

DRAFT
MAIN DITCH SUBWATERSHED PLAN
including Watershed Agreement

for Flood Damage Reduction

in the WEST DITCH WATERSHED

(Hydrologic Unit 080202040502)

Stoddard County, Missouri

June 2026



Photo: Erosion on Main Ditch, Conservation Works Joint Venture Partner 11/20/2024

PREPARED BY:

NATURAL RESOURCES CONSERVATION SERVICE
601 BUSINESS LOOP W STE. 250
COLUMBIA, MISSOURI 65203

IN COOPERATION WITH:

CIRCUIT COURT DRAINAGE DISTRICT 37
OF SOUTHEAST MISSOURI (DD37)
6282 COUNTY ROAD 717
DEXTER, MISSOURI 63841

Abstract (Fly Sheet)

Main Ditch Subwatershed Plan for Flood Damage Reduction in the West Ditch Watershed Stoddard County, Missouri 8th Congressional District

LEAD AGENCY: UNITED STATES DEPARTMENT OF AGRICULTURE – NATURAL RESOURCES CONSERVATION SERVICE (NRCS)

COOPERATING AGENCIES: UNITED STATES ARMY CORPS OF ENGINEERS – MEMPHIS DISTRICT

SPONSORING LOCAL ORGANIZATION: CIRCUIT COURT DRAINAGE DISTRICT 37 (DD37)

AUTHORITY: This Subwatershed Plan (Plan) is authorized by the Watershed Protection and Flood Prevention Act of 1954 (Public Law 83-566), as amended (16 U.S.C. Section 1001 et seq.).

ABSTRACT: The Circuit Court Drainage District 37 (DD37) of Missouri requested that a Watershed Plan be prepared for the proposed Flood Damage Reduction Project for the Main Ditch Subwatershed, located within the West Ditch Watershed. The purpose of the proposed Project is to alleviate flooding on agricultural lands and enhance community safety by reducing the frequency, depth, and velocity of flooding. Multiple alternatives were evaluated to maximize benefits and cost-effectiveness, with the preferred solution combining multiple approaches across different segments of the Project. These include vegetative buffers, riprap lining at the toe of slopes, riprap armoring, and the installation of parallel subsurface drains.

COMMENTS: NRCS has completed this Plan in accordance with the National Environmental Policy Act (NEPA) and applicable NRCS policies, guidelines, and standards. Comments and inquiries must be received by *********, 2026. Submit comments and inquiries to the following contact:

Andrew Rackers – NRCS Acting Assistant State Conservationist for Water Resources and
Easements
601 Business Loop W Ste 250, Columbia, MO 65203
573-876-9376
andrew.rackers@usda.gov



Non-Discrimination Statement

In accordance with the Federal civil rights laws 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, 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 <https://www.usda.gov/oascr/how-to-file-a-program-discriminationcomplaint> 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.

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Watershed Agreement

Main Ditch Subwatershed

Watershed Agreement No. 1

between the
Circuit Court Drainage District 37 of Southeast Missouri (DD37)
(Referred to herein as Sponsor)

and the

UNITED STATES DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE
(Referred to herein as NRCS)

Whereas, application has heretofore been made to the Secretary of Agriculture by the Sponsor for assistance in preparing a plan for works of improvement for the Main Ditch Subwatershed, State of Missouri, under the authority of the Watershed Protection and Flood Prevention Act, as amended (16 U.S.C. Sections 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, there has been developed through the cooperative efforts of the Sponsor and NRCS a Subwatershed Project Plan for works of improvement for the Main Ditch Subwatershed, State of Missouri, hereinafter referred to as the Subwatershed Project Plan or Plan, which plan is annexed to and made a part of this agreement;

Now, therefore, in view of the foregoing considerations, the Secretary of Agriculture, through NRCS, and the Sponsor hereby agree on this 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 Plan and including the following:

1. **Term.** The 52 year term of this agreement is for the installation period (2 years) and evaluated life of the Project (50 years) and does not commit NRCS to assistance of any kind beyond the end of the evaluated life.
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 Sponsor 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 Sponsor and NRCS are as shown in the Cost-share Table in Item 5 hereof.

The Sponsor agrees that all land acquired for measures, other than land treatment practices, with financial or credit assistance under this agreement will not be sold or otherwise disposed of for the evaluated life of the Project, except to a public agency which will continue to maintain and operate the development in accordance with the Operation and Maintenance Agreement.

4. **Uniform Relocation Assistance and Real Property Acquisition Policies Act.** The Sponsor 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. Section 4601 et seq. as further implemented through regulations in 49 Code of Federal Regulations (CFR) Part 24 and 7 CFR Part 21) when acquiring real property interests for this federally assisted Project. If the Sponsor is legally unable to comply with the real property acquisition requirements, it agrees that, before any federal financial assistance is furnished, it will provide a statement to that effect, supported by the 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 Subwatershed Work Plan.** The following table shows cost-share percentages and amounts for Plan implementation.

Table W-1. Cost-share for Subwatershed Work Plan

Works of Improvement – Main Ditch	NRCS	Sponsor	Total
Cost Sharable Items			
Structural Measures, Ditch Work (Construction Costs)	\$12,815,900	-	\$12,815,900
Relocation, Replacement in-kind	-	-	-
Relocation, Required Decent, Safe, Sanitary	-	-	-
Sponsor Planning Costs	-	-	-
Sponsor Engineering Costs	-	-	-
Sponsor Project Administration	-	160,200	160,200
Land Rights Acquisition Cost	-	-	-
Subtotal: Cost-Share Costs	\$12,815,900	160,200	\$12,976,100
Cost-Share Percentages	98.77%	1.23%	100.00%
Non Cost-Sharable Items a/			
NRCS Engineering & Project Administration	\$2,403,000	-	\$2,403,000
Natural Resource Rights	-	-	-
Federal, State and Local Permits	-	\$10,000	\$10,000
Relocation, Beyond Required decent, safe, sanitary	-	-	-
Subtotal: Non Cost-Share Costs	\$2,403,000	\$10,000	\$2,413,000
TOTAL			\$15,389,100

a/ If actual Non Cost-Sharable item expenditures vary from these figures, the responsible party will bear the change.

1/ Investigation of the watershed project area indicates that no displacements will be involved under present conditions. However, in the event that displacement becomes necessary at a later date, the cost of relocation assistance and payments will be cost-shared in accordance with the percentages shown.

6. **Land Treatment Agreements.** The Sponsor will obtain agreements from owners of not less than 50 percent of the land above each multiple-purpose and floodwater-retarding structure. These agreements must provide that the owners will carry out farm or ranch conservation plans on their land. The Sponsor will ensure that 50 percent of the land upstream of any retention reservoir site is adequately protected before construction of the dam. The Sponsor will provide assistance to landowners and operators to ensure the installation of the land treatment measures shown in the watershed project plan. The Sponsor will encourage landowners and operators to continue to operate and maintain the land treatment measures after the long-term contracts expire, for the protection and improvement of the watershed.
7. **Floodplain Management.** Before construction of any project for flood damage reduction, the Sponsor must agree to participate in and comply with applicable federal floodplain management and flood insurance programs. The Sponsor is required to have development controls in place below low and significant hazard dams prior to NRCS or the Sponsor entering into a construction contract.
8. **Water and Mineral Rights.** The Sponsor 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.
9. **Permits.** The Sponsor 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, except where project activities are categorically exempt under Section 404(f)(1)(C) of the Clean Water Act for the maintenance of currently serviceable drainage ditches.
10. **NRCS Assistance.** This agreement is not a fund-obligating document. Financial and other assistance to be furnished by NRCS in carrying out the 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 Sponsor 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 deauthorize or terminate funding at any time it determines that the Sponsor has 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 Sponsor in writing of the determination and the reasons for the deauthorization of project funding, together with the effective date. Payments made to the Sponsor or recoveries by NRCS must be in accordance with the legal rights and liabilities of the parties when project funding has been deauthorized. An amendment to incorporate changes affecting a specific measure may be

made by mutual agreement between NRCS and the Sponsor 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 Sponsor 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 Operation & Maintenance (O&M) Agreement. An O&M Agreement (52 years) will be entered into before federal funds are obligated and will include the project life (50 years). Although the Sponsor'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 Sponsor 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 Sponsor must prepare an Emergency Action Plan (EAP) for each dam or similar structure where failure may cause loss of life or as required by state and local regulations. The EAP must meet the minimum content specified in the NRCS Title 180, National Operation and Maintenance Manual (NOMM), Part 500, Subpart F, Section 500.52, and meet applicable state agency dam safety requirements. NRCS will determine that an EAP is prepared prior to the execution of fund obligating documents for construction of the structure. EAPs must be reviewed and updated by the Sponsor annually.
16. **Nondiscrimination Provisions.** In accordance with federal civil rights laws 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, 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, audiotope, 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.

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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.

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

- 17. Certification Regarding Drug-Free Workplace Requirements (7 CFR Part 3021).** By signing this watershed agreement, the Sponsor is providing the certification set out below. If it is later determined that the Sponsor 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 subrecipients or subcontractors in covered workplaces).

Certification:

A. The Sponsor certifies 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 violations 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 10 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 numbers 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 employee 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 a 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 Sponsor may provide a list of the sites 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) (for projects > \$100,000).

A. The Sponsor certifies 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 Sponsor, 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 Sponsor must require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients 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 U.S. Code, Title 31, Section 1352. 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 Sponsor certifies 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 3-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 3-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 (☒) listed by the U.S. Environmental Protection Agency (USEPA) as a violating facility, as identified through USEPA's Enforcement and Compliance History Online (ECHO) system or equivalent compliance determination mechanisms.
 - (2) To promptly notify the NRCS-State administrative officer prior to the signing of this agreement by NRCS, of the receipt of any communication from the Director, Office of Federal Activities, USEPA, indicating that any facility which is proposed for use under this agreement has been identified as being in Significant Noncompliance or High Priority Violation status, or is otherwise subject to formal federal enforcement action under the Clean Air Act or Clean Water Act.
 - (3) To include substantially this certification, including this subparagraph, in every nonexempt sub-agreement.
- B. The project sponsoring organization signatory to this agreement agrees 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 thereunder 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 by the EPA as violating applicable Clean Air Act or Clean Water Act requirements, as identified through EPA's ECHO system, on the date when this agreement is signed by NRCS, unless and until EPA determines that such facility has returned to compliance.
- (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 sub-agreement.

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 USEPA 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 sub-agreement. 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, USEPA, determines that independent facilities are collocated in one geographical area.

21. **Assurances and Compliance.** As a condition of the grant or cooperative agreement, the Sponsor assures and certifies that it is 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 Nos. A-87, A-102, A-129, and A-133; and 7 CFR Parts 3015, 3016, 3017, 3018, 3021, and 3052.

Nonprofit Organizations, Hospitals, Institutions of Higher Learning: OMB Circular Nos. 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 Sponsor 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 (3) years after completion of the terms of this agreement, in accordance with the applicable OMB Circulars.

23. **Signatures.**

CIRCUIT COURT DRAINAGE DISTRICT 37 OF SOUTHEAST MISSOURI

The signing of this Plan was authorized by a resolution by the Circuit Court Drainage District 37 governing body and adopted at an official meeting held on

_____, 2026 in Dexter, Missouri.

By:

Date: _____

Mr. Tim Mayberry
President – Drainage District 37
6282 CO Rd 717
Dexter, MO 63841

USDA-NATURAL RESOURCES CONSERVATION SERVICE

Approved by:

Date: _____

Nate Goodrich, Acting State Conservationist
Natural Resources Conservation Service
601 Business Loop W Ste. 250
Columbia, MO 65203



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Acronyms and Abbreviations

ac	Acre(s)
ACS	American Community Survey
AJD	Approved Jurisdictional Determination
APE	Area of Potential Effects
BCR	Benefit/Cost Ratio
BCA	Benefit/Cost Analysis
BGEPA	Bald and Golden Eagle Protection Act
BMP	Best Management Practice
BRPEDC	Bootheel Regional Planning and Economic Development Commission
BSTEM	Bank Stability and Toe Erosion Model
CAA	Clean Air Act
CFR	Code of Federal Regulations
CEQ	Council on Environmental Quality
COA	Conservation Opportunity Areas
CWA	Clean Water Act
DD37	Drainage District 37
EA	Environmental Assessment
ESA	Endangered Species Act
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
FWOFI	Future Without Federal Investment
GIS	Geographic Information System
HUC	Hydrologic Unit Code
IPaC	Information for Planning and Consultation
MBTA	Migratory Bird Treaty Act
mi	Mile(s)
MLRA	Major Land Resource Area
MDA	Missouri Department of Agriculture
MDC	Missouri Department of Conservation
MDNR	Missouri Department of Natural Resources
MSL	Mean Sea Level
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NHRR	Natural Heritage Review Report
NLCD	National Land Cover Database
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NWI	National Wetlands Inventory
NWPM	National Watershed Program Manual
OHWM	Ordinary High-Water Mark
O&M	Operation and Maintenance
PIFR	Preliminary Investigation Feasibility Report
PL	Public Law
PL 83-566	Watershed Protection and Flood Prevention Act



Table of Contents

Plan	Watershed Plan
PR&G	Principles, Requirements and Guidelines for Water and Land Related Resources
	Implementation Studies
ROW	Right-of-Way
SHPO	State Historic Preservation Office
SLO	Sponsoring Local Organization
T&E	Threatened and Endangered
TMDL	Total Maximum Daily Load
USACE	U.S. Army Corps of Engineers
USC	United States Code
USCB	U.S. Census Bureau
USDA	U.S. Department of Agriculture
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WEI	Wind Erodibility Index
WFPO	Watershed and Flood Prevention Operations
WOTUS	Waters of the U.S.

Summary (OMB Fact Sheet)

**Main Ditch Subwatershed Plan
For Flood Damage Reduction
West Ditch Watershed
Stoddard County, Missouri
8th Congressional District**

Authorization:

This Watershed Plan (Plan) is authorized by the Watershed Protection and Flood Prevention Act of 1954 (PL 83-566), as amended (16 U.S.C. Section 1001 et seq.).

Sponsoring Local Organization (SLO)

Circuit Court Drainage District 37 of Southeast Missouri.

Proposed Action

This Proposed Action (Project) involves flood damage reduction measures aimed at better protecting the Subwatershed from flood damage and soil erosion. This would be achieved by removing accumulated sediment to restore the drainage system's capacity to its original design, stabilizing banks, and implementing native vegetation for multiple benefits, including safeguarding landowners' property, reducing safety risks, and preserving farmland. Additionally, the Project would include development of a comprehensive plan to manage runoff and drainage for the benefit of local landowners, farmers, and communities.

Purpose and Need for Action

The purpose of the Proposed Action is to implement targeted measures along the Main Ditch and associated laterals (Project Area) in the Subwatershed to provide flood damage reduction measures for agricultural lands, community infrastructure, and downstream areas. These measures are designed to minimize damage from erosion, flooding, and sediment accumulation.

Preferred Alternative

The preferred alternative for the Main Ditch Subwatershed uses targeted improvements to stabilize drainage ditches, reduce erosion, and improve floodwater movement in areas with the greatest need. In high and medium priority reaches, ditch banks would be reshaped and protected with riprap at the toe of slope and at crossings where erosion threatens bank stability, roadways, or utilities. Existing surface and subsurface drainage outlets would be armored to reduce localized scour, and grade stabilization structures would be installed where differences in elevation are causing active erosion. Parallel subsurface drains would be added in persistently wet areas to relieve groundwater pressure and improve bank stability. Native vegetation would be reestablished on regraded banks to provide long-term stabilization with lower maintenance requirements. Together, these measures are expected to reduce sediment buildup, improve drainage performance, protect adjacent farmland, and lower long-term maintenance costs while meeting the Project's flood damage reduction purpose.

Project Setting

The context of the Project is summarized in **Table S-1** and described below in terms of climate, topography, land use, and resource concerns. Some attributes are characterized at different scales than others, based on whether data are available and relevant for the Project Area and/or for the overall Subwatershed.

Table S-1. Resource Information

Approximate Location	Stoddard County, Missouri
Latitude and Longitude	36.7083, -89.9558
Hydrologic Unit Code (HUC12)	080202040502
Subwatershed Name	Main Ditch
Subwatershed Size	31,775 acres
Sponsoring Local Organization	Circuit Court Drainage District 37

Land Ownership

Land ownership within the Project Area is predominantly private. As shown in **Table S-2**, approximately 99 percent of the land within the Project Area is privately owned, with less than 1 percent under municipal ownership. No state or federal lands occur within the Project Area.

Table S-2. Land Ownership in the Project Area

Municipal	State	Federal	Private
<1%	0%	0%	99%

Climate and Topography

The climate in southeastern Missouri is generally characterized by hot, humid summers and cool, wet winters. Temperature, precipitation, and snowfall can vary substantially from year to year. The average annual high temperature in southeastern Missouri near the Project Area is 69.6 degrees Fahrenheit (°F), which is greater than the Missouri long-term average of 67.8°F. The average annual low temperature is 50.1°F, which is also greater than the Missouri long-term average of 45.7°F. The coldest average temperatures are in January, and the warmest temperatures are in July. Stoddard County's average annual total precipitation is 56.6 inches (in) (NOAA 2025).

The average growing season lasts approximately 230 days. Major cyclonic storms occur from April to June, causing regional flooding. Short-duration, intense storms occurring during the growing season are known to cause localized flooding.

The topography of the Subwatershed is characteristic of the broader HUC10 watershed, and southeastern Missouri, consisting of rolling uplands and broad floodplains. Elevation in the Project Area ranges from approximately 275 feet (ft) to 300-ft.

Land Use

Within the Subwatershed, the dominant National Land Cover Dataset (NLCD) cover type is cultivated cropland (70 percent at 22,172 acres [ac]) and is expected to continue as agricultural use. Other cover types include forestland (11 percent at 3,355-ac) and pasture/hay (4 percent at

1,182-ac). Developed land accounts for approximately 13 percent of the Subwatershed, primarily within the communities of Bernie and Dexter (USGS 2021).

Because agriculture and rural land uses dominate the Subwatershed, the Project meets PL 83-566 eligibility requirements that agriculture and rural communities account for at least 20 percent of total project benefits.

The proposed Project Area is predominantly agricultural, with over 89 percent classified as cultivated cropland (348-ac) based on NLCD land cover (USGS 2021). The Project Area consists of ditch and levee banks, with a small buffer of land from the top of the bank that slopes outward. Scattered trees and small forest stands exist along the Project corridor, but areas are generally outside of the maintained riparian corridor.

Population, Demographics & Civil Rights

According to the U.S. Census Bureau (USCB) American Community Survey (ACS), completed in 2023, Stoddard County has an estimated population of approximately 28,400 residents. Agricultural land uses, including cultivated cropland and pasture/hay, account for more than 74 percent of land use within the watershed and contribute substantially to the local economy. In 2021, agriculture, agri-food, forestry, and related industries accounted for approximately 49.6 percent of jobs and 43.7 percent of household income within the county's watershed area (MDA 2021).

Based on 2023 ACS estimates, the median household income is approximately \$51,700, with 16.5 percent of households below the poverty level and 17.6 percent of the population has less than a high school diploma. By comparison, the median household income for Missouri is \$61,043, with 12.6 percent of households below the poverty level and 8.4 percent of the population having less than a high school diploma (USCB 2023a-c,f,i).

Resource Concerns

Resource concerns identified during the scoping process and determined to be relevant to the Project are summarized below. These resource areas were considered in describing the Affected Environment and were used to evaluate the potential environmental impacts of the proposed project alternatives.

- Erosion and sedimentation
- Prime farmland, unique farmland, and farmland of statewide importance
- Floodplain management
- Waters of the U.S. (Streams, Wetlands, Ponds, and Lakes)
- Surface water quality (CWA)
- Surface water quantity
- Groundwater and sole source aquifers
- Air quality (CAA)
- Fish and wildlife habitat and conservation
- Threatened and endangered species
- Migratory Bird Treaty Act and Bald and Golden Eagle Protection Act
- Invasive species
- Riparian areas
- Public health and safety
- Potable water supply
- Historic and cultural resources
- Energy

Mitigation

Mitigation measures are required to avoid or minimize potential impacts to endangered species and migratory birds. These measures include limiting felling of potential roost trees to the inactive period for Indiana and tricolored bats (November 16 through March 31) and conducting construction activities or site preparations outside the primary nesting season for most bird species (May 1 through July 15) (FSA 2020).

Alternatives Considered

The Project team developed and evaluated three (3) categories of alternatives for the Main Ditch Subwatershed: (1) a Future without Federal Investment (FWOFI), (2) a Structural Alternative, and (3) a Nonstructural Alternative. The No Action/FWOFI alternative describes the most likely future condition if the Natural Resources Conservation Service (NRCS) were to take no action. The Structural Alternative (Alternative 2) includes toe-of-slope riprap lining, parallel drainage features, vegetative buffers, and riprap armoring. The Nonstructural Alternative (Alternative 3) would involve easement acquisition of areas that currently experience flooding during the 100-year storm event. Of the three alternatives evaluated, the Structural Alternative (Alternative 2) was identified as the Locally Preferred Alternative. **Table S-3** summarizes the primary alternatives considered for addressing flooding.

Table S-3. Screening Criteria for Completeness, Effectiveness, Efficiency, & Acceptability

Alternative	Completeness ¹	Effectiveness ²	Efficiency ³	Acceptability ⁴	Carried Forward?
Alternative 1 – No Action/FWOFI	Yes	No	No	No	Yes
Alternative 2 – Structural: Grade Stabilization Structures, Bank Protection at Crossings (riprap/bedding), Parallel Drains, Existing Subsurface Drainage Outlet Protection, Vegetative Buffers (<i>Preferred</i>)	Yes	Yes	Yes	Yes	Yes
Alternative 3 – Nonstructural: Landowner Easement Acquisition	Yes	Yes	No	No	Yes

¹ Completeness is the extent to which an alternative provides and accounts for all features, investments, and/or other actions necessary to realize the planned effects, including any necessary actions by others.

² Effectiveness is the extent to which an alternative alleviates the specific problems and achieves the specified opportunities.

³ Efficiency is the extent to which an alternative alleviates the specific problems and realizes the specific opportunities at least cost.

⁴ Acceptability is the viability and appropriateness of an alternative from the perspective of the Nation's general public and consistency with existing federal laws, authorities, and public policies.

Project Costs and Benefits

This Project benefit/cost analysis (BCA) was completed according to Evaluation of Alternatives and Determination of Preferred Alternative requirements outlined in the Project Statement of Work. All economic benefits and costs are expressed in 2026 dollars and were discounted and amortized to average annual equivalent values using the 2026 federal water resources planning rate of 3.25 percent. Results, including annualized damages for each alternative scenario, are summarized in **Table S-4**. Other potential damages, such as crop losses, may occur; however, these impacts were considered minimal and were not quantified for the purposes of this planning document.

Two categories of damages were evaluated for the Project Area: flood-related damages and sediment-related damages. Flood-related damages were further subdivided into three damage categories: structural damages, roadway damages, and agricultural (cropland) damages.

Flood damage reduction benefits were estimated in accordance with the Principles, Requirements, and Guidelines for Federal Investments in Water Resources (PR&G) and the Natural Resources Conservation Service (NRCS) National Resources Economics Handbook (NREH), Part 611 (NRCS, 2014). Consistent with this guidance, damages were quantified on an expected annual damage (EAD) basis using stage-damage relationships and probability-weighted flood events.

Within the Project Area, flood-related damages were developed for structures, transportation infrastructure (roadways), and agricultural cropland. Structure damages were estimated based on depth-damage relationships applied to the building inventory. Roadway damages were estimated considering roadway overtopping, erosion potential, and repair costs associated with flood events. Agricultural damages were based on crop type, acreage, and associated yield losses.

The procedures and assumptions used to estimate damages for each damage category are described in Appendix D. Results are summarized in **Table S-4**.

Table S-4. Comparison of Alternative Benefits and Costs

Works of Improvement	Average Annual Benefits						Average Annual Costs ^{1,3}	Benefit/Cost Ratio
	Damage Reduction			Restoration to Former Use ^{1,2}	Other Benefits ¹	Total		
	Floodwater ^{1,2}	Sediment ^{1,2}	Indirect ^{1,2}					
Alternative 2a: High Priority	\$397,900	\$329,500	-	-	-	\$727,400	\$649,100	1.1 to 1.0
Alternative 2b: High & Med. Priority	\$415,500	\$386,000	-	-	-	\$801,500	\$805,200	1.0 to 1.0
Alternative 2c: All Priorities	\$539,600	\$604,500	-	-	-	\$1,144,100	\$1,482,000	0.8 to 1.0
Alternative 3: Nonstructural	\$3,955,300	\$0	-	-	-	\$3,955,300	\$7,107,300	0.6 to 1.0

Table S-5 describes the Project's cost estimate, based on 2026 dollars. The BCA indicated that the benefit/cost ratio (BCR) for the preferred alternative (Alternative 2a) is estimated to be 1.1 for the Main Ditch Subwatershed for the proposed project life of 52 years.

Table S-5. Project Alternative Cost Estimates

ITEM	No Action/Future Without Federal Investment ²	Project Alternatives ¹			
		Alternative 2a	Alternative 2b	Alternative 2c	Alternative 3
Total Construction Cost	-	\$12,815,900	\$16,005,500	\$14,778,300	-
NRCS - Construction	-	\$12,815,900	\$16,005,500	\$29,768,100	-
Sponsor - Construction	-	-	-	-	-
NRCS - Easements	-	-	-	-	\$98,106,800
Sponsor - Easements	-	-	-	-	\$32,702,300
Real Property	-				\$37,490,000
NRCS - Project Design, Construction Engineering	-	\$1,922,400	\$2,400,800	\$4,465,200	-
Sponsor - Project Design, Construction Engineering	-	-	-	-	-
NRCS - Project Administration ³	-	\$480,600	\$600,200	\$1,116,300	\$6,311,200
Sponsor - Project Administration ³	-	\$160,200	\$200,100	\$372,100	\$2,103,700
Federal, State and Local Permits	-	\$10,000	\$10,000	\$10,000	-
Total Installation Cost	-	\$15,389,100	\$19,216,600	\$35,731,700	\$176,714,000

¹ Price Base 2026.

² All costs are Average Annual Costs. No installation costs are associated with this alternative.

³ Assumes 75% NRCS /25% Sponsor cost share for floodplain conservation easement (share determined by State Conservationist based on comparison with other federal programs) and project administration.

A comparative cost analysis was completed for alternative plans carried forward for detailed study, which is shown in **Table S-6**.

Table S-6. Main Ditch Subwatershed Restoration Comparative Cost Analysis of Alternative Plans

ITEM	Project Alternative ¹				
	No Action/Future Without Federal Investment ³	Alternative 2a	Alternative 2b	Alternative 2c	Alternative 3
Total Investment	-	\$15,389,100	\$19,216,600	\$35,731,700	\$176,714,000
P.L. 83-566 Funds	-	\$15,218,900	\$19,006,500	\$35,349,600	\$104,418,000
Other Funds	-	\$170,200	\$210,100	\$382,100	\$72,296,000
Average Annual Benefits ²	-	\$727,500	\$801,500	\$1,144,200	\$1,482,000
Average Annual Costs ²	-	\$649,100	\$805,200	\$1,482,000	\$7,107,300
Annual Net Beneficial	-	\$78,400	-\$3,700	-\$337,800	-\$5,625,300
Average Annual O&M Costs	\$20,900	\$32,000	\$34,600	\$49,100	\$20,900

¹ Price Base 2026

² Amortized over 52 years at a discount rate of 3.25 percent. Amortization values on this row include Average Annual O&M Costs presented in last row of table.

³ All costs are Average Annual Costs. No construction costs are associated with this alternative.

Funding Schedule & Cost Sharing

Cost sharing between NRCS and the Sponsor is governed by the provisions of the Watershed Protection and Flood Prevention program. Cost-share requirements for authorized projects are established in *390-USDA-NRCS, National Watershed Program Manual, Part 500, Subpart E*, (April 2014). **Table S-7** summarizes the distribution of funding sources for the total project installation cost. Under the watershed program, federal funds may provide up to 100 percent of construction and engineering costs for works of improvement that address floodwater.

Table S-7. Funds Breakdown for the Preferred Alternative

Works of Improvement	Unit	Number			Estimated Cost (Dollars) ¹		
		Federal Land	Non-Federal Land	Total	PL 83-566 Funds	Other Funds	Total Estimated Costs
Alternative 2a- Structural	lf	-	-	-	\$15,218,900	\$170,200	\$15,389,100

¹ Price Base 2026.

Prepared June 2026.

The works of improvement would be implemented over an estimated two-year period following authorization of federal assistance under the Watershed Protection and Flood Prevention Act (PL 83-566). Final design would begin upon Plan approval and allocation of funds. Construction of the works of improvement would proceed following approval of the final design and funding for the Project. Responsibilities for implementing a site-specific project component would be shared between NRCS and the Sponsor.

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

Project Life: 50 years

Environmental Effects

Table S-8 describes the resource concerns identified during the Project scoping and summarizes the associated potential impacts.

Table S-8. Resource Concerns vs. Preferred Alternative

Resource		Preferred Alternative – Alternative 2	Rating ¹
		Description	
Provisioning Services: Food and Fiber Production			
Soils – Prime and Unique Farmland and Farmland of Statewide Importance	POSITIVE where armored (bank stabilization and seeding) + SLIGHTLY POSITIVE (where previously removed sediment is spread and seeded) + SOMEWHAT NEGATIVE (for areas downstream due to scour from riprap installation, though minimized by existing ditch geometry and proposed riprap installation design).		2+
Regulating Services: Flood Damage Reduction			
Soils – Erosion and Sedimentation	Same as Prime Farmland.		2+
Water – Floodplain Management	POSITIVE where armored (bank stabilization and seeding) + SLIGHTLY POSITIVE (spreading and seeding of previously removed sediment) + SOMEWHAT NEGATIVE (for areas downstream due to scour from riprap installation, though minimized by existing ditch geometry and proposed riprap installation design).		2+
Water – Waters of the U.S. (Streams, Lakes, and Wetlands)	POSITIVE where armored (bank stabilization and seeding) + SLIGHTLY POSITIVE (spreading and seeding of previously removed sediment) + SOMEWHAT NEGATIVE (for areas upstream due to sedimentation and downstream due to scour from riprap installation, though minimized by existing ditch geometry and proposed riprap installation design).		2+

Resource	Preferred Alternative – Alternative 2 Description	Rating ¹
<i>Water – Surface Water Quality (CWA)</i>	POSITIVE where armored (bank stabilization and seeding) + SLIGHTLY POSITIVE (spreading and seeding of previously removed sediment) + SOMEWHAT NEGATIVE (for areas upstream due to sedimentation and increase in nutrient load and downstream due to scour from riprap installation, though minimized by existing ditch geometry and proposed riprap installation design).	2+
<i>Water – Surface Water Quantity</i>	POSITIVE where armored (bank stabilization and seeding) + SOMEWHAT NEGATIVE (for localized upstream and downstream areas due to continued ponding on surrounding lands, though minimized by existing ditch geometry and proposed riprap installation design).	2+
<i>Water – Regional Water Resource Management Plans (RWRMP)</i>	No change to the RWRMP.	0
<i>Water - Groundwater Quality and Sole Source Aquifers</i>	POSITIVE where armored (bank stabilization and seeding) + SOMEWHAT NEGATIVE (for areas upstream and downstream due to increased nutrient loading from ponding on surrounding lands, though minimized by existing ditch geometry and proposed riprap installation design).	2+
<i>Air – Air Quality (CAA) (Counties in the Project Area are not in non-attainment zones for air quality).</i>	POSITIVE long term (decreased wind erosion and less regular maintenance with equipment) + SLIGHTLY NEGATIVE short term (minor due to ditch work and prescribed burning to maintain native vegetation).	2+
<i>Plants and Animals – Fish and Wildlife Habitat and Conservation</i>	POSITIVE for pollinators (where previously removed sediment is spread and seeded with native grasses and forbs) + SOMEWHAT POSITIVE for aquatic species (reduced erosion and sedimentation where armor is installed) + NEGATIVE for riparian species (loss of vegetation-water interface) + SOMEWHAT NEGATIVE (for localized upstream and downstream areas, effects would depend on habitat requirements for individual species. Effects minimized by existing ditch geometry and proposed riprap installation design).	1+
<i>Plants and Animals – Threatened and Endangered (T&E) Species Potential</i>	Same as Fish and Wildlife Habitat and Conservation + POSITIVE (increase in pollinator habitat, including monarch butterfly habitat, as native plantings are established and retaining potential bat roost trees along banks). Potential short-term, minor impacts during duration of bank stabilization and spreading/seeding work would be	2+

Resource	Preferred Alternative – Alternative 2 Description	Rating ¹
to occur: Indiana bat (E) tri-colored bat (proposed E) monarch butterfly (proposed T) Suitable habitat not present: gray bat (E) alligator snapping turtle (proposed T)	mitigated by utilizing proper avoidance/minimization measures for identified T&E species, like conducting work outside of bat active season.	
<i>Plants and Animals –</i> Migratory Bird Treaty Act/Bald and Golden Eagle Protection Act	Same as Fish and Wildlife Habitat and Conservation + POSITIVE (securing trees along banks). Potential short-term, minor impacts during spreading/seeding work would be mitigated by conducting work outside of primary nesting season.	2+
<i>Plants and Animals – Invasive Species</i>	POSITIVE long term where armored (bank stabilization and seeding) + SLIGHTLY POSITIVE long term (where previously removed sediment is spread and seeded with native vegetation) + SLIGHTLY NEGATIVE short term (risk of spreading invasives during spreading/seeding will be minimized by following Best Management Practices (BMPs)). Native plantings, including milkweed, would enhance pollinator habitat and overall ecosystem function, potentially supporting native predator communities.	2+
<i>Plants and Animals –</i> Riparian Areas (RA)	POSITIVE where armored (reduced erosion and sedimentation) + SLIGHTLY POSITIVE (where previously removed sediment is spread and seeded with native vegetation) + NEGATIVE (loss of vegetation-water interface where armored, for areas upstream and downstream due to increase sedimentation and erosion on surrounding lands, though minimized by existing ditch geometry and proposed riprap installation design).	2+
Cultural Services: Recreation		
<i>Plants and Animals – Natural Areas (NA)</i>	NA are not connected to the Project Area and would likely not be impacted.	0
<i>Human Environment –</i> Socioeconomic,	POSITIVE where armored (reduced erosion and sedimentation allowing the drainage system to function more effectively and thus reduce flood risk) + SLIGHTLY NEGATIVE (for areas upstream	3+

Resource	Preferred Alternative – Alternative 2 Description	Rating ¹
Social and Cultural Issues	and downstream due to increased sedimentation and erosion on surrounding lands, though minimized by existing ditch geometry and proposed riprap installation design).	
<i>Human Environment – Recreation</i>	POSITIVE where armored (reduced erosion and sedimentation allowing the drainage system to function more effectively and thus reduce flood risk) + SLIGHTLY NEGATIVE (for areas upstream and downstream due to increase sedimentation and erosion on surrounding lands, though minimized by existing ditch geometry and proposed riprap installation design)	2+
<i>Human Environment – Historic and Cultural Resources (HCR)</i>	No historic properties would be affected. No tribal culturally significant properties were identified.	0
<i>Human Environment – Scenic and Visual Resources</i>	There would be no change from existing conditions.	0
Supporting Services		
<i>Human Environment – Public Health and Safety</i>	Same as Socioeconomic, Social and Cultural Issues.	2+
<i>Human Environment – Potable Water Supply (in the area, this is sourced primarily from groundwater)</i>	Same as Groundwater Quality.	2+
<i>Human Environment – Energy</i>	POSITIVE where armored (less regular use of equipment for bank stabilization and seeding) + SLIGHTLY POSITIVE (where previously removed sediment is spread and seeded, thus requiring maintenance of native vegetation through burning rather than mowing) + SLIGHTLY NEGATIVE Short-term (use of equipment for spreading and seeding, continued use of equipment to maintain ditches).	2+

Resource		Preferred Alternative – Alternative 2	Rating ¹
		Description	
Total Alternative Rating			36+
¹ Ecosystem Service Trade-Off Rating Symbolology for Impact: 0 = Little to no impact; 1+ = minor benefit, long- or short-term; 1- = minor impact, long- or short-term, not requiring mitigation; 2+ = moderate benefit, temporary or permanent duration, benefit not resulting in major benefit; 2- = moderate impact, long- or short-term duration, replaceable or restorable action with mitigation measure; 3+ = major benefit, long-term or permanent duration, improve service enough to change status [e.g. removing waterbody from the 303(d) list of impaired waters]; 3- = major impact with long-term or permanent effect, significantly controversial action, result in loss of life or unmitigable impact, does not meet Federal Objective.			

Major Conclusions

The preferred alternative applies a coordinated set of drainage and bank stabilization measures designed to perform for approximately a 50-year design life. Targeted riprap, channel shaping, grade stabilization, stabilized crossings and protected drain outlets, parallel subsurface drainage, and native vegetative buffers would be used where site conditions warrant to reduce erosion, control sediment, and improve flood conveyance. Together, these measures directly address the Project's Purpose and Need by reducing flood damages to agricultural lands, infrastructure, and downstream areas while improving long-term system reliability. The approach emphasizes durable solutions that lower maintenance demands and sustain agricultural productivity over time.

Areas of Controversy

No areas of controversy were identified.

Issues to be Resolved

No issues to be resolved were identified.

Evidence of Unusual Congressional or Local Interest

No evidence of unusual congressional or local interest was identified.

Compliance Certification

Is this report in compliance with Executive Orders, public laws, and other statutes governing the formulation of water resource projects? Yes(X) No ().

1. INTRODUCTION

Circuit Court Drainage District 37 (DD37), located in southeast Missouri, is proposing a flood damage reduction project in the Main Ditch Subwatershed. This Proposed Action qualifies as a Watershed and Flood Prevention Operations (WFPO) Project under the authority of the Watershed Protection and Flood Prevention Act (Public Law [PL] 83-566).

According to the *Preliminary Investigation Feasibility Report (PIFR) for the Main Ditch Watershed Project*, prepared by the U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) in 2022, DD37 identified the following objectives (NRCS 2022a):

- Enhance protection of prime farmland lost from streambank erosion.
- Reduce erosion and resulting sedimentation from agricultural fields, stream banks, and contributing laterals, all of which reduce hydraulic capacity.
- Improve risk management in agricultural production to achieve appropriate planting and harvesting times and suitable growing conditions.
- Increase land values by improving drainage and reducing flood duration and extent.

1.1. Planning and Assessment Framework

The purposes of this Draft Watershed Plan (Plan), as required by the NRCS *National Watershed Program Manual* (2018) and consistent with the National Environmental Policy Act (NEPA) and other relevant laws, are to:

- Characterize the affected environment by describing and quantifying relevant social, cultural, economic, and environmental conditions;
- Identify and describe all reasonable alternative solutions considered;
- Describe and comparatively assess the environmental impacts of each alternative;
- Evaluate the extent to which each alternative achieves the Project's purpose and need; and
- Describe the arrangements and responsibilities for financing, installation, and operation and maintenance (O&M) of the proposed works of improvement.

This Plan also evaluates the Proposed Action consistent with the Principles, Requirements, and Guidelines (PR&G) for Federal water resource investments (USDA 2017), as required under the Water Resources Development Act of 2007. The PR&G provide a framework for considering economic development, environmental protection, public safety, and watershed-scale outcomes in Federal water resources planning.

Under the PR&G, the Federal Objective specifies that Federal investments in water resources should reflect national priorities and seek to:

- Maximize sustainable economic development;
- Avoid the unwise use of floodplains and flood-prone areas and minimize adverse impacts where such areas must be used; and
- Protect and restore the functions of natural systems and mitigate unavoidable damage.

The PR&G Guiding Principles provide overarching direction for Federal water resources planning. The Federal Objective reflects three Guiding Principles: Sustainable Economic Development, Floodplains, and Healthy and Resilient Ecosystems, and is supplemented by two additional Guiding Principles: Public Safety and Watershed Approach. Additional descriptions of these principles are provided in **Appendix D**.

The General Requirements of the PR&G are intended to promote transparency and informed decision-making by requiring consideration of ecosystem services, use of the best available science, multi-stakeholder collaboration; and identification of uncertainty and risk, including future land use and adaptive management. The General Requirements also emphasize efficient use of water supplies and the formulation and evaluation of alternatives, including nonstructural approaches. These requirements supplement, but do not replace, the procedural and substantive requirements of NEPA and other applicable laws. The NEPA process is integrated with the PR&G framework to support the preparation of a single decision document that satisfies both processes.

Consistent with current federal policy and guidance, Environmental Justice and climate change analyses are not included in this Plan or its appendices.

1.2. Project Background

Drainage District 37 manages a network of drainage ditches constructed in the early 1900s that converted historically flood-prone lands into productive agricultural areas. The Subwatershed supports extensive row-crop production, and Stoddard County ranks among Missouri's leading producers of corn, soybeans, wheat, and cotton (FSA 2024). Portions of the towns of Dexter and Bernie, along with surrounding rural lands, are influenced by the DD37 drainage system.

Ongoing agricultural use and aging drainage infrastructure have increased susceptibility to bank erosion and sediment accumulation, reducing conveyance capacity and increasing flood risk to adjacent farmland. The existing system, now approximately 100 years old, remains critical to the local agricultural economy but requires rehabilitation to maintain functionality and reduce flood damage.

The Proposed Action seeks to improve resilience of aging drainage infrastructure and reduce erosion and flooding impacts within the Main Ditch Subwatershed.

1.3. Project Area

The Main Ditch Subwatershed encompasses approximately 31,775-ac and corresponds to 12-digit Hydrologic Unit Code (HUC12) 080202040502. The Subwatershed is entirely located within Stoddard County, Missouri, and lies within the northern portion of the West Ditch Watershed (HUC10 0802020405). The Subwatershed extends generally from the vicinity of the Holly Ridge Conservation Area downstream through the Main Ditch system (**Appendix B, Figure B-1**).

Within the Subwatershed, the Project Area evaluated in this Plan is limited to approximately 391-ac and corresponds to the locations of proposed improvements along the Main Ditch, Lateral No. 1, Lateral No. 2, and Unnamed Lateral (**Appendix B, Figure B-2**).

2. PURPOSE AND NEED FOR ACTION

2.1. Purpose

The purpose of the Proposed Action is to implement flood damage reduction measures within the Subwatershed to reduce risks to agricultural lands and associated infrastructure, including areas downstream of the watershed. The Proposed Action is intended to address all three general purposes outlined in Section 1 of PL 83-566 by: (1) reducing damage from erosion, floodwater, and sedimentation; (2) furthering the utilization and disposal of water; and (3) furthering the conservation and proper utilization of land. The Proposed Action is intended to benefit local farmers, landowners, and communities within the Subwatershed.

2.1.1. Objectives

Planning objectives reflect the desired outcomes of a watershed planning process and are established through the scoping process, including coordination with agencies, public involvement, and consultation with other stakeholders (see Section 3).

NRCS and the Sponsor seek to fulfill the Project purpose by identifying the most economically, socially, and environmentally acceptable means of achieving the following objectives:

- **Objective 1:** Reduce damage from erosion, floodwater, and sedimentation.
- **Objective 2:** Improve the utilization and conveyance of water within the drainage system.
- **Objective 3:** Promote the conservation and proper utilization of land resources.
- **Objective 4:** Improve the performance and reliability of the existing drainage system to support agricultural production.

2.1.2. Constraints

Constraints are conditions that limit the ability to achieve the Project's objectives or to meet the Federal Objective. These factors may be environmental, economic, social, or cultural in nature. The following constraints were identified for this Project:

- **Constraint 1:** The Project needs to avoid adverse impacts on emergency access and transportation routes.
- **Constraint 2:** The Project needs to avoid adverse impacts to downstream residences and developed areas.
- **Constraint 3:** The Project needs to avoid actions that would degrade agricultural land or result in significant changes to existing land use patterns.

2.2. Need

The Project is needed to address aging drainage infrastructure within the DD37 system, where declining structural integrity and ongoing sediment accumulation have reduced conveyance capacity and increased the risk of overtopping and flooding. These conditions affect agricultural lands and increase flood-related risks to adjacent rural communities.

2.2.1. Problems

Primary resource concerns include soil erosion, sediment accumulation, impaired drainage, and flood-related impacts to agricultural lands and infrastructure. Sediment enters the drainage system

through sheet and rill erosion from adjacent croplands, localized gully formation, and bank erosion associated with historical channelization. Accumulated sediment reduces ditch capacity and contributes to increased flood extent and duration within the Subwatershed.

Soils in the Project Area are generally poorly drained and prone to ponding without effective drainage management, reducing agricultural productivity. Prolonged saturation also destabilizes ditch banks, leading to sloughing and localized failures that further contribute sediment and degrade system performance.

2.2.2. Opportunities

The Sponsor seeks to rehabilitate existing drainage infrastructure and implement targeted improvements within the Project Area to restore system performance and reduce flood-related risks. Funding available under PL 83-566 provides an opportunity to address these concerns at a watershed scale, where localized maintenance activities alone are insufficient to resolve ongoing erosion, sedimentation, and conveyance limitations.

3. SCOPE OF THE ENVIRONMENTAL ASSESSMENT

3.1. Purpose of Scoping and Methods

Scoping was conducted to identify relevant environmental, social, economic, and cultural issues associated with the Proposed Action and to inform development of reasonable alternatives. Issues determined to be relevant are analyzed in subsequent sections of this Plan. Issues considered but determined not to warrant detailed evaluation were eliminated from further analysis, as summarized below.

The Project planning team conducted scoping efforts to identify economic, environmental, cultural, and social issues relevant to the Subwatershed and to the areas of potential effect associated with the Proposed Action. Input from DD37, interested agencies, and local residents was collected and documented through correspondence and public meetings. An interdisciplinary planning team with experts in engineering, hydraulics, biology, economics, resource conservation, water quality, soils, archaeology, and geology identified factors that have the potential to affect soil, water, air, plants and animals, and the human environment.

NRCS distributed stakeholder participation letters to relevant Tribal, federal, state, and local officials to request input on the Project and to announce the Project's first interagency meeting scheduled for August 21, 2024. NRCS held the Project's initial public participation meeting on that date. Public notice of the meeting was published in the *Bernie Banner* and in the *Dexter Statesman*, with each notice published twice. The objectives of the meetings were to discuss the problems and opportunities associated with the Project and to solicit feedback on topics and specific concerns to be investigated during the Plan development.

NRCS subsequently distributed a second round of stakeholder participation letters announcing a second public meeting, held on November XX, 2026. Notice of the public meeting was published twice in the *Standard Democrat*. The purpose of the meeting was to provide details of the flood damage reduction alternatives under consideration and to obtain additional public input.

3.2. Scoping Concerns: Natural Resources and the Human Environment

Table 3-1 summarizes the results of the scoping process for this Project. The table is organized according to the standard NRCS scoping categories, which include soil, water, air, plants and animals, and the human environment. Resource concerns identified in the table as 'Relevant to Project = Yes' are addressed in greater detail in Section 4 (Affected Environment). Concerns identified as 'Relevant to Project = No' were determined not to warrant further analysis and are not discussed further in this Plan.

Table 3-1. Resource and Human Environmental Concerns Identified During Scoping

Concern	Relevant to Project?	Rationale
Soils		
Erosion and Sedimentation	Yes	Sediment accumulates in the drainage network ditches due to sheet and rill erosion, gully erosion, and documented bank

Concern	Relevant to Project?	Rationale
		instability, leading to deposition of sediment in the ditches and areas downstream.
Prime and Unique Farmland and Farmland of Statewide Importance	Yes	Prime and Unique Farmland are more frequently flooded due to sediment-compromised ditch and lateral capacity. This also creates head-cuts into prime and unique farmland and farmland of statewide importance.
Water		
Floodplain Management	Yes	The ditch drainage system in the Project Area is in Federal Emergency Management Agency (FEMA) flood hazard zone A, within the 100-year floodplain. Sediment buildup within the system reduces floodplain effectiveness, thereby reducing the ability to protect nearby farmland and communities from flooding.
Waters of the U.S. (Streams, Lakes, and Wetlands)	Yes	Streams (ditches) are negatively impacted by sedimentation from uplands and ditch banks. Neither wetlands nor open water features (beyond the ditches) were identified in the Project Area.
Surface Water Quality (CWA)	Yes	Surface water quality is affected by erosion and transport of natural and chemically laden sediment, from agricultural practices, into the drainage system. A total maximum daily load (TMDL) for sediment was identified in 2008 by the Missouri Department of Natural Resources (MDNR 2020a) and USEPA in response to Section 303(d).
Surface Water Quantity	Yes	The Project Area is subject to inundated ground surfaces due to increasing flooding concerns.
Groundwater and Sole Source Aquifers	Yes	While groundwater levels remain stable, flooding and prolonged ponding in fields may harm groundwater quality from increasing nutrient and pathogen leaching and infiltration into aquifers. Sole source aquifers were not identified in the watershed.
Regional Water Resource Management Plan	Yes	The state Missouri Water Resources Plan includes information and strategies for the region in which the Project is located.

Concern	Relevant to Project?	Rationale
Wild and Scenic Rivers	No	Wild and scenic rivers were not identified in the watershed (National Wild and Scenic Rivers System 2025).
Coastal Zone Management Areas	No	The watershed is not in a coastal zone management area (NOAA 2005).
Air		
Air Quality (CAA)	Yes	Construction practices can lead to short-term negative effects on air quality.
Plants and Animals		
Fish and Wildlife Habitat and Conservation	Yes	The watershed does not contain Essential Fish Habitat. The potential for fish and wildlife habitat within the Project Area is very limited, as the area is already highly disturbed by ongoing sedimentation and routine maintenance activities.
Threatened and Endangered Species	Yes	Five federal and numerous state-listed species have the potential to occur within the Project Area, according to publicly available data from the U.S. Fish and Wildlife Service (USFWS) and the MDNR.
Migratory Bird Treaty Act/Bald and Golden Eagle Protection Act	Yes	The Project is within the Mississippi Flyway, and migratory birds and bald eagles have been observed in the Project Area.
Invasive Species	Yes	Invasive species have been documented in the Subwatershed.
Natural Areas	Yes	MDNR data indicates one Conservation Area and one Conservation Opportunity Area within the Subwatershed.
Riparian Areas	Yes	Riparian areas along the ditches are minimal and highly disturbed by normal ditch maintenance.
Coral Reefs	No	Coral reefs do not exist in the watershed (USGS 1990).
Human Environment		
Socioeconomic Issues	Yes	Flooding damages agricultural lands and impacts communities socially and economically by disrupting access to essential services and roadways during flood events.
Recreation	Yes	Flooding and drainage conditions may affect seasonal hunting and other recreation activities.
Public Health and Safety	Yes	The current infrastructure is vulnerable to overtopping and flood-related impacts and

Concern	Relevant to Project?	Rationale
		contributes to property damage, disruption of public services, and increased public safety risks. Extended ponding due to inadequate capacity from flood events, and other drainage challenges also lead to mosquito proliferation, increasing the vectors for mosquito-borne illnesses.
Potable Water Supply	Yes	Potable water intake is through groundwater wells; county and private wells may be impacted by pollutants percolating through soil to the aquifer.
Historic and Cultural Resources	Yes	Section 106 of the National Historic Preservation Act (NHPA) requires federal agencies to account for the potential effects of proposed undertakings on historic properties. The potential for historic or cultural resources in the Project Area was evaluated. No archaeological sites or cultural features were documented during the survey. One architectural area (AR-1) was identified within the survey area, but was determined as not eligible for NRHP listing.
Energy	Yes	Energy use is associated with irrigation and drainage pumping within the Subwatershed.
Scenic and Visual Resources	No	Not applicable as the Project Area possesses minimal scenic or visual resource potential as identified during scoping (NRCS 2022a).

3.3. Scoping Concerns: Ecosystem Services

Environmental assessments may be framed using an **ecosystem services** approach, which evaluates how natural resources, such as soil, air, water, plants, and animals, provide benefits to people. An ecosystem services framework simply reframes the assessment by considering: (a) how the combination of resources relevant to a particular environment provides benefits to people; (b) how those benefits will be impacted by a proposed action; and (c) how negative impacts can be avoided, minimized, or mitigated.

Ecosystem services are commonly grouped into four categories, as described by the Millennium Ecosystem Assessment (MEA 2005):

1. **Provisioning** services provide tangible goods that humans use and consume, such as food, fiber, freshwater, fuelwood, and biomass.

2. **Regulating** services maintain a world in which it is possible for people to live, providing critical benefits such as water and disease regulation, water filtration, climate stabilization, and crop pollination.
3. **Cultural** services provide a place where people want to live – recreational use, spiritual values, aesthetic viewsheds, or Tribal values.
4. **Supporting** services refer to the underlying processes that maintain conditions to sustain an ecosystem, including nutrient cycling, soil formation, and primary production.

The Project affects, or may be affected by, ecosystem services in all four categories. Provisioning, regulating, and cultural services are addressed more fully in Section 4 (Affected Environment). Supporting services are not discussed further, as they underpin the other ecosystem service categories and do not present distinct considerations specific to the Project.

Table 3-2 illustrates how the relevant resource concerns identified in **Table 3-1** relate to the three ecosystem service categories carried forward for detailed discussion. Changes in ecosystem services as a result of the Project can be positive or negative.

Table 3-2. Ecosystem Services Concerns in Relation to the Project

Ecosystem Services Category	Ecosystem Services Relevant to the Project	Related Resource Concerns (Table 3-1)
Provisioning		
Food, fiber, and biofuel production occur in the Subwatershed and may be affected by changes in flood management. Freshwater availability is a critical resource for agricultural production, which represents the predominant land use within the Subwatershed and Project Area.		Soil: Food and fiber production depend on suitable farmland, including Prime Farmland and Farmland of Statewide Importance.
		Water: Waters of the U.S., surface water quality, and surface water quantity are all components of freshwater use and management as it relates to food, fiber, and biofuel production.
Regulating		
Water regulation, erosion control, regulation of human diseases, pollination, and biological control are all services addressed by the purpose of the Project – Flood Damage Reduction.		Soil: Erosion and sedimentation contribute to reduced drainage capacity and increased flooding risk.
		Water: Waters of the U.S., surface water quality, surface water quantity, floodplain management, and groundwater are all integral to flood reduction and regional water resource management.
		Plants and Animals: Vegetation influences flood attenuation and erosion control, while flood regimes affect habitat quality. Invasive species may degrade habitat function. Pollinator habitat and riparian areas may also contribute to regulating flood processes.
		Human Environment: Socioeconomic conditions and public health and safety are key considerations in flood reduction planning. Flooding may affect potable water supplies by increasing vulnerability of private wells, and prolonged standing water may increase mosquito-borne disease risks.
Cultural		

Ecosystem Services Category	Ecosystem Services Relevant to the Project	Related Resource Concerns (Table 3-1)
	The Main Ditch and surrounding area provide non-material benefits to the local community, including a sense of place through recreational opportunities, such as hunting and fishing.	Human Environment: Recreation would be affected by the Project. The drainage system's history is likely connected to historic and cultural resources. The State Historic Preservation Office (SHPO) concurred that the proposed Project would result in no adverse effect on historic properties.

4. AFFECTED ENVIRONMENT

4.1. Planning and Evaluation Methods

The Project planning team reviewed geological, engineering, and flood-related reports and conducted engineering analysis, Geographic Information System (GIS) analysis, biological surveys, cultural resource reviews, and economic analyses to characterize existing conditions within the Project Area.

The subsections that follow first describe elements of the Project setting that were not introduced in **Section 3 (Scoping)**. **Section 4.2 (Project Setting)** provides an overview of these elements. Existing conditions for natural resources and the human environment are described in **Section 4.3**, organized in the same order as **Table 3-1**, followed by an evaluation of ecosystem services in **Section 4.4**, organized in the same order as **Table 3-2**.

4.2. Project Setting

4.2.1. Location

The Main Ditch Subwatershed is located entirely within Stoddard County in southeastern Missouri, approximately 24 miles (mi) northwest of the Mississippi River. The Subwatershed extends generally north to south from the vicinity of the Holly Ridge Conservation Area to the Stoddard–Dunklin County line and encompasses portions of the cities of Dexter and Bernie. The Subwatershed ranges from approximately 2 to 5-mi in width (**Appendix C, Figure 1**).

4.2.2. Climate

The region experiences a humid subtropical climate characterized by warm summers, mild winters, and a growing season that typically extends from mid-April through mid-October. Based on 1991–2020 climate normals, average summer temperatures are approximately 77°F, with average highs near 88°F, while winter temperatures average approximately 41°F (NOAA 2025).

Average annual precipitation is approximately 56.6 inches (in), with the majority occurring between May and October. Periodic high-intensity rainfall events contribute to surface runoff, erosion, and flooding within the Subwatershed.

4.2.3. Topography

The Project Area occurs within a relatively flat floodplain landscape drained by engineered, low-sinuosity ditches. Local relief is minimal and primarily defined by levees constructed and maintained along drainage features. Ground elevations generally range from approximately 275 feet (ft) above mean sea level (msl) in downstream reaches to approximately 300-ft msl in upstream reaches (**Appendix C, Figure 2**).

Historical topographic mapping indicates that engineered drainage features have been present in the area since at least the early twentieth century.

4.2.4. Geology

Stoddard County lies within the transition between the Ozark Uplift and the Mississippi Alluvial Plain. The Project Area is underlain by unconsolidated Quaternary alluvial and loess deposits over

older Coastal Plain sediments. These deposits form a broad, low-relief floodplain that supports highly productive agricultural soils but also influences drainage behavior, sediment transport, and bank stability within the ditch system.

4.2.5. *Ecoregion*

The Project Area is located within the Mississippi Alluvial Plain ecoregion. This region is characterized by low-lying terrain historically dominated by wetlands and bottomland hardwood forests and now largely converted to row-crop agriculture. Extensive drainage modification has occurred throughout the region, and the area remains susceptible to periodic flooding.

4.2.6. *Land Use and Land Cover*

Land use within the Subwatershed is dominated by agriculture, including cultivated cropland and pasture, which account for approximately 74 percent of total land cover. Developed lands and deciduous forest represent smaller proportions of the Subwatershed. Agricultural production is expected to remain the predominant land use.

The Project Area is predominantly agricultural, with approximately 89 percent classified as cultivated cropland. Proposed improvements are limited to drainage ditches and associated levee corridors with narrow adjacent buffers. Scattered trees and small forested patches occur along portions of the Project corridor (**Appendix C, Figure 3**).

4.3. Existing Conditions: Natural Resources and the Human Environment

The following section describes the existing conditions of natural resources and aspects of the human environment that were identified as relevant during scoping (see **Table 3-1**).

4.3.1. *Soils*

Soils in the Subwatershed and Project Area are derived primarily from silty, sandy, or clayey alluvium parent materials and are typically very deep, poorly drained to somewhat poorly drained, and loamy or clayey in texture. The depth to the seasonal high-water table for the majority of soils within the Project Area ranges from approximately 0 to 24 inches (in) below ground surface. The Project Area is dominated by Gideon loam, Roellen silty clay loam, and Mhoon silt loam soil series. Acreages and percentages of soil map units, drainage classes, and hydrologic soil groups are included in **Appendix D, Table D3-3**, and maps are provided in **Appendix C, Figures 6a–6k**. Without effective field-scale and regional drainage management, these soil conditions result in excess ponding and flooding, which can limit agricultural productivity and contribute to sediment delivery to the drainage system (NRCS 2025).

Table 4-1. Dominant Soils in the Subwatershed and Project Area

Soil Type	Subwatershed		Project Area	
	Acres	Percent	Acres	Percent
Lilbourn fine sandy loam	8,787	28	0	0
Gideon loam	5,007	16	137	35
Roellen silty clay loam	0	0	106	27
Mhoon silt loam	0	0	33	8
All Remaining Soils	17,981	56	115	30

Soil Type	Subwatershed		Project Area	
	Acres	Percent	Acres	Percent
Total	31,775	100	391	100

Erosion and Sedimentation

Erosion and sedimentation within the Subwatershed occur both within drainage ditches and from overland flow originating in adjacent agricultural fields. Water erosion is the dominant erosive force acting on soils in the Subwatershed; however, wind erosion is also a contributing factor (NRCS 2025). Wind Erodibility Index (WEI) values within the Subwatershed range from approximately 60 to 97, indicating moderate susceptibility to wind erosion (USDA 2025).

Within the Project Area, the majority of soils are classified as Hydrologic Soil Group B/D, comprising approximately 59 percent of mapped soils. Dual hydrologic group classifications reflect drained and undrained areas. Under drained conditions, Group B soils exhibit moderate infiltration and water transmission rates. Group D soils exhibit very slow infiltration and high runoff potential. These characteristics increase susceptibility to sheet and rill erosion, particularly during high-intensity rainfall events (NRCS 2025).

Runoff from adjacent croplands and from ditch bank areas containing previously excavated sediment contributes additional sediment loads to the drainage system. Saturation of these banks reduces soil strength and leads to bank sloughing, further increasing in-ditch sediment accumulation. In locations where runoff becomes concentrated at the interface between agricultural fields and ditch banks, gully head cuts form, accelerating localized erosion and sediment delivery.

Recent increases in conventional tillage practices to address herbicide-resistant weeds, combined with limited use of conservation practices such as reduced tillage, cover cropping, riparian buffers, and introducing crops with higher conservation value, have increased the amount of exposed soil across the landscape. These conditions reduce the landscape's capacity to slow runoff and trap sediment before it enters the drainage system. Accumulated sediment reduces ditch conveyance capacity, increases maintenance requirements, and contributes to downstream sediment transport (NRCS 2022a). Additionally, the presence of low-shear-strength and dispersive soils within the drainage system contributes to unstable ditch banks and continued sloughing, further impairing floodwater conveyance.

Prime and Unique Farmland and Farmland of Statewide Importance

NRCS classifies soil map units based on soil characteristics that are best suited to growing food, feed, fiber, forage, and oilseed crops. Within the approximately 31,775-ac Subwatershed, about 85 percent (27,050-ac) is classified as Prime Farmland, Prime Farmland if Drained, and Farmland of Statewide Importance (**Appendix C, Figure 7** and **Appendix D, Table D3-4**). Within the Project Area, 99 percent (387-ac) are classified as Prime Farmland if Drained. The remaining 1 percent is classified as All Areas Prime Farmland (**Appendix C, Figures 6a – 6k**).

4.3.2. *Water*

Waters of the U.S. (Streams, Lakes, and Wetlands)

Surface waters within the Subwatershed generally flow north to south through an interconnected network of engineered drainage ditches, with tributaries joining the primary conveyance feature (Main Ditch) at multiple locations before the system continues south into Arkansas and ultimately discharges to the Mississippi River.

The Project Area includes approximately 25-mi of five mapped perennial stream reaches (engineered drainage ditches), consisting primarily of engineered drainage ditches, fed by approximately 38 tributary ditches within the Subwatershed (**Appendix C, Figure 8; Appendix D, Table D6-1a**).

According to the National Wetlands Inventory (NWI), the Project Area contains approximately 58 acres (ac) of riverine wetlands and 11-ac of freshwater forested wetlands (**Appendix C, Figure 9; Table D6-1b**). The forested wetlands are seasonally flooded and associated with broadleaf deciduous systems, while riverine wetlands are primarily associated with active stream channels.

The Project Area was reviewed for potential wetlands in November 2024 in accordance with the Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Atlantic and Gulf Coastal Plain Region (Version 2.0) (USACE 2010). NWI mapping reflects riverine and seasonally flooded features associated with the drainage network; however, field indicators sufficient to meet Corps wetland criteria were not observed during the November 2024 site review.

Floodplain Management

Drainage ditches in the Project Area are mapped within FEMA Zone A special flood hazard areas (**Appendix C, Figure 11**), consistent with Executive Order 11988 – Floodplain Management (FEMA 2024). Zone A represents areas subject to a 1-percent annual chance of flooding and is associated with a 26-percent chance of flooding over the life of a 30-year mortgage (FEMA 1983a,b).

Surface Water Quality (CWA)

Current surface water quality conditions were evaluated using information from the MDNR and USEPA (MDNR 2020a; USEPA 2024a). The Main Ditch through Lateral No. 2 is listed on Missouri's 2020 303(d) list of impaired waters for dissolved oxygen and ammonia (**Appendix C, Figure 12; Appendix D, Table D6-2**). In addition, Lateral No. 2 has an approved Total Maximum Daily Load (TMDL) for sediment, which establishes load allocations and implementation targets to address sediment-related impairments within the watershed.

Based on the nature and location of proposed activities, which are primarily limited to rehabilitation within the existing drainage system footprint, water quality certification requirements under Section 401 of the Clean Water Act (CWA) are expected to be addressed through existing MDNR certification processes, as applicable. Any required coordination with MDNR would occur during permitting to ensure compliance with state water quality standards.

Surface Water Quantity

The Project Area is subject to excess surface water due to flat terrain and poorly drained soils. Ponding and inundation are common, and clay-rich soil layers limit infiltration to deeper subsurface zones, resulting in slow drainage and increased surface water retention without effective drainage management (NRCS 2022a).

Although annual precipitation generally supports agricultural production, precipitation timing and intensity often require managed drainage during wet periods and supplemental irrigation during dry periods. According to the 2022 Census of Agriculture, approximately 197,380-ac (47.2 percent) of annual cropland in Stoddard County were irrigated (NASS 2025a).

Regional Water Resource Management Plans

No watershed-specific management plans have been developed for the Project Area; however, MDNR maintains the Missouri Water Resources Plan, which provides statewide water resource assessments and planning considerations (MDNR 2020b). The Project Area is located within the Southeastern Missouri Region and the Lower Mississippi–St. Francis Subregion.

The Missouri Water Resources Plan indicates that water resources in the Southeastern Missouri Region are generally non-limiting, with recharge exceeding consumption, although groundwater declines have been documented in portions of the adjacent Mississippi Delta region in Arkansas and demands in southeastern Missouri are projected to increase by approximately 17 percent by 2060. The plan also identifies aging infrastructure as a regional challenge and recommends continued monitoring and investment (MDNR 2020b).

Groundwater and Sole Source Aquifers

The Project Area is located within the Southeastern Lowlands Groundwater Province (MDNR 2024a). The Alluvial Aquifer serves as the primary groundwater source for most uses, with additional deeper aquifers including the Wilcox and McNairy. Water quality within the Alluvial Aquifer is generally suitable for irrigation, although elevated iron concentrations are common. Irrigation pumping may cause localized drawdown but generally does not result in long-term regional declines, and the aquifer is readily recharged by precipitation and hydraulic connection with surface waters.

Few groundwater-related environmental concerns have been documented in the Southeastern Lowlands Groundwater Province; however, contamination from agricultural inputs represents a potential concern, and periodic flooding or prolonged ponding may increase nutrient and pathogen transport under certain conditions (MDNR 2021). According to USEPA, no Sole Source Aquifers are located within the Subwatershed (USEPA 2024b).

4.3.3. Air

The Clean Air Act (42 U.S.C. §§ 7401–7671, as amended) authorizes the USEPA to establish National Ambient Air Quality Standards (NAAQS) for criteria pollutants, including carbon monoxide, nitrogen dioxide, ozone, particulate matter (PM_{2.5} and PM₁₀), sulfur dioxide, and lead (USEPA 2024c).

The MDNR operates ambient air monitoring stations and reports data to the USEPA Air Quality System database (USEPA 2024d). Stoddard County is designated as in attainment for all applicable NAAQS pollutants, including particulate matter and ozone (MDNR 2024b), and no nonattainment areas are designated within the Project Area (USEPA 2024e). The Project Area is located within a predominantly rural setting characterized by cropland and scattered farmsteads.

4.3.4. *Plants and Animals*

Fish and Wildlife Habitat and Conservation

The Project Area supports wildlife typical of agricultural and riparian landscapes, including white-tailed deer, coyote, rabbit, gray squirrel, bats, turtles, water snakes, frogs, otters, beavers, wild turkey, mourning doves, and waterfowl. The area lies within the Mississippi Flyway and provides habitat for migratory birds. Recreational fishing opportunities are limited to oxbow lakes, rivers, and bayous. Fish species known to occur include largemouth bass, smallmouth bass, catfish, drum, bluegill, gar, and yellow perch (NRCS 2022a).

Threatened and Endangered Species

The Federal Endangered Species Act of 1973 (ESA) establishes protections for fish, wildlife, and plant species listed as threatened and endangered, and requires federal agencies to ensure that actions they authorize, fund, or carry out do not result in the “take” of listed species, except as permitted under the Act.

As part of Project planning, an updated official species list was obtained from the USFWS Information for Planning and Consultation (IPaC) tool on June 30, 2026. Species with potential occurrence include:

- Indiana bat (*Myotis sodalis*) – Endangered
- Tricolored bat (*Perimyotis subflavus*) – Proposed Endangered
- Alligator snapping turtle (*Macrochelys temminckii*) – Proposed Threatened
- Monarch butterfly (*Danaus plexippus*) – Proposed Threatened

No areas of designated Critical Habitat was identified within the Project Area (**Appendix A**). Additional details on the official species list are provided in **Appendix D, Table D6-3a**.

The Missouri Department of Conservation Natural Heritage Review Report (NHRR) dated February 18, 2025 indicated no federal or state-listed species or critical habitats documented within the Project Area. Records identify the Illinois chorus frog within a 1-mi radius, and Indiana bats are known to occur in Stoddard County outside the Subwatershed. Consistent with USFWS guidance, Indiana bats are assumed present where suitable habitat occurs (USFWS 2024b). A complete species list is provided in **Appendix D, Table D6-3b**, and the NHRR is included in **Appendix A**.

A field habitat assessment conducted in November 2024 identified trees with potential summer roosting characteristics for Indiana and tricolored bats. Although the assessment occurred outside the milkweed growing season, ditch bank conditions were generally suitable for milkweed establishment, indicating potential monarch habitat. Results of the assessment are summarized in **Appendix D, Section D6 (Biology)**.

Migratory Bird Treaty Act/Bald and Golden Eagle Protection Act

USFWS IPaC identifies Birds of Conservation Concern and potential bald or golden eagle occurrence under the Bald and Golden Eagle Protection Act. Both bald eagles (*Haliaeetus leucocephalus*) and golden eagles (*Aquila chrysaetos*) are known to occur in the Subwatershed. Bald eagles were observed during field assessments, including near the Bernie Public Fishing Pond; no golden eagles were observed.

Additional migratory birds protected under the Migratory Bird Treaty Act may occur within the Project Area (**Appendix D, Table D6-4a**).

Natural Areas

No designated Natural Areas occur within the Project Area. The Holly Ridge Conservation Area near the northern Subwatershed supports rare plant species and perched bog wetlands and represents an important regional resource. Conservation Opportunity Areas identified by MDC include the Holly Ridge COA, which occurs within the Project Area (**Appendix A**). Conservation Areas within or near the Subwatershed are shown in **Appendix C, Figure 10** (MDC 2024a; 2024b).

Riparian Areas

Riparian functions within the Project Area are primarily associated with the drainage ditch network. Historic bottomland hardwood forests and floodplain wetlands were largely removed or modified through land clearing and channelization. As a result, existing riparian areas are generally narrow and fragmented, consisting primarily of herbaceous vegetation with scattered trees and limited native woody cover (NRCS 2022a).

Invasive Species

Developing a comprehensive list of invasive species with the potential to occur within the Subwatershed is challenging due to the large number of species involved, the inclusion of multiple taxa (e.g., terrestrial plants and aquatic organisms), and variations in how “invasive species” are defined. As a result, this assessment focuses on species documented within the Project Area during field investigations.

During the November 2024 field assessment, several invasive plant species were documented within the Project Area, including autumn olive (*Elaeagnus umbellata*), Japanese hop (*Humulus japonicus*), and sericea lespedeza (*Lespedeza cuneata*). In addition, Johnsongrass (*Sorghum halepense*), which is designated as a noxious weed by the Missouri Department of Agriculture (MDA 2025), was documented. A complete list of vegetation recorded during the field assessment, including invasive species, is provided in **Appendix D, Table D6-5**.

4.3.5. Human Environment

Socioeconomic Issues

According to the U.S. Census Bureau (USCB) American Community Survey (ACS), Stoddard County has a population of approximately 28,400, with agriculture comprising over 80 percent of total land area and representing a primary driver of the local economy (USGS 2021; USCB 2023a).

In 2021, agricultural activities contributed approximately 74 percent of household income within the county (MDA 2021; USCB 2023a).

Socioeconomic indicators show a median household income of \$51,700, with approximately 17 percent of households living below the poverty level and approximately 18 percent of the population having attained less than a high school diploma. By comparison, Missouri's statewide median household income is \$61,043, with approximately 13 percent of households living below the poverty level and approximately eight percent of the population having attained less than a high school diploma (USCB 2023a–p). Additional regional socioeconomic data are provided in **Appendix D (Tables D8-1 through D8-6)**.

Historic and Cultural Resources

Section 106 of the National Historic Preservation Act (NHPA) requires federal agencies to consider the effects of undertakings on historic properties and to provide the Missouri State Historic Preservation Office (SHPO) an opportunity to comment.

A literature review for previously recorded cultural resources and an archeological and architectural survey was conducted for the Area of Potential Effects (APE) in December 2024. The APE was based on the initial scope and design of the proposed project. Through Section 106 consultation, the APE was further refined and is defined as approximately 9,205 square meters (m), encompassing approximately 2.3-ac and including construction footprints, access routes, staging areas, and areas of potential indirect or visual effects.

Review of the historical and archival records found no known archaeological sites or historic structures within or adjacent to the APE. One architectural resource (AR-1) greater than 50 years of age was identified. A pedestrian survey completed on December 5, 2024 identified no archaeological sites or cultural features. AR-1 was evaluated and determined as not eligible for listing due to lack of historic or architectural significance.

Based on these findings, NRCS issued a determination of No Adverse Effect pursuant to 36 CFR 800.5(b), and the Missouri SHPO concurred by letter dated March 27, 2025, (**Appendix A**). Tribal consultation letters were distributed on October 21, 2024, and no comments were received. No additional archaeological investigations are recommended. A summary of findings is provided in **Appendix D, D9**, and the complete Cultural Resources Report is included in **Appendix E**.

Recreation

State-recognized Conservation Areas within or adjacent to the Project Subwatershed include the Holly Ridge Conservation Area. These areas are owned or managed through lease agreements by the MDC and are open to the public for recreational use. Primary management objectives include fishing, hunting, and conservation of native plant communities and wildlife habitat.

Public Health and Safety

Communities in proximity to the Project Area include Dexter, Bernie, Malden, and Essex, which are connected by local and state roadways crossing the drainage system. Major transportation routes include Missouri State Highway 25, U.S. Highway 114, and Missouri State Highway D.

Residents rely on these roadways for access to schools, employment, medical services, and other essential services. Flood-related roadway inundation presents a public safety hazard and may delay emergency response services, increasing risks to residents within and adjacent to the Project Area (NRCS 2022a).

Potable Water Supply

Based on MDNR data, the Project Area includes approximately 81 high-yield groundwater wells, three public drinking water supply wells, and one monitoring well (MDNR 2024c,d). Public drinking water systems serving the Subwatershed include Stoddard County Public Water Supply District No. 1, which serves an estimated population of approximately 3,000 residents (MDNR 2024e).

Groundwater levels are generally stable due to consistent recharge from precipitation and hydraulic connectivity with the Mississippi River, although localized drawdown may occur near high-capacity irrigation wells during peak demand. Groundwater from the alluvial aquifer generally meets potable supply criteria, although treatment may be required for naturally occurring constituents such as calcium, iron, sulfate, sodium, and manganese (MDNR 2024e).

Energy Use

Energy use within the Project Area is primarily associated with agricultural water management, including irrigation and drainage operations. Although gravity-fed systems are used where feasible, flat topography and soil conditions often require electric- or fuel-powered pumping systems to deliver irrigation water during dry periods and remove excess water during wet conditions (NRCS 2022a). Energy consumption associated with these activities represents an ongoing operational requirement for agricultural producers and is directly related to drainage system performance.

4.4. Existing Conditions: Ecosystem Services

As summarized in **Table 3-2**, scoping concerns related to natural resources and the human environment correspond to the Provisioning, Regulating, and Cultural categories of ecosystem services. The subsections that follow describe existing ecosystem services within the Project Area that have not already been addressed in Section 4.3 (Affected Environment).

4.4.1. Provisioning Services

The Subwatershed provides provisioning services primarily through agricultural production of food, fiber, and biofuel crops. Soybeans, corn, and cotton are the dominant commodities and together accounted for approximately 96 percent of cultivated farmland acreage within the Subwatershed in 2024. Cotton accounted for approximately 49 percent of cultivated acreage and is produced primarily for fiber, while corn and soybeans are commonly used for livestock feed and biofuel production (NASS 2025b). Winter wheat, peanuts, and specialty crops represent a smaller portion of total production.

Existing drainage infrastructure supports these provisioning services by providing flood protection and water management for approximately 32,000 acres of cropland within the Subwatershed. Farms in Stoddard County average approximately 655 acres, emphasizing the importance of drainage system performance to agricultural productivity and economic viability.

4.4.2. Regulating Services

Regulating ecosystem services in the Subwatershed, including flood attenuation, erosion control, and water quality regulation, have been substantially altered by historical conversion of wetlands and bottomland forests to agriculture. The managed drainage system provides some regulation of water quantity, flow velocity, erosion, and sediment transport; however, aging infrastructure and sediment accumulation have reduced system performance.

Many drainage ditches lack vegetated buffers capable of filtering sediment, nutrients, and agricultural contaminants from adjacent cropland. Adoption of soil health practices such as cover crops and reduced tillage remains limited in portions of the Subwatershed. Native riparian vegetation and pollinator habitat are minimal. Because approximately 74 percent of land use is agricultural, crop pollination represents an important regulating service, with pollinators contributing to an estimated 35 percent of global food crops (USDA 2024a).

4.4.3. Cultural Services

Cultural ecosystem services within the Subwatershed include recreation, heritage values, and outdoor activities. Hunting contributes to Missouri's cultural heritage and economy, with more than 500,000 participants statewide accounting for approximately 10 million hunter-days annually (HWMO 2024). Southeast Missouri is recognized for waterfowl hunting due to regional landscape characteristics and migratory bird use (SMSG 2024).

A Conservation Area managed by MDC is located within or adjacent to the Subwatershed and supports hunting, fishing, and other recreational uses. The City of Dexter maintains Dexter Lake, an approximately 11-acre fishing lake that provides handicap-accessible recreational opportunities (City of Dexter 2008).

4.5. Existing Conditions: Drainage Ditches

Drainage ditches managed by DD37 are integral components of the regional drainage system supporting intensively managed agricultural cropland. The surrounding landscape is relatively flat and dominated by cultivated fields, with common features including graded slopes, lateral field ditches, berms, irrigation infrastructure, and pump systems.

Drainage ditches within the Subwatershed generally range from approximately 30 to 75-ft in top-of-bank width, with bottom widths of 13 to 20-ft and depths of 8 to 15-ft. The Main Ditch is larger, with bottom widths of approximately 19 to 40-ft and depths of 9 to 15-ft. Agricultural activities commonly extend to the top of ditch banks, resulting in minimal buffer areas between cultivated fields and the drainage system.

4.5.1. Status of Operation and Maintenance

DD37 manages the drainage system to support agricultural productivity and reduce flood-related impacts within the Subwatershed and downstream areas. The district conducts routine inspections, mowing and brush control, sediment removal above the ordinary high-water mark (OHWM), and ditch bank repairs as needed (NRCS 2022a).

Maintenance activities are largely reactive and performed in response to erosion, sediment accumulation, or storm damage. While these actions allow continued operation, they have not fully offset long-term channel adjustment, widening, or progressive bank instability observed throughout the system.

4.5.2. Structural Conditions of Drainage Ditches

Field inspections and coordination with DD37 identified widespread evidence of ongoing erosion along the Main Ditch and associated laterals. In many locations, channels have widened substantially over time, with portions of Main Ditch, Lateral No. 1, and Lateral No. 2 approaching nearly double their apparent original width due to long-term bank sloughing, toe erosion, and repeated disturbance during high-flow events and maintenance access.

Bank conditions commonly include steep or near-vertical slopes, with abrupt drops of approximately 8 to 10-ft observed in several locations, indicating limited structural stability and vulnerability to bank instability during prolonged saturation or high-flow conditions. Localized erosion was observed beneath road crossings and bridge structures, where concentrated flows and constricted hydraulics have caused undercutting and scour. In some areas, past stabilization efforts appear to have included placement of broken concrete or miscellaneous fill, which provides limited short-term protection and contributes to localized turbulence and scour.

Subsurface drain outlets discharge directly into the ditches at numerous locations, with inconsistent outlet protection and evidence of localized erosion and bank degradation. Sediment deposition within channels further reduces hydraulic efficiency, contributing to shallow flow during normal conditions and reduced conveyance during storm events.

Overall, the existing drainage system continues to function as intended but reflects cumulative effects of long-term erosion, channel enlargement, and constrained maintenance. These conditions reduce hydraulic efficiency, increase sediment transport, and elevate the risk of further bank instability during future flood events.

These existing conditions informed the range of alternatives evaluated in Section 5.

5. ALTERNATIVES

5.1. Formulation Process

The National Watershed Program Manual (NWPM) (NRCS 2018) requires that all reasonable alternatives that address the purpose and need for action must be presented in the Plan, including alternatives outside NRCS authorities and those not preferred by the Sponsor. For watershed project plans involving flood damage reduction, the NWPM also requires consideration of nonstructural measures, which reduce vulnerability to flood damage without substantially altering the depth or extent of flooding. Such measures may include the purchase of property via floodplain acquisition (nonstructural).

In accordance with PR&G for Federal water resource investments (USDA 2018), alternative plans were formulated and evaluated using the Guiding Principles described in **Section 1.1** and the following four evaluation criteria:

- *Completeness* is the extent to which a given alternative plan provides and accounts for all necessary investments or other actions to ensure the realization of the planned effects. This may require relating the plan to other types of public or private plans if the other plans are crucial to the realization of the contributions to the objective.
- *Effectiveness* is the extent to which an alternative plan alleviates the specified problems and achieves the specified opportunities.
- *Efficiency* is the extent to which an alternative alleviates the specified problems and realizes the specified opportunities at least cost.
- *Acceptability* is the viability and appropriateness of an alternative from the perspective of the general public and consistency with existing federal laws, authorities, and public policies. It does not include local or regional preferences for particular solutions or political expediency.

Using this framework, the Project team formulated and evaluated five (5) alternatives, including:

- One (1) No Action/Future without Federal Investment (FWOFI) (**Alternative 1**)
- Three (3) structural alternatives (**Alternative 2a, 2b, and 2c**); and
- One (1) nonstructural alternative (**Alternative 3**).

Following preliminary screening, Alternative 4 (Reconstruction of Banks) and Alternative 5 (Two-Stage Ditch Conversion) were eliminated from detailed consideration due to limited effectiveness and poor efficiency relative to anticipated costs. Alternative 2 (Vegetative Buffer, Bank Toe Armoring, Parallel Drains, and Grade Stabilization) was identified as the Locally Preferred Alternative.

5.2. Alternative 1: Future without Federal Investment (FWOFI)

The FWOFI represents the expected future condition without Federal action and serves as the baseline for comparative analysis. Although the FWOFI alternative may not meet the Project's purpose and need, and may include conditions that are inefficient or undesirable, it is required as a reference condition for comparative analysis.

Under this alternative, no comprehensive improvements to the Main Ditch and associated laterals would occur. The existing drainage system, much of which is more than 100 years old, would continue to experience bank erosion, sediment accumulation, channel widening, and reduced hydraulic capacity, resulting in continued flood risk to agricultural lands and surrounding areas.

The Sponsor would likely continue routine O&M activities within available resources, including sediment removal above the OHWM, brush control, levee mowing, minor spoil leveling, pipe installation, and debris removal. These activities would address localized issues but would not resolve long-term channel instability or systemic capacity loss.

Within Lateral No. 1, Lateral No. 2, Branch Lateral No. 2, and the unnamed lateral, bank erosion and sediment redistribution would continue, contributing to gradual loss of adjacent agricultural land and reduced conveyance. Previously placed spoil along ditch banks would remain in place and may contribute to continued sloughing or localized instability.

5.3. Alternative 2a, 2b, and 2c – Structural - Vegetative Buffer, Bank Toe Armoring and Parallel Drains, Riprap Armoring with Grade Stabilization Structures

Alternative 2 includes three implementation options (2a, 2b, and 2c) that differ in prioritization and phasing of structural measures within high, medium, and low priority areas. All three options provide flood reduction benefits but Alternative 2a has the greatest benefit-to-cost ratio. Refinement would occur during final design following Plan approval.

Alternative 2 consists of structural and vegetative practices intended to stabilize ditch banks and reduce ongoing erosion under NRCS Streambank and Shoreline Protection (Code 580). Measures include toe-of-slope riprap armoring, bank slope reconstruction, additional armoring at road crossings, outlet protection, grade stabilization structures, parallel subsurface drainage systems, and vegetative buffers.

Planning-level hydraulic modeling indicates that Alternative 2 would improve conveyance and reduce flood extents across much of the Project Area. Modeling also indicates that localized changes in flood depth or extent may occur at isolated locations due to site-specific hydraulic controls, including crossings, outlet discharges, and grade stabilization features.

5.3.1. Bank Slope Regrading and Riprap Armoring

In reaches characterized by weak or highly erodible soils, ditch banks would be stabilized by regrading to a 2H:1V configuration and installing riprap armoring along the lower slopes and toe. Armoring would consist of a bedding layer overlain by riprap and would be applied in segments exhibiting severe erosion, high flow velocities, turbulence, shallow groundwater, low-shear-strength soils, or seismic considerations (**Appendix C**).

Excavated materials would be spread on adjacent agricultural fields, with topsoil stripped and replaced prior to spreading. Spoil placement would maintain a minimum 10-ft setback from the top of bank to avoid loading effects and maintain field productivity.

5.3.2. Outlet Armoring and Grade Stabilization

Surface and subsurface drainage outlets that contribute to localized bank or bed erosion would be stabilized using riprap armoring. Desktop analysis indicates that approximately 34 outlets may require stabilization.

Grade Stabilization Structures (NRCS Code 410) or Structures for Water Control (NRCS Code 587) would be installed at selected locations where concentrated surface inflows are contributing to erosion. Desktop review identified approximately seven side inlets requiring further evaluation, with final structure type and configuration determined during design in accordance with NRCS standards.

5.3.3. Parallel Drainage Systems

Parallel subsurface drainage systems (NRCS CPS 606) would be installed in selected reaches to reduce bank saturation associated with shallow water tables. Drains would generally be located 10 to 20 feet from the bank and spaced to provide effective drawdown, with outlets no greater than 1,000 feet apart. Drains would terminate at property boundaries to limit service to individual ownerships, and outlets would be armored to prevent scour. Existing subsurface drainage infrastructure would be incorporated where present.

5.3.4. Vegetation Stabilization

Vegetation would be established along ditch tops and regraded side slopes to improve soil stability and reduce erosion. Native grasses with deep root systems would be used along ditch tops, while reshaped slopes would receive rapid-establishment seed mixes with erosion control fabric, consistent with NRCS Critical Area Planting (CPS 342). Mulch or erosion control fabric would be applied as needed in accordance with NRCS Mulching (CPS 484).

5.3.5. Construction Components

Implementation of Alternative 2 would include bank excavation and reshaping, installation of riprap armoring and bedding, installation and integration of subsurface drainage systems, stabilization of drainage outlets, installation of grade stabilization or water-control structures, spreading of excess material along ditch tops, and revegetation of disturbed areas.

5.3.6. Applicable NRCS Conservation Practice Standards

Alternative 2 would be implemented in accordance with the following NRCS conservation practice standards:

- Streambank and Shoreline Protection (580)
- Subsurface Drain (606)
- Critical Area Planting (342)
- Grade Stabilization Structure (410)
- Structure for Water Control (587)
- Mulching (484)

5.4. Alternative 3: Nonstructural Alternative – Easement Acquisition

This alternative would involve acquisition of floodplain conservation easements on agricultural lands subject to inundation during the 100-year flood event. Hydraulic screening identified approximately 12,404-ac within the Project Area as potentially eligible for easement consideration.

According to data from the University of Missouri (2025), average agricultural land values in Missouri are approximately \$7,129 per acre, increasing to about \$9,356 per acre for irrigated cropland. For planning purposes, a conservative easement unit cost of \$8,500 per acre was assumed based on available regional land value information and typical reductions associated with conservation easements. This assumed unit cost reflects acquisition of partial property rights through conservation easements rather than fee-simple ownership and therefore represents a reduced value relative to full market land prices. This planning-level assumption will be refined using local market comparables and NRCS appraisal requirements during implementation. Applying the assumed unit cost to the acreage subject to flooding results in an estimated easement acquisition cost of approximately \$113,747,000, as summarized in **Appendix D, Table D7-14**.

This alternative would reduce exposure to flood damages by removing agricultural production from flood-prone areas. However, implementation would result in the permanent conversion of substantial productive farmland and a Sponsor cost-share obligation exceeding \$32 million, raising concerns regarding efficiency and acceptability.

Although Alternative 3 provides flood damage reduction through land use conversion rather than structural improvements, it is carried forward for detailed analysis in Section 6 to allow comparison of nonstructural and structural approaches.

5.5. Locally Preferred Alternative

The Sponsor has identified Alternative 2a as the locally preferred alternative. Alternative 2 consists of a coordinated suite of structural and vegetative practices, including the installation of vegetated buffers, bank toe armoring, parallel drains, full-bank armoring, grade stabilization structures, and pipe outlet armoring.

These practices would be implemented at targeted locations within the Project Area based on documented erosion severity, hydraulic conditions, soil characteristics, and infrastructure constraints. Among the alternatives evaluated, Alternative 2a best satisfies the Project's purpose and need and meets the PR&G evaluation criteria by providing a balanced approach to flood damage reduction, agricultural land protection, and environmental considerations.

5.6. Alternatives Eliminated from Detailed Analysis

Alternative 4: Structural Alternative – Reconstruction of Banks

This alternative would have involved excavating approximately 433,400 cubic yards (cu-yds) of accumulated in-ditch sediment to re-form and stabilize ditch side slopes. The approach was considered only in conjunction with riprap armoring at the toe of slope. However, stability analyses conducted using the Bank Stability and Toe Erosion Model (BSTEM) indicated an unacceptably high risk of bank failure under anticipated hydraulic and geotechnical conditions. As documented in Appendices C and D, the modeled factors of safety did not meet acceptable thresholds for long-term stability. This elevated failure risk was the primary basis for eliminating this alternative from further consideration.

Alternative 5: Structural Alternative – Two-Stage Ditch Conversion

This alternative would have involved conversion of selected ditch reaches to a two-stage ditch configuration, requiring excavation of approximately 465,000 cu-yds of material within high

priority areas of the Project. Implementation of this alternative would require significant expansion of the existing right-of-way (ROW) or drainage ditch easements, raising concerns related to landowner coordination, loss of productive agricultural land, and spoil disposal. Due to limited on-site placement opportunities, a substantial portion of excavated material would likely need to be hauled off-site, increasing construction complexity and cost.

During construction, this alternative would result in short-term adverse impacts to ditch stability and surface water quality due to extensive excavation and soil disturbance. While a two-stage ditch configuration may provide long-term erosion reduction benefits and could potentially facilitate future parallel drainage installation, overall feasibility was determined to be limited due to high construction costs, ROW/easement constraints, and uncertainty regarding landowner participation.

Based on these considerations, Alternative 5 was eliminated from detailed analysis due to poor efficiency and acceptability, despite its potential long-term performance benefits.

5.7. Alternative Summary and Comparison

Each alternative was evaluated with regard to:

1. PR&G Guiding Principles, which incorporate the Federal Objective (USDA 2018), the Project Purpose and Need (flood damage reduction; see Section 2), and environmental, economic, and social impacts (**Table 5-1**);
2. Evaluation criteria of Completeness, Effectiveness, Efficiency, and Acceptability (**Table 5-2**); and
3. Scoping Concerns of Section 3 (**Table 5-3**).

The final column in **Table 5-1** and **Table 5-2** indicates whether each alternative met the applicable screening criteria and was carried forward to Section 6 (Environmental Consequences) for detailed evaluation. The No Action/FWOFI alternative is carried forward regardless of screening results, as required for comparative analysis.

Table 5-1. Screening Criteria for PR&G Guiding Principles, Purpose and Need, and Environmental, Economic, and Social Impacts

Alternative	Guiding Principles Met? ¹	Project Purpose and Need Met?	Environmental, Economic, and Social Goals Met?	Carried forward for Analysis?
Alternative 1: No Action/FWOFI	No	No	No	Yes
Alternative 2: Structural	Yes	Yes	Yes	Yes
Alternative 3: Nonstructural	Yes	Yes	No	Yes
¹ The PR&G Guiding Principles include: Sustainable Economic Development, Floodplains, Healthy and Resilient Ecosystems, Public Safety, and Watershed Approach (Appendix D, Section 1.1).				

Table 5-2. Screening Criteria for Completeness, Effectiveness, Efficiency, and Acceptability

Alternative	Completeness ¹	Effectiveness ²	Efficiency ³	Acceptability ⁴	Carried Forward for Analysis?
Alternative 1: No Action/FWOFI	Yes	No	No	Yes	Yes
Alternative 2: Structural	Yes	Yes	Yes	Yes	Yes
Alternative 3: Nonstructural	Yes	No	No	No	Yes
¹ Completeness is the extent to which an alternative provides and accounts for all features, investments, and/or other actions necessary to realize the planned effects, including any necessary actions by others. ² Effectiveness is the extent to which an alternative alleviates the specific problems and achieves the specified opportunities. ³ Efficiency is the extent to which an alternative alleviates the specific problems and realizes the specific opportunities at least cost. ⁴ Acceptability is the viability and appropriateness of an alternative from the perspective of the Nation's general public and consistency with existing Federal laws, authorities, and public policies.					

Although Alternative 3 does not meet the screening criteria for effectiveness, efficiency, or acceptability, it is carried forward for comparative purposes to satisfy PR&G and NWPM requirements for evaluation of nonstructural alternatives. The No Action/FWOFI alternative is also carried forward as the required baseline condition.

Based on the screening results presented in **Tables 5-1** and **5-2**, all alternatives not previously eliminated are carried forward for further analysis in Section 6 (Environmental Consequences). **Table 5-3** compares the retained alternatives with respect to natural resources and the human environment (see **Table 3-1** and Section 4.3) and organizes effects by ecosystem services (see **Table 3-2** and Section 4.4).

Potential impacts are evaluated for the Project Area, areas downstream of the Project Area, and, where applicable, the Subwatershed. **Table 5-3** applies a qualitative rating system to describe relative ecosystem service trade-offs among alternatives. Comparative cost information and the Project economic analysis are provided in **Appendix D, Section D-7**.

Table 5-3. Summary and Comparison of Impacts of Alternatives

Alternatives						
		Alternative 1 - No Action/ FWOFI	Alternative 2 - Structural	Alternative 3 – Nonstructural		
Resource or Concern	Impact on Resource	Rating ¹	Impact on Resource	Rating ¹	Impact on Resource	Rating ¹
Provisioning Services: Food and Fiber Production						
<i>Soils – Prime and Unique Farmland and Farmland of Statewide Importance</i>	NEGATIVE (continued erosion and headcutting (an upstream moving wave of erosion), inadequate drainage, and flooding).	3-	POSITIVE where armored (bank stabilization and seeding) + SLIGHTLY POSITIVE (where previously removed sediment is spread and seeded) + SOMEWHAT NEGATIVE (for areas downstream due to scour from riprap installation, though minimized by existing ditch geometry and proposed riprap installation design).	2+	NEGATIVE Short Term (continued erosion and headcutting, inadequate drainage, and flooding) + NEGATIVE Long Term (decreased farmland as system increases potential for long-term riparian recovery).	3-
Regulating Services: Flood Damage Reduction						
<i>Soils – Erosion and Sedimentation</i>	Same as Prime Farmland	3-	Same as Prime Farmland	2+	POSITIVE Long Term (decreased erosion as system reestablishes riparian buffer) + NEGATIVE Short Term (continued erosion and headcutting, inadequate drainage, and flooding).	2+

Alternatives						
Alternative 1 - No Action/ FWOFI			Alternative 2 - Structural		Alternative 3 – Nonstructural	
Resource or Concern	Impact on Resource	Rating ¹	Impact on Resource	Rating ¹	Impact on Resource	Rating ¹
<i>Water – Floodplain Management</i>	NEGATIVE (continued flood damage to agricultural lands, property, and infrastructure).	3-	POSITIVE where armored (bank stabilization and seeding) + SLIGHTLY POSITIVE (spreading and seed of previously removed sediment) + SOMEWHAT NEGATIVE (potential localized changes in flood extent at isolated locations identified during planning level modeling).	2+	POSITIVE Long Term (decreased flood damage as system reestablishes riparian buffer). + SLIGHTLY NEGATIVE as area continues to flood until ecosystem equilibrium returns.	2+
<i>Water – Waters of the U.S. (Streams, Lakes, and Wetlands)</i>	NEGATIVE (continued sedimentation).	3-	POSITIVE where armored (bank stabilization and seeding) + SLIGHTLY POSITIVE (spreading and seed of previously removed sediment) + SOMEWHAT NEGATIVE (for areas upstream due to sedimentation and downstream due to scour from riprap installation, though minimized by existing ditch geometry and	2+	POSITIVE Long Term (decreased sedimentation as system increases potential for long-term riparian recovery) + NEGATIVE Short Term (continued sedimentation).	2+

Alternatives						
Alternative 1 - No Action/ FWOFI			Alternative 2 - Structural		Alternative 3 – Nonstructural	
Resource or Concern	Impact on Resource	Rating ¹	Impact on Resource	Rating ¹	Impact on Resource	Rating ¹
			proposed riprap installation design).			
<i>Water</i> – Surface Water Quality - (CWA)	NEGATIVE (continued sedimentation and increase in nutrient load).	3-	POSITIVE where armored (bank stabilization and seeding) + SLIGHTLY POSITIVE (spreading and seed of previously removed sediment) + SOMEWHAT NEGATIVE (for areas upstream due to sedimentation and increase in nutrient load and downstream due to scour from riprap installation, though minimized by existing ditch geometry and proposed riprap installation design).	2+	POSITIVE Long Term (decreased sedimentation and nutrient load as system increases potential for long-term riparian recovery) + NEGATIVE Short Term (continued sedimentation and increase in nutrient load).	2+

Alternatives						
Alternative 1 - No Action/ FWOFI			Alternative 2 - Structural		Alternative 3 – Nonstructural	
Resource or Concern	Impact on Resource	Rating ¹	Impact on Resource	Rating ¹	Impact on Resource	Rating ¹
<i>Water – Surface Water Quantity</i>	NEGATIVE (continued ponding on surrounding lands).	3-	POSITIVE where armored (bank stabilization and seeding) + SOMEWHAT NEGATIVE (for areas upstream and downstream due to continued ponding on surrounding lands, though minimized by existing ditch geometry and proposed riprap installation design).	2+	POSITIVE Long Term (decreased sedimentation and duration of ponding on surrounding lands as system increases potential for long-term riparian recovery) + NEGATIVE Short Term (for areas upstream and downstream due to continued ponding on surrounding land).	2+
<i>Water – Regional Water Resource Management Plans (RWRMP)</i>	No change to the RWRMP.	0	No change to the RWRMP.	0	No change to the RWRMP.	0
<i>Water – Groundwater Quality and Sole Source Aquifers</i>	NEGATIVE (increase in nutrient loading from ponding on surrounding lands).	3-	POSITIVE where armored (bank stabilization and seeding) + SOMEWHAT NEGATIVE (for areas upstream and downstream due to increase in nutrient loading from ponding on surrounding lands,	2+	POSITIVE Long Term (nutrient cycling increases on surrounding lands as system increases potential for long-term riparian recovery) + NEGATIVE Short Term (for areas upstream	2+

Alternatives						
Alternative 1 - No Action/ FWOFI			Alternative 2 - Structural		Alternative 3 – Nonstructural	
Resource or Concern	Impact on Resource	Rating ¹	Impact on Resource	Rating ¹	Impact on Resource	Rating ¹
			though minimized by existing ditch geometry and proposed riprap installation design).		and downstream due to increase in nutrient loading from ponding on surrounding lands).	
<i>Air</i> – Air Quality (Clean Air Act) (Counties in the Project Area are not in non-attainment zones for air quality).	NEGATIVE (increase in wind erosion leading to increase in air particulates).	-1	POSITIVE Long Term (decreased wind erosion as system reestablishes riparian buffer and less regular maintenance with equipment) + SLIGHTLY NEGATIVE Short Term (minor due to ditch work and burning to maintain native vegetation).	2+	POSITIVE Long Term (decreased wind erosion as system increases potential for long-term riparian recovery) + NEGATIVE Short Term (increase in wind erosion leading to increase in air particulates).	2+

Alternatives						
Alternative 1 - No Action/ FWOFI			Alternative 2 - Structural		Alternative 3 – Nonstructural	
Resource or Concern	Impact on Resource	Rating ¹	Impact on Resource	Rating ¹	Impact on Resource	Rating ¹
<i>Plants and Animals</i> – Fish and Wildlife Habitat and Conservation	POSITIVE for species like waterfowl or others that utilize ephemeral water sources (where ponding continues) + NEGATIVE for aquatic species (where erosion and sedimentation continue).	2-	POSITIVE for pollinators (where previously removed sediment is spread and seeded with native grasses and forbs) + SOMEWHAT POSITIVE for aquatic species (reduced erosion and sedimentation where armor is installed) + NEGATIVE for riparian species (loss of vegetation-water interface) + SOMEWHAT NEGATIVE (for areas upstream and downstream, whether effects are positive or negative would depend on habitat requirements of a given species. Effects minimized by existing ditch geometry and proposed riprap installation design).	1+	POSITIVE Long Term for aquatic species (reduced erosion and sedimentation as system increases potential for long-term riparian recovery) + NEGATIVE Short Term for aquatic species (where erosion and sedimentation continue).	2+

Alternatives						
Alternative 1 - No Action/ FWOFI			Alternative 2 - Structural		Alternative 3 – Nonstructural	
Resource or Concern	Impact on Resource	Rating ¹	Impact on Resource	Rating ¹	Impact on Resource	Rating ¹
<i>Plants and Animals</i> – Threatened and Endangered (T&E) Species Potential to occur Indiana bat (E) tricolored bat (proposed E) monarch butterfly (proposed T) Suitable habitat not present gray bat (E) alligator snapping turtle (proposed T)	Same as Fish and Wildlife Habitat and Conservation + NEGATIVE (loss of bat roost trees along banks as erosion continues and loss of pollinator habitat as nonnative plantings continue).	2-	Same as Fish and Wildlife Habitat and Conservation + POSITIVE (increase in pollinator habitat, including monarch butterfly habitat, as native plantings are established and securing bat roost trees along banks). Potential short-term, minor impacts during duration of bank stabilization and spreading/seeding work. Would be mitigated by utilizing proper avoidance/minimization measures for identified T&E species, like conducting work outside of bat active season.	2+	Same as Fish and Wildlife Habitat and Conservation + POSITIVE Long Term (increase in bald eagle nest trees as system increases potential for long-term riparian recovery) + NEGATIVE Short Term (loss of trees along banks as erosion continues).	2+

Alternatives						
Alternative 1 - No Action/ FWOFI			Alternative 2 - Structural		Alternative 3 – Nonstructural	
Resource or Concern	Impact on Resource	Rating ¹	Impact on Resource	Rating ¹	Impact on Resource	Rating ¹
<i>Plants and Animals</i> – Migratory Bird Treaty Act and Bald and Golden Eagle Protection Act (at least 12 sensitive migratory bird species)	Same as Fish and Wildlife Habitat and Conservation + NEGATIVE (loss of trees along banks as erosion continues).	3-	Same as Fish and Wildlife Habitat and Conservation + POSITIVE (securing trees along banks). Potential short-term, minor impacts during spreading/seeding work. Would be mitigated by conducting work outside of primary nesting season.	2+	Same as Fish and Wildlife Habitat and Conservation + POSITIVE Long Term (increase in bald eagle nest trees as system increases potential for long-term riparian recovery) + NEGATIVE Short Term (loss of trees along banks as erosion continues).	2+
<i>Plants and Animals</i> – Invasive Species	NEGATIVE (continued erosion and colonization by invasives).	-1	POSITIVE Long Term where armored (bank stabilization and seeding) + SLIGHTLY POSITIVE Long Term (where previously removed sediment is spread and seeded with native vegetation) + SLIGHTLY NEGATIVE Short Term (risk of spreading invasives during spreading/seeding; will be minimized through standard NRCS construction	2+	POSITIVE Long Term (decreased erosion and renewal of native species as system increases potential for long-term riparian recovery) + SLIGHTLY NEGATIVE Short Term (continued erosion and colonization by invasives).	3+

Alternatives						
Alternative 1 - No Action/ FWOFI			Alternative 2 - Structural		Alternative 3 – Nonstructural	
Resource or Concern	Impact on Resource	Rating ¹	Impact on Resource	Rating ¹	Impact on Resource	Rating ¹
			sequencing and equipment hygiene practices).			
<i>Plants and Animals</i> – Riparian Areas (RA)	NEGATIVE (continued erosion, sedimentation, and headcutting)	3-	POSITIVE where armored (reduced erosion and sedimentation) + SLIGHTLY POSITIVE (where previously removed sediment is spread and seeded with native vegetation) + NEGATIVE (loss of vegetation-water interface where armored, for areas upstream and downstream due to increase sedimentation and erosion on surrounding lands, though minimized by existing ditch geometry and proposed riprap installation design)	2+	POSITIVE Long Term (decreased erosion and sedimentation as system increases potential for long-term riparian recovery) + NEGATIVE Short Term (continued erosion, sedimentation, and headcutting).	2+
Cultural Services: Recreational Opportunities, Socioeconomic Status, Historical Resources						
<i>Plants and Animals</i> – Natural Areas (NA)	NA are not connected to the Project Area and would likely not be impacted.	0	NA are not connected to the Project Area and would likely not be impacted.	0	NA are not connected to the Project Area and would likely not be impacted.	0

Alternatives						
Alternative 1 - No Action/ FWOFI			Alternative 2 - Structural		Alternative 3 – Nonstructural	
Resource or Concern	Impact on Resource	Rating ¹	Impact on Resource	Rating ¹	Impact on Resource	Rating ¹
<i>Human Environment – Socioeconomic, Social and Cultural Issues</i>	NEGATIVE (risk of drainage system failure that could interfere with agricultural production and lead to loss of life, property damage, and disruption of public services)	3-	POSITIVE where armored (reduced erosion and sedimentation allowing the drainage system to function more effectively and thus reduce flood risk) + SLIGHTLY NEGATIVE (for areas upstream and downstream due to increase sedimentation and erosion on surrounding lands, though minimized by existing ditch geometry and proposed riprap installation design)	3+	SLIGHTLY POSITIVE (landowners are no longer vulnerable to flooding) + NEGATIVE Short Term (landowners who sell their land having to relocate) + NEGATIVE Long Term (reduced land availability for agriculture and development as system increases potential for long-term riparian recovery).	2-

Alternatives						
Alternative 1 - No Action/ FWOFI			Alternative 2 - Structural		Alternative 3 – Nonstructural	
Resource or Concern	Impact on Resource	Rating ¹	Impact on Resource	Rating ¹	Impact on Resource	Rating ¹
<i>Human Environment – Recreation</i>	SLIGHTLY POSITIVE (waterfowl use of ponded areas during the hunting season) + NEGATIVE (risk of drainage system failure that could interfere with hunting and other recreational activities)	0	POSITIVE where armored (reduced erosion and sedimentation allowing the drainage system to function more effectively and thus reduce flood risk) + SLIGHTLY NEGATIVE (for areas upstream and downstream due to increase sedimentation and erosion on surrounding lands, though minimized by existing ditch geometry and proposed riprap installation design).	2+	POSITIVE Long Term (increased habitat for wildlife, and thus enhanced opportunities for hunting, wildlife viewing, etc.; as system increases potential for long-term riparian recovery).	3+
<i>Human Environment – Historic and Cultural Resources (HCR)</i>	No resources are recommended as eligible for the National Register of Historic Places (NRHP). No Tribal culturally significant properties were identified.	0	No resources are recommended as eligible for the National Register of Historic Places (NRHP). No Tribal culturally significant properties were identified.	0	No resources are recommended as eligible for the National Register of Historic Places (NRHP). No Tribal culturally significant properties were identified.	0
<i>Human Environment –</i>	There would be no change from	0	There would be no change from existing conditions.	0	There would be no change from	0

Alternatives						
Alternative 1 - No Action/ FWOFI			Alternative 2 - Structural		Alternative 3 – Nonstructural	
Resource or Concern	Impact on Resource	Rating ¹	Impact on Resource	Rating ¹	Impact on Resource	Rating ¹
Scenic and Visual Resources	existing conditions.				existing conditions.	
Supporting Services: Nutrient Cycling, Soil Formation, Primary Production						
<i>Human Environment – Public Health and Safety</i>	Same as Socioeconomic, Social and Cultural Issues	3-	Same as Socioeconomic, Social and Cultural Issues	2+	Same as Socioeconomic, Social and Cultural Issues + NEGATIVE Short Term (continued erosion and headcutting, inadequate drainage, and flooding).	3-
<i>Human Environment – Potable Water Supply (in the area, this is sourced primarily from groundwater)</i>	Nutrient and pesticide transport into groundwater could increase over time as duration of ponding in croplands increases.	3-	Nutrient and pesticide transport into groundwater could decrease over time with native plantings filtering surface water; duration of ponding would decrease on cropland with more effective ditch stabilization.	2+	Nutrient and pesticide transport into groundwater could decrease over time as easement acquisition reduces actively farmed acreage and associated chemical inputs.	2+
<i>Human Environment – Energy</i>		0	POSITIVE where armored (less regular use of equipment for bank stabilization and seeding) + NEGATIVE (use of equipment during installation) +	2+	POSITIVE (decreased use of equipment to maintain ditches as system increases potential for long-term riparian recovery).	3+

Alternatives						
Alternative 1 - No Action/ FWOFI			Alternative 2 - Structural		Alternative 3 – Nonstructural	
Resource or Concern	Impact on Resource	Rating ¹	Impact on Resource	Rating ¹	Impact on Resource	Rating ¹
			SLIGHTLY NEGATIVE (some continued use of equipment to maintain ditches).			
Total Alternative Rating		42-		36+		25+

¹Ecosystem Service Trade-Off Rating Symbolology for Impact: 0 = Little to no impact; 1+ = minor benefit, long- or short-term; 1- = minor impact, long- or short-term, not requiring mitigation; 2+ = moderate benefit, temporary or permanent duration, benefit not resulting in major benefit; 2- = moderate impact, long- or short-term duration, replaceable or restorable action with mitigation measure; 3+ = major benefit, long-term or permanent duration, improve service enough to change status [e.g. removing waterbody from the 303(d) list of impaired waters]; 3- = major impact with long-term or permanent effect, significantly controversial action, result in loss of life or unmitigable impact, does not meet Federal Objective.

Although Alternative 3 may provide long-term ecological benefits, it is not consistent with the intent of PL 83-566, which emphasizes conservation and proper use of land and water resources in support of agricultural productivity and watershed function. Large-scale easement acquisition would permanently remove substantial areas of Prime Farmland from production and shift land use away from the drainage system's established agricultural purpose without rehabilitating existing infrastructure. The magnitude of easement acquisition and associated Sponsor cost-share obligations also makes the alternative comparatively inefficient and of limited acceptability relative to structural rehabilitation.

6. ENVIRONMENTAL CONSEQUENCES

6.1. Effects on Existing Conditions

This section describes the economic, environmental, and social effects of the alternatives carried forward for detailed analysis (Alternatives 1-3; see Section 5). Effects are evaluated in accordance with NEPA and are categorized as follows:

- **Direct** effects are caused by the Project, at a similar time and location where the action is implemented.
- **Indirect** effects are also caused by the Project, but it is reasonably foreseeable that they could occur later in time or farther removed in distance.
- **Cumulative** result from the incremental impact of the Project when added to other past, present, and reasonably foreseeable future actions, regardless of the entity undertaking those actions.

Effects may also vary in duration. Where relevant, impacts are described as short-term (occurring during construction or immediately thereafter) or long-term (persisting beyond the construction period).

Project-related impacts may vary across the broader watershed but are expected to be predominantly direct in nature. Where long-term effects may occur, these would still originate in the direct impacts occurring at the time of Project construction and implementation of the Proposed Action. Effects of the alternatives would result primarily from the installation of vegetative buffers, bank toe riprap, and parallel drain installation along the drainage ditches that have been maintained for agricultural purposes for more than 100 years.

Construction associated with the Structural Alternative would occur within previously disturbed drainage corridors and adjacent agricultural lands. Direct construction-related effects would be confined to active work areas and would not extend beyond identified limits of disturbance.

Several Project components have well-established effect pathways:

- Spreading and seeding generally result in beneficial effects through soil stabilization and vegetation establishment, with only short-term, minor adverse effects related to air quality and energy use during construction activities, provided that appropriate seed mixes are selected and successfully established.
- Riprap installation has the potential for both beneficial and adverse effects:
 - Riprap has been widely used to reduce bank erosion in riparian systems. Reduced erosion limits sediment input to surface waters and improves ditch stability; however, these benefits are localized to areas where riprap is installed.
 - Riprap may alter sediment transport processes, potentially resulting in sediment deposition upstream or scour downstream of armored sections due to changes in flow velocity or channel hydraulics (Fischenich, 2003).
 - In this Project, potential adverse effects of riprap are expected to be minimized due to the existing channelized ditch geometry and the application of site-specific riprap design measures intended to reduce upstream and downstream impacts. Because the

drainage ditches have already been dredged and modified, the magnitude of riprap-related impacts is expected to be substantially less than in natural stream systems.

Accordingly, the use of riprap involves tradeoffs that are evaluated on a site-specific basis. Unless otherwise noted, riprap-related impacts are expected to be limited to the ditch segments where riprap is installed, rather than extending throughout the upstream or downstream system.

Section 6.2 evaluates direct, indirect, and cumulative effects on natural resources and the human environment and is organized to correspond with Section 4.3. Section 6.3 evaluates effects on Provisioning, Regulating, and Cultural ecosystem services consistent with Section 4.4. Section 6.4 presents the cumulative effects analysis.

6.2. Consequences for Natural Resources and the Human Environment

This section describes how the alternatives carried forward for detailed analysis would affect natural resources and components of the human environment identified as relevant during the scoping process (**Table 3-1**) and described in Section 4.3.

6.2.1. Soils

Erosion and Sedimentation

Alternative 1: No Action/FWOFI

Under the No Action/FWOFI, sheet, rill, and gully erosion from cultivated fields would continue to deliver sediment to the drainage ditches. Concentrated flow at field overfalls would persist, allowing gully headcuts to migrate upslope and contributing to continued soil loss from agricultural lands. Sediment deposition within ditches would further reduce conveyance efficiency and increase maintenance needs.

These conditions would occur in the short term and are expected to worsen over time as erosion and sediment accumulation continue. Although the Sponsor would likely continue routine sediment removal as part of ongoing O&M, such activities would be limited to in-ditch material above the ordinary high water mark and would not address upland erosion sources or ongoing soil loss from agricultural fields.

Alternative 2: Structural (Locally Preferred)

Structural measures under Alternative 2, including riprap armoring, parallel subsurface drains, and vegetative buffers would reduce bank instability, headcutting, and slumping in treated reaches. Bank regrading of accumulated sediment and establishment of vegetative buffers would reduce surface runoff and sediment delivery to the drainage system. Collectively, these measures would improve soil stability within the Project Area and reduce sediment deposition in stabilized ditch segments.

Localized changes in sediment transport may occur adjacent to armored reaches as ditch hydraulics adjust, including potential sediment deposition upstream and localized scour downstream of stabilized sections. These effects would be limited in extent and associated with altered flow conditions near improved reaches. At the Subwatershed scale, this alternative may result in a net reduction in sediment delivery downstream.

Alternative 3: Nonstructural (Easement Acquisition)

In the short term, Alternative 3 would result in effects similar to the No Action/FWOFI alternative, as no physical stabilization measures would be implemented. Over the long term, erosion rates may decrease in areas converted from active agricultural production if vegetative recovery occurs within acquired easements. However, because erosion sources upstream and along non-easement reaches would remain unaddressed, overall reductions in sediment delivery would likely be localized and limited at the watershed scale.

Prime and Unique Farmland and Farmland of Statewide Importance

Alternative 1: No Action/FWOFI

Under the No Action/FWOFI alternative, existing conditions would persist. Routine maintenance activities within the Main Ditch system would continue but would not address ongoing bank erosion, sedimentation, or declining drainage capacity. Over time, ditch banks would continue to erode laterally into adjacent fields, resulting in loss of Prime Farmland, increased sediment delivery, and more frequent and prolonged flooding of agricultural lands.

Soil-bound nutrients would continue to be lost through erosion, reducing soil health and nutrient cycling efficiency and contributing to degraded water quality. Standing water would continue to pool on Prime Farmland following flood events due to reduced system capacity and degraded drainage infrastructure.

Alternative 2: Structural (Locally Preferred)

Under Alternative 2, installation of bank toe riprap armoring, parallel subsurface drainage, and vegetative buffers would reduce bank erosion and lateral channel migration within treated reaches, thereby protecting adjacent Prime Farmland from continued conversion to ditch and spoil areas. These measures would reduce soil loss from stabilized banks and upland field edges and would improve long-term drainage performance in most areas.

Hydraulic modeling of the 100-year floodplain indicates that Alternative 2 generally reduces flood extent and duration across much of the Subwatershed, while identifying limited locations where localized increases or decreases in flood depth or inundation extent may occur. These localized changes are associated with redistribution of flows within the existing drainage network and site-specific hydraulic controls such as channel geometry, crossings, and stabilization features.

Localized sediment redistribution may occur near armored reaches, including sediment deposition upstream or localized scour downstream of riprap installations. Where present, these effects would be confined to discrete segments and would not alter overall system performance. Overall, Alternative 2 is expected to result in a net beneficial effect on Prime Farmland by reducing erosion rates, sediment delivery, and long-term flood impacts.

Alternative 3: Nonstructural (Easement Acquisition)

In the short term, conditions under Alternative 3 would be similar to the No Action/FWOFI alternative, as no physical improvements to the drainage system would occur. Bank erosion, sedimentation, nutrient loss, and flooding of agricultural lands adjacent to ditches would continue.

Over the long term, localized reductions in claimed flood damages may occur within easement areas if agricultural use is removed and riparian recovery occurs. However, because drainage infrastructure would remain unimproved and agricultural production would continue outside easement areas, benefits to Prime Farmland would be limited in extent and would not offset ongoing erosion and flooding impacts elsewhere in the Subwatershed.

6.2.2. Water

Floodplain Management

Alternative 1: No Action/FWOFI

Under the No Action/FWOFI alternative, existing floodplain conditions would persist. Operation and maintenance activities would continue but would not address declining conveyance capacity or ongoing channel degradation. Flooding would continue to affect agricultural land, property, and infrastructure, and flood frequency and duration would likely increase over time as sediment accumulation and bank instability further reduce channel capacity.

Alternative 2: Structural (Locally Preferred)

Under Alternative 2, bank stabilization and associated measures would increase conveyance capacity within treated reaches and reduce sediment inputs from unstable banks. These improvements would not occur uniformly across the Project Area but would generally improve drainage performance in stabilized segments. Parallel subsurface drains would lower localized groundwater levels adjacent to treated reaches, reducing ponding in those areas.

Hydraulic modeling of the 100-year floodplain indicates that Alternative 2 generally reduces flood extents and duration across much of the Project Area, while identifying limited, discrete locations where flood depth or inundation extent increases relative to the FWOFI condition. These localized increases reflect redistribution of flows within the existing drainage network and are influenced by site-specific hydraulic controls, including channel geometry, crossings, outlet discharges, and stabilization features.

Localized sediment redistribution may occur adjacent to armored reaches, including upstream deposition or downstream scour. Where present, these effects would be confined to discrete segments and would not alter overall system performance. Across the Project Area, Alternative 2 is expected to result in a net beneficial effect on floodplain management by reducing long-term bank instability, sediment accumulation, and overall flood duration, while localized increases in flooding may occur near stabilized reaches.

Alternative 3: Nonstructural (Easement Acquisition)

In the short term, flood events would cause increased damage to surrounding lands and infrastructure, similar to Alternative 1. Over the long term, flood exposure would be reduced within easement areas as agricultural use is removed and riparian recovery occurs; however, because drainage infrastructure would remain unimproved, flood elevations and durations elsewhere in the Subwatershed would remain largely unchanged.

Waters of the U.S. (Streams, Lakes and Wetlands)

Alternative 1: No Action/FWOFI

Under this alternative, existing conditions would persist. Following flood events, previously removed sediment and eroding ditch banks would continue to contribute sediment to streams (engineered ditches), adversely impacting water quality and aquatic habitat. Ponding would occur on agricultural fields and roadways.

Although National Wetlands Inventory mapping identifies riverine and forested wetlands within the Project Area, no lakes or wetlands were identified during field surveys, likely reflecting extensive historical drainage modification and intensive agricultural land use. Under FWOFI, conditions affecting waters of the U.S. (WOTUS) would remain unchanged, and mapped wetlands would continue to be indirectly influenced by sedimentation, altered hydrology, and ongoing drainage system degradation.

Alternative 2: Structural (Locally Preferred)

This alternative could result in short-term, localized disturbances to WOTUS during construction, including temporary increase in turbidity and localized displacement of benthic organisms associated with excavation grading, and armoring activities. Effects would be short-term and confined to active work areas. Indirect effects could include localized changes in sediment transport and hydraulic conditions near stabilized ditches following installation of permanent armoring.

Over the long term, bank stabilization and reduced erosion would decrease sediment inputs and improve channel stability within treated segments. Localized adverse effects may occur where altered hydraulics result in upstream sediment deposition or downstream scour adjacent to armored sections; these effects would be confined to discrete reaches.

When evaluated at the watershed scale, cumulative effects on streams and mapped wetlands are expected to be minor to beneficial, as reductions in bank erosion and sediment delivery would partially offset ongoing impacts associated with regional agricultural drainage and land management.

Alternative 3: Nonstructural (Easement Acquisition)

In the short term, effects would be similar to Alternative 1, as no physical stabilization measures would be implemented. Over the long term, riparian recovery within easement areas may reduce localized impacts to WOTUS; however, because drainage infrastructure would remain unimproved and agricultural land use would continue outside easement areas, benefits would be localized and would not substantially alter drainage performance or flood risk across the Subwatershed.

Surface Water Quality (CWA)

Alternative 1: No Action/FWOFI

Conditions would remain unchanged. Continued and potentially worsening erosion would increase turbidity and nutrient loading as more soil erodes into streams (engineered ditches). Sedimentation in ditches would create localized areas of reduced flow and standing water, which may further degrade water quality through reduced dissolved oxygen and increased nutrient concentrations.

Lateral No. 2 is listed on Missouri's 2020 Section 303(d) list of impaired waters for low dissolved oxygen and elevated ammonia, and it also has an approved sediment TMDL. These impairments are commonly associated with agricultural runoff, nutrient enrichment, and organic matter accumulation. Although the ammonia impairment has been proposed for delisting on the 2022 303(d) list (MDNR 2022), no actions under this alternative would address sediment sources or drainage inefficiencies contributing to water quality degradation.

Alternative 2: Structural (Locally Preferred)

Alternative 2 would reduce bank erosion and sediment delivery in treated reaches, which would lower turbidity and sediment-associated transport of nutrients and contaminants. These changes are expected to support incremental water quality improvements over time, including reduced sediment loading consistent with the sediment TMDL framework.

Short-term construction effects would include localized increases in suspended sediment and turbidity within active work areas. In addition, riprap may cause localized sediment redistribution near armored reaches (e.g., minor deposition upstream or scour downstream) due to site-specific hydraulic adjustments. Effects would be short-term and confined to active work areas.

Overall, Alternative 2 is expected to have a net beneficial effect on surface water quality by reducing sediment loading and improving channel stability, despite localized short-term construction effects and limited reach-scale hydraulic adjustments.

Alternative 3: Nonstructural (Easement Acquisition)

In the short term, effects would be similar to No Action/FWOFI because no stabilization measures would be implemented. Over the long term, water quality may improve within easement areas if agricultural disturbance declines and vegetative recovery occurs. However, because the drainage network and upstream sediment sources would remain largely unchanged outside easement areas, water quality benefits would be localized and would not be expected to substantially improve impairment conditions when evaluated at the watershed scale.

Surface Water Quantity**Alternative 1: No Action/FWOFI**

Under the No Action/FWOFI alternative, existing conditions would persist. Floodwater would continue to pond on agricultural fields and roadways due to inadequate drainage capacity and ongoing sediment accumulation within the ditch system. Sedimentation would restrict flow, creating localized pools of standing water and prolonged inundation following precipitation events.

Alternative 2: Structural (Locally Preferred)

Under Alternative 2, stabilized portions of the drainage system would convey floodwaters more efficiently, reducing ponding and flood duration in many areas. Improved conveyance and reduced sediment accumulation would benefit agricultural lands, roadways, and infrastructure within treated reaches. Parallel subsurface drains would further reduce localized ponding by lowering shallow groundwater levels adjacent to stabilized segments. Effects would be short-term and confined to active work areas. As described in Section 6.2.2, localized changes in flood depth or extent may occur in limited areas due to redistribution of flows.

Across the Project Area, Alternative 2 is expected to result in a net beneficial effect on surface water quantity by reducing long-term sediment accumulation, improving drainage efficiency, and decreasing overall flood duration, despite localized increases in flooding near treated segments.

Alternative 3: Nonstructural (Easement Acquisition)

In the short term, effects would be similar to the No Action/FWOFI alternative, as no physical drainage improvements would occur. Over the long term, surface water quantity impacts would be reduced within easement areas; however, because drainage infrastructure would remain unimproved and agricultural drainage would continue outside easement areas, reductions in flooding and ponding would be localized and would not substantially improve surface water quantity management at the Subwatershed scale.

Groundwater Quality and Sole Source Aquifers

Alternative 1: No Action/FWOFI

Under this alternative, existing groundwater conditions would persist. Continued ponding of floodwaters on agricultural fields could increase transport of nutrients and pollutants into groundwater, particularly in areas with poorly drained soils. Ongoing erosion and sediment accumulation would continue to impair drainage efficiency, prolonging saturation and increasing the potential for nutrient leaching. No Sole Source Aquifers are located within the Project Area.

Alternative 2: Structural (Locally Preferred)

Under Alternative 2, effects on groundwater quality would be minor. Reduced surface ponding and improved drainage within stabilized reaches would slightly alter shallow subsurface hydrologic conditions adjacent to treated ditches. These changes may reduce the duration of saturated conditions and associated nutrient transport to shallow groundwater in localized areas.

Localized changes in infiltration patterns may occur where banks are armored or regraded; however, these effects would be limited in extent and would not be expected to result in measurable degradation of groundwater quality. Effects would be short-term and confined to active work areas. Overall, groundwater conditions are expected to remain stable, with localized indirect effects generally neutral to slightly beneficial due to improved surface water management.

Alternative 3: Nonstructural (Easement Acquisition)

In the short term, this alternative would have a similar impact to Alternative 1, as no physical drainage improvements would be implemented. Over the long term, there would be reduced impact to groundwater as the system increases potential for long-term riparian recovery. However, because drainage infrastructure would remain unimproved and agricultural practices would continue outside easement areas, groundwater quality benefits would be localized and limited when evaluated at the watershed scale.

Regional Water Resource Management Plans

Alternative 1: No Action/FWOFI: No change to existing conditions.

Alternative 2: Structural: No change to existing conditions.

Alternative 3: Nonstructural: No change to existing conditions.

6.2.3. Air

Air Quality (Clean Air Act)

Alternative 1: No Action/FWOFI

Under this alternative, existing air quality conditions would persist. The counties in the Project Area are not designated as nonattainment areas for NAAQS. There could be temporary localized increases in air pollutant emissions from heavy equipment during routine O&M activities, including sediment removal and reshaping of ditch bank walls following flood events. Since the ditch walls are not armored by rock or vegetation, heavy equipment would be needed more often to address erosion from flood events, resulting in periodic short-term emissions.

Alternative 2: Structural (Locally Preferred)

This alternative would result in short-term, localized increases in air pollutant emissions from heavy equipment during installation. These emissions would be temporary and limited to the construction period.

Over the long term, air quality impacts are expected to be neutral to slightly positive impacts. The establishment of native vegetation and bank stabilization would reduce wind erosion of bank soils, thereby decreasing dust generation. In addition, riprap could also have positive long-term effects on air quality, as it would lead to decreased use of heavy equipment in regular maintenance of eroding ditch banks, resulting in reduced long-term emissions compared to Alternative 1.

Alternative 3: Nonstructural (Easement Acquisition)

In the short term, this alternative would have no measurable change to existing air quality, as no construction activities would occur. Over the long term, impacts to air quality could be neutral to slightly positive as the system is converted from croplands to easements, as vegetated riparian areas replace exposed agricultural soils, reducing wind erosion. However, because agricultural activities would occur outside the easement areas, air quality benefits would be localized.

6.2.4. Plants and Animals

Fish and Wildlife Habitat and Conservation

Alternative 1: No Action/FWOFI

Under the No Action/FWOFI alternative, existing habitat conditions would persist and may gradually degrade. Continued bank erosion and sloughing would introduce sediment into drainage ditches, increasing turbidity and reducing aquatic habitat quality. Sedimentation would restrict flow capacity, resulting in localized ponding and altered hydrologic conditions. Habitat structure would remain simplified, with limited vegetative diversity and minimal pollinator habitat along ditch banks. Over time, reduced water quality and continued disturbance would limit habitat suitability for fish, amphibians, invertebrates, and wildlife species that utilize the drainage corridors.

Alternative 2: Structural (Locally Preferred)

Alternative 2 would result in temporary, localized disturbance to aquatic and riparian habitats during construction, including vegetation removal and short-term increases in turbidity within active work areas. Wildlife species may be temporarily displaced from these areas during installation activities. Effects would be short-term and confined to active work areas. As described

in Section 6.2.2, localized changes in flood depth or extent may occur in limited areas due to redistribution of flows.

Over the long term, Alternative 2 is expected to result in net beneficial effects to habitat conditions. Bank stabilization and reduced sedimentation would improve aquatic conditions within stabilized reaches. Establishment of vegetative buffers would increase plant diversity along ditch corridors and provide enhanced pollinator and terrestrial wildlife habitat. Overall, benefits associated with erosion control and vegetative establishment are expected to outweigh localized adverse effects.

Alternative 3: Nonstructural (Easement Acquisition)

In the short term, habitat conditions would be similar to Alternative 1, with continued erosion and sedimentation. Over the long term, habitat conditions may improve within easement areas as agricultural disturbance is reduced and passive riparian recovery occurs. Habitat improvements would be localized and gradual, and because drainage infrastructure would remain unimproved outside easement areas, overall habitat conditions at the Subwatershed scale would remain largely unchanged.

Threatened and Endangered Species

Alternative 1: No Action/FWOFI

Conditions would remain unchanged. Habitat conditions within the Project Area would remain largely unchanged and continue to be influenced by ongoing bank erosion, sedimentation, and routine maintenance activities. Few trees remain in the Project Area, and suitable roosting habitat for federally listed bat species is limited. No milkweed species were observed during field surveys, indicating limited suitability for monarch butterfly breeding habitat. As a result, no new direct or indirect impacts to federally listed species are anticipated under this alternative beyond those already occurring under existing conditions.

Alternative 2: Structural (Locally Preferred)

Alternative 2 would result in minor, short-term direct effects associated with construction-related disturbances, including temporary increases in turbidity, noise, and human activity within active work areas. These effects would be localized and temporary. Effects would be short-term and confined to active work areas.

Field assessments identified minimally suitable habitat for federally listed bat species within the Project Area. Limited tree removal may be required, which could result in temporary disturbance or loss of marginal roosting habitat. These effects would be localized and short term.

Over the long term, effects are expected to be neutral to slightly beneficial due to reduced erosion and sedimentation and improved habitat continuity along stabilized drainage corridors.

Agency coordination indicates no documented occurrences of federally listed species or designated critical habitat within the Project Area. Based on available information, effects are insignificant or discountable for federally listed species.

Alternative 3: Nonstructural (Easement Acquisition)

In the short term, habitat conditions would be similar to Alternative 1. Over the long term, habitat conditions may improve within easement areas as agricultural disturbance is reduced and passive riparian recovery occurs; however, benefits would be localized, and overall conditions at the Subwatershed scale would remain largely unchanged.

Migratory Bird Treaty Act/Bald and Golden Eagle Protection Act

Alternative 1: No Action/FWOFI

Under this alternative, existing conditions would persist. Continued bank erosion and sloughing would result in the gradual loss of scattered trees and marginal woody vegetation along the ditches, reducing the availability of nesting, roosting, and foraging habitat for migratory birds. These effects would occur incrementally over time as a result of ongoing erosion and maintenance activities. No new impacts specific to bald eagles are anticipated beyond existing conditions.

Alternative 2: Structural (Locally Preferred)

Effects to migratory birds would be consistent with those described for wildlife habitat above and would be short-term and confined to active work areas.

Over the long term, stabilized banks and vegetated buffers would increase habitat continuity along drainage corridors and provide additional foraging and cover opportunities for migratory birds. Bald eagles observed in the Project Area primarily utilize larger regional water bodies; therefore, long-term effects to eagles would be minimal.

Across the Project Area, Alternative 2 would result in neutral to minor beneficial effects for migratory birds through incremental increases in linear vegetative cover, while effects to bald eagles would be negligible.

Nonstructural Alternative 3:

In the short term, this alternative would be similar to Alternative 1, with continued erosion and limited habitat quality. Over the long term, there would be a positive impact to migratory bird and bald eagle habitat as the system increases potential for long-term riparian recovery through increased habitat availability, reduced disturbance, and improved ecological connectivity.

Invasive Species

Alternative 1: No Action/FWOFI

Conditions would remain unchanged. Invasive plant species would continue to colonize areas disturbed after flooding events or be transported downstream during flood events, outcompeting native vegetation. Flood events would facilitate the downstream transport of invasive plants, allowing these species to outcompete native vegetation and further degrade habitat quality within the drainage corridor.

Alternative 2: Structural (Locally Preferred)

Alternative 2 would result in short-term, localized increases in invasive species potential associated with soil disturbance and equipment activity during construction. Disturbed soils within active work areas could provide favorable conditions for invasive species documented during field assessments, including Johnsongrass (*Sorghum halepense*), Japanese hop (*Humulus japonicus*),

and sericea lespedeza (*Lespedeza cuneata*). These effects would be localized and temporary. Effects would be short-term and confined to active work areas.

Indirect effects could occur if invasive species establish within disturbed areas before native vegetation becomes established, resulting in localized reductions in habitat quality. Over the long term, stabilized banks and reduced erosion would decrease the frequency of bare soil exposure, which is a primary driver of invasive species establishment.

Overall, cumulative effects are expected to be neutral to minor beneficial, as reduced erosion and stabilized ditch banks would limit conditions that favor continued invasive species colonization.

Alternative 3: Nonstructural (Easement Acquisition)

In the short term, effects would be similar to the No Action/FWOFI alternative, with invasive species continuing to occupy disturbed areas. Over the long term, invasive species prevalence may decline within easement areas as active disturbance is reduced and passive riparian recovery occurs; however, changes would be gradual and localized.

Natural Areas

Alternative 1: No Action/FWOFI

No Missouri Natural Areas or COAs occur within the Project Area. Under the No Action/FWOFI alternative, existing conditions would persist, and no impacts to designated Natural Areas or COAs would occur.

Alternative 2: Structural (Locally Preferred Alternative)

No Missouri Natural Areas or COAs occur within the Project Area. All proposed activities would be confined to previously disturbed drainage corridors and adjacent agricultural lands. Implementation of Alternative 2 would not affect the condition, integrity, or management objectives of nearby Natural Areas or COAs.

Alternative 3: Nonstructural (Easements Acquisition)

No Missouri Natural Areas or COAs occur within the Project Area, and no direct effects would occur under this alternative. Over the long term, conservation easements may indirectly support regional habitat connectivity; however, no direct impacts to designated Natural Areas or COAs are anticipated.

Riparian Areas

Alternative 1: No Action/FWOFI

The riparian areas would continue to degrade due to ongoing bank erosion, limited native vegetation, and repeated disturbances. Sedimentation would continue to accumulate in the ditches, creating small pools of standing water and reducing conveyance capacity, and further limiting riparian function and habitat quality.

Alternative 2: Structural (Locally Preferred)

Alternative 2 would result in short-term, localized disturbance to riparian vegetation and soils within active work areas during construction. Effects would be short-term and confined to active work areas.

Over the long term, bank stabilization and vegetative establishment would increase riparian vegetation cover within treated reaches and reduce ongoing erosion. Indirect effects would include localized improvements in water quality and reductions in sediment and nutrient delivery adjacent to stabilized segments. Localized adverse effects may occur where altered hydraulics influence sediment redistribution near armored reaches.

Overall, Alternative 2 is expected to result in net beneficial effects to riparian function through reduced erosion and expanded vegetative cover, despite localized short-term disturbances and isolated hydraulic adjustments.

Alternative 3: Nonstructural (Easement Acquisition)

In the short term, riparian conditions would be similar to Alternative 1. Over the long term, riparian areas may improve within easement areas as agricultural disturbance is reduced and passive recovery occurs; however, improvements would be gradual and localized, and overall riparian conditions within the Subwatershed would remain largely unchanged.

6.2.5. Human Environment

Socioeconomic, Social, and Cultural Issues

Alternative 1: No Action/FWOFI

Under the No Action/FWOFI alternative, existing conditions would persist. Continued bank erosion, sediment accumulation, and drainage inefficiencies would adversely affect agricultural productivity and farm income. Flood-related inundation of farmland would reduce crop yields and increase economic uncertainty for producers.

Flood events would continue to disrupt transportation networks, resulting in roadway closures, delayed emergency response, and temporary impacts to schools, businesses, and residential areas. These effects would persist and may increase over time as channel capacity declines.

Alternative 2: Structural (Locally Preferred)

Alternative 2 would result in short-term economic activity associated with construction-related labor, materials, and equipment use. No displacement of residents or long-term access restrictions are anticipated.

Over the long term, improved drainage efficiency and reduced bank erosion would help preserve productive farmland and stabilize agricultural income. Reduced flood frequency and duration would improve roadway reliability and access to essential services and reduce flood-related damage to property and infrastructure.

Across the Project Area, Alternative 2 is expected to result in net beneficial socioeconomic effects through improved agricultural stability and reduced flood-related disruptions.

Alternative 3: Nonstructural (Easement Acquisition)

In the short term, effects would be similar to Alternative 1. Over the long term, flood exposure would be reduced within easement areas; however, permanent removal of agricultural lands from production would reduce local agricultural output and associated economic activity.

Socioeconomic effects would vary depending on the extent and distribution of easements and would not address drainage conditions elsewhere in the Subwatershed.

Recreation

Alternative 1: No Action/FWOFI

Under the No Action/FWOFI alternative, existing conditions would persist. Continued bank erosion and habitat degradation would maintain current limitations on wildlife viewing and hunting opportunities within the Subwatershed. During flood events, roadway inundation would continue to limit access to recreational areas, including informal recreation on private lands and nearby publicly accessible areas.

Alternative 2: Structural (Locally Preferred)

Implementation would occur primarily on privately owned agricultural lands where formal recreational facilities are not present. No direct adverse impacts to designated recreational areas are anticipated. Temporary construction-related disturbances, including noise and equipment activity, may limit informal recreational uses such as hunting or wildlife observation within active work areas; however, these effects would be localized and short term.

Over the long term, improved riparian stability and vegetative establishment may enhance habitat conditions within treated reaches, potentially supporting wildlife species utilized for hunting and wildlife observation. When evaluated at the watershed scale, recreational effects are expected to be neutral to minor beneficial.

Alternative 3: Nonstructural (Easement Acquisition)

In the short term, recreational conditions would be similar to Alternative 1. Over the long term, wildlife-related recreational opportunities may increase within easement areas as agricultural disturbance is reduced; however, access would remain dependent on land ownership and management decisions, and effects would be localized.

Public Health and Safety

Alternative 1: No Action/FWOFI

Standing water from flood events would continue to impact local roadways, forcing residents to either drive flooded roadways or postpone traveling to medical appointments, grocery stores, work, and school. The response time for emergency medical services would be impacted. School buses would not be able to travel on flooded roads, causing children to miss school and caretakers to be forced to miss work to provide childcare. Standing water would create a mosquito habitat, increasing the risk of mosquito-borne illnesses.

Alternative 2: Structural (Locally Preferred)

Alternative 2 would result in short-term, localized safety risks associated with construction activities, including heavy equipment operation and increased vehicle traffic within active work areas.

Over the long term, improved drainage performance and reduced bank erosion would generally decrease flood-related disruptions to roadways and surrounding properties. As described in Section 6.2.2, localized changes in flood depth or extent may occur in limited areas due to redistribution of flows.

Reduced sediment accumulation and improved drainage efficiency would decrease the frequency and duration of standing water in many areas, which may reduce localized public health concerns associated with prolonged ponding. Overall, Alternative 2 is expected to result in net beneficial effects on public health and safety through reduced flood-related disruptions, despite localized increases in flooding near stabilized reaches.

Alternative 3: Nonstructural (Easement Acquisition)

In the short term, effects would be similar to Alternative 1. Over the long term, flood exposure would be reduced within easement areas; however, because drainage infrastructure would remain unimproved elsewhere, public health and safety benefits would be localized and would not substantially alter conditions across the Subwatershed.

Potable Water Supply

Alternative 1: No Action/FWOFI

Continued ponding and flooding could facilitate the movement of nutrients, sediments, and other agricultural contaminants into shallow groundwater through infiltration, potentially affecting groundwater quality over time. Because potable water in the Project Area is primarily supplied by private and municipal wells, these conditions could continue to pose a localized risk to drinking water quality, particularly in areas with shallow water tables.

Alternative 2: Structural (Locally Preferred)

Short-term soil disturbance during construction could generate localized sediment runoff. Direct adverse effects to municipal or private drinking water wells are not anticipated, as construction would occur within existing drainage corridors and agricultural fields and would not involve deep excavation near potable water wells. Effects would be short-term and confined to active work areas.

Indirect effects are expected to be neutral to minor beneficial. Reduced bank erosion and sedimentation would decrease sediment- and nutrient-associated contaminant loading to surface waters and adjacent recharge areas. Vegetative buffers and stabilized banks may incrementally reduce contaminant transport to shallow groundwater in localized areas.

Overall, effects on potable water supplies are expected to be negligible to minor beneficial.

Alternative 3: Nonstructural (Easement Acquisition)

In the short term, potable water conditions would be similar to Alternative 1, with continued vulnerability to contamination from flooding and ponding. Over the long term, as the system increases potential for long-term riparian recovery, improvements in water quality and filtration would be expected to reduce potential risks to potable water supplies.

Historic and Cultural Resources

Alternative 1: No Action/FWOFI

Under this alternative, existing conditions would be unchanged. No new archaeological sites or cultural materials were identified or recovered. One architectural resource was identified (Main

Ditch and associated laterals) but was determined as not eligible for NRHP listing. Continued routine maintenance and natural erosion under existing conditions would not be expected to result in adverse effects to historic properties.

Alternative 2: Structural (Locally Preferred)

Implementation of Alternative 2 would occur within previously disturbed drainage corridors and the established APE. Based on the results of cultural resources surveys, NRCS determination and consultation with the Missouri SHPO, no historic properties would be adversely affected. The proposed activities are consistent with ongoing maintenance and improvements to the drainage system and would not alter the characteristics that define the historic integrity of identified resources. Therefore, no change to existing conditions and no adverse effects to historic or cultural resources are anticipated.

Alternative 3: Nonstructural (Easement Acquisition)

Under the Nonstructural alternative, no ground-disturbing activities would occur. As a result, no impacts to archaeological or architectural resources are anticipated, and existing conditions would remain unchanged.

Energy

Alternative 1: No Action/FWOFI

Energy consumption associated with routine O&M of the drainage system would continue and may increase over time as erosion, sedimentation, and bank instability worsen. The Sponsor would continue to rely on mowing, sediment removal, and heavy equipment to maintain ditch geometry, particularly following flood events. Gravity-fed and pumped systems would continue to be used to remove excess floodwater from agricultural fields, with energy demands potentially increasing during periods of frequent or intense rainfall.

Alternative 2: Structural (Locally Preferred)

Implementation of Alternative 2 would result in a short-term increase in energy consumption during construction activities due to the operation of heavy equipment, transportation of materials, and installation of stabilization measures.

Indirect and long-term effects are expected to be beneficial. Following construction, stabilized banks, vegetative buffers, and improved drainage efficiency would reduce erosion, sedimentation, and the frequency of maintenance activities. As a result, long-term energy use associated with ditch maintenance, sediment removal, and emergency repairs would be reduced compared to Alternative 1.

Cumulative effects are expected to be beneficial, as reduced maintenance demands and improved system performance would contribute to lower long-term energy consumption and increased operational efficiency across the drainage system and surrounding agricultural landscape.

Alternative 3: Nonstructural (Easement Acquisition)

In the short term, energy use would remain similar to that under Alternative 1. Over the long term, reduced reliance on active drainage management and maintenance within easement areas would decrease energy requirements associated with pumping, mowing, and ditch maintenance activities.

6.3. Consequences for Ecosystem Services

This section addresses aspects of ecosystem services not already evaluated in Section 6.2. Consistent with the ecosystem services framework introduced in Section 3.3, impacts are discussed within the Provisioning, Regulating, and Cultural service categories, with emphasis on broader system-level effects rather than resource-specific impacts.

6.3.1. Provisioning Services: Food, Fiber, and Biofuel Production and Water Use and Management

The environmental consequences of the proposed alternatives on agricultural resources are addressed in Section 6.2.1 from the perspective of soils, including erosion and sedimentation and impacts to Prime Farmland, Unique Farmland, and Farmland of Statewide Importance. When evaluated more broadly as provisioning services, impacts to food, fiber, and biofuel production involve multiple interacting variables, including crop type, location relative to drainage improvements, and the frequency and magnitude of flooding events. As such, precise quantification of impacts to individual agricultural commodities is not practicable.

Based on the analyses presented in Section 6.2, the Structural Alternative is expected to provide beneficial effects to agricultural production in areas adjacent to stabilized ditch reaches by reducing erosion-related loss of farmland and improving drainage efficiency. In most locations, these improvements would be expected to decrease flood-related crop damage; however, planning-level hydraulic modeling indicates the potential for localized increases in flood extent in limited areas. The degree of benefit to food, fiber, and biofuel production would vary depending on crop types, location relative to modified reaches, and site-specific hydraulic conditions.

Vegetative buffers would provide secondary benefits by filtering agricultural runoff, enhancing soil organic matter, and supporting pollinator habitat, all of which contribute to sustained agricultural productivity. Bank armoring and erosion control would reduce downstream sediment and nutrient transport, improving surface water quality and supporting more reliable water resources for irrigation and livestock.

Similar benefits apply to potable water supplies, as discussed in Section 6.2.5. The Structural Alternative would reduce the transport of nutrients and agricultural chemicals to groundwater through improved drainage performance and vegetative filtration. Under the Nonstructural Alternative, reductions would be more gradual and localized, depending on the extent of easement implementation and subsequent riparian recovery. The extent of benefit to individual wells would depend on hydrogeologic conditions, proximity to affected recharge areas, and the overall effectiveness of the selected alternative.

6.3.2. Regulating Services: Water Use and Management

The environmental consequences of the proposed alternatives on regulating services related to water use and management are addressed in Section 6.2 for soils, surface water, groundwater, plants and animals, and the human environment. The Structural Alternative would provide measurable benefits by improving water quality, enhancing floodwater conveyance, and supporting more effective management of surface and subsurface water for flood reduction and agricultural use. The Nonstructural Alternative would provide more gradual and localized benefits through reduced agricultural activity and long-term riparian recovery in easement areas.

Improved water regulation under the Structural Alternative would have positive effects on other regulating services, including reduced erosion and sedimentation, enhanced habitat function, improved pollination services, and reductions in public safety risks associated with flooding. These improvements also support broader socioeconomic benefits, including increased agricultural resilience, reduced infrastructure damage, and improved energy efficiency associated with drainage system O&M.

As with provisioning services, the magnitude and distribution of these benefits would vary by location, resource type, and the effectiveness of the selected alternative.

6.3.3. Cultural Services: Recreation Opportunities; and Historical and Cultural Resources

The environmental consequences of the proposed alternatives on cultural services, including recreation and historic and cultural resources, are addressed in Section 6.2. The Structural and Nonstructural Alternatives would not result in adverse effects to historic or cultural resources and are expected to provide neutral to beneficial effects on recreational opportunities over time.

Improvements to riparian habitat quality, water clarity, and wildlife presence would enhance informal recreational activities such as wildlife viewing, hunting, and nature appreciation where access is permitted. These benefits would occur incrementally over time and would be influenced by land ownership, access limitations, and the pace of vegetation establishment.

6.4. Cumulative Effects

Cumulative effects, as defined in Section 6.1, occur when the incremental impacts of an action are added to the effects of past, present, and reasonably foreseeable future actions, regardless of the entity undertaking those actions. Individually minor impacts may become significant when considered in combination. This cumulative effects analysis considers the impacts of the Project alternatives, including the No Action Alternative, within the context of ongoing land use, drainage management, and regional planning efforts, and evaluates how these combined actions influence the ability to meet the Project's stated purpose and need for flood damage reduction.

Recent revisions to the Council on Environmental Quality's (CEQ) NEPA regulations removed centralized regulatory definitions and returned implementation authority to individual federal agencies. Consideration of cumulative effects remains required under NEPA, NRCS-specific procedures, and the PR&G for Federal water resource investments (USDA 2018). Accordingly, cumulative effects are evaluated in this Plan consistent with applicable agency guidance and established NEPA practice.

Long-standing NEPA practice, as reflected in prior CEQ guidance (CEQ 1997, 2014), emphasizes that cumulative effects analyses should be focused and bounded to address the most relevant issues at appropriate geographic and temporal scales. Consistent with this established approach, the analysis in this Plan is framed to focus on floodplain management, drainage infrastructure, and associated ecological and socioeconomic resources at the local and regional level.

The cumulative effects analysis for this Plan is defined by the following parameters:

- **Spatial context:** This Plan involves a Project that is relatively large in scale, affecting approximately 25-mi of drainage ditches, with potential effects extending downstream of the drainage system. The analysis considers broad regional conditions for past actions and narrows to the Project Area and Subwatershed within the Missouri Bootheel region of southeastern Missouri, consistent with the planning area of the Bootheel Regional Planning and Economic Development Commission (BRPEDC).
- **Temporal context:** The analysis considers past conditions leading to the current landscape, present conditions as described in Section 4, and reasonably foreseeable future actions over an approximate five-year planning horizon, consistent with BRPEDC's 2024 Building a Better Bootheel Comprehensive Economic Development Strategy. Beyond this timeframe, future actions become increasingly speculative.
- **Key Issues:** Based on the Project's purpose and need and the impact analyses in Sections 6.2 and 6.3, cumulative effects are evaluated primarily with respect to floodplain management, drainage system performance, and fish and wildlife habitat, with secondary consideration of socioeconomic conditions and public safety.

6.4.1. Past Actions

Historically, the Project Area and the broader Missouri Bootheel region have undergone extensive transformation from prairie, forest, and swampland to agricultural and developed land uses. These past actions have substantially altered floodplain function, hydrology, and habitat structure. Long-term channelization and drainage improvements have increased agricultural productivity but have also contributed to habitat loss, altered flow regimes, increased erosion, and sedimentation.

These past cumulative effects are reflected in the existing conditions described in Section 4 and form the baseline against which the Project alternatives are evaluated. While full floodplain restoration is not feasible given existing agricultural uses, improved floodwater management and drainage system stabilization represent realistic opportunities to address ongoing cumulative impacts.

6.4.2. Present Actions

Current cumulative effects include ongoing agricultural production, routine drainage maintenance by the Sponsor, regional infrastructure use, and land management practices within the Subwatershed. These activities continue to influence erosion rates, sediment transport, water quality, habitat condition, and flood risk. Present conditions described in Section 4 incorporate the cumulative influence of these actions.

6.4.3. Reasonably Foreseeable Future Actions

BRPEDC's 2024 Building a Better Bootheel Comprehensive Economic Development Strategy identifies regional goals focused on infrastructure improvement, agricultural opportunity, economic resilience, and quality of place over the next five years. The strategy also documents ongoing socioeconomic challenges, including population decline and household income levels below the Missouri state average (BRPEDC 2024).

Regional efforts are therefore expected to continue emphasizing infrastructure improvements, agricultural support, and intergovernmental coordination. These initiatives represent reasonably

foreseeable actions relevant to cumulative effects evaluation. No specific drainage reconstruction or flood mitigation projects beyond routine maintenance have been identified within the Subwatershed during this planning horizon.

6.4.4. Cumulative Effects on the Project Alternatives

Alternative 1: No Action/FWOFI

Under the No Action Alternative, cumulative effects would continue to worsen over time. Existing erosion, sedimentation, and drainage inefficiencies would persist and interact with past and ongoing land use practices, resulting in increased flood risk, continued loss of agricultural productivity, further degradation of aquatic and riparian habitat, and recurring impacts to infrastructure and public safety.

Alternative 2: Structural (Locally Preferred)

When considered alongside past actions and reasonably foreseeable regional efforts, the Structural Alternative would result in overall beneficial cumulative effects. Planning-level hydraulic modeling identifies limited areas of localized floodplain redistribution under the 100-year event; however, these areas are minor in geographic extent relative to the overall Subwatershed.

Improvements to bank stability, erosion control, drainage performance, and riparian vegetation would counter long-term impacts associated with historic channel modification and intensive land use. Collectively, these changes would support floodplain management objectives, improve water quality and habitat conditions, and enhance the long-term resilience of agricultural lands and local infrastructure.

Alternative 3: Nonstructural Alternative (Easement Acquisition)

The Nonstructural Alternative would yield beneficial cumulative effects over the long term by reducing flood exposure in easement areas and allowing for gradual riparian recovery. However, these benefits would be limited in extent and would occur slowly, as no physical improvements to drainage performance or erosion sources outside the easement areas would be implemented.

6.4.5. Integration of Regional Planning Goals

Table 6-1 summarizes the relationship between DD37's Project goal of flood reduction and the strategic goals identified by BRPEDC (2024). While these goals do not represent site-specific actions, they provide context for anticipated infrastructure, land use, and economic initiatives within the region.

In the Missouri Bootheel, flood reduction directly supports public infrastructure reliability, agricultural resiliency, quality of place, recreation, and overall community well-being. Actions that improve drainage performance therefore also support broader regional objectives related to economic stability, land stewardship, and long-term sustainability.

Table 6-1. Bootheel Region Strategic Goals in Relation to Project Goals

BRPEDC Strategic Goal	Connection to Flood Reduction
Public Infrastructure	Recognizes that ineffective or vulnerable infrastructure poses risks to public health and safety, particularly during flood events.
Agricultural Resiliency	Seeks to improve agricultural opportunities and evaluate their economic impacts; flood reduction supports stable crop production and farm viability.
Quality of Place	Emphasizes improving the region as a place to live and work; reduced flooding contributes to safer communities and improved environmental conditions.
Business Development	Identifies challenges related to business retention and expansion; flood-resilient infrastructure supports long-term economic investment.
Workforce Development	Economic conditions are interrelated with infrastructure reliability, quality of life, and regional resiliency.
Build Capacity of the BRPEDC	Recognizes the need to strengthen regional planning capacity to address infrastructure, economic, and environmental challenges.

6.4.6. Summary of Regional Planning Integration

Evaluation of near-term regional planning objectives indicates that implementation of the Locally Preferred Alternative would result in largely beneficial cumulative effects within the Subwatershed and broader Missouri Bootheel. The proposed structural measures would strengthen drainage system performance and directly support regional goals related to infrastructure resilience, agricultural productivity, and quality of place.

In contrast, the FWOFI and Nonstructural Alternatives would leave the identified flood reduction need largely unmet. Continued flooding, combined with historic landscape modification and existing infrastructure constraints, would be expected to contribute to an adverse cumulative trend affecting agricultural viability, community stability, and environmental conditions over time.

7. RISK AND UNCERTAINTY

Shifting weather patterns introduce uncertainty into hydrologic modeling used to estimate future peak storm events. Changes in precipitation intensity, frequency, and distribution increase uncertainty in rainfall depths associated with published values such as Probable Maximum Precipitation and statistically derived storm events (e.g., the 100-year storm). The most current and best available published data were used in developing all storm event assumptions and analyses for this Plan. Despite this, future deviations from modeled conditions could result in increased Project costs, reduced performance, or the need for design adjustments to maintain intended levels of flood damage reduction. These uncertainties apply equally to all proposed ditch improvement alternatives and, therefore, do not materially affect the comparative evaluation or selection of the Locally Preferred Alternative; however, they could influence the realization of projected benefit/cost ratios (BCRs) over time.

Future land use also represents a source of uncertainty. At the time of preparation of this Plan, no proposed development projects are known within the Subwatershed or downstream of the Project Area. While the proximity of adjacent urban areas and undeveloped lands suggests some potential for future urbanization, the region is not currently experiencing significant development pressure and is expected to remain predominantly in agricultural use for the foreseeable future. Consequently, land use change is not anticipated to substantially affect Project performance or alter the comparative conclusions of this Plan during the planning horizon.

8. CONSULTATION, COORDINATION, AND PUBLIC PARTICIPATION

The Project team developed a Public Participation Plan, including a comprehensive mailing list of agencies, groups, and individual stakeholders, in consultation with the Sponsor and NRCS. The Public Participation Plan complied with NRCS General Title 400, Part 400 – Public Participation Policy.

A comprehensive mailing list was developed and maintained to support outreach, coordination, and public notification efforts. The mailing list, provided in Section 12 of this Plan and **Appendix A**, was used to solicit input and to announce public meetings and other participation opportunities. It included Tribal, federal, state, and local government agencies; elected officials; environmental and public interest organizations; other interested stakeholders; and local newspapers. The list also included affected landowners, including potential ROW grantors, property owners whose land may be temporarily used for Project purposes, residents located within proximity to the Project Area, and individuals who submitted comments on the Project. The mailing list was updated periodically as the planning and environmental review process progressed.

Additional internal consultation and coordination took place between NRCS and the Sponsor throughout the planning process. Findings and discussions during these monthly meetings have enhanced the scoping for this Project by narrowing down the areas where flood damage reduction and erosion control are most needed and most likely to improve current conditions in the watershed's ditches.

8.1. Consultation

8.1.1 Tribal Governments

NRCS solicited input from the Tribal governments listed below during development of this Plan on July 15, 2024. Federally recognized Tribal lands, as defined in the NHPA, do not occur in Missouri. The invitation to participate as a consulting party was requested pursuant to Section 106 of the National Historic Preservation Act of 1966, as amended (16 U.S.C. § 470 et seq.), and the Protection of Historic Properties regulations (36 CFR Part 800). The five Tribes listed below were identified as having Tribal interests in Stoddard County (MODOT 2024). Tribes were invited to participate as consulting parties regarding potential effects to historic properties, including Traditional Cultural Properties, Places of Religious and Cultural Significance, Indian Sacred Sites, and other culturally sensitive resources.

Tribal responses indicated no adverse effects to historic properties based on the alternatives evaluated in this Plan. Correspondence is provided in **Appendix A**.

Consulted Tribes included:

- Osage Nation
- Quapaw Nation
- Shawnee Tribe
- Absentee-Shawnee Tribe of Indians of Oklahoma
- Eastern Shawnee Tribe of Oklahoma

8.1.2. Federal Agencies

The planning team coordinated technical submissions and draft documents with NRCS throughout Plan development. NRCS served as the lead federal agency and tribal liaison.

Input was solicited from the following federal agencies:

- U.S. Army Corps of Engineers – Memphis District, Regulatory Division
- U.S. Environmental Protection Agency – Region 7
- Federal Emergency Management Agency
- U.S. Fish and Wildlife Service
- U.S. Geological Survey
- USDA Farm Service Agency
- USDA Forest Service
- USDA Rural Development

U.S. Environmental Protection Agency (EPA Region 7)

EPA correspondence (**Appendix A**) provided recommendations regarding:

- 303(d) impaired waters (Lateral No. 2 Main Ditch)
- Wetlands and streams and applicability of Section 404 of the CWA
- Air quality considerations during construction
- Infrastructure resiliency
- Demolition debris and contamination
- Energy efficiency
- Pollinator habitat and native plant species
- Land use planning coordination

EPA recommendations were considered in development of the alternatives and environmental analysis presented in this Plan.

U.S. Fish and Wildlife Service (USFWS)

The Official Species List obtained from USFWS is included in **Appendix A** and summarized in **Appendix D, Table D6-3a**. An email was sent to USFWS to initiate consultation on March 12, 2026 and the USFWS concurrence was received on April 21, 2026. An updated species list was obtained on June 30, 2026, no additional species were noted. Correspondence is provided in **Appendix A**.

Consultation Records

Consultation records are maintained as part of this Plan and include correspondence with:

- Missouri State Historic Preservation Office (historic and cultural resources)
- U.S. Army Corps of Engineers (wetlands and waters)
- U.S. Fish and Wildlife Service (federal threatened and endangered species)
- Missouri Department of Natural Resources (state-listed species and water quality)

8.1.3. State Agencies

Input was solicited from the following state agencies.

- Missouri Department of Conservation
- Consultation findings are included in **Appendix A** and summarized in Section 4.3.4.
- Missouri Department of Natural Resources, Water Protection Program

- Missouri Department of Natural Resources, State Historic Preservation Office
- Missouri State Emergency Management Agency (SEMA)
- Missouri State Floodplain Administrators
- Missouri Department of Agriculture
- Missouri Department of Transportation
- Missouri Farm Bureau

Consultation findings and agency correspondence are included in **Appendix A** and are summarized, where applicable, in Section 4 and Section 6 of this Plan.

Missouri Department of Conservation

MDC coordination addressed wildlife resources and habitat considerations within the Project Area. Consultation findings are included in Appendix A and summarized in Section 4.3.4.

Missouri Department of Natural Resources – Water Protection Program

MDNR correspondence (**Appendix A**) identified considerations related to:

- Location within the New Madrid Seismic Zone
- Karst geology and groundwater sensitivity
- Public and private wells within the Project vicinity
- Public lands, including Holly Ridge Conservation Area
- Water quality protection and designated uses
- 303(d)-listed impaired waters and waters with TMDLs
- Applicability of CWA Sections 401 and 404
- Stream and wetland mitigation requirements under state methodology
- Land disturbance and sediment management
- Hazardous waste considerations
- Air quality during construction
- Floodplain coordination
- State-listed species coordination

These considerations were evaluated during alternative development and environmental analysis. Regulatory requirements, where applicable, would be addressed through separate permitting processes.

Missouri Department of Natural Resources – State Historic Preservation Office

NRCS consulted with SHPO regarding the determination of no adverse effect and the National Register of Historic Places (NRHP) eligibility of resource AR-1 on October 21, 2024. SHPO concurred with NRCS's finding in a letter dated March 27, 2025. Correspondence is included in **Appendix A**.

8.1.4 Local Agencies

Input was solicited from the following local agencies:

- City of Dexter
- City of Bernie
- Stoddard County Commission

- Stoddard County Soil and Water Conservation District

The City of Dexter submitted correspondence during the public comment period following the August 21, 2024 public meeting expressing support for investment in drainage improvements and bank stabilization within DD37. Correspondence is included in **Appendix A**.

8.1.5 Elected Officials and Delegates

Notification and opportunity for comment were provided to the following elected officials and governmental offices:

- Governor of Missouri
- US Congress – Senate
- US Congress – House, 8th Congressional District
- Missouri State Senate – Senate District 25
- Missouri State Representative – House District 151

8.1.6 Landowners and Public Meeting Attendees

Affected landowners within the Project Area and members of the public were provided opportunities to comment during the public participation process. Public meetings were conducted in accordance with the Public Participation Plan, and written comments were accepted during designated comment periods. Documentation of public comments and agency responses is included in **Appendix A**.

8.2. Summary of Natural Resources, Cultural Resources, and Tribal Consultations

The following tables summarize consultation activities related to cultural resources and wildlife.

Table 8-1 documents coordination with SHPO and Tribes under Section 106 of the National Historic Preservation Act.

Table 8-2 summarizes state and federal wildlife consultation.

Table 8-1. Cultural Resources and Tribal Consultation

Pedestrian Survey conducted by NRCS Archaeologist	X Yes	“ No	Date: 12/05/2024
Historic Resources Survey	X Yes	“ No	Date: 12/05/2024
Cultural Resources Identified	Yes	X “No	Date: N/A
Consultation with State Historic Preservation Office	X Yes	“ No	Date: 03/27/2025
Consultation with Tribes	X Yes	“No	Date: 07/15/2024
See list in Section 8.1.1 for tribes contacted.			

Table 8-2. Environmental/Wildlife Consultation

U.S. Fish and Wildlife Service (Project Code 2025-0047330)	X Yes	“ No	Date: 10/13/2025, 01/20/2026, 3/10/2026, 04/21/2026, 06/30/2026, Ongoing
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U.S. Army Corps of Engineers	X Yes	" No	Date: 09/05/2023, Ongoing
Missouri Department of Conservation	X Yes	"No	Date: 10/03/2025, Ongoing

8.3. Public Meetings

NRCS and the Sponsor conducted agency and public scoping meetings to inform the public about the Project and to solicit comments for the scoping and environmental review process. In addition, the Sponsor held internal scoping meetings with the NRCS National Water Management Center, NRCS staff, and project consultants to address technical questions and receive input during the initial planning phase (see Section 3.1).

Two public meetings were held on August 21, 2024, and November XX, 2026. Notice of each public meeting was published approximately two to three weeks in advance in the Bernie Banner and the Dexter Statesman. Written invitations were distributed to stakeholders on July 15, 2024, and October XX, 2026, respectively.

Both the Initial Public Scoping Meeting and the Final Public Informational Meeting were held at the Stoddard County USDA Service Center (18450 Ridgeview Lane, Dexter, Missouri 63841). Each meeting was also conducted concurrently via a live virtual stream using Microsoft Teams to accommodate remote participation.

The meetings provided information regarding the Project purpose and need, scope, and the environmental planning process associated with development of the Plan. The first public meeting served primarily as a scoping meeting to introduce the Project and to identify issues, needs, and concerns. Discussion topics included potential improvements to the existing drainage ditch system and possible effects on downstream agricultural lands. Meeting minutes and sign-in sheets from the initial public meeting are included in **Appendix A**.

The second public meeting focused on presentation of the alternatives evaluated in the Plan and preliminary cost estimates. Discussion topics included the feasibility of proposed bank armoring, parallel drainage systems, vegetative buffers, and anticipated cost-share requirements for DD37. Meeting minutes and sign-in sheets from the second public meeting are also provided in **Appendix A**.

9. THE PREFERRED ALTERNATIVE

9.1. Rationale for the Preferred Alternative

Three primary alternatives were considered for this Project: Future Without Federal Investment (FWOFI), Structural Alternative, and a Nonstructural Alternative involving floodplain conservation easements through property acquisition. A detailed description of these alternatives is provided in Section 5.

The FWOFI alternative includes no comprehensive improvements to the Main Ditch and its tributaries within the Subwatershed. Although it represents the lowest federal expenditure because it involves no federal participation, it would not meet the Project's purpose and need. Under FWOFI, ongoing erosion, sediment accumulation, and declining conveyance capacity would continue to increase flood damages to agricultural lands and infrastructure within the Subwatershed.

The Structural Alternative relies on a combined approach of vegetative stabilization and targeted structural measures to address erosion and flood damage along the drainage ditches. Native grasses would be established along ditch top-of-banks and reshaped side slopes where appropriate to stabilize soils and reduce erosion. In reaches where vegetation alone would be insufficient due to higher velocities, soil characteristics, or existing instability, banks would be reshaped and armored to provide long-term stability.

In areas characterized by elevated groundwater conditions and coarse-grained soils, parallel subsurface drains would be installed to relieve hydraulic pressure and reduce stress on ditch banks and increase the overall "factor of safety". Subsurface drainage is a well-established practice in agricultural settings and is expected to be familiar to local stakeholders, contributing to the acceptability of this measure. Additional stabilization would include armoring of surface and subsurface drainage outlets and installation of grade stabilization structures where concentrated flow contributes to erosion. Evaluation of the Structural Alternative indicates that these measures would reduce flood damages by stabilizing banks, limiting sediment inputs, and improving conveyance efficiency. Differences among structural variations are primarily related to construction extent and associated cost.

Modeling results show that the Structural Alternative provides measurable and sustained flood damage reduction benefits. The benefit/cost Analysis (BCA) indicated that the benefit/cost Ratio (BCR) for this proposed Project is estimated to be 1.1:1.0 (Alternative 2a) for the proposed project life of 52 years (50-year design life plus 2 years for design and construction) with an annual net monetized benefit of \$78,400. All other alternatives produced a negative net monetized benefit and lower BCR.

The Nonstructural Alternative would involve the acquisition of floodplain conservation easements on approximately 13,382-ac subject to reoccurring inundation during the 100-year flood event. While this alternative could reduce exposure to flood damages in easement areas, it would not address underlying erosion, sedimentation, or drainage system performance issues. It would also result in the permanent removal of productive agricultural land and was determined to be locally unacceptable. In addition, the Sponsor cost-share requirement associated with large-scale

easement acquisition was determined to be infeasible. The BCA indicated that the BCR for this proposed Project is estimated to be 0.6:1.0 for the proposed project life of 52 years (50-year design life plus 2 years for design and construction) with a negative net monetized benefit of -\$5,625,300.

Unlike the nonstructural approach, the Structural Alternative directly addresses bank instability, erosion, and sediment accumulation, key drivers of flood risk in the Subwatershed. These measures are necessary to maintain long-term drainage system function and reduce future maintenance demands.

Based on the evaluation of effectiveness, efficiency, acceptability, and consistency with the Project's purpose and need, the Preferred Alternative for the Main Ditch Subwatershed is Alternative 2a – Structural. This alternative is consistent with practices previously implemented by the Sponsor, reduces the extent of future mowing and spraying along ditch banks, and maximizes long-term sediment reduction and ecosystem service benefits.

The Preferred Alternative, has a B/C ratio of 1.1:1.0 and an annual monetized net benefit of \$78,400, reflecting lower long-term maintenance costs and improved drainage performance relative to the other alternatives.

9.2. Measures to be Installed

The Project would implement a combined approach of structural and vegetative measures designed to reduce erosion, stabilize ditch banks, and improve floodwater conveyance within the Main Ditch Subwatershed. The primary components include full-bank riprap stabilization, parallel subsurface drainage, native vegetative buffers, erosion control blankets, and associated seeding. Bank stabilization is intended to prevent further erosion and encroachment beyond the original channel design and is consistent with historic and ongoing maintenance activities performed under the Sponsor's statutory authority.

Very high- and high-priority areas would receive approximately 117,000 tons of Type D50 = 6-in riprap with 64,000 tons of stone bedding placed at the toe of slope. Medium- and low-priority reaches would receive approximately 182,000 tons of riprap with 99,000 tons of stone bedding. Riprap installation would focus on areas exhibiting severe erosion, bank instability, or low-shear-strength soils.

Parallel subsurface drains consisting of 4-in corrugated plastic tubing would be installed to reduce bank saturation and improve stability. These drains would extend approximately 101,400 linear feet (LF) in very high- and high-priority areas and 158,000-LF in medium- and low-priority reaches. Drain outlets would be armored to prevent scour and would be configured to serve individual ownerships where feasible.

In very high-and high priority areas, approximately 155,975 cu-yds of accumulated sediment would be removed from the drainage ditches and regraded along the upper banks in accordance with NRCS standards. Medium- and low-priority areas would total approximately 172,807 cu-yds of excavated sediment. Disturbed areas, including regraded sediment and reshaped banks, would be seeded and stabilized to minimize erosion during establishment.

Native vegetative buffers approximately 20-ft wide on each bank would be established along stabilized reaches, totaling approximately 120-ac. Buffers would be planted with native grasses and forbs selected to provide rapid establishment, deep rooting, and long-term erosion control.

Collectively, these measures are intended to reduce erosion and sedimentation, improve bank stability during flood events, and enhance overall conveyance efficiency within the drainage system. Structural stabilization combined with vegetative establishment is expected to reduce long-term sediment deposition and associated maintenance demands while supporting improved flood damage reduction performance.

9.3. Mitigation

Permanent impacts to WOTUS, if present, may require compensatory mitigation in the form of restoration (re-establishment or rehabilitation), enhancement, or establishment of aquatic resources. The need for compensatory mitigation would be evaluated during the CWA Section 404 permitting process, if applicable.

The Preferred Alternative would not impact wetlands. Project activities would occur within existing drainage ditches and associated banks that have been constructed, operated, and maintained for agricultural drainage purposes. The Sponsor will request an Approved Jurisdictional Determination (AJD) from the U.S. Army Corps of Engineers (USACE), Memphis District, to determine whether the drainage ditches are subject to federal jurisdiction under Section 404 of the CWA and whether the proposed activities qualify for exemption under Section 404(f)(1)(C) for the maintenance of currently serviceable drainage ditches.

Guidance for applying the Section 404(f)(1)(C) exemption is provided in a joint memorandum issued by the USACE and the U.S. Environmental Protection Agency (USACE 2020). That guidance clarifies that maintenance activities that do not convert a WOTUS to a new use or expand the original footprint of a drainage system may be exempt from permitting and compensatory mitigation requirements.

9.3.1. Wetland Mitigation

Wetlands were not identified within the Project Area during field surveys, and implementation of the Preferred Alternative would not result in wetland impacts. Therefore, wetland mitigation is not required.

9.3.2. Stream (Ditch) Mitigation

Implementation of the Preferred Alternative would involve work within approximately 130,804-LF (24.8-mi) of existing drainage ditches. The AJD will determine whether these ditches are jurisdictional WOTUS and whether the proposed activities qualify for exemption under Section 404(f)(1)(C).

If the ditches are determined to be jurisdictional and the proposed work is not exempt, the nature and extent of impacts would be evaluated in coordination with the USACE to determine whether compensatory mitigation is required. If mitigation is necessary, it would be assessed using the Missouri Stream Mitigation Method or another agency-approved functional assessment methodology, as appropriate.

An approved in-lieu fee mitigation provider serves the Missouri Bootheel Region and would be available if compensatory mitigation is required. Any mitigation would be implemented consistent with the 2008 Compensatory Mitigation Rule, including the established mitigation preference hierarchy and watershed-based considerations.

The Project Area consists of manmade drainage ditches constructed and maintained by DD37, including the Main Ditch and associated laterals, which have served a consistent agricultural drainage function since the early 1900s. Project activities are intended to maintain and stabilize the existing drainage system and would not expand its footprint or convert the ditches to a new use.

9.4. Permits and Compliance

Construction of the Project will require compliance with applicable federal, state, and local permits and regulatory requirements. The Sponsor will be responsible for obtaining all required permits and approvals prior to initiating construction.

9.4.1. Clean Water Act Sections 404 and 401

Portions of the Project are anticipated to qualify for the Section 404(f)(1)(C) exemption for the maintenance of currently serviceable drainage ditches and therefore may not require permitting by the USACE. However, ditches exhibiting perennial flow were identified during Project planning that may be subject to federal jurisdiction. The USACE, Memphis District, will make the final determination regarding jurisdiction and applicability of the Section 404(f)(1)(C) exemption through the AJD process.

If any Project components are determined not to qualify for the exemption, an individual Section 404 permit may be required for the discharge of dredged or fill material. In that event, an individual Section 401 Water Quality Certification from the MDNR would also be required prior to permit issuance.

9.4.2. Migratory Bird Treaty Act and Endangered Species Act Section 7

The Project Area is within the known range of one federally endangered bat species, one proposed endangered bat species, one proposed threatened reptile species, one proposed threatened insect species, bald eagles, and multiple migratory bird species of conservation concern. Conservation and avoidance measures will be implemented to comply with the MBTA and ESA, including:

- Limiting removal of trees with potential bat roost habitat to the inactive bat season (November 16 through March 31); and
- Scheduling construction activities, where practicable, outside of the primary migratory bird nesting season (May 1 through July 15).

These measures are intended to avoid adverse effects to protected species and ensure compliance with federal wildlife protection statutes.

9.4.3. National Pollutant Discharge Elimination System

The National Pollutant Discharge Elimination System (NPDES) regulates discharges of pollutants from point sources to waters of the United States (USEPA 2024f). Construction activities associated with the Project will involve land disturbance and may result in sediment discharges to drainage ditches.

Prior to construction, the Sponsor will obtain coverage under the NPDES Construction General Permit through MDNR. Permit coverage will require preparation and implementation of a Stormwater Pollution Prevention Plan (SWPPP) outlining BMPs, inspection requirements, and reporting procedures to minimize water quality impacts during construction.

9.4.4. National Historic Preservation Act

As the lead federal agency, NRCS has complied with Section 106 of the National Historic Preservation Act. A Phase I cultural resources survey was conducted within the Area of Potential Effects. No archaeological resources were identified. One architectural resource associated with the manmade drainage canal system was documented; however, it was determined to be not eligible for listing on the National Register of Historic Places.

NRCS made a finding of No Historic Properties Affected, and the Missouri SHPO concurred with this determination in a letter dated March 27, 2025 (**Appendix A**).

9.4.5. Floodplain Management

Project activities occurring within mapped regulatory floodplains will comply with Executive Order 11988 (Floodplain Management) and applicable state and local floodplain management requirements. Where required, a Floodplain Development Permit will be obtained from the Missouri Department of Public Safety – State Emergency Management Agency (SEMA). All work will be conducted in accordance with applicable floodplain ordinances, local zoning requirements, and state and federal regulations.

9.4.6. National Environmental Policy Act

This Plan was prepared in compliance with NEPA and PR&G for Federal water resource investments. The document provides the environmental analysis necessary to support NRCS decision-making for implementation of the Preferred Alternative.

9.5. Costs and Cost Sharing

Economic Cost Tables for the Preferred Alternative are presented in Section 9.8. All costs presented in these tables and throughout this Plan–EA were developed using standard federal cost-accounting practices applicable to watershed planning and implementation by the Natural Resources Conservation Service (NRCS).

Cost estimates and annualization methods follow the Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies (USDA 2014). These methods ensure that project costs are presented in a consistent, transparent manner suitable for federal decision-making and comparison of alternatives.

Cost sharing between NRCS and the Sponsor is governed by the provisions of the Watershed Protection and Flood Prevention Program (Public Law 83-566). Cost-share eligibility and limitations for authorized watershed projects are established in 390-USDA-NRCS, National Watershed Program Manual (NWPM), Part 500, Subpart E, including Section 500.42 (NRCS 2018).

Under the Watershed Program authorities applicable to flood damage reduction projects include:

- Watershed Program funds may provide up to 100 percent of the construction and engineering costs associated with works of improvement for flood damage reduction purposes.
- No cost sharing is available for the acquisition of land, easements, or rights-of-way required in connection with works of improvement for flood damage reduction, except for:
 - Acquisition of wetland or floodplain conservation easements, as authorized under 390-NWPM, Part 500, Subpart E, Section 500.42A; and
 - Certain acquisitions associated with Section 500.42C(3), where applicable, which may also be eligible for 100-percent federal cost share.

All cost-sharing arrangements for the Preferred Alternative would be finalized during project authorization and agreement development in accordance with NRCS policy and program requirements. The estimated Proposed Action (Preferred Alternative) costs are \$15,389,100. The sponsors' estimated costs (permitting and administration) are \$170,200, and the estimated cost eligible for PL 83-566 funding is \$15,218,900.

9.6. Installation and Financing

9.6.1. Installation

Works of improvement would be installed over an anticipated two-year period following authorization of federal assistance under the Watershed Protection and Flood Prevention Act (Public Law 83-566). Final design and construction would commence upon approval of this Plan and the allocation of authorized funds.

Construction sequencing would be coordinated to minimize impacts to agricultural operations, drainage system function, and adjacent landowners while ensuring compliance with applicable environmental and permitting requirements.

9.6.2. Responsibilities

Responsibilities for implementing site-specific project components would be shared between NRCS and the Sponsor, as outlined below.

NRCS

NRCS would be responsible for the following:

- Provide overall project administration;
- Provide engineering design and construction inspection for works contracted by NRCS;
- Provide engineering designs for works contracted by Sponsor;
- Complete all required federal, tribal, state, and local consultation processes;

- Provide funds to Sponsor for preparing engineering designs and construction inspection for works contracted by Sponsor;
- Providing up to 100 percent of the total construction costs for works of improvement for flood damage reduction, and up to 50 percent of eligible recreation-related measures, consistent with applicable national program cost-share policies at the time of project agreement execution;
- Provide funds to Sponsor for project management and engineering typically performed by NRCS to implement projects.

Sponsor

The Sponsor would be responsible for the following:

- Provide project and contract administration costs for installing works of improvement;
- Acquire any land rights necessary for installing the works of improvement; (**Appendix C**)
- Bear the costs of relocating or modifying utilities;
- Secure all required federal, state, and local permits;
- Provide O&M of all components of installed works of improvement;
- When funded by NRCS, provide project management and engineering typically performed by NRCS to implement projects.

Contracting

Construction of the Project would be implemented through project agreements between NRCS and the Sponsor. Depending on the division of responsibilities and funding arrangements, construction may be completed using federal contracts, local contracts, force account work, or a division of work between NRCS and the Sponsor, as authorized under applicable program authorities.

Real Property Rights

The Sponsor has acquired, or will acquire prior to construction, all necessary real property rights, easements, and rights-of-way required to install, operate, and maintain the works of improvement. Acquisition of real property rights will be completed in accordance with NRCS requirements and applicable state and local laws.

9.7. Operation, Maintenance, and Replacement

All works of improvement installed under the Preferred Alternative will be operated, maintained, and replaced by the Sponsor in accordance with applicable NRCS standards, specifications, and project agreements.

O&M activities will include routine inspection, vegetation management, sediment management, structural repairs, and any necessary replacement of installed components to ensure continued functionality of the drainage system and flood damage reduction benefits. Estimated O&M costs associated with the Preferred Alternative are provided in **Appendix D**.

A detailed O&M Plan will be developed and finalized during the final design phase. The O&M Plan will define inspection frequencies, maintenance responsibilities, performance standards, and procedures for addressing damage or deterioration of the works of improvement over their design life.

9.8. Cost Tables

Tables 9-1 through 9-6 (Economic Tables 1 through 6) document and describe the Project costs, channel data and Project benefits for the Preferred Alternative. Estimated installation costs and cost distribution between NRCS and the Sponsor for the Preferred Alternative are shown in Table 9.1 and 9.2 (Economic Tables 1 and 2). Channel data including channel dimensions and peak discharges are provided in Table 9-3 (Structural Table 3b). Total annualized costs for the preferred alternative are shown in Table 9-4 (Economic Table 4). Average Annual Flood Damage Reduction Benefits are provided in Table 9-5 (Economic Table 5). Estimated detailed construction costs for each alternative are provided in Appendix D, Section D7. The calculation of damages for each alternative, the annual damages, construction cost estimates, project administration costs, and operation and maintenance costs were used to conduct a benefit/cost analysis (BCA) for the proposed project life of 50 years plus one year for design and one year for construction. Details on this BCA are provided in Appendix D, Section D7. The costs shown in these tables and throughout the document are based on standard cost accounting practices required of federal watershed planning agencies, such as NRCS.

Table 9-1. Estimated Project Installation Cost [Main Ditch Watershed DD37], [MO] [Dollars]

Works of Improvement	Unit	Number			Estimated Cost (Dollars) ¹		
		Federal Land	Non-Federal Land	Total	PL 83-566 Funds	Other Funds	Total Estimated Costs
Alternative 2a (Structural Measures – Channel Work)	lf		Need values		\$15,218,900	\$170,200	\$15,389,100

¹ Price base 2026

Prepared June 2026

Table 9-2. Estimated Cost Distribution [Main Ditch Watershed DD37], [MO] [Dollars]

Works of Improvement	Installation Cost - Public Law 83-566 ^{1,3}				Installation Cost - Other Funds ^{1,3}							Total Installation Costs
	Const	Eng	Admin	Total P.L. 83-566 Funds	Const	Eng	Mitigation	RP Rights	Permits	Admin	Total Other	
Alternative 2a (Structural Measures – Channel Work)	\$12,815,900	\$1,922,400	\$480,600	\$15,218,900	-	-	-	-	\$10,000	\$160,200	\$170,200	\$15,389,100

¹ Price base: 2026

Prepared June 2026

² PL 83-566 Cost paid by federal agency responsible for assisting in improvement installation, USDA-NRCS.³ Cost Codes: *Construction* = Const; *Engineering* = Eng; *Property Acquisition* = Prop Acq; *Project Administration* = Admin; *Real Property Rights* = RP Rights

Table 9-3. Structural Table 3b [Main Ditch Watershed DD37], [MO]

		Hydrology and Hydraulic Data					Ditch Dimensions			n Value		Velocities (ft/s)		Velocities (ft/s)			
Ditch Name (reach)	Sta.-Sta.	Drainage Area (mi ²)	50 Year Frequency Design Discharge (cfs)	Water Surface Elevation feet (NAVD88)	Hydraulic Gradient (ft/ft)	Gradient (ft/ft)	Bottom Width (ft)	Elev. (ft/NAVD88)	Side Slope	Aged (Existing)	As built (Proposed)	Aged (Existing)	As built (Proposed)	Excavation Volume (yd ³)	Type of work ^{2/}	Existing Channel type ^{3/}	Present Flow cond. ^{4/}
Main Ditch	00+00 - 65+00	43.0	1,507	280.97	0.00020	0.00042	41	268.78	2:1	0.03	0.03	2.13	2.23	39,495	III, V	Ditch	Pr
Main Ditch	65+00 - 180+00	42.6	1,528	282.35	0.00025	0.00033	55	271.66	2:1	0.03	0.03	1.61	2.13	101,649	III, V	Ditch	Pr
Main Ditch	180+00 - 335+00	37.2	1,489	285.18	0.00029	0.00043	41	275.34	2:1	0.03	0.03	2.29	3.08	94,568	III, V	Ditch	Pr
Main Ditch	335+00 – 355+00	30.8	1,399	289.67	0.00031	0.00059	33	280.41	2:1	0.03	0.03	2.57	3.14	5,543	III, V	Ditch	Pr
Main Ditch	355+00 – 415+00	11.8	838	290.12	0.00032	0.00057	25	281.03	2:1	0.035	0.035	2.79	3.69	23,311	III, V	Ditch	Pr
Main Ditch	415+00 – 505+00	3.5	337	292.25	0.00047	0.00042	20	284.87	2:1	0.04	0.04	0.99	1.39	38,815	III, V	Ditch	Pr
Lateral 1	00+00 – 70+00	3.6	319	289.55	0.00012	0.00004	22	280.66	2:1	0.04	0.04	1.35	1.74	6,760	III, V	Ditch	Pr
Lateral 2	00+00 – 47+00	19.0	680	290.15	0.00020	0.00033	24	281.00	2:1	0.035	0.035	0.64	2.09	11,499	III, V	Ditch	Pr

^{1/} Minor excavation to remove sediment and armor^{2/} III-Cleaning out; V-Stabilization primary purpose^{3/} Manmade ditch/previously modified channel (Drainage District 01)^{4/} Pr-Perennial flow, I-Intermittent, E-Ephemeral, based on USGS quad maps^{5/} Existing discharge velocities in the table are based on (design, year, etc.)Prepared: January
2026

Table 9-4. Estimated Average Annual NED Costs [Main Ditch Watershed DD37], [MO] [Dollars]¹

Works of Improvement	Amortization of Installation Costs	Operation, Maintenance, and Replacement Cost	Total Average Annual Costs
Alternative 2a (Structural Measures – Channel Work)	\$617,100	\$32,000	\$649,100

¹ Price base: 2026

Prepared June 2026

Table 9-5. Estimated Average Annual Flood Damage Reduction Benefits [Main Ditch Watershed DD37], [MO] [Dollars]¹

Item	Estimated Average Annual Flood Damage ^{1,2}				Damage Reduction	
	Without Project		With Project			
	Agriculture Related	Non Agric. Related	Agriculture Related	Non Agric. Related	Agriculture Related	Non Agric. Related
Floodwater						
Residential	\$280,700	-	\$279,700	-	\$1,000	-
Commercial	\$177,300	-	\$176,000	-	\$1,300	-
Agriculture (Structures)	\$55,600	-	\$53,400	-	\$2,200	-
Crop and Pasture	\$3,736,500	-	\$3,347,000	-	\$389,500	-
Other (Roads)	\$223,000	-	\$219,100	-	\$3,900	-
Sediment	\$604,500	-	\$275,000	-	\$329,500	-
Erosion	-	-	-	-	-	-
Total	\$5,077,600	-	\$4,350,200	-	\$ 727,400	-

¹ Price base 2026

Prepared June-2026

² Agriculture-related damage includes damage to rural communities.

Table 9-6. Comparison of NED Benefits and Costs¹, Drainage District 37, Missouri

Works of Improvement	Average Annual Benefits						Average Annual Costs ^{1,3}	Benefit/Cost Ratio
	Damage Reduction			Restoration to Former Use ^{1,2}	Other Benefits ¹	Total		
	Floodwater ^{1,2}	Sediment ^{1,2}	Indirect ^{1,2}					
Alternative 2a (Structural Measures – Channel Work)	\$397,900	\$329,500	-	-	-	\$727,400	\$649,100	1.1 to 1.0

¹ Price base 2026

Prepared June 2026

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11. LIST OF PREPARERS

This Plan was prepared by Conservation Works Joint Venture (CWJV) with support from WSP USA, and local and state NRCS staff. Subject matter experts responsible for hydraulic and civil engineering, resource conservation, soils, biology, economics, geology, ecology, and contract administration internally reviewed this Plan and concurred on findings and solutions. The in-house review was followed by a review by the NRCS National Water Management Center, and then an interagency and public review. **Table 11-1** lists the qualifications of the individuals who provided significant input and effort in preparing this Plan.

Table 11-1. Experience and Qualifications of Report Preparers

Name and Project Role	Present Title	Education	Years Experience
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Name and Project Role	Present Title	Education	Years Experience
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Doug Tate, P.E. WSP, Geologic Considerations	Geotechnical Engineer	BS Civil Engineering	43

12. DISTRIBUTION LIST

Comments regarding the Plan were requested from the agencies and stakeholders listed below in **Table 12-1**. The table also notes if a response was received.

Table 12-1. Distribution List

Agency or Stakeholder	Response Received	Agency or Stakeholder	Response Received
Federal Agencies		Tribal Governments	
US Army Corps of Engineers	07/29/2024	Absentee-Shawnee Tribe of Indians of Oklahoma	
US Environmental Protection Agency	11/12/2024	Eastern Shawnee Tribe of Oklahoma	
US Federal Emergency Management Agency		Osage Nation	04/23/2025
US Fish and Wildlife Service		Quapaw Tribe of Oklahoma	07/26/2024
US Geological Survey		Shawnee Tribe	03/17/2025
USDA Farm Service Agency			
USDA Natural Resources Conservation Service			
USDA Rural Development			
Missouri State Agencies		Local Agencies	
Missouri Department of Agriculture		Stoddard County Commission	
Missouri Farm Bureau		Stoddard County Soil and Water Conservation District	
Missouri Department of Conservation			
Missouri Department of Natural Resources – Water Protection Program	08/12/2024	City of Bernie	
Missouri Department of Natural Resources – State Historic Preservation Office	03/27/2025	City of Dexter	
Missouri State Emergency Management Agency		Drainage District 37	
Missouri State Floodplain Administrators			
Missouri Department of Transportation – Southeast District			
NRCS Missouri			
USDA Rural Development			
USDA Farm Service Agency			
Public Stakeholders		Delegates	

Agency or Stakeholder	Response Received	Agency or Stakeholder	Response Received
		US House – 8 th Congressional District	N/A
		US Senate	N/A
		Missouri State Representative - District 148	N/A
		Missouri State Representative - District 149	N/A
		Missouri State Representative - District 150	N/A
		Missouri State Representative - District 151	N/A
		Missouri State Senate - District 25	N/A
		Missouri State Senate - District 27	N/A
		Governor of Missouri	N/A

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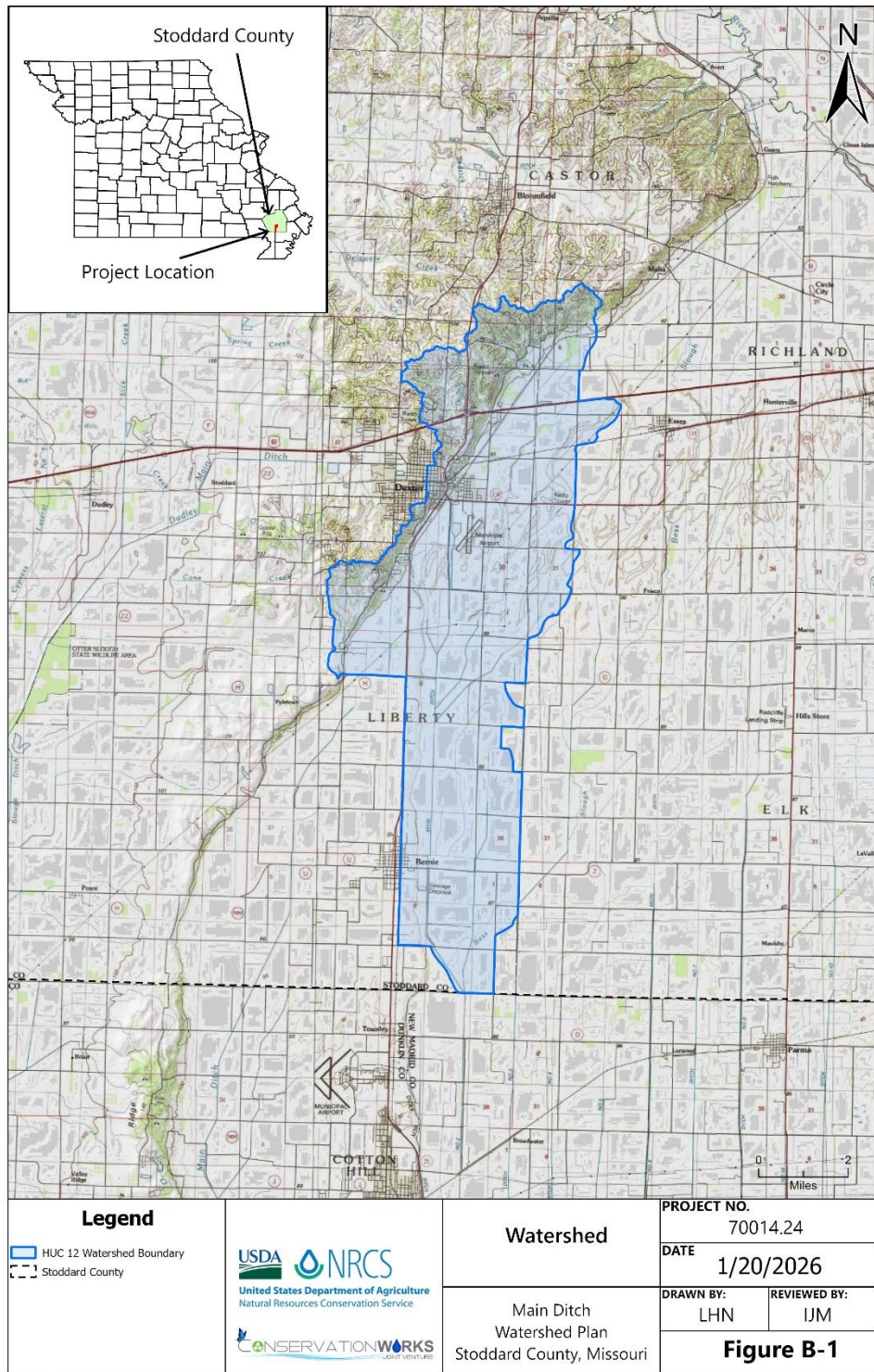
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