Natural Resources Conservation Service

Office of the Chief

P.O. Box 2890
Washington, D.C.
20013

DATE: August 31, 2026

SUBJECT: PDM – Authorization of Federal Assistance for the Environmental Assessment on the Clarke County Water Supply Project located in Clarke County, Iowa

TO: Jaia Fischer, State Conservationist (acting)
Des Moines, Iowa

FILE CODE: 390-11

Action Required Within 10 and 30 Days

This memorandum authorizes federal assistance for installing works of improvement for the Clarke County Water Supply Project located in Clarke County, Iowa. The authorization for this federal assistance falls under the authority of the Watershed Protection and Flood Prevention Act of 1954 (Public Law 83-566 and 16 U.S.C. 1001, et seq.). As funds appropriated for this project are made available, they should be allocated in accordance with the terms, conditions, and stipulations included in the final watershed plan's environmental impact statement on the Clarke County Water Supply Project.

Copies of letters sent to the Iowa congressional delegation informing them of this authorization are attached. Please contact each member of the congressional delegation within 10 days of receiving your authorization to provide details on the project and the funding status for the improvements. Please copy the Conservation Planning and Technical Assistance Division Director when you send the letter of authorization to your congressional delegation.

I also ask you provide local sponsors with information on project status and the projected annual funding needs within 10 days of receiving your authorization and within 30 days of receiving this authorization, please coordinate a public announcement with local sponsors about this project.

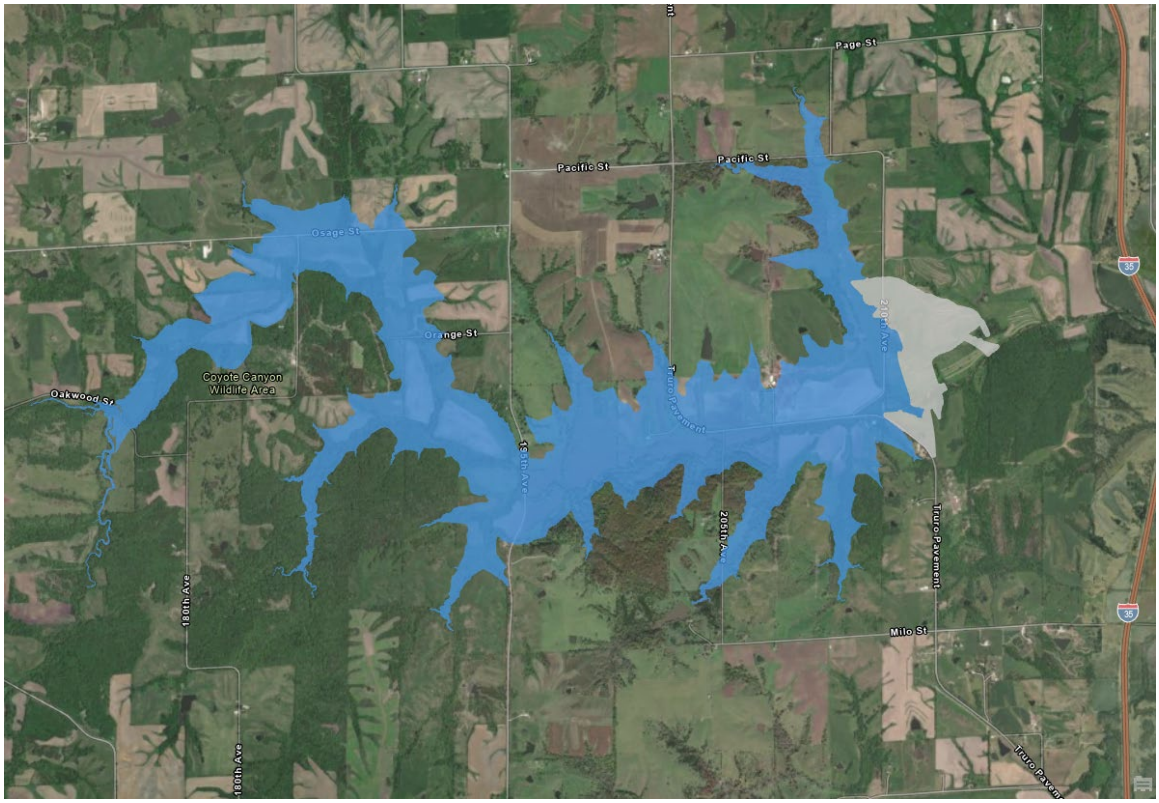
Scott Edwards
Acting for Chief Colton L. Buckley

Attachments: As stated

cc: Scott Edwards, Associate Chief (acting)
Astrid Martinez, Deputy Chief for Programs
Noller Herbert, Deputy Chief for Science and Technology
Casey Sheley, Director (acting), Conservation Planning and Technical Assistance Division (CPTAD)
Kevin Farmer, Director, Conservation Engineering Division
Ralph Smith, Branch Chief Watershed Programs, CPTAD
Tim Wilson, Director, National Water Management Center, Science and Technology
Sonya Keith, Watershed Operations Program Coordinator, CPTAD

USDA Natural Resources Conservation Service
U.S. DEPARTMENT OF AGRICULTURE

Environmental Impact Statement for the Clarke County Water Supply Project



PREPARED BY

NRCS
Natural Resources Conservation Service

Clarke County, Iowa
FEBRUARY 2026

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Watershed Plan-Environmental Impact Statement for the Clarke County Water Supply Project

Clarke County, Iowa

Lead Agency: US Department of Agriculture, Natural Resources Conservation Service (USDA-NRCS)

Cooperating Agencies: US Army Corps of Engineers (USACE)

Sponsoring Local Organization (SLO): Clarke County Reservoir Commission (CCRC)

Authority: This Watershed Project Plan and Environmental Impact Statement (Plan-EIS) has been prepared under the Authority of Public Law 83-566, Watershed Protection and Flood Prevention Act of 1954, and in accordance with the National Environmental Policy Act (NEPA) of 1969, Public Law 91-190, as amended (42 United States Code [U.S.C.] 43221 et seq.).

Abstract: The purpose of the proposed action is to provide reliable agricultural water supply to meet existing and anticipated agricultural water needs in Clarke and Decatur Counties, Iowa. The Project is needed due to current agricultural water supply inadequacies and unreliability, which have limited agricultural livestock operations over the past several decades in Clarke and Decatur Counties. The need is to supply water for the agricultural users in Clarke County; the rural communities of Osceola, Murray, and Woodburn, Iowa; and other rural water users in Clarke County. The recommended plan includes construction of a water supply reservoir at dam site 4B in the Upper West Creek Watershed and associated transportation and primary water supply infrastructure. The total Project costs are $116,981,000, of which $74,148,820 (63 percent) will be paid by Public Law 566 funds, and $42,832,000 (37 percent) will be paid by the Sponsor. This document is intended to fulfill NEPA requirements and to be considered for authorization of Public Law 566 funding.

This environmental document was initiated using the 40 CFR 1500-1508 (April 2022) and 7 CFR 650 regulations, which were recently rescinded and replaced with USDA regulations found under 7 CFR 1b. In a good-faith effort to fulfill NEPA's requirements, the agency decided to continue to use 40 CFR 1500-1508 (April 2022) and 7 CFR 650. This is permissible per the USDA policy guidance issued in the Interim Final Rule's preamble (90 FR 29644 (July 3, 2025)). In the NRCS's expert opinion, it has thoroughly considered the factors mandated by the statute and the regulatory frameworks it used.

For additional information, please contact:

USDA-Natural Resources Conservation Service
Attn: Jon Hubbert, State Conservationist
Iowa State Office
210 Walnut Street, Room 693
Des Moines, IA 50309

Or by email to:
jon.hubbert@usda.gov

Non-Discrimination Statement:

In accordance with Federal civil rights law and U.S. Department of Agriculture (USDA) civil rights regulations and policies, the USDA, its Agencies, offices, and employees, and institutions participating in or administering USDA programs are prohibited from discriminating based on race, color, national origin, religion, sex, 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 State or local Agency that administers the program or contact USDA through the Telecommunications Relay Service at 711 (voice and TTY). Additionally, program information may be made available in languages other than English.

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

USDA is an equal opportunity provider, employer, and lender.

Watershed Plan Agreement

between the
Clarke County Reservoir Commission
(Referred to herein as Sponsors)

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 Sponsors for assistance in preparing a plan for works of improvement for the Upper West Creek and South West Creek Watershed, State of Iowa, 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 Sponsors and NRCS a watershed project plan and environmental impact statement for works of improvement for the Upper West Creek and South West Creek Watershed, State of Iowa, hereinafter referred to as the watershed 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 Sponsors hereby agree on this watershed project 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 term of this agreement is for the installation period and evaluated life of the project (installation period 5 years + life of the Project 100 years = 105 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 sponsors 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 Sponsors and NRCS are as shown in the Cost-share table in item 5 hereof.

   The sponsors 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 sponsors 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 CFR Part 24 and 7 CFR Part 21) when acquiring real property interests for this federally assisted project. If the sponsors are 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 an opinion of the chief legal officer of the state containing a full discussion of the facts and law involved. This statement may be accepted as constituting compliance.

5. **Cost-share for Watershed Work Plan.** The following table shows cost-share percentages and amounts for Watershed Work Plan implementation.

Works of Improvement	NRCS	Sponsor	Total
Cost-Sharable Items[1]			
Water Supply Dam[2]	$47,474,250	$15,824,750	$63,299,000
Water Supply Components	$13,091,250	$4,363,750	$17,455,000
Relocation[3]	$0	$0	$0
Subtotal: Cost-Sharable Costs	$60,565,500	$20,188,500	$80,754,000
Non-Cost-Sharable Items[4]			
NRCS Technical Assistance/Engineering[5]	$10,999,000	$0	$10,999,000
Project Administration[6]	$2,584,320	$2,378,680	$4,963,000
Real Estate[7]	$0	$18,500,000	$18,500,000
Federal, State, and Local Permits	$0	$1,765,000	$1,765,000
Relocation, beyond required decent, safe, sanitary[8]	$0	$0	$0
Subtotal: Non-Cost-Share Costs	$13,583,320	$22,643,680	$36,227,000
Total:	$74,148,820	$42,832,180	**$116,981,000**

1. The cost-share rate is the percentage of the average cost of installing the practice in the selected plan for the evaluation unit. During Project implementation, the actual cost-share rate must not exceed the rate of assistance for similar practices and measures under existing national programs.
2. Includes wetland and stream mitigation costs.
3. Investigation of the 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 associated authorized purpose.
4. If actual non-cost-sharable item expenditures vary from these figures, the responsible party will bear the change.
5. Technical Assistance assumes that an A/E contract would be used for Project design and construction.
6. The Sponsor and NRCS will each bear the costs of Project administration that each incurs.
7. Includes real property rights costs associated with construction of public infrastructure (re-alignment of Truro Pavement), and water supply pipeline. CCRC already owns the land required for the dam construction and reservoir pool inundation boundary. No real estate costs are required for public roadway infrastructure.
8. Relocation payments for the cost of improvements beyond decent, safe, and sanitary requirements is a non- Project cost ineligible for assistance under the act.

6. **Land treatment agreements.** The sponsors 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 sponsors will ensure that 50 percent of the land upstream of any retention reservoir site is adequately protected before construction of the dam. The sponsors will provide assistance to landowners and operators to ensure the installation of the land treatment measures shown in the watershed project plan. The sponsors 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 prevention, the sponsors 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 sponsors will acquire or provide assurance that landowners or resource users have acquired such water, mineral, or other natural resources rights pursuant to State law as may be needed in the installation and operation of the works of improvement. Any costs incurred must be borne by the sponsors and these costs are not eligible as part of the sponsor's cost-share.

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

10. **NRCS assistance.** This agreement is not a fund-obligating document. Financial and other assistance to be furnished by NRCS in carrying out the 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 sponsors before either party initiates work involving funds of the other party. Such agreements will set forth in detail the financial and working arrangements and other conditions that are applicable to the specific works of improvement.

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 sponsors have failed to comply with the conditions of this agreement or when the program funding or authority expires. In this case, NRCS must promptly notify the sponsors in writing of the determination and the reasons for the deauthorization of project funding, together with the effective date. Payments made to the sponsors or recoveries by NRCS must be in accordance with the legal rights and liabilities of the parties when project funding has been deauthorized. An amendment to incorporate changes affecting a specific measure may be made by mutual agreement between NRCS and the sponsors having specific responsibilities for the measure involved.

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

14. **Operation and Maintenance (O&M).** The sponsors will be responsible for the operation, maintenance, and any needed replacement of the works of improvement by actually performing the work or arranging for such work, in accordance with an O&M Agreement. An O&M agreement will be entered into before Federal funds are obligated and will continue for the project life (installation period 5 years + life of the Project 100 years = 105 years). Although the sponsors' 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 sponsors acknowledge that continued liabilities and responsibilities associated with works of improvement may exist beyond the evaluated life.

15. **Emergency Action Plan.** Prior to construction, the sponsors 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. The 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 sponsors annually.

16. **Nondiscrimination Provisions**. In accordance with Federal civil rights law and U.S. Department of Agriculture (USDA) civil rights regulations and policies, the USDA, its Agencies, offices, and employees, and institutions participating in or administering USDA programs are prohibited from discriminating based on race, color, national origin, religion, sex, 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.

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

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

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

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

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

Certification:

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

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

(2) Establishing an ongoing drug-free awareness program to inform employees about—
(a) The danger of drug abuse in the workplace;
(b) The grantee's policy of maintaining a drug-free workplace;
(c) Any available drug counseling, rehabilitation, and employee assistance programs; and
(d) The penalties that may be imposed upon employees for drug abuse 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 sponsors 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 sponsors certify to the best of their knowledge and belief, that:
(1) No Federal appropriated funds have been paid or will be paid, by or on behalf of the sponsors, to any person for influencing or attempting to influence an officer or employee of an agency, Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

(2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned must complete and submit Standard Form LLL, “Disclosure Form to Report Lobbying,” in accordance with its instructions.

(3) The sponsors must require that the language of this certification be included in the award documents for all 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 sponsors certify to the best of their knowledge and belief, that they and their principals:

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

(2) Have not within a 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) (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 sponsors is unable to certify to any of the statements in this certification, such prospective participant must attach an explanation to this agreement.

20. **Clean Air and Water Certification.**

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

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

(2) To promptly notify the NRCS-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, U.S. Environmental Protection Agency, indicating that any facility which is proposed for use under this agreement is under consideration to be listed on the Environmental Protection Agency List of Violating Facilities.

(3) To include substantially this certification, including this subparagraph, in every nonexempt sub-agreement.

B. The project sponsoring organizations 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 there under before the signing of this agreement by NRCS.

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

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

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

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

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

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

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

(4) The term “clean water standards” means any enforceable limitation, control, condition, prohibition, standards, or other requirement which is promulgated pursuant to the Water Act or contained in a permit issued to a discharger by the Environmental Protection Agency or by a State under an approved program, as authorized by section 402 of the Water Act (33 U.S.C. Section 1342), or by a local government to assure compliance with pretreatment regulations as required by section 307 of the Water Act (33 U.S.C. Section 1317).

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

21. Assurances and Compliance. As a condition of the grant or cooperative agreement, the sponsors 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 a 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 sponsors must give the NRCS or the Comptroller General, through any authorized representative, access to and the right to examine all records, books, papers, or documents related to this agreement, and retain all records related to this agreement for a period of three years after completion of the terms of this agreement in accordance with the applicable OMB Circular.

23. **Signatures.**

CLARKE COUNTY RESERVOIR COMMISSION

The signing of this plan was authorized by a resolution by the CCRC governing body and adopted at an official meeting held on

Thursday, September 18, 2025, at 9:30 am

By: _____ Date: 9/18/25

Ty Wheeler, Board Chair
Clarke County Reservoir Commission
PO Box 515
Osceola, IA 50213

USDA-NATURAL RESOURCES CONSERVATION SERVICE

Approved by: Date: 9/19/25

JON HUBBERT Digitally signed by JON HUBBERT
Date: 2025.09.19 06:28:56 -05'00'

Jon Hubbert, State Conservationist
Natural Resources Conservation Service
210 Walnut Street, Room 693
Des Moines, IA 50309

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Summary (OMB Fact Sheet)

Watershed Plan – Environmental Impact Statement for the Clarke County Water Supply Project, Upper West Creek and South West Creek Watersheds
Clarke County, Iowa
3rd Congressional District

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

Authorization: Public Law 83-566 Stat. 666 as amended (16 U.S.C. Section 1001 et. seq.) 1954

Sponsor: Clarke County Reservoir Commission

Proposed Action: The proposed action is development of a water supply reservoir in Upper West Creek Watershed in Clarke County, Iowa.

Purpose and Need for Action: The purpose of the proposed action is to provide reliable agricultural water supply to meet existing and anticipated agricultural water needs in Clarke and Decatur Counties, Iowa. The Project is needed due to current agricultural water supply inadequacies and unreliability. Water supply for agricultural use is at risk, and water use restrictions have limited agricultural livestock operations over the past several decades in Clarke and Decatur Counties.

Description of the preferred alternative/plan: The preferred alternative of a water supply reservoir at site 4B in Upper West Creek[1] Watershed would include construction of an earthfill embankment dam on West Creek with a reinforced concrete pressure pipe spillway and vegetated auxiliary spillway. There would also be a water supply pipeline to transport water from the reservoir to the water treatment plant, which would travel through Upper West Creek Watershed and South West Creek Watershed. The dam construction and inundated area would also require the relocation of a segment of a local road, Truro Pavement.

Resource Information:
Location: Latitude and Longitude**:** 93.7991579°W 41.1006176°N

Hydrologic Unit Code (HUC): HUC 8 – 710000808, Lake Red Rock

Watershed size:
Upper West Creek (HUC 071000080802) = 18,280 acres
South West Creek (HUC 071000080801) = 14,667 acres

[1] West Creek and associated watersheds were officially renamed by USGS in 2024. NRCS notes the previous legal name (Squaw Creek) of West Creek may appear in various sources and appendices throughout the EIS that were created before the legal name change. NRCS acknowledges the derogatory nature of the name and apologizes for its use.

Land ownership: Upper West Creek and South West Creek = Private (88.2%), State-Local (11.8%), Federal (0%)

*Climate and topography***:** The climate is mid-continental with warm summers and cold winters. The mean annual temperature in the summer is 73°F while the mean temperature in the winter is 25°. Average annual precipitation is 35 inches, with 24 inches occurring during the months of April through September.

Soils: The watershed area is located within the Southern Iowa Drift Plain landform region, characterized by glacial drift mantled with loess soils. This region ranges from nearly level to very steep. Rolling to very steep valleys along streams and major drainageways are commonplace. It is nearly level and gently rolling on upland divides, retaining much of the original surface character. Narrow strips of nearly level bottomland border most creeks and streams.

Prime and unique farmland:

	Acres
All areas are prime farmland	4,528
Farmland of statewide importance	18,322
Not prime farmland	5,718
Prime farmland if drained	4,378
Total:	32,947

Land use:

Land Use Type	**Acres**
Grassland	15,891
Cropland	8,444
Forest	5,931
Developed	2,082
Water & wetlands	525
Barren/fallow	74

Water Resources: The watershed area encompasses the following acres of wetlands, miles of streams.

Wetland Type (NWI)	**Acres**
Riverine	340.8
Freshwater Forested/Shrub Wetland	123.8
Freshwater Pond	235.5
Freshwater Emergent Wetland	127.5
Lake	293.3
Total:	1,120.9

Stream Type (NHD)	Length (miles)
Intermittent	124.0
Ephemeral	182.3
Perennial	23.8
Artificial Path	23.3
Connector	2.2
Total:	355.6

Floodplains: A total of 2,201 acres in the watershed area are within Zone A floodplain, representing the 0.1-percent annual chance of flooding, or the 100-year event. An additional 30,746 acres are within Zone X floodplain, representing the 0.2-percent annual chance of flooding, or the 500-year flood event.

Terrestrial and aquatic wildlife: The watershed area includes two Level IV ecoregions, Rolling Loess Prairies (47f) and Loess Flats and Till Plains (40a), with just over 61 percent within the Loess Flats and Till Plains. Potential threatened and endangered species in the Project Area were identified, including Prairie Bush Clover, Mead's Milkweed, Eastern Prairie Fringed Orchis, Indiana Bat, and Northern Long-eared Bat.

Cultural resources and historic properties: The watershed area has one site currently on the National Register of Historic Places, in the city of Osceola. There are 20 recorded archaeological sites in the watershed area.

Public health, safety, and transportation: Under drought conditions, communities in Clarke and Decatur Counties are at risk due to inadequate water sources for firefighting. Three major highways serve the county. I-35 traverses the county north and south, and US Highway 34 runs east and west near the southern edge of the Upper West Creek Watershed. Iowa Highway 2 runs east and west in Decatur County near the center of the county. US Highway 69 is east of the watershed and intersects US Highway 34 at the center of Osceola.

Social and economic conditions: Of the population 16 years of age and older in Clarke County, 60.5 percent were reported to be employed, and 36.4 percent were not currently in the labor force. Of those employed, 3.9 percent reported to work in the agriculture industry. In Decatur County, 5.9 percent reported to work in the agriculture industry. The leading industries for the employed civilian population within Clarke County were educational services, manufacturing, and retail trade. Leading industries within Decatur County were educational services, construction, and retail trade.

Place	2000 Population	2010 Population	2020 Population
Osceola	4,659	4,929	5,415
Clarke County	9,133	9,286	9,748
Decatur County	8,689	8,457	7,645

Alternative plans considered: Alternatives considered but eliminated from detailed study include pipelines to other regional water users, groundwater wells, and expansion of the existing water supply reservoir.

Mitigation measures: Installation of the preferred alternative would include the following mitigation and conservation conditions:

- Historic Properties and Cultural Resources: A programmatic agreement has been executed to ensure proper phased inventory of cultural resources and evaluation of all Project effects on historic properties and other cultural resources. Mitigation measures for effects on historic properties and other cultural resources will be addressed through the Project's programmatic agreement.
- Streams and Wetlands: Preliminary concept designs have been developed in order to mitigate for the 52.24 acres of wetland impacts and 75,198.68 linear feet of stream impacts.
- Habitat: Conservation measures are anticipated to cover all mitigation measures for habitat impacts. Coordination with USFWS and Iowa DNR was initiated. Conservation actions include construction timing, biological surveys, and approved seeding plans to avoid adverse impacts.

Project costs:

Works of Improvement	NRCS	Sponsor	Total
Cost-Sharable Items[1]			
Water Supply Dam[2]	$47,474,250	$15,824,750	$63,299,000
Water Supply Components	$13,091,250	$4,363,750	$17,455,000
Relocation[3]	$0	$0	$0
Subtotal: Cost-Sharable Costs	$60,565,500	$20,188,500	$80,754,000
Non-Cost-Sharable Items[4]			
NRCS Technical Assistance/Engineering[5]	$10,999,000	$0	$10,999,000
Project Administration[6]	$2,584,320	$2,378,680	$4,963,000
Real Estate[7]	$0	$18,500,000	$18,500,000
Federal, State, and Local Permits	$0	$1,765,000	$1,765,000
Relocation, beyond required decent, safe, sanitary[8]	$0	0$	$0
Subtotal: Non-Cost-Share Costs	$13,583,320	$22,643,680	$36,227,000
Total:	$74,148,820	$42,832,180	**$116,981,000**

1. The cost-share rate is the percentage of the average cost of installing the practice in the selected plan for the evaluation unit. During Project implementation, the actual cost-share rate must not exceed the rate of assistance for similar practices and measures under existing national programs.
2. Includes wetland and stream mitigation costs
3. 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 associated authorized purpose.
4. If actual non-cost-sharable item expenditures vary from these figures, the responsible party will bear the change.
5. Technical Assistance assumes that an A/E contract would be used for Project design and construction.
6. The Sponsor and NRCS will each bear the costs of Project administration that each incurs.

7. Includes real property rights costs associated with construction of public infrastructure (re-alignment of Truro Pavement), and water supply pipeline. CCRC already owns the land required for the dam construction and reservoir pool inundation boundary. No real estate costs are required for public roadway infrastructure.
8. Relocation payments for the cost of improvements beyond decent, safe, and sanitary requirements is a non-Project cost ineligible for assistance under the act.

Number of direct beneficiaries: The Osceola Water Works (OWW) and SIRWA service area encompasses Clarke County and Decatur Counties, which includes the cities of Osceola, Woodburn, and Murray, and a total population of 9,748 in Clarke County and a total served population of 3,688 in Decatur County. As of 2022, there were 649 farms in Clarke County and 666 farms in Decatur County. The Project would have a permanent benefit to these farms and residents by increasing the available water supply.

Benefit to Cost Ratio: 2.46

Net beneficial effects (NEE): $173.4 million

Funding schedule:

Year	PL 83-566	Other Funds	Total
2026–2027 Design and Permitting	$10,310,000	$1,765,000	$12,075,000
2028–2030 Construction Dam and Spillway Measures	$50,040,850	$16,964,150	$67,005,000
2029–2030 Construction Water Supply Infrastructure	$13,797,970	$4,678,030	$18,476,000
2030–2031 Construction Transportation Infrastructure	$0	$19,425,000	$19,425,000

Period of analysis: 105 years

Project life: 100 years

Environmental impacts of the Preferred Alternative (Project Area).
Soils: This alternative would have a minor, short-term, direct impact on soils and erosion in the Project Area due to construction impacts. Proper erosion measures would be implemented. Long-term, the alternative would have a minor impact on soils and erosion around the normal pool and downstream of the reservoir.

Prime and unique farmland: This alternative would result in minor, permanent, direct, impacts on prime and unique farmland due to the Project construction and inundation of the normal pool. There would be minor, temporary, direct impacts on farmland due to construction of the water supply pipeline.

Land use: There will be a moderate, permanent, direct impact on land use due to the Project. The predominant existing land use impacted by this alternative is grassland, at 53.4 percent.

Water resources: There would be a moderate, short-term, direct impact on wetlands and streams due to this alternative. A total of 52.24 acres of wetlands would be permanently impacted. Compensatory mitigation would be required.

Impact Type	Stream Type	Linear Feet (ft)
Complete Loss	Intermittent	2,698.21
	Perennial	840.24
Inundated by Impoundment	Ephemeral	13,617.27
	Intermittent	31,101.35
	Perennial	26,457.58
Temporary	Intermittent	45.12
	Perennial	438.91
Total Complete Loss		**3,538.45**
Total Impoundment		**71,176.20**
Total Temporary		**484.03**
Total Stream		**75,198.68**

Floodplains: There would be moderate, permanent, direct impacts on floodplains due to the Project. This alternative would require revision to FEMA flood mapping via a Conditional Letter of Map Revision and Letter of Map revision.

Terrestrial and aquatic wildlife: The proposed reservoir's implementation would result in direct and indirect, short-term and long-term, and localized and farther-reaching effects on terrestrial and aquatic wildlife. Filling the reservoir is anticipated to take several years to complete and would result in gradual landscape modification. A Biological Evaluation (BE) was completed to assess impacts on threatened and endangered species. For all listed plant species, NRCS determined that Project activities would have No Effect on the species. The proposed alternative may impact monarch butterfly individuals, but it is not likely to adversely affect. For the three bat species, Project activities may affect, likely to adversely affect. The BE will be used for coordination with the USFWS in which a Biological Assessment (BA) will be prepared to initiate formal consultation during design phase.

Cultural resources and historic properties: A Phase 1A desktop evaluation of the entire Area of Potential Effect (APE) has been conducted, and no cultural resources sites likely to be considered eligible for inclusion on the National Register of Historic Places (NRHP) were identified. The APE contains the following components: dam and auxiliary spillway construction area, dam impoundment area, a raw water supply pipeline (including pumping station and ground storage reservoir), Truro Pavement realignment, the dam breach zone, indirect effects area that includes a 0.25-mile buffer around major above-ground components, wetland mitigation areas, and streambank mitigation areas. Phase 1 field investigations of the APE are in process. A programmatic agreement has been executed to allow for planning and design level work to continue during the cultural resources investigations and subsequent determinations of NRHP eligibility and findings of effects.

Public health, safety, and transportation: This alternative would have a permanent, beneficial impact on public health and safety due to a reliable drinking water supply, as well as water availability for firefighting. There would be moderate, permanent and short-term, direct impacts on transportation in the region due to inundation from the reservoir and construction impacts.

Social and economic conditions: Based on the most recent available census information, it is not expected that this alternative would disproportionately affect any minorities, socially disadvantaged, or economically disadvantaged people. Long term, the assurance of a reliable, high-quality water supply would help provide for beneficial future economic development and jobs in the community.

Areas of controversy/Controversial issues: During a previous planning effort, landowners expressed concerns over the use of eminent domain, in particular whether the Project was to be used for recreational purposes. As a result of these concerns and subsequent legislation requirements, recreation was removed as a Project purpose. Also, Iowa State Historic Preservation Office (SHPO) expressed concern in 2023 about a violation of Section 110(k) of the NHPA, NRCS investigated and determined no violation occurred. After being provided the results of the investigation, Iowa SHPO concurred with the findings.

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

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1 Purpose and Need for Action

1.1 Introduction

In April 2021**,** the Clarke County Reservoir Commission (CCRC) received assistance from the US Department of Agriculture (USDA) – Natural Resources Conservation Service (NRCS) to develop a watershed project plan for the Clarke County Water Supply Project Watershed under the Watershed and Flood Prevention Operations (WFPO) program. This plan would investigate alternatives to augment the existing water supply needs served by Osceola Water Works (OWW), including the Clarke and Decatur Counties service area of Southern Iowa Rural Water Association (SIRWA) and the city of Osceola.

1.1.1 Authority

The Watershed Project Plan and Environmental Impact Statement (Plan-EIS) was prepared under the authority of the Watershed Protection and Flood Prevention Act of 1954 (Public Law 83-566). The Plan-EIS has been prepared in accordance with the National Environmental Policy Act (NEPA) of 1969, as amended.

1.1.2 Sponsor

CCRC is the non-federal Sponsor for this study and Project. The non-federal Sponsor is referred to as Sponsoring Local Organization (SLO), Sponsor, or CCRC.

1.1.3 Cooperating Agencies and Consulting Parties

NRCS and the Sponsor coordinated and consulted with many local, State, federal, and Tribal agencies for the preparation of this Plan-EIS, as discussed in Chapter 7, Consultation, Coordination, and Public Participation. The United States Army Corps of Engineers (USACE) formally joined the Project as a cooperating agency per the process described in the National Environmental Compliance Handbook (NECH) 610.61.

1.1.4 Historical Background

CCRC has been planning for a new surface water reservoir to supplement the water supply for Clarke County, Iowa, for nearly 30 years. OWW began this planning effort in the late 1980s. CCRC continued the planning effort after commission formation in 2003. CCRC is an intergovernmental entity created under Chapter 28E, Code of Iowa, 2001, that includes the following members:

- City of Murray, Iowa
- City of Osceola, Iowa
- City of Woodburn, Iowa
- Clarke County, Iowa
- OWW Board of Trustees
- SIRWA

1.1.5 Planning Area

The Planning Area is the broad area in which the problems occur. The Planning Area for this Plan-EIS includes all of Clarke County and Decatur Counties, Iowa, (Figure 1-1). This Planning Area was established as due to the area of rural water delivery as follows:

- OWW treats raw water from West Lake, its sole water supply source reservoir, in its surface water treatment plant downstream of the West Lake dam.
- OWW provides potable water service to the city of Osceola and to SIRWA.
- SIRWA provides potable water service to the cities of Murray and Woodburn and the rural areas of Clarke and Decatur Counties, including agricultural operations.

The Planning Area includes portions of the following Hydrologic Unit Code (HUC) 10 watersheds:

Watershed Code	Watershed Name	County
710000805	Clanton Creek	Clarke County
710000808	Upper West Creek	Clarke County
710000809	Headwaters South River	Clarke County
710000810	Otter Creek	Clarke County
710000813	Headwaters White Breast Creek	Clarke County
1028010202	Threemile Creek-Thompson River	Clarke County
1028010203	Long Creek	Clarke County, Decatur County
1028010205	Sand Creek-Thompson River	Clarke County, Decatur County
1028010208	Headwaters Weldon River	Clarke County, Decatur County
1028020102	Wolf Creek-Chariton River	Clarke County, Decatur County
1028010109	Big Creek	Decatur County
1028010206	Panther Creek-Thompson River	Decatur County
1028010204	Elk Creek	Decatur County
1028010207	Little River	Decatur County

The Planning Area will be used to identify the full range of alternatives. The Study Area includes the Upper West Creek and South West Creek Watersheds (Hydrologic Unit Codes 071000080802 and 071000080801).[2] The Study Area is a subset of the Planning Area and the location for the reservoir alternatives evaluated.

[2] West Creek and associated watersheds were officially renamed by the US Geological Survey in 2024. NRCS notes the previous legal name (Squaw Creek) of West Creek may appear in various sources and appendices throughout the EIS that were created before the legal name change. NRCS acknowledges the derogatory nature of the name and apologizes for its use.

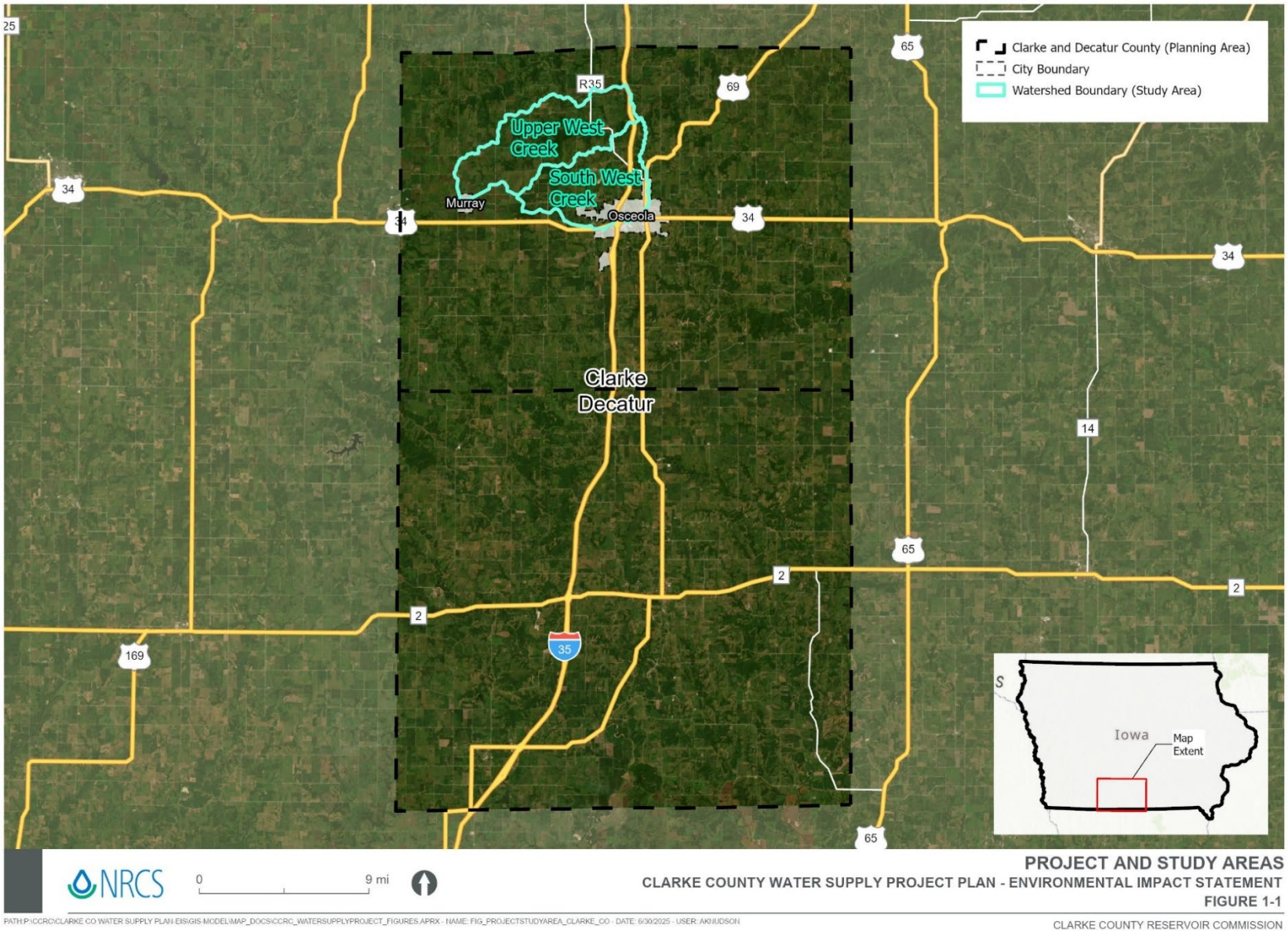


Figure 1-1. Planning and Study Area

1.2 Purpose and Need

The purpose of the proposed action is to provide a reliable water supply to meet existing and anticipated water needs for agricultural customers served by OWW and SIRWA. The Project is needed due to current agricultural and other water supply deficiencies and unreliability.

1.2.1 Existing Water Supply and Demands

Currently, OWW treats raw water from West Lake and supplies potable water to the city of Osceola and the surrounding area through the sale of water to SIRWA. OWW and SIRWA are both members of CCRC. SIRWA purchases the wholesale water from OWW and then distributes it to agricultural and rural customers and small communities within their service area.

Water Supply Source

The current water supply source is a reservoir located west of Osceola (West Lake). West Lake is located approximately 0.5 mile west of Interstate 35 (I-35) and just south of Clay Street/County Road-H33. West Lake is a 300-acre reservoir owned by the City of Osceola that is recharged by surface water runoff from South West Creek, which has a drainage area of approximately 6,350 acres upstream of the dam. NRCS conducted a West Lake water budget analysis in 2009 and found the lake's yield for the design drought conditions was approximately 0.9 million gallons per day (mgd) of raw water supply and would decrease to approximately 0.8 mgd in 2040 due to sedimentation. The West Lake supply is assumed to remain at 0.8 mgd in 2050.

SIRWA Demands

SIRWA's service area includes all or part of 13 counties in southern Iowa. SIRWA serves Clarke and Decatur Counties with water purchased from OWW. There is a significant livestock population in the Planning Area served by SIRWA, which requires substantial water use. As of 2022, there was a total of 123,448 livestock (25,296 cattle and calf, 19 dairy cows, 96,648 hogs, 867 poultry, and 618 sheep) in Clarke County and 195,142 livestock (39,170 cattle and calf, 63,701 hogs, 90,978 poultry, and 1,293 sheep) in Decatur County (USDA 2022). SIRWA also serves rural communities in Clarke and Decatur Counties. SIRWA's average daily water demand is shown in Figure 1-2. Agricultural uses include water for cattle operations, hog confinements, and farmsteads. Non-agricultural uses include churches, commercial use, government, and residential/bulk sales to rural communities.

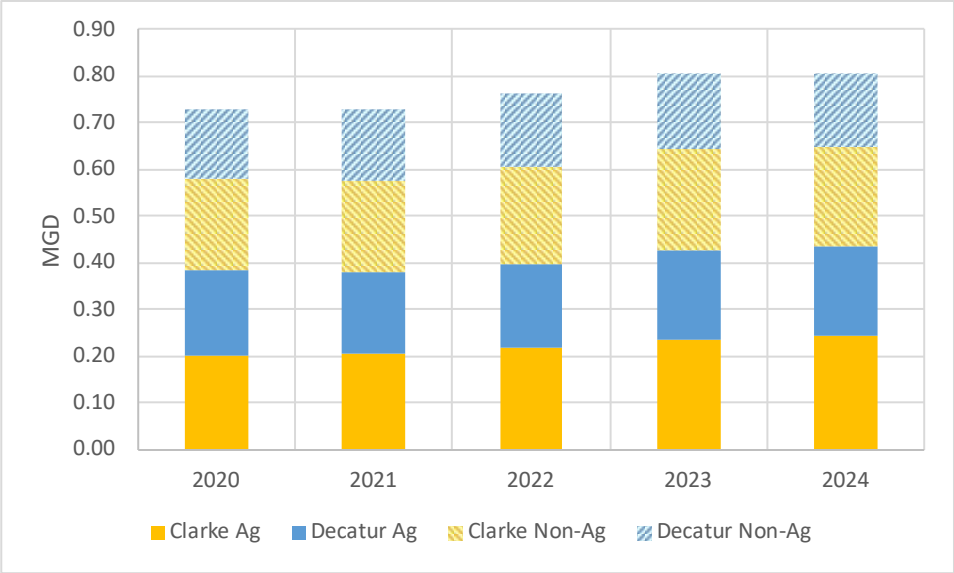


Figure 1-2. SIRWA Average Daily Demand – Clarke and Decatur Counties 2020–2024

City of Osceola Demands

OWW also serves residential, commercial, and agricultural users in the city of Osceola, which includes, a turkey hatchery, several hog confinement operations, and Osceola Foods, a pork processing facility for Hormel and the largest employer and water user in Osceola. The city of Osceola's average daily demand is shown in Figure 1-3. A full summary of demand is included in Appendix D1.

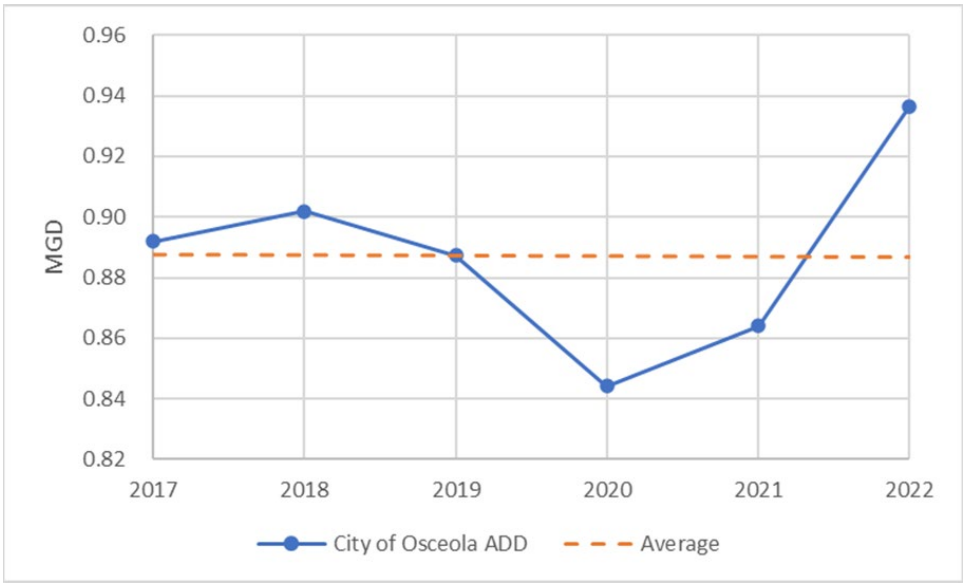


Figure 1-3. City of Osceola Average Daily Demand 2017–2022

1.2.2 Existing Water Supply Deficiencies

At least four serious drought events have occurred in Clarke County since the 1980s impacting West Lake and OWW. Drought in 1988 and 1989 reduced the West Lake supply, and the City of Osceola invoked voluntary water conservation measures. OWW and the City of Osceola began efforts at this time to investigate alternative sources of water supply. Another drought occurred in 2006, and the water level in West Lake was drawn down again. In August of 2006, the OWW Water Board considered instituting restrictions, but a large rainfall event occurred before restrictions became necessary. The plant superintendent estimated only a 10-month water supply was available at the reduced water level (Lesko 2007). Another drought began in the fall of 2011 and continued into April 2013. The City of Osceola invoked voluntary conservation measures in late 2012. Additionally, in 2023, SIRWA was asked to switch as much of their water supply as possible to other sources (OWW 2023b). SIRWA has also implemented its own water conservation advisories during recent drought (SIRWA 2022, SIRWA 2023a, SIRWA 2023b). OWW is pursuing short-term measures to extend the water supply as long as possible, including modifications to the lower intake and recycling greywater (OWW 2023c; Osceola Sentinel-Tribune 2023). Drought conditions continued through 2023, where West Lake was in its third year of lake levels being below the principal spillway/normal pool elevation, last exceeding the overflow in May of 2021. In October 2023, the OWW Board of Trustees increased the water conservation ordinance to Section 3, Water Emergency. Due to rain during the summer of 2024, all water conservation ordinances were lifted on June 6, 2024; however, the pool did not reach the normal pool level until May 2025, so pool levels were below normal pool for four consecutive years (OWW 2024a, OWW 2025a).

During periods of low precipitation, the water level in West Lake has dropped significantly due to withdrawal rates exceeding recharge rates. NRCS conducted a water budget analysis of West Lake in 2009 and found that the lake's raw water yield for the design drought condition is approximately 0.9 mgd in 2009 and decreases to approximately 0.8 mgd in 2040 due to sedimentation. OWW consistently withdraws more water than this safe to meet customer needs, which is an unsustainable practice that is resulting in further drawdown of the lake levels. As the lake level drops, withdrawal becomes inadvisable due to poor water quality that causes higher treatment costs and adds an odor and taste to the treated water (City of Osceola 2022).

Livestock producers face financial hardship and stress related to the uncertainty of water supply and restrictions on water usage. The lack of water or restrictions on water could lead to reduction in quality of livestock, quantity purchased for production, type of feed, high mortality rates during extreme heat events or even selling of a herd due to uncertainty. Several large cattle producers have communicated to OWW that with the ongoing drought and water restrictions, they had to find other places to relocate cattle, creating significant additional expenses for the producers (OWW 2025b).

1.2.3 Future Water Supply Need

The agricultural water supply in Clarke and Decatur Counties is at risk because OWW is projected to have insufficient water supply to continue to provide water to both the city of Osceola and SIRWA. City of Osceola demand is growing due to population growth and

business/industrial growth, and it is projected to surpass the average supply of the reservoir as soon as 2030. Therefore, if a new water supply is not identified, OWW is unlikely to renew purchasing agreements with SIRWA, jeopardizing agricultural demand. As members of CCRC, SIRWA and OWW would both be partners in the new water supply, ensuring a sustainable water supply for SIRWA and the agricultural users and other rural customers they serve.

A water demand analysis completed in 2024 provides the most recent assessment of water demand projections (Appendix D1). As indicated, the city of Osceola alone is expected to exceed the capacity of West Lake, and in identifying a new water supply for agricultural users there is also an opportunity to identify additional water supply for users in the city of Osceola. Table 1-1 shows the current demands and future demand projections for the city of Osceola and SIRWA. Raw water demand represents the total water withdrawals from the water supply source, and finished water demands indicate treated water that is sold to customers after treatment. Recent data from OWW suggests an average raw to finished water ratio of 1.07.

Table 1-1. Current (2022) and projected (2050) future water demands in million gallons per day

Entity	Current Finished ADD (mgd)[1]	Current Raw ADD (mgd)[1,2]	2050 Finished ADD (mgd)	2050 Raw ADD (mgd)[2]
City of Osceola Total	0.88	0.94	1.21	1.29
Agriculture	0.02	0.02	0.03	0.03
SIRWA Total	0.74[3]	0.79[3]	0.88	0.94
Agriculture	0.39	0.41	0.52	0.56
Osceola Business Park Total[4]	NA	NA	0.43	0.46
Total Demand	**1.62**	**1.74**	**2.52**	**2.70**

Source: HDR 2024

Notes:

[1] Current demand is an average of 2020-2022 water demands.

[2] Raw water is calculated using the metered or projected future finished water demands and the current ratio of raw to finished water at OWW (ratio 1.07, or an efficiency of 93.5%).

[3] SIRWA current demand includes all water supplied in Clarke and Decatur Counties. In 2022 part of Decatur County demand is partially met by Leon WTP, but this demand is expected to shift to OWW due to aging infrastructure.

[4] Current demands to the Business Park are included in the city of Osceola demands.

The study indicates an 48 percent increase in raw water demand. NRCS West Lake water budget analysis estimated raw water supply at 0.8 mgd in 2050, as discussed in Section 1.2.1. This existing water supply is significantly below the projected future water demand. The demand update estimated the average day raw water demand to be 2.7 mgd in year 2050. Given the estimated yield of West Lake in 2050 (0.8 mgd), the unmet average daily demand for 2050 would be 1.9 mgd. The full Water Demand Projections report is included in Appendix D1.

1.3 Problems and Opportunities

1.3.1 Problems

After discussions with stakeholders and review of the 2024 demand analysis, the following problems were identified:

- Inadequate agricultural water supply to meet existing demand
- Inadequate agricultural water supply to meet projected demand
- Inadequate water supply for supporting agricultural services

1.3.2 Opportunities

There are several opportunities to consider within the Project Area associated with the development and implementation of this Project. These opportunities include:

- Provide reliable water supply to meet current and projected agricultural demand
- Improved drinking water quality for rural areas (farmsteads supporting agriculture) and rural communities (supporting the agricultural industry in Clarke and Decatur Counties)
- Increased water availability for fire fighting
- Increased and improved fish and wildlife lacustrine habitat

1.4 Objectives and Constraints

This study consists of two sets of objectives: The Federal Objective, which every NRCS planning study shares; and the Project objectives, which are developed on a per-project basis and detailed below.

1.4.1 Federal Objective and Guiding Principles

To meet NRCS requirements for federal investment in a water resources project, the Project must meet the Federal Objective set forth in the Water Resources Development Act of 2007 and promote the guiding principles as stated in the Principles, Requirements, and Guidelines (PR&G) for water and land related resources implementation studies and federal water resource investments. The Federal Objective specifies that federal water resources investments shall reflect national priorities, encourage economic development, and protect the environment by:

1. seeking to maximize sustainable economic development,
2. seeking to avoid the unwise use of floodplains and flood-prone areas and minimizing adverse impacts and vulnerabilities in any case in which a floodplain or flood-prone area must be used,
3. protecting and restoring the functions of natural systems and mitigating any unavoidable damage to natural systems.

Additionally, the Project should seek to achieve the guiding principles identified by the federal government: healthy and resilient ecosystems, sustainable economic development, floodplains, public safety, and watershed approach.

1.4.2 Project Objectives

Project objectives were developed to address the problems and realize opportunities in the watershed. In coordination with the public and stakeholder agencies, NRCS and the Sponsors established the following objective for the Project:

- Develop water source to supply forecasted unmet agricultural average daily demand of 0.6 mgd
- Develop water source to supply forecasted total unmet average daily demand of 1.9 mgd

1.4.3 Constraint Considerations

Constraints in addressing agricultural water management in the study area include the following:

- Hydraulic and hydrologic constraints on watershed yield
- Adequate groundwater resources
- Eminent domain for property acquisition outside of CCRC authority

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2 Scope of Environmental Impact Statement

The scope of the EIS is based on resources identified in previous studies as well as current investigations and scoping meetings with NRCS, the Sponsor, and interested agencies and individuals. This section identifies the resources deemed relevant to decision making as well as resources that were considered but not studied in detail.

The Project involves the development of a plan to manage, protect, and enhance water and land resources in the County Planning Area. NRCS planning assistance has been provided under the authority of the Watershed Protection and Flood Prevention Act, PL 83-566.

NRCS has completed studies to determine the extent of natural resource problems and needs, in accordance with the Sponsors' objectives. The PR&G (DM 9500-013) provides guidance for the formulation and evaluation of studies conducted by federal agencies that work with water resources and was used in the development of this Plan-EIS.

A scoping meeting was held on August 19, 2021. Eight agencies were contacted in advance and the meeting was advertised to the public, as detailed in Chapter 7, Consultation, Coordination, and Public Participation. A brief Project presentation was given, and agencies and the public were provided opportunities to express concerns in the meeting, by email, and through comments. NRCS conducted Tribal consultations and coordination beginning in August 2021 and continued throughout planning, in accordance with the National Historic Preservation Act (NHPA) of 1966, Executive Order (EO) 13175, *Consultation and Coordination with Indian Tribal Governments,* and NEPA. See Chapter 6 for a complete summary of scoping and Appendix A4 for documentation of Tribal communication.

The Summary of Scoping (Table 2-1) was developed based on public participation at the scoping meeting, Sponsor, and landowner objectives, NRCS policy, federal and state laws, and agency consultation. Resource concerns listed in Table 2-1 were evaluated to analyze effects of proposed alternative actions. These evaluations are described further in the "Alternatives" section.

Table 2-1. Summary of Scoping

Item/Concern	Relevant to Proposed Action?		Rationale
	Yes	No	
SOILS			
Erosion	X		Erosion has potential to impact and be impacted by Project construction.
Sedimentation	X		Sedimentation has potential to impact drinking water quality.
Prime and Unique Farmland	X		There are prime and unique farmlands in the Planning Area.

Item/Concern	Relevant to Proposed Action?		Rationale
	Yes	No	
WATER RESOURCES			
Water Quality	X		Water quality may be impacted by alternatives and water quality will also be considered for water source.
Wetlands and Other Waters of the US	X		There are jurisdictional waters of the US in the Planning Area.
Floodplain Management	X		Construction and operation of the Project could occur in the 100-year floodplain.
Wild and Scenic Rivers		X	There are no wild and scenic rivers present in the planning area or watersheds downstream of the planning area.
Sole Source Aquifers		X	There are no sole source aquifers in the Planning Area.
AIR			
Air Quality		X	Planning Area is in attainment for all criteria pollutants, no anticipated impacts to air quality and no air quality permitting will be required.
TERRESTRIAL AND AQUATIC WILDLIFE			
Special Status / Threatened or Endangered Species	X		There are known federal and state listed species in the Planning Area.
Essential Fish Habitat		X	There is no designated essential fish habitat in Planning Area.
Invasive Species	X		There are invasive species present in the Planning Area and there is potential for them to be impacted by alternatives.
Natural Areas	X		Presence of natural areas with prairie remnant and oak savannah.
Riparian Areas	X		Riparian areas are present and could be impacted by alternatives.
Fish and Wildlife Habitat	X		Alternatives impact forest, grassland, and aquatic habitat.
Ecological critical areas		X	There are no ecologically critical areas within the Planning Area, the state of Iowa or downstream in the HUC 2 watershed the Planning Area is within.
Coral Reefs		X	No coral reefs present in Planning Area.
Coastal zone management areas		X	No coastal zones present in Planning Area.
Migratory Birds	X		Alternatives resulting in land use changes could impact migratory birds.
Bald and Golden Eagles	X		Alternatives have the potential to impact bald or golden eagles present in the Planning Area.
HUMAN ENVIRONMENT			
Flood Damages	X		There are potential flood benefits and risks with the proposed alternatives.

Item/Concern	Relevant to Proposed Action?		Rationale
	Yes	No	
Archeological and Historical Resources	X		Consultation with State Historic Preservation Office, Native American tribes, local governments, and other interested consulting parties is required for compliance with Section 106 of the National Historic Preservation Act and NEPA. There are NRHP-eligible historic properties or other cultural resources listed in the state database in the Planning Area. Inventory survey will be necessary to identify and evaluate cultural resources in the Project APE and assess effects of the proposed Project on historic properties and other cultural resources.
National Parks, Monuments, and Historic Sites		X	There are no national parks, national monuments, or national historic sites to be potentially impacted within the Planning Area.
Local and Regional Economy	X		All Project alternatives would impact local and regional economy.
Public Health and Safety	X		All Project alternatives should provide a readily available water source for firefighting and a reliable and safe drinking water source.
Recreation and Parklands		X	Recreation is not a Project purpose. No existing parklands would be impacted.
Significant Scientific Resources		X	There are no significant scientific resources in the Planning Area.
Scenic Areas	X		Proposed actions could enhance visual resources in the Planning Area.
Land Use	X		Construction and operation of alternatives could affect land use.
ECOSYSTEM SERVICES			
Provisioning Services	X		Provisioning services supported by water availability could be impacted by the proposed action.
Regulating Services	X		Regulating services supported by water availability could be impacted by the proposed action.
Supporting Services	X		Supporting services supported by water availability could be impacted by the proposed action.
Cultural Services	X		Cultural services supported by water availability could be impacted by the proposed action.

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3 Affected Environment

The Affected Environment section provides the baseline for NEPA evaluation and planning. This section describes the current ecosystem service flows and physical, biological, ecological, economic, and social environments for the Upper West Creek (HUC 071000080802) and South West Creek (HUC 071000080801) watersheds Study Area, as well as projected future conditions, to the extent possible, based on reasonably foreseeable trends and actions. This section provides context for the formulation of alternatives as well as the existing conditions of the above identified watersheds, which total 32,947 acres. The resources presented were identified during scoping. The Planning Area of Clarke and Decatur Counties, as defined in Section 1.1.5, was also evaluated for public health, safety, transportation, and social and economic conditions because it is the area impacted from agricultural water supply problems and the area that will benefit from the Project.

3.1 Soils

The Study Area is located within the Southern Iowa Drift Plain landform region, characterized by glacial drift mantled with loess soils. Rolling to very steep valleys along streams and major drainageways are commonplace. It is nearly level and gently rolling on upland divides, retaining much of the original surface character. Narrow strips of nearly level bottomland border most creeks and streams. This area is characterized by incised valleys in Pre-Illinoian glacial till. Thin caps of loess may be present on the ridges or side slopes. Till/loess derived alluvium, sediment laid down along the major streams and narrow upland drainageways, is present in the valleys and drainageways. Depth to bedrock varies widely in the county and in a few locations may outcrop at the surface. Bedrock consists of Pennsylvanian (Kansas City Group) formations. These formations include shale and limestone. Upland soils consist primarily of units of the Grundy-Haig-Arispe soil association, which are somewhat poorly drained to poorly drained soils that are silty and formed in loess. Loess, which was deposited by wind, is the most extensive parent material in the watershed, occurring mostly on the uplands and benches. It consists of mainly silt-sized particles and is calcareous. The loess is believed to have blown mainly from the Missouri River flood plain during the Wisconsin glacial period. The loess is thinner (18 feet thick) and finer textured in the eastern part of the county than the western part (25 feet thick).

Highly Erodible Land (HEL) was evaluated to determine susceptibility to erosion in the area. HEL is an NRCS designation that indicates land that can erode at an excessive rate because of soil properties, leading to long-term decreased productivity. Approximately 55 percent of the soil in the Study Area is considered highly erodible, largely in upland areas (Table 3-1, Figure 3-1).

Table 3-1. Study Area Highly Erodible Land

HEL	Acres	Percentage (%)
Highly Erodible Land	18,161	55
Potentially Erodible land	2,295	7
Not Highly Erodible	4,898	15
No Designation	7,592	23
Total:	32,947	100.0

Source: USDA NRCS 2020b

3.2 Prime and Unique Farmlands

The Federal Farmland Protection Policy Act (FPPA) was enacted to minimize unnecessary and irreversible conversion of farmland to other uses because of federal decisions. In addition, FPPA states that federal programs should be compatible with State and local policies or programs that protect farmland. Soils that exhibit the soil quality, growing season, and moisture supply needed to economically produce sustained high yields of crops when treated and managed (including water management) according to acceptable farming methods are designated as prime or unique farmland. For FPPA purposes, farmland includes prime farmland, unique farmland, and land of statewide or local importance. Farmland subject to FPPA requirements does not have to be used for cropland currently. It can be forest land, pastureland, cropland, or other land, but not water or urban, built-up land (USDA NRCS 2023).

Prime farmland is of major importance in meeting the nation's short- and long-range needs for food and fiber. Because the supply of high-quality farmland is limited, USDA recognizes that responsible levels of government, as well as individuals, should encourage and facilitate the wise use of our nation's prime farmland. In some areas, land that does not meet the criteria for prime or unique farmland is considered to be farmland of statewide importance to produce food, feed, fiber, forage, and oilseed crops. The criteria for defining and delineating farmland of statewide importance are determined by the appropriate State agencies. Generally, this land includes areas with soils that nearly meet the requirements for prime farmland and that economically produce high yields of crops when treated and managed according to acceptable farming methods. Some areas may produce as high a yield as prime farmland if conditions are favorable. Farmland of statewide importance may include tracts of land that have been designated for agriculture by State law (USDA NRCS 2020a).

In total, 4,528 acres in the Study Area are considered prime farmland, and 18,322 acres are considered farmland of statewide importance (Figure 3-2). In total, 69 percent of the Study Area is considered prime farmland or farmland of statewide importance (see Table 3-2).

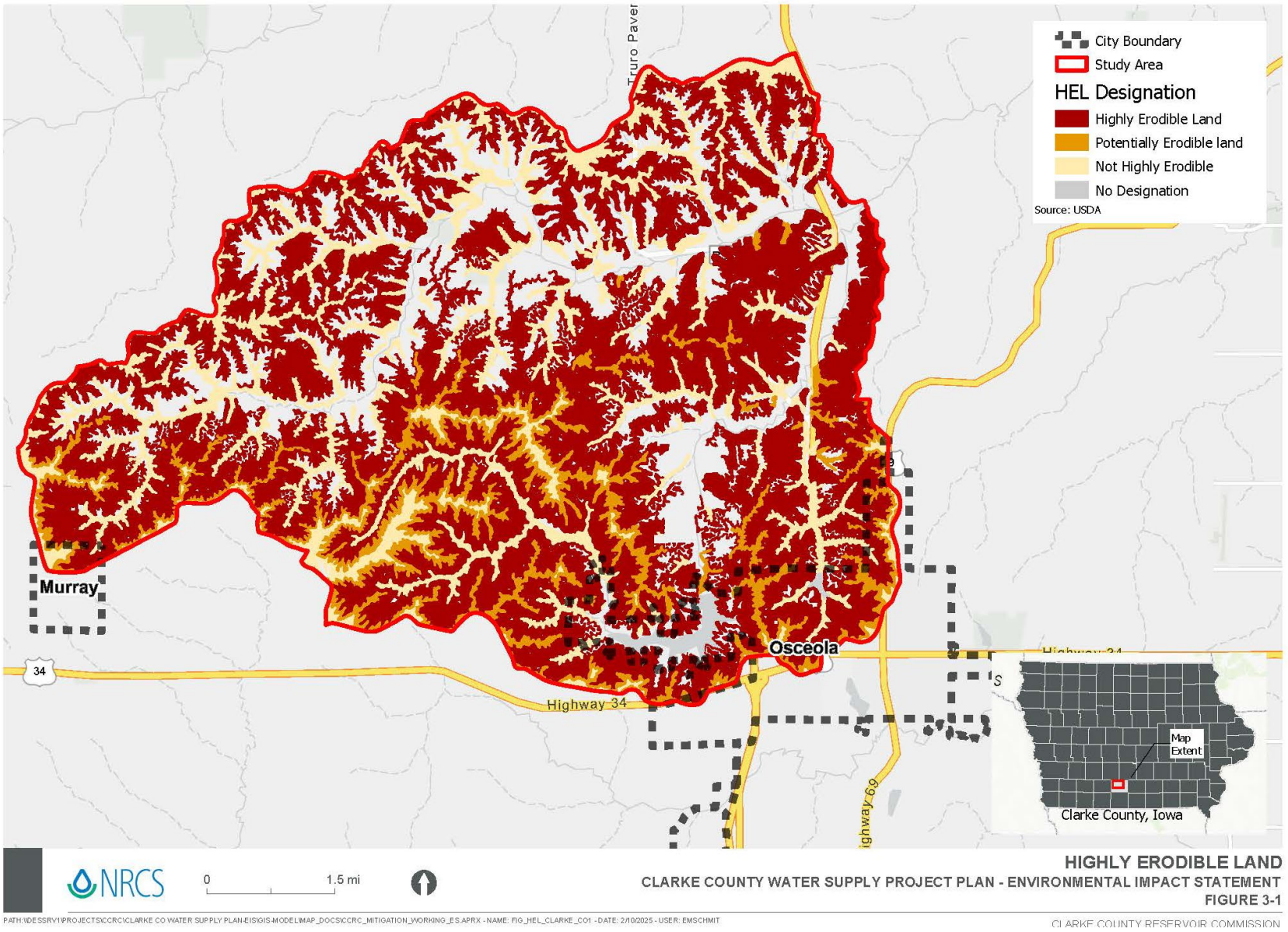


Figure 3-1. Soil Erodibility Factor in the Study Area

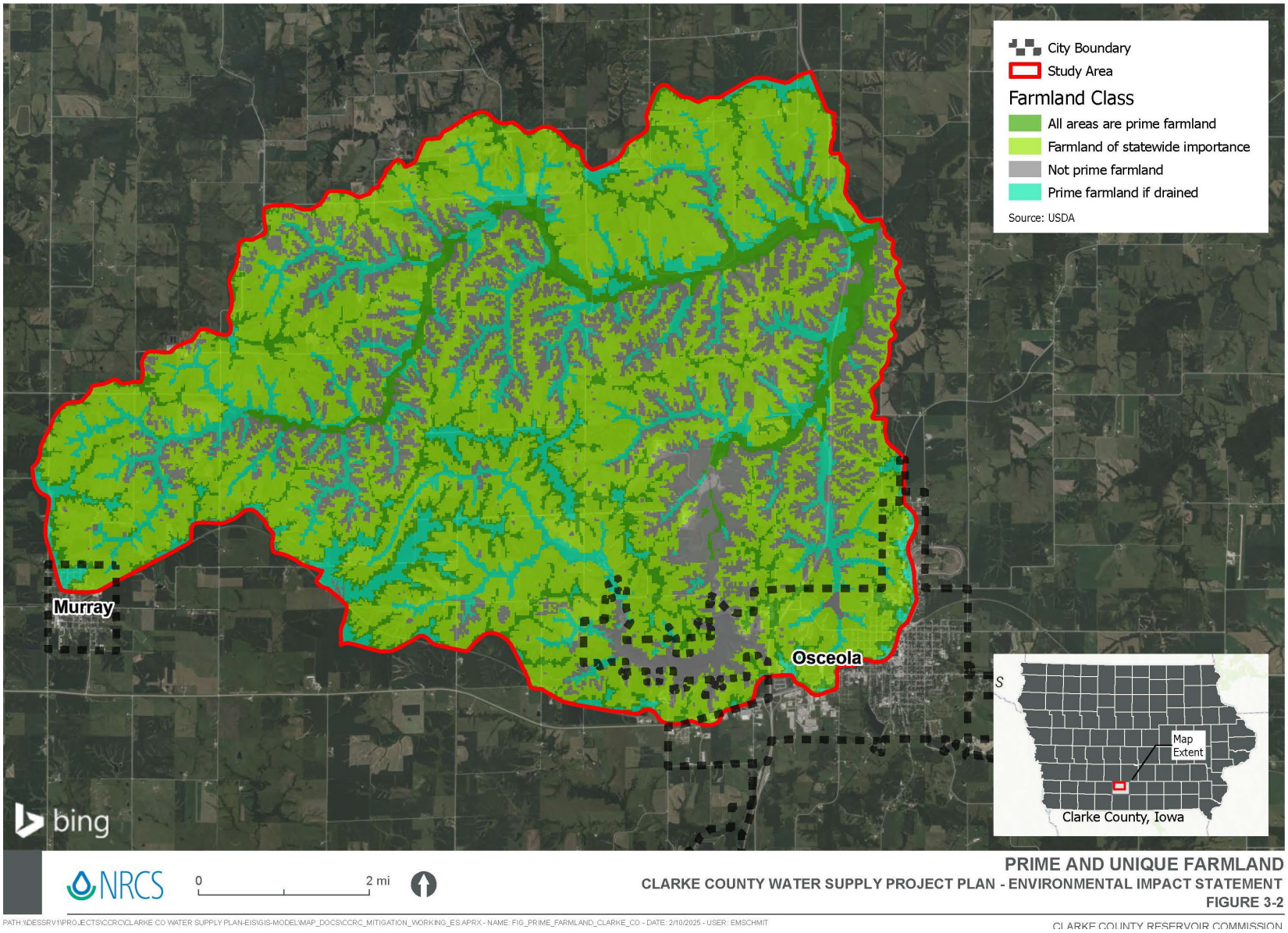


Figure 3-2. Prime and Unique Farmland in the Study Area

Table 3-2. Study Area Prime and Unique Farmland

Farmland Class	Acres
All areas are prime farmland	4,528
Farmland of statewide importance	18,322
Not prime farmland	5,718
Prime farmland if drained	4,378
Total:	32,947

Source: USDA NRCS 2020b

3.3 Land Use

Land ownership in the Study Area is primarily private, with the majority of land use being agricultural pasture/grassland and row crops. Grassland is the largest landcover class at 48 percent, followed by cropland at 26 percent. Cropland includes all row crop types, but corn and soybeans comprise 85 percent of the cropland in the Study Area (Table 3-3, Figure 3-3).

Table 3-3. Study Area Land Use 2023

Land Use Type	Acres	Percent of Study Area (%)
Grassland[1]	15,891	48
Cropland[2]	8,444	26
Forest[3]	5,931	18
Developed[4]	2,082	6
Water & Wetlands[5]	525	2
Barren/Fallow[6]	74	<1

Source: USDA NRCS 2023b
Notes:
[1] Grassland land use classes include Clover/Wildflowers, Grassland/Pasture, and Shrubland.
[2] Cropland land use classes include Alfalfa, Apples, Barley, Corn, Oats, Other Hay/Non Alfalfa, Rye, Sorghum, Soybeans, Spring Wheat, Sweet Corn, Triticale, and Winter Wheat.
[3] Forest land use classes include Deciduous Forest, Evergreen Forest, and Mixed Forest.
[4] Developed land use classes include open space, high, medium, and low intensity developed.
[5] Water & wetlands land use classes include Open Water, Herbaceous Wetlands, and Woody Wetlands.
[6] Barren/fallow land use classes include Barren, Fallow/Idle Cropland, and Sod/Grass Seed.

The Study Area intersects two incorporated communities: Murray and Osceola. Most of the developed areas are within these incorporated communities.

3.4 Water Resources

This section describes the various forms of water related resources in the Study Area relative to type, quantity, and quality.

3.4.1 Wetlands

The United States Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI) provides detailed information on the abundance, characteristics, and distribution of wetlands within the United States. According to NWI, there are five different types of wetlands totaling

1,120.9 acres in the Study Area (Figure 3-4). Not all wetland types would be affected by the alternatives. Some artificial wetlands exist in peripheral areas of livestock ponds. The majority of the wetlands are riverine, but there is also a substantial number of lakes and freshwater ponds.

Table 3-4. NWI Resources in the Study Area

Wetland Type	Acres
Riverine	340.8
Lake	293.3
Freshwater Pond	235.5
Freshwater Emergent Wetland	127.5
Freshwater Forested/Shrub Wetland	123.8
Total:	1,120.9

Source: USFWS 2022

3.4.2 Watersheds, Streams, and Riparian Areas

The United States Geological Survey (USGS) National Hydrography Dataset (NHD) represents the water drainage network of the United States, including rivers and streams. There are approximately 330.1 miles of ephemeral, intermittent, and perennial streams in the Study Area (Figure 3-4).

Table 3-5. NHD Waterways in the Study Area

Type	Length (miles)
Ephemeral	182.3
Intermittent	124.0
Perennial	23.8
Artificial Path	23.3
Connector	2.2
Total:	355.6

Source: USGS 2023a

The Study Area comprises the extents of two HUC-12 watersheds: Upper West Creek and South West Creek (Figure 3-4). The Study Area is within the Upper Mississippi Region HUC 2 (HUC Code 07) and drains to the northeast via the South River, West Creek, Otter Creek, and White Breast Creek to the Des Moines River and eventually the Mississippi River.

Table 3-6. Study Area HUC-12 Watersheds

Watershed Code	Watershed Name
071000080802	Upper West Creek
071000080801	South West Creek

Source: USGS 2023b

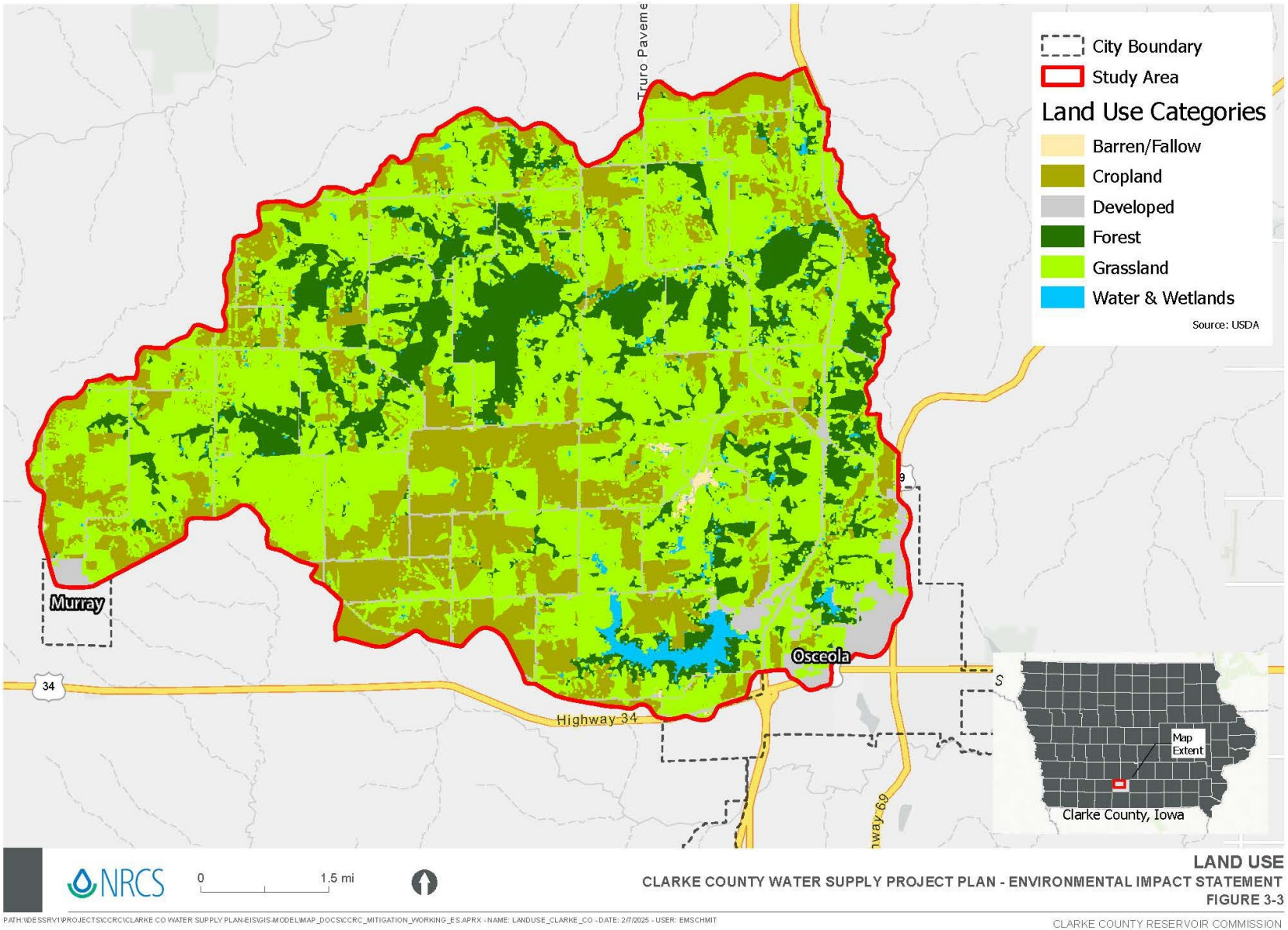


Figure 3-3. Land Use in the Study Area

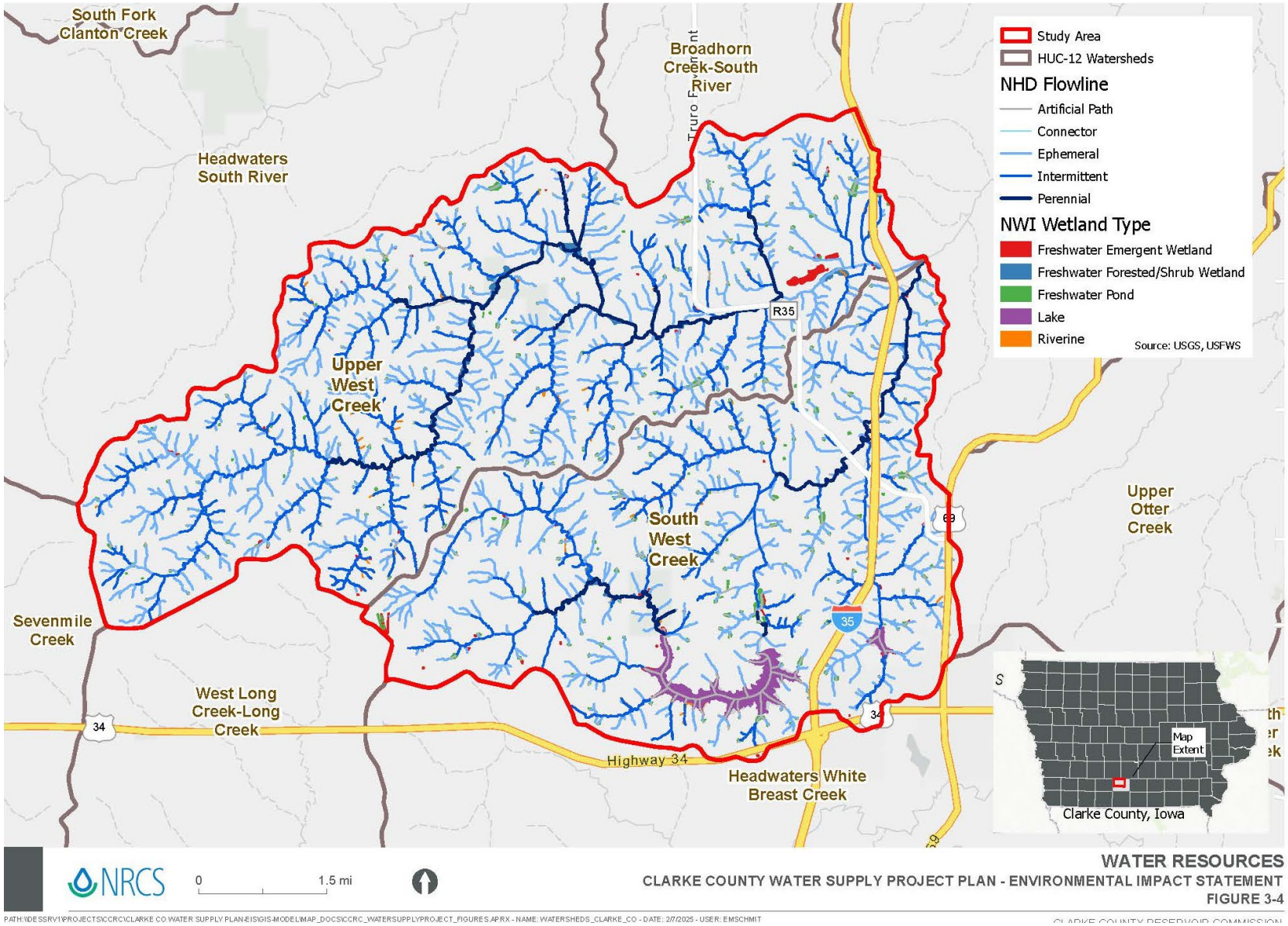


Figure 3-4. Water Resources in the Study Area

3.4.3 Water Quality

According to the Iowa Department of Natural Resources (Iowa DNR) 2024 Water Quality Assessment Impaired List (Section 303[d] impaired waters), there is one impaired water body in the Study Area (Iowa DNR 2025). West Lake (IA 01-LDM-1082), the existing water supply reservoir, was listed as a Category 5 waterbody in the 2024 assessment cycle. A Category 5 waterbody means the water is impaired or threatened, and a total maximum daily load (TMDL) is needed. The listed impairment consists of organic enrichment/low dissolved oxygen. West Lake was listed as an impaired water body in 2005, with “pesticides” listed as the designated pollutant and drinking water as the impaired use, but this impairment was removed in 2016. West Creek (IA 04-LDM-1079) and South West Creek (IA-04-LDM-3167) were assigned Category 3 designations during the 2024 assessment cycle. Category 3 means there is insufficient data to determine whether any designated uses are met.

3.5 Floodplains

Federal Emergency Management Agency (FEMA) floodplains and floodways are mapped along major streams and rivers across the United States. The Study Area intersects Zone A floodplains, which are defined by FEMA as the base (1-percent annual chance, or the 100-year flood event) floodplain where no flood depths or base flood elevations (BFE) are provided. FEMA has not completed a detailed study in the Study Area that designates Zone AE floodplains or floodways. A total of 2,201 acres in the Study Area are within Zone A floodplain. An additional 30,746 acres are within Zone X floodplain, representing the 0.2-percent annual chance flood, or the 500-year flood event. The floodplains within the Study Area are confined around waterways (see Figure 3-5).

3.6 Terrestrial and Aquatic Wildlife

The Study Area intersects two Level IV ecoregions, Rolling Loess Prairies (47f) and Loess Flats and Till Plains (40a), with approximately 61 percent in the Loess Flats and Till Plains (Figure 3-6). An ecoregion is identified through the patterns and composition of both biological and physical characteristics, including geology, physiography, vegetation, climate, soils, land use, wildlife, and hydrology. The landform in both ecoregions is irregular plains to open low hills. Potential vegetation includes a mosaic of bluestem prairie and oak-hickory forest.

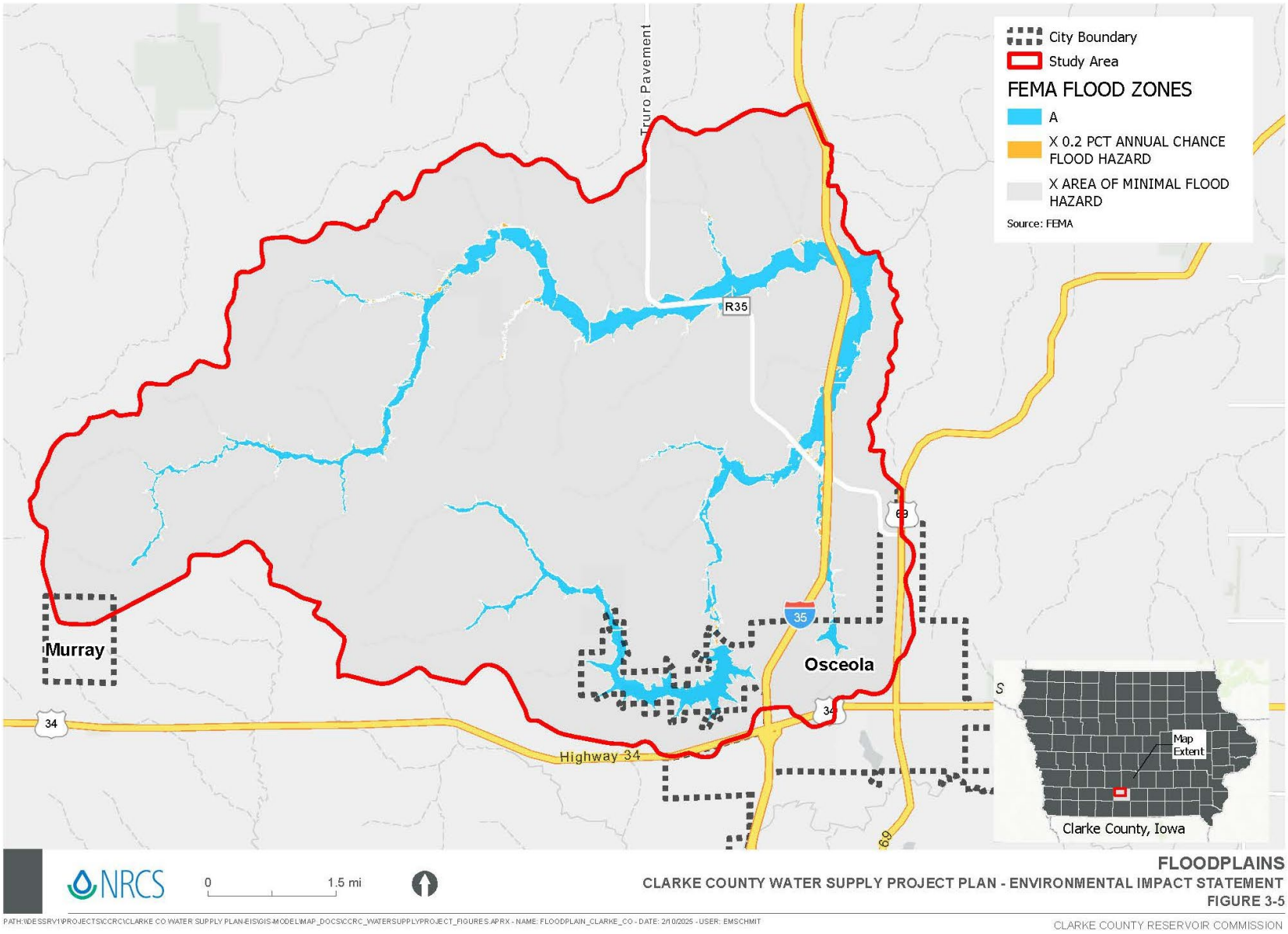


Figure 3-5. Floodplains in Study Area

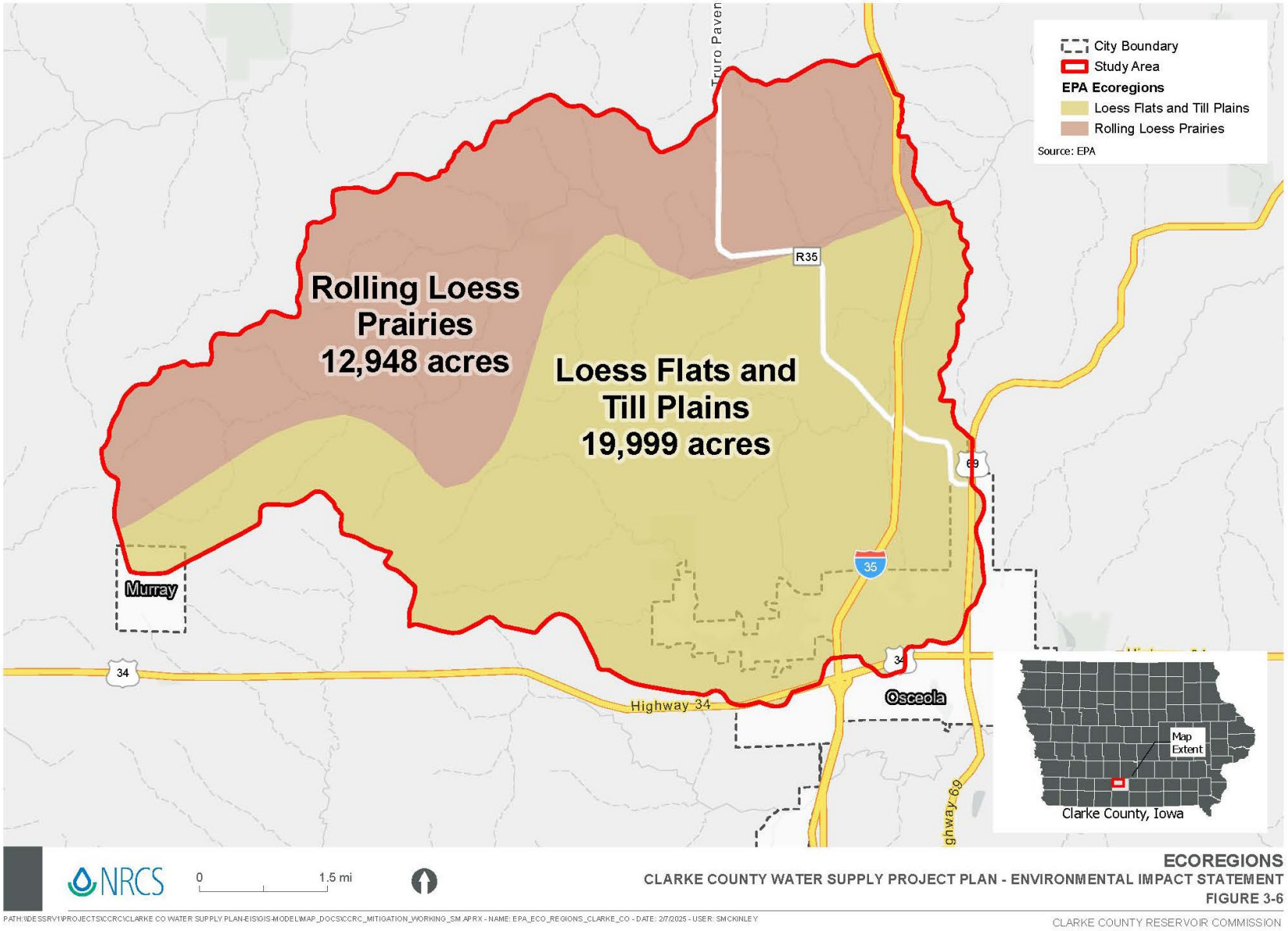


Figure 3-6. Ecoregions in Study Area

3.6.1 Habitat

The Study Area contains 21,822 acres of terrestrial habitat, which consists of grassland/pasture, shrubland, and forest land use types. In addition, there are 525 acres of aquatic habitat, including wetlands and open water land use types (USDA NRCS 2023b). Aquatic habitat in the Study Area consists largely of small farm ponds. However, larger bodies of water, including West Lake and Q Pond, are located in the southeast portion of the Study Area near the northwestern city limits of Oceola. Most of the woodlands are of a good wildlife quality, while most of the grassland ranges from fair to poor quality due to heavy grazing pressure. The Study Area includes the Coyote Canyon Wildlife Area, which is a County Conservation Board area. Coyote Canyon Wildlife Area is 9.0 miles northwest of Osceola and comprised of restored prairie and heavy oak and hickory timber (Clarke County 2023a).

NRCS consulted with biologists from USFWS and Iowa DNR to ascertain what potential impacts on threatened and endangered species, fish and other aquatic species, and terrestrial wildlife habitat could result from projects in the Study Area. The woodland cover has the potential to be significant to the Indiana, northern long-eared, and tricolored bats. The USFWS Information for Planning and Consultation (IPaC) tool was used for the planning area and indicated no critical habitat in the Study Area (USFWS 2025). An Official Species List (OSL) was obtained for the Project Area and is discussed in Chapter 5. The loss of grassland cover, while less significant, was deemed an important consideration in the analysis of potential Project impacts.

3.6.2 Aquatic Species

Iowa DNR is responsible for the Endangered Plants and Wildlife Law (Chapter 481B of the Code of Iowa), which requires designating a state list of endangered and threatened species. In addition to species with the endangered and threatened designation, low and declining populations of fish and wildlife are defined as Species of Greatest Conservation Need (SGCN). Table 3-7 provides a list of aquatic SGCN identified in the Coyote Canyon Wildlife Area by Iowa DNR. Coyote Canyon Wildlife Area is partially within the Upper West Creek Watershed and has records of SGCN as it is one of Iowa DNR's Multi-Species Inventory and Monitoring (MSIM) sites. The letter from Iowa DNR identifying SGCN is included in Appendix A7.

Table 3-7. Aquatic SGCN identified by Iowa DNR

Common Name	Scientific Name	Habitat preference
Blanchard's Cricket Frog	*Acris crepitans*	Rivers, streams, lakes, wetlands
Spotted Spreadwing	*Lestes congener*	Ponds and lakes of all sizes with emergent vegetation
Amber-winged Spreadwing	*Lestes eurinus*	Fishless shallow ponds and wetlands

Source: Iowa DNR 2020

Field observations and anecdotal information indicate that the fishery is composed mainly of generalist minnow species, which are tolerant of moderately degraded habitat conditions.

3.6.3 Terrestrial Species

Table 3-8 provides a list of terrestrial SGCN identified in Coyote Canyon Wildlife Area.

Table 3-8. Terrestrial SGCN identified by Iowa DNR

Common Name	Scientific Name	Habitat preference
American Woodcock	*Scolopax minor*	Open woodland, dense forest, riparian forest
Yellow-Billed Cuckoo	*Coccyzus americanus*	Forest, shrubland, open woodland
Northern Flicker	*Colaptes auratus*	Savanna, open woodland
Eastern Wood-Pewee	*Contopus virens*	Forest/woodland, savanna
Acadian Flycatcher	*Empidonax virescens*	Deciduous, riparian forest
Purple Martin	*Progne subis*	Riparian forest, towns, and wetlands
Sedge Wren	*Cistothorus platensis*	Marsh, dense grasslands
Wood Thrush	*Hylocichla mustelina*	Shrubby forest and woodland
Brown Thrasher	*Toxostoma rufum*	Shrubby grassland
Kentucky Warbler	*Oporornis formosus*	Deciduous and riparian shrubby forest
Common Yellowthroat	*Geothlypis trichas*	Shrubland and grassland
Dickcissel	*Spiza americana*	Shrubby grassland
Field Sparrow	*Spizella pusilla*	Shrubland-grassland, grass-shrub-woodland edge
Henslow's Sparrow	*Ammodramus henslowii*	Large, older grasslands
Bobolink	*Dolichonyx oryzivorus*	Medium height grassland
Eastern Meadowlark	*Sturnella magna*	Grassland, savanna
Baltimore Oriole	*Icterus galbula*	Open woodland, savanna
Black Dash	*Euphyes conspicua*	Fens, wet prairies, marshes
Byssus Skipper	*Problema byssus*	Tallgrass prairie
Southern Cloudywing	*Thorybes bathyllus*	Xeric prairie
Northern Broken-Dash	*Wallengrenia egeremet*	Fens, xeric prairie, forest/woodland
Monarch Butterfly	*Danaus plexippus*	Open habitat and disturbed areas
Regal Fritillary	*Speyeria idalia*	Prairie and open grassland
Northern Prairie Skink	*Eumeces septentrionalis*	Grasslands with loose soil and rocky areas adjacent to marshes or lakes
Plains Garter Snake	*Thamnophis radix*	Generalist
Eastern Hognose Snake	*Heterodon platyrhinos*	Woodland, savanna, grassland

Source: Iowa DNR 2020

3.6.4 Migratory Birds and Eagles

The Migratory Bird Treaty Act (MBTA) of 1918, as amended; Executive Order 13186, Responsibilities of Federal Agencies to Protect Migratory Birds; and the Bald and Golden Eagle Protection Act (BGEPA) of 1940, as amended, require NRCS to consider impacts on migratory bird and bald and golden eagle populations and habitats. Migratory birds are essentially all wild birds found in the United States, except for the house sparrow, starling, feral pigeon, and resident game birds. The protections under MBTA and BGEPA cover the birds and their parts, including eggs, nests, and feathers; therefore, it is unlawful for private individuals or federal

agencies to kill, capture, collect, possess, buy, sell, trade, ship, import, or export any migratory bird. BGEPA includes protections for any disturbance to bald and golden eagles and their nests.

Although MBTA and BGEPA are applicable year-round, it is accepted that most migratory bird nesting activity occurs in Iowa during the period of April 1 to July 15. Some migratory birds nest outside of this range. For example, raptors generally nest in woodland habitats during the period of February 1 to July 15.

There are 5,931 acres of forested habitat distributed throughout the Study Area but largely concentrated along waterways that offer value to migratory passerines and other bird groups for resting and feeding. There are approximately 15,891 acres of distributed grassland/pasture throughout the Study Area that offer habitat for migrating grassland birds. There are 525 acres of wetlands and open water areas that provide habitat for water dependent species (see Figure 3-3). Nesting and brood rearing habitat for migratory bird species is limited.

3.6.5 Noxious Weeds and Invasive Species

The following invasive plant species have been observed in the Study Area: crown vetch, garlic mustard, honeysuckle, multiflora rose, Queen Anne's lace, wild parsnip, musk thistle, reed canary grass, sericea lespedeza, common teasel, velvetleaf, bull thistle, and Canada thistle. As wildlife management areas (WMA) could be converted from cropland and grassland to forestland, the following species could become more problematic depending on management of forested areas: honeysuckle, multiflora rose (a listed noxious weed under Iowa law), and garlic mustard. Invasive species adaptable to aquatic environments, such as purple loosestrife, also have a risk of becoming established.

3.6.6 Endangered and Threatened Species

Special status plant and animal species potentially present in the Study Area are listed in Table 3-9. State-listed species were identified from the Iowa DNR Natural Areas Inventory for the Study Area (which is within Clarke County), and federally listed species were identified using the USFWS IPaC tool.

Table 3-9. State and federally listed plant and animal species potentially present in the Study Area

Common Name	Scientific Name	State Status	Federal Status
Barn owl	*Tyto alba*	Endangered	
Byssus Skipper	*Problema byssus*	Threatened	
Earleaf Foxglove	*Tomanthera auriculata*	Special Concern	
Eastern Prairie Fringed Orchid	*Platanthera leucophaea*		Threatened
Edwards' Hairstreak	*Satyrium edwardsii*	Special Concern	
Glomerate Sedge	*Carex aggregata*	Special Concern	
Great Plains Ladies'-tresses	*Spiranthes magnicamporum*	Special Concern	
Henslow's Sparrow	*Ammodramus henslowii*	Threatened	
Indiana bat	*Myotis sodalis*	Endangered	Endangered
Long-eared Owl	*Asio otus*	Threatened	

Common Name	Scientific Name	State Status	Federal Status
Mead's Milkweed	*Asclepias meadii*	Endangered	Threatened
Monarch Butterfly	*Danaus plexippus*		Proposed Threatened
Northern Long-eared Bat	*Myotis septentrionalis*		Endangered
Prairie Bush Clover	*Lespedeza leptostachya*	Threatened	Threatened
Red-shouldered hawk	*Buteo lineatus*	Endangered	
Regal Fritillary	*Speyeria idalia*	Special Concern	
Sand Pigweed	*Amaranthus arenicola*	Special Concern	
Slender Glass Lizard	*Ophisaurus attenuatus*	Threatened	
Slim-leaved Panic Grass	*Dichanthelium linearifolium*	Threatened	
Smooth Green Snake	*Liochlorophis vernalis*	Special Concern	
Speckled Kingsnake	*Lampropeltis getulus*	Threatened	
Tricolored Bat	*Perimyotis subflavus*		Proposed Endangered
Tunnel-formed Penstemon	*Penstemon tubiflorus*	Special Concern	
Western Prairie Fringed Orchid[1]	*Platanthera praeclara*	Threatened`	Threatened`
Western Regal Fritillary	*Argynnis idalia occidentalis*		Proposed Threatened
White Evening Primrose	*Oenothera speciosa*	Special Concern	
Zabulon Skipper	*Poanes zabulon*	Special Concern	

Source: Iowa DNR, 2025. USFWS, 2025

Notes:

[1] Western Prairie Fringed Orchid is listed as threatened at both the state and federal levels. The Study Area is not in the range identified for Western Prairie Fringed Orchid but is close and was recommended for consideration by Iowa DNR.

3.7 Cultural Resources and Historic Properties

Section 106 of the National Historic Preservation Act of 1966, as amended (54 U.S.C. § 306108) and its implementing regulations (36 CFR Part 800) require federal agencies to consider effects of federal undertakings on historic properties. Historic properties are defined as cultural resources that are eligible for or listed on the National Register of Historic Places (NRHP). NRCS is consulting with the Iowa State Historic Preservation Office (SHPO), Office of the State Archaeologist (OSA), Native American tribes, local governments, the Advisory Council of Historic Preservation, and other consulting parties in order to comply with Section 106 of the NHPA.

History in the Study Area is generally divided into two categories: Precontact and Postcontact. Precontact (12,500 B.P until 1700 A.D.) is the history of the native people who were present in the county prior to the arrival of European and Euro-Americans into the area and Postcontact is the history after their arrival (1700 A.D. until present day).

Along with other historical sources, "I Sites"—a publicly available electronic cultural resources site database for Iowa maintained by OSA— was referenced to understand the previously

recorded cultural resources in the Study Area. According to I-Sites, there are 20 recorded archaeological sites in the Study Area (see Table 3-10). The site types range from historic farm residences to pre-contact artifact scatters (see Table 3-10). Of these archaeological sites, none are listed on the NRHP, but three are recommended as potentially eligible. Many of the sites have not been evaluated for National Register eligibility, so it is possible that more are eligible. There are 12 recorded precontact sites in the Study Area. The recorded precontact sites include one Woodland Period site (500 B.C.–1000 A.D.) and 11 sites that are listed simply as precontact. According to I-Sites, there are nine recorded postcontact sites and two recorded cemeteries in the Study Area. A portion of Osceola falls within the South West Creek Watershed boundary, and there are 29 historic-aged structures within it. There is one structure on the NRHP within the Study Area, the Webster Dickinson House in Osceola (see Figure 3-7).

Table 3-10: Types of recorded archaeological sites in the Study Area

Historic type	Site types	Number of sites[1]
Precontact	Isolated find	1
Precontact	Lithic scatter	6
Postcontact	Historic dump	1
Postcontact	Historic farm/residence	6
Postcontact	Historic scatter	1
Postcontact	Precontact scatter	5
Postcontact	School	1

Source: I Sites

[1] Some sites have multiple cultural components, so the sum is greater than the total number of recorded sites for the county (39)

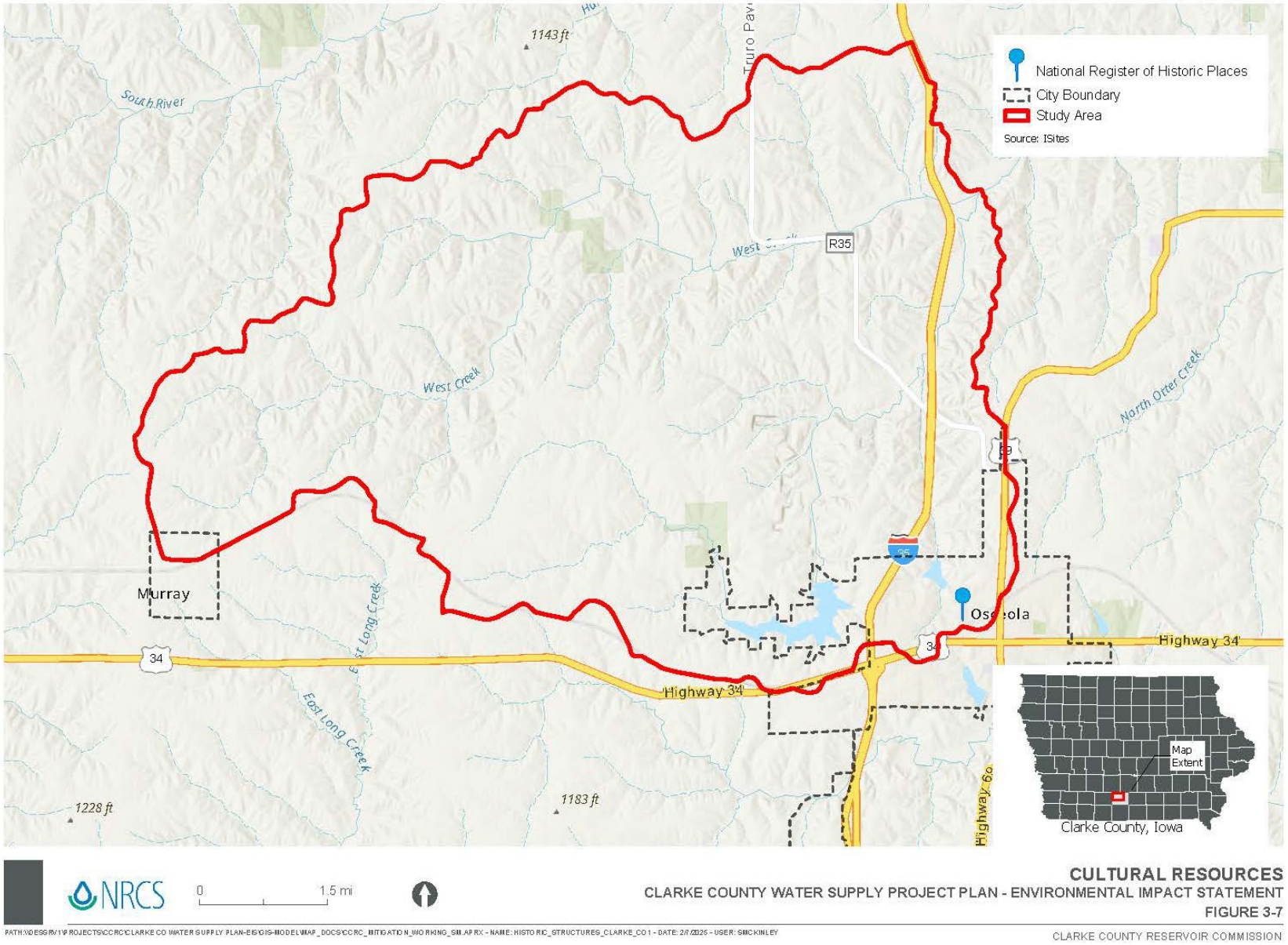


Figure 3-7. National Register of Historic Places in Study Area

Compared to other areas in Iowa, the Study Area has had relatively little archaeological or historical surveys conducted. Most of the Study Area has yet to be fully investigated by Secretary of the Interior qualified professionals. Since relatively few archaeological or historical surveys conducted in the Study Area, there are likely to be many unrecorded National Register eligible sites. Due to the large survey area and complexity of water supply projects, NRCS determined the need for a programmatic agreement in accordance with 36 CFR § 800.4(b)(2) and 800.14(b)(1)(ii). The Project programmatic agreement will allow for phased identification and evaluation of historic properties to implement Section 106 of the NHPA for the Project. The programmatic agreement was executed on April 21, 2025 and is included in Appendix A5.

3.8 Public Health, Safety, and Transportation

As discussed in Section 1.2, Purpose and Need, the Project is needed because current water supply is inadequate to support basic health and sanitary requirements under sustained drought conditions. Under drought conditions, communities in the Planning Area are at risk due to inadequate water sources for firefighting. Area law enforcement is provided by the local Osceola Police Department, Clarke County Sheriff's office in Osceola. The communities of Leon and Lamoni in Decatur County also have their own Police Department, and the Decatur County Sheriff's Office is located in Leon. The Iowa State Patrol serves both Clarke and Decatur Counties out of the District 2 – Area A office in Osceola. Medical services in Clarke County are provided by the Clarke County Hospital in Osceola (Clarke County 2023b). Medical Services in Decatur County and provided by the Decatur County Hospital in Leon.

I-35 and US Highway 69 traverse both counties north and south. I-35 passes through Osceola, while Van Wert, Decatur City, and Lamoni are all directly off the interstate. US Highway 69 is east of the Upper West Creek Watershed and intersects US Highway 34 at the center of Osceola (Figure 1-1). US Highway 34 runs east and west in Clarke County near the southern edge of the Upper West Creek Watershed. Iowa Highway 2 runs east and west in Decatur County near the center of the county. In addition, Amtrak passenger train service and rail freight bisect Clarke County east and west along the BNSF rail lines, which parallel US Highway 34. Hard-surface county roads connect all the smaller communities to major highways.

3.9 Social and Economic Conditions

3.9.1 Population

US Census Bureau was obtained to develop an understanding of the demographic characteristics within the Planning Area. Demographic statistics for the Planning Area were generated using the US Census Bureau 2020 Decennial Census and the American Community Survey (ACS) 5-year estimates and narrative profiles. The population that would benefit from the Project include those outside of the Study Area and those in the Project Area of Clarke and Decatur Counties. The Census areas in the Project Area in Clarke County include Osceola, Murray, Woodburn, and unincorporated rural areas of Clarke County; and Census areas in the Project area in Decatur County include Grand River, Davis City, Van Wert, Decatur City, Weldon, Pleasonton, and unincorporated rural areas of Decatur County.

The population in Clarke County increased 10.2 percent from 1990 to 2000. The County continued to grow from 2000 to 2010, but at a more modest 1.7 percent. From 2010 to 2020, the population of Clarke County grew by 5.0 percent. The populations of Murray and Woodburn have declined since 2000, while the populations of Osceola and Clarke County have increased (see Table 3-11).

In Decatur County, the population decreased 2.7 percent from 2000 to 2010, and 9.6 percent from 2010 to 2020 (see Table 3-11). The communities of Grand River, Van Wert, Weldon, and Decatur City all had generally declining populations from 2000 to 2020. The communities of Garden Grove, Lamoni, Leon, and Le Roy within Decatur County are not included because they have their own water supply and treatment and are not served by SIRWA. As of the 2020 census, these communities have a combined population of 3,976, which means a total population of 3,669 in Decatur County is served by SIRWA.

Table 3-11. Total Population of Census Geographies in the Planning Area

Census Geography	2000 Population	2010 Population	2020 Population
Clarke County	9,133	9,286	9,748
Osceola	4,659	4,929	5,415
Murray	766	756	684
Woodburn	244	202	146
Decatur County	8,689	8,457	7,645
Grand River	225	236	196
Davis City	275	204	179
Van Wert	231	230	178
Decatur City	199	197	175
Weldon	145	125	136
Pleasonton	37	49	32

Source: US Census Bureau 2021, US Census Bureau 2011, US Census Bureau 2001.

3.9.2 Local and Regional Economy

According to the Clarke County data provided in the 2022 Census of Agriculture, the average per farm income decreased from $18,882 in 2017 to $16,594 in 2022.In 2022, Clarke County had 649 farms with 177,968 acres of land for an average farm size of 274 acres. In Clarke County, the number of farms and average farm size increased 4 percent and 14 percent, respectively, from 2017 to 2022, while land in farms decreased by 8 percent.

In Decatur County, the average per farm income increased from $15,129 in 2017 to $16,455 in 2022. In 2022, Decatur County had 666 farms with 231,581 acres of land for an average farm size of 348 acres. In Decatur County, the number of farms from 2017 to 2022 increased approximately 1 percent, while land in farms decreased by approximately 2 percent.

In Clarke County, approximately 58 percent of the land in farms was in cropland in 2022, with 22 percent in pastureland, 13 percent in woodland, and 7 percent in other use. Corn and soybeans account for 65 percent of total harvested acres, followed by 35 percent planted to forages (hay) with less than 1 percent in oats (US Census of Agriculture 2022). The percentage of acres of woodland has increased since 2017 when 10 percent of the land in farms was in

woodland. The percentage of land in pasture has decreased since 2017 when 26 percent of the land in farms was in pasture. The percentage in cropland and other uses has remained steady (US Census of Agriculture 2017). Cattle and calves and hogs and pigs account for the vast majority of the livestock market value in the county. In 2022, there were 25,296 cattle and calves, a 28 percent reduction from 2017 when there were 35,301 cattle and calves. Similarly, in 2022, there were 96,648 hogs and pigs, a 28 percent reduction from 2017 when there were 134,081 hogs and pigs. Drought conditions in 2022 may have contributed to lower numbers of livestock in the County compared to 2017.

In Decatur County in 2022, approximately 61 percent of the land in farms was cropland, 24 percent was pastureland, and 11 percent was woodland. Compared to 2017, all of these land uses were approximately the same, within 1 percent (US Census of Agriculture 2022, US Census of Agriculture 2017). Corn and soybeans account for 72 percent of total harvested acres (US Census of Agriculture 2022). In 2022, there were 39,170 cattle and calves, a 14 percent reduction from 2017 when there were 45,508 cattle and calves. In 2022 there were 63,701 hogs and pigs, a 26 percent reduction from 2017 when there were 85,939 hogs and pigs. Decatur County also has chicken operations, but they count for significantly less of the market value. Similar to Clarke County, drought conditions in 2022 may have contributed to lower numbers of livestock in the County compared to 2017.

The socioeconomic condition of the Planning Area can be shown by the income and the employment for the counties and the places that the Planning Area lies within (see Table 3-12 and Table 3-13). According to the 2018–2022 American Community Survey (ACS) 5-year Estimate Narrative Profile for Clarke County, the median household income was $63,120. Of the population 16 years of age and older in Clarke County, 60.5 percent were reported to be employed, and 36.4 percent were not currently in the labor force. Of those employed, 3.9 percent reported to work in the agriculture industry. The leading industries for the employed civilian population within the County were educational services, manufacturing, and retail trade. According to the 2013–2017 ACS Narrative for Clarke County, 6.7 percent of the employed civilian population worked in the agriculture industry, which would be consistent with the per farm income reduction between 2017 and 2022 described above. In 2017, the average per farm income was 37.98 percent of the median household income for Clarke County; whereas in 2022, the average per farm income was 26.29 percent of the median household income

According to the 2018–2022 ACS 5-year Estimate Narrative Profile for Decatur County, 56.6 percent of the population 16 years of age and older were employed and 40.9 percent were not currently in the labor force. The median household income was $56,068. Of those reported to be employed, an average of 5.9 percent were reported to work in the agriculture industry, and leading industries within Decatur County were educational services, manufacturing, and construction. In 2017, the average per farm income was 29.3 percent of the median household income, similar to the proportion in Clarke County. Table 3-12 and Table 3-13 display the income and employment information for Clarke and Decatur Counties, as well as the city of Osceola

Table 3-12. Median Household Income

Census Geography	Median Household Income		Percent Employed[1]	
	2017	2022	2017	2022
Osceola	$46,642	$55,208	62.7	61.3
Clarke County	$49,718	$63,120	63.4	60.5
Decatur County	$41,042	$56,068	57.4	56.6

Source: US Census Bureau 2018a, US Census Bureau 2018b, US Census Bureau 2018c, US Census Bureau 2018d, US Census Bureau 2023a, US Census Bureau 2023b, US Census Bureau 2023c, US Census Bureau 2023d
Note: [1]Percent of the population 16 years of age and over

Table 3-13. Employment by Industry

Industry	Clarke County	Clarke County	Osceola	Osceola	Decatur County	Decatur County
	2017 (%)	2022 (%)	2017 (%)	2022 (%)	2017 (%)	2022 (%)
Agriculture, forestry, fishing and hunting, mining	6.7	3.9	2.3	0.0	5.9	6.2
Construction	7.2	8.1	4.4	6.5	9.3	7.4
Manufacturing	16.7	20.1	19.8	21.3	13.2	8.7
Wholesale Trade	2.6	1.8	3.1	2.1	1.1	2.0
Retail Trade	13.4	14.9	13.0	20.3	10.9	11.3
Transportation	4.5	5.7	2.9	5.8	5.1	7.5
Information	0.4	0.7	0.0	0.0	1.1	1.5
Finance and insurance, real estate	6.4	8.9	4.7	8.8	3.5	3.5
Professional, scientific	5.5	2.1	6.7	1.1	3.7	2.8
Educational Services, health care, social assistance	21.4	22.4	23.5	21.4	29.1	34.5
Arts and Entertainment	8.4	5.7	11.7	7.5	8.7	6.9
Other Services	4.8	2.4	6.9	1.9	5.4	5.7
Public Administration	2.0	3.3	1.1	3.2	3.1	1.9

Source: US Census Bureau 2018a, US Census Bureau 2018b, US Census Bureau 2018c, US Census Bureau 2018d, US Census Bureau 2023a, US Census Bureau 2023b, US Census Bureau 2023c, US Census Bureau 2023d

3.10 Ecosystem Services

Per requirements of the PR&G for water and land related resources, an ecosystem framework is required to provide an integrated approach for evaluation of the benefits and trade-offs of potential alternatives on ecosystem services (USDA 2017).

Ecosystem services refer to the benefits that people and their communities derive from their natural environment in which they live. Ecosystem services are based on four service categories (USDA 2017):

1. Provisioning services: tangible goods provided for direct human use and consumption, such as food, fiber, water, timber, or biomass

2. Regulating services: services that maintain a world in which it is possible for people to live, providing critical benefits that buffer against environmental catastrophe—examples include flood and disease control, water filtration, climate stabilization, or crop pollination

3. Cultural services: services that make the world a place in which people want to live—examples include spiritual, aesthetic viewsheds, or tribal values

4. Supporting services: services that refer to the underlying processes maintaining conditions for life on Earth, including nutrient cycling, soil formation, and primary production

These ecosystem services contribute to people's overall quality of life, but often cannot be quantified in the same way as services sold in marketplaces. Therefore, federal investment into projects that could impact ecosystems and natural resources require an ecosystem services assessment to illuminate how management decisions would enhance, sustain, or degrade the benefits that nature provides. An assessment of links between ecological function and social well-being helps to ensure that beneficial ecological impacts of a project are recognized and that detrimental impacts are minimized, to the extent possible (EEA 2019).

Figure 3-8 provides a concept diagram that highlights different ecosystem services as related to improved water supply and links each service to its change in ecological features and its benefit or social value.

Supporting services are not evaluated in this Plan-EIS because they support the other ecosystem services (Regulating, Provisioning, and Cultural) (EEA 2019; USDA 2017). Project scoping (see Chapter 2) led to the determination of the ecosystem services (or resources of concern) to be considered in the Plan-EIS.

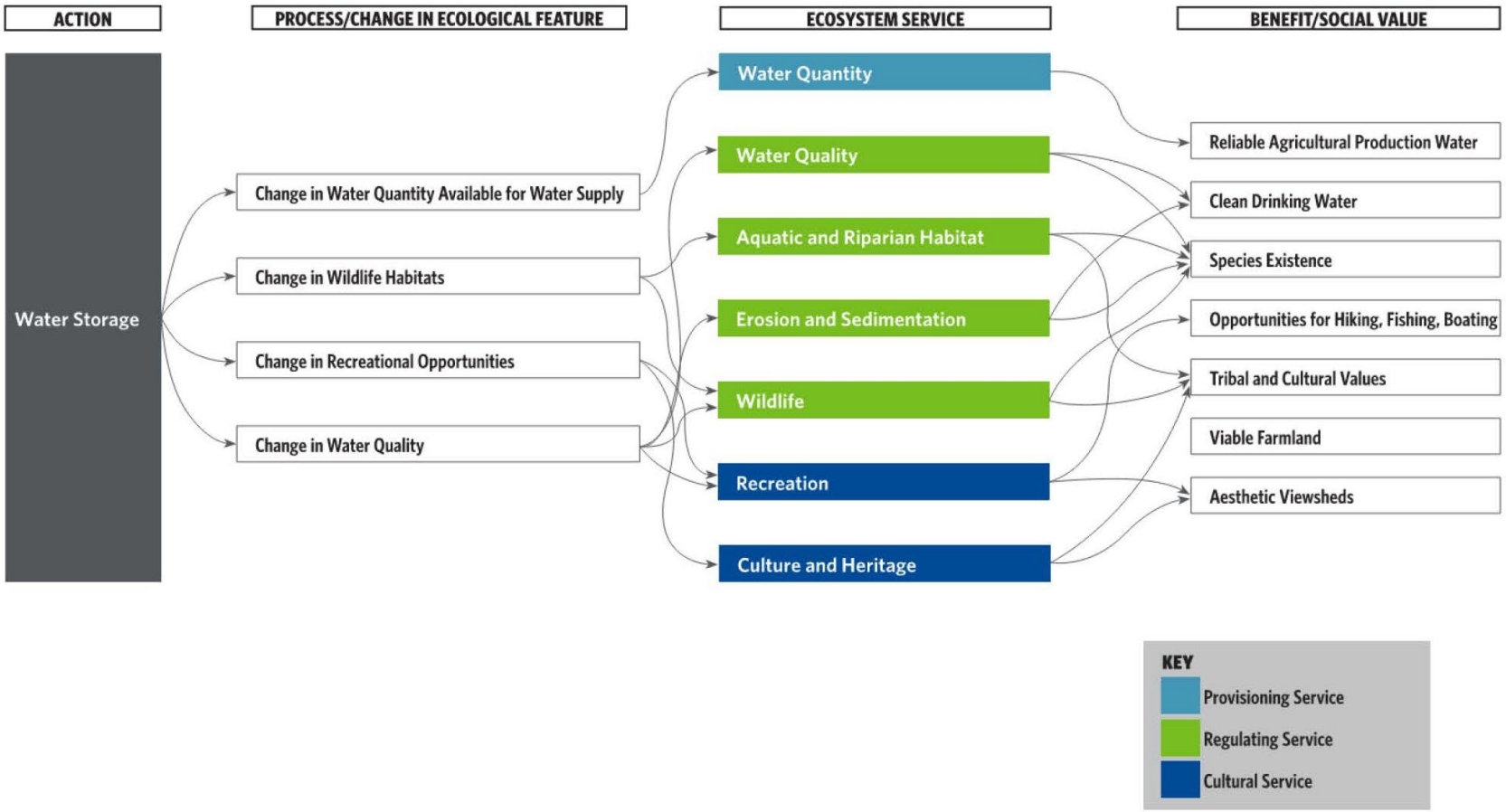


Figure 3-8. Ecosystem Services Concept Diagram

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4 Alternatives

This section describes how alternatives were formulated, evaluated, and screened to meet the Project purpose and need for action. This includes alternatives studied in the planning process as well as alternatives considered but eliminated from detailed study. Local, state, regional, federal, and non-governmental agencies and organizations participated in the process. Additional details on alternative evaluation can be found in Appendix D2, Detailed Alternatives Analysis.

4.1 Alternative Formulation and Screening

The formulation process is the basis for selecting combinations of measures to include as alternatives. The alternatives developed are based on combinations of measures that could meet the Project purpose and take multiple federal requirements into consideration to streamline the planning and decision-making process. This analysis is meant to satisfy the alternatives development and screening criteria requirements of NEPA, Clean Water Act Section 404(b)(1) guidelines, and PR&G for federal investments in water resources. This means that a wider range of alternatives was used to satisfy all applicable federal alternatives analysis requirements and to reduce the time, cost, and cumbersome agency reviews that often come with multiple analysis documents. Table 4-1 describes when each regulation is required.

Table 4-1. Federal Requirements for Alternatives Analyses

NEPA	404(b)(1)	PR&G
National Environmental Policy Act requirement for federal agencies to assess the environmental effects of proposed major federal actions prior to making decisions.	Clean Water Act guidelines for an alternatives analysis when an Individual Permit for fill in jurisdictional wetlands and/or streams is required from the US Army Corps of Engineers.	Alternatives analysis requirements when federal funds are used for water projects. Agencies have specific guidelines, including the US Department of Agriculture (which is funding this Plan-EIS).

Once an appropriate range of alternatives is selected, each alternative is screened to determine if it should be carried forward for a more detailed analysis. Detailed analysis includes a more refined preliminary design, analysis of environmental and social consequences (both beneficial and detrimental), and an economic analysis. This pre-screening allows for a detailed look at a narrower range of alternatives, which allows for a more efficient decision-making process. Different federal requirements and guidelines present different screening criteria based on each policy's overarching goal. This screening process is shown in Figure 4-1.

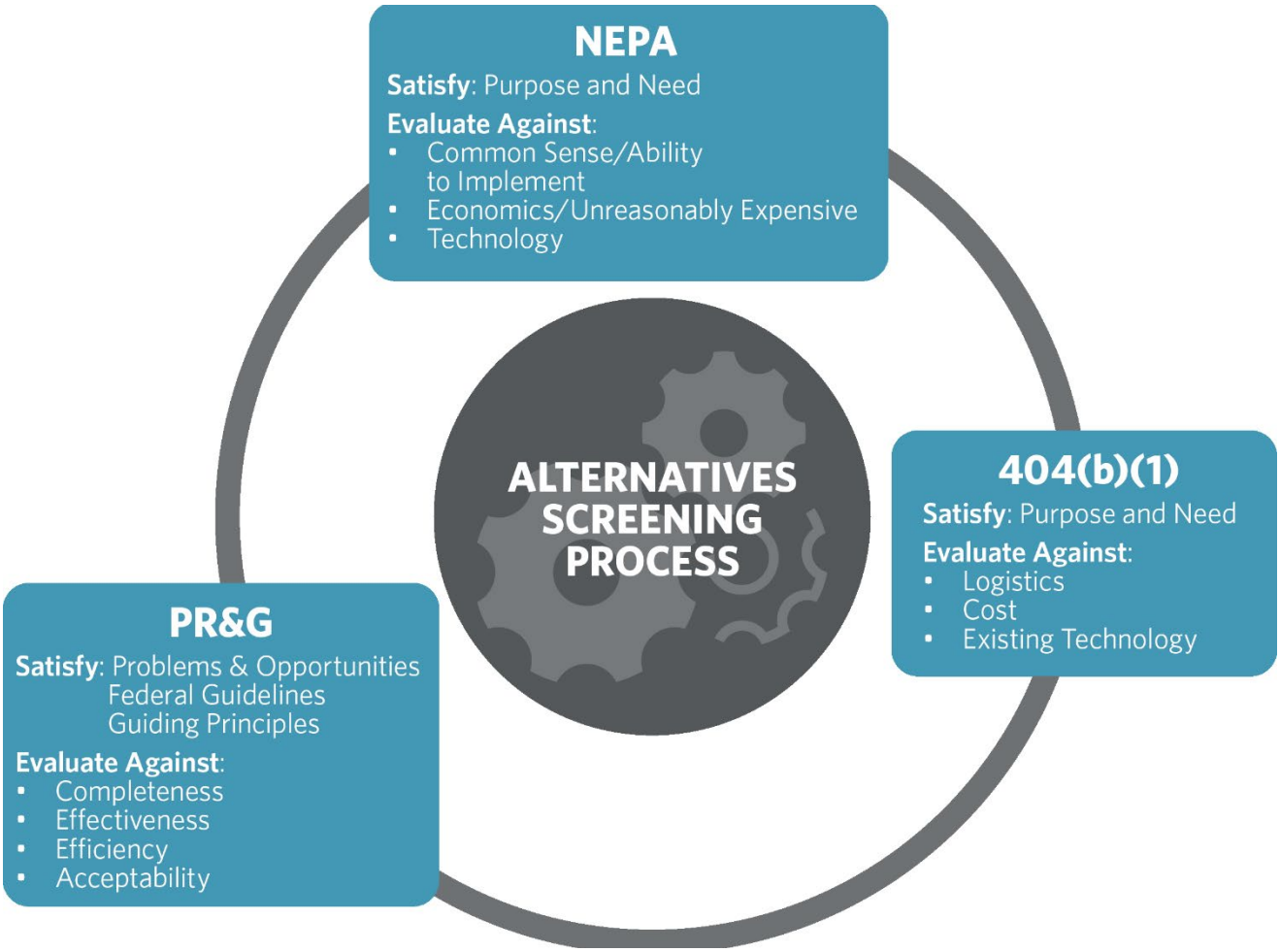


Figure 4-1. Alternatives Screening Criteria

4.2 Description of Alternatives Considered but Eliminated from Detailed Study

During the scoping phase of this Plan-EIS, several alternatives were considered to address the Project purpose of agricultural water management. The range of alternatives was evaluated using the process described in Section 4.1, Alternative Formulation and Screening. Table 4-2 summarizes the range of alternatives and results of the screening process and identifies the alternatives carried forward for detailed study in the Plan-EIS. Section 4.3, Description of Alternatives, provides details on the alternatives carried forward for detailed study (see Appendix D2 for additional information on screening).

4.2.1 Water Supply Reservoir at Dam Site 4B-2

This alternative would include one water supply detention dam constructed at site 4B-2, one raw water intake, a raw water supply pipeline, and local road modifications. Screening methodology included evaluating the reservoir location for inundation extents, subsequent environmental and archaeological impacts, sufficient water supply capacity, and cost. After evaluating the water supply capacity at this site, the reservoir would only provide a water supply of 1.6 mgd and

therefore does not meet the required raw water demand of 1.9 mgd. The cost to construct the reservoir at site 4B-2 would also be higher than the alternative reservoir site (site 4B), while providing less water. This alternative does not meet the Project purpose and need and was not carried forward for detailed study.

4.2.2 Purchase water from Des Moines Water Works

This alternative would require the construction of a 20-inch pipeline that is 38.5 miles long, a booster station from Des Moines Water Works (DMWW), a capacity buy-in cost, and then paying for water usage through bulk water purchase. This alternative is not practicable because the Sponsor would not have jurisdiction to use eminent domain outside of Clarke County to purchase land to build the water supply pipeline. There are also concerns about purchase capacity limitations from DMWW. Discussion with DMWW indicates they would not be able to sell purchase capacity due to lack of production during periods of drought and/or poor water quality. Therefore, this alternative does not meet acceptability standards. This alternative was not carried forward for detailed study.

4.2.3 Rathbun Regional Water Association pipeline

This alternative would require the construction of a 20-inch pipeline that is 71 miles long, a capacity booster, a buy-in cost, and paying for usage through bulk water purchase. This alternative is not practicable because the Sponsor would not have jurisdiction to use eminent domain outside of Clarke County to purchase land to build the water supply pipeline. Therefore, this alternative does not meet acceptability standards and was not carried forward for detailed analysis.

4.2.4 Groundwater well field

This alternative would include the construction of a groundwater wellfield in the Clarke County region. It would includes new wells, piping from well field to the water treatment plant, and expansion of the water treatment plant. Groundwater sources in the Clarke County region consist primarily of alluvial deposit aquifers, buried glacial drift aquifers, and three bedrock aquifers (Mississippian, Devonian/Silurian, and Jordan). Groundwater sources in Clarke County are severely limited. Groundwater sources consist of alluvial deposit aquifers, buried drift glacial aquifers, the Mississippian aquifer and the Devonian/Silurian aquifer, which were all determined to have insufficient water supply to meet Project needs. The Jordan aquifer, the groundwater source with the most potential to meet the Project need, was determined to have unreliable yields and could not reliably supply 1.9 mgd. Additionally, withdrawal rates are limited under Iowa Administrative Code Chapter 52.4(3), which could limit future use of the wells. This alternative does not meet the purpose and need of 1.9 mgd due to poor water quality and unreliable water yields, and was therefore not carried forward for detailed analysis.

4.2.5 Existing reservoir expansion

This alternative would expand the water storage capacity at West Lake by dredging, raising the existing spillway crest elevation, or raising the top of dam. The existing West Lake provides an estimated withdrawal capacity of 0.8 mgd in 2050, which is insufficient for Project needs.

Increasing the reservoir normal pool and top of dam is not feasible due to topographic and hydrologic constraints. At the pool size necessary to achieve required storage, evaporation and water usage would considerably exceed estimated watershed yield. Therefore, this alternative does not meet the Project purpose of providing 1.9 mgd of water supply and was not carried forward for detailed analysis.

Table 4-2. Summary of Alternatives Eliminated from Detailed Study

Alternative	Summary of Alternative	Meets Purpose and Need	Reasonable, Practicable & Meets PR&G[1]	Carried Forward for Detailed Study
Reservoir at Dam Site 4B-2	This alternative would include one water supply detention dam at site 4B-2, one raw water intake, one raw water pipeline, and water treatment plant expansion.	No. The alternative provides 1.6 mgd of raw water supply and therefore does not meet the required 1.9 mgd raw demand.	Not applicable	No
Purchase water from Des Moines Water Works (DMWW)	This alternative would require the construction of a 20-inch diameter pipeline that is 38.5 miles long, a booster station from DMWW, a capacity buy-in cost, and paying for usage.	Alternative would be able to provide 1.9 mgd demand.	The Sponsor would not have jurisdiction to use eminent domain outside of Clarke County to purchase land to build the water supply pipeline. There are also concerns about purchase capacity limitations from DMWW. Conversation with DMWW indicates they would not be able to sell purchase capacity as a result of lack of production during periods of drought and/or poor water quality. Therefore, this alternative does not meet the standards of reasonableness, practicability, and PR&G.	No
Purchase water from Rathbun Regional	This alternative would require the construction of a 20-inch diameter pipeline that is 71	Alternative would be able to provide 1.9 mgd demand.	The Sponsor would not have jurisdiction to use eminent domain outside of Clarke County to purchase land to build the water	No

Alternative	Summary of Alternative	Meets Purpose and Need	Reasonable, Practicable & Meets PR&G[1]	Carried Forward for Detailed Study
Water Association.	miles long, a capacity booster, a buy-in cost, and paying for usage.		supply pipeline. Therefore, this alternative does not meet the standards of reasonableness, practicability, and PR&G.	
Groundwater well field	Construction of a groundwater well field in the Clarke County region. Includes new wells, piping from well field to WTP, and WTP expansion.	Jordan aquifer has uncertain yields and therefore would not be able to provide the necessary demand. It was determined that approximately 80% of the flow would have to be treated with a reverse osmosis system due to poor water quality. Given finished water to raw water recovery, the equivalent peak day raw water supply needed would be higher. A total of eight Jordan wells would be required. Additionally, withdrawal rates are limited under Iowa Administrative Code Chapter 52.4(3).	Not applicable	No

Alternative	Summary of Alternative	Meets Purpose and Need	Reasonable, Practicable & Meets PR&G[1]	Carried Forward for Detailed Study
Existing reservoir expansion	Expand water storage capacity at West Lake by dredging, raising the existing auxiliary spillway crest elevation, or raising the top of dam.	No. Due to existing drainage area restraints, the normal pool and top of dam cannot be raised to sufficiently expand the water supply capacity. Water usage and evaporation would well exceed estimated watershed yield.	Not applicable.	No

[1] Addresses reasonableness under NEPA, practicability under Section 404(b)(1) guidelines, and PR&G as described in DM 9500.

4.3 Description of Alternatives Carried Forward

4.3.1 No Action Alternative

This alternative is the most likely course of action should the Sponsor not receive federal funding for the Project. No federal assistance would be available under this alternative, and the Sponsor would pursue no further action. While there would be no costs associated with this alternative, water supply would continue to be limited.

4.3.2 Water Supply Reservoir at Dam Site 4B

This alternative would include one water supply detention dam at site 4B, one raw water intake, one raw water pipeline, and water treatment plant expansion. See Appendix B for a map of the planned components. See Chapter 7 and Appendix E1, Draft Design Development Report, for additional details on the design.[3]

Water Supply Dam

A detention dam at site 4B would be developed to meet the Project objective of a 1.9 mgd average day demand water supply. Current Site 4B design would consist of an earth fill dam, a reinforced concrete principal spillway, and a vegetated auxiliary spillway (see Figure 4-2). The approximate height would be 58 feet above the valley floor (69 feet above channel bottom) and the approximate length would be 2,800 feet. The dam crest would be at 1,021 feet NAVD88 and

[3] The preliminary concept was based off of a demand of 2.0 mgd. While above the project objective of 1.9 mgd, the added design capacity is a conservative approach as it relates to project costs and potential impacts.

provide approximately 3 feet of freeboard between the Probable Maximum Flood (PMF) static water level and the dam crest. Available water supply storage would be 11,030 acre-feet. The drainage area would be 16,448 acres, the top of dam area would be 1,494 acres, and the normal pool would be 790 acres. This site has a drainage area to pool area ratio of 20.9:1.

The principal spillway configuration would include a 96-inch diameter conduit, morning glory style inlet, and cast-in-place riser to improve hydraulic performance. The auxiliary spillway requires a 600-foot gross width.

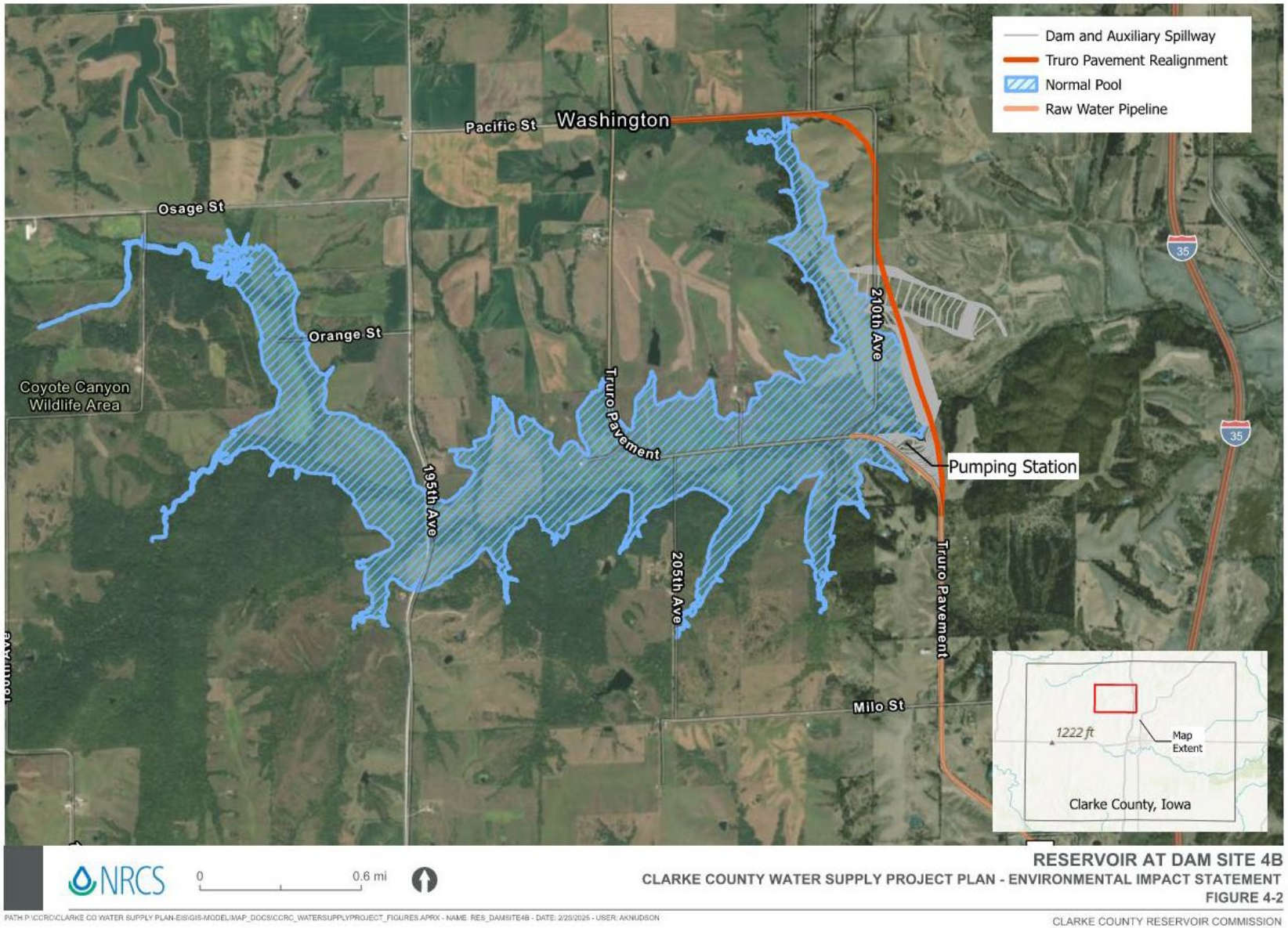


Figure 4-2. Reservoir at Dam Site 4B Dam and Auxiliary Spillway Components

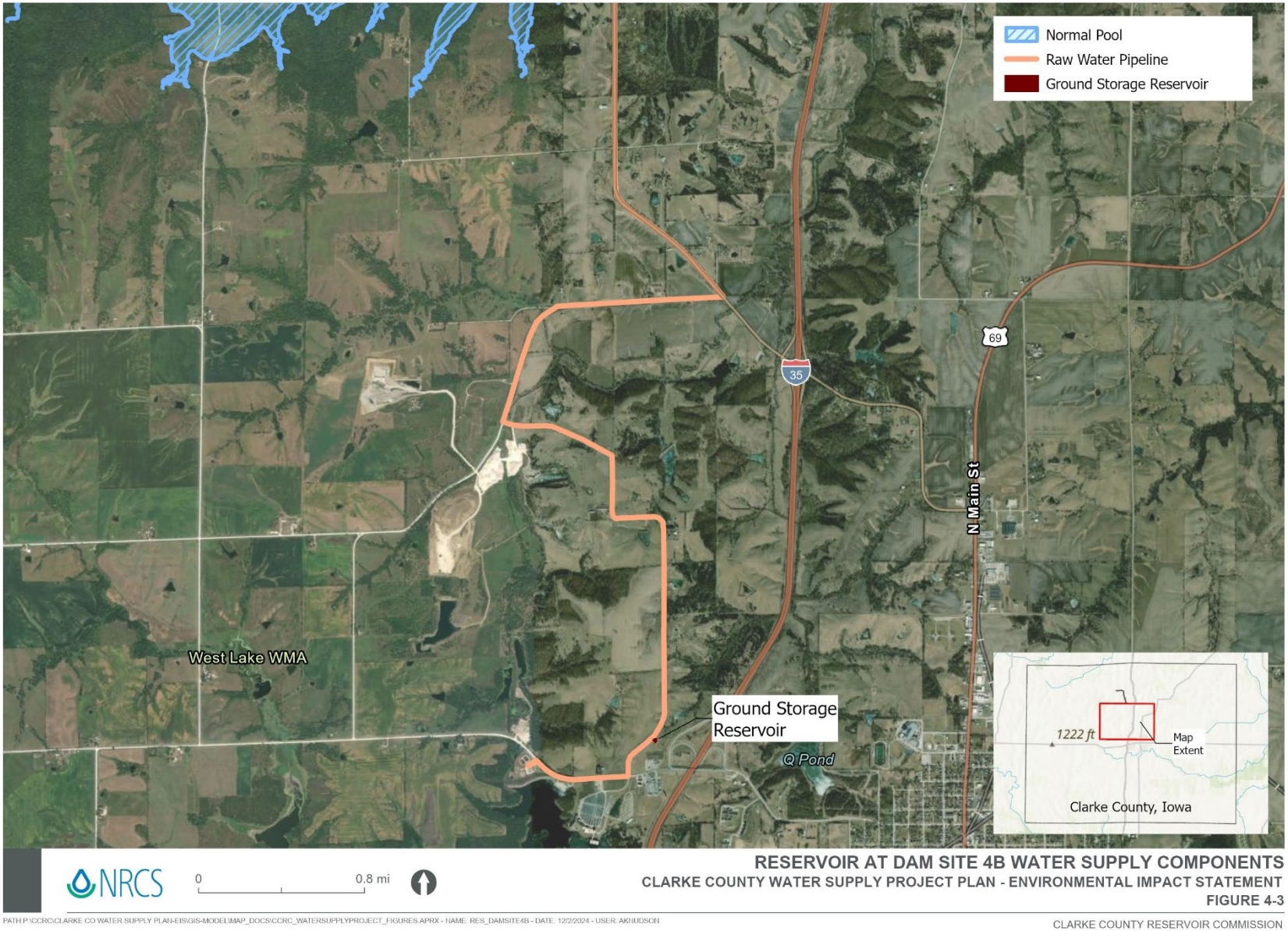


Figure 4-3. Reservoir at Dam Site 4B Water Supply Infrastructure Components

Water Supply Infrastructure

A pumping station at the reservoir would pump water through a new raw water pipeline to the existing water treatment plant. The raw water pipeline would include a nominal pipe diameter of 16 inches to provide sufficient velocities over the anticipated flow range. The pipeline route would follow Clarke County Highway R35—known locally as "Truro Pavement"—to Leisure Street, and then follow 218th Avenue to the water treatment plant on Kansas Street, all within existing road rights-of-way (see Figure 4-3). A ground storage reservoir (GSR) off 218th Avenue is included to help maintain pressure flow within the pipeline.

The pumping station was sized to be an approximately 1,800 square foot building three vertical turbine raw water intake pumps. The GSR is recommended as a nominal, 150,000-gallon, pre-stressed concrete tank, approximately 20-foot diameter, with a nominal sidewater depth of 20 feet.

Truro Pavement and County Road Modifications

The reservoir would inundate an existing segment of Truro Pavement, requiring approximately 2.4 miles of the road to be relocated (see Figure 4-2). The typical section was developed with the assistance of Clarke County Engineer to be consistent with similar roads in the area. It includes two 12-foot-wide driving lanes and two 8-foot-wide granular shoulders.

The reservoir will also require permanent closure of segments of 95th Avenue, 205th Avenue, and Orange Street. Required roadway modifications include raising sections of 205th Avenue and Pacific Street (relocated Truro Pavement) to 1 foot above the top of dam elevation (1,021.0 NAVD88) and raising 180th Avenue (including a replacement bridge) and Osage Street to or above the auxiliary spillway elevation (1,009.0 NAVD88).

In lieu of a conventional bridge crossing of the auxiliary spillway, and as a cost-saving measure, the crossing consists of the roadway being routed down to and across the auxiliary spillway “approach channel.” Preliminary computations indicate that the road crest could be set approximately at elevation 1,007 feet NAVD88 without adversely affecting the auxiliary spillway hydraulics or freeboard requirements.

5 Environmental Consequences

This chapter contains an analysis of each of the proposed alternatives (as described in Chapter 4, Alternatives) and their effects on identified resource concerns. The environmental consequences analysis was completed in accordance with the National Watershed Program Manual (390 NWPM § 501.38). The analysis considers impacts and their duration, intensity, type, and context; cumulative impacts; and measures to mitigate impacts. The resources presented were identified during scoping. Chapter 3 describes the resources as they currently exist.

The descriptions of environmental consequences that follow address the potential economic, environmental, and social effects of each alternative. The comparisons include four assessment aspects: intensity, duration, type, and context, which are defined as follows:

- Intensity: negligible (slight or not detectable), minor (measurable but small), moderate (measurable and apparent), and substantial (significant).
- Duration: short-term (transitory, days or months) and permanent.
- Type: direct (caused by the action and occur at the same time and place) or indirect (caused by the action and are later in time or farther removed in distance but still reasonably foreseeable. Impacts can be either beneficial or adverse.
- Context: the circumstances or actions that form the environmental consequence.
- Cumulative: impacts on the environment that result from the alternative's incremental impacts when considered with other past, present, and reasonably foreseeable future actions.

Most resource impacts are evaluated based on the Project Area footprint, as established in the 2020 preliminary design. The Project Area footprint for this design is conservatively large. The Project Area was divided into five components: the dam and auxiliary spillway, the normal pool, the area between the normal pool and top of dam, the Truro Pavement relocation, and the raw water pipeline (including the pumping station and GSR) (see Figure 5-1). Permanently impacted components include the inundation area of the normal pool, the dam and auxiliary spillway construction footprint, and the relocated Truro Pavement construction footprint. Exact impact areas, such as staging or access, are not determined at the current stage of design, but are anticipated to be within the footprints identified. Areas within these construction footprints would not necessarily all be impacted permanently. Therefore, the permanent impact footprints are conservatively large. Temporarily impacted components include the area between the normal pool elevation (1,001 feet NAVD88) and the top of dam elevation (1,021 feet NAVD88) and the raw water pipeline construction footprint. The area between normal pool and top of dam elevations is considered a temporary impact for most resources because it will only be impacted periodically when the water levels in the reservoir rise above the normal pool during high precipitation. The raw water pipeline impacts are also temporary due to construction. Overall, there are 975 acres analyzed for permanent impacts and 779 acres analyzed for temporary impacts for all relevant resources. For resources impacts presented below, where areas have both permanent and temporary impacts, the permanent impact component was considered over the temporary impact.

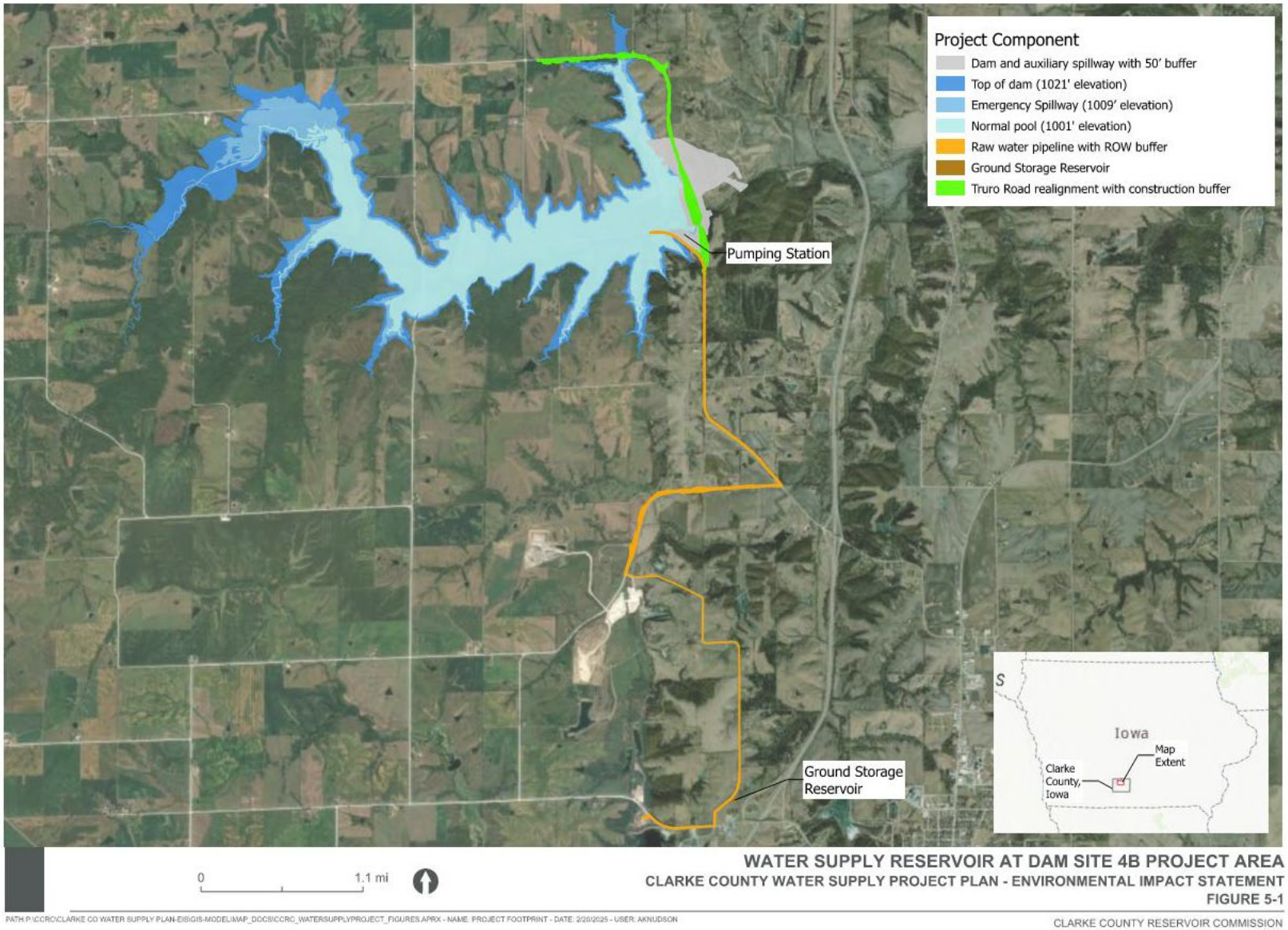


Figure 5-1. Water Supply Reservoir at Dam Site 4B Project Area

5.1 Soils

5.1.1 No-Action Alternative

The No-Action Alternative would not affect erosion or sedimentation. Sedimentation would continue to impact the existing water supply reservoir and decrease the design safe withdrawal capacity of the reservoir to 0.8 mgd by 2040.

5.1.2 Reservoir Site 4B

This alternative would have a minor, short-term, direct impact on soils and erosion in the Project Area due to construction impacts. The dam and auxiliary spillway and Truro Pavement realignment will impact 128.0 acres and 33.5 acres, respectively via construction, including soil compaction. Overall, of the approximately 162 acres impacted by construction approximately 41.7 percent is highly erodible (see Figure 5-2). Proper sediment and erosion control measures, such as silt fence, erosion control blankets, sedimentation basins, etc., would be implemented to minimize temporary impacts during construction, as discussed in Chapter 7.

There will also be minor, long-term, direct impact on soils through inundation. The dam will permanently inundate 775 acres of soils within the normal pool. The area between the normal pool and auxiliary spillway elevation would be expected to receive periodic inundation during high water stages and this area would be susceptible to erosion due to wave action. There would be a temporary impact on soils on the fringe of the normal pool as vegetation reestablishes from existing grassland or wooded areas to more hydrophytic species that will better prevent erosion. The normal pool has 10.9 percent highly erodible land, and the normal pool to top of dam area has 20.3 percent highly erodible land. This is low compared to approximately 58 percent in the whole county. Sediment from erosion will be trapped in the reservoir and sedimentation is accounted for as a part of the reservoir capacity. Table 5-1 provides a breakdown of impacts by soil erodibility.

Table 5-1: Reservoir Site 4B Project Area Highly Erodible Land

	Acres	Percentage of Component (%)
Dam and auxiliary spillway construction	**Total Acres: 128.00**	
Highly Erodible Land	62.99	49.2
Potentially Erodible Land	0	0
Not Highly Erodible Land	17.31	13.5
No Designation	47.70	37.3
Normal pool	**Total Acres: 774.99**	
Highly Erodible Land	84.14	10.9
Potentially Erodible Land	1.51	0.2
Not Highly Erodible Land	209.95	27.1
No Designation	479.40	61.9
Truro Pavement realignment	**Total Acres: 33.47**	
Highly Erodible Land	17.12	51.1

	Acres	Percentage of Component (%)
Potentially Erodible Land	0	0
Not Highly Erodible	8.46	25.3
No Designation	7.89	23.6
Normal pool to top of dam	**Total Acres: 682.42**	
Highly Erodible Land	138.26	20.3
Potentially Erodible Land	1.05	0.2
Not Highly Erodible Land	273.03	40.0
No Designation	270.08	39.6
Raw water pipeline construction	**Total Acres: 69.99**	
Highly Erodible Land	33.16	47.4
Potentially Erodible Land	4.72	6.7
Not Highly Erodible	15.45	22.1
No Designation	16.66	23.8

Source: USDA NRCS 2020b

The majority of sediment delivered from the watershed upstream of the proposed reservoir is trapped, remaining within the reservoir. Sediment trapped in the reservoir will reduce sediment and phosphorus in the stream below the reservoir. This reduction in sediment supply downstream of the dam could result in an increase in bank erosion downstream. Land use changes in the area owned by CCRC from agriculture to grassland, as discussed in Section 5.3.2, will reduce sediment and phosphorus delivered to the reservoir due to a decrease in farming.

Sedimentation in the watershed was evaluated as part of the Draft Design Development Report (HDR 2020), average annual sediment deposit was calculated to be 22.6 acre-feet and adequate sediment storage capacity was planned. Sediment storage capacity and annual sedimentation calculations are included in Appendix E1.

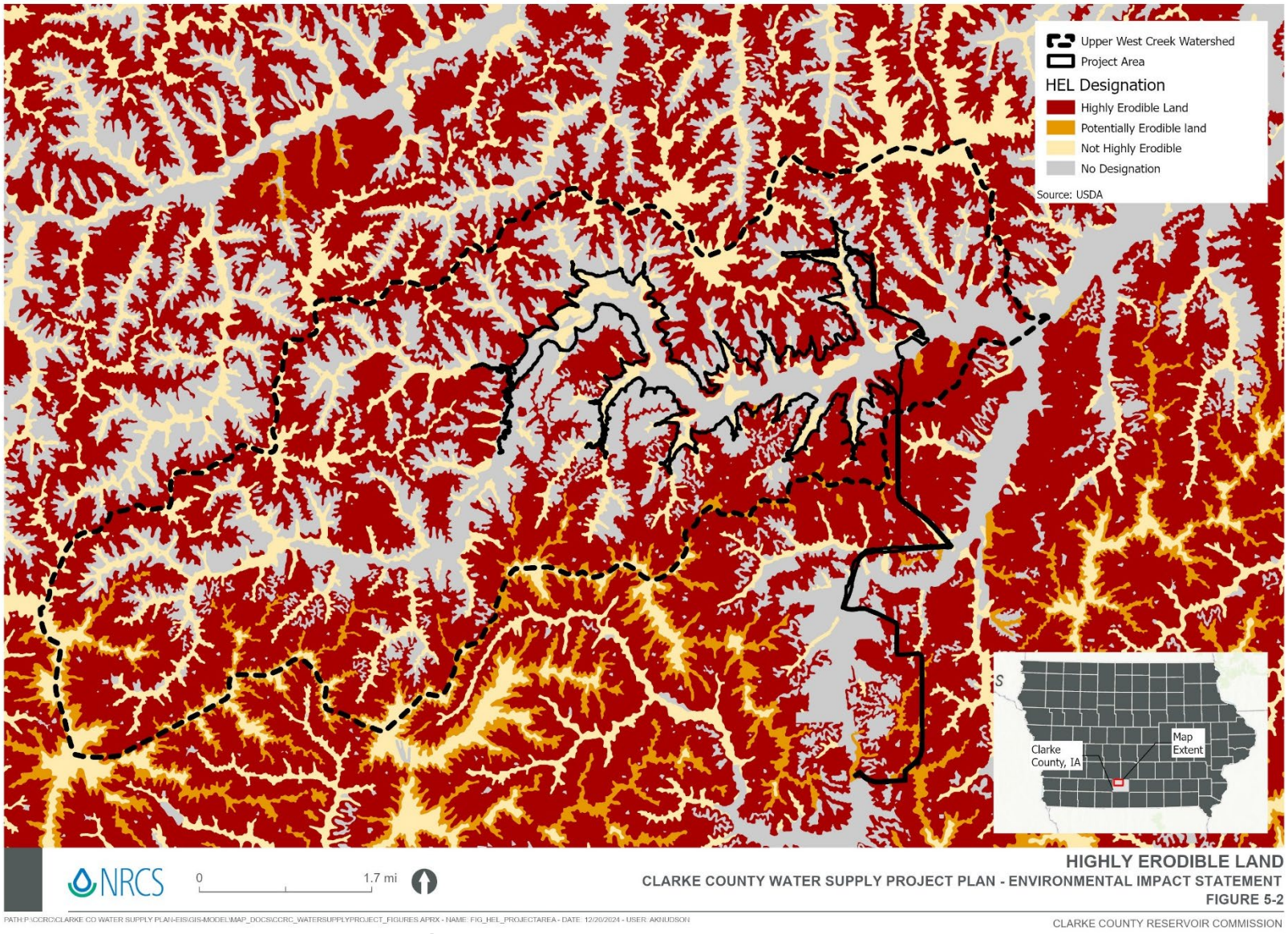


Figure 5-2. Soil Erodibility Factor Dam Site 4B Project Area and Upper West Creek Watershed

5.2 Prime and Unique Farmlands

5.2.1 No-Action Alternative

The No-Action Alternative would not impact any prime or unique farmland or farmland of statewide importance. There would be no new, irreversible conversion of FPPA-protected soils to non-agricultural use.

5.2.2 Water Supply Reservoir at Dam Site 4B

This evaluation was carried out in part using Prime and Unique Farmlands Evaluation Procedure Guide Sheet in the National Environmental Compliance Handbook (NECH) 610.113 in addition to watershed planning and NEPA evaluation requirements.

This alternative would result in minor, permanent, direct, impacts on prime and unique farmland. As defined in Section 3.2, prime and unique farmland is not necessarily used for cropland currently. It is defined by soils that exhibit the soil quality, growing season, and moisture supply needed for the potential to economically produce sustained high yields of crops. It can be forest land, pastureland, cropland, or other land, but not water or urban, built-up land (USDA NRCS 2023). Impacts by the Project would include direct, permanent impact on prime farmland due to construction of Project elements and inundation, thereby permanently removing these soil resources making them unavailable for future agricultural production purposes. Overall, there are 380.6 acres of prime farmland and 215.1 acres of farmland of statewide importance within the normal pool and dam/Truro Pavement construction footprints (see Figure 5-3). In comparison with the 193,657 acres of prime farmland/farmland of statewide importance in the county, this impact results in a loss of approximately 0.3 percent of total prime and unique farmland in the County and any agricultural related benefit being derived from these areas. Table 5-2 provides a breakdown by impact and farmland classification in the Project Area.

An AD-1006 farmland conversion worksheet was completed by NRCS for the Project Area, and since the total score is less than 160, no further consideration for protection is required and no additional sites need to be evaluated.

There would be minor, temporary, direct impacts on prime and unique farmland due to construction of the water supply pipeline and temporary inundation up to the top of dam elevation. The pipeline construction would temporarily impact 14.6 acres of prime farmland and 30.8 acres of farmland of statewide importance. Pipeline construction impacts are anticipated to be maintained within the road right-of-way and therefore these acreages are unable to be farmed currently. Between the normal pool and top of dam there are 120.3 acres of prime farmland and 166.9 acres of farmland of statewide importance. Since there would not be permanent inundation in this area, there are not anticipated permanent impacts on the soils. However, land owned by CCRC up to the top of dam is not anticipated to be used for farming (see Section 5.3.2 for land use discussion on CCRC owned land).

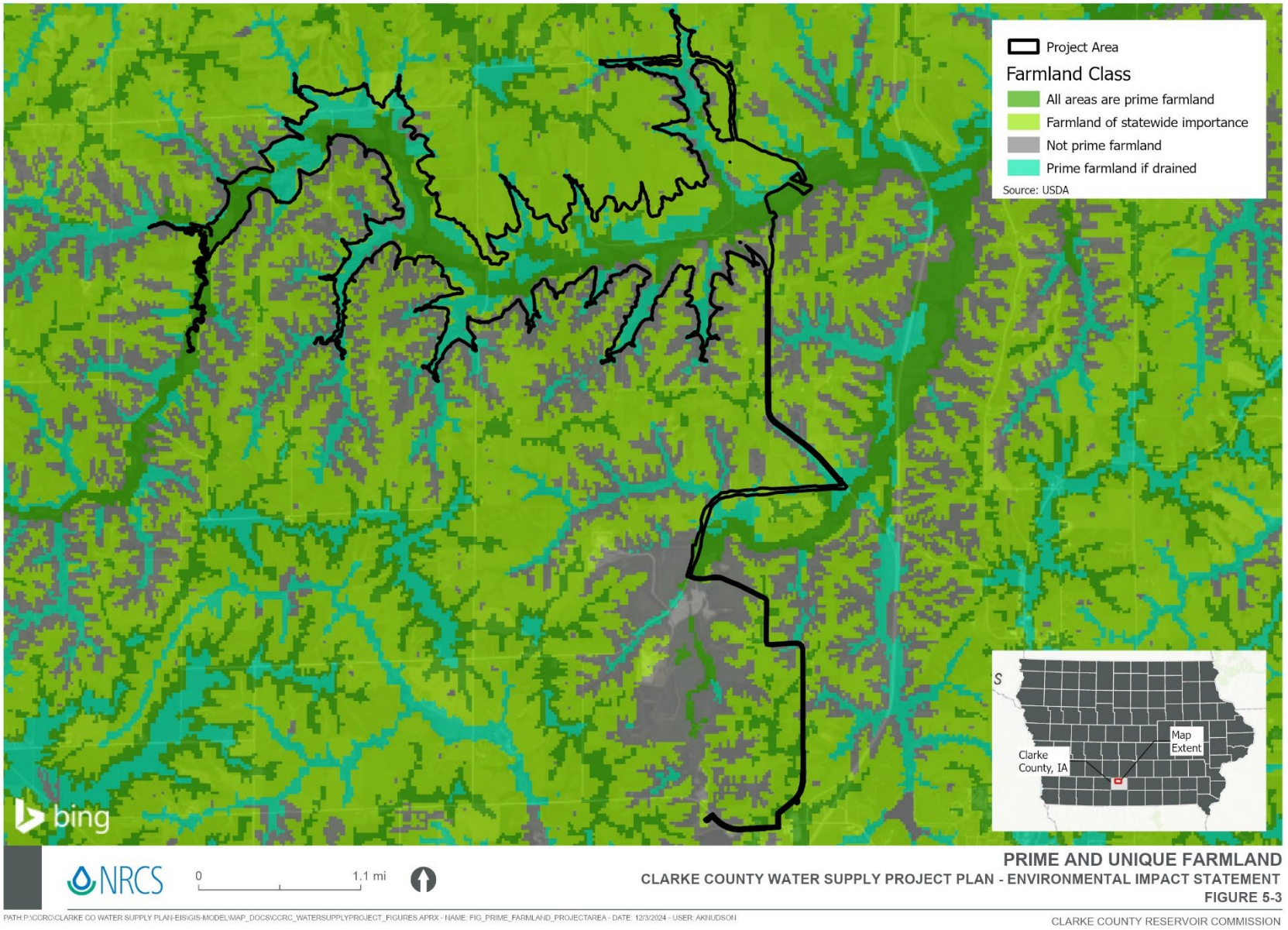


Figure 5-3. Prime and Unique Farmland Dam Site 4B Project Area

Table 5-2: Reservoir Site 4B Project Area Prime and Unique Farmland Impacts

Dam and auxiliary spillway construction	Total Acres: 96.01
All areas are prime farmland	24.44
Farmland of statewide importance	71.57
Normal pool	**Total Acres: 476.34**
All areas are prime farmland	355.63
Farmland of statewide importance	120.71
Truro Pavement realignment	**Total Acres: 23.34**
All areas are prime farmland	0.48
Farmland of statewide importance	22.86
Normal pool to top of dam	**Total Acres: 287.25**
All areas are prime farmland	120.34
Farmland of statewide importance	166.90
Raw water pipeline construction	**Total Acres: 47.21**
All areas are prime farmland	13.94
Farmland of statewide importance	33.28
Grand Total:	**930.15**

Source: USDA NRCS 2020

5.3 Land Use

5.3.1 No-Action Alternative

The No-Action Alternative would not impact any current land use.

5.3.2 Water Supply Reservoir at Dam Site 4B

There will be a moderate, permanent, direct, and indirect impact on land use due to the Project. The predominant land uses impacted by this alternative (including dam and auxiliary spillway construction, normal pool, Truro Pavement realignment, normal pool to top of dam, and raw water pipe construction) are grassland at 53.4 percent of the total impact acreage, followed by forest and cropland at 27.1 and 11.4 percent, respectively. Impacts on grassland or forest with respect to animal habitat is discussed in Section 5.6. Table 5-3 and Figure 5-4 provide a breakdown of acreage impacts by Project component. The permanent pool would inundate and permanently impact 790.32 acres of land by converting to water & wetlands land use type. Dam construction would permanently impact 127.99 acres of land by converting primarily to developed land. There would be no temporary impacts on land use.

CCRC is required by Iowa Administrative Code (567-43.3(7) to own or maintain an easement for all the land upstream of the dam to an elevation of equal to or greater than the top of dam or 400-feet horizontally from the normal pool, and for the dam and auxiliary spillway construction footprint. Any agricultural land owned by CCRC is anticipated to move out of agricultural production to grassland or woodland when the Project is built (see Figure 5-3). Although the land would not be directly impacted by the Project, the land is owned due to the reservoir's development and therefore any land use changes to this land would be considered an indirect,

permanent Project impact. There are 95.0 acres of cropland, 83.8 of which are hay, that are owned by CCRC and outside of the direct Project impact area. The land use will shift from cropland to grassland or woodlands. Other than agriculture, there are no other anticipated land use changes to CCRC owned land outside of the direct Project Area.

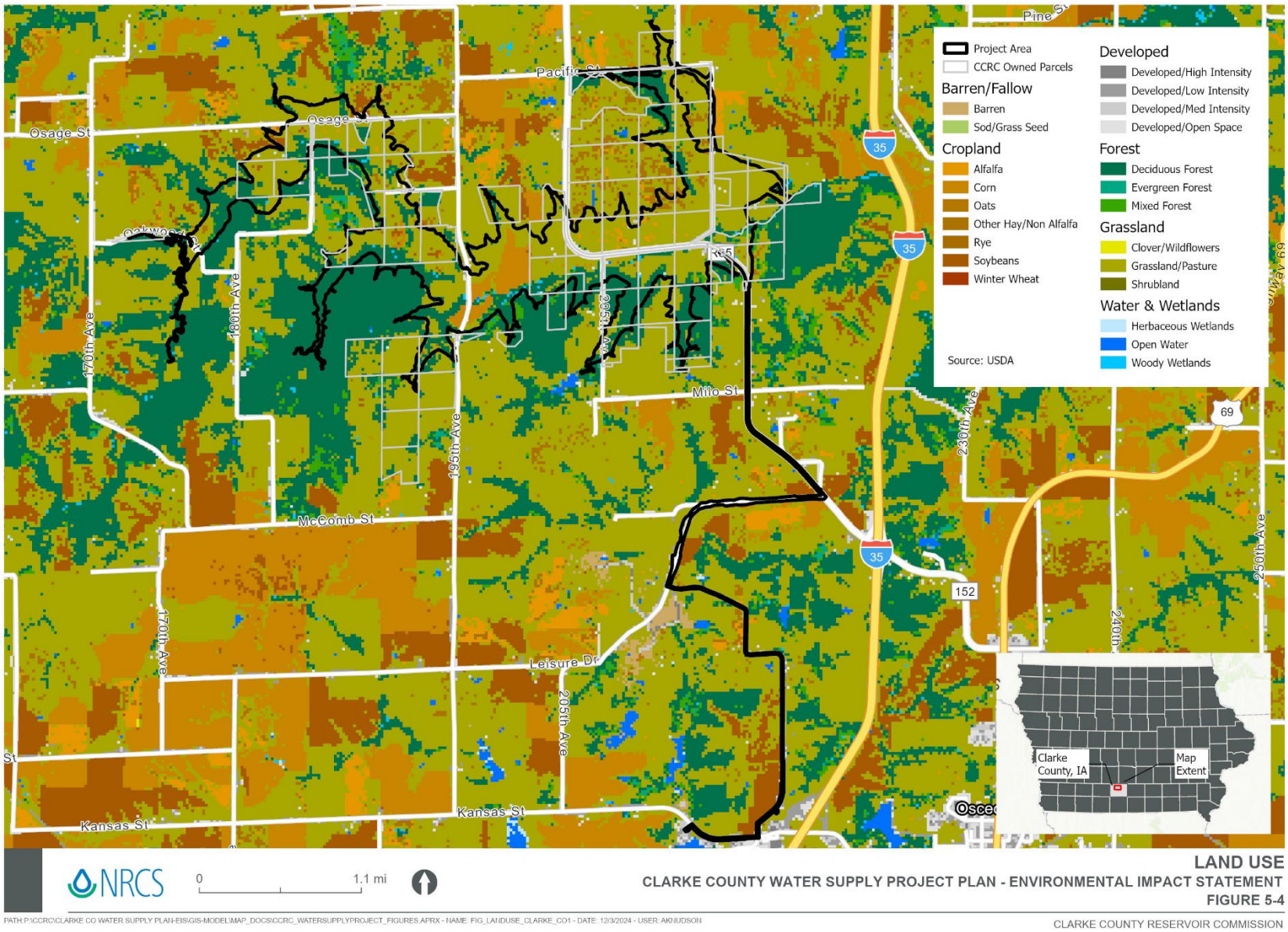


Figure 5-4. Land Use Dam Site 4B Project Area

Table 5-3: Reservoir Site 4B impacts by land use type

Dam and auxiliary spillway construction	**Total Acres: 128.00**
Grassland	110.82
Forest	8.35
Developed	6.50
Cropland	1.47
Water & wetlands	0.85
Barren/fallow	0
Normal pool	**Total Acres: 774.99**
Grassland	436.24
Forest	197.03
Cropland	98.51
Developed	33.19
Water & wetlands	10.04
Barren/fallow	0
Truro Pavement realignment	**Total Acres: 33.47**
Grassland	14.12
Developed	10.62
Forest	6.97
Cropland	1.68
Barren/fallow	0.08
Water & wetlands	0
Normal pool to top of dam	**Total Acres: 682.42**
Grassland	380.80
Forest	256.67
Cropland	20.70
Developed	22.20
Water & wetlands	2.04
Barren/fallow	0
Raw water pipeline construction	**Total Acres:76.54**
Developed	54.47
Grassland	20.34
Cropland	1.20
Forest	0.47
Water & wetlands	0.05
Barren/fallow	0
Grand Total:	**1,695.43**

Source: USDA NRCS 2023b

Notes:

[1] Grassland land use classes include clover/wildflowers, grassland/pasture, and shrubland.

[2] Forest land use classes include deciduous forest, evergreen forest, and mixed forest.

[3] Cropland land use classes include alfalfa, apples, barley, corn, oats, other hay/non-alfalfa, rye, sorghum, soybeans, spring wheat, sweet corn, triticale, and winter wheat.

[4] Developed land use classes include open space, high, medium, and low intensity developed.

[5] Water and wetlands land use classes include open water, herbaceous wetlands, and woody wetlands.

[6] Barren/fallow land use classes include barren, fallow/idle cropland, and sod/grass seed.

5.4 Water Resources

This section describes impacts on the various water related resources in the Project Area relative to type, quantity, and quality.

5.4.1 No-Action Alternative

Under the No-Action Alternative, there would be no impacts on wetlands and other waters of the US or to streams and other riparian areas within the Project Area because no reservoir would be constructed.

Water quality in South West Creek would continue to be negatively impacted by nutrients and sedimentation in the watershed, and poor water quality at lower levels in West Lake would continue to impact water treatment costs as well as water taste and odor, according to OWW. There is no Section 303[d] impairment of West Lake or South West Creek at the current time.

5.4.2 Water Supply Reservoir at Dam Site 4B

Wetlands

Construction of this alternative would result in minor, direct, long-term impacts on 52.24 acres of wetlands. This is predominantly from the inundation of the normal pool, with some impacts from the dam construction and Truro Pavement realignment. There would be no temporary impacts on wetlands within the Project Area. There are no wetlands impacted by the water supply pipeline/GSR construction or between the elevation of the normal pool and top of dam. Table 5-4 provides a breakdown of permanent impacts by wetland type. Further documentation of wetland delineation methodology and figures is provided in Appendix E2, Wetland Delineation Report.

Table 5-4: Reservoir Site 4B permanent impacts by wetland type

Wetland Type[1]	Acre[2]
PEMA/C	44.56
PEMF	1.17
PFOA	3.22
PSSA	2.89
WIAS	0.40
Total	**52.24**

Notes:

[1] PEMA/C = Palustrine Emergent Temporarily/Seasonally Flooded Wetland, PEMF = Palustrine Emergent Semi-Permanently Flooded, PFOA = Palustrine Forested Temporarily Flooded, PSSA = Palustrine Scrub Shrub Temporarily Flooded, WIAS = Wetland in Agricultural Setting.

[2] Estimated wetland acreages calculated based on 2023 wetland delineation report.

Streams and Riparian Areas

There would be a moderate, long-term, direct impact on streams due to this alternative. Construction of this alternative, including the Truro Pavement realignment, dam and auxiliary spillway, normal pool, and raw water pipe construction, would directly impact approximately 49 existing riparian reaches identified within the Project Area. Complete loss is defined as any

filling or excavation, for the Project complete loss of stream would result from road realignment and construction of the dam and auxiliary spillway. Impoundment impacts would result from inundation from the reservoir normal pool. Temporary impacts would result from the installation of the raw water pipeline. Stream impacts were analyzed in accordance with the 2019 USACE State of Iowa Stream Mitigation Method (ISMM). Table 5-5 provides a breakdown of impacts by stream type. Compensatory mitigation for stream impacts is discussed in Section 6.2.5.

Further documentation regarding the methodology used to calculate impacts and figures are provided in Appendix E3, Stream Condition Assessment Memorandum.

Table 5-5: Reservoir Site 4B Impacts by stream type

Impact Type[1]	Stream Type[1]	Linear Feet (ft)[2]
Complete Loss	Intermittent	2,698.21
	Perennial	840.24
Impoundment	Ephemeral	13,617.27
	Intermittent	31,101.35
	Perennial	26,457.58
Temporary	Intermittent	45.12
	Perennial	438.91
Total Complete Loss		**3,538.45**
Total Impoundment		**71,176.20**
Total Temporary		**484.03**
Total Stream		**75,198.68**

[1] Impact and stream type were determined using the USACE ISMM.
[2] Estimated linear feet of streams calculated based on 2023 wetland delineation report.

Water Quality

There would be no impacts on Section 303[d] impaired waters in the Project Area, West Creek is not listed as an impaired water. There would be a minor, permanent, indirect beneficial impact on water quality in other water bodies near the Project Area. Sediment trapped in the reservoir would reduce sediment and phosphorus in the stream below the reservoir. The reservoir would also result in a reduction in *E. coli* downstream due to retention time in the reservoir resulting in *E. coli* dying off. Land use changes in the acquisition area from agriculture to woodland or grassland would also reduce nutrient loads from fertilizer. The new reservoir at Site 4B would have improved water quality compared to the existing West Lake (see Section 0), which could improve stress on residents due to water quality warnings and reduce costs for water treatment and improve taste and odor of drinking water.

There would be a minor, temporary, adverse impact on water temperature and dissolved oxygen when the reservoir is filling. Once the baseflow resumes through the principal spillway these would improve.

5.5 Floodplains

5.5.1 No-Action Alternative

The No-Action Alternative would have no impact on floodplains.

5.5.2 Water Supply Reservoir at Dam Site 4B

There would be moderate, permanent, direct impacts on floodplains due to the Project. This alternative would impact areas within FEMA Zone A (1-percent annual chance flood hazard, or 100-year floodplain) and Zone X floodplain (0.2-percent annual chance flood hazard, or 500-year floodplain). There are 485.6 acres of Zone A floodplain and 36.9 acres of the Zone X floodplain that would be impacted permanently (see Figure 5-5). Upstream of the dam, the Zone A floodplain would be inundated and expanded due to the reservoir backing up water. This alternative would require revision to FEMA flood mapping via a Conditional Letter of Map Revision and Letter of Map Revision. The principal spillway is designed to accommodate the 100-year flood without activating the auxiliary spillway, and the top of dam is designed to accommodate the probable maximum precipitation. The acres of FEMA floodplain impacted by each Project component is summarized in Table 5-6. Downstream of the dam, there would be incidental minor, beneficial effects due to flood control impacts of the dam. Flood control is not an intended purpose of the dam and is not considered in the economic analysis.

There would also be temporary impacts on floodplain in the area between the normal pool and top of dam, and due to the raw water pipeline construction. There are 160.8 acres of the Zone A floodplain and 29.7 acres of Zone X floodplain that would be impacted temporarily.

Table 5-6: Reservoir Site RB impacts by FEMA Special Flood Hazard Zones

	Sum of Acres
Dam and auxiliary spillway construction	**29.92**
Zone A, 1-percent annual chance	28.78
Zone X, 0.2-percent annual chance	1.14
Normal pool	**482.57**
Zone A, 1-percent annual chance	447.09
Zone X, 0.2-percent annual chance	35.48
Truro Pavement realignment	**9.95**
Zone A, 1-percent annual chance	9.71
Zone X, 0.2-percent annual chance	0.24
Normal pool to top of dam	**187.3**
Zone A, 1-percent annual chance	158.31
Zone X, 0.2-percent annual chance	28.99
Raw water pipeline construction	**3.16**
Zone A, 1-percent annual chance	2.47
Zone X, 0.2-percent annual chance	0.99
Grand Total	**712.9**

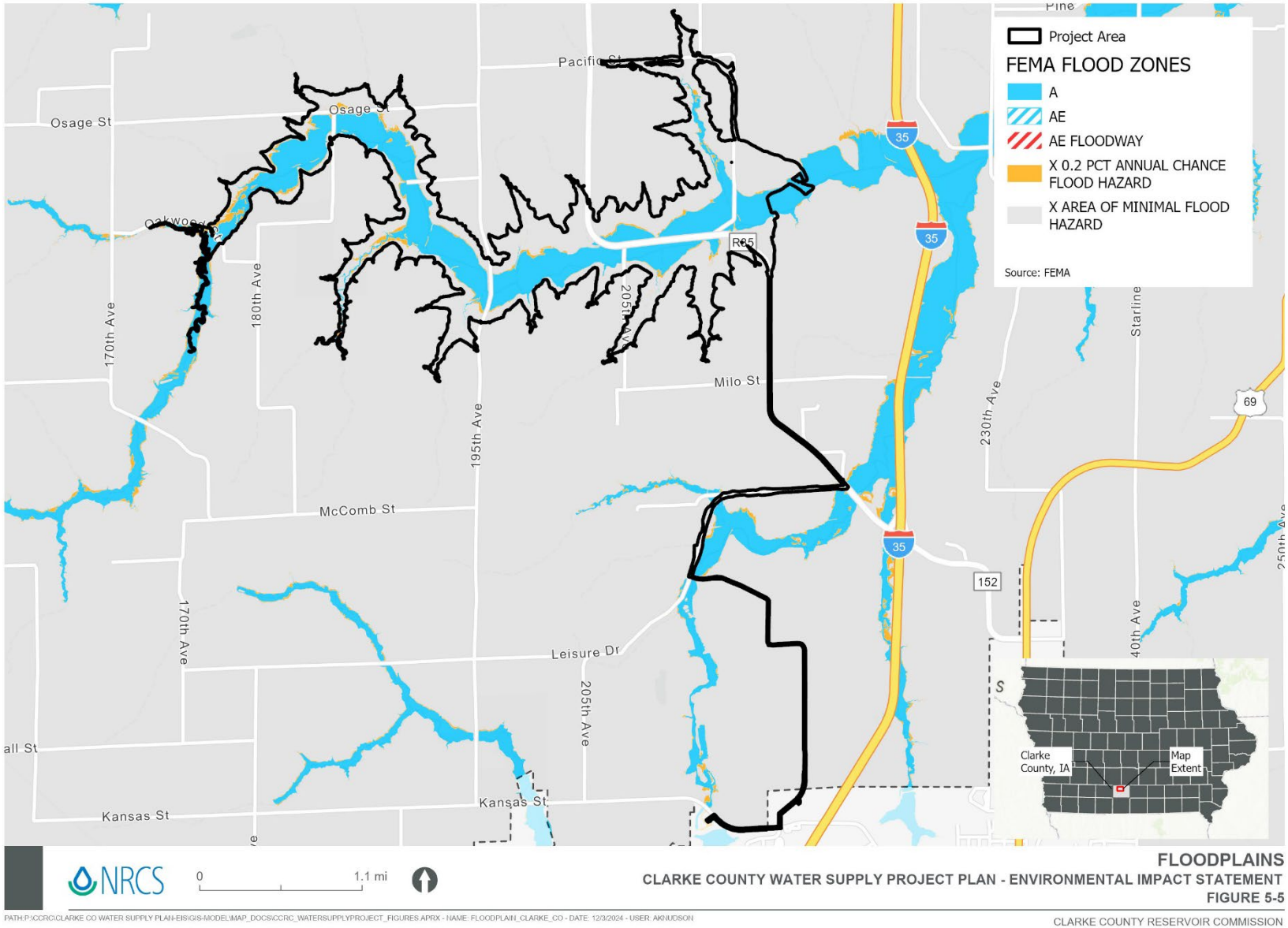


Figure 5-5. Floodplains Dam Site 4B Project Area

5.6 Terrestrial and Aquatic Wildlife

5.6.1 No-Action Alternative

Under the No-Action Alternative, there would be no change to the wildlife and habitat communities in the Project Area.

5.6.2 Water Supply Reservoir at Dam Site 4B

The proposed reservoir's implementation would result in direct and indirect, short-term and long-term, and localized and farther-reaching effects on terrestrial and aquatic wildlife. Filling the reservoir is anticipated to take several years to complete and would result in gradual landscape modification. A Biological Evaluation (BE) (Appendix D3), Bat Habitat Survey (Appendix D4), and Floristic Survey (Appendix D5) were completed in support of the Project between Summer 2023 and Fall 2024.

Habitat

The creation of the proposed reservoir would provide new upland, wetland, riparian, and lacustrine habitats across the landscape. According to the USFWS IPaC tool, there is no critical habitat for federally listed species (USFWS 2025). The proposed reservoir would also result in the conversion of existing cropland, grassland/pasture, shrubland, forest, and wetlands to open water and new upland and riparian woodland. Woodland habitat is the primary habitat of concern due to federally endangered bat species. As shown in Section 5.3, Land Use, there would be 220.79 acres of forest habitat permanently impacted. The normal pool would permanently inundate 203.92 acres, while the dam construction and Truro Pavement reconstruction would impact 10.19 and 6.68 acres, respectively. The impact on this habitat does have the potential to impact woodland species, however there are a total of 56,031 acres of woodland habitat in the county (see Chapter 3), so there is still considerable woodland habitat in the surrounding area. A bat habitat survey was completed for threatened and endangered bat species in Fall 2024, including the Northern Long-Eared Bat, Indiana Bat, and Tricolored Bat (proposed endangered). According to the field survey performed by HDR in 2024, all forested acres in the Project Area met the criteria of suitable roosting habitat (containing live trees and/or snags of minimum DBH; having exfoliating bark, cracks, crevices, and/or cavities; and located within 1,000 feet of other forested/wooded habitat and/or containing potential roost substrate) and/or suitable foraging habitat (forested/wooded habitats of varying density and canopy closure generally near water) (HDR 2024b, see Appendix D4). More detail for the bat species is provided in the threatened and endangered species section below.

Despite poor diversity and a high percentage of invasive species in many of the grasslands and shrublands in the Project Area, the conversion of these habitats would adversely affect some bird, invertebrate, mammal, and reptile species that require open habitats dominated by graminoids and forbs. The creation of open water/lacustrine habitat, wetlands adjacent to the reservoir, and upland and riparian woodland would provide habitat for certain amphibians, birds, fish, invertebrates, mammals, and reptiles. Since some existing wooded areas in the Project Area are affected by invasive species, creation and management of new woodlands could

increase the quality of habitat for existing populations and promote immigration from other populations. The proposed reservoir would change distribution patterns and land use of some wildlife, including big game.

Wildlife Communities

Big Game

Several short-term direct and indirect impacts on wildlife would occur during and following Project construction. Locally, movements and forage patterns of big game, such as white-tailed deer, would be disrupted temporarily due to human presence and machinery noise. Direct impacts on big game may include habitat avoidance, increased daily movements and movement rates, higher probabilities of flight response, and increased chance for injury or mortality. Although big game can readily disperse across the landscape to other suitable habitat in response to disturbance, increased movement results in increased energy demands. If these increased energy demands are not met, a reduction of survival fitness or reproductive success of individuals or herds could result. However, the reservoir would take multiple years to fill, which means that big game would have time to adapt to the change in the landscape. In general, completing construction of individual Project components in the shortest practical timeframe would minimize direct disturbance impacts on big game.

Migratory Birds

Short-term direct impacts on migratory birds would include disturbance and displacement during construction activities. There would be no direct effect on breeding migratory songbirds or waterbirds when construction activities would occur outside the nesting season (April 1 through July 15). For Project activities involving vegetation disturbance that would occur during the nesting season, surveys for nesting birds would be conducted before vegetation-disturbing activities could begin to prevent “take” of birds protected by the MBTA, to the extent practicable. Therefore, wintering or migrating birds are not expected to be affected measurably by construction disturbance or displacement because they have the flexibility to move away from disturbances to other suitable areas.

Bald Eagles, Golden Eagles, and Nesting Raptors

Before construction, CCRC would coordinate with USFWS and Iowa DNR biologists to identify known active bald and golden eagle nests. Nesting raptor surveys would be conducted, as necessary, to provide clearance for construction during raptor nesting season. A qualified biologist would field verify if any trees within 0.5 mile of the Project Site are actively being used for eagle nesting.

If nesting is identified, coordination with USFWS would occur to incorporate BMPs during the entirety of the construction process to minimize impacts on eagles within the vicinity of the Project Area. To minimize impacts on migratory birds, vegetation clearing would be conducted during the non-nesting period, or a qualified biologist would survey the site before construction begins to identify any nesting sites. If sites are identified, coordination would occur with NRCS and USFWS.

Construction activities in the vicinity of active raptor nests would respect USFWS-guidance-approved buffer distances (if a more current guidance becomes available) or buffer distances specified through coordination with a USFWS biologist. Roosting bald eagles are protected during any season by the Bald and Golden Eagle Protection Act, and construction activities would respect USFWS-recommended buffer distances (if available) near bald eagle roosts identified during surveys or by USFWS.

Small Animals

Direct impacts on small animals, especially burrowing mammals, amphibians, and reptiles, could include mortality or displacement during construction activities and stress from human presence and construction noise. Small animal species may experience reduced localized populations in direct proportion to the amount of habitat disturbed. Restricting ground disturbance to the smallest practical footprint for individual Project components would reduce the direct loss of small burrowing animals and temporal loss of their habitat. The proposed action would disturb approximately 1,754 acres of land. However, it is likely that small, ground dwelling species would be able to relocate and would suffer minimal direct mortality from inundation due to the reservoir's slow fill rate.

Noxious Weeds and Invasive Species

The reservoir and its associated wetlands, grassland, and woodland may provide new opportunity for invasive species and noxious weeds. Reseeding disturbed areas would occur in a timely manner (within one growing season) and would be consistent with the surrounding vegetation community. NRCS would approve seed mixes prior to use. Weed management would be implemented according to NRCS, State, and county standards.

Fisheries and Aquatic Species

There are no records of any Iowa DNR fishery surveys of the West Creek system. Field observations and anecdotal information indicates that fishery is composed mainly of generalist minnow species which are tolerant of moderately degraded habitat conditions. Installation of the reservoir will convert several miles of a flashy, warm water lotic habitat to a high-quality warm water lentic system. The dam will effectively divide the stream into two sections and block upstream movement of fish from the lower portions of West Creek to its headwaters. Both native game species and existing minnow species in the stream system will be able to move upstream from the reservoir into the headwaters areas of West Creek and the same fish will also be able to move downstream from the reservoir.

The Project will disrupt continuity of the stream system and isolate the upper reaches of the West Creek system from the lower reaches. It will allow any fish species in the lake as well as native minnows, to move upstream when water conditions permit. The pool will provide a refuge for the existing fish species to utilize when low water conditions necessitate moving downstream.

Downstream Communities

Terrestrial and aquatic communities downstream of the Project Area may be affected by irregular or reduced flows during construction and filling of the reservoir. This could temporarily

affect drinking water and hydrology for certain wildlife and vegetation outside of the Project Area. An effort would be made to redirect the flow of West Creek during construction, and the principal spillway, auxiliary spillway, and trickle channel would provide downstream flow once the reservoir is completed. After the Project is complete, groundwater mounding in the periphery of the impoundment is expected to increase baseflow downstream from the dam. The Project is forecasted to benefit downstream habitat by maintaining a more stable flow regime, will reduce stream incision, and reduce sedimentation and turbidity downstream of the reservoir.

Endangered and Threatened Species

A draft BE was developed for federally listed species identified in the official species list obtained for the Project Area (see Appendix A7). USFWS and Iowa DNR coordinated on survey windows for the species evaluated in BE. Floristic surveys for plant species were conducted in summer 2023. A bat habitat evaluation was completed in summer 2024 to inform an effect determination for the bat species. Both the bat habitat evaluation and floristic survey are included as appendices, Appendix D4 and D5, respectively. USFWS was provided the BE for review, summary of consultation is in Section 7.2.1 and Appendix A7. The proposed reservoir's potential impact areas were evaluated for six federally listed threatened and endangered species, one proposed species, and one candidate species whose ranges are within the Project limits (see Table 5-7).

Table 5-7: Threatened and Endangered Species evaluated in the Biological Evaluation

Common Name	Scientific Name	Status[1,2]	Effect Determination[3]
Mead's milkweed	*Asclepias meadii*	FT | SE	No effect
Prairie bush-clover	*Lespedeza leptostachya*	FT | ST	No effect
Eastern prairie fringed orchid	*Platanthera leucophaea*	FT | SE	No effect
Western prairie fringed orchid[4]	*Platanthera praeclara*	FT | ST	No effect
Northern long-eared bat	*Myotis septentrionalis*	FE | SN	May affect, likely to adversely affect
Indiana bat	*Myotis sodalis*	FE | SE	May affect, likely to adversely affect
Tricolored bat	*Perimyotis subflavus*	FP | SN	May affect, likely to adversely affect
Monarch butterfly	*Danaus plexippus*	FP | SN	May affect, not likely to adversely affect
Western regal fritillary[5]	*Argynnis idalia occidentalis*	FP | SN	N/A

Notes:

1 FC = Federal candidate, FE = Federally endangered, FP = Federally proposed, FT = Federally threatened, SE = State endangered, SN = No state listing, ST = State threatened

2 Special Status species were identified in summer 2023 when field work for the BE began.

3 Effect determination is assumed by HDR based on discussions with USFWS, formal consultation and concurrence has not yet taken place.

4 Western Prairie Fringed Orchid is listed as threatened at both the state and federal levels. The Project Area is not in the range identified for Western Prairie Fringed Orchid but is close and was recommended for consideration by Iowa DNR.

5 Western Regal Fritillary was proposed to be listed as a threatened species on August 6, 2024, after BE field work was completed. This species will be evaluated in the next phase of the Project, as discussed with USFWS.

A formal Section 7 Consultation will take place during the design phase, including the submittal of a BA and the anticipated result of a Biological Opinion (BO) due to an impact of may affect, likely to adversely affect for the bat species. A summary of the potential impacts on each evaluated species can be found in the following sections. A detailed evaluation of each species can be found in the BE (Appendix D3).

Mead's Milkweed

Species associated with Mead's milkweed were documented during floristic surveys; however, no Mead's milkweed individuals were observed. Many areas of potential habitat in the Project Area, such as mesic to dry-mesic upland tallgrass systems, are disturbed and dominated by invasive species. Therefore, there is only marginally suitable habitat available. Because there is only marginally suitable habitat available and no Mead's milkweed individuals were observed during floristic surveys, the Project would have no effect on Mead's milkweed.

Prairie Bush-clover

Species associated with prairie bush-clover were documented during floristic surveys; however, no prairie bush-clover individuals were observed. Many areas of potential habitat in the Project Area, such as dry and dry-mesic prairie, are disturbed and dominated by invasive species. Therefore, there is only marginally suitable habitat available. Because there is only marginally suitable habitat available and no prairie bush-clover individuals were observed during floristic surveys, the Project would have no effect on prairie bush-clover.

Eastern Prairie Fringed Orchid

Species associated with eastern prairie fringed orchid were documented during floristic surveys, but no eastern prairie fringed orchid individuals were observed. Many areas of potential habitat in the Project Area, such as wet and mesic prairies and sedge meadows, are disturbed and dominated by invasive species; therefore, only marginally suitable habitat is available. Because there is only marginally suitable habitat available and no eastern prairie fringed orchid individuals were observed during floristic surveys, the Project would have no effect on eastern prairie fringed orchid.

Western Prairie Fringed Orchid

Species associated with western prairie fringed orchid were documented during floristic surveys, but no western prairie fringed orchid individuals were observed. Many areas of potential habitat in the Project Area, such as wet and mesic prairies and sedge meadows, are disturbed and dominated by invasive species; therefore, only marginally suitable habitat is available. Because there is only marginally suitable habitat available and no western prairie fringed orchid individuals were observed during floristic surveys, the Project would have no effect on western prairie fringed orchid.

Northern Long-Eared Bat

Forested areas of suitable size with live and dead trees that provide suitable roosting habitat are present in the Project Area. The present forest understory and availability of preferred prey provide suitable hunting opportunities. The results of the bat habitat assessment in summer

2024 indicate that all forested areas impacted by the Project are considered suitable habitat for all three target bat species, for either suitable roosting habitat or suitable foraging habitat. Due to suitable bat habitat being identified, the presence of the Northern long-eared bat is assumed. The relative loss of forested habitat to be permanently or temporarily impacted when compared to the available habitat within a 5-mile radius of the Survey Area is approximately 1.5 percent. Formal consultation with USFWS and coordination with Iowa DNR would be conducted prior to construction to identify methods and timing that would minimize effects on the northern long-eared bat, such as completing construction in the shortest practical timeframe, completing construction in the smallest area practicable, and removing trees outside of the northern long-eared bat's active season. Due to the assumed presence of the bat species, the size of the Project, and the anticipated long-term loss of habitat, the presumed effect determination is may affect, likely to adversely affect, for the northern long-eared bat.

Indiana Bat

Forested areas of suitable size with dead or dying trees that provide habitat suitable roosting are present in the Project Area along forest edges or canopy gaps. Riparian areas, forest edges, and forested habitats with an open understory are present in the Project Area and provide suitable hunting opportunities. The results of the bat habitat assessment in summer 2024 indicate that all forested areas impacted by the Project are considered suitable habitat for all three target bat species, for either suitable roosting habitat or suitable foraging habitat. Due to suitable bat habitat being identified, the presence of the Indiana bat is assumed. The relative loss of forested habitat to be permanently or temporarily impacted when compared to the available habitat within a 5-mile radius of the Survey Area is approximately 1.5 percent. Formal consultation with USFWS and coordination with Iowa DNR would be conducted prior to construction to identify methods and timing that would minimize effects on the Indiana bat, such as completing construction in the shortest practical timeframe, completing construction in the smallest area practicable, and removing trees outside of the Indiana bat's active season. Due to the assumed presence of the bat species, the size of the Project, and the anticipated long-term loss of habitat, the presumed effect determination is may affect, likely to adversely affect, for the Indiana bat.

Tricolored Bat

Forested areas of suitable size with live or recently dead deciduous trees that provide suitable roosting habitat are present in the Project Area. Riparian areas and forest edges are present in the Project Area and provide suitable hunting opportunities. The results of the bat habitat assessment in summer 2024 indicate that all forested areas impacted by the Project are considered suitable habitat for all three target bat species, for either suitable roosting habitat or suitable foraging habitat. Due to suitable bat habitat being identified, the presence of the Tricolored bat is assumed. The relative loss of forested habitat to be permanently or temporarily impacted when compared to the available habitat within a 5-mile radius of the Survey Area is approximately 1.5 percent. Formal consultation with USFWS and coordination with Iowa DNR would be conducted prior to construction to identify methods and timing that would minimize effects on the tricolored bat, such as completing construction in the shortest practical timeframe, completing construction in the smallest area practicable, and removing trees outside of the

tricolored bat's active season. Due to the assumed presence of the bat species, the size of the Project, and the anticipated long-term loss of habitat, the presumed effect determination is may affect, likely to adversely affect, for the Tricolored bat.

Monarch Butterfly

Open habitats with milkweeds that provide suitable habitat for monarch butterflies are present in the Project Area. Despite the low diversity of native species in the Project Area, foraging opportunities are present for the monarch butterfly. Coordination with USFWS and Iowa DNR would be conducted prior to construction to identify methods and timing that would minimize effects on the monarch butterfly, such as completing construction in the shortest practical timeframe, completing construction in the smallest area practicable, and removing vegetation outside of the monarch butterfly's active season. The proposed alternative may impact monarch butterfly individuals, but it is not likely to adversely affect.

State Listed Threatened and Endangered Species

Habitat for state-listed species was not explicitly evaluated at this time. State listed species that are not federally listed include Bald Eagle, Barn Owl, Byssus Skipper, Earleaf Foxglove, Edwards' Hairstreak, Glomerate Sedge, Great Plains Ladies' tresses, Henslow's Sparrow, Long-Eared Owl, Red-shouldered Hawk, Regal Fritillary, Sand Pigweed, Slender Glass Lizard, Slim-leaved Panic grass, Smooth Green Snake, Speckled Kingsnake, Tunnel-formed Penstemon, White Evening Primrose, and Zabulon Skipper. Iowa DNR was consulted for an Environmental Review on the Project in 2020 and identified Indiana bat (*Myotis soldalis*), a state and federally listed Endangered Species, as likely to be present in the Project Area. In a 2024 Environmental Review, Iowa DNR recommended surveys for two state listed orchid species (Slender Ladies-tresses orchid and Oval Ladies-tresses orchid). Iowa DNR concurred that surveys could take place during design stage because the recommendation for a survey came after the survey window in 2024. Discussions with Iowa DNR determined that if these orchid species are found, minimization and avoidance of impacts is recommended if impacts are temporary (i.e., not in the dam construction footprint or normal pool). If impacts are permanent and avoidance or minimization are not options, then mitigation measures could include translocation, transplantation, or habitat enhancement (see Appendix A7). Iowa DNR determined that no further action was needed on the federally listed plant species evaluated by the floristic surveys. An Environmental Review for the mitigation sites was requested and received in September 2025 and identified no site-specific records of species that would be impacted by the mitigation project work. Both of the Iowa DNR Environmental Reviews are included in Appendix A7.

Wildlife Community Impact Summary

Table 5-8 summarizes the impacts on wildlife communities that would result from reservoir construction. Best management practices (BMP) or other measures to reduce or eliminate negative consequences or comply with applicable laws are identified with each impact.

Table 5-8: Impacts on Wildlife Communities as a Result of Reservoir at Site 4B

Wildlife Community	Timeframe	Impact Type	Impact Description	BMP or Measure to Comply with Applicable Laws
Big game	Short-term	Direct	Stress, disturbance, and displacement of wintering big game in the Project Area due to machinery operation and human presence during construction	Complete construction activity in the shortest practical timeframe and in the smallest area practicable.
Nesting migratory birds except raptors	Short-term	Direct	Due to observance of BMPs, low potential for "take" under the MBTA (loss of eggs or young from nest abandonment or direct destruction)	Tree removal outside the primary nesting period for migratory birds of concern (April 1 through July 15). If construction activities are planned during the primary nesting season, accomplish any vegetation clearing or grubbing prior to the primary nesting season. If planning vegetation-disturbing activities during the typical nesting season, the area must be surveyed for active nests no more than 2 weeks prior to commencement of work. If active nests are found during nest surveys, establish nest buffers in coordination with the local USFWS biologist. If an active nest is discovered during construction, cease work and consult the local USFWS biologist for next steps.
Nesting raptors (hawks, falcons, owls)	Short-term	Direct	Due to observance of BMPs, low potential for "take" under the MBTA (loss of eggs or young from nest abandonment) due to machinery operation and human presence during construction	Complete tree removal activities outside of primary raptor nesting period (April through July). If construction activities are to occur during the primary raptor nesting period, complete a nesting raptor survey and operate outside of USFWS-guidance-approved buffer distances. If nesting raptors are present inside recommended buffer zones, work with the local USFWS and Iowa DNR

Wildlife Community	Timeframe	Impact Type	Impact Description	BMP or Measure to Comply with Applicable Laws
				biologists to adjust the buffer distance if warranted (i.e., if topographic or vegetative barriers protect the nesting raptors from disturbance, a shorter buffer distance may be acceptable), otherwise work must not proceed until nesting is complete (young have fledged). Cease work if a nesting raptor is discovered within a recommended buffer distance during construction and consult the local USFWS and Iowa DNR biologists for next steps.
Bald and golden eagles	Short-term	Direct	Due to observance of BMPs, low potential for "take" under the MBTA (loss of eggs or young from nest abandonment) due to machinery operation and human presence during construction. Potential to interfere with an eagle's "substantial lifestyle, including shelter, breeding, and feeding" as defined by the Bald and Golden Eagle Protection Act of 1940. This can include disturbance of eagles on hunting roosts and night roosts.	Bald eagles typically use the same nest sites year after year; prior to construction complete a bald and golden eagle nest survey and consult with the local USFWS or Iowa DNR biologists for the most recent understanding of the locations of active nests and operate outside the USFWS- guidance-approved buffer distances. If operating inside the recommended buffer distance, operate outside the nesting season; note that bald and golden eagles may commence nesting as early as January. Maintain the USFWS-guidance-approved buffer distance from known and observed bald and golden eagle roosts.
Small ground dwelling mammals, reptiles, and amphibians	Short-term	Direct	Direct mortality of small, ground-dwelling mammals, reptiles, and amphibians hibernating or sheltering in the construction area; localized reduction in small animal populations in direct proportion to the amount of habitat disturbed.	Limit the construction footprint to the smallest area practicable.

Wildlife Community	Timeframe	Impact Type	Impact Description	BMP or Measure to Comply with Applicable Laws
Noxious weeds	Long-term	Indirect	Introduction of invasive plant species to the construction area and surrounding native vegetation communities causing habitat degradation.	Implement weed management practices per current county weed management plans. Clean construction equipment prior to bringing it onsite to reduce risk of introducing weed seeds to the construction site. Ensure borrow material imported to the construction area is not infested with invasive plant species. Ensure seed sources for revegetation are weed-free.
Downstream communities	Short-term	Indirect	Temporary change in hydrological regime downstream of Project Area until flow is redirected or resumed.	Complete construction activity in the shortest practical timeframe. Redirect downstream flow to West Creek during construction and implement spillways and channels that can provide a consistent flow downstream during reservoir operation.
Threatened and Endangered Species	Short-term	Indirect	Temporary loss of functional habitat and displacement of wildlife from the construction area until the area is revegetated.	Complete timely and appropriate revegetation of the construction area (seed mixes would be approved by Iowa DNR biologists). Limit the construction footprint to the smallest area practicable. Conduct tree and other vegetation removal outside of the active season of listed species. Consult with USFWS and Iowa DNR biologists before removing any trees or other vegetation and develop a plan to mitigate impacts.
All	Short-term	Direct	Stress, disturbance, and displacement of wildlife in the Project Area due to machinery operation and human presence during construction.	Minimize direct disturbance impacts by completing construction of individual Project components in the shortest practical timeframe.
All	Short-term	Indirect	Temporary loss of functional habitat and	Complete timely and appropriate revegetation of the

Wildlife Community	Timeframe	Impact Type	Impact Description	BMP or Measure to Comply with Applicable Laws
			displacement of wildlife from the construction area until the area is revegetated.	construction area (seed mixes would be approved by Iowa DNR biologists). Limit the construction footprint to the smallest area practicable.
All	Long-term	Indirect	Permanent loss of functional habitat, such as grassland and shrubland, due to inundation and conversion to open water and woodland habitat.	Limit the construction footprint to the smallest area practicable.

5.7 Cultural Resources and Historic Properties

5.7.1 No-Action Alternative

The No-Action Alternative would have no effect on historic properties or other cultural resources. No construction work would be conducted; therefore, no ground disturbing activities would occur.

5.7.2 Water Supply Reservoir at Dam Site 4B

Under Section 106 of the NHPA (54 U.S.C. § 306108) and its implementing regulations (36 CFR Part 800) federal agencies are required to account for a projects effects on historic properties within the Area of Potential Effects (APE) and allow opportunity for comment from the Advisory Council on Historic Preservation. NRCS has determined that this alternative has the potential to cause effects on historic properties. The APE is the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist (36 CFR. Part 800.16d). The APE was determined by the federal agency in consultation with the Iowa SHPO, OSA, Native American tribes, local governments, the Advisory Council of Historic Preservation, and other consulting parties.

The APE contains the following components: dam and auxiliary spillway construction area, dam impoundment area, a raw water supply pipeline (including pumping station and ground storage reservoir), Truro Pavement realignment, the dam breach zone, an indirect effects area that includes a 0.25-mile buffer around major above-ground components, (see Figure 5-6 for the reservoir components of the APE), and wetland and stream mitigation areas, (see Appendix D8 for the mitigation components of the APE). The raw water pipeline was not given a 0.25-mile indirect effects buffer area because it will be buried in the existing right-of-way. Construction activities such as staging, spoil, grading, and borrow, are planned to occur within the existing APE components. The acreages of the respective APE components are included in Table 5-9.

There are four proposed wetland and stream mitigation sites, one on CCRC property and three on Iowa DNR properties. The CCRC wetland mitigation site is within the top of dam contour, so it is within the APE of the reservoir (T73N, R26W, Section 21). The three Iowa DNR properties are Rolling Hills WMA for stream mitigation (T74N, R26W, Section 21), the Kirke Woods WMA for wetland mitigation (T76N, R26W, Section 10), and Stephens State Forest for both stream and wetland mitigation (T72N, R23W, Section 2). No cultural resource investigations have taken place for mitigation areas, but they will be inventoried and evaluated as part of the Project's programmatic agreement.

Table 5-9: APE component areas

Project Component	Area (acres)[1]
Dam and auxiliary spillway with 50-foot buffer	128
Impoundment area: acreage includes normal pool (1,001-foot elevation), emergency spillway pool level (1,009-foot elevation), and top of dam pool level (1,021 feet)	1,494
Raw water supply pipeline with right-of-way buffer, pumping station, and ground storage reservoir[2]	82
Truro Pavement realignment with construction buffer	57
Dam breach zone	251
Indirect effects area that includes a 0.25-mile buffer around major above-ground components	4,645
CCRC wetland mitigation site[3]	24
Rolling Hills WMA stream mitigation site	108
Kirke Woods WMA wetland mitigation site	45
Stephens State Forest stream and wetland mitigation site	81
Total Acreage of APE:	6,797[1]

[1] Project component acres include overlapping areas, total does not equal sum of each component

[2] GSR site is approximately 0.3 acres

[3] CCRC mitigation sites are within the impoundment pool area of the top of dam

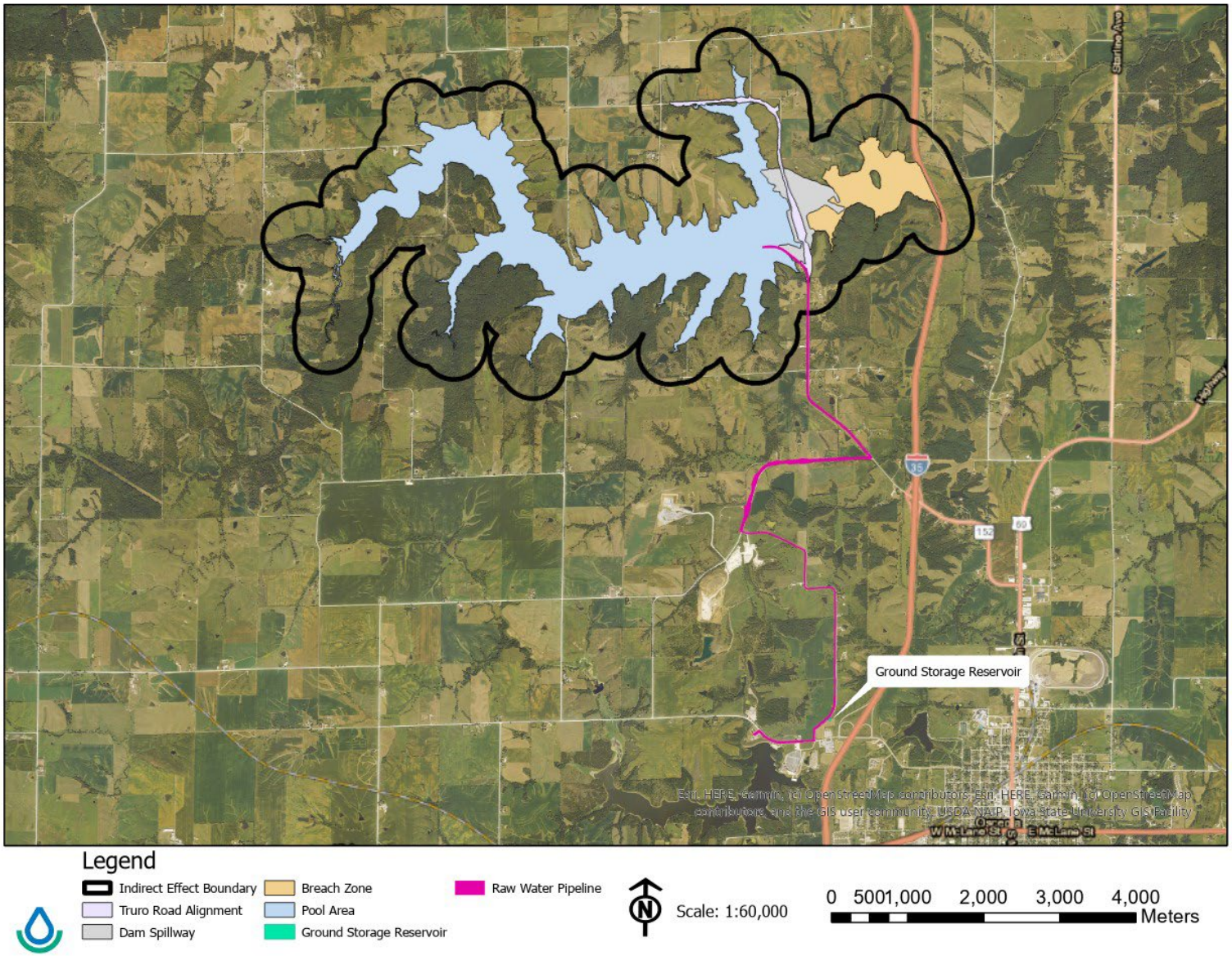


Figure 5-6. APE as consulted on and presented in Project Programmatic Agreement

At this time, there are no known historic properties within the APE; however, there have been very few professional investigations of the APE prior to this planning process. Based on the topography of the area, and the locations of previously recorded resources in the county, there is a reasonable probability of encountering unrecorded archeological sites. Additional cultural resources surveys and subsurface testing of the APE will be completed by archeologists and architectural historians that meet the Secretary of Interior Qualification Standards (36 CFR Part 61, Appendix A).

To inform the EIS planning process, a Phase 1A Archaeological Desktop Assessment and a combined intensive and reconnaissance-level Historical/Architectural survey of the Dam Site 4B components of the APE were completed by Tallgrass Archaeology LLC. (see Appendix E4, Phase 1A Cultural Resources Assessment for the Proposed Clarke County Reservoir Project and Appendix E5, Historical/Architectural Survey of the Proposed Clarke County Reservoir Project Area, Northwest of Osceola, Clarke County, Iowa).

Both reports have been distributed to consulting parties, but no formal determinations of National Register eligibility have been made at this time. The Phase 1A assessment identified three previously recorded postcontact archaeological sites within the APE. These sites are recommended as not eligible for the National Register and no further investigations are recommended for these sites. At this time, NRCS has not made any formal determinations of eligibility or findings of effect because NRCS is phasing identification and evaluation. There was also one I-Sites Notable Location intersected with the APE. The notable location was recorded in 1928 by Charles Keyes as an area that used to be long mound with no artifacts in it. The mound is not evident in any other historical records or in aerial or lidar imagery, but additional consultation and investigations will occur to see if the mound falls within the APE. Additionally, eight farmsteads were identified on historic period plat maps and aerial photographs of the APE. All eight farmstead locations are recommended for further investigation.

In addition to analyzing recorded sites within the APE, the Phase 1A report created an assessment potential for archaeological sites within the APE. Based on mapped soils, geomorphology, historical contextual information, and previous sites and surveys, the assessment identified moderate to high potential areas, low potential areas, and minimal potential areas within the Project. The assessment found that approximately 378.9 acres of the Project Area has a Moderate to High Potential to contain archaeological deposits, 875.4 acres of the Project Area is characterized as having a Low Potential to contain archaeological deposits, and the remaining 656.7 acres of the Project Area has a Minimal Potential to contain archaeological deposits due to previous archaeological surveys or steeply sloping terrain. In consultation with consulting parties, these findings will help inform future cultural resource investigation methods in the APE.

The historical/architectural survey conducted an intensive level survey of the APE surrounding the dam and spillway area, the impoundment area, and the Truro Pavement alignment area. Tallgrass Archaeology identified twenty structures or buildings within this area. They recommend that none are eligible for the National Register of Historic Places. The rest of the Project APE, the dam breach zone and indirect effects area, was surveyed at a reconnaissance

level; this included fifty-one buildings or structures. All but three buildings/structures surveyed at the reconnaissance level are preliminarily recommended not eligible for the National Register of Historic Places. The remaining three properties, all within the indirect effects area, contain individual resources that are recommended for further study if they are found to be indirectly impacted by the proposed work. No formal cultural resource identification or site potential assessment efforts have occurred within the streambank and wetland mitigation components of the APE. A review of I-Sites did not identify any recorded historic properties in these components.

Due to the size of the APE, potential for historic properties in the APE, and the substantial amount of time it would take to complete identification efforts, NRCS cannot fully anticipate or determine the effects of the alternative on historic properties at the time of this plan and EIS. NRCS, with the concurrence of Required and Invited signatories will comply with the Section 106 process through the execution and implementation of a programmatic agreement, per 36 CFR § 800.4(b)(2) and 800.14(b)(1)(ii). The Project programmatic agreement outlines the process for phased identification and evaluation of historic properties and application of the criteria of adverse effects in accordance with 36 CFR § 800.4(b)(2) and 36 CFR § 800.5(a)(3), respectively. Because the Project may have adverse effects on historic properties that have yet to be inventoried, Section 106 identification and evaluation will be conducted separately for each component of the Project. The wetland and stream mitigation sites will be components of the Project and will be evaluated under the programmatic agreement. The programmatic agreement was drafted in consultation with the SHPO, OSA, Native American tribes, the ACHP, and other consulting parties. It provides stipulations for conditions, professional qualification standards, defining the APE, inventory and evaluation, assessment of effects, treatment and mitigation plans, inadvertent discovery plans, the treatment of human remains and items of religious and cultural significance, annual reporting, dispute resolution, amendments, termination, and execution. The programmatic agreement was executed on April 21, 2025. The agreement is provided in Appendix A5.

5.8 Public Health, Safety, and Transportation

5.8.1 No-Action Alternative

Under the No-Action Alternative, public water supply inadequacies would continue. During drought years, the public would continue to be more vulnerable to water supply disruptions.

5.8.2 Water Supply Reservoir at Dam Site 4B

This alternative would have a permanent, beneficial impact on public health and safety. This alternative meets the Project need of 1.9 mgd water supply, which would positively impact public health and safety via a reliable drinking water supply, as well as water availability for firefighting.

There would be moderate, permanent and short-term, direct impacts on transportation in the region. The reservoir would inundate a segment of Clarke County Highway R35, known locally as “Truro Pavement,” requiring a relocation of approximately 2.4 miles in length. There are also

several other local roads that would be impacted by reservoir construction, including Osage Street and 195th Avenue (HDR 2020).

Truro Pavement is a vital farm-to-market route for the rural area and is classified as a major collector according to the Federal Functional Classification Map prepared by Iowa DOT (Iowa DOT 2003). Osage Street and 195th Avenue are both classified as minor collectors while the remaining affected roadways are classified as local roads. Figure 5-8 shows a portion of average daily traffic (ADT) for the Project Area roadways (Iowa DOT 2018). Roads that would be directly affected by dam construction or the reservoir (see Figure 5-7), and their respective ADT are listed in Table 5-10 and shown in Figure 5-8.

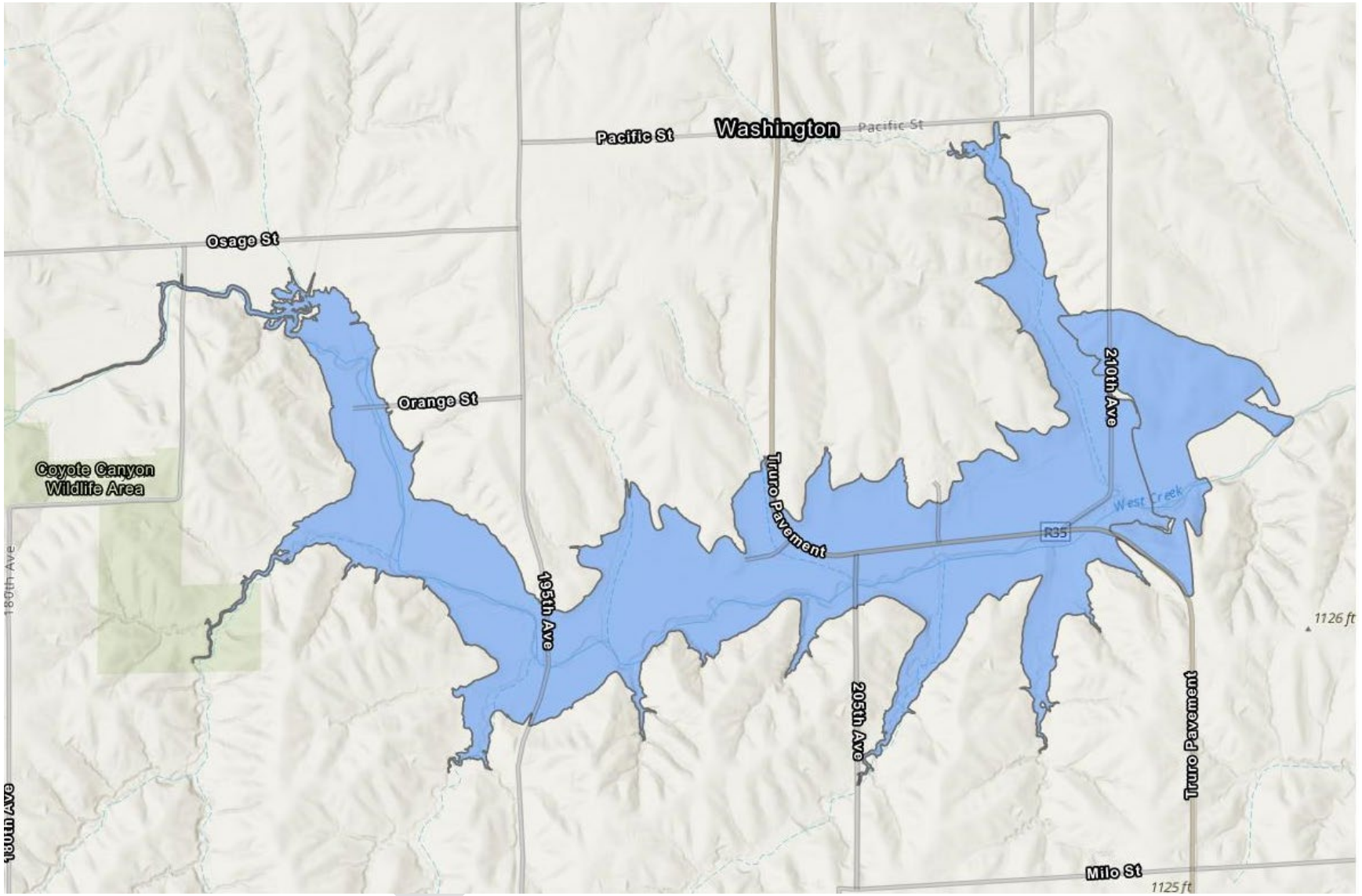


Figure 5-7: Local roads impacted by dam construction and normal pool

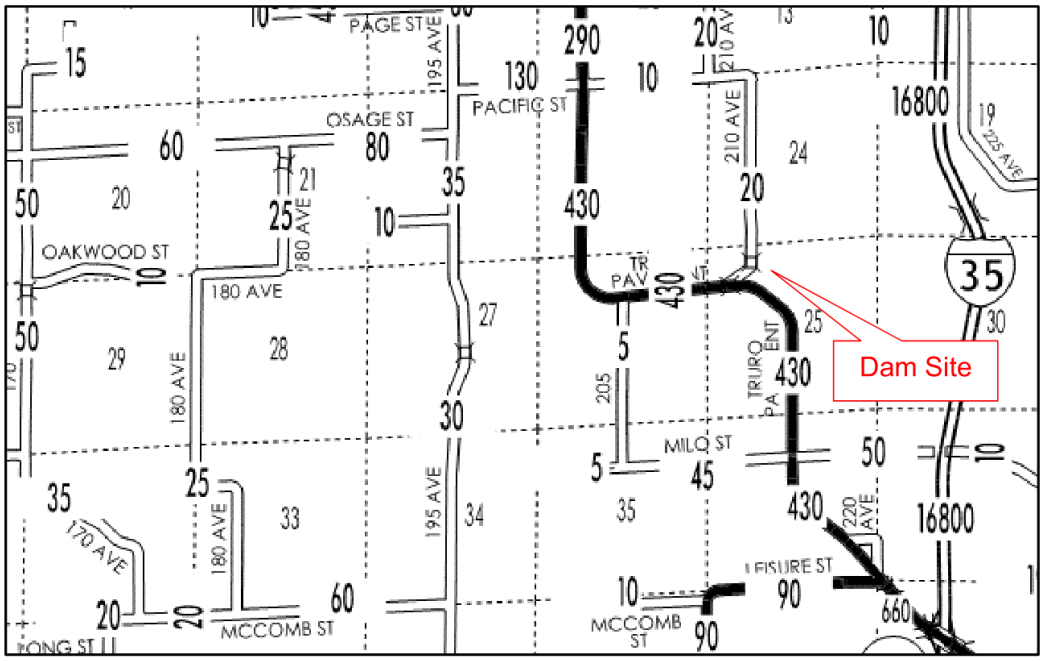


Figure 5-8: Project Area Average Daily Traffic

Table 5-10: Project Area Average Daily Traffic

Roadway	ADT (vehicles per day)
Truro Pavement	430
Pacific Street	130
210th Avenue	20
205th Avenue	5
195th Avenue	30
Orange Street	10
Osage Street	80
180th Avenue	25
Oakwood Street	10

Iowa DOT 2018

There would be a short-term impact on Truro Pavement during the construction, and a permanent impact due to the realignment and crossing of the auxiliary spillway. At the current stage of design, the new road and auxiliary spillway would be overtopped and face closures during the approximate 17-year flood event. A plan for closing Truro Pavement during a flood event would be included in the Emergency Action Plan (EAP) developed during design. Sections of 19th Avenue, 205th Avenue, and Orange Street would be closed permanently, and sections of 205th Avenue and Pacific Street (relocated Truro Pavement) would be raised to 1 foot above the top of the dam. More detail on the road impacts can be found in Section 6.2.3 or in Appendix E1.

5.9 Social and Economic Conditions

5.9.1 No-Action Alternative

Under the No-Action Alternative, public water supply inadequacies will continue to limit agricultural and economic growth in Clarke and Decatur Counties and negatively impact the quality of life of its residents due to water supply restrictions and poor drinking water quality. Currently, the existing West Lake reservoir provides water in the Planning Area, but drought has repeatedly limited water supply from West Lake. As evidence for this, OWW has imposed water use restrictions on its customers due to current drought conditions (see Section 1.2.2). Water use in the city of Osceola will continue to exceed the supply from West Lake, and OWW would not be able to continue to sell water to SIRWA. The inability to provide water to SIRWA would reduce the number of livestock produced and reduce the market value of the livestock sold in Clarke and Decatur Counties. In 2022, the market value of livestock sold in Clarke County was $93 million, and the market value of crops was $32 million (USDA 2022). Therefore, continued water supply uncertainty or restrictions for livestock production would have a substantial impact on the County's agricultural economy, and economy in general.

Also, within Osceola the inability to expand water withdrawal from West Lake has resulted in several businesses deciding not to locate in Osceola. In 2006, the former city manager, Ralph Lesko, estimated that one or two water-use intensive businesses would contact him each year about locating a facility in Osceola. In every case, these businesses have located elsewhere (Lesko 2006). The limitations on prospective business have continued. Andrew Clark of the Development Corporation of Clarke County says he has continued to turn away business and development opportunities due in large part to the limited water availability (Clark 2024). This also impacts current business, which must restrict water use up to 10 or 20 percent during Section 3 and 4 restrictions, respectively. According to OWW, Hormel/Osceola Foods, one of Osceola's largest agricultural processing water users, moved cooling for their industrial machines from water-based to electrical, fan-driven cooling, which comes at higher energy usage and potentially higher cost (OWW 2024c).

In absence of the proposed reservoir, OWW and its customers, including SIRWA, would incur additional costs for developing an alternative water supply and may also face increasingly stringent water use restrictions. Ultimately, without the Project, economic growth would be constrained in the OWW service area because of water availability. Agricultural water supply in Clarke and Decatur Counties would be in jeopardy due to the possibility of OWW not renewing purchasing agreements with SIRWA. Additional details on water deficiencies are discussed in Section 1.2.2 and Appendix D1.

5.9.2 Water Supply Reservoir at Dam Site 4B

Population, Minority Communities and Low-Income Communities

There would be no direct impacts on population and demographic trends in the county from the proposed action. The increased water supply would support municipality growth in the future. Based on the most recent available census information, it is not expected that this alternative

would disproportionately affect any minorities, socially disadvantaged, or economically disadvantaged people. All affected and interested groups have been given an opportunity to participate in the planning process via a public scoping meeting and regular public CCRC board meetings. The reservoir would be planned and constructed to conform with any federal, state, and local requirements. Long term, the assurance of a reliable, high-quality water supply would help provide for beneficial future economic development and jobs in the community.

Local and Regional Economy

The Project would result in direct, short- and long-term beneficial impacts on the local economy. During construction, the proposed action would result in 239 annual jobs. During construction, a temporary increase in business foot traffic at locations such as gas stations and dining establishments may occur during typical business hours due to the presence of construction crews within the area. There would be a minor amount of work created in operation and maintenance of the dam and reservoir. Long-term, the additional water supply would support additional economic growth in the Osceola business park and in agriculture in SIRWA's service area.

Overall, the service area and the regional economy is expected to experience benefits related to increased water delivery and reliability of the water supply reservoir. The Project results in present value net benefits of about $173.4 million, with a benefit-to-cost ratio (BCR) of 2.46 for agricultural demand, and BCR of 2.83 and net benefits of $276.1 million for the full demand. Full national economic efficiency (NEE) benefit-cost analysis is provided in Appendix D6.

5.10 Ecosystem Services

5.10.1 No-Action Alternative

Provisioning Services

This alternative would have a minor, long-term impact on provisioning services. During periods of drought, residents may experience water shortages requiring emergency water conservation measures. Water supply would be limited and insufficient for residential, commercial, and industrial growth. A lack of water quantity would lead to the loss of provisioning services due to continued threat to public health and safety and limited economic growth.

Regulating Services

This alternative would have a moderate, long-term effect on regulating services. Water quality would remain unchanged and poor water quality would continue in West Lake Reservoir impacting drinking water during drought periods. There would be no change in floodplains, aquatic and riparian habitats, erosion and sedimentation, and wildlife.

Cultural Services

This alternative would have no effect on historic properties and cultural resources as there would not be any ground disturbance undertaking. Recreation would continue to be impacted by

potentially limiting use of water for community pools and golf courses, as discussed in Section 0.

Supporting Services

Supporting services are not evaluated in this Plan-EIS because they give rise to and support the final ecosystem services (Regulating, Provisioning, and Cultural) (EEA 2019; USDA 2017).

5.10.2 Water Supply Reservoir at Dam Site 4B

Provisioning Services

This alternative would provide a moderate, long-term benefit to regulating services. Sufficient water quantity would be provided improvements to public health and safety and reduce the water shortages requiring emergency water conservation measures. Water supply would not be limited and would be sufficient for residential, commercial, and industrial growth.

Regulating Services

The alternative would provide a long-term direct benefit to regulating service for water quality on drinking water quality due to better water quality compared to the existing source and aquatic and riparian habitat due to adding 790 acres of aquatic habitat in reservoir. The alternative will have a loss of terrestrial wildlife habitat but will be short-term direct impact due to the mitigation required.

Cultural Services

NRCS cannot fully anticipate or determine the effects of the alternative on historic properties at this planning stage. NRCS, with the concurrence of Required and Invited signatories will comply with the Section 106 process through the execution and implementation of the Project programmatic agreement, per 36 CFR § 800.14(b)(1)(ii), (discussed further in Section 5.7 and attached in Appendix A5).

Recreation is not a Project purpose of the reservoir and therefore recreation would not be impacted by the creation of the lake. However, the adequate water supply provided would allow for use of water in recreation such as golf courses and swimming pools.

Supporting Services

Supporting services are not evaluated in this Plan-EIS because they give rise to and support the final ecosystem services (Regulating, Provisioning, and Cultural) (EEA 2019; USDA 2017).

5.11 Cumulative Impacts

Cumulative effects were analyzed based on the reasonably foreseeable environmental effects affecting the quality of the human environment per PR&G (DM 9500-13). Cumulative effects could be additively beneficial or adverse to a resource. Cumulative effects could result from individually minor, but collective actions that take place over time.

Accordingly, a cumulative effects analysis identifies and defines the scope of other actions and their interrelationship with the Project's alternatives if there is an overlap in space and time. Cumulative effects are most likely to occur when there is an overlapping geographic location and a coincidental or sequential timing of events. Because the environmental analysis required under NEPA is forward-looking, the aggregate effect of past actions is analyzed to the extent relevant and useful in analyzing whether the reasonably foreseeable effects of a proposed action could have a continuing, additive, and significant effect on the resource.

5.11.1 Cumulative Effect Approach

For this cumulative effect analysis, the resources that the proposed action had a potential to have an adverse effect on were considered. For each resource affected, an estimated effect of the proposed action on the resource with past, present, and reasonably foreseeable actions was considered. Based on the analysis within this document, the following resources were included in this cumulative effect analysis:

- Prime and unique farmland
- Land use
- Water resources
- Floodplains
- Terrestrial and aquatic wildlife
- Cultural and historic places
- Public health, safety, and transportation

The temporal span of these cumulative effects is assumed to be 100 years from date of construction, the design life of the reservoir. Due to the nature of the Project, the geographic extents were based on the watersheds of the stream that would impound. The confluences of West Creek are 0.5-mile north of the city of Murray and continues until it flows into South River. The boundaries of the Upper, South, and Middle West Creek Watersheds were identified as the overall boundary of the cumulative effect analysis. The geographic area is referred to as the Cumulative Effect Study Area and is shown in Figure 5-9.

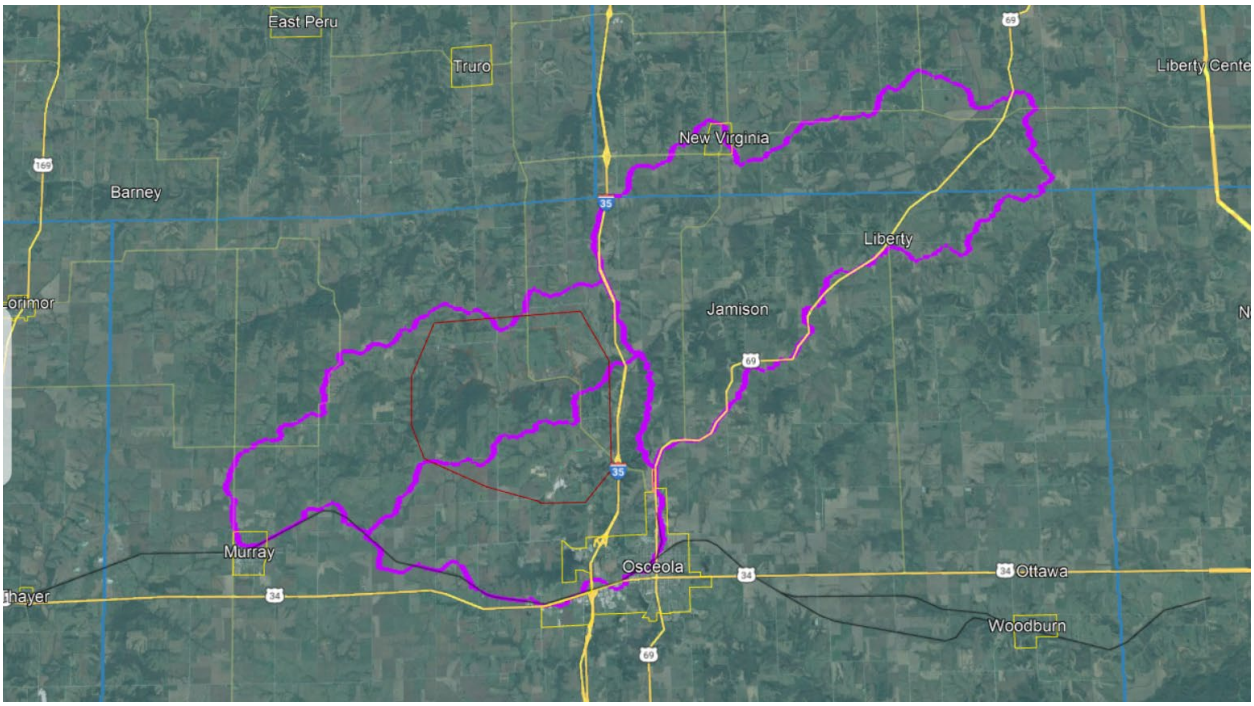


Figure 5-9. Cumulative Effect Study Area (Upper, South, and Middle West Creek Watersheds)

5.11.2 Past, Present, and Reasonably Foreseeable Actions within the Geographic Scope of Analysis

Table 5-11 lists the past, present, and reasonably foreseeable actions considered for the cumulative effects analysis. Each is discussed further in the following sections. These actions include baseline conditions known for the area and projects or actions that are known to occur within the area that are unrelated to the proposed action.

Table 5-11. Present and Reasonably Foreseeable Actions Considered for Cumulative Effects

Action	Proponent	Description	Status
Osceola Quarry	Schildberg Construction Co.	Open mining for agricultural lime and limestone	Present – 174 acres currently being mined under IDALS permit.
Agricultural Practices	Individual Landowners	Row crop and pastureland	Present – throughout the watersheds
Iowa DOT HSIP-54566	Iowa DOT	I-35 – Missouri state line to Clarke County line: Pavement Marking	Reasonably foreseeable – Planned in Statewide Transportation Improvement Program 2024–2027
Iowa DOT HBP-8899	Clarke County	On Scott Street, over local creek, from 195th Avenue west 0.3 mile to bridge S9 T73 R26: Bridge replacement	Reasonably foreseeable – Planned in Statewide Transportation Improvement Program 2024–2027

Action	Proponent	Description	Status
Iowa DOT HBP-6407	Clarke County	On Kansas Street, over South West Creek S15 T72 R26: Bridge replacement	Reasonably foreseeable – Planned in Statewide Transportation Improvement Program 2024–2027
Iowa DOT Pavement Rehab Program	Iowa DOT	0.5 mile north of US 34 to Warren County south boundary: Pavement rehabilitation	Reasonably foreseeable – Planned for 2025 in 2024–2028 5-Year Highway Program
Proposed Mixed Development-Residential	Osceola	Future Land Use Plan shows mixed development area planned for the north side of Osceola within the Cumulative Effect Analysis Study Area	Reasonably foreseeable – no determined timeline
Industrial North	Osceola	Future Land Use Plan shows industrial development area planned for the north side of Osceola within the Cumulative Effect Analysis Study Area	Reasonably foreseeable – no determined timeline

Sources: Iowa DOT 2023; IALS 2023; Osceola 2022

Past Effects in the Area

The area was previously undeveloped, natural forested and prairie area before European settlement converted areas into developed communities and cities. The cumulative effects of converting natural areas to agriculture, urban, and managed forests have made a pronounced change to hydrology, habitats, habitat connectivity, air emissions, and discharges of pollutants to receiving waters.

Two cities, Osceola and Murray, exist within the Cumulative Effects Study Area. Residential development is located mainly within the limits of these cities and within rural subdivisions. The rural subdivisions do appear to have more presence of small ponds for personal use, either excavated wetlands or dammed small streams. These have had minor changes to hydrology in the area.

Transportation systems were constructed, including I-35, that traverses Clarke County north and south. Clarke County and township roads are located throughout the Cumulative Effects Study Area. Specifically, within the proposed footprint of the reservoir, H2R, Truro Pavement, R35, and H29 would be affected by the Project (Iowa DOT 2024).

Present Effects in the Area

Gravel pits are present within the Project Area and have open cutting with follow up restoration activities as part of their Iowa Department of Agriculture and Land Stewardship mining permitting requirements (Iowa Department of Agriculture and Land Stewardship 2023).

Agriculture land use is prevalent throughout the Cumulative Effects Study Area. In these areas, West Creek appears to have been altered to have less sinuosity and is more channelized than the more natural segments of the stream. The crops present include corn, soybeans, oats, and hay. Row crop land is present and would have converted the land through clearing and cultivation.

Reasonably Foreseeable Future Effects in the Study Area

Iowa DOT has several maintenance and bridge reconstruction projects planned within the Cumulative Effects Study Area. These are typical projects to maintain the transportation system within the area.

Future growth of Osceola shows several areas within the Cumulative Effects Study Area that are planned for development. One area directly east of I-35 is planned for mixed development and industrial development is planned northeast of this area. West of I-35 north of the railroad is planned for residential development, as shown in Figure 5-10 (City of Osceola 2022). No comprehensive plan was available for Murray to identify any planned development areas (City of Murray 2023).

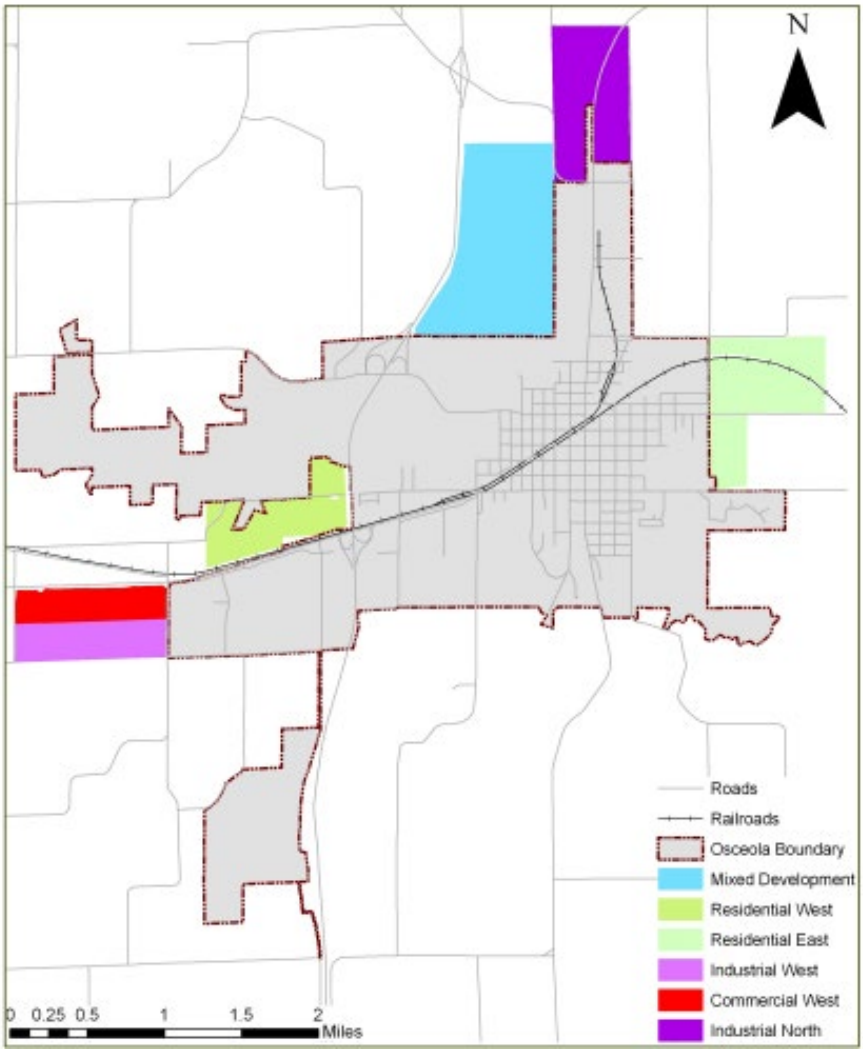


Figure 5-10. Future Growth of Osceola (City of Osceola 2022)

5.11.3 Cumulative Effect Analysis

The Cumulative Effect Analysis reviewed the resources that the Environmental Consequences Analysis determined would have adverse effects under the Project. Resources that would have a beneficial effect under the Project are not included in this discussion. Refer to the Environmental Consequences Section for further discussion of these effects. A checklist was adapted from “Considering the Cumulative Effects of NRCS Activities” (NRCS 2003) to analyze the cumulative effects on resources that would have an adverse effect.

Prime and Unique Farmland

The Project Area contains prime and unique farmland, and the alternatives would convert prime and unique farmland areas. Previously, the cities of Osceola and Murray, as well as the rural residential areas, have converted prime and unique farmland. Industrial use has converted areas that could be used, or were previously used, for farmland. Gravel pits and transportation systems have also converted farmland areas. Due to the relative area that would remain

available for farmland, the converted area would have minimal to moderate effect on the overall amount of land. Therefore, the Project, in conjunction with the past, present, and future effects, would have a cumulatively low adverse effect on farmland.

Land Use

The land use in the Project Area within Clarke County's jurisdiction is zoned mainly for agriculture, with small portions of rural residential and industrial (Figure 5-11). The portion of the Cumulative Effects Study Area that overlaps with the city limits of Osceola has the assigned land uses of open space, civic/utilities, commercial, agriculture, parks and recreation, multi-family residential, single family residential, and mobile home park (see Figure 5-12**)**. Murray has land use designated as residential, commercial, and industrial.

The Project, present actions, and future actions are consistent with the County and City comprehensive plans and State Transportation Improvement Program. Many of these are noted specifically within these documents, and those that are not consistent with the goals and objectives are noted for the area. Therefore, these projects would cumulatively have low adverse effects on land use in the area due to the direct conversion of the specific areas, but would have an overall benefit for meeting the area's goals and objectives.

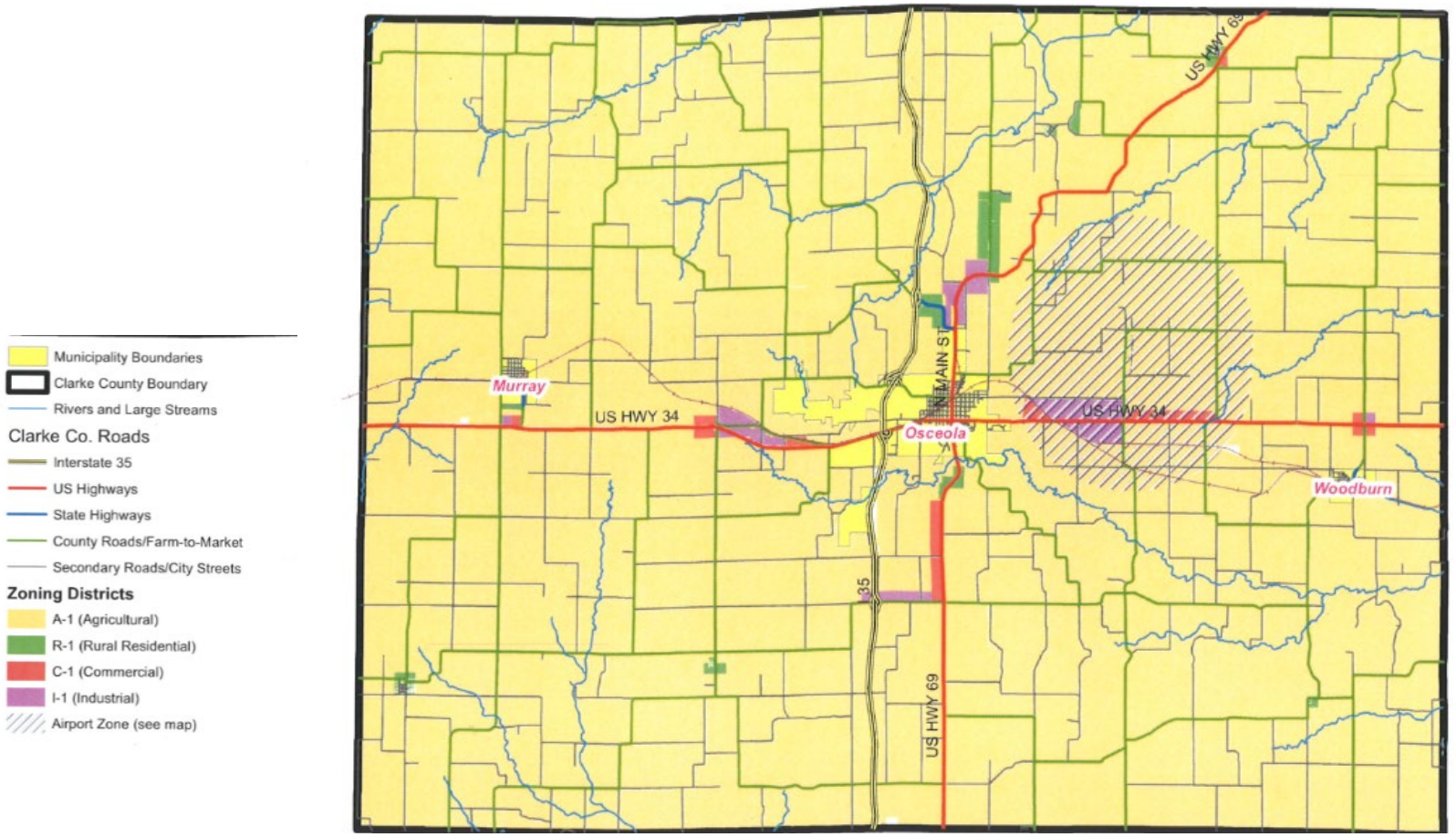


Figure 5-11. Clarke County Zoning Map (Clarke County 2023)

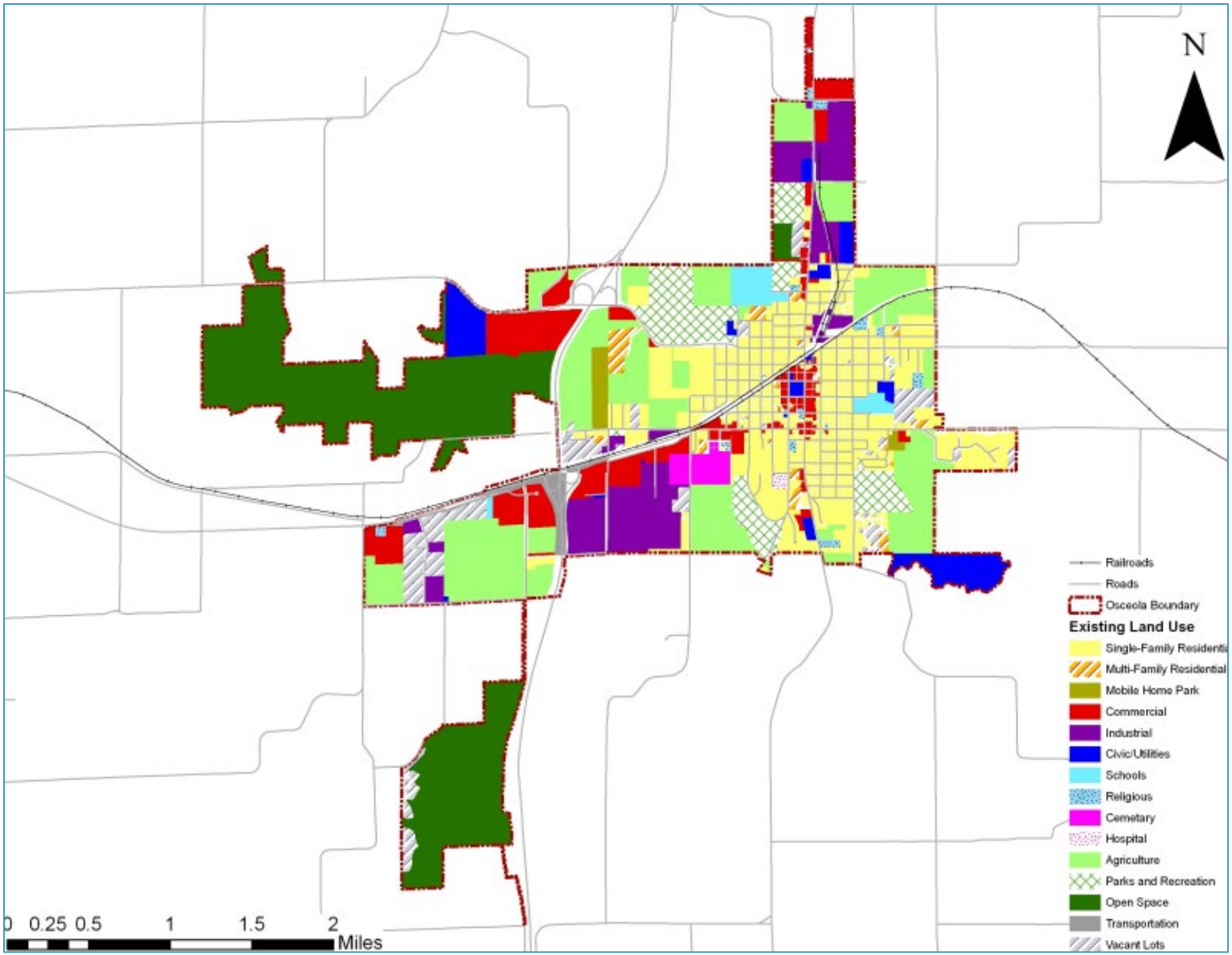


Figure 5-12. Current Land Use Map for Osceola (Osceola 2022)

Water Resources

The Project Area contains portions of the Upper and South West Creek Watersheds, which flow into the Middle West Creek Watershed. The confluences of West Creek are west of the Project Area. West Creek flows through the Project Area and continues northeast until it flows into South River (EPA 2023). West Creek Watershed's boundaries were the geographic boundary reviewed for these resources for cumulative impacts (see Figure 5-13).

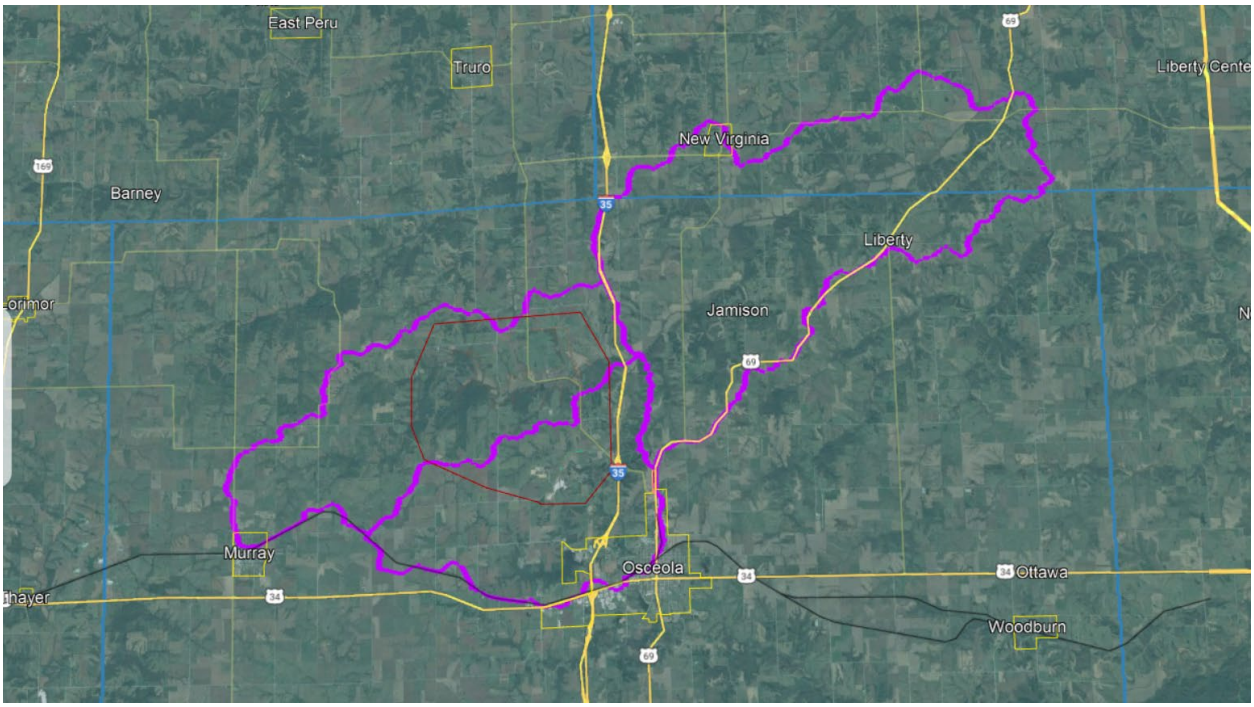


Figure 5-13. West Creek Watersheds (Upper, South, and Middle)

The Project would create a reservoir by impounding a portion of West Creek. The current water supply reservoir, West Lake, was also created by impounding water on South West Creek, a tributary to West Creek. The previously constructed roadway system has likely changed the natural conveyance flow rates of West Creek. Several small, constructed water features for residences are also present throughout the watersheds, either through impoundment of surface water flow or excavation of wetland or stream areas.

The Project would have an overall benefit to the city of Osceola's water supply quantity. The City needs another source of water beyond West Lake, as documented in Chapter 1, and this Project would create a redundancy and source of additional water. This reservoir would affect the current flow quantity that occurs in West Creek and its flow into South River. West Creek currently meets its beneficial use standards. The sediment trapped in the dam could improve downstream water quality.

Groundwater recharge is not anticipated to be altered. The reservoir would provide a location that allows water to interface and seep into groundwater aquifers in the area. Minor alterations to recharge may occur since the flow would change along West Creek. If present, alluvial aquifer recharge locations may be altered slightly.

Floodplains

The past conversion of prairie and forested areas into urban areas have affected the floodplains of the rivers and tributaries in the area. Overall, the Cumulative Effects Study Area is undeveloped, rural area that the floodplain has remained similar. The floodplain would have continued to have the capacity to hold the flooding of the 100- and 500-year events.

The present and future actions would need to meet EO 11998, Floodplain Management, if a federal nexus is present. This Project would affect the designated floodplain and cause a change in the floodplain, requiring a remapping of the areas through a Conditional Letter of Map Revision (CLOMR) or Letter of Map Revision (LOMR). The proposed roadway projects would likely have no rise effects due to the sizing of the crossings to meet the openings that are needed to allow floodplain capacity to remain the same as current conditions. Cumulatively, the Project and other projects would have a minor to moderate effect on floodplains causing changes to the flood storage capacity slightly.

Terrestrial and Aquatic Wildlife

The past conversion of natural forest and prairie areas to developed agricultural, industrial, and residential areas has affected terrestrial and aquatic habitats by directly converting habitat and causing habitat fragmentation. Species have adapted to this previous development and conversion by using the existing habitat throughout the Cumulative Effects Study Area.

Wildlife is present throughout the Cumulative Effects Study Area with the present actions, with some fragmentation occurring. For example, the gravel mining area and developed cities have created areas that have limited species' habitat. The future projects would convert or affect further habitat areas, but the overall habitat area affected within the entire Cumulative Effects Study Area would be a small percentage of the total area. Fish populations within West Creek would be affected by the Project due to impoundment and the future proposed detention areas. The remaining present and future actions would have no to low effects on fisheries. Overall, cumulative effects are anticipated to have no to low effects on wildlife and fisheries.

Cultural and Historic Places

Archeological and cultural sites within the Cumulative Effects Study Area are likely to include Native American and European settlers' sites. These sites may have been affected previously by past or present actions. Present and future actions have the potential to affect cultural and historic places. Much of the area has remained undeveloped to the extent that it would completely disturb sites. NRCS cannot fully anticipate or determine the effects of the alternative on historic properties at this planning stage.

Public Health, Safety, and Transportation

The past, present, and future actions have taken public health and safety into consideration; therefore, there would be no adverse cumulative effect. County roadways would be affected by the Project, requiring reconfiguration and reconstruction for the impoundment. This Project, along with future transportation improvement projects, would have a low overall adverse impact on the transportation system.

Table 5-12. Cumulative Effect Analysis for Preferred Alternative.

Environmental Category	Potential Project Impacts				Cumulative Impacts of Projects			
Will the Project result in:	**No**	**Low Adverse**	**Moderate Adverse**	**High Adverse**	**No**	**Low Adverse**	**Moderate Adverse**	**High Adverse**
Prime and Unique Farmland								
Substantially affect the amount of farmable land?		✓				✓		
Substantially impact prime and unique farmland?		✓				✓		
Land Use								
Substantially alter existing land use of an area?		✓				✓		
Impact parks?	✓				✓			
Water Resources								
Change quality of water resources?		✓				✓		
Change quantity of water?			✓				✓	
Alter flows or change hydrology?			✓				✓	
Impact wetlands?			✓				✓	
Impact recharge area or rate?		✓				✓		
Floodplains								
Change in floodplains?		✓				✓		
Terrestrial and Aquatic Wildlife								
Change diversity or productivity of vegetation?		✓				✓		

Environmental Category	Potential Project Impacts				Cumulative Impacts of Projects			
Will the Project result in:	**No**	**Low Adverse**	**Moderate Adverse**	**High Adverse**	**No**	**Low Adverse**	**Moderate Adverse**	**High Adverse**
Impact riparian habitat?		✓				✓		
Introduce new plant species into area?		✓				✓		
Impact wildlife habitat and nesting areas?		✓				✓		
Impact migration or movement of animals or fish?			✓				✓	
Impact fisheries?			✓				✓	
Cultural and Historic Places								
Impact archaeological or cultural sites?		Not Yet Deter-mined				Not Yet Deter-mined		
Public Health, Safety, and Transportation								
Health hazard or potential health hazard?	✓				✓			
Increase accident and traffic hazards?	✓				✓			
Impact transportation system?		✓				✓		
Change existing patterns of movement of persons and materials?		✓				✓		

5.12 Risk and Uncertainty

Proposed alternatives and projects could change in costs and benefits in coming years. All estimated costs and benefits are subject to change due to local, regional, or world economics. Inherent risks in dam planning studies include three uncontrollable factors that have the effect of increasing Project costs significantly. These risks include a lengthy planning horizon, unforeseen soils conditions, and changes in the standard of practice for dam design. The potential increasing risk of extreme weather events creates additional uncertainty by impacting water supply and flood events that could impact infrastructure. This will be considered to the extent of best available guidance at the time of design.

Further uncertainties in economic calculations are detailed in Appendix D6. Uncertainty is also involved in the Hydrology and Hydraulics Analysis, including around limited terrain data. Further uncertainties in the Hydrology and Hydraulics analysis are detailed in Appendix E1, Draft Design Development Report.

5.13 Summary and Comparison of Alternatives

Table 5-13. Summary and Comparison of Alternative Plans

Item or Concern		No Action / Future Without Federal Project	Water Supply Reservoir at Dam Site 4B
Alternative Description		No federal assistance would be provided, and the Sponsor would not pursue further action.	Water supply reservoir at site 4B with associated water supply pipeline infrastructure.
Alternative Plans			
Locally Preferred			X
National Economic Efficiency (NEE)			X
Environmentally Preferred			X
Socially Preferred			X
Non-Structural		X	
Installation Cost	- NRCS Contribution - Sponsor Contribution - Total	$0 $0 $0	$74,148,820 $42,832,180 $116,981,000
National Economic Efficiency Account	Average Annual Costs: - Installation[1] - O&M[2] - Total [1]Installation include all pre-construction	$0 $0 $0	$3,237,958 $508,512 $3,746,470

Item or Concern		No Action / Future Without Federal Project	Water Supply Reservoir at Dam Site 4B
	and construction costs; [2]O&M costs include all facility maintenance costs and treatment costs for agricultural demand		
	Average Annual Benefits	$0	$9,233,985
	Average Annual Costs	$0	$3,746,470
	Average Annual Net Benefits	$0	$5,487,515
PR&G Guiding Principles			
	Healthy and Resilient Ecosystems[1]		X
	Sustainable Economic Development[1]		X
	Floodplains[1]		X
	Public Safety		X
	Watershed Approach		X
Provisioning Services			
	Water Quantity	No effect. Drinking water would continue to threaten public health and safety and limit economic growth.	Reservoir would supply the entire 1.9 mgd of water need.
	Agriculture/ Prime and Unique Farmland	No effect. Agriculture in the county would remain unchanged.	Reservoir normal pool would inundate 361.58 acres of prime and unique farmland and 24.44 more acres would be impacted by dam construction.
Regulating Services			
	Water Quality	No effect. The existing surface water quality would remain unchanged. Poor water quality in West Lake reservoir would continue to impact drinking water during drought.	There would be a direct, long-term, beneficial impact[2] on drinking water quality due to better water quality compared to the existing West Lake reservoir. Surface water quality would remain unchanged.
	Floodplains	No effect. Floodplains and flooding in the Planning Area would remain unchanged.	There would be an indirect, long-term, beneficial impact on flooding downstream of the reservoir.

Item or Concern		No Action / Future Without Federal Project	Water Supply Reservoir at Dam Site 4B
	Aquatic and Riparian Habitat	No effect. The existing surface aquatic habitat would remain unchanged.	A direct, long-term, beneficial effect on aquatic wildlife would occur due to adding acres of aquatic habitat in the reservoir. Mitigation would be required for any impacts on existing aquatic resources.
	Erosion and Sedimentation	No effect. Erosion and sedimentation would continue.	There would be a direct, temporary, adverse effect on erosion during construction. Erosion control would be implemented as appropriate. The reservoir would trap sediment from moving downstream of the dam.
	Wildlife	No effect. The existing wildlife would be unimpacted.	There would be permanent, adverse effects on woodland habitat from dam construction and normal pool inundation of habitat. Conservation measures would be taken where recommended in coordination with USFWS.
Cultural Services			
	Historic and cultural resources	No effect. Historic and cultural resources would remain unchanged.	There could be permanent, adverse effects on historic properties within the elevation contour footprint up to the top of dam. Cultural resources inventory surveys will be completed per an executed programmatic agreement to comply with Section 106 of the National Historic Preservation Act.
	Recreation	No effect. Recreation would not be impacted.	Recreation is not an intended use for the reservoir; therefore, there will be no impact on recreation.
Regional Economic Impacts			
	Annual local jobs during construction	0	239

Item or Concern		No Action / Future Without Federal Project	Water Supply Reservoir at Dam Site 4B
	Annual jobs from recreation	Not Applicable	Not Applicable
	Annual jobs from agriculture (including direct, indirect, and induced)	Negligible	Negligible
Beneficial Effects Annualized[3] (Millions, 2023$)			
	Region	$0	Negligible effects related to construction employment/income, but not estimated
	Rest of Nation	$0	Not Applicable
Adverse Effects Annualized[4]			
	Region	Not Applicable	Not Applicable
	Rest of Nation	Not Applicable	Not Applicable

[1] Represents the federal objective.

[2] Negligible impacts are generally those that might be perceptible but are at the lower level of detection. A minor effect is slight, but detectable. A moderate effect is readily apparent. Major or significant effects are those that, in their context and because of their magnitude (severity), have the potential to meet the thresholds for significance and, thus, warrant heightened attention and examination of potential means for mitigation to fulfill the policies set forth in NEPA.

[3] Beneficial effects include only those related to labor income and do not include the net economic benefits quantified in the NEE.

[4] Adverse Effect Annualized includes only the direct costs (no indirect/induced costs included).

6 Provisions of the Preferred Alternative

6.1 Rationale for the Preferred Alternative

The water supply reservoir at site 4B without modification, as described in Chapter 4, is the preferred alternative. The environmental review did not identify any significant impacts or other environmental consequences that were of special concern.

Economically, this alternative has a BCR of 2.46 and a positive annual net benefit of $9,233,985 for agricultural water supply based on a net income approach. See Appendix D6.

This alternative is the locally preferred alternative. When implemented, it will meet future demand for agricultural water that, as the primary business for the area, will allow agriculture to continue to flourish and provide the economic base that supports local communities, businesses, and industry. The preferred alternative also will help in meeting a portion of the anticipated water supply needs for the city of Osceola.

6.2 Works of Improvement

For conservative costs and associated impacts, the preliminary design is based on a demand of 2.0 mgd (from a 2016 demand forecast), instead of the updated 1.9 mgd. When the Project moves to final design, the updated demand of 1.9 mgd would be used.

The proposed action, a water supply reservoir with dam at site 4B, includes an earthfill embankment dam with a reinforced concrete pressure pipe principal spillway and vegetated auxiliary spillway. There would also be a water supply pipeline (including pumping station and GSR) to transport water from the reservoir to the water treatment plant. The dam construction and inundated area would also require the relocation of a segment of Truro Pavement. All of these components are detailed below. See Appendix E1 for detailed information on investigations and analysis of the preferred alternative.

6.2.1 Water Supply Dam and Spillway Measures to be Installed

Preliminary design of the dam, principal spillway, and auxiliary spillway was completed by HDR in 2020 and is documented in the Draft Design Development Report (Appendix E1). Table 3, Structural Data – Dams with Planned Storage Capacity Upper West Creek Watershed, Iowa, in Section 6.12, Economic and Structural Tables, provides structural data that is applicable to the Project.

Principal spillway

The principal spillway was designed per TR-210-60, which requires it to pass the 100-year principal spillway design flood without activating the auxiliary spillway. In addition, drawdown from the peak stage to 85 percent of the principal spillway event must occur in less than 10 days. The principal spillway design hydrograph (PSH) is a synthetic hydrograph including

both the 24-hour (8.3 inches) and 10-day (12.0 inches) rainfall depths. Rainfall depths and distributions are from NOAA Atlas 14 interpolated values (NOAA 2019). Additional information on design storms and flood routing is including in Appendix E1.

The proposed principal spillway riser would be located near the right dam (south) abutment along the right bank of the existing channel. Principal spillway flows would enter the spillway riser structure over a morning glory inlet weir, drop through a 66-inch diameter throat and into a 96-inch diameter conduit, be routed through the embankment, discharge into a hydraulic jump type energy dissipation structure, and then be routed to the natural channel approximately 150 feet downstream of the embankment toe.

Per NRCS TR-210-60, trash racks would be included to provide protection against spillway clogging under any operating level. Per TR-210-60, “The average velocity of flow through a clean trash rack is not to exceed 2.5 feet per second under the full range of stage and discharge.”

The 96-inch diameter principal spillway conduit would convey water from the riser structure downstream to the outlet structure. The conduit size and slope combination was selected to flow at 75 percent of full conduit depth at the PMF pool elevation while considering the conduit invert elevation at the riser and the cost of a larger diameter conduit. Steeper slopes would allow for smaller conduits to provide the required capacity, but would also result in a higher upstream invert requiring more extensive construction diversion operations. Conversely, flatter slopes would simplify construction diversion operations, but require a larger conduit to convey the flow, thus increasing costs. The conduit would be designed to operate in the super critical flow regime, which would provide upstream control that would not be impacted by downstream tailwater conditions.

The principal spillway conduit would convey flow to a hydraulic jump type stilling basin consisting of a reinforced concrete headwall, sidewalls, wing walls, floor, and end sill. Hydraulic design of the stilling basin would be based on USACE guidelines (USACE 1980). The 96-inch diameter conduit would transition to a 12-foot-wide rectangular cross section while maintaining a 0.02 ft/ft invert slope. The rectangular section would continue to widen while following a parabolic downward trajectory to the stilling basin floor, 9 feet lower than the conduit outlet. A 20-foot-wide by 38-foot-long flat stilling basin floor with a 0.75-foot-high end sill would generate and contain the hydraulic jump. The goal would be to contain the hydraulic jump within the stilling basin and not have the jump sweep out into the receiving waterbody. The stilling basin would be designed for principal spillway discharge up to and including the PMF event. The transition from the stilling basin to West Creek is described later in this section.

Plan and profile views of the principal spillway are provided in Figure 6-1.

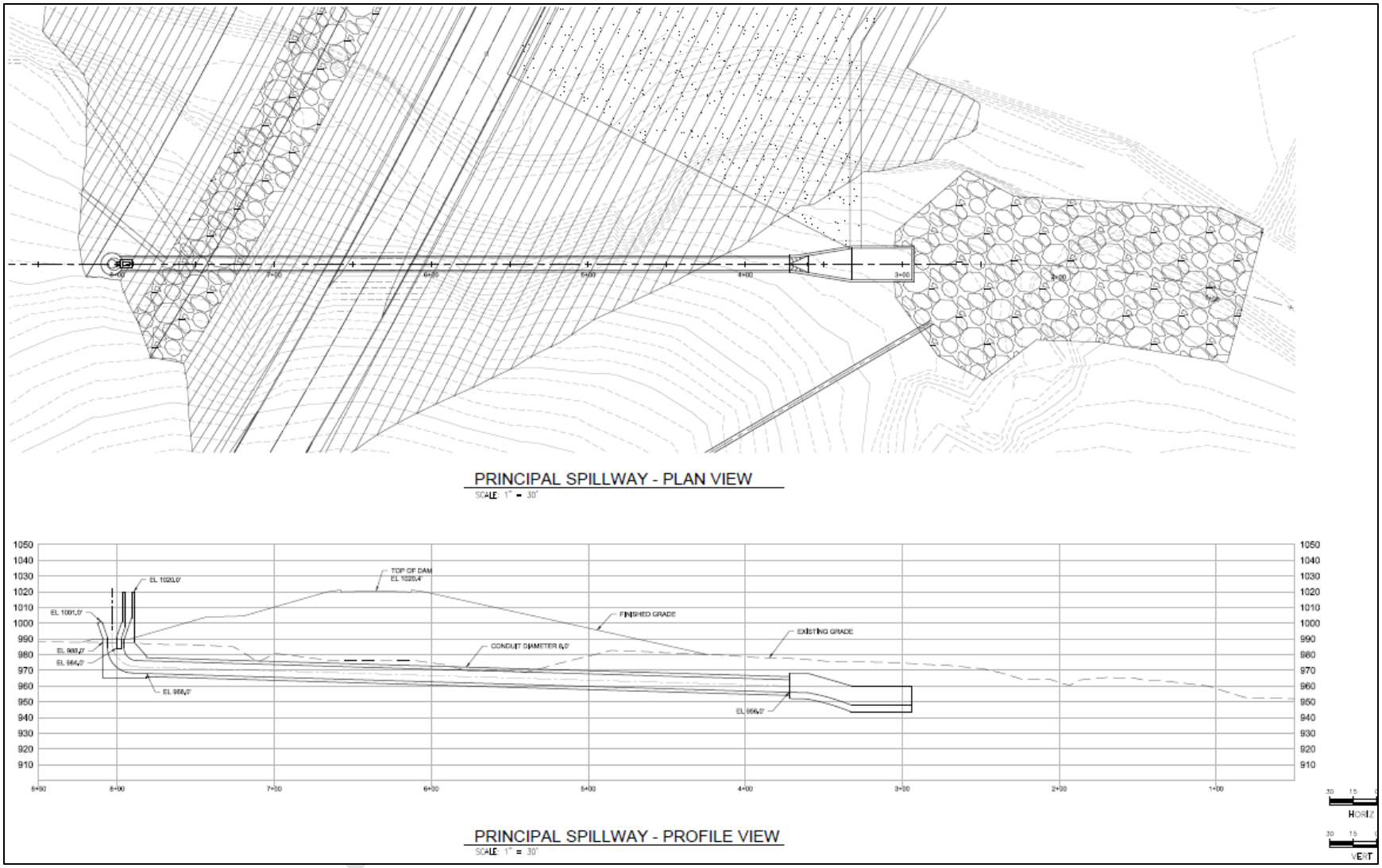


Figure 6-1. Principal Spillway Plan and Profile

Auxiliary spillway

The auxiliary spillway would be located north of the dam's left abutment. The existing hillslope would provide a large portion of the fill material needed for dam construction. The spillway would consist of a 600-foot-wide trapezoidal channel with a level crest hydraulic control set at elevation 1,009 feet NAVD88 designed to operate at flood events greater than the 100-year return interval. The auxiliary spillway would include the inlet channel, level crest, and exit channel.

The inlet channel would connect the reservoir to the auxiliary spillway level crest and exit channel during flood events. The channel cross section would be trapezoidal with 3H:1V side slopes and an 800-foot bottom width at the entrance, narrowing to 600 feet wide at the level crest 1,100 feet downstream. At the level crest, the elevation of the inlet channel bottom would be 1,004 feet NAVD88, 5 feet below the level crest elevation of 1,009 feet NAVD88 in order to provide a deepened forebay. A deeper inlet channel was designed to reduce the channel discharge velocity, erosion, and vegetal failure potential. To promote local drainage to the reservoir when the auxiliary spillway is not activated, the inlet channel would be graded to drain toward the reservoir at a 1.0 percent slope. The inlet channel grade would increase at a 1H:1V slope from an elevation of 1,004 feet NAVD88 to the crest elevation. The inlet channel would be completely in cut, including over-excavation and replacement of the upper 21 inches with graded rock and bedding.

The level crest would function as a 600-foot-long (perpendicular to flow) broad-crested weir to control conveyance through the auxiliary spillway. It would be located approximately 100 feet downstream of the dam axis, 50 feet wide (parallel to flow), and set at elevation 1,009.0 feet NAVD88. The upstream face of the level crest would be established by a sheet pile cutoff wall. Iowa Department of Transportation (Iowa DOT) Class B (18-inch D50) riprap would armor the upstream face, the 50-foot-long level crest, and the first 50 feet of the exit channel to a depth of 36 inches. A "trickle channel" would be provided to convey more frequently occurring low flows, local drainage, and wave splash-over during elevated reservoir conditions.

The exit channel profile would be divided into two segments. The first would be a 1,100-foot long gentle (1.4 percent) slope, and the second would be a 250-foot-long steep (10 percent) slope. The 600-foot bottom width cross section would be maintained along both segments. To reduce the formation of rills and gullies, the trickle channel would be armored with 12 inches of Iowa DOT erosion stone for nearly its entire length, except for the last 580 feet, which would be vegetated. To reduce the frequency of vegetal failure and to add bulk to arrest headcut, the shallow sloped segment would be extended as far as practical. Portions of the exit channel would require fill for the right dike and adjacent exit channel bottom. No fill would be required at the exit channel centerline or further north.

A vegetated trickle channel would drain local runoff from the exit channel to West Creek. Spoils from the trickle channel excavation would be used to create a berm to direct flows that exceed the pilot channel capacity back into the natural waterway.

A hydraulic analysis of the auxiliary spillway was performed to confirm maximum water surface elevations in the reservoir, locations of flow regime shift, riprap sizing, vegetal stress, and potential hydraulic jump location. Steady state flows reflect a range of conditions from 5,000 cfs up to the Freeboard Hydrograph (FBH) design discharge of 40,000 cfs.

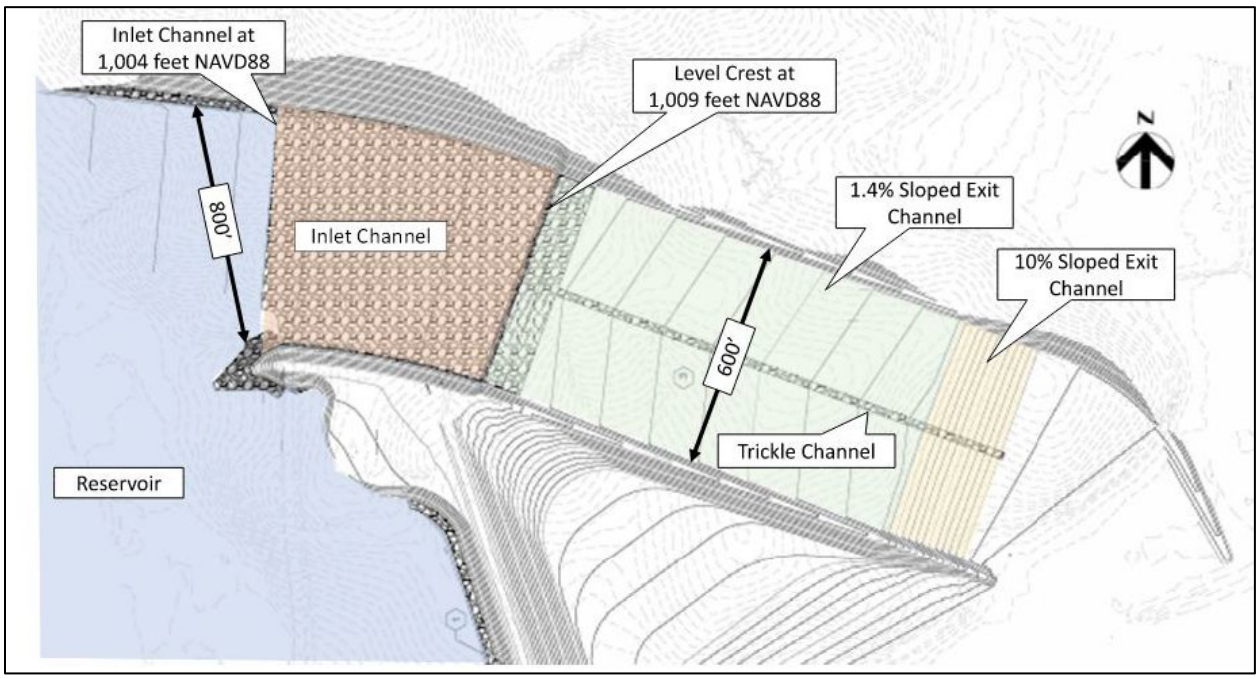


Figure 6-2. Auxiliary Spillway Plan

Dam embankment

The dam crest elevation of 1021.0 NAVD88 was used in the current design. Based on updated reservoir hydrology and hydraulics, this crest elevation would provide approximately three feet of freeboard between the PMF static water level and the dam crest. According to specifications in NRCS TR 210-60 (USDA 2019), the PMF must be considered as the freeboard design flood for high hazard dams. TR 210-60 also specifies that the storm duration which results in the highest water elevation must be used when selecting the freeboard design flood. As a result, both the NOAA Atlas 14 6-hour (26.8 inches) and 24-hour (32.8 inches) duration PMF events were evaluated for the freeboard design flood (Percia, et al 2013.

The proposed earthen dam would be a zoned embankment with a relatively impermeable clay core center and side slopes constructed of a more permeable dam shell material. The glacial till unit would be the borrow source for the dam core and dam shell. Borrow is anticipated to be within the current APE. The dam core must meet specific permeability and strength requirements for construction where the dam shell would have looser construction requirements. The foundation material would be excavated to a minimum of 10 feet and a clay key would be present under the clay core. A soil bentonite wall would act as a seepage cutoff under the majority of the dam, tie into the clay core key, and extend into relatively impermeable native clays. Where the soil bentonite wall is not present, a sheet pile cutoff wall would be present. The dam would include a chimney and blanket sand drain to facilitate through seepage.

A portion of the dam would also include a toe trench, which would tie into the blanket drain system. The toe trench would include a seepage collection consisting of a two-stage sand and gravel filter and a perforated PVC collection pipe. The seepage collection system would daylight into the proposed stilling basin. A typical embankment section is shown in Figure 6-3.

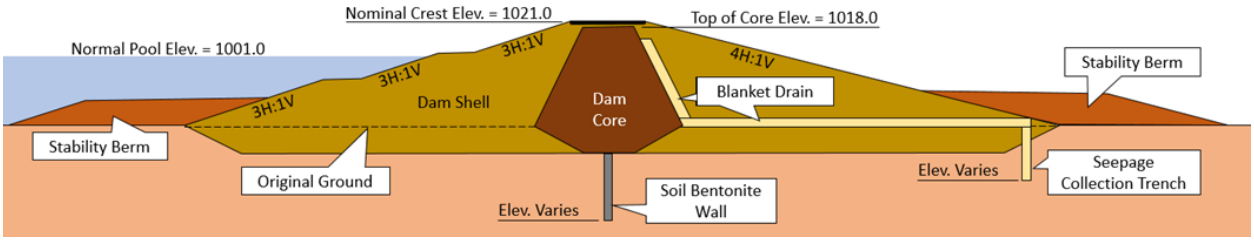


Figure 6-3. Typical Dam Embankment Section

Dam and spillway elements would be cleared of vegetation prior to earthwork activities commencing. No reservoir vegetation clearing is currently planned. The number of acres to be cleared for various types of vegetation are shown in Table 6-1.

Table 6-1. Acres to be Cleared

Area	Heavy Trees (acres)	Light Trees (acres)	Brush/Pasture (acres)	Total (acres)
Dam Footprint	10	4	40	54
Auxiliary Spillway	0	0	7	7
Total	**10**	**4**	**47**	**61**

Design life

The design life of the dam and associated appurtenances is 100 years.

The previous estimate of required sediment storage is 2,263 acre feet. Sediment loads to the reservoir were determined to be 33,500 tons annually, resulting primarily from the intensively farmed upstream cropland. The design life of the dam and associated structures was assumed to be 100 years with 80 percent of the sediment submerged and 20 percent aerated. This results in a sediment pool elevation of 980.0 feet NAVD88.

Foundation conditions

Clarke County lies within the Southern Iowa Drift Plain. The landforms of this region are composed primarily of glacial drift (till) deposited during several pre-Illinoian glaciations approximately 300,000 years ago. Much of the glacial landscape has changed over time and the typical glacial features have been buried or eroded, making them undetectable (Prior 1991). The region's modern landscapes have been shaped by rivers and streams carving valleys through the glacial till.

In 2019, HDR completed a geotechnical investigation to support the preliminary design phase for the earthen embankment dam. This investigation included a seismic refraction survey along the proposed dam centerline, 51 exploratory test borings, installation of open-standpipe piezometers, in-situ hydraulic pressure testing, and laboratory testing of soil and rock samples. This was the first geotechnical investigation completed at the proposed dam site. A subsequent, smaller investigation was completed in 2021. The 2021 investigation included 8 borings along an alternative dam site, 14 test pits throughout the Project Area, and laboratory testing. The purpose of the test pits was to determine borrow suitability.

A thick deposit of gray sandy lean clay till is the basal layer of soil that overlies bedrock in the region. The till was transported by Pre-Illinoisan glaciers and deposited onto the underlying bedrock as the glaciers melted. As the glaciers retreated, glaciofluvial lakes and streams formed on top of, within, or beneath the ice depositing fine to coarse sand within the fine-grained till unit (Iowa Geological Survey 2020). Between major glacial events, fresh till was exposed on the hillslope and subjected to weathering processes. This weathered till is also referred to as a paleosol. At the Project Site, the paleosols were divided into two sub-groups, with the moderately weathered slopewash deposit exposed on the hillslope being the more competent of the two. In the Southern Iowa Drift region, a specific type of paleosol is referred to as the Yarmouth-Sangamon surface, or “gumbotil,” and characterized as a thick, gummy, gray clay leached of coarse-grained material; the gumbotil was the less competent paleosol and typically encountered on the valley floor. In general, the competent glacial till, slightly weathered oxidized glacial till, and the paleosols all generally consist of primarily lean clay, and all appear similar during field observation. However, there are statistical differences in both strength and index testing that allowed HDR to separate the clay deposits into different units to support the subsequent Site 4B geotechnical analysis. HDR evaluated the laboratory summary statistics and population spread of strength and index test results to determine the stratigraphy across the dam site.

The left and right abutment hillslopes are characterized as having slightly weathered oxidized glacial till (approximately 30 to 40 feet thick) overlying glacial till. Very thin seams of glacial outwash were encountered within the oxidized glacial till and glacial till at the left and right abutments and were generally 5 feet thick or less. Slopewash was encountered on the hillslope near the left and right abutment. The slope angle of the hillside influenced the thickness of the slopewash deposit on the hillsides. The surficial deposit along the valley floor is gumbotil and ranges between 10 and 45 feet thick. Glacial outwash underlies the gumbotil, and the outwash deposit is approximately 20 feet thick at the center of the valley. Bedrock was encountered along a portion of the alignment. Where bedrock was encountered, it was over 100 feet below ground surface.

Borrow

Table 6-2 provides the preliminary evaluated suitability for the onsite subsurface soil materials. In general, glacial till (including oxidized till) is assumed to be a suitable borrow source for the clay core and dam shell based on preliminary laboratory testing. The slopewash and fine-grained alluvium deposit would likely require additional treatment and/or mixing to be made

suitable as clay core or dam shell and, as a result, has a lower assumed suitability for core borrow, but could be used in the dam shell. Note that no data was gathered for the West Creek deposit as it is not expected to be a significant borrow source.

Table 6-2. Site 4B-2 Material Suitability Summary

Soil Unit	Suitability (%) Spoil	Suitability (%) Core	Suitability (%) Shell
West Creek	0	0	0
Slopewash	67	0	33
Fine-Grained Alluvium	67	0	33
Oxidized Glacial Till / Till	20	25	55

Special materials, such as aggregates, drains, bentonite, etc., would be obtained from off-site commercial sources. All on-site borrow would be obtained from lands under the control of the Sponsor, with potential borrow sites identified in the highlands within the current APE.

Provisions for safeguarding public health, water quality, sanitation, and safety

In order to protect water quality during construction, temporary sediment and erosion control measures would be used and are anticipated to include conventional best practices, such as silt fence, bio-rolls, erosion control blankets, sedimentation basins, rock entrances, etc. New embankment slopes would be required to receive temporary or permanent vegetative cover within 7 days of construction. Detailed sediment and erosion control measures would be developed in the final design phase.

Sanitation during construction would be the responsibility of the contractor. It is anticipated that temporary potable water and sanitary facilities would be provided by a licensed commercial vendor who would be retained by the contractor. No permanent potable water or sanitation facilities are planned for the raw water intake or pump station.

Worker safety would be covered by the selected contractor’s corporate safety program, based on Occupational Safety and Health Administration (OSHA) regulations, and tailored to this specific Project. Bidders would be required to provide safety records as part of their bid packages. The selected contractor would be required to formally submit its site-specific safety plan for review by the Sponsor. Safety would be a topic of each construction progress meeting.

Public safety and security measures are anticipated to include fencing, locked gates, and security alarms/cameras near key structures, including the principal spillway intake and outlet works, raw water intake, and pump station. Measures may also include warning signs near the principal spillway and outlet works. Details of public safety and security measures will be developed as part of the Final Design Phase.

The America's Water Infrastructure Act (AWIA) requires community water systems serving more than 3,300 persons to develop Risk and Resilience Assessments and Emergency Response Plans. It is anticipated that these requirements would eventually apply to the city of Osceola and SIRWA and their treatment and distribution facilities but not the reservoir itself.

Public safety during construction would largely be provided by site access control (i.e., temporary fencing and gates). Worker badges would be required to enter the work areas. Work areas would be monitored by security staff during non-working hours.

Potential hazard induced by dam failure risk

To date, the proposed dam has been informally classified as High Hazard potential since it provides for public water supply and due to its proximity to I-35. A formal hazard potential classification would be issued by Iowa DNR as part of its regulatory process. All current engineering evaluations and analyses presume the High Hazard potential classification. A dam breach has been completed to inform the potential impact area but has not been used to support hazard classification or to develop an EAP. Hazard classification and EAP development will occur as part of final design.

Construction of the dam presents a remote risk to inhabitants and infrastructure downstream resulting from a failure of the dam, abutments, or spillways. A dam breach scenario was evaluated with the assumption of the upstream pool at the crest of the dam. Design of the principal and auxiliary spillway includes PMF conveyance with approximately 3 feet of vertical freeboard between the maximum pool elevation and the dam crest. A PMF is a flood that is the result of the most severe combination of critical meteorologic and hydrologic conditions that are reasonably possible in a region. In the unlikely scenario that partial or complete failure of the dam were to occur, a flood wave would move rapidly downstream, likely overtopping the I-35 bridge and several structures downstream. Appendix D7, Clarke County Dam Breach Inundation Model, includes a description of the breach evaluation and inundation extents. A map of the breach inundation extents is included in Appendix C.

Design of the dam has conformed to criteria specified in TR-210-60 (USDA 2019) "Earth Dams and Reservoirs," and supplemented by USACE, Bureau of Reclamation, and FEMA criteria where these design criteria were not sufficient.

A formal risk analysis has not been completed for the proposed dam; however, the foundation material does present some design challenges and, if not addressed appropriately, potential risks for the proposed dam. Mitigating differential settlement across the dam cross-section, as well as across the dam alignment, would be one of these challenges. Excavation, foundation treatment (including pre-loading and wick drains), and staged construction are all options proposed currently to address risk of adverse differential settlement. Additionally, a coarse-grained glacial fluvial deposit would be present under the majority of the dam foundation. Because this deposit presents a risk with respect to internal erosion in the dam foundation, a soil-bentonite cutoff wall is proposed under the dam centerline.

A dam breach analysis was performed following the TR-210-60 (NRCS 2019) dam breach peak flow estimation methods and using the relevant dam design features: the dam's cross-sectional area, crest length, and reservoir storage volume. Results of the breach analysis are included in Appendix D7. A Probable Failure Mode Analysis (PFMA) and a Semi-quantitative Risk Analysis (SQRA) will be performed in the next phase of design to identify the most likely failure modes and estimate the risk of these events occurring.

Channel Characteristics by Reach

Channel work associated with construction of the dam ancillary would include only that required to construct the dam and outlet works. The following construction sequence[4] is anticipated, with emphasis placed on channel-related work:

1. North (left) embankment stripping, wick drains, pre-load, and temporary instrumentation
2. North embankment foundation sub-cut and dewatering system
3. West Creek diversion and sheet pile/berm protection. The diversion includes a new channel of similar cross section to the existing creek and construction of temporary berms and temporary sheet pile walls to protect in-progress embankment construction from high water. It may be possible to construct the diversion system coincident with the foundation sub-cut.
4. North embankment soil bentonite wall and seepage collection trench
5. Construction of the north embankment
6. South (right) embankment excavation and auxiliary spillway crossing
7. South embankment soil bentonite wall
8. Principal spillway and diversion conduit. This work step includes construction of the principal spillway riser and conduit. Riser construction would begin during this work step and progress coincident with raising of the south embankment. Installation of the temporary West Creek diversion conduit would also take place during this step.
9. South embankment and raw water caisson and laterals
10. Move creek diversion to principal spillway. In this step, the West Creek diversion is moved from the temporary channel to the temporary conduit connected to the principal spillway. The changeover should be deferred as long as practical since the latter has less discharge capacity and may result in more construction-induced high water in areas upstream of the dam. A temporary earthen berm is included to help contain the creek and protect the closure embankment work area. It is recommended that the timing of this work step be coordinated carefully in the next design phase and as the construction contract documents are being prepared. Ideally the principal spillway diversion would be

[4] The generalized construction sequence presented herein one practical manner in which the dam can be constructed. The sequence is not intended to dictate strict step-by-step work activities, rather to show general flow of work with the understanding that coincident operations will take place and work steps will overlap. A more formal generalized construction sequence will be included in the bid/contract documents to assist bidders with their project planning and to alert them to schedule and/or sequencing constraints that must be considered. The selected contractor would be required to develop his own comprehensive work and sequencing plan for approval by the Sponsor.

relied upon during months or seasons that have historically experienced relatively low flows.

11. Closure soil bentonite wall and seepage collection trench
12. Closure embankment and auxiliary spillway control structure
13. Truro Pavement, site restoration, and begin reservoir fill
14. Pump station and water transmission line

Permanent channel work is limited to that required to accommodate the principal spillway. Principal spillway flows would enter the spillway riser structure over the morning glory inlet weir, drop through a 66-inch diameter throat and into an 96-inch diameter conduit, and then be routed through the embankment, discharging into a hydraulic jump type energy dissipation structure, then to the natural channel approximately 150 feet downstream of the embankment toe. Water would then be conveyed back to West Creek via the outlet channel.

The outlet channel would be a 25-foot-wide trapezoidal cross section with 3.0H:1.0V side slopes and the invert would be graded at a 5.0H:1.0V slope to tie into the existing channel invert. The channel would be armored with Class B (D50 of 18 inches) riprap with a thickness of 36 inches for a minimum of 110 feet downstream from the stilling basin. Riprap design would be based on USACE guidelines (USACE 1980, 1970).

Further details on channel work are provided in the following sections.

Establishment of new channel

As indicated in the generalized construction sequence above, a new temporary channel would be excavated to facilitate construction of the dam and outlet works. Stabilization measures (required to facilitate controlled and unimpeded dam construction) are anticipated to include sheet pile and riprap.

Enlargement or alignment of existing channel

As indicated in the generalized construction sequence above, a new temporary channel would be excavated to facilitate construction of the dam and outlet works. It is anticipated that the temporary channel would be enlarged to reduce the level of backwater produced during larger precipitation events.

Cleanout of channel

Prior to relocating West Creek (Step 3 in the generalized construction sequence), it is anticipated that the existing channel would be cleaned to improve its conveyance capacity. Cleaning would include thalweg smoothing and vegetative debris removal.

Measures or means for private on-farm drainage

As part of site preparation activities during construction and continuing on to dam foundation preparation, measures would be taken to locate and remove existing and/or abandoned underground agricultural drains within or near the dam footprint. Remnant drains are considered a dam safety risk as they could lead to unwanted seepage paths. The Sponsor has secured the

lands necessary to construct and operate the reservoir and therefore private landowner use is not anticipated.

Presence of rock or other material that would significantly affect the design of the channel

The nominal elevation of bedrock in the Project Area is at least 100 feet below ground surface, which is well below any planned construction work within the channel or otherwise. There is potential to encounter boulder clusters within the subsurface material, specifically at the contact or within the glacial outwash unit. Large boulders, if encountered, should be separated from borrow stockpiles.

6.2.2 Water Supply Infrastructure

A raw water pipeline is planned for transportation of water from the reservoir to the existing water treatment plant located on the north side of West Lake. A nominal pipe diameter of 16 inches is recommended to provide pipeline flow velocities in the range of 2 to 4 ft/s over the range of anticipated flow. Ductile iron piping is recommended due to its relative strength over other materials. Corrosion protection would be provided by asphaltic coating, zinc coating, and polyethylene encasement.

Three routing alternatives were considered for the raw water transmission main between the new CCRC reservoir and the existing OWW Water Treatment Plant (WTP) site. Two routes would allow the pipeline to be constructed in the right-of-way adjacent to the roadway while the third would take a “cross-country” route. Alternative 2 (along 218th Avenue) was selected because it is shorter in length and has significantly less variability in ground profile. The pipeline would connect directly to the existing water treatment plant, requiring minor modifications to the treatment plant at the connection site.

A raw water intake and pumping station are planned at the reservoir. The pumping station was sized to be an approximately 1,800-square-foot building with an interior block, exterior brick cavity wall construction. Three vertical turbine raw water intake pumps are recommended, each sized at 50 percent of the water treatment plant’s peak capacity of 2,500 gpm. In order to meet Iowa DNR standards and provide operational flexibility, two intake screens were included, one at Elevation 990.0 and the other at Elevation 981.0. Raw water from the reservoir would pass through the passive intake screens and flow through 20-inch buried intake lines into a 17-foot diameter, reinforced concrete wet well located beneath the intake pumping station.

In order to minimize operational issues with transitions between full-pipe and partial-pipe flow, a ground storage reservoir (GSR) with automated control improvements is recommended for the connection at the WTP to provide a means to effectively maintain pressurized flow. An approximately 0.3-acre site along the pipeline route will be acquired for the GSR.

A full transient model of the raw water system is recommended to be included in final design. This transient model would assist with placement of combination air-vacuum release valve manholes and identify additional measures needed to mitigate pressure transients. Additional measures could include motor flywheels, a hydropneumatic surge tank(s), or a combination of these measures.

6.2.3 Truro Pavement and County Road Modifications

The planned construction of the reservoir would inundate a segment of Clarke County Highway R35, known locally as "Truro Pavement," requiring approximately 2.4 miles to be relocated. In addition to Truro Pavement, several other local roads in the Project vicinity would be impacted by reservoir construction. Truro Pavement is a farm-to-market route for the rural area and is classified as a major collector according to the Federal Functional Classification Map prepared by Iowa DOT (Iowa DOT 2003).

The reservoir would also inundate sections of four county roads: Truro Pavement, 195th Avenue, 205th Avenue, and Orange Street. These roadway sections would be closed permanently, as indicated in the EIS (CCRC 2013). Other required roadway modifications include raising sections of 205th Avenue and Pacific Street (relocated Truro Pavement) to 1 foot above the top of dam elevation and raising 180th Avenue and Osage Street to or above the auxiliary spillway elevation. Osage Street and 195th Avenue are both classified as minor collectors, while the remaining affected roadways are classified as local roads.

There is an existing bridge along 180th Avenue, just south of Osage Street. Since 180th Avenue would be raised to or above the auxiliary spillway elevation, this bridge would require replacement.

Figure 6-4 show the locations of the affected roadways and their 2018 average daily traffic counts, and Table 5-10 summarizes traffic counts.

Figure 6-4. Roads Affected by Reservoir Construction

Anticipated utility impacts related to the raw water transmission line are as follows:

- SIRWA owns and maintains the finished water distribution system piping along Truro Pavement and provides service to the existing 1141 Truro Pavement property located near the proposed intake site. The proposed raw water intake and pumping station would require finished water service for interior plumbing and emergency eyewash and shower systems. SIRWA indicated they would maintain service along Truro Pavement south of the new reservoir and were looking into options within their system to minimize the new reservoir’s impacts. Costs for connecting to the SIRWA system are included in the Opinion of Probable Construction Costs. No cost sharing between CCRC and SIRWA was established as part of the current effort.
- The pumping station would require 480V, 3-phase service to power the equipment. The intake site is within Alliant’s service territory and would require extending 480V service to the site from near the intersection of Truro Pavement and Milo Street.

6.2.4 General Project Information

Land rights

Iowa has two administrative codes that dictate contiguous land rights or ownership in the area of the reservoir:

- Iowa Administrative Code (567-43.3(7)) states, “legal control through ownership, lease, easement, or other similar means, of contiguous land for a distance of 400 feet from the shoreline at the maximum water level.”
    - Land coverage totals 801 acres and 1,700 acres for normal pool and normal pool plus buffer, respectively.

- Iowa Administrative Code (567-72.3(2)) requires that CCRC own or have a perpetual easement for temporary flooding of areas that would be located up to the top of the dam elevation. The requirement that the governmental entity owns or have a controlling easement upstream up to the top of the dam elevation is to ensure the safety of the public and private property.
    - The top of dam contour covers 1,495 acres.

The combined composite area of land required by Iowa Administrative Code (567-43.3(7)) and Iowa Administrative Code (567-72.3(2)) is 1,941 acres, and this is the minimum contiguous area of land required to be legally controlled through ownership, lease, or perpetual easement for the Project.

The Sponsor has completed the land acquisition required for the Project through a combination of title ownership and easement. Several parcels were acquired through eminent domain. These are permanent easements that allow the Sponsor to occupy and pool permanent water on the property, essentially taking the property for all uses from the owner. Taking these easements by condemnation instead of by title was a legal requirement because of the Sponsor’s organization type. These easements include Kelly, D-Bar Farms, Robins, and Hofbauer parcels. Additionally, there are flowage easements up to top of dam contour that restrict the owner from building permanent structures in addition to other restrictions. For all of these easements, the original property owner is still shown as the landowner, but the easements are all legally recorded.

In a few isolated locations, the Sponsor would need to obtain variances from the requirements of legal control boundaries associated with the reservoir. Typically, these variances would be justified through undue hardship or equivalent protection (e.g., steep wooded areas in upstream areas of the reservoir that are effectively undevelopable). The Sponsor has had discussions with Iowa DNR about variances in these specific areas to begin the required variance process, which must be completed during the design process.

The raw water transmission main is anticipated to be installed entirely within Clarke County right-of-way; therefore, no new easements are anticipated to be required. Entrance permits for the pumping station and ground storage reservoir would be obtained for new entrances from Clarke County roads.

Soil erosion and water, air, and noise pollution measures

Temporary sediment and erosion control measures during construction are anticipated to include conventional best practices, such as silt fence, bio-rolls, erosion control blankets, sedimentation basins, and rock entrances. New embankment slopes would be required to

receive temporary or permanent vegetative cover within 7 days of construction. Detailed sediment and erosion control measures would be developed in the final design phase.

Noxious weed management

Iowa's noxious weed law, IAC Chapter 317, gives each county the authority to order the destruction of weeds classified by the state as noxious. Clarke County's noxious weed control plan includes responding to requests from the Clarke County Weed Commissioner to mitigate noxious weed issues on CCRC lands. This plan would continue after the Project has been completed.

The construction contract would include requirements for the contractor to use best management practices to control the spread of noxious weeds. Practices would include the following:

- Before ground-disturbing activities begin, inventory and prioritize weed infestations for treatment in Project operating areas and along access routes. Identify what weeds are on site, or within reasonably expected potential invasion vicinity, and do a risk assessment accordingly. Control weeds as necessary.
- Begin construction operations in un-infested areas before operating in weed-infested areas.
- Locate and use weed-free Project staging areas. Avoid or minimize all types of travel through weed-infested areas, or restrict to those periods when spread of seed or propagules are least likely.
- Remove mud, dirt, and plant parts from Project equipment before moving it into the Project Area.
- Clean all equipment before leaving the Project Site if operating in areas infested with weeds.
- Workers to inspect, remove, and properly dispose of weed seed and plant parts found on their clothing and equipment.
- Coordinate Project activities with any nearby herbicide application to maximize cost effectiveness of weed treatments.
- Inspect material sources on site and ensure that they are weed-free before use and transport. Treat weed-infested sources for eradication, and strip and stockpile contaminated material before any use of pit material.
- Maintain stockpiled, un-infested material in a weed-free condition.
- Retain native vegetation in and around Project activity to the maximum extent possible, consistent with Project objectives.
- Minimize soil disturbance to the extent practical, consistent with Project objectives.
- Where Project disturbance creates bare ground, re-establish vegetation to prevent conditions to establish weeds, consistent with Project objectives.
- Revegetation may include topsoil replacement, planting, seeding, fertilization, liming, and weed-free mulching as necessary. Use native material and certified weed-free or weed-seed-free hay or spray where appropriate and feasible.

6.2.5 Mitigation Features

Field surveys were conducted within the affected Project Area to determine the quantities of wetlands and streams impacted by the implementation of the Project. Land cover data and surveys for habitat suitability were used to determine the areas of terrestrial habitat expected to be impacted or lost. In addition, a Phase 1A Cultural Resources Assessment and Historical/Architectural Survey were performed for the Project Area, and additional detailed studies are in progress. All mitigation cost estimates are included in Project costs, see Appendix D8 for details on proposed mitigation and cost estimates.

Wetland mitigation

Permanent unavoidable wetland impacts are expected as a result of construction of the preferred alternative. A wetland delineation was conducted on June 12–16, June 26–30, and August 29, 2023, in accordance with the USACE 1987 Wetlands Delineation Manual (Environmental Laboratory 1987) and the Midwest Regional Supplement (Version 2.0) (Environmental Laboratory 2010) to determine quantities of wetlands and streams within the Project Area (Appendix E2). A desktop analysis was used to determine the quantity of wetlands to be impacted by the Project. The preferred alternative would result in the loss of 52.24 acres of wetlands, including 46.13 acres considered emergent (PEMA/C and PEMF) and 6.11 acres considered forested (PFOA and PSSA). For a breakdown of impacts by wetland type, see Table 5-4.

To comply with Executive Order 11990 and Section 404 of the Clean Water Act, appropriate mitigation is needed to compensate for unavoidable wetland impacts. Due to the anticipation of insufficient wetland mitigation bank credits available within the geographic service area of the preferred alternative, permittee responsible mitigation (PRM) was pursued for planning purposes. USACE Rock Island District Regulatory Branch requires a compensation ratio of 1.5 for emergent wetlands (1.5 acres of in-kind wetland mitigation for every 1.0 acre of wetland impact) and 2.0 for forested wetland. This results in total required mitigation acreage of 81.42.[5]

Wetland mitigation sites were identified on two properties owned by Iowa DNR: Kirke Woods WMA and Stephens State Forest. In addition to Iowa DNR sites, there are suitable wetland mitigation sites on CCRC owned land upstream of the reservoir. Conceptual design and cost estimated for mitigation work was developed for all of these sites in collaboration with USACE and Iowa DNR. Meetings were held with USACE on March 27, 2024, August 5, 2024, and November 20, 2024, to discuss mitigation concepts and mitigation acreage development. These three sites are anticipated to meet the mitigation need. Contingencies have been considered for variances in final design and resultant wetland mitigation acreage development. Further documentation on the stream mitigation concepts developed can be found in Appendix D8, Mitigation Concepts Memorandum.

[5] This acreage assumes that all wetland impacts meet the current definition of a jurisdictional waters of the U.S.

Stream mitigation

Permanent unavoidable stream impacts are expected as a result of construction of the preferred alternative. A stream condition assessment was performed in accordance with the 2019 USACE ISMM to quantify stream impacts. Based on the assessment, construction of the preferred alternative would directly impact approximately 49 existing stream channels[6] (identified as riparian reaches in ISMM) identified within the Project Area.

The ISMM was used to score the impacted streams and determine the number of adverse impact debits generated by the Project's linear feet of impacts. The ISMM evaluation resulted in a range of potential credits needed. ISMM calculation included 22 ephemeral stream reaches, 22 intermittent stream reaches, and 2 perennial stream reaches for a total of 46 reaches. Under current rules, ephemerals are not jurisdictional waters and mitigation is not required. When the Project enters permitting phase, CCRC has the option to pursue an Approved Jurisdictional Determination (AJD) for the ephemeral streams to confirm ephemeral status and remove them from the Project's adverse impacts. Additionally, a total of 41 of the impacted reaches were scored as moderately. It is likely that some of the reaches scored as moderately functional may be functionally compromised, although additional review would be needed to confirm their status. At permitting, further verification could be pursued to score those reaches as functionally compromised, which would lower the number of adverse impact debits generated. The uncertainty in ephemeral and stream function status results in a range of potential Project debits, from 275,555 to 390,367 debits. For a breakdown of impacts by stream type, see Table 5-5.

To comply with Section 404 of the Clean Water Act, appropriate mitigation is needed for unavoidable impacts on stream resources. Due to the anticipation of insufficient bank credits available within the geographic service area of the preferred alternative to purchase for stream mitigation, permittee responsible mitigation (PRM) was pursued for planning purposes.

Stream mitigation sites were identified on two properties owned by Iowa DNR: Rolling Hills WMA and Stephens State Forest. Conceptual design and cost estimates for mitigation work were developed for these sites in collaboration with USACE and Iowa DNR. Meetings were held with USACE on March 27, 2024, August 5, 2024, and November 20, 2024, to discuss mitigation concepts and stream functional unit development. These sites are anticipated to meet the mitigation need. Contingencies have been considered for variances in Project debits, final design, and resultant development of stream mitigation functional units. Further documentation on the stream mitigation concepts developed can be found in Appendix D8

[6] Stream channels include potential ephemeral channels and/or other potential non-aquatic resources that may not meet the current definition of a jurisdictional waters of the U.S. They were included for conservatism regarding the development of stream mitigation. During permitting, an approved jurisdictional determination will be requested from USACE to review stream resources in questions against the definition of waters of the U.S. at that time.

Historic properties and cultural resources mitigation

As discussed in Section 5.7.2, a Phase 1A cultural resources assessment and historical/architectural surveys were performed for the Project Area, and additional detailed investigations are in progress. A programmatic agreement is in place to complete surveys prior to construction and address cultural resources mitigation prior to construction (see Appendix A5). Cultural resources mitigation will be completed as determined by the results of the cultural investigations as laid out in the Project's programmatic agreement.

6.3 Irreversible or Irretrievable Commitment of Resources

Irreversible effects are those caused by the proposed program that cannot be reversed and are considered permanent. Irretrievable effects are gains and losses of outputs such as land use and may occur in the short term or long term.

The Proposed Action (Preferred Alternative) would require construction equipment and materials and other energy in the form of labor and fossil fuels. Using these items would be generally irretrievable, with the exception of items that can be salvaged during demolition and removal of the Dam at the conclusion of the evaluated life of the structure. No components of the rehabilitation of the South Dam would be retrievable. The expenditure of financial resources is irretrievable in the short-term, but the investment would provide long-term benefit in reliable water supply.

6.4 Areas of Controversy

The existing community members, agencies, and landowners largely support Project implementation. During a previous planning effort, there were concerns expressed by landowners over the use of eminent domain, in particular if the Project was to be used for recreational purposes. As a result of these concerns and subsequent legislation requirements, recreation was removed as a Project purpose. All land acquisition and easements for the dam and impoundment has since been completed for the Project, so further controversy from landowners is not anticipated.

During the period between the initial planning effort that began in 2004 and ended in 2011 and the new planning effort that began in 2021 with a request for NRCS assistance, CCRC completed nine maintenance construction activities on their own properties in the Project Area. In 2023, Iowa SHPO expressed a concern to NRCS that CCRC's construction activities might have constituted anticipatory demolition to avoid Section 106 compliance should the Project obtain federal assistance. Doing so would have been a violation of Section 110(k) of the NHPA (54 U.S.C. § 306113) and would have prohibited NRCS from assisting CCRC in the Project in any way. A Section 110(k) investigation was initiated by NRCS to determine if CCRC took any actions with the intent to avoid the Section 106 process while NRCS was the lead federal agency. NRCS reviewed CCRC meeting minutes, aerial imagery, police records, NRCS records, and CCRC Project records. Based on the results of the investigation, NRCS found that these were not done to avoid Section 106 responsibilities but were instead completed to

address health and safety concerns (such as removing structures where squatters were residing) and as general land management activities (such as installing property boundary fence lines). Thus, NRCS determined that there was no intent to avoid the Section 106 process and therefore no violation of Section 110(k). Tribes with ancestral, traditional use, or traditional cultural property claims in Clarke County were kept apprised of the Section 110(k) investigation and no concerns were expressed. After providing documentation and the findings to SHPO, SHPO considered the matter resolved on May 31, 2024 (see Appendix A6).

6.5 Permits and Compliance

An Environmental Impact Statement is prepared to comply with NEPA and the PR&G for Water and Land Related Resources. Prior to construction, a Federal Clean Water Act Section 404 permit will be required from the USACE. All requirements of the Migratory Bird Treaty Act, Section 7 of the Endangered Species Act, and Section 106 of the National Historic Preservation Act will be met. A Conditional Letter of Map Revision/Letter of Map Revision will be required from FEMA.

At the state level, as a required component of the Section 404 permit, an Iowa DNR review will be required for the State Section 401 Water Quality Certification. A Floodplain Development Permit and Dam Construction Permit will be required from the Iowa DNR Floodplain and Dam Safety Section, as outlined in Iowa Administrative Code (IAC) 567. The dam will be designed in accordance with NRCS standards (NRCS 210-60) as well as standards established by the US Bureau of Reclamation, USACE, and FEMA. Water Supply Construction Permits for intake and pipelines will be required from the Iowa DNR Water Supply Engineering Section, and requirements will the Water Allocation and Use program, including a Water Use Permit. Construction standards for public water supplies would be met as set forth under IAC 567. Under a 1987 amendment to the Federal Clean Water Act, a National Pollutant Discharge Elimination System (NPDES) Permit from Iowa DNR will also be required prior to the start of construction. An NPDES General Permit No. 2 for stormwater associated with construction is anticipated. All Iowa DNR antidegradation policy requirements and appropriate state T&E species accommodations will be followed. All final engineering plans will be reviewed by Iowa DNR and an operations and maintenance plan will be prepared using the NRCS National Operation and Maintenance Manual.

At a local level, all required permits will be acquired from Clarke County, including a Development – Conditional Use Permit, Grading Permit, Utility Permit, and Entrance Permit.

6.6 Mitigation of Potential Effects

During construction, site mitigation measures would include erosion and sediment control, dust control, and other practices identified during the design process. Best management practices (BMPs) during construction would be implemented to minimize the mobilization of the sediment into stream systems. Typical BMPs include silt fencing, bank stabilization, construction entrances, sediment storage, matting, and grassing/vegetative cover. Wetland and stream compensatory mitigation is discussed in Section 6.2.5.

The Project programmatic agreement that was developed for the resolution of adverse effects on the historic properties includes provisions to deal with the subsequent discovery or identification of additional historic properties affected by the undertaking, as needed. As required, NRCS would conduct further consultations with the Section 106 consulting parties to seek ways to avoid, minimize, or mitigate adverse effects on those discoveries. The Sponsor would bear the costs of the mitigation of adverse effects on historic properties under NHPA. No costs for such mitigation have been explicitly included in the economic analysis as these costs are as yet undetermined.

6.7 Costs and Cost Sharing

The Project is expected to be funded through the NRCS WFPO program. WFPO allocated funds include 100 percent funding for planning, 100 percent and engineering and design ($10,217,000 total cost) and up to 75 percent funding for installation and construction ($99,254,000 total cost). The Project Sponsor would be responsible for all permitting and land acquisition costs, as well as any associated transportation infrastructure. The availability of federal funds is contingent upon appropriations available for this purpose. Costs are provided in 2023 dollars.

A description of the various costs and cost sharing for the preferred alternative are included in Section 6.12. Further cost and benefit details are included in the Economic Analysis, see Appendix D6.

6.7.1 Construction

Construction costs include costs for the earthen embankment dam and spillway, raw water supply infrastructure (intake structure, raw water pipeline, ground storage reservoir, and water treatment plant modifications), transportation infrastructure (Truro Pavement realignment and county road modifications), and wetland and stream mitigation. According to the Association for the Advancement of Cost Engineering International (AACE), construction cost estimates are considered Class 3 and therefore have an accuracy range of -20 to +30 percent. Current costs include a 15-percent contingency to reflect the stage of design and account for uncertainties.

Inherent risks in dam planning studies include three uncontrollable factors that have the ability to increase Project costs significantly. These risks include a lengthy planning horizon, unforeseen soils conditions, and changes in the standard of practice for dam design. Details of the estimate are included in Appendix E1, Draft Design Development Report. Economic Tables 1 and 2, provided at the end of this chapter, summarize construction costs and cost share.

Construction costs have also been estimated for the four stream and wetland mitigation sites discussed in Section 6.2.5. For detail on mitigation cost development see Appendix D8. A mitigation contingency cost was included to conservatively cover the worst-case mitigation needs. Mitigation costs are included in the water supply dam and spillway measure costs. Because effects and costs to mitigate effects on cultural resources cannot be known at this juncture, these costs are not included.

6.7.2 Engineering

Engineering services costs include the direct cost of design surveys, investigations, design, preparation of drawings and specifications for Project measures, and construction inspection. Engineering costs were estimated to be 10 percent of construction costs for the dam and water supply components. Engineering services were estimated to be between 10 and 15 percent for the different wetland and stream mitigation work. This is a preliminary estimate based on engineering judgement and is subject to change. Permitting was estimated at an additional 2 percent of construction costs for the dam and water supply components.

6.7.3 Real property acquisition and easements

Real property rights costs include all expenditures made to acquire land and buildings, for areas inundated by the permanent pool and temporary pool to the top of dam, for the raw water intake structure, and for the ground storage reservoir. Other costs necessary for real property acquisition include appraisals, legal fees, easements, perimeter fencing, and county road and utility modifications. The Sponsor is responsible for 100 percent of real property acquisition and easements, and this is already complete. Prior to NRCS involvement, the Sponsor acquired 22 parcels fee title for a total of 2,575 acres and easements on six parcels for a total of 400 acres. No real property acquisition is needed for mitigation alternatives due to mitigation work on Iowa DNR and CCRC property. Because effects and costs to mitigate effects on cultural resources cannot be known at this juncture, these costs are not included.

6.7.4 Project administration

Project administration costs are associated with the installation of Project measures (including construction administration/observation), including the cost of contract administration, inspection services, government representation, obtaining permits, relocation assistance advisory services, and administrative functions connected with relocation payments. CCRC would pay the administrative costs it incurs.

6.7.5 Operation and Maintenance

O&M costs include materials, equipment, services, and facilities needed to operate the Project, and make the repairs and replacements necessary to maintain Project measures in sound operating condition during the evaluated design life of the Project (100-years). Included is an appropriate charge for inspection, engineering, supervision, and general overhead. O&M costs will be paid from local funds. O&M for wetland and stream mitigation was estimated for the first 5-years of establishment and monitoring as specified by USACE for permittee responsible mitigation, then a small amount covering as needed maintenance for the remainder of the 100-year Project life.

O&M costs are not included in total Project installation costs but are included in economic analysis and estimated average annual costs.

6.8 Ecosystem Services Benefits

The resource concerns discussed above include all categories of ecosystem services present within Upper West Creek Watershed. The ecosystem services evaluated for agricultural water management include water quantity, water quality, aquatic and riparian habitat, erosion and sedimentation, wildlife, and culture and heritage. Public scoping comments, planning documents, watershed plans from surrounding areas, and discussions with the Project Sponsor and federal agencies further suggest the Project's primary benefits will result from agricultural water management in Upper West Creek Watershed. The Proposed Action would improve the provision of water supply to the agricultural users in Clarke and Decatur Counties. In constructing a new reservoir, there is also the opportunity to supply water for commercial and household uses. In summary, the proposed improvements for agricultural water supplies would generate a monetized benefit for farmers based on the quantities of water provided and the net incomes per unit of water use, for a total net present value of $173.4 million, or annual net present value of $5,487,515, for the agricultural demand. It is expected to improve or keep stable conditions related to all six Guiding Principles: Healthy and Resilient Ecosystems, Sustainable Economic Development, Floodplains, Public Safety, Environmental Justice, and Watershed Approach (DM 9500-013). EOs 14148 and 14173 have revoked federal agencies responsibilities to assess impacts of their actions on communities with environmental justice concerns. As a result, environmental justice was not assessed for this Plan-EIS. For full discussion on ecosystem services, see Appendix D6.

6.9 Installation and Financing

6.9.1 Planned Sequence of Installation

The anticipated construction sequence is shown in Figure 6-5 through Figure 6-8 and described below. Figure 6-9 shows the associated construction schedule for the water supply components. Installation of mitigation components would take place concurrently with the filling of waters of the United States in accordance with Section 404 permit special condition requirements

1. **North (left) embankment stripping, wick drains, pre-load, and temporary instrumentation, consolidation wait period**. Existing soils that will serve as the dam foundation must be treated in advance of actual dam construction activities. This treatment is anticipated to include installation of wick drains and preloading using imported drainage material and on-site common fill obtained from the auxiliary spillway excavation. Instrumentation is included to monitor foundation material deformation during the loading process. Evaluation of monitoring data will dictate the duration that the preload must remain in place, but preliminary results indicate a duration of 180 days.
2. **North embankment foundation sub-cut and dewatering system**. This work step includes removal of unsuitable soils from beneath the north embankment foundation and installation of the dewatering system required to facilitate this work.
3. **Creek diversion and sheet pile and berm protection**. The diversion includes a new channel with a cross section similar to the existing creek and construction of temporary

berms and temporary sheet pile walls to protect in-progress embankment construction from high water. It may be possible to construct the diversion system coincident with the foundation sub-cut.

4. **North embankment soil bentonite wall (SBW) and seepage collection trench**. The SBW forms the foundation seepage barrier for the dam. SBW construction involves excavating a trench through the permeable layer into the more impervious layer. During the excavation, the trench is filled with a bentonite slurry that stabilizes the excavation. The slurry is continually added to maintain a constant level of slurry at the top of the trench to facilitate trench stability. The bentonite slurry creates a filter cake (membrane) on the sides of the trench that works together with the hydrostatic force of the slurry to provide stability for the sides of the trench. This operation is sequenced here (rather than after filling of the foundation sub-cut) to make the required reach of the excavator reasonable and practical. This work step also includes construction of the seepage collection trench located downstream of the dam. This operation is included now since the majority of the trench limits would be exposed by the foundation sub-cut.
5. **North embankment**. North embankment components include the clay core and shell material that would be sourced from auxiliary spillway excavation and/or supplemental borrow areas and the embankment's internal drainage system would be constructed of material supplied by a commercial quarry. Embankment construction also includes installation of construction and permanent dam safety monitoring equipment, including settlement plates, shape arrays, vibrating wire piezometers, and data loggers.
6. **South (right) embankment excavation and auxiliary spillway crossing**. As north embankment construction progresses, preparatory work may begin on the south embankment. South embankment excavation and grading is required for the Truro Pavement realignment, construction of the principal spillway, and construction of the raw water intake's caisson and lateral intakes. Excavation of the south embankment also represents a significant source of dam embankment fill material. This work step also includes continued work associated with the auxiliary spillway including the Truro Pavement crossing.
7. **South embankment soil bentonite wall**. Same as described in Step 4. No seepage collection trench is anticipated to be required for the south embankment.
8. **Principal spillway and diversion conduit**. This work step includes construction of the principal spillway riser and conduit. Riser construction would begin during this work step and progress coincident with raising of the south embankment. Installation of the temporary West Creek diversion conduit would also take place during this step.
9. **South embankment and raw water caisson and laterals**. This work step features the start of south embankment construction including the various materials and components described above for the north embankment. Installation of the raw water intake's deep caisson and lateral intake pipes is included also.
10. **Move creek diversion to principal spillway**. In this step, the West Creek diversion would be moved from the temporary channel to the temporary conduit connected to the

principal spillway. The changeover should be deferred as long as practical since the latter has less discharge capacity and may result in more construction-induced high water in areas upstream of the dam. A temporary earthen berm is included to help contain the creek and protect the closure embankment work area. It is recommended that the timing of this work step be carefully coordinated in the next design phase and as the construction contract documents are being prepared. Ideally, the principal spillway diversion would be relied on during months and seasons that have historically experienced relatively low flows.

11. **Closure soil bentonite wall and seepage collection trench**. The temporary gap between the north and south embankments would be filled by the "closure embankment." This work step includes construction of the closure embankment's SBW and seepage collection trench as described in previous work steps. Closure of both elements would include special requirements (e.g., overlapping construction) to verify continuity across the completed dam.
12. **Closure embankment and auxiliary spillway control structure**. Raising of the closure embankment continues in this work step and includes the various materials and components described for the north and south embankments. Work also continues in the auxiliary spillway including construction of its control structure, which consists of an earthen berm, riprap armoring, and sheet pile scour protection wall.
13. **Truro Pavement, site restoration, and begin reservoir fill**. Prior to this work step, all previous work on the dam would be substantially complete and the dam would be ready to retain water. This work step includes construction of Truro Pavement on the dam crest and approaches, removal and permanent closure of the temporary diversion conduit, riprap armoring, final vegetation of embankment and auxiliary spillway, restoration of disturbed areas, and site cleanup. Pending no outstanding issues with construction or construction monitoring and an approved filling plan, reservoir filling operations may begin.
14. **Pump station and water transmission line**. The final major work step is construction of the intake and pump structure and water transmission pipeline, including GSR.

Figure 6-5. Generalized Construction Sequence (1 of 4)

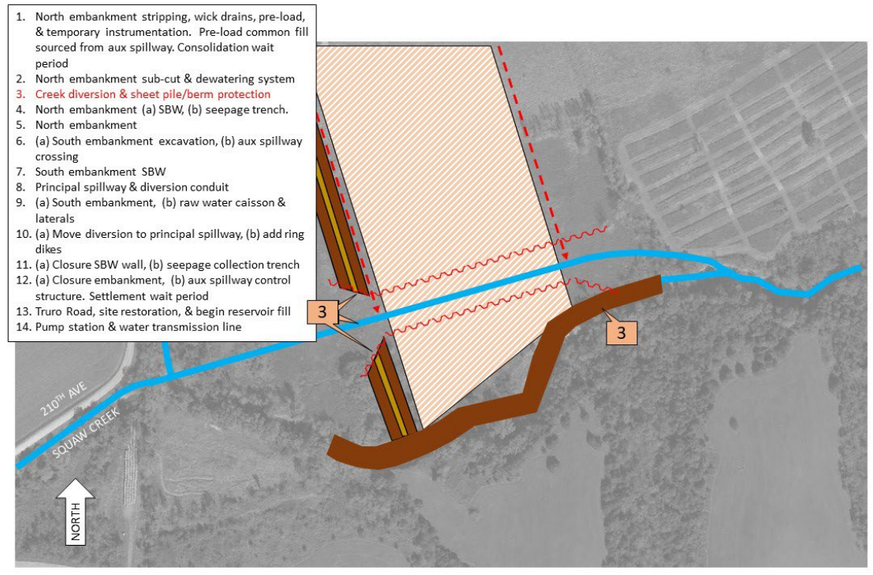
Step 1



Step 2



Step 3



Step 4

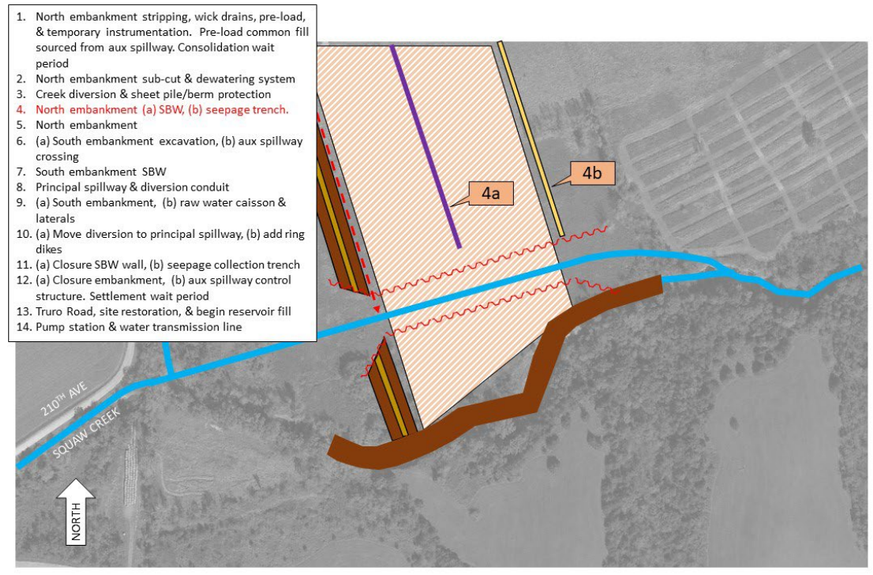
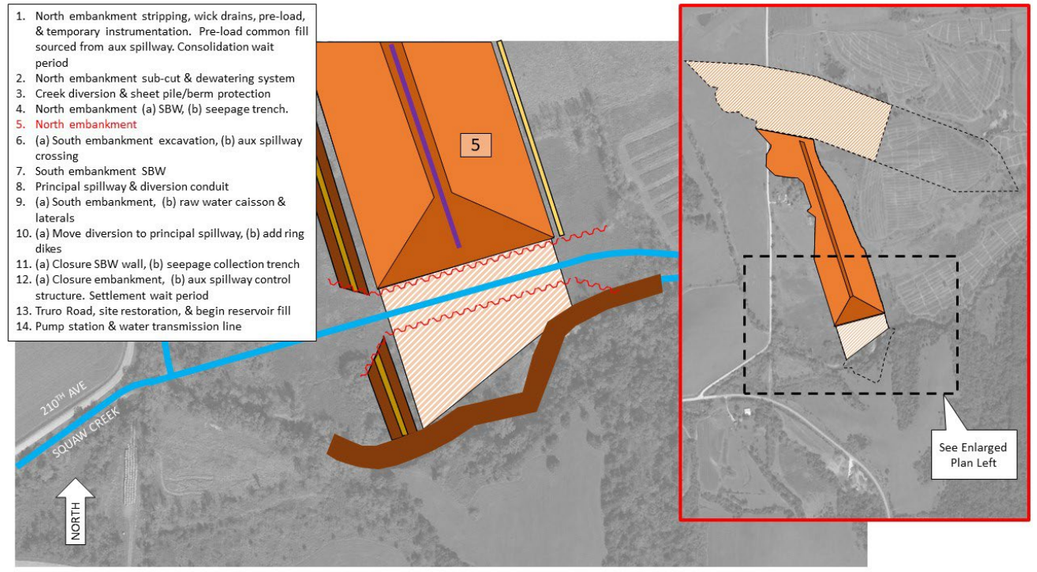
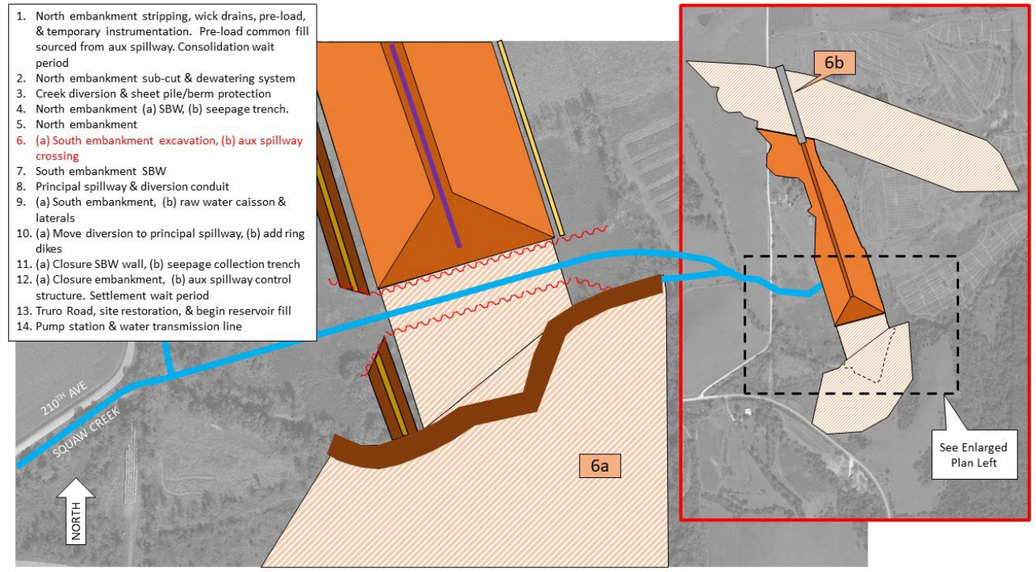


Figure 6-6. Generalized Construction Sequence (2 of 4)

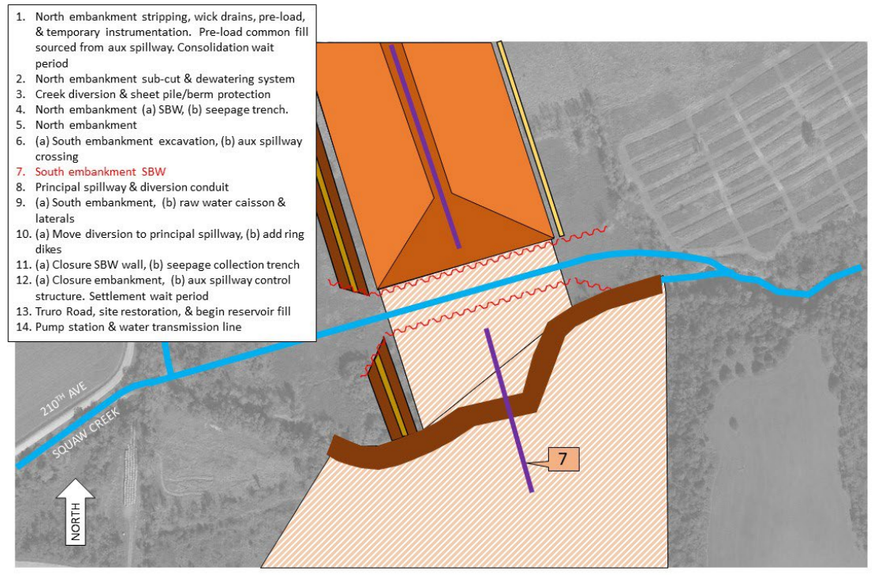
Step 5



Step 6



Step 7



Step 8

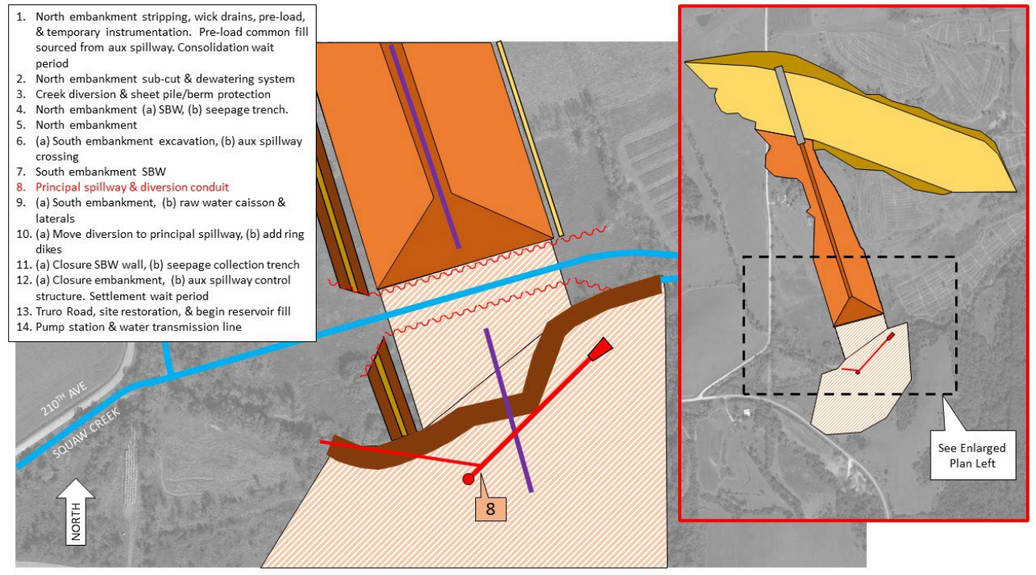
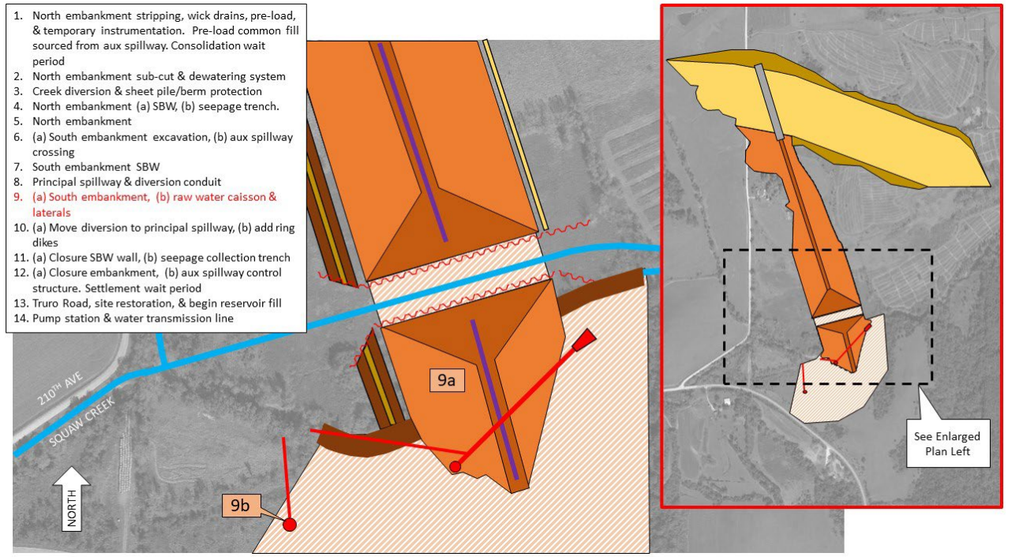
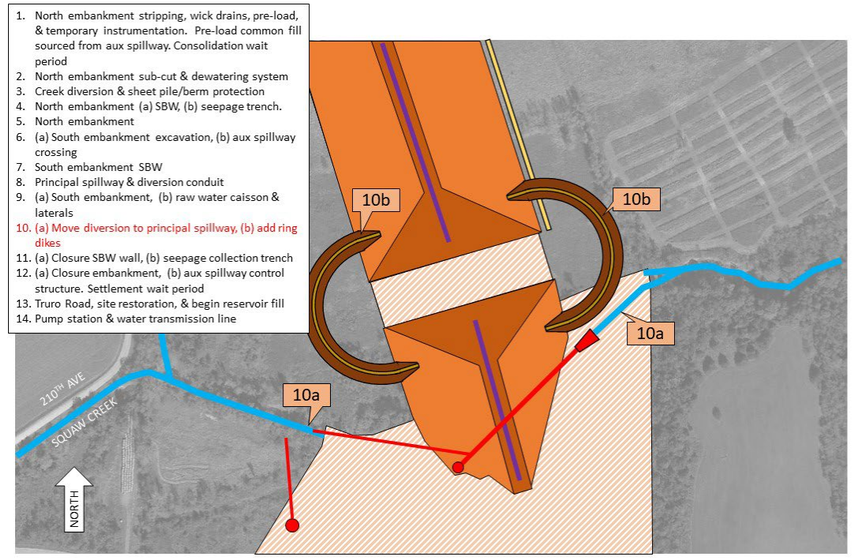


Figure 6-7. Generalized Construction Sequence (3 of 4)

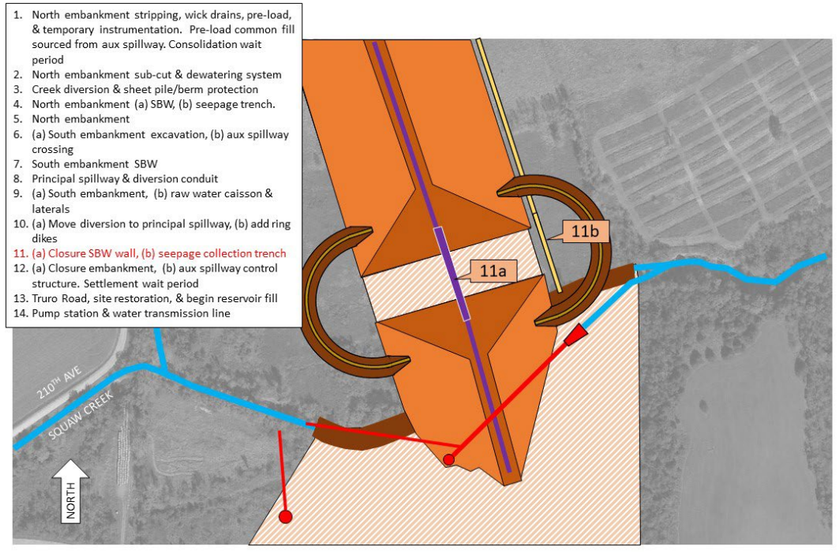
Step 9



Step 10



Step 11



Step 12

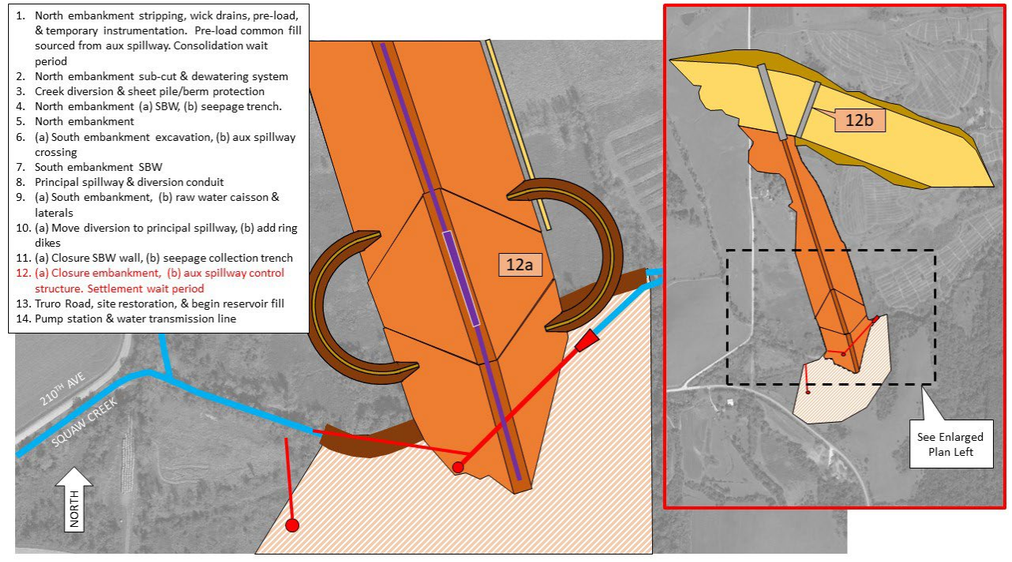


Figure 6-8. Generalized Construction Sequence (4 of 4)

Step 13



Step 14

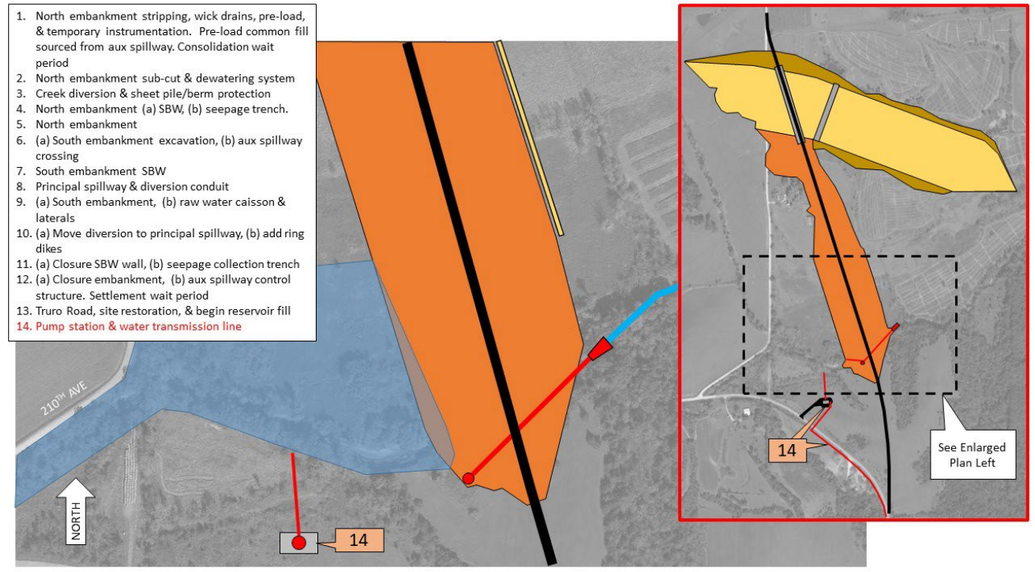
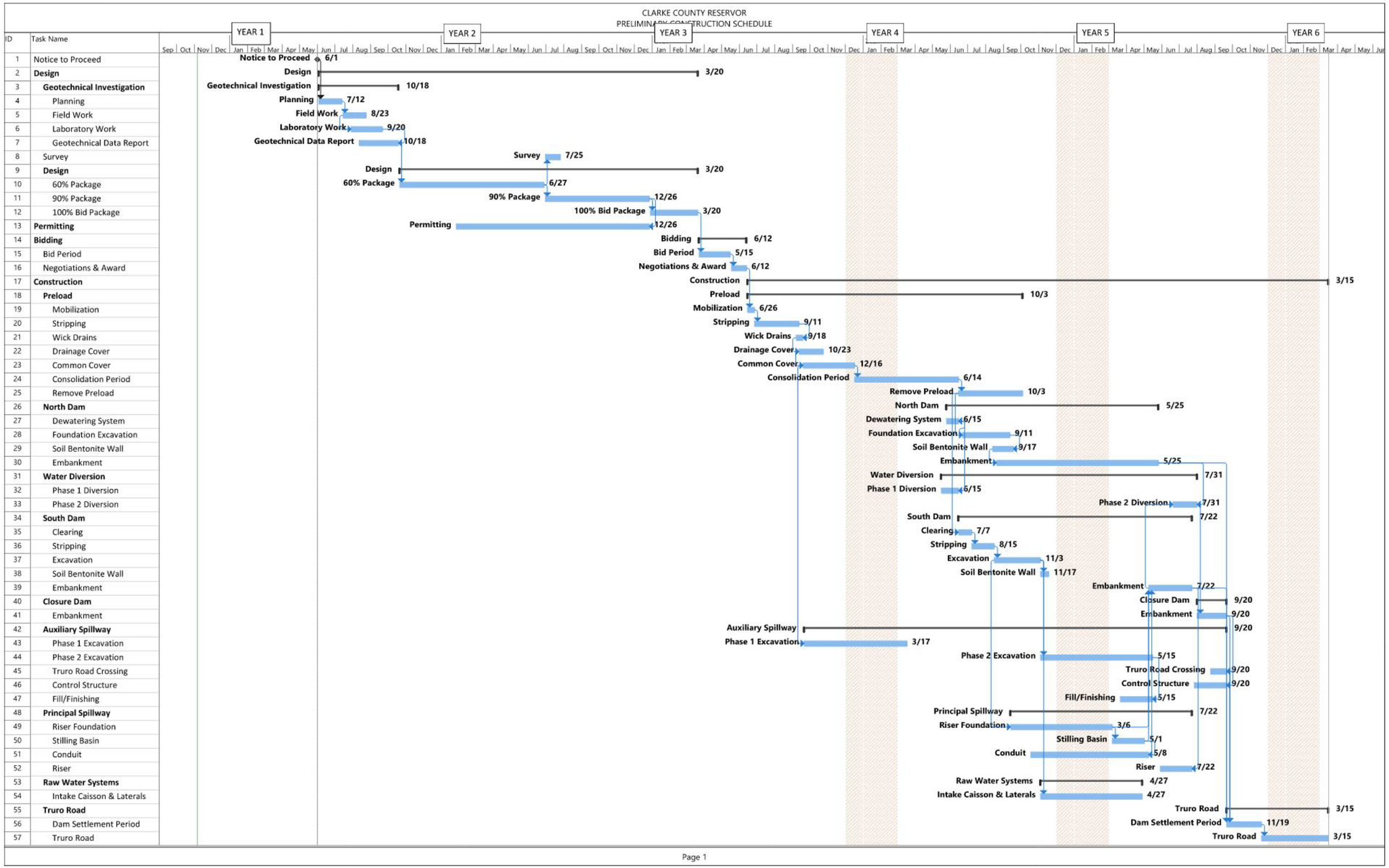


Figure 6-9. Anticipated Construction Schedule



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6.9.2 Responsibilities

The Sponsor is responsible for obtaining all relevant permits and ensuring compliance, as identified in Section 6.5, Permits and Compliance. In addition, the Sponsor is responsible for obtaining all land rights and easements required for Project implementation. Federal funds are to be provided by NRCS through the Watershed and Flood Prevention Operations program for design and construction of the water supply reservoir at Dam Site 4B. Federal funds are to be provided for Project administration, technical assistance, and construction observation as well. The availability of federal funds is contingent on appropriations available for the Project purpose. Prior to entering into agreements that obligate NRCS funds, the Sponsor would have a financial management system for control, accountability, and disclosure of PL 83-566 funds received and for control and accountability for property and other assets purchased with PL 83-566 funds.

6.9.3 Contracting

It is anticipated that the method of contracting would be conventional design-bid-build. Multiple construction contracts are anticipated due to the relatively long duration anticipated for construction and subsequent reservoir filling, as well as the differing types of construction involved with the Project. Below is a preliminary list of the anticipated construction contracts.

1. Dam pre-load activities
2. Dam construction (including raw water intake caisson and laterals)
3. Raw water intake and pump station
4. Raw water transmission (including ground storage reservoir)
5. Water treatment plant modifications
6. Truro Pavement realignment
7. Secondary road improvements and closures

Ancillary activities that may be folded into the above contracts or let on their own include:

- Fencing
- Logging and clearing
- Structure demolition and septic system removals
- Well abandonment and sealing
- Utility relocations

The Sponsor will coordinate with NRCS during all construction activities. The Sponsor will also administer all construction contracts. No long-term contracts are anticipated.

6.9.4 Real Property and Relocations.

The Sponsor is responsible for property acquisitions, which have already been completed as of May 2021.

6.9.5 Financing

The Sponsor has assessed their finances and is willing and able to provide funds as needed.

6.10 Operation, Maintenance, and Replacement

The Sponsor would be responsible for operating, maintaining, and replacing all Project components. Operation includes the administration and management needed to keep the structure safe and functioning. Maintenance includes preventative maintenance as well as repairing damage by any cause. An O&M Manual would be developed as part of final design. The O&M manual would be based on Title 180 – National Operation and Maintenance Manual, Part 500, and a plan would be prepared for each measure. Additionally, an EAP would be developed.

O&M includes materials, equipment, services, and facilities needed to operate the Project, and make repairs and replacements necessary to maintain Project measures in sound operating condition during the evaluated life of the Project.

Significant O&M items:

1. Repair and replacement items relative to the dam, raw water intake structure, and raw water pipeline.
2. Re-establishing vegetative cover on earth fills, auxiliary spillways, and borrow areas.
3. Operation and maintenance of the dam, appurtenances, and water intake facilities to ensure the proper use of water in regulated storage capacity.

Routine and recurring O&M items:

1. Replacing soil moved by erosion and burrowing animals on earth fills and auxiliary spillways.
2. Removing debris accumulations in sediment and retarding pools.
3. Keeping trash racks in proper working order and free of trash and debris.
4. Keeping water control gate in working order.
5. Removing undesirable vegetation from embankments and auxiliary spillways.
6. Repairing or replacing damaged sections of fence around embankments, pools, and livestock exclusion areas.

Costs for O&M will be paid from local funds. Estimated annual O&M costs are $122,000 in 2023 1Q (economic Table 4).

6.11 NRCS Conservation Practice Standards

This section describes how the Project will conform to NRCS Conservation Practice Standards. Applicable standards are listed and detailed below. Note that conservation practice criteria and

considerations are discussed in this document. Conformance to the conservation practice plans and specifications and O&M guidelines will be addressed in the future.

6.11.1 Code 533 – Pumping Plant

Criteria

General criteria applicable to all purposes

Pumping plant design will comply with all federal, State, and local laws and regulations.

Pump requirements

Pumps will be sized to provide firm pumping capacity at low reservoir water level to match or exceed the treatment capacity of the existing water treatment facilities. Final pump specification requirements will be based on comparison with available manufacturer-supplied pump curves.

The final specified pump materials will be compliant with projected raw water quality from the reservoir and any anticipated chemical application.

Power (drive) units

Pump drive units will be selected to be premium efficiency with drives selected to meet the operational requirements of the downstream water treatment facility while minimizing hydraulic transients to ensure efficient and safe pump operation.

Electric drive units will meet the requirements of the National Electrical Code with power source(s) selected based on available power source(s) and sources appropriate for the required electrical loads and reliability.

Available renewable energy technologies are not practical to meet the energy capacity and reliability needs of this Project and therefore are not anticipated to be pursued.

Variable frequency drives

The electrical system will be designed to meet the power provider's standards regarding potential harmonics. Variable frequency drives (VFD) will be provided, if needed, to minimize hydraulic transients and meet the operational requirements of the existing water treatment facilities.

Building envelope and HVAC system(s) be designed to protect any VFDs from overheating. Controls will also be provided to display flow rate, pressure, and any other parameters deemed necessary for pumping unit operation.

Suction and discharge pipes

Piping design will take into consideration and accommodate suction lift, net positive suction head, pipe diameter and length, minor losses, temperature, and altitude to prevent cavitation. The size of suction and discharge pipes will be based on hydraulic analysis, operating costs, and compatibility with other system components. Piping appurtenances will be provided as required.

Intake screens will be provided to prevent the intake of sand, gravel, debris, or other objectionable material into the pump and will meet applicable federal and State guidelines.

Backflow prevention devices will be provided to prevent cross contamination, where needed, in accordance with federal, State, and local laws.

Buildings and accessories

Pumps will be supported on a solid foundation designed for the applicable loads and designed to prevent settlement. The pumphouse design will include ventilation systems and consider accessibility for maintenance, repairs, and equipment removal. The suction wet well will be designed to prevent air entrapment within the pump suction piping and to prevent rotating currents. The discharge side of the pumps will be designed to meet the required hydraulic and structural requirements.

Safety

Appropriate safety measures will be included. The pump drive unit will be enclosed in the secure pumphouse and not accessible to the public or livestock. The Project includes excavation and utility surveys, and utility locations would be identified prior to ground disturbing activities.

Additional criteria to reduce energy use

The pumping system would be designed to meet or exceed Nebraska Pumping Plant Performance Criteria for electrical grid power sources. Pipeline design would evaluate options to reduce hydraulic losses and minimize hydraulic surging, including anticipated operational costs against Project capital costs.

Additional criteria for pumping waste and waste byproducts

The Project will not involve transfer of wastewater or manure.

Considerations

When planning this practice, the following considerations are recommended:

- Impacts on wetlands are not anticipated.
- Reasonable measures to contain spilled fuel will be implemented and any federal and State laws or regulations will be followed.
- The pumping plant elevation was selected to be greater than 3 feet above the 100-year flood elevation.
- The building will be complimentary of the surrounding environment.
- Sensors and alarms will be provided to notify low and high flow and pressure events.
- Pumps and motors will be located within an enclosed building, which will greatly limit, if not eliminate, noise to adjoining properties.
- The primary energy source will be electricity, which will be constructed within other Project impact areas and will have minimal impact on surrounding areas.

6.11.2 Code 560 – Access Road

Criteria

General criteria applicable to all purposes

Access roads will be applicable for the pumping station, raw water intake, and potentially private spillway or reservoir access. These roads will be designed using planning criteria for Code 560 – Access Road. The secondary roads are designed to the Rural Design Guidelines within Iowa DOT Instructional Memorandums to Local Public Agencies (I.M.) No. 3.210 or guidelines specifically requested by the Clarke County Engineer. Truro Pavement (County Road R35) is considered a Major Collector based on the Federal Functional Classification maps and is planned to be re-routed. The remaining affected roadways are considered Minor Collectors and are planned to remain granular surfaced. Code 560 is not relevant to these other road reconstructions.

Location

Access roads will be constructed where they can be maintained and, in order to minimize disturbance of existing drainage patterns, so water management problems are not created.

Alignment

Design elements will be developed in accordance with guidance to not exceed 10 percent and to consider intensity of use and type of equipment/load weights.

Width

Access roads will be designed to be 20 feet wide for two-way traffic. Cul-de-sacs are provided at the end of each dead-end roadway. The vehicles used for the radius design were a typical Clarke County snowplow and a typical school bus.

Side Slopes

The typical section for the local roadways includes a proposed 2.5:1 backslope design, and this will also be used for access roads, as possible. The roadways will be designed to use the recommendations from geotechnical investigations for the Project, which will be provided by a licensed geotechnical engineer.

Drainage

A detailed drainage analysis will be conducted during final roadway design. Any required culverts will be designed to the applicable Iowa DOT guidelines found in the Preliminary Design of Culverts section of the Iowa DOT Bridge Design Manual.

All bridges and culverts will be designed to the applicable Iowa DOT guidelines found in the Iowa DOT Bridge Design Manual.

Table 6-3. Road intensity and usage and storm frequency

Road Intensity & Usage	Storm Frequency
Intermittent; single purpose or farm use	2-year – 24 Hour
Frequent; farm headquarters, livestock access, isolated recreation areas	10-year – 24 Hour
High intensity; residential or public access	25-year – 24 Hour

All roadways are designed with a 2 percent roadway crown.

Surfacing

Access roadways are proposed as granular surfaced. Additional required stabilization will be included if recommended by a licensed geotechnical engineer.

Dust control will be considered during construction. After construction, dust control will be at the Clarke County Engineering Department's discretion.

Safety

Passing lanes, turnouts, guardrails, signs, and other facilities will be included, as needed, for safe traffic flow. Intersections with secondary roads are designed to the Rural Design Guidelines within Iowa DOT I.M. No. 3.210 or guidelines specifically requested by the Clarke County Engineer. All signing will be designed to the requirements of the Manual on Uniform Traffic Control Devices (MUTCD).

Erosion Control

Temporary construction erosion control and permanent erosion control will be designed to the requirements of Iowa DOT's Design Manual. The materials will follow the current requirements of the Iowa DOT Standard Specifications for Highway and Bridge Construction at the time of bid letting.

Iowa DNR regulates the requirements for NPDES, General Permit No. 2 for stormwater discharge associated with construction activities. An NPDES Permit and a Pollution Prevention Plan (PPP) will be required for the Project. The Project design will include the appropriate measures required by these permits.

Considerations

When planning this practice, the following considerations are recommended:

- Visual and environmental resources should be considered.
- Where possible, roads will be located outside of the floodplain.
- Dust control will be considered during construction. After construction dust control will be at the discretion of the Clarke County Engineering Department.
- Downstream flows will generally flow into the proposed reservoir via existing roadway ditches and waterways.

6.11.3 Code 402 – Dam

Criteria

General Criteria Applicable to All Purposes

Dam design will comply with all federal, State, and local laws and regulations. To date, the proposed dam has been informally classified as High Hazard potential, a formal hazard potential classification would be issued as part of the regulatory process. All current engineering evaluations and analyses presume the High Hazard potential classification.

A principal and auxiliary spillway will be provided and sized to have adequate capacity to release the flow resulting from the combined demands at any time and supply downstream water needs.

Exposed surfaces of earthen embankments, earth spillways, borrow areas, and other areas disturbed during construction will be seeded in accordance with the criteria in Iowa NRCS Conservation Practice Standard (CPS) Critical Area Planting (Code 342).

Safety

Dam design will include measures necessary to limit human access and prevent serious injury or loss of life in accordance with requirements of 210-National Engineering Manual (NEM), Part 503, “Safety.”

Cultural Resources

Cultural resources in the Project Area, and any Project impacts on such resources, will be evaluated and conserved or mitigated as part of the Project programmatic agreement.

Additional Criteria to Reduce Downstream Flood Damage

The flood-retarding storage capacity will be designed to contain the runoff for the probable maximum precipitation event, with proper allowance for discharge through the principal spillway. The auxiliary spillway will be designed to limit use to the 100-year event, with consideration of the erosion resistance of the spillway material and the provided vegetative protection.

Additional Criteria for Permanent Water Storage Uses

Dam and permanent storage will be designed with adequate storage volume in the reservoir to meet user demands for all intended purposes of the reservoir, considering seasonal variations in demand and the expected losses from seepage and evaporation.

The methods, materials, location, and capacity of spillways and outlet works will be designed to safely pass flood discharges to facilitate the use of the stored water for the intended purposes. Recreation is not an intended purpose of the proposed reservoir.

Additional Criteria for Wildlife Habitat Creation or Improvement

To the extent possible, dam design will include site-specific measures that reflect the functional requirements of the reservoir, dam, and appurtenances for wildlife benefits by retaining habitat

structure, providing shallow areas, and providing aquatic habitat. For criteria related to wildlife habitat, the criteria in Iowa NRCS CPS Wetland Wildlife Habitat Management (Code 644) will be used.

Considerations

When designing the dam and water supply, the following considerations are recommended:

- The visual design of dam for appropriateness.
- Downstream water quantity and environmental flows.
- Water quality from trapping sediment and associated nutrients and pesticides in pool area.
- Fish and wildlife habitat from changes in quality, quantity, timing, or duration of stream flows after dam installation.

6.12 Economic and Structural Tables

Economic Table 1: Estimated Installation Costs
Upper West Creek Watershed, Iowa
Dollars[1]

Table 6-4: Economic Table 1, Estimated Installation Costs

Works of Improvement	Unit	Federal Land (acres)	Non-Federal Land (acres)	Tota (acres)	Public Law 83-566 Estimated Cost – Federal Land (Dollars[1])	Public Law 83-566 Estimated Cost – Non-federal Land (Dollars[1])	Public Law 83-566 Estimated Cost – Total (Dollars[1])	Other funds Estimated Cost - Federal Land (Dollars[1])	Other funds Estimated Cost – Non-federal Land (Dollars[1])	Other funds Estimated Cost – Total (Dollars[1])	Estimated Cost – Total (Dollars[1])
Water Supply Dam[4]	Acres	0	1589.6[2]	1589.6	$0	$56,219,750	$56,219,750	$0	$18,453,250	$18,453,250	$74,673,000
Water Supply Infrastructure[5]	Acres	0	82.0	82.0	$0	$15,420,750	$15,420,750	$0	$5,149,250	$5,149,250	$20,570,000
Transportation Infrastructure	Acres	0	57.1	57.1	$0	$1,850,000	$1,850,000	$0	$19,888,000	$19,888,000	$21,738,000
Total Project	Acres		1,695.4[3]	1,695.4	$0	$73,490,500	**$73,490,500**	$0	$43,490,500	**$43,490,500**	$116,981,000

1. Price base 2024
2. Water supply dam acreage includes the impoundment area up to the top of dam and the dam and auxiliary spillway footprint
3. Project components overlap, so total Project acreage is less than the sum of the components
4. Water Supply Dam costs include costs for wetland and stream mitigation, since effects and costs to mitigate effects on cultural resources cannot be known at this juncture, these costs are not included
5. Water supply infrastructure includes raw water intake/pumping station and raw water pipeline to existing water treatment plant

Table 2: Estimated Cost Distribution – Structural measures
Upper West Creek Watershed, Iowa
Dollars[1]

Table 6-5: Economic Table 2, Estimated Cost Distribution – Structural measures

Works of Improvement	PL 83-566 - Construction[2]	PL 83-566 - Engineering	PL 83-566 - Real Prop Rights	PI 83-566 - Project Administration[3]	Total Public Law 83-566 Funds	Other Funds -Construction	Other Funds - Engineering	Other Funds - Real Property Rights[4]	Other Funds – Relocation Payments	Other Funds -Permits	Other Funds - Project Admin	Total Other Funds	Total - Installation Costs
Water Supply Dam[2]	$47,474,250	$6,622,000	$0	$2,123,500	$56,219,750	$15,824,750	$0	$0	$0	$1,046,000	$1,582,500	$18,453,250	$74,673,000
Water Supply Infrastructure	$13,091,250	$1,745,000	$0	$584,500	$15,420,750	$4,363,750	$0	$0	$0	$349,000	$436,500	$5,149,250	$20,570,000
Transportation Infrastructure	$0	$1,850,000	$0	$93,000	$1,943,000	$18,500,000	$0	$0	$0	$370,000	$925,000	$19,795,000	$21,738,000
Total Project	$60,565,500	$38,688,500	$0	$2,801,000	**$73,583,500**	$38,688,500	$0	$0	$0	$1,765,000	$2,944,000	$43,397,500	**$116,981,000**

1. Price base 2024
2. Includes wetland and stream mitigation measures, since effects and costs to mitigate effects on cultural resources cannot be known at this juncture, these costs are not included
3. Includes NRCS technical assistance
4. Real property rights for the water supply dam are not included because property acquisition is completed No property acquisition is needed for the proposed mitigation sites.

Table 3: Structural Data – Dams with Planned Storage Capacity
Upper West Creek Watershed, Iowa

Table 6-6: Structural Table 3, Structural Data – Dams with Planned Storage Capacity

Item	Unit	Structure
Class of Structure	--	High Hazard
Seismic Zone	--	Site Class E
Peak ground acceleration (2,475-year return period)	g	0.06
Total Drainage Area	mi^2	28.7
Runoff Curve No. (1-day) (AMC II)	--	80
Time of Concentration (T_c)	hours	5.5
Elevations		
Drawdown system	ft NAVD88	980.0
Crest Principal Spillway Inlet	ft NAVD88	1,001.0
Crest Auxiliary Spillway	ft NAVD88	1,009.0
Top of Dam	ft NAVD88	1,021.0
Auxiliary Spillway		
Auxiliary Spillway Type	--	Earthen
Auxiliary Spillway Bottom Width	ft	600
Auxiliary Spillway Exit Slope	%	1.4% and 10.5%
Maximum Height of Dam	ft	58
Fill Volume	yd^3	853,998
Storage Volume		
Total Capacity (Auxiliary Spillway Crest)	acre ft	20,410
Sediment Submerged	acre ft	1,906
Sediment Aerated	acre ft	357
Beneficial Use (Water Supply)	acre ft	11,030
Floodwater Retarding	acre ft	6,993
Between FBH Crest and Principal Spillway Crest	acre ft	17,160
Top of Dam	acre ft	35,650
Surface Area	--	
100-Year Sediment Pool	acres	270
Beneficial Use Pool (Water Supply)	acres	790
Floodwater Retarding Pool	acres	1,057
Principal Spillway Design	--	

Item	Unit	Structure
Spillway Elevation	Ft	1,001
Peak Spillway Discharge	ft^3/s	874
Rainfall Depth 1 (100-year, 24-day)	in	8.3
Rainfall Depth 2 (100-year, 10-day)	in	12.0
Runoff Depth (10-day)	Watershed in	7.1
Dimensions of Conduit	in	96
Type of Conduit	--	Reinforced concrete
Auxiliary Spillway Design		
Frequency Operation	% Chance	1%
Auxiliary Spillway elevation	ft	1,009.0 NAVD88
Peak Auxiliary Spillway Discharge	ft^3/s	36,060
Rainfall Depth	in	11.9
Runoff Depth	Watershed in	8.5
Storm Duration	hours	6
Velocity of Flow (V_c) (two slopes on Auxiliary Spillway)	fps	5.3 and 11.5
Max Reservoir Water Surface Elev.	ft	1,011.5 NAVD88)
Freeboard Design		
Rainfall Depth (Probable Maximum Precipitation, 24-hour)	in	32.8
Rainfall Depth (Probable Maximum Precipitation, 6-hour)	in	26.8
Runoff Depth (24-hour)	Watershed in	27.50
Max Reservoir Water Surface Elev.	ft	1,017.2
Capacity Equivalents		
Sediment Volume	in	1.5
Floodwater Retaining Volume	in	5.1
Beneficial Volume (Water Supply)	in	8.0

Table 4: Estimated Average Annual NED Costs
Upper West Creek Watershed, Iowa
Dollars[1]

Table 6-7: Economic Table 4, Estimated Average Annual NED Costs

Works of Improvement	Amortization of Installation Cost[2]	Operation and Maintenance Cost[3]	Total Cost
Water Supply Reservoir at Dam Site 4B	$3,237,958	$508,512	$3,746,470

[1] Price base 2024, amortized over 100 years at a discount rate of 3.0 percent.
[2] Installation includes all pre-construction and construction costs and accounts for the years in which installation dollars are spent
[3] O&M costs include average of $125,000 annual cost for O&M of the dam, and also includes water treatment operation costs for agricultural demand

Table 6: Comparison of NED Benefits and Costs
Upper West Creek Watershed, Iowa
Dollars[1]

Table 6-8: Economic Table 6, Comparison of NED Benefits and Costs

Works of Improvement	Agricultural Water Supply	Average Annual Benefits	Annual Costs[2]	Benefit Cost Ratio
Water Supply Reservoir at Dam Site 4B	$9,233,985	$9,233,985	$3,746,469	2.46

[1] Price base 2024, amortized over 100 years at a discount rate of 3.0 percent.
[2] O&M costs include operation and maintenance of the facility, and water treatment costs.

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7 Consultation, Coordination, and Public Participation

There is a long history of water supply investigations in Clarke County. The Osceola Water Board of Trustees, rural users, and other sponsoring bodies organized and formed a 28E organization in late 2002 to become the CCRC. A letter from the commission dated July 10, 2003 requested Project planning assistance from NRCS, and NRCS authorized planning assistance near the end of 2004. CCRC conducted scoping meetings and NRCS contacted Native American tribes and local historical societies as a part of this planning process, but funding was eliminated before the planning process was completed.

A new planning agreement with NRCS was signed on April 22, 2021, and a new scoping process was conducted as a part of this new Plan-EIS.

7.1 Coordination

NRCS sent scoping letters in August 2021. People at 22 agencies and public entities were contacted, including USFWS, USACE, SHPO, and the Office of the State Archeologist (OSA) (Tribal consultation and contact is discussed in Section 7.2). All agencies and public entities contacted are listed in Table 7-1. The scoping letter can be found in Appendix A4. OSA and USACE both responded to the letter and agreed to be cooperating agencies. Prior to the letters being sent out, SHPO reached out to express interest in being involved in the planning process.

Table 7-1. Agency and Public Entity Contact List

Agency	Agency
Iowa Department of Natural Resources	OWW Board of Trustees
United States Army Corps Engineers	City of Murray
United States Environmental Protection Agency	City of Woodburn
United States Fish and Wildlife Service	Board of Supervisors, Clarke County
Office of the State Archaeologist	Southern Iowa Rural Water Assoc.
Iowa State Historic Preservation Office	Clarke County Engineer
Federal Aviation Administration	Clarke Co. Emergency Management
Federal Emergency Management Agency	Clarke Co. Conservation
Federal Railroad Administration, Region 6	Clarke Co. Environmental Health
Federal Transit Administration, Region VII	Clarke Co. Soil and Water Conservation District
Iowa Department of Public Health	Clarke Co. Development Corp.
City of Osceola	

Three interagency coordination meetings were held. First, a pre-application coordination meeting was held on November 13, 2019, and included NRCS, Iowa DNR, USACE, and SHPO. Another interagency meeting was held on December 20, 2022, and included NRCS, OSA, Iowa

DNR, USFWS, USACE and SHPO. A third coordination meeting was held with USACE and USWFS to discuss mitigation needs in February 2024, with follow-up with USACE on mitigation in March, August and November. CCRC and NRCS held regular meetings throughout 2022 to 2025 to make progress on the Plan-EIS.

7.2 Consultation

7.2.1 USFWS and Iowa DNR Consultation (Section 12 of Public Law 83-566, Section 7 of the Endangered Species Act, and Iowa Code 481B)

Communication and coordination with USFWS and Iowa DNR were initiated concurrently with other agency coordination throughout the planning process. In accordance with Section 12 of the Watershed Protection and Flood Prevention Act, Public Law 83-566 (U.S.C. Section 1008), NRCS sent a letter to USFWS in January 2025 to notify USFWS on intent to prepare a plan for works of improvement and to provide opportunity for recommendations. The Section 12 letter is included in Appendix A7. As part of Endangered Species Act (ESA) Section 7 compliance, early coordination was performed with the USFWS. A BE was completed in November 2023, with field work during the summer and fall of 2023. NRCS sent the BE to USFWS for initial review on January 17, 2024, and Iowa DNR on January 30, 2024. USFWS recommended a bat habitat evaluation, which was completed in Summer 2024 and added to the BE. A meeting was held with USFWS in November 2024 to discuss the results of the bat habitat suitability evaluation and the effect determination for species evaluated in the BE. Results of the evaluation is discussed in detail in Section 5.6.2. The BE is included in Appendix D3. In January 2025, USFWS responded and indicated that the consultation procedure and effect determinations for the listed species that may occur in the Project Area are appropriate based on the information known to date. The full USFWS response is included in Appendix A7. The summary letter of coordination sent to USFWS in December 2024 is included in Appendix A7.

USFWS will not provide official concurrence of determinations until the project designs are finalized. USFWS has reviewed the BE and provided guidance for the additional steps that will need to be taken. During the next phase of the project (design phase), the BA will be finalized and submitted to pursue formal consultation with both USFWS and Iowa DNR. The BE already completed will be updated as necessary and submitted as the BA. The anticipated conclusion is that the project is not likely to jeopardize any federal threatened and endangered species, but that will not be determined until the BA is reviewed. The project does not have any federal threatened and endangered species' critical habitat. NRCS anticipates the need to obtain an incidental take permit and identify applicable conservation measures for species outlined in the NRCS December 2024 letter to USFWS (See Appendix A7). Construction will not commence until consultation is complete.

In August 2024, Iowa DNR was invited to comment on the Project via a PERMT application request. Iowa DNR responded in an Environmental Review in September 2024 and indicated records of plant-listed species as potentially within the Project Area (see Appendix A7). Iowa DNR recommended surveys for two state-listed orchis species and concurred via phone call on February 28, 2025, that surveys could take place during the design phase, and mitigation would

be possible if any plant individuals were found. An Environmental Review for the mitigation sites was requested and received in September 2025 and identified no site-specific records of species that would be impacted by the mitigation project work. Both of the Iowa DNR Environmental Reviews are included in Appendix A7.

7.2.2 NHPA Section 106 Consultation

Pursuant to 36 CFR Part 800 of the National Historic Preservation Act, NRCS involved consulting parties with the drafting of this Plan-EIS. Consultation with the OSA, SHPO, and several Native American tribes who consider the Project Area to be ancestral lands occurred throughout the planning process. NRCS acknowledges that Native American tribes possess special expertise in assessing the eligibility of historic properties that may possess religious and cultural significance to them. Other consulting parties in the Project, including Osceola Historic Preservation Commission and the Clarke County Historical Society and Museum were also contacted as part of Section 106 consultation.

A letter was sent to consulting parties in August 2021 to initiate consultation. An example of the initiation of consultation letter can be found in Appendix A4. The initial tribal consultation list was broad and contained all 37 of NRCS's tribal contacts for Iowa and not just those with ancestral lands reportedly in Clarke County. Responses were received in September 2021 from two Indian tribes, Sac and Fox Tribe of Mississippi and Iowa Tribe of Kansas and Nebraska. Both expressed interest in the Project but had no specific comments or concerns at the time. SHPO and the OSA both expressed interest in the Project. The Osceola Historic Preservation commission did not wish to continue as a consulting party and no response has been received from the Clarke County Historical Society.

In February 2023 a consultation packet containing the proposed APE was sent to the OSA, SHPO, and a narrowed tribal list of 24 Indian tribes (Table 7-2). The narrowed list was created by reviewing the Housing and Urban Development's Tribal Directory Assessment Tool, the Native Languages Interactive Map, the Native Land Digital Map, the Iowa OSA website, and previous agency correspondences with Indian tribes. Three responses, from the Iowa Tribe of Kansas and Nebraska, the Omaha Tribe of Nebraska, and the Upper Sioux Tribe, have been received as of December 2024. Responses indicated no known adverse effects on any tribal cultural properties. The response is included in Appendix A, and summarized below:

- Iowa Tribe of Kansas and Nebraska: Expressed agreement on APE and support for Association of Iowa Archaeologist (AIA) survey guidelines.
- Omaha Tribe of Nebraska: Expressed desire to be consulting party and for any additional information on APE to be shared.
- Upper Sioux Tribe: Expressed that based on information available there are no adverse effect on any known Tribal Cultural Properties.
- SHPO: Asked for clarifying information on the APE
- OSA: Noted the limit of existing survey data in the APE and the need for more investigations that meet the AIA standards.

In January 2024, an update was sent to the same Indian tribes clarifying the APE boundaries. A response was received from the Iowa Tribe of Kansas and Nebraska expressing support for working toward a water source in Clarke County.

Due to the large size and scope of the Project, the Clarke County Water Supply Project Plan-EIS must be finalized before all the cultural resource identification efforts can be completed in the APE. Per 36 CFR § 800.4(b)(2), NRCS plans to defer final identification and evaluation of historic properties within the APE. In 2024, NRCS proposed the development of a Project programmatic agreement for this complex undertaking in accordance with 36 CFR § 800.14(b)(3).

Between March and May 2024, the Section 106 consulting parties were invited to participate in the development of the programmatic agreement. The programmatic agreement will facilitate phased identification and evaluation of historic properties and address how to govern the implementation of NHPA Section 106 for the Project. The OSA, SHPO, CCRC, the Iowa Tribe of Kansas and Nebraska, and the Flandreau Santee Sioux tribe expressed interest in participating in the development of the programmatic agreement. The Advisory Council of Historic Preservation was also invited to participate in the development of the programmatic agreement, in compliance with 36 CFR § 800.14(b), but declined the invitation at that time (May 24, 2024).

The Project programmatic agreement for phased identification and evaluation was executed on April 21, 2025. Signatories to the PA include NRCS, Iowa SHPO, CCRC, Iowa Office of the State Archaeologist, Flandreau Santee Sioux Tribe, and Iowa Tribe of Kansas and Nebraska. The agreement is included in Appendix A5.

Table 7-2. Final Tribal Mailing List

Native American Tribe	Native American Tribe
Citizen Potawatomi Nation	Ponca Nation
Flandreau Santee Sioux Tribe	Ponca Tribe of Nebraska
Forest County Potawatomi Community	Prairie Island Indian Community
Fort Peck Assiniboine and Sioux Tribes	Sac and Fox Nation of Missouri in Kansas and Nebraska
Ho-Chunk Nation	Sac and Fox Nation of Oklahoma
Iowa Tribe of Kansas and Nebraska	Sac and Fox Tribe of the Mississippi in Iowa
Iowa Tribe of Oklahoma	Santee Sioux Tribe of Nebraska
Lower Sioux Indian Community	Shakopee Mdewakanton Sioux Community of Minnesota
Oglala Sioux Tribe	Sisseton-Wahpeton Oyate
Omaha Tribe of Nebraska	Upper Sioux Community, Minnesota
Otoe-Missouria Tribe	Winnebago Tribe of Nebraska
Peoria Tribe of Indians of Oklahoma	Yankton Sioux Tribe

7.3 Public Participation

A public meeting was held during a CCRC Board meeting on August 19, 2021. The meeting was advertised on the City of Osceola website and advertised in the local paper to notify the public of the meeting (Appendix A2). Information on the Project was presented for the purposes of providing an update on Project status and process, seeking input on problems and opportunities in the watershed, and providing information to consider while developing alternatives. A copy of the slides presented in the meeting is included in Appendix A3. The meeting materials were available for review and comment for 30 days, August 19, 2021, through September 18, 2021. No comments were received from the public at the August 19 meeting, and no comments were received during the 30-day comment period.

CCRC has continued to hold regular meetings nearly every month from June 2002 through the present. All meetings have been conducted in accordance with Iowa Open Meetings Laws. The public was notified of each meeting and invited to attend and participate. Members of the public and local reporters have attended these meetings periodically.

7.4 Plan Development and Review

A notice of intent (NOI) to prepare the EIS was published in the Federal Register on April 5, 2024, Volume 89 Number 67 in the Federal Register. See Appendix A1 for the NOI. Letters were sent by NRCS to:

- State Historic Preservation Office
- Office of the State Archaeologist
- Statewide Tribal list
- Osceola Historic Preservation Commission
- Clarke County Historical Society
- USACE
- USFWS
- Iowa DNR
- EPA
- FEMA
- Iowa Homeland Security
- Water Resources Bureau

As a cooperating agency, USACE reviewed the preliminary Draft Plan-EIS and provided comments on October 2, 2025. Comment responses were provided and comments were discussed with USACE. Additional USACE comments will be addressed during permitting. The Draft Plan-EIS was posted in the Federal Register and to the CCRC and NRCS websites on November 21, 2025. The Notice of Availability (NOA) of the Draft Plan-EIS was published in the Federal Register Volume 90 Number 223, the NOA is included in Appendix A8. The 30-day public comment period was promoted on the CCRC website and via public notice in the Osceola Sentinel-Tribune. An invitation for comments was sent on December 3, 2025, to USFWS, Office of the State Archaeologist, SHPO, and Iowa DNR (see Appendix A9). Two public comments were received via the CCRC website, and ten public comments were received via NRCS, six written and four via phone call. EPA provided a response indicating they had no comments on the Plan-EIS, and no other agencies provided comment. The comment period closed on December 22, 2025. Comments are included in Appendix A9.

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9 List of Preparers

The Clarke County Water Supply Project Plan-EIS was prepared by a variety of individuals and subject matter experts. Those individuals who made significant input to the Plan-EIS are included in Table 9-1. The watershed plan and environmental impact statement was reviewed and concurred with by State staff specialists having responsibility for engineering, soils, agronomy, range conservation, biology, cultural resources, forestry, and geology. This review was followed by review of the document by the National Water Management Center (NWMC). A similar review was also provided by USACE.

The document was prepared and reviewed, with guidance provided throughout the development of this project, by those listed in Table 9-1.

Table 9-1. List of Preparers and Reviewers

Name	Present Title	Years of Experience	Education	Other Pertinent Qualifications and Professional Licenses
USDA NRCS Employees				
Scott Cagle	Assistant State Conservationist for Partnerships	38	A.A.S., Civil Engineering Technology, Itawamba Community College B.S., Animal Science, Mississippi State University M.S., Agriculture and Extension Education, Mississippi State University Ph.D., Agriculture and Extension Education/Agronomy Minor, Mississippi State University	
Nichole Williams	Resource Conservationist	19	Bachelor of Science, Forestry, Iowa State University	

Name	Present Title	Years of Experience	Education	Other Pertinent Qualifications and Professional Licenses
Megan Messerole	State Archaeologist/Cultural Resources Specialist	10	Bachelors, Anthropology and English, University of Minnesota-Duluth Masters, Cultural Resource Management – Archaeology, St. Cloud University	Secretary of the Interior qualified archaeologist
Michael Henderson	State Resource Conservationist	21	Bachelor of Science, Agronomy, Oklahoma State University Masters, Agronomy, Oklahoma State University	Certified Crop Adviser – Iowa
Mark McCurdy	Assistant State Conservation Engineer	36	Bachelors, Agricultural Engineering, Iowa State University	Professional Engineer – IA
Christian Osborn	State Conservation Engineer	34	Bachelors, Civil Engineering, Ohio State University	Professional Engineer – IA
Joe Thompson	State Geologist	20	Bachelors, Geology, University of Nebraska Masters, Geology, Washington State University	

Name	Present Title	Years of Experience	Education	Other Pertinent Qualifications and Professional Licenses
Sponsor (CCRC)				
Dave Beck	Project Coordinator	49	Bachelors, Wildlife Biology, Kansas State University MPA-Public Management, University of South Dakota	
Consulting Planning Firm Contributors				
Mike Butterfield	Project Manager	22	Bachelors, Civil Engineering, University of Nebraska, Lincoln	Professional Engineer - NE, IA
Matt Pillard	Environmental Project Manager	29	Bachelors, Natural Resources, University of Nebraska, Lincoln Masters, Community & Regional Planning, University of Nebraska, Lincoln,	American Institute of Certified Planners
Ashley Knudson	Water Resources EIT	5	Bachelors, Environmental Biology, Washington University in St. Louis Masters, Civil and Environmental Engineering, University of Iowa	Engineer in Training - IA
Matt Wray	Senior Environmental Planner	25	Bachelor of Science, Environmental	

Name	Present Title	Years of Experience	Education	Other Pertinent Qualifications and Professional Licenses
			Sciences, Midland University	
Martin Weber	North Central Hydropower Leader	38	Bachelor of Science, Civil Engineering, Michigan Technical University Masters, Civil Engineering, Michigan Technical University	Professional Engineer - IA
Nicholas Thomas	Hydraulics & Hydrology Team Lead	9	Bachelor of Science, Civil Engineering, University of Minnesota Masters, Water Resources Engineering, University of Iowa Doctor of Philosophy, Water Resources Engineering, University of Iowa	Professional Engineer - MN
Greta Backman	Geotechnical Team Lead	14	Bachelor of Science, Geological Engineering, University of Minnesota Masters, Civil Engineering, Iowa State University	Professional Engineer - MN

Name	Present Title	Years of Experience	Education	Other Pertinent Qualifications and Professional Licenses
Emily Schmit	Environmental Scientist	8	Bachelors, Environmental Sciences, Creighton University Masters, Biology, University of Nebraska, Kearney	USACE Wetland Delineation, Regional Supplement, and Waters of the US training
Shannon McKinley	Environmental Scientist	4	Bachelor of Science in Biology, University of Nebraska Omaha	
Hannah Hedinger	Environmental Scientist	6	Bachelors, Natural Resources and Environmental Science, University of Illinois Masters, Environmental Sciences, University of Illinois	Associate Wildlife Biologist Certificate, Geographic Information Science, University of Illinois
Kelly Farrell	Senior Environmental Scientist	26	Bachelors, Environmental Studies, University of Nebraska, Lincoln Masters, Business Administration, University of Nebraska, Omaha	Certified Environmental Professional

Name	Present Title	Years of Experience	Education	Other Pertinent Qualifications and Professional Licenses
Becky Baker	Senior Environmental Project Manager	21	Bachelor of Science, Biology, South Dakota State University Bachelor of Science, Environmental Management, South Dakota State University	
Matt Hodgson	Technical Editor	19	M.A., Composition Theory and Rhetoric; B.A. English and Education	
USACE				
Kirsten Brown	Biologist/Senior Project Manager, Western Branch, Regulatory Division, Rock Island District			
Abigail Steele	Chief, Western Branch, Regulatory Division, Rock Island District			

10 Abbreviations and Acronyms

AACE	Association for the Advancement of Cost Engineering
ADT	Average Daily Traffic
AIA	Association of Iowa Archaeologists
APE	Area of Potential Effect
AWIA	America's Water Infrastructure Act
BA	Biological Assessment
BE	Biological Evaluation
BFE	Base flood elevation
BGEPA	Bald and Golden Eagle Protection Act
BMP	Best Management Practices
CCRC	Clarke County Reservoir Commission
CEQ	Council on Environmental Quality
CLOMR	Conditional Letter of Map Revision
CTA	Conservation Technical Assistance
DMWW	Des Moines Water Works
EAP	Emergency Action Plan
EO	Executive Order
ESA	Endangered Species Act
FBH	Freeboard Hydrograph
FEMA	Federal Emergency Management Agency
FPPA	Farmland Protection Policy Act
FWCA	Fish and Wildlife Coordination Act
GSR	Ground Storage Reservoir
I-35	Interstate 35
IAC	Iowa Administrative Code
Iowa DNR	Iowa Department of Natural Resources
Iowa DOT	Iowa Department of Transportation
ISMM	Iowa Stream Mitigation Method

LEP	Limited English Proficiency
LOMR	Letter of Map Revision
MBTA	Migratory Bird Treaty Act
mgd	Million gallons per day
MUTCD	Manual on Uniform Traffic Control Devices
NEE	National Economic Efficiency
NEPA	National Environmental Policy Act
NHD	National Hydrography Dataset
NHPA	National Historic Preservation Act
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
O&M	Operation and Maintenance
OSA	Office of the State Archeologist
OSHA	Occupational Safety and Health Administration
OWW	Osceola Water Works
PCC	Portland Cement Concrete
PFMA	Probable Failure Mode Analysis
Plan-EIS	Watershed Plan and Environmental Impact Statement
PMF	Probable Maximum Flood
PPP	Pollution Prevention Plan
PR&G	Principles, Requirements, and Guidelines
PSH	Principal spillway hydrography
SBW	Soil bentonite wall
SCS	Soil Conservation Service
SGCN	Species of Greatest Conservation Need
SHPO	State Historic Preservation Office

SIRC&D	Southern Iowa Resource Conservation and Development
SIRWA	Southern Iowa Rural Water Association
SLO	Sponsoring Local Organization
SQRA	Semi-quantitative Risk Analysis
USACE	US Army Corps of Engineers
USC	United States Code
USDA	US Department of Agriculture
USFWS	US Fish and Wildlife Service
USGS	US Geological Survey
VFD	Variable Frequency Drive
WFPO	Watershed and Flood Prevention Operations
WTP	Water Treatment Plant

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