigation section of this report, this proposal is unlikely to have significant effects on ambient air quality, important farmland, forest resources, historic resources, water quality and wetlands. It is unlikely to adversely affect species of plants or insects listed by state agencies as rare, threatened, or endangered.

ENVIRONMENTAL IMPACTS AND MITIGATION

1. Water Quality and Wetlands. According to the SWP/EA (page 33), rehabilitation of the dam will have no permanent adverse effects on Lake Pelham. The lake will be drawn down about 3 feet for approximately six months during the summer construction season. This will result in the temporary loss of 10 acres of surface water. The fringe wetlands around the lake will also be temporarily impacted during this time. About 1 acre of riparian forested wetlands will be lost as a result of the installation of the labyrinth weir. This will be replaced at a 2:1 ratio by construction of a similar wetland or by purchase from an approved mitigation bank.

1(a) Agency Jurisdiction. The State Water Control Board promulgates Virginia's water regulations covering a variety of permits to include the Virginia Pollutant Discharge Elimination System Permit regulating point source discharges to surface waters, Virginia Pollution Abatement Permit regulating sewage sludge, storage and land application of biosolids, industrial wastes (sludge and wastewater), municipal wastewater, and animal wastes, the Surface and Groundwater Withdrawal Permit, and the Virginia Water Protection (VWP) Permit regulating impacts to streams, wetlands, and other surface waters. The VWP permit is a state permit which governs wetlands, surface water, and surface water withdrawals and impoundments. It also serves as §401 certification of the federal Clean Water Act §404 permits for dredge and fill activities in waters of the U.S. The VWP Permit Program is under the Office of Wetlands and Stream Protection, within the DEQ Division of Water Permitting. In

addition to central office staff that review and issue VWP permits for transportation and water withdrawal projects, the six DEQ regional offices perform permit application reviews and issue permits for the covered activities:

- Clean Water Act, §401;
- Section 404(b)(i) Guidelines Mitigation Memorandum of Agreement (2/90);
- State Water Control Law, Virginia Code section 62.1-44.15:20 *et seq.*; and
- State Water Control *Regulations*, 9 VAC 25-210-10.

1(b) Agency Findings. DEQ-NRO finds that the proposed action will require a VWP permit due to the anticipated wetland impacts described in the document.

1(c) Recommendations. In general, DEQ recommends that stream and wetland impacts be avoided to the maximum extent practicable. To minimize unavoidable impacts to wetlands and waterways, DEQ recommends the following practices:

- Operate machinery and construction vehicles outside of stream-beds and wetlands; use synthetic mats when in-stream work is unavoidable.
- Preserve the top 12 inches of trench material removed from wetlands for use as wetland seed and root-stock in the excavated area.
- Erosion and sedimentation controls should be designed in accordance with the most current edition of the Virginia Erosion and Sediment Control Handbook. These controls should be in place prior to clearing and grading, and maintained in good working order to minimize impacts to State waters. The controls should remain in place until the area is stabilized.
- Place heavy equipment, located in temporarily impacted wetland areas, on mats, geotextile fabric, or use other suitable measures to minimize soil disturbance, to the maximum extent practicable.
- Restore all temporarily disturbed wetland areas to pre-construction conditions and plant or seed with appropriate wetlands vegetation in accordance with the cover type (emergent, scrub-shrub, or forested). The applicant should take all appropriate measures to promote revegetation of these areas. Stabilization and restoration efforts should occur immediately after the temporary disturbance of each wetland area instead of waiting until the entire project has been completed.
- Place all materials which are temporarily stockpiled in wetlands, designated for use for the immediate stabilization of wetlands, on mats, geotextile fabric in order to prevent entry in State waters. These materials should be managed in a manner that prevents leachates from entering state waters and must be entirely removed within thirty days following completion of that construction activity. The disturbed areas should be returned to their original contours, stabilized within thirty days following removal of the stockpile, and restored to the original vegetated state.
- All non-impacted surface waters within the project or right-of-way limits that are within 50 feet of any clearing, grading, or filling activities should be clearly

flagged or marked for the life of the construction activity within that area. The project proponent should notify all contractors that these marked areas are surface waters where no activities are to occur.

- Measures should be employed to prevent spills of fuels or lubricants into state waters.

1(d) Requirements. The applicant must submit a Joint Permit Application (JPA) to the Virginia Marine Resources Commission (VMRC), which serves as the clearinghouse for permits issued by VMRC, DEQ, U.S. Army Corps of Engineers, and local wetlands boards. Upon receipt of a JPA for the proposed surface water impacts, DEQ VWP Permit staff will review the proposed project in accordance with the VWP permit program regulations and current program guidance.

2. Dam Safety and Floodplain Management. The SWP/EA (page 33) states that the rehabilitation of the Lake Pelham dam will be done in accordance with all necessary requirements and restrictions. The existing level of flood protection will be maintained. Existing floodplain management zoning restrictions will not be changed. The Town and County does not currently have the 500-year floodplain mapped on the flood insurance rate map (FIRM) or have zoning restrictions within the 0.2% annual chance flood. If the Town or the County decide to have the 500-year floodplain mapped in the future, the rehabilitated dam and appurtenances will need to be considered.

2(a) Agency Jurisdiction. The DCR Division of Dam Safety and Floodplain Management (DSFM) is the lead coordinating agency for the Commonwealth's floodplain management program and the National Flood Insurance Program (Executive Memorandum 2-97). Pursuant to §10.1-603 of the Virginia Code and in accordance with 44 CFR section 60.12 of the National Flood Insurance Program Regulations for Floodplain Management and Flood Hazard Identification, all construction or land-disturbing activities initiated by an agency of the Commonwealth, or by its contractor, in floodplains shall be submitted to the locality and comply with the locally adopted floodplain management ordinance.

2(b) Agency Findings. DCR-DSFM finds that the project is located in an AE Zone on the FIRM, with base flood elevations (BFEs) of 365 feet and 394 feet.

2(c) Requirements. The project is located in the Town of Culpeper and must comply with the Town's floodplain ordinance. The ordinance requires the following:

> *"Until a regulatory floodway is designated, no new construction, substantial improvements, or other development (including fill) shall be permitted within the areas of special flood hazard, designated as Zones A1-30 and AE or AH on the FIRM, unless it is demonstrated that the cumulative effect of the proposed development, when combined with all other existing and anticipated*

development, will not increase the water surface elevation of the base flood more than one foot at any point within the Town of Culpeper."

According to the Town's ordinance and federal regulations, documentation must be provided to the Town for the effect that the project will have on the BFE. Local governments have the authority and responsibility to properly manage the mapped floodplain within the community, and that includes submitting to FEMA new technical data on the floodplain within six months of receipt so the maps updated for accuracy.

In addition, the project will require Dam Alteration Permit from DCR-DSFM.

2(d) Conclusion. DCR-DSFM does not object to the project as designed, provided it complies with the local floodplain ordinance.

For additional information and coordination, contact DCR-DSFM, Charles Wilson (Dam Safety) at (804) 371-6233 and Charley Banks (Floodplain Management) at (804) 371-6135.

3. Erosion and Sediment Control and Stormwater Management. According to the SWP/EA (page 34), erosion and sediment control measures will be in place and water releases from the project area are expected to meet the appropriate water quality standards. In addition, the document (page 44) states that the successful contractor is required to develop a Stormwater Pollution Prevention Plan which includes applicable erosion and sediment control measures.

3(a) Agency Jurisdiction. The DEQ Office of Stormwater Management (OSWM) administers the following laws and regulations governing construction activities:

- Virginia Erosion and Sediment Control (ECS) Law (§ 62.1-44.15:51 *et seq.*) and *Regulations* (9 VAC 25-840);
- Virginia Stormwater Management Act (§ 62.1-44.15:24 *et seq.*);
- *Virginia Stormwater Management Program* (*VSMP*) *Regulation* (9 VAC 25-870); and
- 2014 General Virginia Pollutant Discharge Elimination System (VPDES) Permit for Discharges of Stormwater from Construction Activities (9 VAC 25-880).

In addition, DEQ is responsible for the Virginia Stormwater Management Program (VSMP) General Permit for Stormwater Discharges from Construction Activities related to Municipal Separate Storm Sewer Systems (MS4s) and construction activities for the control of stormwater discharges from MS4s and land disturbing activities under the Virginia Stormwater Management Program (9 VAC 25-890-40).

3(b) Requirements. DEQ-OSWM did not respond to DEQ's request for comments. However, based on previous responses to similar projects, regulatory guidance for the

control of non-point source pollution is presented below.

(i) Erosion and Sediment Control and Stormwater Management Plans

The applicant and its authorized agents that are conducting regulated land-disturbing activities on private and public lands in the state must comply with Virginia ESC Law and *Regulations*, Virginia Stormwater Management Act and *VSMP Regulations*, and other applicable federal nonpoint source pollution mandates (e.g., *Clean Water Act* Section 313 and federal consistency under the *Coastal Zone Management Act*). Clearing and grading activities, installation of staging areas, parking lots, roads, buildings, utilities, or other structures, soil or dredge spoil areas, or related land conversion activities that disturb equal to or greater than 10,000 square feet would be regulated by the state Acts and *Regulations*. Accordingly, the project sponsors must prepare and implement erosion and sediment control (ESC) and stormwater management (SWM) plans to ensure compliance with state law and regulations. The ESC plan is submitted to DEQ-NRO, which serves the area where the project is located, for review for compliance. The applicant is ultimately responsible for achieving project compliance through oversight of on site contractors, regular field inspection, prompt action against non-compliant sites, and other mechanisms consistent with agency policy. [Reference: Virginia ESC Law § 62.1-44.15:51 *et seq.* and *Regulations* 9 VAC 25-840; Virginia Stormwater Management Act § 62.1-44.15:24 *et seq.* and *VSMP Regulations* 9 VAC 25-870].

(ii) Virginia Stormwater Management Program General Permit for Discharges of Stormwater from Construction Activities (VAR10)

The operator or owner of a construction activity involving land disturbance of equal to or greater than 1 acre is required to register for coverage under the VAR10 permit and develop a project specific stormwater pollution prevention plan (SWPPP). The SWPPP must be prepared prior to submission of the registration statement for coverage under the General Permit and the SWPPP must address water quality and quantity in accordance with the *Virginia Stormwater Management Program Regulations*. General information and registration forms for the General Permit are available on DEQ's website at http://www.deq.virginia.gov/Programs/Water/StormwaterManagement/VSMPPermits/ConstructionGeneralPermit.aspx. [Reference: Virginia Stormwater Management Act §62.1-44.15:24 *et seq.*; *VSMP Permit Regulations* 9 VAC-25-870-10 *et seq.*]

4. Air Pollution Control. According to the SWP/EA (page 34), during the rehabilitation of the dam, particulate matter (dust) will increase during construction activities. Air pollution abatement actions will minimize any potential temporary dust problems during construction, and the proposed work is not expected to violate any federal, state, or local air quality standards. Open burning of vegetative debris may require a permit.

4(a) Agency Jurisdiction. The DEQ Air Division, on behalf of the State Air Pollution Control Board, is responsible for developing regulations that implement Virginia's Air Pollution Control Law (Virginia Code §10.1-1300 *et seq.*). DEQ is charged with carrying out mandates of the state law and related regulations as well as Virginia's federal obligations under the Clean Air Act as amended in 1990. The objective is to protect and enhance public health and quality of life through control and mitigation of air pollution. The division ensures the safety and quality of air in Virginia by monitoring and analyzing air quality data, regulating sources of air pollution, and working with local, state and federal agencies to plan and implement strategies to protect Virginia's air quality. The appropriate DEQ regional office is directly responsible for the issuance of necessary permits to construct and operate all stationary sources in the region as well as monitoring emissions from these sources for compliance. As a part of this mandate, EIRs of projects to be undertaken in the state are also reviewed. In the case of certain projects, additional evaluation and demonstration must be made under the general conformity provisions of state and federal law.

The Air Division regulates emissions of air pollutants from industries and facilities and implements programs designed to ensure that Virginia meets national air quality standards. The most common regulations associated with major State projects are:

- Open burning: 9 VAC 5-130 *et seq.*
- Fugitive dust control: 9 VAC 5-50-60 *et seq.*
- Permits for fuel-burning equipment: 9 VAC 5-80-1100 *et seq.*

4(b) Agency Findings. According to the DEQ Air Division, the project site is located in an ozone attainment area.

4(c) Recommendation. The applicant should take all reasonable precautions to limit emissions of oxides of nitrogen (NO_x) and volatile organic compounds (VOCs), principally by controlling or limiting the burning of fossil fuels.

4(d) Requirements.

(i) Fugitive Dust

Fugitive dust must be kept to a minimum by using control methods outlined in 9 VAC 5-50-60 *et seq.* of the *Regulations for the Control and Abatement of Air Pollution.* These precautions include, but are not limited to, the following:

- Use, where possible, of water or chemicals for dust control;
- Installation and use of hoods, fans, and fabric filters to enclose and vent the handling of dusty materials;
- Covering of open equipment for conveying materials; and

- Prompt removal of spilled or tracked dirt or other materials from paved streets and removal of dried sediments resulting from soil erosion.

(ii) Open Burning

If project activities include the open burning or use of special incineration devices for the disposal of land clearing debris, this activity must meet the requirements of 9 VAC 5-130-10 through 9 VAC 5-130-60 and 9 VAC 5-130-100of the *Regulations* for open burning, and it may require a permit. The *Regulations* provide for, but do not require, the local adoption of a model ordinance concerning open burning. The project sponsors should contact Culpeper County officials to determine what local requirements, if any, exist.

(iii) Fuel-Burning Equipment

The installation, operation or modification of stationary or portable fuel burning equipment (e.g., generators, wood chippers/grinders, boilers, etc.) or other sources of air pollutants may be subject to registration and/or air permitting requirements (http://www.deq.virginia.gov/Programs/Air/PermittingCompliance/Permitting/TypesofAirPermits.aspx).

5. Solid and Hazardous Wastes and Hazardous Management. The SWP/EA does not discuss solid and hazardous waste issues and management.

5(a) Agency Jurisdiction. On behalf of the Virginia Waste Management Board, the DEQ Division of Land Protection and Revitalization (DEQ-DLPR) is responsible for carrying out the mandates of the Virginia Waste Management Act (Virginia Code §10.1-1400 *et seq.*), as well as meeting Virginia's federal obligations under the Resource Conservation and Recovery Act (RCRA) and the Comprehensive Environmental Response Compensation Liability Act (CERCLA), commonly known as Superfund.

Virginia:

- Virginia Waste Management Act, Virginia Code § 10.1-1400 *et seq.*
- *Virginia Solid Waste Management Regulations*, 9 VAC 20-81 (9 VAC 20-81-620 applies to asbestos-containing materials).
- *Virginia Hazardous Waste Management Regulations*, 9 VAC 20-60 (9 VAC 20-60-261 applies to lead-based paints).
- *Virginia Regulations for the Transportation of Hazardous Materials*, 9 VAC 20-110.

Federal:

- Resource Conservation and Recovery Act, 42 U.S. Code sections 6901 *et seq.*

- U.S. Department of Transportation *Rules for Transportation of Hazardous Materials*, 49 *Code of Federal Regulations*, Part 107
- Applicable rules contained in Title 40, *Code of Federal Regulations*.

DEQ-DLPR also administers laws and regulations on behalf of the State Water Control Board governing Petroleum Storage Tanks (Virginia Code §62.1-44.34:8 *et seq.*), including Aboveground Storage Tanks (9 VAC 25-91 *et seq.*) and Underground Storage Tanks (9 VAC 25-580 *et seq.* and 9 VAC 25-580-370 *et seq.*), also known as 'Virginia Tank Regulations', and § 62.1-44.34:14 *et seq.* which covers oil spills.

5(b) Agency Findings. DEQ-DLPR staff conducted a cursory search (500 feet radius) of solid and hazardous waste databases for waste sites in close proximity to the project area, and did not identify any waste sites in close proximity which might impact the project activity. However, one CERCLA waste site of possible concern is located within the same 22701 zip code. The waste site is:

> VAD059165282, Culpeper Wood Preservers Inc., Route 666, Culpeper, Virginia 22701. Final National Priorities List (NPL)

5(c) Requirement. Any soil that is suspected of contamination or wastes that are generated during construction must be tested and disposed of in accordance with applicable federal, state, and local laws and regulations. All construction waste must be characterized in accordance with the *Virginia Hazardous Waste Management Regulations* prior to management at an appropriate facility.

5(d) Recommendations.

(i) CERCLA Site

The following websites may be accessed to identify additional information on the CERCLA site using the facility identification number:

- http://www.epa.gov/superfund/sites/cursites/index.htm
- https://www3.epa.gov/enviro/

(ii) Pollution Prevention

DEQ-DLPR recommends the implementation of pollution prevention principles, including the reduction, reuse, and recycling of all solid wastes generated. All generation of hazardous wastes should be minimized and handled appropriately.

For questions or further information regarding waste comments, contact DEQ-DLPR, Katy Dacey at (804) 698-4274.

6. Pesticides and Herbicides. DEQ recommends that the use of herbicides or pesticides for construction or landscape maintenance should be in accordance with the principles of integrated pest management. The least toxic pesticides that are effective in controlling the target species should be used. Contact the Department of Agriculture and Consumer Services at (804) 786-3501 for more information.

7. Natural Heritage Resources. According to the SWP/EA (page 35), a survey for Dwarf wedgemussel was performed and none were found to exist in the project area. There is potential habitat in the watershed for the Northern long-eared bat, but there have been no known recorded roost trees or hibernacula within a quarter mile of the project area.

7(a) Agency Jurisdiction.

(i) The Virginia Department of Conservation and Recreation (DCR) Division of Natural Heritage (DNH)

DNH's mission is conserving Virginia's biodiversity through inventory, protection and stewardship. The Virginia Natural Area Preserves Act (Virginia Code §10.1-209 through 217), authorizes DCR to maintain a statewide database for conservation planning and project review, protect land for the conservation of biodiversity, and the protect and ecologically manage the natural heritage resources of Virginia (the habitats of rare, threatened and endangered species, significant natural communities, geologic sites, and other natural features).

(ii) Virginia Department of Agriculture and Consumer Services (VDACS)

The Endangered Plant and Insect Species Act of 1979 (Virginia Code Chapter 39 §3.1-1020 through 1030) authorizes VDACS to conserve, protect and manage endangered and threatened species of plants and insects. Under a Memorandum of Agreement established between VDACS and the DCR, DCR represents VDACS in comments regarding potential impacts on state-listed threatened and endangered plant and insect species.

7(b) Agency Findings.

(i) Dwarf Wedgemussel

According to the information currently in DCR files, the Dwarf wedgemussel (*Alasmidonta heterodon*, G1G2/S1/LE/LE) has been historically documented downstream in Mountain Run. The species is currently classified as endangered by the United States Fish and Wildlife Service (USFWS) and the Virginia Department of Game and Inland Fisheries (DGIF). Because mussels are sedentary organisms, they are sensitive to water quality degradation related to increased sedimentation and pollution.

They are also sensitive to habitat destruction through dam construction, channelization, and dredging, and the invasion of exotic mollusk species.

(ii) State-listed Plant and Insect Species

DCR finds that the activity will not affect any documented state-listed plants or insects at the site.

(iii) State Natural Area Preserves

DCR files do not indicate the presence of any State Natural Area Preserves under the agency's jurisdiction in the project vicinity.

7(c) Recommendation.

(i) Dwarf Wedgemussel

DCR recommends the implementation of and strict adherence to applicable state and local erosion and sediment control and stormwater management laws and regulations to minimize adverse impacts to the aquatic ecosystem. Due to the legal status of the Dwarf wedgemussel, DCR recommends coordination with USFWS and DGIF, Virginia's regulatory authority for the management and protection of the species, to ensure compliance with protected species legislation.

(ii) Natural Heritage Resources

Contact DCR-DNH to secure updated information on natural heritage resources if the scope of the project changes or six months pass before the project is implemented, since new and updated information is continually added to the Biotics Data System.

8. Water Supply. According to the SWP/EA (page 39), the primary purposes of the lake are for water supply storage and flood protection. Because the lake is used for municipal water supply by the Town of Culpeper, the lake will only be drawn down about 3 feet during construction. The Sponsors plan to upgrade the 18-inch raw water intake structure by removing the existing service building and installing a new intake location on the left side of the new auxiliary spillway.

8(a) Agency Jurisdiction. The Virginia Department of Health (VDH) Office of Drinking Water (ODW) reviews projects for the potential to impact public drinking water sources (groundwater wells, springs and surface water intakes). VDH administers both federal and state laws governing waterworks operation.

8(b) Agency Findings. VDH-ODW finds that there are no public groundwater wells within a 1-mile radius of the project site. The Town of Culpeper has a surface water intake (PWSID 6047500) on Lake Pelham. The project site is within the watershed of

the Town of Culpeper and Spotsylvania County Utilities (Rappahannock River intake, PWSID 6177300).

8(c) Recommendations. Best Management Practices should be employed on the project site to protect water supply sources, including erosion and sediment controls and spill prevention controls and countermeasures. Care should be taken while transporting materials in and out of the project site to prevent impacts to surface water intakes within 5 miles (i.e. Town of Culpeper).

8(d) Conclusion. There may be impacts to public drinking water sources due to this project if the mitigation efforts are not implemented.

For additional information, contact VDH, Arlene Fields Warren at (804) 864-7781.

9. Historic Structures and Archaeological Resources. According to the SWP/EA (page 8), NRCS cultural resources staff completed database searches for any known cultural resources and ground-surveyed the project area for evidence of archaeological and/or historical resources that had the potential to be impacted. No cultural resources were found in the areas of potential new disturbance and overall, there appears to be low potential for intact subsurface cultural deposits in these areas. A search of the Virginia Department of Historic Resources' Archeological and Architectural Sites database was completed in November 2015 and did not reveal any recorded archeological or historic sites in the vicinity of the proposed project. Consultation with the Virginia Department of Historic Resources (DHR) was initiated in November 2015. On December 18, 2015, the DHR indicated their finding of "no historic properties affected" for the proposed Lake Pelham dam project and indicated no additional studies or consultation would be necessary (SWP/EA, Appendix D).

9(a) Agency Jurisdiction. The Virginia Department of Historic Resources (DHR) conducts reviews of both federal and state projects to determine their effect on historic properties. Under the federal process, DHR is the State Historic Preservation Office, and ensures that federal undertakings-including licenses, permits, or funding-comply with Section 106 of the National Historic Preservation Act of 1966, as amended, and its implementing regulation at 36 CFR Part 800. Section 106 requires federal agencies to consider the effects of federal projects on properties that are listed or eligible for listing on the National Register of Historic Places. For state projects or activities on state lands, DHR is afforded an opportunity to review and comment on (1) the demolition of state property; (2) major state projects requiring an EIR; (3) archaeological investigations on state-controlled land; (4) projects that involve a landmark listed in the Virginia Landmarks Register; (5) the sale or lease of surplus state property; (6) exploration and recovery of underwater historic properties; and (7) excavation or removal of archaeological or historic features from caves. Please see DHR's website for more information about applicable state and federal laws and how to submit an application for review: http://www.dhr.virginia.gov/StateStewardship/Index.htm.

9(b) Agency Findings. DHR did not respond to the request for comments on the proposed project.

For additional information, contact DHR, Roger Kirchen at (804) 482-6091.

REGULATORY AND COORDINATION NEEDS

1. Water Quality and Wetlands. Surface water and wetland impacts associated with this proposal will require a VWP Permit issued by the DEQ Northern Regional Office pursuant to Virginia Code §62.1-44.15:20 For additional information and coordination, contact DEQ-NRO, Trisha Beasley at (703) 583-3940.

2. Dam Safety and Floodplain Management. Coordinate with the Town of Culpeper Department of Planning at (540) 829-8260, on the required documentation demonstrating the effect the project will have on the BFE. In addition, coordinate with DCR-DSFM, Charles Wilson at (804) 371-6233 regarding the acquisition of a Dam Alteration Permit.

3. Erosion and Sediment Control and Stormwater Management.

3(a) Erosion and Sediment Control and Stormwater Management. The project sponsors must ensure the project is conducted in compliance with *Virginia's Erosion and Sediment Control Law* (*Virginia Code* §62.1-44.15:51 *et seq.*) and *Regulations* (9 VAC 25-840 *et seq.*) and *Stormwater Management Law* (*Virginia Code* §62.1-44.15:24 *et seq.*) and *Regulations* (9 VAC 25-870 *et seq.*). Additional information and coordination on erosion and sediment control and stormwater management plans may be addressed to DEQ-NRO, Kelly Vanover at (804) 837-1073.

3(b) General Permit for Stormwater Discharges from Construction Activities (VAR10). For land-disturbing activities of equal to or greater than one acre, the applicant is required to register for coverage under the Virginia Stormwater Management Program General Permit for Discharges of Stormwater from Construction Activities (9 VAC 25-880-1 *et seq.*). Specific questions regarding the Stormwater Management Program requirements should be directed to DEQ-OSWM, Holly Sepety at (804) 698-4039.

4. Air Quality Regulations. This project is subject to air regulations administered by the Department of Environmental Quality. The following sections of the Code of Virginia and Virginia Administrative Code are applicable:

- fugitive dust and emissions control (9 VAC 5-50-60 *et seq.*);
- open burning restrictions (9 VAC 5-130 *et seq.*); and
- fuel-burning equipment (9 VAC 5-80 *et seq.*).

For more information and coordination contact DEQ-NRO, Terry Darton at (703) 583-3845. Also, contact local Culpeper County officials for information on any local requirements pertaining to open burning.

5. Solid and Hazardous Wastes.

5(a) Solid and Hazardous Waste Management Regulations. All solid waste, hazardous waste, and hazardous materials must be managed in accordance with all applicable federal, state, and local environmental regulations. Contact DEQ-NRO, Richard Doucette at (703) 583-3813 for information on the location and availability of suitable waste management facilities in Virginia if free product, discolored soils, or other evidence of contaminated soils are encountered.

5(b) Fuel Storage Tanks. If petroleum-contaminated soils or water are encountered during work or if petroleum storage tanks are used, contact DEQ-NRO, Randy Chapman at (703) 583-3816.

6. Natural Heritage Resources.

(i) Dwarf Wedgemussel

Due to the legal status of the Dwarf wedgemussel, DCR recommends coordination with the USFWS Virginia Field Office at (804) 693-6694 and DGIF, Amy Ewing at (804) 367-2211 to ensure compliance with protected species legislation.

(ii) Natural Heritage Resources

Contact DCR-DNH, Rene Hypes at (804) 371-2708 to secure updated information on natural heritage resources if the scope of the project changes and/or six months passes before the project is implemented, since new and updated information is continually added to the Biotics Data System.

(iii) Wildlife Information

DGIF maintains a database of wildlife locations, including threatened and endangered species, trout streams, and anadromous fish waters that may contain information not documented in this response. The database may be accessed from http://vafwis.org/fwis/ or contact Ernie Aschenbach at (804) 367-2733 or ernie.aschenbach@dgif.virginia.gov.

7. Water Supply. Coordinate with the Town of Culpeper Department of Public Services at (540) 825-4717, concerning any potential impacts to the local water supply sources.

SWP No. 5 and EA
Rehabilitation of Floodwater Retarding Structure No. 50
DEQ 16-142F

Thank you for the opportunity to review the Supplemental Watershed Plan No. 5 and Environmental Assessment for the Rehabilitation of Floodwater Retarding Structure No. 50 of the Mountain Run Watershed, Culpeper County. Detailed comments of reviewing agencies are attached for your review. Please contact me at (804) 698-4204 or John Fisher at (804) 698-4339 for clarification of these comments.

Sincerely,

Bettina Sullivan, Program Manager
Environmental Impact Review and Long-Range Priorities

Enclosures

Ec: Amy Ewing, DGIF
Robbie Rhur, DCR
Tony Watkinson, VMRC
Roy Soto, VDH
Roger Kirchen, DHR
Keith Tignor, VDACS
John Egertson, Culpeper County
Patrick Mauney, Rappahannock-Rapidan RC
Wade Biddix, NRCS

USDA
United States Department of Agriculture

July 19, 2016

Bettina Sullivan, Program Manager
Environmental Impact Review and Long-Range Priorities
Commonwealth of Virginia
Department of Environmental Quality
P.O. Box 1105
Richmond, VA 23218

Re: Draft Supplemental Watershed Plan-Environmental Assessment (EA) for the Rehabilitation of Mountain Run Watershed Dam No. 50 (Lake Pelham), Culpeper County, Virginia

Dear Ms. Sullivan:

Thank you for providing the Commonwealth's consolidated comments on the referenced project. We also received individual comments from the Town of Culpeper and the Culpeper Soil and Water Conservation District. It is acknowledged that the Department of Environmental Quality has no objection to the proposed action provided that the activities are performed in accordance with your recommendations. We will work with the local project sponsors regarding the regulatory and coordination issues of this project.

Since most of the comments address issues that are required during the implementation process, they will be addressed during the design, permitting, and/or construction phases of this project. It is very helpful to have this comprehensive listing of the State's requirements in your letter and we appreciate your support of this project.

If questions or concerns arise as the project proceeds, please contact David Kriz, Assistant State Conservationist for Water Resource Operations, at David.Kriz@va.usda.gov or by phone at 804-287-1646.

Sincerely,

JOHN A. BRICKER
State Conservationist

NATURAL RESOURCES CONSERVATION SERVICE
1606 Santa Rosa Road, Suite 209 ♦ Richmond, Virginia 23229
Phone: (804) 287-1691 ♦ Fax: (855) 627-9827

APPENDIX B

PROJECT MAPS

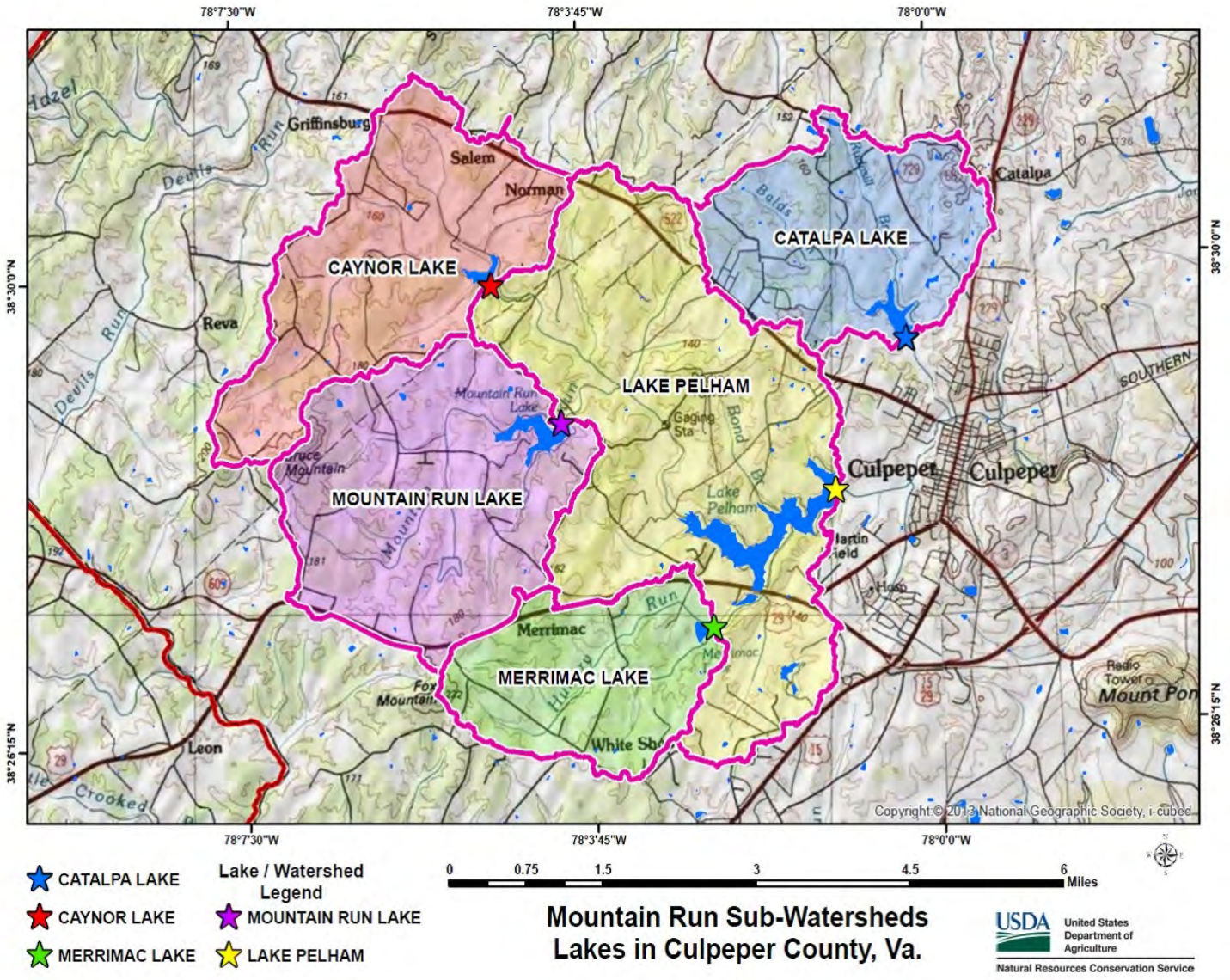


Figure B1. Location map.

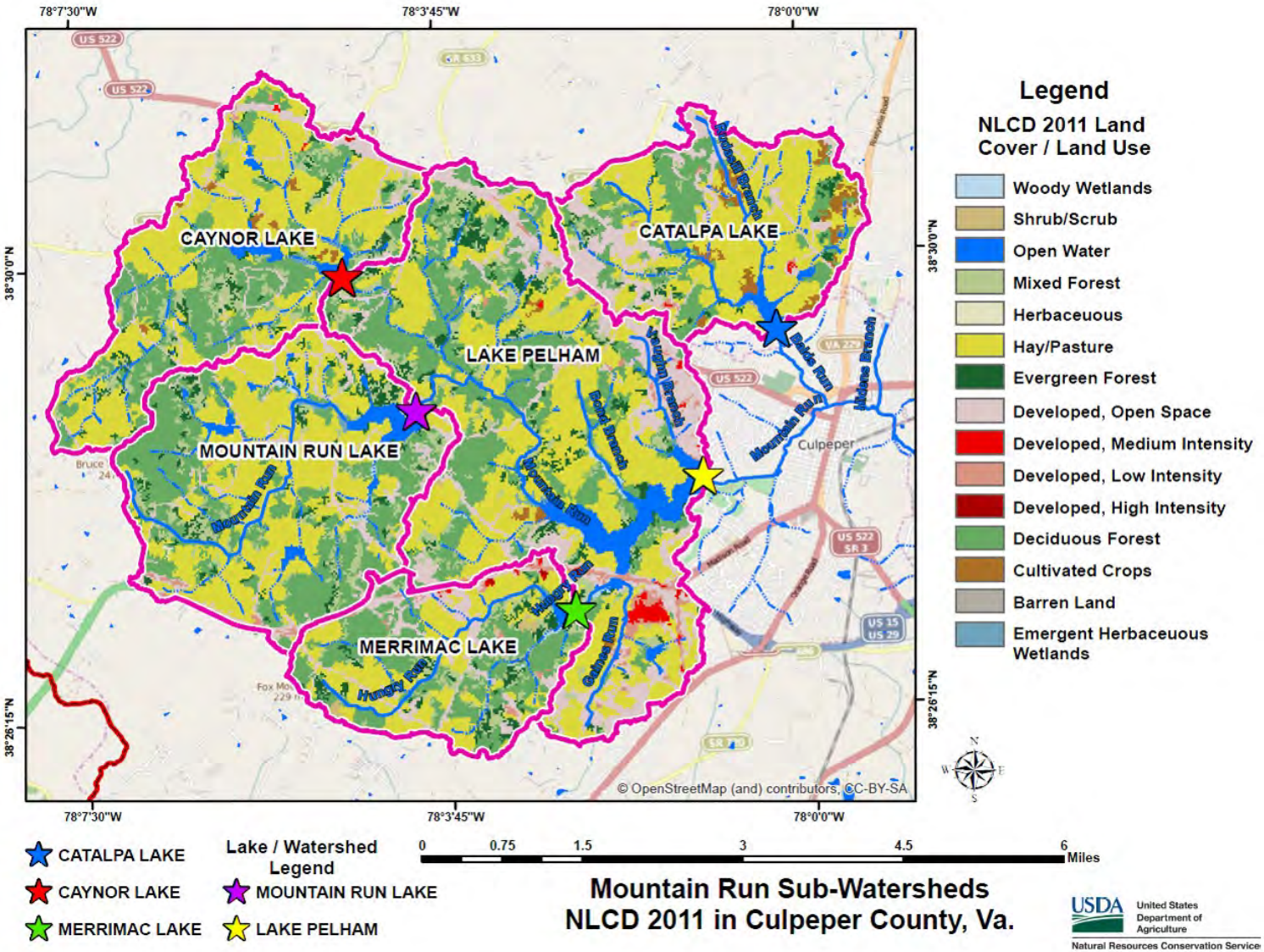
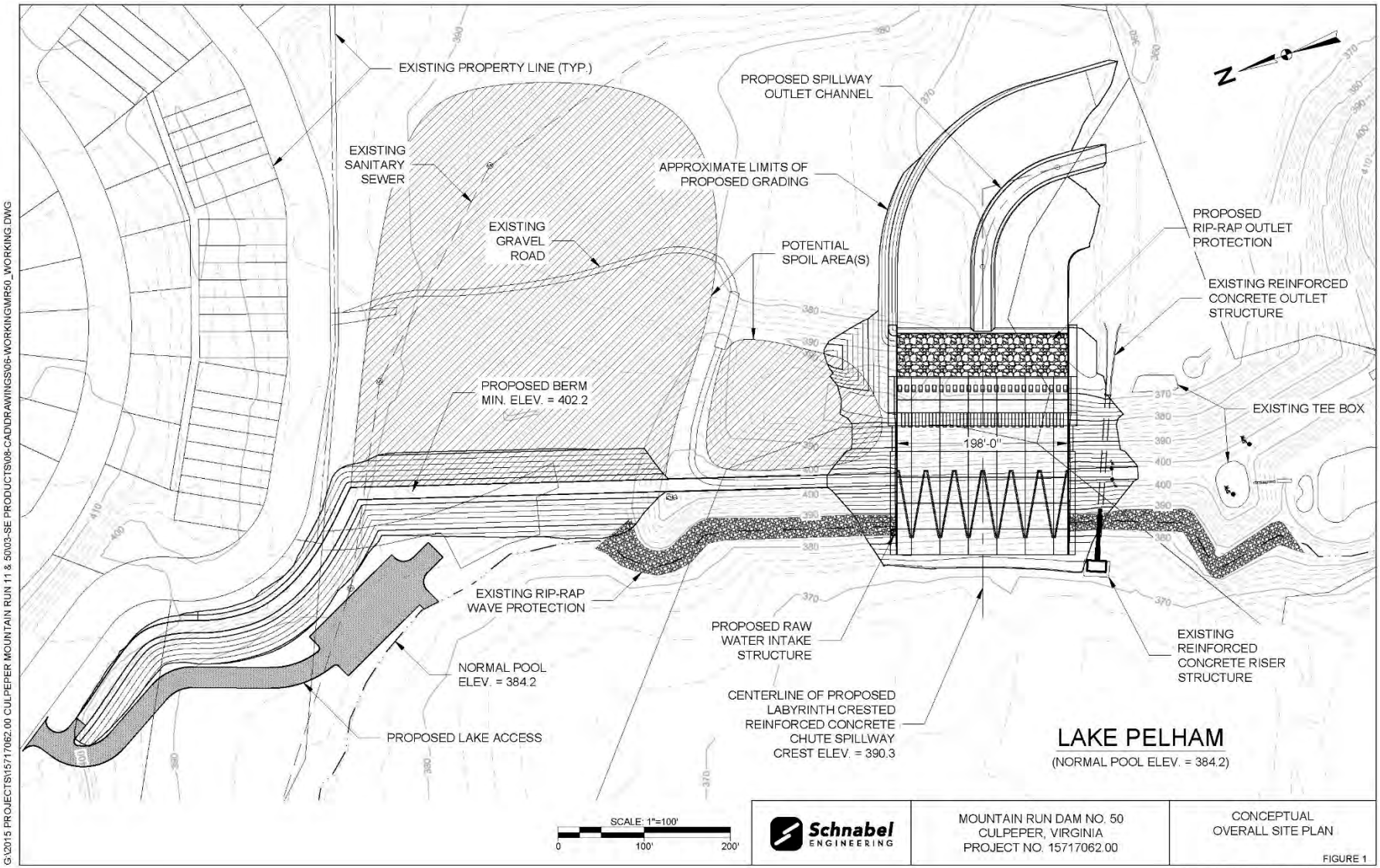


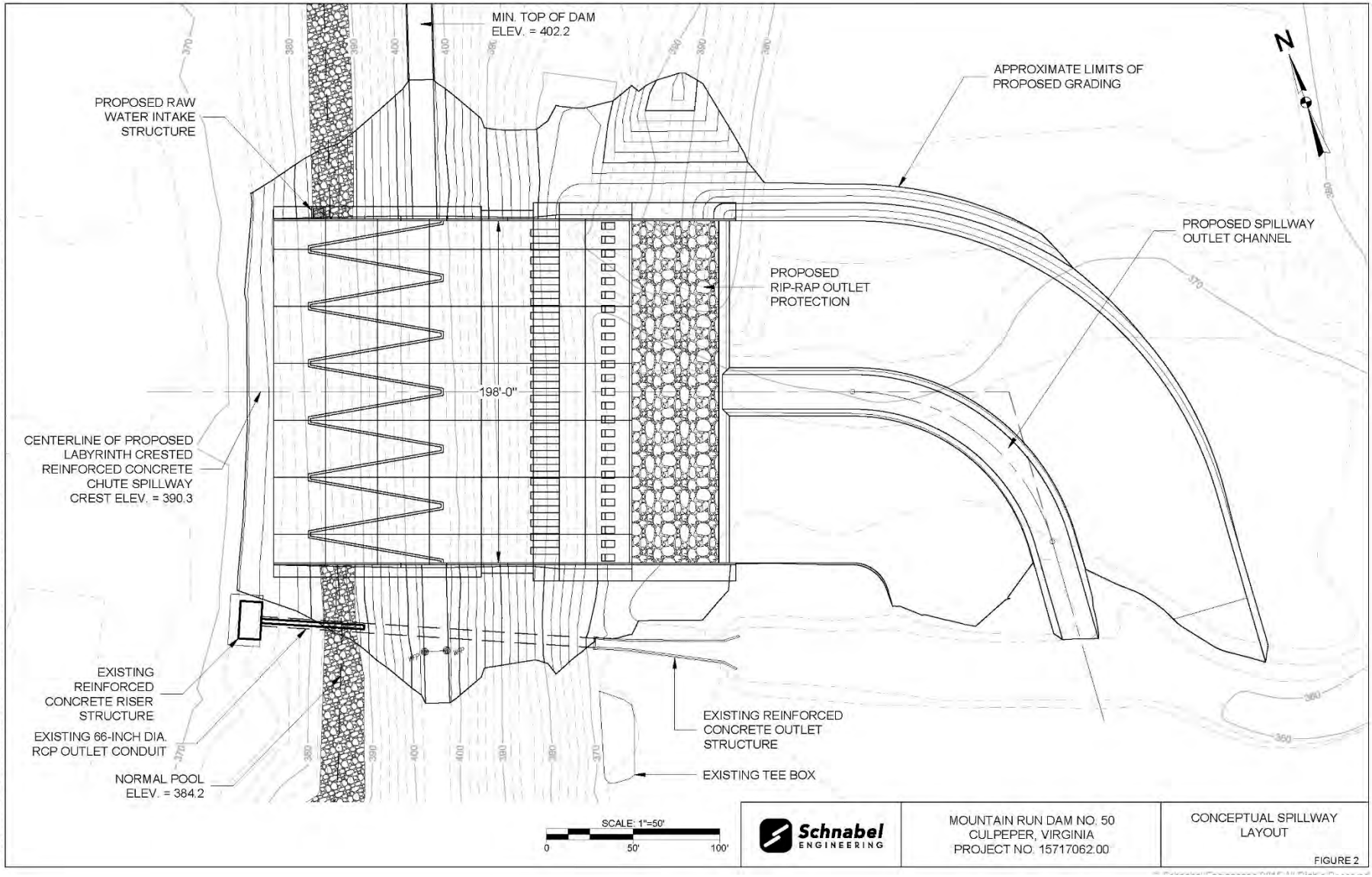
Figure B2. Lake Pelham Subwatershed with Land Use.

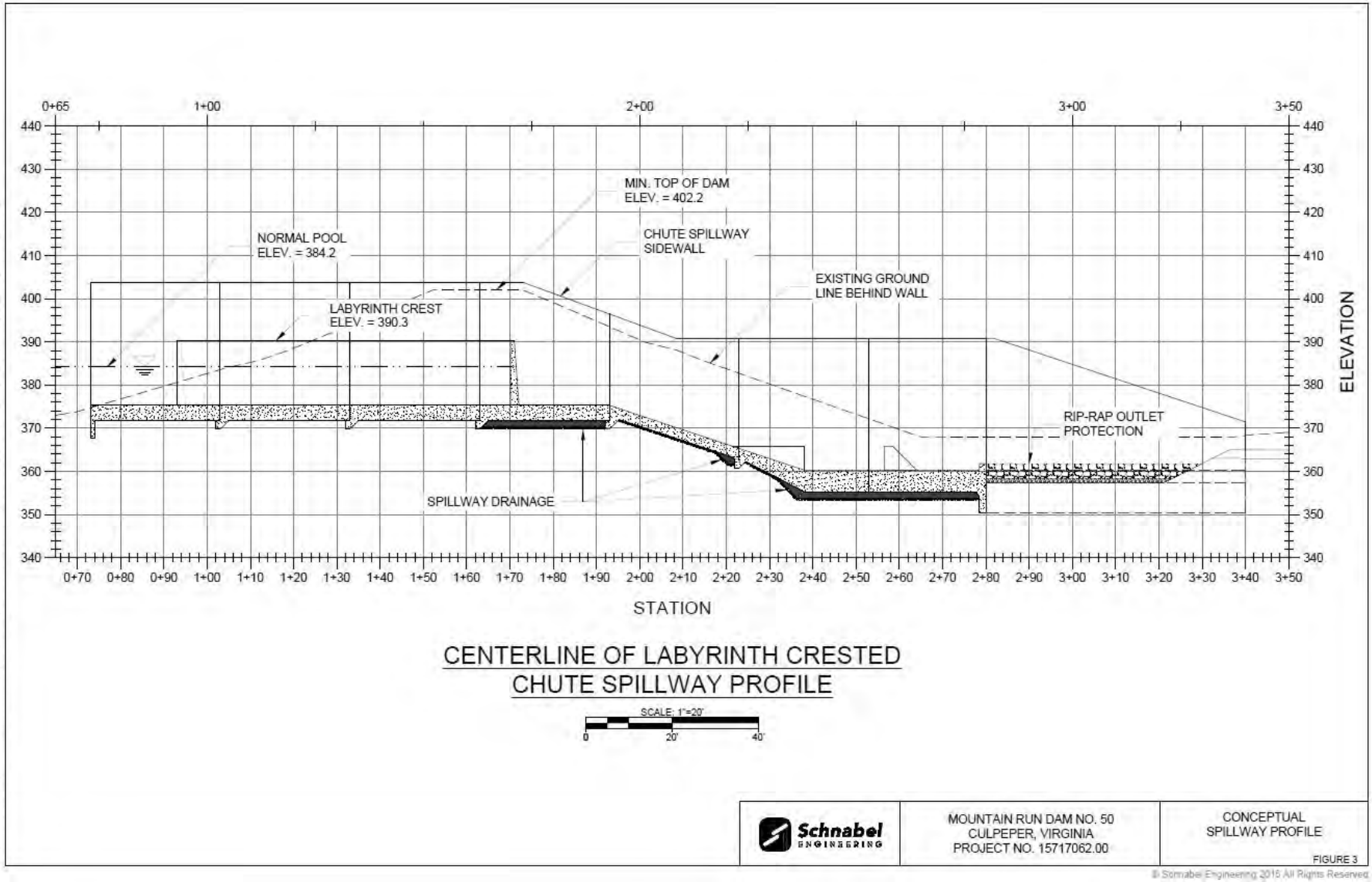
APPENDIX C

SUPPORT MAPS



G:\2015 PROJECTS\15717062.00 CULPEPER MOUNTAIN RUN 11 & 50\03-SE PRODUCTS\08-CAD\DRAWINGS\06-WORKING\MR50_WORKING.DWG


MIN. TOP OF DAM
ELEV. = 402.2
APPROXIMATE LIMITS OF
PROPOSED GRADING
N
PROPOSED RAW
WATER INTAKE
STRUCTURE
PROPOSED SPILLWAY
OUTLET CHANNEL
PROPOSED
RIP-RAP OUTLET
PROTECTION
198'-0"
CENTERLINE OF PROPOSED
LABYRINTH CRESTED
REINFORCED CONCRETE
CHUTE SPILLWAY
CREST ELEV. = 390.3
EXISTING
REINFORCED
CONCRETE RISER
STRUCTURE
EXISTING 66-INCH DIA.
RCP OUTLET CONDUIT
NORMAL POOL
ELEV. = 384.2
EXISTING REINFORCED
CONCRETE OUTLET
STRUCTURE
EXISTING TEE BOX
SCALE: 1"=50'
0
50'
100'
Schnabel
ENGINEERING
MOUNTAIN RUN DAM NO. 50
CULPEPER, VIRGINIA
PROJECT NO. 15717062.00
CONCEPTUAL SPILLWAY
LAYOUT
FIGURE 2
G:\2015 PROJECTS\15717062.00 CULPEPER MOUNTAIN RUN 11 & 50\03-SE PRODUCTS\08-CADDRAWINGS\06-WORKINGMR50_WORKING.DWG



CENTERLINE OF LABYRINTH CRESTED CHUTE SPILLWAY PROFILE

SCALE: 1"=20'

0 20' 40'

Schnabel ENGINEERING

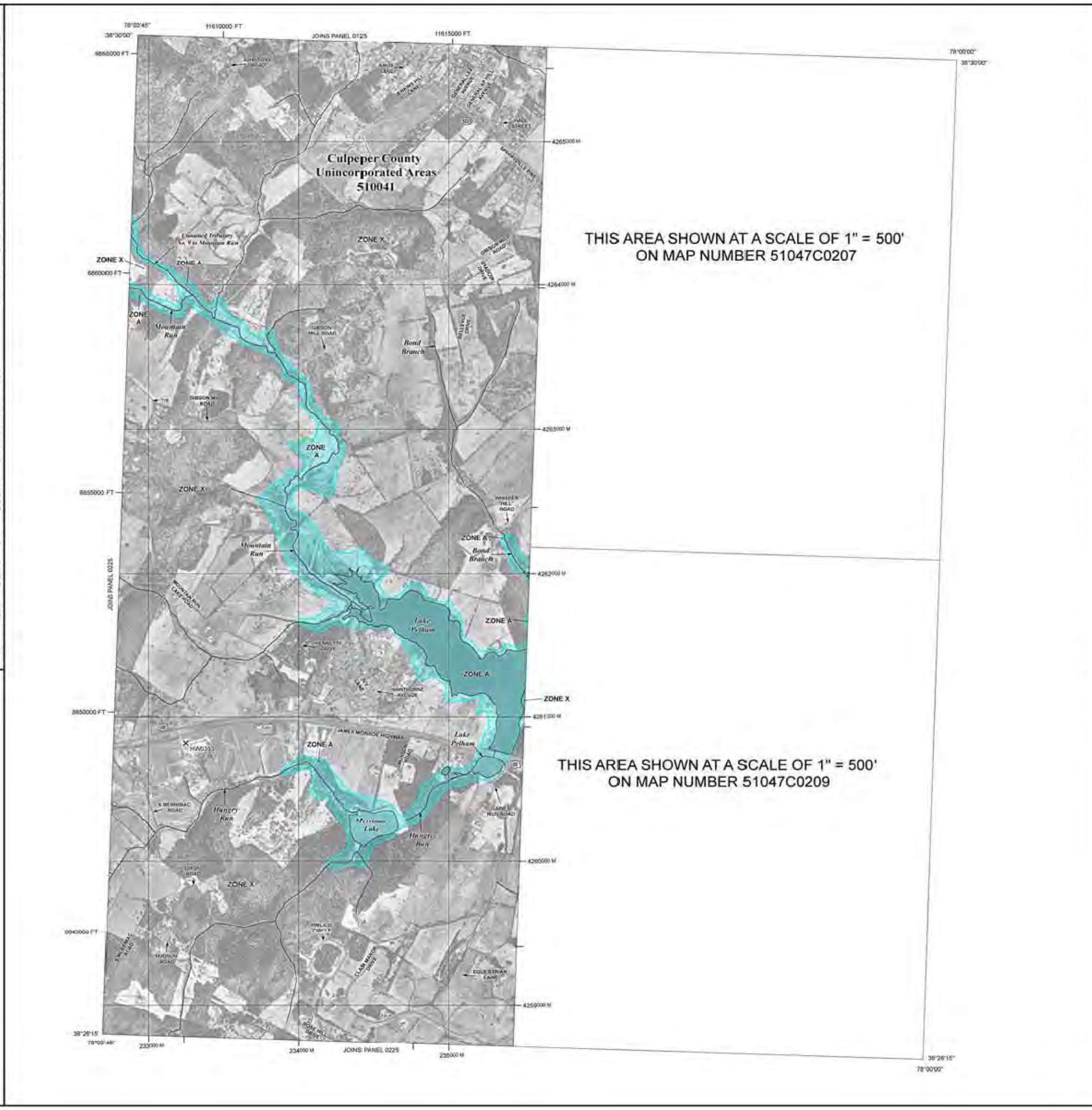
MOUNTAIN RUN DAM NO. 50
CULPEPER, VIRGINIA
PROJECT NO. 15717062.00

CONCEPTUAL
SPILLWAY PROFILE

FIGURE 3

G:\2015 PROJECTS\15717062.00 CULPEPER MOUNTAIN RUN 11 & 50\03-SE PRODUCTS\06-CAD\DRAWINGS\06-WORKING\MR50_WORKING.DWG

NOTES TO USERS



LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

FLOODWAY AREAS IN ZONE AE

OTHER FLOOD AREAS

OTHER AREAS

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

MAP SCALE 1" = 1000'

NFIP

PANEL 0210C

FIRM

FLOOD INSURANCE RATE M

CULPEPER COUNTY
VIRGINIA
AND INCORPORATED ARE

PANEL 210 OF 450

(SEE MAP INDEX FOR FIRM PANEL L

NATIONAL FLOOD INSURANCE PROGRAM

MAP NU
51047C

EFFECTIVE
JUNE 18

Federal Emergency Management

NOTES TO USERS

...tap is for use in administering the National Flood Insurance Program. It ...not necessarily identify all areas subject to flooding, particularly from local ...ge sources of small size. The **community map repository** should be ...fied for possible updated or additional flood hazard information.

...tain more detailed information in areas where **Base Flood Elevations** ...) and/or **floodways** have been determined, users are encouraged to ...the Flood Profiles and Floodway Data and/or Summary of Stillwater ...ions tables contained within the Flood Insurance Study (FIS) report that ...panies this FIRM. Users should be aware that BFEs shown on the FIRM ...ent rounded whole-foot elevations. These BFEs are intended for flood ...rance rating purposes only and should not be used as the sole source of ...evation information. Accordingly, flood elevation data presented in the FIS ...should be utilized in conjunction with the FIRM for purposes of construction ...floodplain management.

...eas of the **floodways** were computed at cross sections and interpolated ...en cross sections. The floodways were based on hydraulic considerations ...egard to requirements of the National Flood Insurance Program. Floodway ...and other pertinent floodway data are provided in the Flood Insurance ...eport for this jurisdiction.

...areas not in Special Flood Hazard Areas may be protected by **flood ...ol structures**. *Refer to* Section 2.4 "Flood Protection Measures" of the ...Insurance Study report for information on flood control structures for this ...sdiction.

...rojection used in the preparation of this map was Universal Transverse ...tor (UTM) Zone 18. **Horizontal datum** was NAD 83, GRS80 spheroid. ...ances in datum, spheroid, projection or UTM zones used in the production ...Ms for adjacent jurisdictions may result in slight positional differences in ...atures across jurisdiction boundaries. These differences do not affect the ...acy of this FIRM.

...elevations on this map are referenced to the North American Vertical ...of 1988. These flood elevations must be compared to structure and ...d elevations referenced to the same **vertical datum**. For information ...ing conversion between the National Geodetic Vertical Datum of 1929 and ...rth American Vertical Datum of 1988, visit the National Geodetic Survey ...e at http://www.ngs.noaa.gov/ or contact the National Geodetic Survey at ...lowing address:

...l Reference System Division
...al Geodetic Survey, NOAA
Spring Metro Center
...ast-West Highway
Spring, Maryland 20910
...713-3191

...tain current elevation, description, and/or location information for **bench** ...nown on this map, please contact the Information Services Branch of the ...al Geodetic Survey at **(301) 713-3242**, or visit its website at ...ww.ngs.noaa.gov/.

MAP SOURCE: Base map files were obtained in digital spatial data format ...he U. S. Geological Survey, the U. S. Census Bureau and the Culpeper ...y Planning Department. Streamline, or NHDFlowline, files were ...aded, by basin, from the National Hydrography Dataset, political boundary ...were downloaded from the 2000 TIGER/Line files, and 1995 digital ...hotographs were provided by the U.S. Geological Survey. Road centerline ...r the Unincorporated Areas of Culpeper County and the Town of Culpeper ...rovided by the Culpeper County Planning Department. Adjustments were ...to specific base map features to align them to 1:12000 Digital Orthophoto ...r Quads.

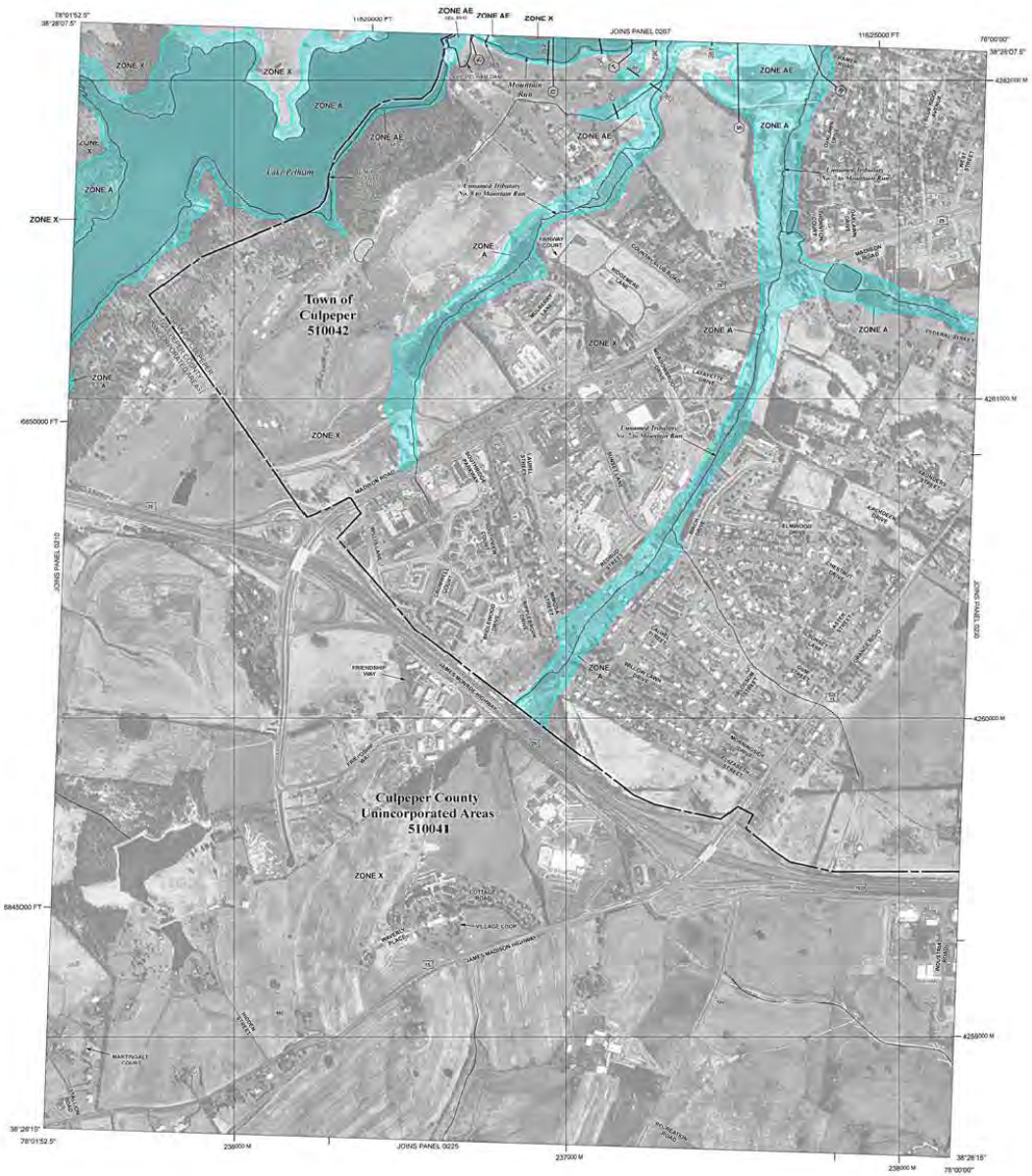
...on the above mentioned digital orthophotographs, this map reflects more ...ent and up-to-date stream channel configurations than those shown on ...revious FIRM for this jurisdiction. As a result, the Flood Profiles may reflect ...channel distances that differ from what is shown on the map. Also, the ...e floodplain relationships for unrevised streams may differ from what is ...on previous maps.

...rate limits shown on this map are based on the best data available at the ...f publication. Because changes due to annexations or de-annexations may ...occurred after this map was published, map users should contact ...priate community officials to verify current corporate limit locations.

...refer to the separately printed **Map Index** for an overview map of the ...showing the layout of map panels; community map repository addresses; ...Listing of Communities table containing National Flood Insurance Program ...for each community as well as a listing of the panels on which each ...unity is located.

...t the **FEMA Map Service Center** at 1-800-358-9616 for information on ...ble products associated with this FIRM. Available products may include ...ously issued Letters of Map Change, a Flood Insurance Study report, and/or ...versions of this map. The FEMA Map Service Center may also be reached ...t 1-800-358-9620 and its website at http://www.msc.fema.gov/.

...have **questions about this map** or questions concerning the National ...Insurance Program in general, please call **1-877-FEMA MAP** (1-877-336-...or visit the FEMA website at http://www.fema.gov/business/nfip.



LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water surface elevation of the 1% annual chance flood.

ZONE A — No Base Flood Elevations determined.

ZONE AE — Base Flood Elevations determined.

ZONE AH — Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.

ZONE AO — Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.

ZONE AR — Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.

ZONE A99 — Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.

ZONE V — Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.

ZONE VE — Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X — Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X — Areas determined to be outside the 0.2% annual chance floodplain.

ZONE D — Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAS)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

1% annual chance floodplain boundary

0.2% annual chance floodplain boundary

Floodway boundary

Zone D boundary

CBRS and OPA boundary

Boundary dividing Special Flood Hazard Areas of differing Base Flood Elevations, flood depths or flood velocities.

513 — Base Flood Elevation line and value; elevation in feet*

(EL 987) — Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988

A — A — Cross section line

B1 — B2 — Transect line

97°07'45", 32°22'30" — Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)

4276000 M — 1000-meter Universal Transverse Mercator grid values, zone 18

6560000 FT — 5000-foot grid ticks: Virginia State Plane coordinate system (FIPSZONE 4501), Lambert Conformal Conic projection

DX5510 — Bench mark (see explanation in Notes to Users section of this FIRM panel)

M1.5 — River mile

MAP REPOSITORY
Refer to listing of Map Repositories on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
JUNE 18, 2007

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

For communities map revision history prior to countywide mapping, refer to the Community History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 500'

250 0 500 1000 — CREATED FEET

150 0 150 300 — METER

NFIP

PANEL 0209C

FIRM

FLOOD INSURANCE RATE M

CULPEPER COUNTY VIRGINIA AND INCORPORATED ARE

PANEL 209 OF 450

(SEE MAP INDEX FOR FIRM PANEL L

CONTAINS:

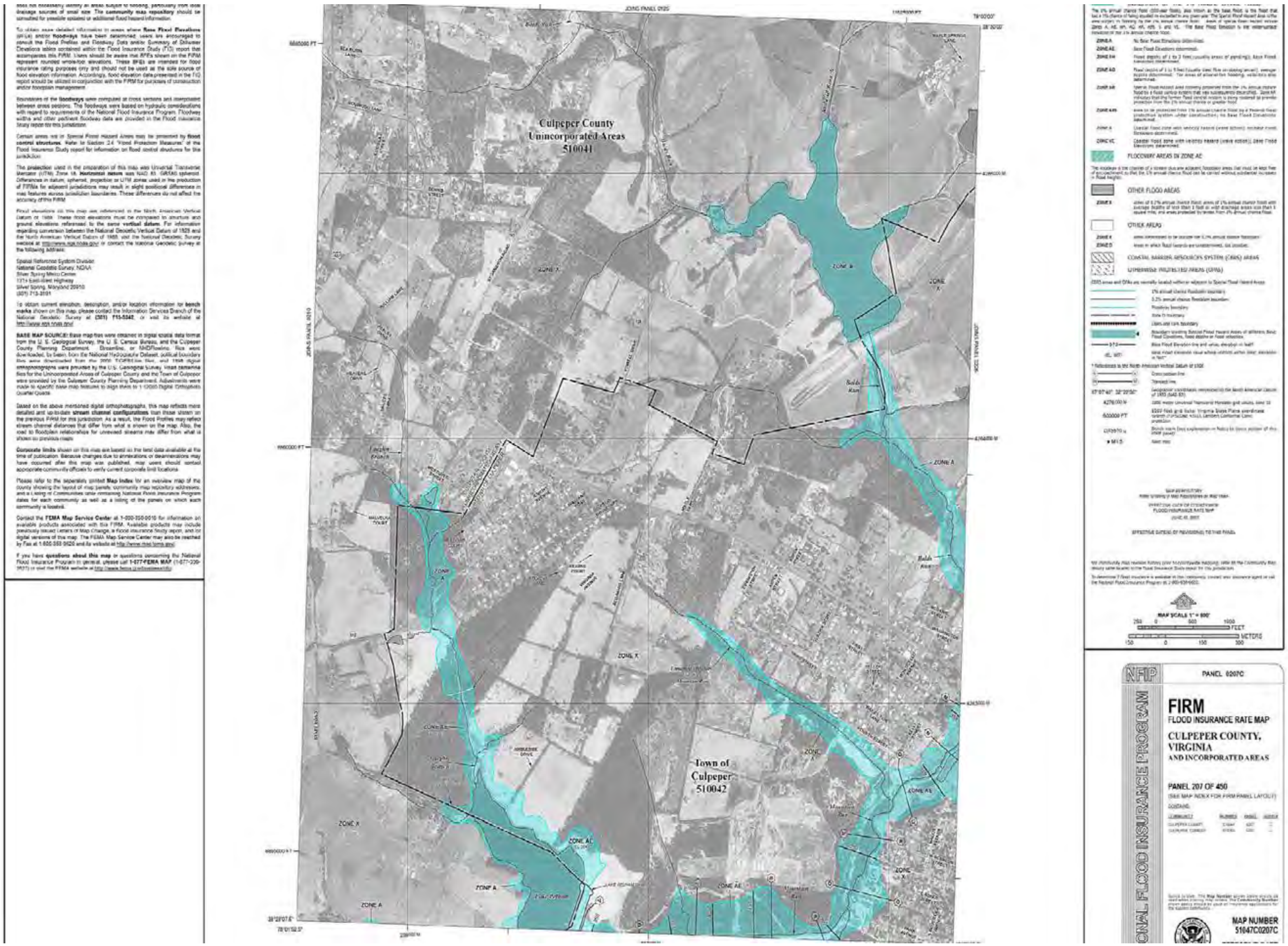
COMMUNITY	NUMBER	PANEL
CULPEPER COUNTY	510041	0209
CULPEPER, TOWN OF	510042	0209

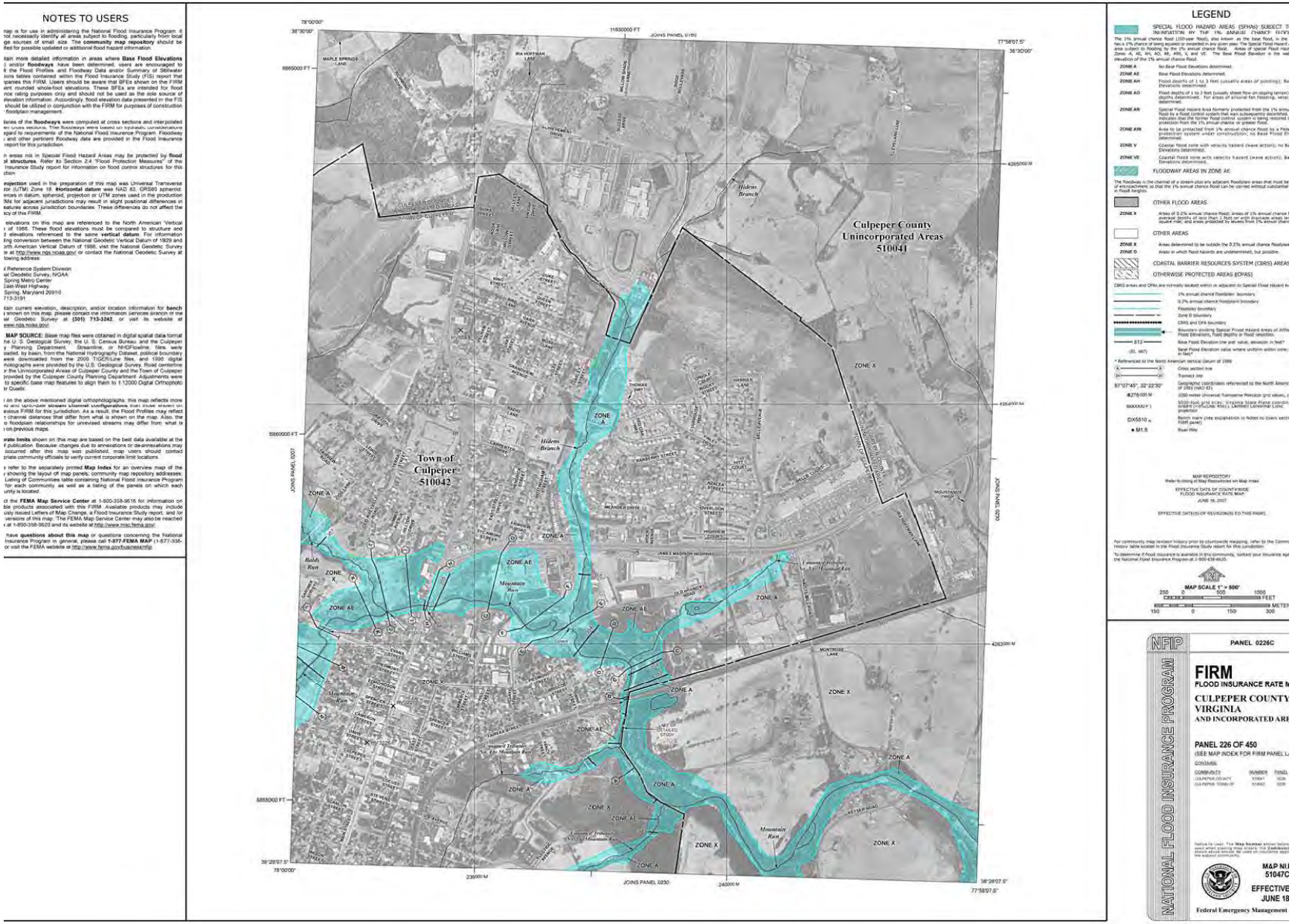
Notice to User: The **Map Number** shown below should be used when placing map orders; the Community Number shown above should be used on insurance applications for the subject community.

MAP NU
51047C

EFFECTIVE
JUNE 18

Federal Emergency Management


Culpeper County
Unincorporated Areas
510041
Town of
Culpeper
510042
ZONE X
ZONE A
ZONE AE
FLOODWAY AREAS IN ZONE AE
OTHER FLOOD AREAS
OTHER AREAS
MAP SCALE 1" = 500'
FEET
METERS
NFIP
PANEL 0207C
FIRM
FLOOD INSURANCE RATE MAP
CULPEPER COUNTY,
VIRGINIA
AND INCORPORATED AREAS
PANEL 207 OF 450
MAP NUMBER
51047C0207C
NATIONAL FLOOD INSURANCE PROGRAM


NOTES TO USERS
LEGEND
Culpeper County
Unincorporated Areas
510041
Town of
Culpeper
510042
Hidens
Branch
Mountain
Run
Balds
Run
ZONE A
ZONE AE
ZONE X
ZONE V
MAP SCALE 1" = 500'
NATIONAL FLOOD INSURANCE PROGRAM
PANEL 0226C
FIRM
FLOOD INSURANCE RATE M
CULPEPER COUNTY
VIRGINIA
AND INCORPORATED ARE
PANEL 226 OF 450
(SEE MAP INDEX FOR FIRM PANEL L
CONTAINS:
Federal Emergency Management

NOTES TO USERS

nap is for use in administering the National Flood Insurance Program. It not necessarily identify all areas subject to flooding, particularly from local ge sources of small size. The **community map repository** should be fied for possible updated or additional flood hazard information.

ain more detailed information in areas where **Base Flood Elevations** and/or **floodways** have been determined, users are encouraged to lt the Flood Profiles and Floodway Data and/or Summary of Stillwater ions tables contained within the Flood Insurance Study (FIS) report that ganies this FIRM. Users should be aware that BFEs shown on the FIRM ent rounded whole-foot elevations. These BFEs are intended for flood nce rating purposes only and should not be used as the sole source of elevation information. Accordingly, flood elevation data presented in the FIS should be utilized in conjunction with the FIRM for purposes of construction floodplain management.

laries of the **floodways** were computed at cross sections and interpolated en cross sections. The floodways were based on hydraulic considerations egard to requirements of the National Flood Insurance Program. Floodway and other pertinent floodway data are provided in the Flood Insurance report for this jurisdiction.

n areas not in Special Flood Hazard Areas may be protected by **flood ol structures**. Refer to Section 2.4 "Flood Protection Measures" of the Insurance Study report for information on flood control structures for this diction.

rojection used in the preparation of this map was Universal Transverse ator (UTM) Zone 18. **Horizontal datum** was NAD 83, GRS80 spheroid. nces in datum, spheroid, projection or UTM zones used in the production MIs for adjacent jurisdictions may result in slight positional differences in features across jurisdiction boundaries. These differences do not affect the acy of this FIRM.

elevations on this map are referenced to the North American Vertical of 1988. These flood elevations must be compared to structure and d elevations referenced to the same **vertical datum**. For information ting conversion between the National Geodetic Vertical Datum of 1929 and orth American Vertical Datum of 1988, visit the National Geodetic Survey te at http://www.ngs.noaa.gov/ or contact the National Geodetic Survey at lowing address:

d Reference System Division
nal Geodetic Survey, NOAA
Spring Metro Center
East-West Highway
Spring, Maryland 20910
713-3191

tain current elevation, description, and/or location information for **bench** s shown on this map, please contact the Information Services Branch of the nal Geodetic Survey at **(301) 713-3242**, or visit its website at www.ngs.noaa.gov/.

MAP SOURCE: Base map files were obtained in digital spatial data format the U.S. Geological Survey, the U.S. Census Bureau, and the Culpeper y Planning Department. Streamline, or NHDFlowline, files were pted, by basin, from the National Hydrography Dataset; political boundary were downloaded from the 2000 TIGER/Line files, and 1998 digital tographs were provided by the U.S. Geological Survey. Road centerline e this Unincorporated Areas of Culpeper County and the Town of Culpeper provided by the Culpeper County Planning Department. Adjustments were to specific base map features to align them to 1:12000 Digital Orthophoto or Quads.

on the above mentioned digital orthophotographs, this map reflects more ed and up-to-date **stream** channel configurations than those shown on previous FIRM for this jurisdiction. As a result, the Flood Profiles may reflect channel distances that differ from what is shown on the map. Also, the floodplain relationships for unrevised streams may differ from what is on previous maps.

rate limits shown on this map are based on the best data available at the publication. Because changes due to annexations or de-annexations may occurred after this map was published, map users should contact priate community officials to verify current corporate limit locations.

refer to the separately printed **Map Index** for an overview map of the showing the layout of map panels; community map repository addresses; Listing of Communities table containing National Flood Insurance Program for each community as well as a listing of the panels on which each unity is located.

ct the **FEMA Map Service Center** at 1-800-358-9616 for information on ble products associated with this FIRM. Available products may include usly issued Letters of Map Change, a Flood Insurance Study report, and / versions of this map. The FEMA Map Service Center may also be reached at 1-800-358-9620 and its website at http://www.msc.fema.gov/.

have **questions about this map** or questions concerning the National Insurance Program in general, please call **1-877-FEMA MAP** (1-877-336- or visit the FEMA website at http://www.fema.gov/business/nfip.

LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT T
DESIGNATION BY THE 1% ANNUAL CHANCE FLOO
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areas subject to flooding by the 1% annual chance flood. Areas of special Flood Haz
Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the wa
elevation of the 1% annual chance flood.

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indicates that the former flood control system is being restored t
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protection system under construction; no Base Flood El
determined.
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Elevations determined.
ZONE VE — Coastal flood zone with velocity hazard (wave action); Ba
Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be
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average depths of less than 1 foot or with drainage areas le
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1% annual chance floodplain boundary
0.2% annual chance floodplain boundary
Floodway boundary
Zone D boundary
CBRS and OPA boundary
Boundary dividing Special Flood Hazard Areas of diffe
Flood Elevations, flood depths or flood velocities.
513 — Base Flood Elevation line and value; elevation in feet*
(EL 987) — Base Flood Elevation value where uniform within zone;
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DX5510 — Bench mark (see explanation in Notes to Users sect
FIRM panel)
M1.5 — River Mile

MAP REPOSITORY
Refer to listing of Map Repositories on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
JUNE 18, 2007

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

For community map revision history prior to countywide mapping, refer to the Comm
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To determine if flood insurance is available in this community, contact your insurance ag
the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 1000'
500 0 1000 2000 FEET
300 0 300 600 METE

NFIP
NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0230C

FIRM
FLOOD INSURANCE RATE M

CULPEPER COUNTY
VIRGINIA
AND INCORPORATED AR

PANEL 230 OF 450
(SEE MAP INDEX FOR FIRM PANEL L

CONTAINS:

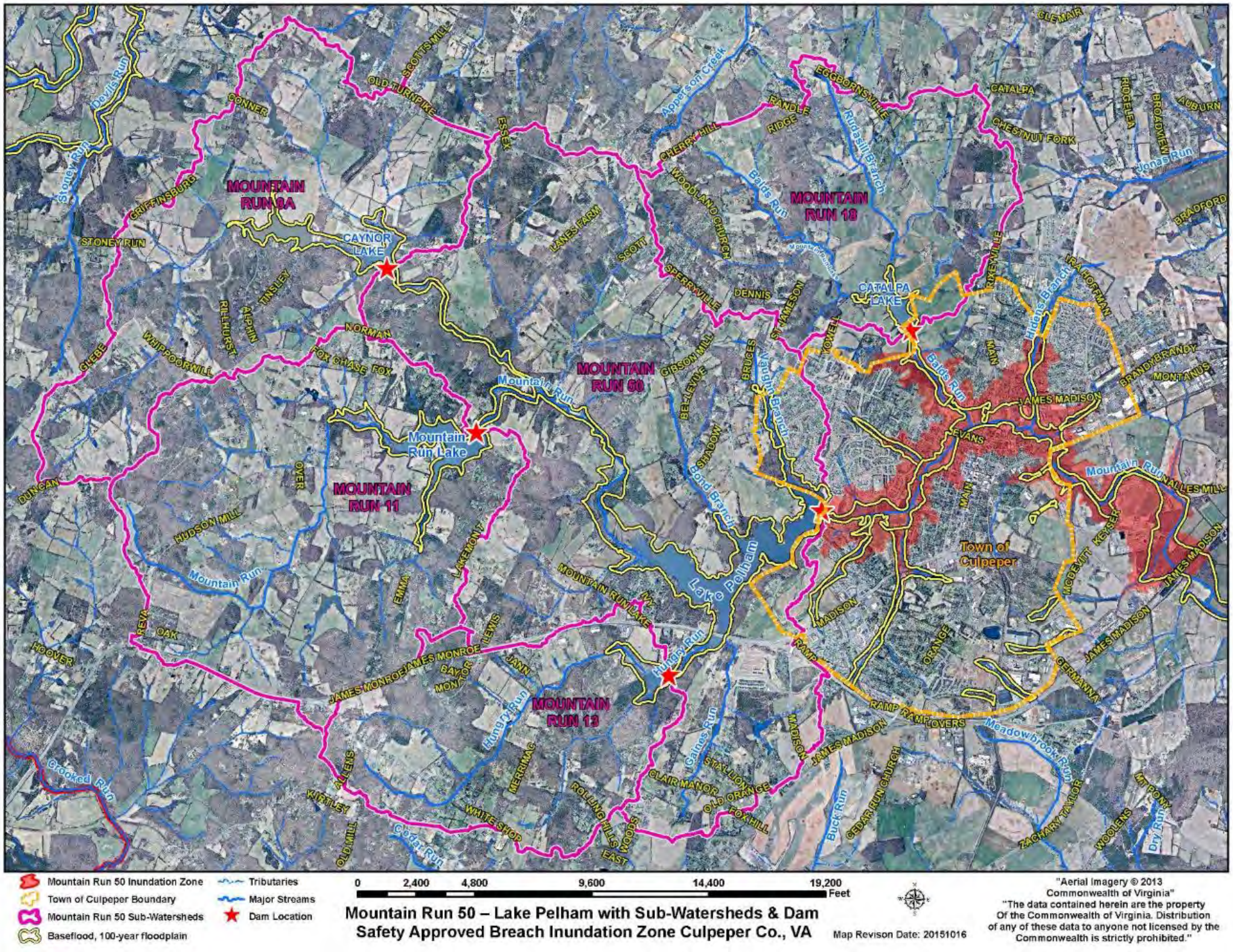
COMMUNITY	NUMBER	PANEL
CULPEPER COUNTY	510041	0230
CULPEPER, TOWN OF	510042	0230

Notice to User: The **Map Number** shown below
used when placing map orders; the **Community**
shown above should be used on insurance appli
the subject community.

MAP NU
51047C

EFFECTIVE
JUNE 18

Federal Emergency Management



Mountain Run 50 – Lake Pelham with Sub-Watersheds & Dam Safety Approved Breach Inundation Zone Culpeper Co., VA

Map Revison Date: 20151016

"Aerial Imagery © 2013 Commonwealth of Virginia"
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APPENDIX D

INVESTIGATIONS AND ANALYSES REPORT

Investigations and Analyses Used in the Planning for Rehabilitation of Mountain Run Dam Site No. 50 (Lake Pelham)

Planning Engineering

Background

Mountain Run stream originates in the western part of Culpeper County and flows generally east through the Town of Culpeper (Town) and emptying into the Rappahannock River. The Mountain Run Watershed is located west of the Town. A Watershed Plan was developed by the NRCS in the 1950s and supplemented in the 1970s to reduce flood flow in and around the Town and to provide water supply storage for the Town. Five watershed structures are located in the Mountain Run Watershed.

Mountain Run Dam No. 50 is currently in planning for rehabilitation to meet current state dam safety requirements, maintain existing flood control and maintain water supply storage.

Purpose

This document summarizes the investigations and analysis completed for the dam rehabilitation planning engineering of Mountain Run Dam No. 50. This includes a summary and reference for the existing conditions, breach, deficiencies, alternatives studied and the selected rehabilitation alternative for Mountain Run Dam No. 50. The following documents state the assumptions, investigations, analysis performed and the conclusions developed:

- Document A– Schnabel Engineering, Preliminary Planning and Engineering for Mountain Run Dam No. 50, December, 28, 2015.
- Document B – Schnabel Engineering, Mountain Run 50 Inlet/Outlet Inspection report, December 2, 2015.
- Document C – NRCS Hydrologic Analysis of Mountain Run 11 and Mountain Run 50 Watershed and Dams, May 2015
- Document D – Topo Survey, NRCS 2014
- Document E – Risk Evaluation Sheet, August 5, 2013
- Document F – Hazen & Sawyer, Preliminary Engineering Report, Lake Pelham and Mountain Run Lake Dam Improvements, April 25, 2013
- Document G. Breach Inundation Study, The Timmons Group, 2010
- Document H– Breach Maps, NRCS 2013
- Alternatives

The basis for the planning engineering investigations and analysis are current NRCS criteria and standards, including the following:

- National Engineering Handbook, Part 630, Hydrology
- National Engineering Handbook, Part 628, Dams
- Technical Release 60, Earth Dams and Reservoirs, July 2005
- NRCS Conservation Practice Standard, 402 Dams

Existing Conditions and Deficiencies

NRCS and consulting engineers evaluated the existing condition of the dam and appurtenances since 2013. Initial investigations include a topographic survey, sediment survey and report, hydrologic analysis, spillway integrity analysis, and embankment and spillway capacity analysis. Detailed descriptions of the existing dam, reservoir and spillways are located in Documents A, B, C, E, and F. The existing topographic survey and key elevations are displayed in Document D, Topo Survey.

The dam is well maintained and appears structurally sound. The principal spillway (riser, outlet pipe, and stilling basins) is in good condition and expected to maintain integrity for 50-years.

The SITES model was used to evaluate the capacity and integrity of the existing structure and the auxiliary spillway alternatives. Geotechnical information was taken from the as-builts, original design folder (1970), and the Hazen & Sawyer preliminary engineering report. Reservoir storage was developed using the current sediment survey. Crest elevations were taken from the current NRCS topo survey (NAVD 88) and the as-built drawings (NVD29 converted to NAVD 88). The 24-hour storm was found to be the critical duration for the Freeboard Hydrograph (FBH). The 24-hr storm was developed using the NRCS 5-point distribution and 24-hr Probable Maximum Precipitation (PMP) from Hydrometeorology Report No. 51, of 36 inches.

In 2012, the Town commissioned Hazen and Sawyer to study alternatives to bring Mountain Run Site 50 up to current criteria. As part of that study, a geological investigation of the auxiliary spillway was completed. The investigation consisted of two phases. In the first phase, two boreholes were drilled in the auxiliary spillway, each to ten feet of depth. Both boreholes documented soil materials and neither encountered rock. In the second phase, an electrical resistivity survey of the auxiliary spillway was completed. It consisted of five lines. The intent of the electrical resistivity survey was to document the top of competent rock. The survey seemed to show that competent rock at the auxiliary spillway control section was just over 25 feet deep on the inside edge, which is the most critical area. The two phases of the investigation provided data used to develop the SITES model for the auxiliary spillway integrity and stability.

Results show that Mountain Run Dam No. 50 does not meet the 10-day drawdown requirement during the PSH events; does not have the capacity to route the FBH events without overtopping the dam; and does not have the integrity to resist auxiliary spillway erosion during the FBH events. The dam does not meet NRCS capacity or integrity criteria for high hazard dams. The dam does not meet Virginia Division of Dam Safety criteria for a high hazard dam.

Reservoir Storage

Mountain Run Dam No. 50 was originally designed to detain future sediment, provide water supply, and provide flood storage. In order to determine the current reservoir storage, sediment surveys were completed by NRCS staff for Mountain Run Dam No. 50 in September 2014. The sediment survey is also used to determine the yearly sedimentation rate which is used to determine the required sediment storage for fifty to one-hundred years after the rehabilitation is complete. A detailed trip report is available in the file as part of the supporting documentation (Document C).

The results of the sediment survey for Mountain Run Dam No. 50 show a total storage of 1,709 acre-feet below the crest of the principal spillway (PSW). Therefore, there is sufficient storage

capacity below the crest of the PSW to store a minimum of 50 and 100 years of submerged sediment accumulation and the originally planned volume of water supply.

Lake Pelham Storage Capacity

Storage Capacity, acre-feet	Planned Storage (50 years after rehabilitation)	Planned Storage (100-years after rehabilitation)	Existing Storage (2014 Sediment Survey)	Designed Storage (1968 Design Folder)
Submerged Sediment Storage	223 [1]	433 [1]	NA	877
Water Supply Storage	1,486	1,276	NA	1,000
PSW Storage (Total Storage to PSW crest) [2]	1,709	1,709	1,709	1,877
Aerated Sediment Storage (above the PSW crest)	16 [3]	30	NA	61
Flood Storage (Total Storage between PSW and ASW crest [2]) [4]	1,903	1,903	1,903	2,095

1. The sedimentation rate of 4.2 acre-feet-year was determined using actual sedimentation accumulation over the life of the structure. Therefore, the submerged sediment accumulation over the next 53 years (50 yr. minimum storage + 3 years to construction from the time of the last sediment survey) is 223 acre-feet and over the next 103 years (100 yr. storage + 3 years to construction from the time of the last sediment survey) is 433 acre-feet.
2. PSW = principal spillway; ASW = auxiliary spillway
3. The future aerated sediment for Mountain Run No. 50 was documented in the original design folders and was utilized to predict the future aerated sedimentation rate. The aerated sediment is 7% of the sediment (by volume). This yields a 0.29 acre-feet-year aerated sedimentation rate, which equates to 16 acre-feet of submerged sediment over the next 53 years and 30 acre-feet over the next 103 years.
4. The storage volume was determined using current Digital Elevation Models, sediment survey, and the reservoir routing procedures in SITES. The difference between the designed storage and the existing storage is attributed to more precise measurements using current technology.

Dam Rehabilitation Alternatives

Rehabilitating Mountain Run Dam No. 50 to meet current NRCS criteria requires substantial modifications to the structures. Several alternatives were evaluated to rehabilitate the dam.

1. Vegetated Spillway without dam raise. NRCS analyzed a vegetated spillway to meet current safety and performance criteria (Document C). The Sponsors are unable to raise the top of dam due to difficulty and cost with moving homes and structures and gaining landrights to expand their flood pool easement. Since the auxiliary spillway materials are erodible, a minimum width of 600 feet is needed or substantial amount of armoring and barriers would be needed. The widening of the spillway is impractical due to the vicinity of townhomes on the left abutment. A structural spillway can be operated more frequently than a vegetated auxiliary spillway and will maintain the existing normal, flood, and top of dam elevations.

2. Top of Dam Raise and Armor Auxiliary Spillway. Hazen & Sawyer performed a preliminary design to raise the top of dam and armor the spillway in 2013. (Document F). The Sponsors are unable to raise the top of dam due to difficulty and cost with moving homes and structures and gaining landrights to expand their flood pool easement. Due to exorbitant costs to obtain additional floodpool easements, this alternative was eliminated from further study.

3. Roller Compacted Concrete (RCC) Chute. Schnabel performed a preliminary design to provide a new structural spillway using RCC. This would maintain the existing flood protection and water supply storage, and provide capacity and integrity to pass the FBH event. (Document A). It is estimated that an RCC overtopping spillway with an Ogee control section would have construction costs approximately $900,000 more than the alternative of a labyrinth spillway over the embankment. The entire length of dam to the left of the principal spillway outlet works would have overtopping protection. This alternative requires significant excavation into the left abutment and significant disturbance below the dam to train the spillway flows back towards the natural stream channel. Because of the close proximity of a large residential community to the dam with the only access to the dam through this community, the impact to the residential community during RCC construction was considered a very significant factor in the evaluation of the best alternative. Over 3,000 round trips for the delivery of aggregate, cement, and fly ash for the RCC mixture would be required via the residential streets. Conflicts with children playing and school buses would likely occur. The potential for noise and dust from aggregate handling activities and the mixing of the RCC is significant. For summer temperature control of the RCC mix, oftentimes working at night is an industry standard which would create sleep disturbance issues with the townhomes adjacent to the dam. RCC production and placement is a high energy activity that can create undesirable situations in and around residential areas.

   RCC production and placement is considered more disruptive to the community than the installation of a labyrinth weir since the RCC staging area is twice as large as the labyrinth weir staging area and the delivery of materials requires double impact on surrounding roads. Due to these reasons, this alternative was eliminated from further study.

4. Labyrinth weir and concrete chute (Preferred Alternative and No Action/Future Without Federal Project Alternative). Schnabel performed a preliminary design to provide a new structural spillway using a labyrinth weir and concrete chute. This would maintain the existing flood protection, continue water supply storage, and provide capacity and integrity to pass the FBH event. (Document A).

Lake Pelham: Watershed Rehabilitation Alternatives with Rationale for Level of Analysis

Alter-natives	Alternative Description	Cost (millions)	Carried Through	Rationale
No Action/Future Without Federal Project	Future Without Project - No Federal Action Alternative. Sponsors to rehabilitate the dam to meet current safety and performance standards, maintain water supply, maintain recreational use, maintain existing top of dam crest, and maintain existing flood control to downstream properties. They have decided to fully rehabilitate the dam the same way that the dam would be rehabilitated using federal assistance (see dam rehabilitation preferred alternative below for further details).	$11.1	Yes	No Action
Dam Decommissioning	Decommission the dam - Federal assistance by performing a controlled breach of the structure to reduce dam breaching hazard potential downstream. Since the regulatory floodplain (100-yr) was established assuming the dam is in place, structures in the downstream flood zone would need to be relocated or flood-proofed. Since water supply for the Town would be eliminated, the action would require development of alternative drinking water sources.	$23.5	No	Due to the exorbitant cost of developing alternative water supply and relocating or floodproofing structures, this alternative was eliminated from further study.

Alter-natives	Alternative Description	Cost (millions)	Carried Through	Rationale
Dam Rehabilitation	Future With Project - Federal assistance to rehabilitate the dam to meet current safety and performance standards, continue water supply, maintain recreational use, maintain existing top of dam crest, and maintain existing flood control to downstream properties. Install a 198-foot-wide, 6-cycle structural concrete labyrinth spillway over the embankment, install a SAF stilling basin and rip-rap outlet protection, and install an 800-foot-long earthen berm across the existing auxiliary spillway. The storage below the principal spillway is more than the designed condition. The Sponsors could decide to reallocate the water supply storage from 1,000 acre-feet to 1,486 acre-feet.	$11.1	Yes	Preferred Alternative
Dam Rehabilitation	Future With Project - Federal assistance to rehabilitate the dam to meet current safety and performance standards, continue water supply, maintain recreational use, maintain existing top of dam crest, and maintain existing flood control to downstream properties. Install Roller Compacted Concrete (RCC) stepped spillway with ogee weir, and install an 800-foot-long earthen berm across the existing auxiliary spillway. The storage below the principal spillway is more than the designed condition. The Sponsors decided to reallocate the water supply storage from 1,000 acre-feet to 1,486 acre-feet.	$12.0	No	Due to added cost and exorbitant disruptions to the community, this alternative was eliminated from further study.
Dam Rehabilitation	Future With Project - Federal assistance to rehabilitate the dam to meet current safety and performance standards, continue water supply, maintain recreational use, and maintain existing flood control to downstream properties. Raise the crest of the dam by 1.8' with a parapet wall, armor the spillway with combination of vertical cutoff located 80-ft downstream of the crest and install articulated concrete blocks (ACBs)	$13.4	No	Due to exorbitant costs to obtain additional floodpool easements, this alternative was eliminated from further study.

Preferred Alternative

In order to meet current safety and performance standards, maintain water supply, maintain recreational use, maintain existing top of dam crest, and maintain flood control to downstream properties, a structural spillway was selected to rehabilitate the dam. Schnabel Engineering performed the preliminary engineering analysis to install a labyrinth weir and concrete chute to meet the objectives of the project (Document A). This alternative includes the following:

1) Install a 198-foot-long, 6-cycle structural concrete labyrinth spillway over the embankment,
2) Install a SAF stilling basin and riprap outlet protection, and
3) Install an 800-foot-long earthen berm in existing auxiliary spillway.
4) Upgrades to the water intake system.

The proposed alternative calls for eliminating the vegetative earth auxiliary spillway from the project. To eliminate the function of the spillway, a berm will be constructed across the existing auxiliary spillway channel with an elevation the same as the crest of the dam. This berm would have a minimum 12 foot crest width with 3H:1V side slopes. The average height of the berm would be approximately twelve feet. This berm will be designed to meet the same NRCS standards for a typical dam. Maps of the conceptual plan and profile are shown in Document A.

Based on the conceptual drawing developed as part of this planning effort, it is estimated that there will be 62,000 cubic yards of excavation required for the proposed labyrinth spillway and stilling basin. Of this quantity, it is expected that at least 18,000 cubic yards will be required for the construction of the earthen berm across the auxiliary spillway. The remainder of the excavated soils will be wasted within the current limits of the auxiliary spillway and the downstream slope of the dam.

In order to maintain the existing flood protection, the principal spillway will not be rehabilitated. This means that the principal spillway is not adequate to empty the flood pool within 10 days. The intent of the 10-day principal spillway drawdown and hydrograph criteria is to minimize the frequency that an earthen/vegetated auxiliary spillway is activated. The proposed rehabilitation alternative is to install a structural spillway that will maintain existing elevations and reservoir storage. A structural auxiliary spillway can be operated more frequently than a vegetated auxiliary spillway. This approach is acceptable under the new, draft TR-60 criteria (June 2016). For final design, the new criteria will be employed or a variance to the 10-day drawdown criteria will be requested.

Modes of Failure and Breach Study

The potential impacts to downstream structures and people due to an instantaneous breach of the dam were evaluated to assist the economist with benefit estimates and to verify the hazard class of high. The Sponsors have current break inundation zone maps for the dam that complies with the Virginia Impounding Structures Law and Regulations for high hazard dams. The Virginia Impounding Structures Regulations requires owners of high hazard dams to provide a dam breach inundation zone map with multiple zones represented to determine hazard classification and develop the Emergency Action Plan (EAP). The spillway design flood for High Hazard dams is the PMF, consistent with NRCS Freeboard Hydrograph criteria. The zones for a High Hazard dam include:

- a sunny day dam failure using the volume at the auxiliary spillway crest;
- a spillway design flood (PMF) without a dam failure; and
- a dam failure during the spillway design flood (PMF).

The breach inundation report and maps are sealed by a Virginia professional engineer and are provided in Document G.

The breach inundation zone analysis and maps were approved by the Virginia Division of Dam Safety in 2010. The Sponsors provided the hydrologic and hydraulic models to NRCS. The models and hydraulic data are consistent with NRCS policies and procedures for water surface modeling.

The current Sponsor breach inundation zones and maps were used to identify the population at risk and the impacted structures. All of the structures in the potential breach impact zone of Lake Pelham were identified using GIS information provided by the Town and Culpeper County. This was determined by overlaying the sunny day breach inundation zone and the Sponsor real estate data. This data includes current land ownership and description of associated improvements. This data includes single family dwellings, multiple family dwellings, businesses, commercial developments, recreational areas, and government infrastructure (roads, water supply, and water treatment).

A risk evaluation of the existing structure was completed by NRCS in 2013 using the current Sponsor breach inundation study and maps (Document G, The Timmons Group, 2010). The risk assessment shows that the dam has a potential to fail through hydrologic (overtopping) and static (piping) modes. There is a high risk of lifeline and municipal services (sanitary and drinking water) disruption, if not complete collapse. Within the sunny day breach inundation zone, the population at risk is 3,992.

The table below describes the estimated population at risk per structure type, the number of structures in the sunny day breach inundation zone and the estimated damages expected to occur in such an event.

Structure Class	PAR (population at risk)	No. of Structures in the Sunny Day Breach inundation zone	Estimated Total Damages from a Sunny Day Breach (structure and content damages)
Single family dwellings	2,803	691	$71,405,000
Multi-family dwellings	68	34	$7,974,000
Townhouses	450	149	$11,705,000
Condominiums	26	13	$1,000,000
Commercial/Industrial bldgs.	576	80	$23,230,000
Religious organization bldgs.	12	6	$13,127,000
Charitable organization blgs.	8	4	$1,077,000
Educational buildings	25	1	$17,775,000
Local government buildings	24	6	$5,610,000
Total No. of Impacted Blds.:	3,992	984	$152,903,000

The summary of the risk assessment is located in Document E.

SUMMARY OF DATA SOURCES FOR PLANNING ENGINEERING

Land Cover - NLCD 2011

The land cover was derived from the "National Land Cover Dataset" Circa 2011. This layer was extracted from the Virginia NLCD dataset using the Sub-Watershed Boundaries for Mountain Run 11 and Mountain Run 50. The National Land Cover Database (NLCD) serves as the definitive Landsat-based, 30-meter resolution, land cover database for the Nation. NLCD provides spatial reference and descriptive data for characteristics of the land surface such as thematic class (for example, urban, agriculture, and forest), percent impervious surface, and percent tree canopy cover. All NLCD data products are available for download at no charge to the public from the MRLC Web site: http://www.mrlc.gov.

Land Use Information

Future Land Cover was developed by overlaying Map 12.3 contained in the Future Land Use Plan from the Culpeper County Comprehensive Plan, adopted September 1, 2015. The existing land cover was used for any land shown on the Future Land Use Plan to be in conservation/parks/open space, agricultural or rural land use. The existing land use was also used for any land already in an urban land use such as residential or commercial. The land use shown as developed on the Future Land Use Map was used for any land currently in open space, pasture, or woods. More detailed information is contained in the Report entitled *Preliminary Engineering and Planning Study, Mountain Run Watershed Dam No. 50*, December 28, 2015 by Schnabel Engineering.

SSURGO Soils

This product was used to derive the Prime Farmland and Hydrologic Groups in the Mountain Run Dam Studies. SSURGO datasets consist of map data, tabular data, and information about how the maps and tables were created. The extent of a SSURGO dataset is a soil survey area, which may consist of a single county, multiple counties, or parts of multiple counties. SSURGO map data can be viewed in the Web Soil Survey or downloaded in ESRI® Shapefile format. The coordinate systems are Geographic. Attribute data can be downloaded in text format that can be imported into a Microsoft® Access® database. A more detailed description can be found at this URL- http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/survey/geo/?cid=nrcs142p2_053627

Prime Farmland

The Prime Farmland layers was derived from the USDA NRCS - SSURGO data for Culpeper County, Virginia. The NRCS Soil Data Viewer version 6.2 was used, with ArcGIS 10.2. The attributes selected for this layer is under Farmland Classification. Farmland classification identifies map units as prime farmland, farmland of statewide importance, farmland of local importance, or unique farmland. It identifies the location and extent of the soils that are best suited to food, feed, fiber, forage, and oilseed crops. NRCS policy and procedures on prime and unique farmlands are published in the "Federal Register," Vol. 43, No. 21, January 31, 1978.

Hydrologic Soil Groups

This layer was derived from the USDA NRCS - SSURGO data for Culpeper County, Virginia. The NRCS Soil Data Viewer version 6.2 was used, with ArcGIS 10.2. The attributes selected for this layer is under “Soil Qualities and Features” – Hydrologic Soil Groups. Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

National Hydrography Dataset (USGS)

This layer was used in the Mountain Run 50 dam rehabilitation study to depict Streams and Water Bodies. The National Hydrography Dataset (NHD) and Watershed Boundary Dataset (WBD) are used to portray surface water on The National Map. The NHD represents the drainage network with features such as rivers, streams, canals, lakes, ponds, coastline, dams, and stream gages.

FEMA – FIRM

The Flood Insurance Rate Map is used to depict the base flood, 100-yr floodplain zone in the Mountain Run Dam Studies. The FIRMETTES for Lake Pelham are included in Appendix C. In Virginia, the localities are the zoning authorities. For the streams below Mountain Run Dam, both Culpeper County and the Town of Culpeper are the regulatory authorities for the base flood. The base flood depicted on all maps are FEMA Zone AE and Zone A. For the preferred rehabilitation alternative, the base flood will not change in the downstream channels.

Sub-Watershed Boundaries

These Boundaries were derived by using the LiDAR Bare Earth Digital Elevation Model, and Hydrologic Analysis in ArcGIS 10.2 Spatial Analyst Tool.

LiDAR – Digital Elevation

This data was used to create the sub-watershed boundaries for Mountain Run 50 in Culpeper, Virginia. The data consist of highly detailed elevation information collected circa 2013. This consisted of numerous tiles of information that were mosaicked into a seamless coverage for the study area. LIDAR, which stands for Light Detection and Ranging, is a remote sensing method that uses light in the form of a pulsed laser to measure ranges (variable distances) to the Earth. These light pulses—combined with other data recorded by the airborne system— generate precise, three-dimensional information about the shape of the Earth and its surface characteristics. The LiDAR data used for the Mountain Run 50 plan was Quality Level 2 data. The QL2 data has a resolution accuracy level that uses a nominal pulse spacing of 0.7 meters and a vertical accuracy of 9.25 centimeters. The project was overseen and contracted by the U.S. Geological Survey.

SOCIAL AND ECONOMIC CONDITIONS

Economic Analysis

The NRCS National Watershed Manual was used as a reference for the economic analysis along with two economic analysis guidance documents: "Principles and Guidelines for Water and Land Related Resources Implementation Studies (P&G), December, 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 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 carry out water and related land resource implementation studies. The basic objective of P&G is to determine whether or not benefits from project actions exceed project costs. P&G also allows for abbreviated procedures to be used (section 1.7.2 (a) (4) (ii)), when more detailed analysis will not alter identification of the recommended National Economic Development alternative. In this case, the future without federal project and the future with federal project involve the same least-cost alternative with comparable scope, effects, benefits and costs. No net change in benefits occurs when comparing the two candidate plans to each other.

Per use of abbreviated procedures allowed by P&G and NRCS policy, avoidance of the local cost is claimed as the benefits of the federally-led dam rehabilitation. The federally assisted alternative as displayed 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). Thus, although the average annual benefits of rehabilitation are $439,000, net benefits are zero because the total project cost is equal to the claimed benefits and the resulting B/C ratio is 1:1.

Assessed values for all homes and other properties within the breach inundation zone were obtained from local government sources within the watershed and used to estimate damages from

a possible catastrophic breach. Estimated flood damages were based on the results of the hydrology and hydraulics (H&H) simulation modeling indicating that a maximum peak discharge average depth of 9 feet would be experienced outside of the stream channel should a breach event occur. This assumed depth of flood water data was then used with water depth to damage functions developed by the Federal Emergency Management Agency (FEMA) to estimate structural damages. Content values were then estimated as a function of assessed property values. All estimated values and damages were assessed within a customized Excel template prepared for this purpose.

The 50, 75 and 100 year useful lives were evaluated (52, 77 and 102 year periods of analysis including 1 year for design and 1 year for construction). Given policy mentioned above, the no federal action alternative is viewed as local costs avoided and the resulting B/C ratio of the federal action is 1:1 due to the no federal action alternative being materially the same as the federal action alternative. Any added costs accrued to increase the project's expected useful life beyond meeting the minimum 50-year life by definition increase costs. A net present value analysis was conducted comparing the Future With Flood Protection versus Future Without Flood Protection. Added cost to replace the principal spillway riser and components (the trash-rack and valves) were used to assess net benefits for the 75 year project investment. Added costs to replace the entire principal spillway (riser, trash rack, valves, total length of outlet pipe and associated plunge-pool) were used to assess net benefits for the 100 year project life. The federal action with a 52-year period of analysis yielded the highest net benefits.

All costs of installation, operation and maintenance were based on 2015 prices. The costs associated with designing and implementing all structural measures were assumed to be implemented over a two-year installation period (2 years for design/construction) and to have a 50-year useful life. Thus, a 52-year period of analysis was used along with the mandated 3.125% discount rate for all federal water resource projects for FY16 to discount and amortize the anticipated streams of costs and benefits.

NRCS policy regarding minimum land rights for potentially flood-pool impacted areas upstream of the dam require the local Sponsors to acquire an easement for all area below the top of dam, unless the plan explicitly allows for a lower elevation. When a lower elevation for flood-pool easement acquisition is supported, this elevation can never be set below the 100 year storm event flood level nor below the crest of the auxiliary spillway elevation whichever is higher. Prior to construction of Mountain Run Site 50 in 1972, the local Sponsors acquired easements for the flood-pool. The easements were based upon an elevation thought at the time to equate to 3ft. above the crest of the auxiliary spillway. NAVD 88 datum now indicates the easements are actually set at 2.5 ft. above the crest of the auxiliary spillway. SCS policy in that time permitted acquisition of easements for the flood-pool above the dam as low as the crest of the auxiliary spillway. In addition, the county has current construction setback requirements that prohibit construction of inhabitable buildings within 200 ft. of the normal pool of the MR50 reservoir. Depending upon the topography, this added local restriction limits building within the area below the top of dam. In other areas of the above dam topography the existing flood-pool easement is more restrictive than the 200 ft. setback.

Planning principles were used to conduct an analysis of the potential cost of meeting current top of dam easement policy. The difference between the existing flood-pool easement elevation (393.3 ft.) and the elevation of the flood-pool associated with a PMP event (400.8 ft. as compared to the top of dam elevation of 402.2 ft.) was used to estimate potential structure and content

damages to hypothetical properties assuming this area was completely built-out with single family residences (a worst possible case scenario). A set of assumptions were used to estimate: 1) the cost of an easement for the added 225 acres of land (easement encumbrance cost and legal fees); 2) the value of residences and associated contents for an assumed built-out scenario based upon 0.2 acre parcels and 1,120 parcels; and 3) estimated damages from a PMP event based upon 7.5 foot flood depth assuming all 1,120 parcels were developed with points of water entry at the 393.3 elevation. The associated average annual damages for a PMP event (10,000 year worst case scenario event) were estimated to be $23,600. The estimated average annual cost for acquiring additional easements to the top of dam, excluding administrative costs (legal and deed restriction recording fees) and potential payments for private takings, were estimated to be $504,000. The resulting benefit/cost ratio comparing average annual cost of PMP damages vs. average annual cost of the easements (mathematically: the cost of the potential damages/cost of avoiding the potential damages) came out to 0.05:1; an extremely low B/C ratio. A more complete analysis would take into account multiple storm events and associated risk, but was deemed unnecessary.

The local Sponsors unequivocally prefer to live with the existing easement and its associated risk for potential damages. The local Sponsors accepted and have lived for almost 45 years with the existing easement and its associated potential for risk of flood damages. The auxiliary spillway has not to date experienced a flood flow and the local Sponsors have determined that acquisition of additional easement area to meet current NRCS policy to the top of dam would require a significant added cost, including likely lawsuits and potential compensation for private takings. They feel that such added costs, for storm event eventualities with very low probabilities of occurrence, are not worth making and indeed such actions would not be feasible socially, including politically, nor legally without significant cost/budget better used for other local needs. The existing easement set at 2.5 ft. above the crest of the auxiliary spillway provides protection up to 0.42 of the Probable Maximum Precipitation (PMP) event which is greater protection than for the 1,000 year storm event (2 ft. above the crest). The Sponsors opted to not acquire the added easement given the risk/cost comparison, i.e., relatively high current cost of potential damage avoidance in view of a very low risk/low probability of occurrence of storm events greater than the existing 0.42 of a PMP level of protection.

Recreational activities around and on the reservoir will be impacted during construction, but are expected to return to before construction levels once the rehabilitation is completed. No new investments in recreational facilities are planned and recreation benefits are not claimed as a part of project benefits. Therefore, incidental recreation occurring as part of the site is expected to continue, but was not evaluated and no recreation benefits are included in the economics tables. Since recreation is not a planned purpose for this project, all costs for incidental recreation will be paid with non-federal funds.

The level of boating and fishing permits issued annually were assessed simply as part of evaluation of the decommissioning alternative. Boat permits were an estimated 317 for 2015 with revenue of almost $4,650 for the year. Fishing permits were an estimated 560 issued for 2015 with revenue of $8,880 for the year.

ENVIRONMENTAL CONDITIONS

Threatened and Endangered Species

NRCS staff first consulted informally with the USFWS in January 2013 thru their online Information for Planning and Conservation (IPaC) system. At that time, the only T&E species reported was the Dwarf wedgemussel (*Alasmidonta heterodon*) was potentially in Mountain Run downstream of Mountain Run Dam No. 50. In the summer of 2015, NRCS contracted with an approved USFWS surveyor to survey 800 meters downstream of Mountain Run Dam No. 50 per USFWS protocol. In August 2015, the final report for the survey was submitted to NRCS. The report indicated that after a thorough survey for the Dwarf wedgemussel, none were found (report is available in the administrative record).

In November 2015, NRCS began informal consultation with the USFWS thru the IPaC system. At that time the only T&E species in the proposed project area was the Northern long-eared bat (*Myotis septentrionalis*). Furthermore, no longer was the Dwarf wedgemussel listed as potentially in the vicinity of the proposed project and no designated or proposed federally designated Critical Habitat for any species was identified.

According to USFWS species range maps, all of Virginia is within the range of the Northern long-eared bat. However, no known Northern long-eared bat hibernacula or maternity roost trees have been designated or recorded within ¼ mile of the project area. As stated in the USFWS Final 4(d) Rule, published February 16, 2016, of the Endangered Species Act of 1973, as amended, on the Northern long-eared bat, since no known maternity roost trees or hibernacula have been designated within a ¼ mile of the proposed project, any incidental take that may result from the project is exempted by the 4(d) rule and no further action is necessary to comply with the Endangered Species Act prohibitions to protect Northern long-eared bats. In addition, no trees will be removed as a result of project implementation. Finally, NRCS concludes that the proposed project will have "no effect" on any federally listed or proposed species or their designated or proposed critical habitat. Likewise, primarily because there are no sensitive species or habitat present, and there will be no trees removed during implementation, the project will have no impact to any other identified sensitive species. Supporting consultation information and data can be found in the administrative record.

Cultural Resources, Natural and Scenic Areas, and Visual Resources

NRCS cultural resources staff completed database searches for any known cultural resources and ground surveyed the project area for evidence of archaeological and/or historical resources that had the potential to be impacted. A pedestrian survey was conducted throughout the entire project area in February 2015. No cultural resources were found in the areas of potential new disturbance associated with rehabilitation measures at Mountain Run No. 50, and overall there appears to be low potential for intact subsurface cultural deposits in these areas. A search of the Virginia Department of Historic Resources' Archeological and Architectural Sites database in November 2015, did not reveal any recorded archeological or historic sites in the vicinity of the proposed project. Consultation with the Virginia Department of Historic Resources (VDHR) was initiated in November 2015 by NRCS thru their online Electronic Project Information Exchange (ePIX) website pertaining to the proposed Lake Pelham Dam rehabilitation project. On December 18,

2015, the VDHR indicated their finding of "*no historic properties affected"* for the proposed Lake Pelham dam project and indicated no additional studies or consultation would be necessary (documentation is available in the administrative record).

A search of the Native American Consultation Database (NACD) was conducted in November 2015 to determine if there were any Indian tribes that might list consultation contacts, attach religious or cultural significance to historic properties that could be located in the proposed project area. An additional search of the Tribal Directory Assessment Tool (TDAT) v2.0 was conducted in November 2015 to determine if there were any Indian tribes that might list consultation contacts, attach religious or cultural significance to historic properties that could be located in the proposed project area. This was done in accordance with 36 CFR 800.2 (c)(i) of the Advisory Council on Historic Preservation Regulations. Neither database identified any tribes to have a claimed interest or consultation contact in Culpeper County, Virginia (National Park Service 2015) (Housing and Urban Development 2015).

The NRCS has determined pursuant to 36 CFR 800.4(d) that there are no properties included in or eligible for the National Register of Historic Places within the area of potential effect of the alternative resulting in rehabilitation of Mountain Run No. 50. This determination was reported to the SHPO in November 2015 for review and concurrence, and the SHPO concurred in the determinations on December 18, 2015 (both letters are available in the administrative record).

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

Water Quality

Water quality data was taken from the Virginia DEQ 2014 305(b)/303(d) Integrated Water Quality Assessment and Impaired Waters Report.

Wetlands

A wetland investigation for Lake Pelham was completed during the growing season of 2015. Prior to conducting fieldwork, an off-site evaluation was completed. NRCS consulted the Culpeper West USGS 7.5 minute Topographical Quadrangle Map, the National Wetlands Inventory Interactive Mapper (NWI) website administered by the USFWS, and soil survey information provided by NRCS. The USGS quad map shows a moderately sloping site within the floodplain of Mountain Run. The NWI mapping depicts the 220-acre open water wetland, several acres of freshwater emergent wetlands at the inflow of the lake, and 1 acre of forested wetland immediately downstream of the dam directly adjacent to Mountain Run. No additional wetlands were identified during the on-site investigation. Fieldwork was conducted using methods as outlined in the *1987 Corps of Engineers Wetland Delineation Manual and the Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Eastern Mountains and Piedmont Region (Version 2.0).*

Forest and Wildlife Resources

Information on the forest and wildlife resources was obtained from field surveys and existing information from the Virginia Department of Game and Inland Fisheries and the Virginia Department of Forestry. Field surveys were conducted by NRCS staff during the growing season of 2015.