Supplemental Watershed Plan No. 15 and Environmental Assessment for the American Fork-Dry Creek Watershed Project

American Fork River Watershed

Utah County, Utah

PREPARED BY

USDA NRCS
United States Department of Agriculture
Natural Resources Conservation Service

IN COOPERATION WITH

Sponsoring Local Organization (SLO):
American Fork City

Co-Sponsoring Local Organizations:
Lehi City
Saratoga Springs City

June 2025

Title and Document Status: Draft American Fork-Dry Creek Supplemental Watershed Plan No. 15 and Environmental Assessment for Flood Prevention Improvements in American Fork City, Lehi City, and Saratoga Springs City

Lead Agency: United States Department of Agriculture Natural Resources Conservation Service (NRCS)

Name of Watershed: American Fork-Dry Creek Watershed

County: Utah County

State: Utah

Cooperating Agencies: None

Sponsoring Local Organization: American Fork City

Co-Sponsoring Local Organizations: Lehi City, Saratoga Springs City

Authority: This Supplemental Watershed Project Plan and Environmental Assessment (Plan-EA) has been prepared under the authority of NRCS Watershed Protection and Flood Prevention Act (16 U.S.C. Section 1001 et seq.) 1954; (Public Law 83-566) as amended and in accordance with Section 102(2)(C) of the National Environmental Policy Act of 1969 (NEPA), PL 91-190, as amended, and in accordance with the Guidance for Conducting Analyses Under the Principles, Requirements, and Guidelines for Water and Land Related Resources implementation Studies and Federal Water Resource Investments (DM 9500-013) also known as PR&G.

Abstract: The purpose for the project is to address concerns of flooding in American Fork City along the American Fork River, in Lehi City along Dry Creek and Waste Ditch, and Saratoga Springs City along lower Dry Creek. Snowpack at high elevations in the watershed melts in the spring and flows downstream through urban areas to Utah Lake. These waterways are prone to flooding and are insufficiently sized based on each city's design standards. Channel improvements are needed to reduce the risk of flooding and increase public safety.

The No Action Alternative/Future Without Federal Investment and Action Alternatives/Future With Federal Investment were analyzed. The Flood Reduction Alternative is the Preferred Alternative and National Economic Efficiency (NEE) Alternative. This alternative would consist of the following actions:

1. Proposed improvements for American Fork City include channel improvements at four locations to increase the river's capacity.
2. Proposed improvements for the Lehi City/Saratoga Springs City would reconstruct approximately 12,000 feet of existing channel to improve the channel capacity and hydraulics through Lehi Elementary School's property, public transportation corridors, private property, and parks.

The cost (design, engineering, construction management, permitting, administration, and construction) for the Preferred Alternative is $13,263,000. The total project cost including real property rights is $16,207,000.

Comments: NRCS has completed this Plan-EA in accordance with the NEPA and NRCS guidelines and standards. Reviewers should provide their comments to NRCS during the allotted Plan-EA review period. Comments need to be submitted by July 9, 2025, to become part of the Administrative Record. Please send comments to:

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Ancestral Land Acknowledgement: NRCS, through the review of the NPS Native American Graves Protection and Repatriation Act Native American Consultation Database (NACD), the U.S. Department of Housing and Urban Development Tribal Directory Assessment Tool (TDAT), the Bureau of Indian Affairs (BIA) website, and the Utah Division of Indian Affairs (UDIA) website, and previous NEPA & NHPA consultations, identified four Federally Recognized Tribes (Confederated Tribes of the Goshute Reservation, Skull Valley Band of Goshute Indians, Ute Indian Tribe of the Uintah & Ouray Reservation, Shoshone-Bannock Tribes of the Fort Hall Reservation) with ancestral land, traditional use, and/ or traditional cultural property claims within the project area and the immediate vicinities. Consultation with these four entities continued throughout this plan's development, refer to Appendix A for that correspondence.

(Insert **watershed agreement**) **– to be included in the Final Plan-EA**

Table of Contents

List of Tables & Figures

Summary: Office of Management and Budget Fact Sheet

S.1 Title of Action Alternative

American Fork-Dry Creek Supplemental Watershed Plan No. 15 and Environmental Assessment for Flood Prevention Improvements Project (project) in American Fork City, Lehi City, and Saratoga Springs City.

S.2 Location

S.2.1 County, State

Utah County, Utah

S.2.2 Congressional District

Third Congressional District

S.2.3 Watershed

American Fork—Dry Creek Watershed

S.3 Organizations & Agencies

S.3.1 Sponsoring Local Organizations (SLOs)

American Fork City (Sponsor)

Lehi City (Co-Sponsor)

Saratoga Springs City (Co-Sponsor)

S.3.2 Cooperating Agency/Agencies

There are no cooperating agencies.

S.4 Authority

The original watershed plan was prepared and works of improvement have been installed under the authority of the Watershed Protection and Flood Prevention Act of 1954 (Public Law 83-566) as amended. The American Fork-Dry Creek Supplemental Watershed Plan No. 15 and Environmental Assessment (Plan-EA) has been prepared under the authority of Natural Resources Conservation Service (NRCS) Watershed Protection and Flood Prevention Act (16 USC Section 1001 et Seq.) 1954; (Public Law 83-566 [PL-566]), as amended and in accordance with Section 102(2)(c) of the National Environmental Policy Act of 1969 (NEPA), PL 91-190, as amended and in accordance with Section 102(2)(c) of the NEPA of 1969, PL 91-190, as amended. The purposes for which the project is planned include flood prevention.

S.5 Purpose & Need for Action

The purpose of the Project is to reduce potential risk of personal injury and flood damage to municipal and private properties, agricultural enterprises, and public infrastructure along certain

waterways within the American Fork-Dry Creek Watershed (watershed) that are subject to flooding events during spring runoff and after storms. The project is needed since prior flooding events associated with the identified waterways have resulted in damage to structures and also jeopardizes the safety of the public in American Fork City, Lehi City, and Saratoga Springs City.

In addition to meeting the above purpose and need, the project must meet NRCS requirements for a Federal investment, promote the Federal Objective and Guiding Principles (as identified in the Principles, Requirements, and Guidelines for Water and Land Related Resource Implementation Studies (PR&G) [USDA-NRCS 2017]), and be an authorized project purpose under Sections 3 and 4 of PL-566, which include watershed protection, flood prevention, watershed protection, agricultural water management, municipal and industrial water supply, water quality management, fish and wildlife enhancement, recreation and watershed structure rehabilitation.

S.6 Description of the Preferred Alternative

American Fork City, north of Interstate 15, has sections of concrete lined channels and concrete culverts along the American Fork River, which provide flood protection to the surrounding areas. The hydrologic analysis identified that channel improvements are needed to reduce the risk of flooding and increase public safety. The proposed improvements for American Fork City include four sections of channel improvements, totaling approximately 1,000 feet, to increase the river's capacity.

Developed areas in Lehi City and Saratoga Springs City, Uth, have been flooded or are at risk for flooding along Dry Creek and Waste Ditch, which is a secondary canal used to convey excess water from Dry Creek to the Jordan River. Improvements to Dry Creek and Waste Ditch channels would reduce the risk of flooding throughout the cities. The proposed improvements for the area would reconstruct approximately 12,000 feet of existing channel to improve the channel capacity and hydraulics through Lehi Elementary School's property, public transportation corridors, private property, and parks.

S.7 Resource Information

Table S-1 identifies relevant resource information for the watershed area.

Table S-1 Existing Resource Information.

Resource	Description
Latitude/Longitude	American Fork City: 40°22'34.01" N / 111°47'37.14" W (O'Reilly Auto Parts) Lehi City/Saratoga Springs City: 40°23'49.45" N / 111°51'02.70" W (Lehi Elementary School) Source: Google Earth
Elevation	4,515 feet
Hydrologic Unit Code (HUC-8)	American Fork Canyon: 1602020108

Resource	Description
	Dry Creek-Jordan River: 1602020110
Climate (U.S. Climate Data 1991-2020)	Summer average high: 92.5 degrees F Winter average low: 20.3 degrees F https://www.weather.gov/wrh/Climate?wfo=slc
Topography	Wasatch Range (project locations are in valley)
Annual Precipitation (U.S. Climate Data 1991-2020)	Average 17 inches rain / 49 inches of snow https://www.weather.gov/wrh/Climate?wfo=slc
Watershed Area	118,200 acres, 184.7 sq miles
Study Area Land Use	Residential (25,943 Acres), Commercial (70.77 Acres), Agricultural (855.75 Acres), Public Use/Outdoor (2.51 Acres)
Study Area Land Ownership	Private (97.4%), Federal (1.6%), State (1.0%)
Population (U.S. Census 2010)	American Fork City: 26,263 (2010) Lehi City: 47,407 (2010) Saratoga Springs City: 17,781 (2010) Utah County: 516,564 (2010)
Demographics (U.S. Census 2020)	American Fork / Lehi / Saratoga Springs / Utah County White: 85.2% / 89.5% / 87.6% / 92.0% African American: 0.2% / 0.5% / 0.2% / 0.9% American Indian: 0.4% / 0.2% / 0.1% / 0.9% Asian: 1.6% / 2.0% / 1.1% / 2.0% Native Hawaiian/Pacific Islander: 1.0% / 0.4% / 0.1% / 1.0% Hispanic/Latino: 9.9% / 7.7% / 10.1% / 13.1% Two or More Races: 7.0% / 5.3% / 8.0% / 3.2%

S.8 Alternative Plans Considered

Four alternatives were formulated and considered, with two , the 500-year Storm Event Alternative and the Floodproofing Alternative, being removed from detailed study .. Alternatives that were analyzed in detail include the No Action Alternative or Future Without Federal Investment (FWOFI), the Nonstructural Alternative, and the Flood Reduction Alternative or Future With

Federal Investment (FWFI). The Flood Reduction Alternative is the Preferred Alternative and the National Economic Efficiency (NEE) Alternative. It is also the environmentally preferred alternative from NEPA. Mitigation measures were identified for potential impacts under the Preferred Alternative.

Flood Reduction Alternative (Preferred Alternative): The Flood Reduction Alternative is the Preferred Alternative. It best meets the NEPA Purpose and Need and addresses the PR&G problems and opportunities. Two methods for channel improvements would be implemented under this alternative including an earthen channel or gabion baskets, depending on what would be most feasible for each location in the watershed.

Nonstructural Alternative (Property Buyouts/Relocations): The Nonstructural Alternative involves the acquisition of downstream properties within the 100-year inundation area and demolishing structures to prevent recurring flood damage. This would include 994 residences, 91 commercial businesses, and 4 public properties at a cost of $394,346,259. Under the PR&G, a nonstructural alternative is required to be carried forward through detailed analysis for flood prevention projects.

No Action (FWOFI) Alternative: The No Action (FWOFI) alternative comprises the analytic baseline if no actions are taken to address the identified problems and opportunities. It is required to be carried forward through detailed analysis so it may serve as a comparison of how the watershed would change should no project be selected.

500-Year Storm Even Alternative: This alternative evaluates channel improvements for the 500-year storm event for the waterways through the use of the hydraulic model. The projects in each of the cities were evaluated. However, the alternative was ultimately eliminated due to its infeasibility and potential to cause increased flooding in other areas.

Nonstructural Alternative (Floodproofing): This alternative evaluated floodproofing structures affected in the 100-year inundation area as a nonstructural solution. However, lack of SLO support, environmental damage, and exorbitant costs, caused this alternative to be removed from detailed study.

S.9 Project Costs and Funding Source

The estimated installation cost for the Preferred Alternative is summarized in Table S-2. NRCS funds include design, engineering, construction management, permitting, construction, and NRCS-incurred administration costs, which are not cost-shared by the SLOs. Any costs incurred for administration and real property acquisition by the SLOs would not be cost-shared by NRCS.

Table S-2. Estimated Project Costs (2024 Dollars[1]).

Works of Improvement	PL 566 Funds	Other Funds	Total Funds
Construction	$11,542,000	$0	$11,542,000
Engineering	$1,721,000	$0	$1,721,000
Real Property Rights	$0	$2,944,000	$2,944,000
Relocation Payments	$0	$0	$0
Project Administration	$0	$0	$0

Total	$13,263,000	$2,944,000	$16,207,000

[1]*Price Base 2024.*

S.10 Net Economic Benefits

The estimated average annual economic benefits for the Action Alternative are summarized in Table S-3. This Alternative is the NEE Alternative for the project, per Sections 505.2 and 505.35.B (1) (iv) of the National Watershed Program Manual (NWPM) since it has the greatest net economic benefit.

Table S-3. Estimated Average Annual Economic Benefits (2024 Dollars).

Works of Improvement	Agricultural Damage Reduction Flood Reduction	Non Agricultural /Other	Average Annual Benefits	Average Annual Costs
Land Treatment—Acres				
American Fork	$534,956	$0	$534,956	$112,600
Lehi Upstream	$974,733	$0	$974,733	$265,600
Lehi Downstream	$1,160,501	$0	$1,160,501	$278,600
Total	$2,670,190	$0	$2,670,190	$656,800

Price Base 2024.

The number of direct onsite and offsite beneficiaries of the project were calculated. Onsite direct beneficiaries were calculated by multiplying the average number of people per household in both American Fork and Lehi cities by the number of homes/mobile homes affected by the 100-year (American Fork) and 50-year (Lehi) flood events. The number of direct onsite beneficiaries in American Fork is 510 and 2,777 in Lehi. The results of the analysis for each city were then summed to get the total number of direct onsite beneficiaries (3,287)

Offsite direct beneficiaries for the project were calculated by subtracting the number of direct onsite beneficiaries for each city from the total population of American Fork (26,263) and Lehi (47,407) cities. The 2010 census was used for the cities to show the 20% agricultural benefits that existed when the project was initially funded for planning in 2019 (NRCS headquarters approved this decision, see letter in Appendix E). The number of direct offsite beneficiaries in American Fork is 25,753 and in Lehi it is 44,630. The results of the analysis for each city were then summed up to get the total number of direct offsite beneficiaries (70,383).

The combined total direct onsite and offsite beneficiaries for this project are 73,670 people.

S.11 Period of Analysis

The period of analysis is the time required for installation of the Project plus the evaluated life (project life) of the Project. The alternatives were evaluated with a period of analysis of 52 years. This includes a 2-year construction period, and a 50-year evaluated life.

S.12 Project Life

The life of the Project is estimated to be 50 years following 2 years of construction (See table S-4 below).

Table S-4 Five-Year Federal/Non-Federal Funding Schedule

Year	Project Phase	Federal Funds	Non-Federal Funds
2025	Planning & Design	$430,250	$0
2026	Design (Engineering)	$1,290,750	$0
2027	Construction	$5,401,656	$1,377,792
2028	Construction	$5,401,656	$1,377,792
2029	Construction/Closeout	$738,688	$188,416
TOTAL COST	**NA**	**$13,263,000**	**$2,944,000**

S.13 Environmental Impacts

Table S-5 identifies the resources of concern and potential environmental impacts associated with implementation of the project. Resources not impacted by the project are not listed in this table.

Table S-5 Summary of Resource Concerns and Potential Environmental Impacts.

Resource Concern	Context and Intensity	Environmental Effects Summary
Soil Resources	Type: Direct Impact Duration: Temporary Intensity: Minor	Temporary impact on soils during construction but would not impact soil composition. Some excavated soil may need to be transported and dumped off-site. Short-term stream bank erosion may occur due to disturbance of soils along the waterways. These could lead to increased sedimentation during construction.
Water Quality	Type: Direct Impact Duration: Temporary Intensity: Minor Type: Indirect Benefit Duration: Permanent Intensity: Minor	Surface water quality may be affected short-term due to soil disturbance which may result in erosion and sedimentation. Long-term benefits as a result of erosion reduction and less susceptibility to streambank erosion following construction.
Floodplain Mgmt.	Type: Direct Benefit Duration: Permanent	Potential for impacts to American Fork River and Dry Creek floodway.

Resource Concern	Context and Intensity	Environmental Effects Summary
	Intensity: Substantial	Project measures would enlarge the capacity of structures and channels to better handle flood flows.
Special Aquatic Sites/WOTUS	Type: Direct Impact Duration: Temporary Intensity: Negligible Type: Direct Impact Duration: Permanent Intensity: Minor	Potential for impacts to American Fork River and Dry Creek. Temporary and Permanent impacts anticipated to wetlands. Stream Alternation permits would be required.
Regional Water Resource Plans	Type: Cumulative Benefit Duration: Permanent Intensity: Minor	Project is expected to improve compliance with local water resource management plans, cumulatively improving compliance in the watershed.
Air Quality	Type: Direct Impact Duration: Temporary Intensity: Negligible	Temporary direct impacts to air quality may occur due to emissions and dust from construction equipment and excavation activities. No long-term impacts.
Threatened & Endangered Species	Type: Indirect/None Duration: Temporary Intensity: Negligible, No Effect	The project may affect but would not likely adversely affect the Federally listed June Sucker. There would be no effect on any other species identified in the BA. No effect on critical habitat..
Fish & Wildlife/Mig. Birds/Eagles	Type: None Duration: None Intensity: No Effect	The project is not anticipated to impact any known fish, wildlife, migratory bird or eagle species as suitable habitat and food can be found elsewhere.
Invasive Species/Noxious Weeds	Type: Indirect Impact Duration: Temporary Intensity: Minor	Potential for the spread of invasive species. Due to construction activities, there is potential for the spread of invasive plant species.
Riparian Areas	Type: Direct Impacts Duration: Temporary Intensity: Minor Type: Direct Benefits Duration: Permanent Intensity: Moderate	Potential for impacts to plants and vegetation within the riparian areas. Waterways would be temporarily affected due to project activities and the removal of vegetation including riparian vegetation along the channel banks. Long-term improvements to riparian vegetative conditions following construction/reseeding.
Cultural & Historic Resources	Type: Direct Benefit Duration: Permanent Intensity: Moderate	Potential impacts to National Register of Historic Places (NRHP)-eligible sites. A determination of ‘no adverse effect to historic properties” was made. Flood risk to historic properties would be reduced.
Scenic Beauty/Visual Resources	Type: Direct Impact Duration: Temporary	Temporary impacts on natural views. The presence of construction

Resource Concern	Context and Intensity	Environmental Effects Summary
	Intensity: Minor Type: Direct Benefit Duration: Permanent Intensity: Minor	equipment as well as the project activities would temporarily affect the beauty of the surrounding area. Long-term flood damage reduction would improve the aesthetic quality of the study area.
Land Use	Type: Direct Impact Duration: Temporary Intensity: Minor	Land acquisition and easements are expected for Project implementation in Lehi and Saratoga Springs cities. Acquisition and/or conversion is not anticipated for any publicly owned recreational areas.

S.14 Major Conclusions

The Action Alternative—Flood Reduction Alternative—meets the purpose and need of the Project and has the greatest benefit-cost ratio. This alternative is the Preferred Alternative and the NEE Alternative. The adverse effects from this alternative are minor and/or short-erm during construction. Long-term beneficial effects would result from implementing the Action Alternative.

S.15 Areas of Controversy

There are no known areas of controversy. No significant issues or controversy would be anticipated resulting from the implementation of the Action Alternative.

S.16 Issues to Be Resolved

The following issues would be resolved for the implementation of the Action Alternative.

- Securing easements on private property for project measures in Lehi City and Saratoga City.
- Coordinating with city/state on roadway crossings.

S.17 Evidence of Unusual Congressional or Local Interest

There is no evidence of unusual congressional or local interest.

S.18 In Compliance

This Plan-EA is in full compliance with all public laws, statutes, and Executive Orders governing the development of water resource projects.

0.0 Changes Requiring a Supplement

Previous Watershed Plan and Environmental Assessments (Plan-EAs) for the American Fork-Dry Creek Watershed (watershed) evaluated other geographical areas and needs within the watershed. This Plan-EA addresses the areas of flood concern along the American Fork River in American Fork City and along Dry Creek and Waste Ditch in Lehi City and lower Dry Creek in Lehi and Saratoga Springs cities that need to be addressed.

As the lead federal agency, the U.S. Department of Agriculture-Natural Resource Conservation Service (NRCS), with the City of American Fork as the sponsoring local organization (SLOs) with Lehi City and Saratoga Springs City as a co-sponsors, are proposing the Flood Prevention Improvements Project (project) to provide solutions and measures to address flooding concerns within the watershed, located in Utah County, Utah (see Figure B-1, Appendix B). This Supplemental Watershed Plan No. 15 and Environmental Assessment has been prepared under the Watershed Protection and Flood Prevention Act (Public Law 83-566 [PL-566]) to assess and disclose the potential effects of the Project. Through this program, NRCS authorizes Federal funding and technical assistance to project sponsors such as states, local governments, and tribes to plan and implement authorized watershed project plans. The PL-566 Program requires the development of a "physically, environmentally, socially, and economically sound improvement plan" to be implemented over a specific period of years.

The Plan-EA assists NRCS in determining if the selected alternative would have a significant impact on the quality of the human and natural environment (individually or cumulatively) and if preparation of an Environmental Impact Statement (Plan-EIS) is required. If the NRCS State Conservationist (responsible federal official) determines that the selected alternative would not significantly affect the quality of the environment, then the NRCS State Conservationist would prepare and sign a Finding of No Significant Impact (FONSI), and the Project may proceed. If the NRCS State Conservationist determines that the selected alternative would significantly affect the quality of the environment, then a Plan-EIS and a Record of Decision (ROD) must be prepared and signed before the project can proceed. This document presents a detailed analysis of the project to allow implementation of the project.

1.0 Watershed Planning Background

1.1 Authority

This Watershed Plan-EA has been prepared under the authority of the Watershed Protection and Flood Prevention Act of 1954, Public Law (PL) 83-566, as amended (16 USC Section 1001 et. seq); in accordance with Section 102(2)(c) of the National Environmental Policy Act of 1969 (NEPA), PL 91-190, as amended (42 USC 4321 et seq); and in accordance with the Principles, Requirements, and Guidelines for Water and Land-Related Resource Implementation Studies and Federal Water Resource Investments (PR&G), DM 9500-013. This project has been prepared for the authorized purpose of Flood Prevention.

1.2 Sponsor

The non-Federal SLO is American Fork City, Utah. The non-Federal co-sponsors are Lehi City and Saratoga Springs City. The sponsors meet the relevant SLO responsibilities as outlined in 390 National Watershed Program Manual (NWPM) section 500.11.

1.3 Cooperating Agencies

The NRCS sent requests to the following state, Federal, and Tribal agencies requesting to be a cooperating agency under NEPA on this project as part of the external scoping process.

- U.S. Army Corps of Engineers (USACE)
- Environmental Protection Agency (EPA)
- U.S. Fish and Wildlife Service (USFWS)
- Bureau of Land Management (BLM)
- U.S. Forest Service (USFS).

EPA, BLM, and USFS formally declined cooperating agency status. No other agencies expressed interest in becoming a cooperating agency during the external scoping process. External scoping materials are included in the Scoping Report in Appendix A.

1.4 Planning Area

1.4.1 Selected Watershed

For this project, the study area is defined by the American Fork-Dry Creek Watershed which is comprised of two sub watersheds — American Fork Canyon-Frontal Utah Lake (HUC 1602020108) and Dry Creek-Jordan River (HUC 1602020110) — which combined are 118,200 acres (see Figure B-2, Appendix B). Watersheds are located in Utah County starting high in the Wasatch mountains with tributaries ending at Utah Lake (Utah Lake Watershed - HUC 16020201). The elevation ranges between 4,500 feet and 10,400 feet above sea level. The communities of American Fork, Lehi, and Saratoga Springs cities are located within the valley of the watershed with elevation ranges between 4,500 feet and 4,660 feet. Three waterways, American Fork River, Dry Creek, and Waste Ditch, flow through the watershed, with representative photos shown in Figures 1-1 through 1-8. High flows in these waterways pose an increasing flooding threat to

residential and commercial structures. This project meets NRCS's authorized purpose of flood prevention.

TM001 – Existing Conditions (Appendix D) provides more details on the current conditions and deficiencies.

Figure 1-1 American Fork River at 300 North in American Fork City

Figure 1-2 American Fork River

Figure 1-1 American Fork River at 400 South

Figure 1-2 American Fork River at 400 South

Figure 1-5 Dry Creek and Waste Ditch Diversion

Figure 1-6 Waste Ditch near 200 West in Lehi City.

Figure 1-7 Waste Ditch near Willow Park in Lehi City.

Figure 1-8 Lower Dry Creek near Utah Lake in Saratoga Springs City.

The planning area overview map below identifies the target watershed in its surrounding context. The watershed map below identifies the study area within the relevant HUCs.

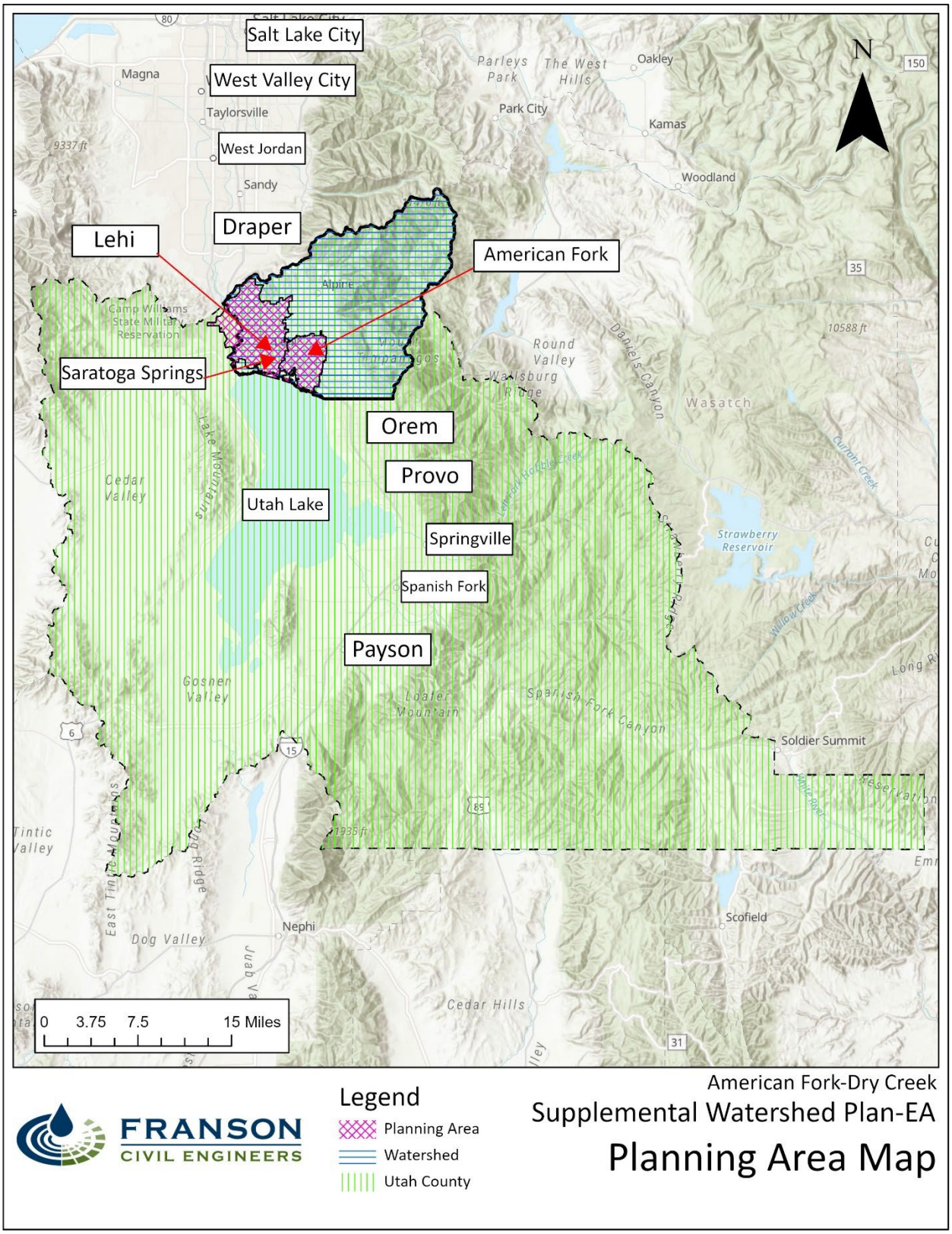

Figure 1-3 Planning Area Map

1.4.2 Study Area

The study area, also referred to as the project footprint, defines the boundary where the proposed project would be implemented and is where relevant resource studies were conducted (See Figure 1-10).

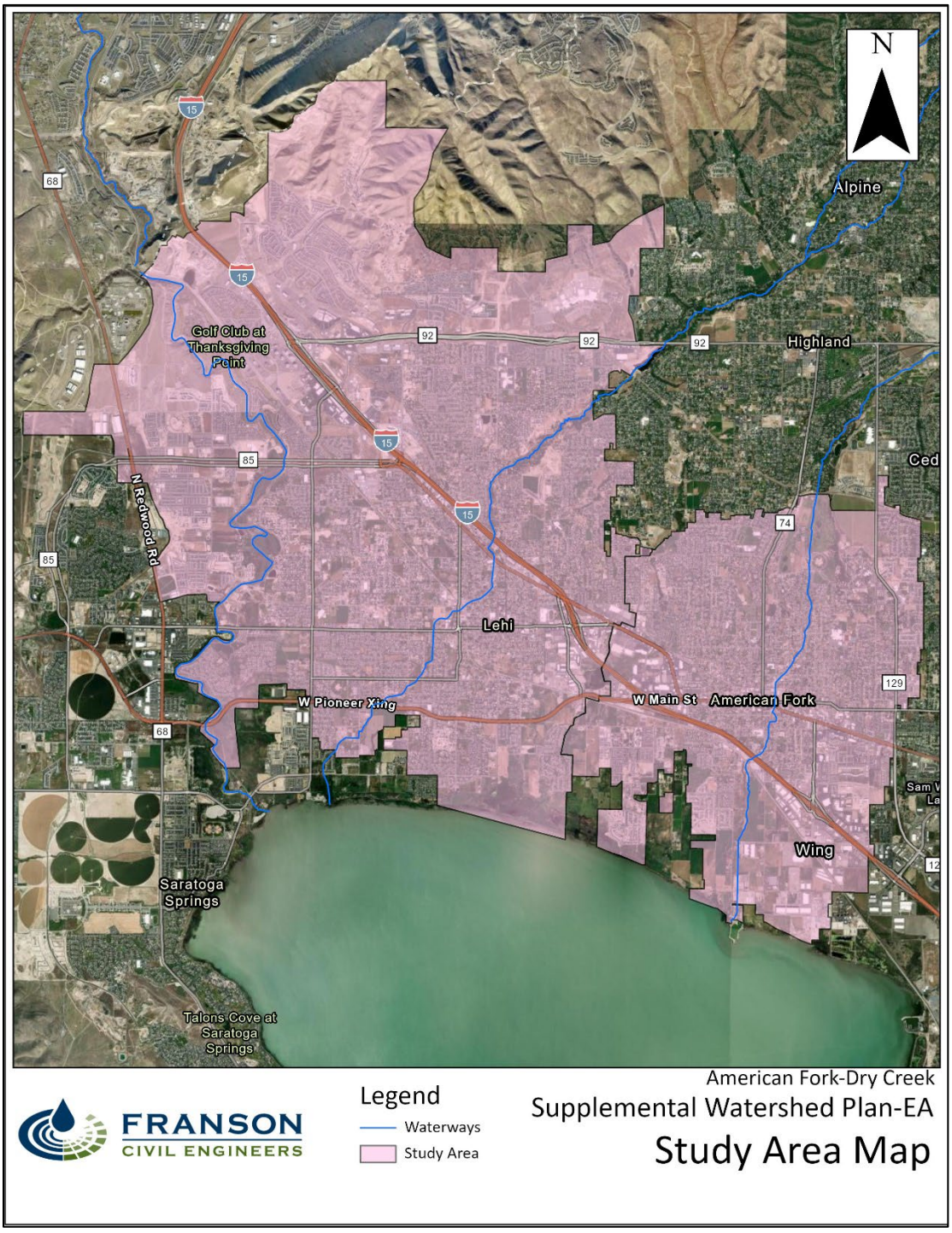

Figure 1-4 Study Area Map

1.4.3 Area(s) of Potential Effects for NHPA Section 106 Compliance

Section 106 of the National Historic Preservation Act of 1966 (NHPA), as amended, mandates that the potential effects of a proposed Federal undertaking on historic properties be considered. In order to properly conduct Section 106 analysis, the Area of Potential Effects must first be defined. The Area of Potential Effects (APE) is defined as "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. The area of potential effects is influenced by the scale and nature of an undertaking and may be different for different kinds of effects caused by the undertaking" (36 CFR, 800.16(d)). Figure 1-11 shows the direct APE used to evaluate alternatives.

Figure 1-5 Area of Potential Effects

1.5 Planning Process and Study Scope

The SLOs requested assistance from NRCS through the watershed flood prevention and operations (WFPO) program to address deficiencies identified related to flood prevention in the watershed. This Plan-EA presents the results of the watershed planning and the NEPA evaluation process and is anticipated to be followed by final design and construction of the Preferred Alternative.

This Plan-EA has been prepared by the NRCS to comply with the requirements of the National Environmental Policy Act of 1969 and its implementing regulations, which are set forth in the Council on Environmental Quality regulations 40 Code of Federal Regulations [CFR] §1500-1508; and in accordance with the NRCS National Watershed Program Manual (NWPM-390) 500-M, June 2024). It has also been prepared in accordance with the PL-566 program's Federal Objective set forth in the Water Resources Development Act of 2007 (Act).

1.5.1 Stepwise Planning Process

Watershed Plans are voluntary, comprehensive plans for a watershed of other large geographic areas. NRCS areawide conservation planning policy requires consideration of all natural and cultural resources within a planning area, as well as social and economic considerations. Watershed Plans are developed through a voluntary locally led effort to achieve the following:

- Assess natural resource conditions and needs
- Set goals
- Identify programs
- Alternative actions and other resources to solve those needs
- Develop proposals and recommendations to solve those needs
- Implement solutions
- Measure success

The NRCS conservation planning process consists of nine steps, divided into three phases, which cover development, implementation, and evaluation of an Areawide Conservation Plan. The three phases and nine steps are identified below:

Phase 1 – Collection and Analysis
- Step 1: Identify Problems and Opportunities
- Step 2: Determine Objectives
- Step 3: Inventory Resources
- Step 4: Analyze Resource Data

Phase 2 – Decision Support
- Step 5 – Formulate Alternatives
- Step 6 – Evaluate Alternatives
- Step 7 – Make Decisions

Phase 3 – Application and Evaluation
- Step 8 – Implement the Plan
- Step 9 – Monitor the Plan

This Plan-EA follows the format outlined in the NRCS NWPM (NRCS 2024) Parts 500 through 506 and NRCS National Watershed Program Handbook (NWPH) (NRCS 2014) Parts 600 through 606. Figure 1-12 illustrates how the Plan-EA incorporates NRCS's nine steps to conservation planning and PR&G's eight step watershed planning process. See *Economics Investigations and*

Analysis Report and the *PR&G Alternative Formulation and Screening Matrix*, Appendix E, for more details.

This Plan-EA also adheres to other stepwise planning processes such as those outlined in NEPA and the NHPA, which help to facilitate environmental and cultural resource compliance throughout the planning process. The NEPA Process can be broken into three levels of analysis, each level being representative of the scope of the project. The levels are Categorical Exclusion (CatEx), Environmental Assessment (EA), or Environmental Impact Statement (EIS). This project requires an EA, which requires the following chapters:

- 1: Purpose and Need for Action/External Scoping
- 2: Affected Environment
- 3: Alternatives
- 4: Environmental Consequences
- 5: Preferred Alternative

PLAN-EA	NRCS NINE-STEPS TO CONSERVATION PLANNING	PR&G EIGHT-STEPS WATERSHED PLANNING PROCESS
PHASE 1: COLLECTION AND ANALYSIS		
Chapter 1: Purpose and Need for Action **Chapter 2:** Scope of the Plan-EA	1. Identify Problems and Opportunities 2. Determine Objectives	1. Identify Problems and Opportunities
Chapter 3: Affected Environment	3. Inventory Resources 4. Analyze Resource Data	2. Inventory Existing Resources and Conditions
PHASE II: DECISION SUPPORT		
Chapter 4: Alternatives	5. Formulate Alternatives 6. Evaluate Alternatives	3. Forecast Future Conditions 4. Develop Array of Alternatives
Chapter 5: Environmental Consequences	6. Evaluate Alternatives	3. Forecast Future Conditions 5. Evaluate Effects of Individual Alternatives 6. Compare Alternatives
Chapter 6: The Preferred Alternative	7. Make Decisions	7. Identify Recommended Alternative
PHASE III: APPLICATION AND EVALUATION		
Chapter 7: The Preferred Alternative (Discussion of Monitoring and Adaptive Management in Preferred Alternative)	8. Implement the Plan 9. Evaluate the Plan	8. Implement and Evaluate

Figure 1-6 Plan-EA, NRCS, and PR&G Planning Processes.

The National Historic Preservation Act (NHPA) Section 106 is a process that seeks to guarantee minimal adverse impacts to cultural and/or historic properties and ensures that a reasonable and

good faith effort is made to consult with State Historic Preservation Officers (SHPOs) and Tribes on Federal undertakings. The Advisory Council on Historic Preservation (ACHP) defines a 4-step process to comply with Section 106 of the NHPA:

Step 1- Determine Applicability
Determine Undertaking
Coordinate with Other Reviews (i.e., NEPA, PR&G, etc.)
Notify SHPO/THPO
Identify Tribes and other Consulting Parties
Plan to Involve the Public
Step 2 – Determine the APE and Identify Resources
Determine the APE
Identify Historic Properties
Consult with SHPO/THPO, Tribes, and other Consulting Parties
Involve the Public
Step 3 – Determine Effects
Apply Criteria of Adverse Effects
Consult with SHPO/THPO, Tribes, and other Consulting Parties
Involve the Public
Step 4 – Resolve Adverse Effects
Avoid, Minimize, or Mitigate Adverse Effect
Notify the ACHP
Consult with SHPO/THPO, Tribes, and other Consulting Parties
Involve the Public

1.5.2 PR&G and the Ecosystem Services Framework

In addition to the planning processes listed in the previous subsection, this Plan-EA also complies with the PR&G as outlined in USDA DM 9500-013. The PR&G utilizes its own 8-step planning process that mirrors the processes in NEPA and NRCS's 9-step process. As of April 2019, PR&G replace the 1983 Principles and Guidelines (P&G). The PR&G states that "In consideration of the many competing demands for limited Federal resources, it is intended that Federal investments in water resources as a whole should strive to maximize public benefits, with appropriate consideration of costs. Public benefits encompass environmental, economic, and social goals, include monetary and non-monetary effects and allow for consideration of both quantified and unquantified measures". PR&G utilizes an ecosystem service framework which describes the benefits that people receive from nature. Ecosystem services can either be tangible or intangible and can characterize the ecological goods and services provided by a healthy, functioning environment.

The PR&G 8-step watershed planning process is outlined below:

Step 1: Identify Problems and Opportunities
Step 2: Inventory Existing Resources and Conditions
Step 3: Forecast Future Conditions
Step 4: Develop a Wide Array of Alternatives
Step 5: Evaluate Effects of Individual Alternatives
Step 6: Compare Alternatives

Step 7: Identify Recommended Alternative
Step 8: Implement and Evaluate

An important part of the PR&G planning process is the use of an ecosystem services framework. This framework was designed to illustrate the benefits that people receive from nature, encompassing the goods and services provided by a healthy and balanced environment. Commonly, the ecosystem services framework is organized into four service categories including:

1 **Provisioning Services:** Services that provide tangible goods for direct human use or consumption.
2 **Regulating Services:** Services that maintain a world in which it is possible for people to live and provide critical benefits that buffer against environmental catastrophes or disaster either locally, regionally, or on a larger scale.
3 **Supporting Services:** Services that support the underlying processes for maintaining conditions for life on Earth such as nutrient cycling, soil formation, and primary production (photosynthesis).
4 **Cultural Services:** Services that make the World a place in which we want to live in such as recreational, spiritual, aesthetic viewsheds, Tribal, or other cultural and community values.

1.5.3 Period of Analysis

The period of analysis for this project is 52-years. This includes the 2-year implementation period and 50-year evaluation period (project life).

1.5.4 Project Scope

This Plan-EA is being conducted via the WFPO Program, authorized by PL-566. This program seeks to provide technical and financial assistance to states, local governments, and tribes to plan and implement authorized watershed project plans for various purposes. A Watershed Plan document can provide assistance for projects planned for any combination of the following authorized purposes:

- Flood Prevention
- Watershed Protection
- Public Recreation
- Public Fish & Wildlife
- Agricultural Water Management
- Municipal & Industrial Water Supply
- Water Quality Management
- Watershed Structure Rehabilitation (this purpose is managed by a separate program)

This Plan-EA has been prepared with the PL-566 authorized purpose of Flood Prevention.

1.5.5 External Scoping

An early and open process is required by NEPA to determine the scope and significance of the issues to be addressed by the Plan-EA. Participation of the involved and impacted public, agencies, organizations, and tribes is a vital component of the process to identify issues and resource concerns. This ensures that those who are interested in or potentially affected by proposed alternatives have an opportunity to share concerns and provide insight and input during the initial

phases of the planning process. A scoping notice announcing the project, scoping period of January 13 through February 12, 2021, and public scoping meeting held virtually on January 27, 2021, was placed in *The Daily Herald*, a newspaper of general circulation for the study area, on January 6, 13, and 20, 2021. Additionally, the public scoping notice was placed virtually on American Fork City's Facebook page and online calendar, on the project website https://www.fransoncivil.com/american-fork-plan-ea/, and sent to stakeholders and the public adjacent to project measures on January 8, 2021. In accordance with the NHPA of 1966, EO 13007, and EO 13175, tribal consultation was conducted to maintain the NRCS' government-to-government relationship. Letters were sent to the following tribes on January 6, 2021, and November 12, 2024, providing project information, requesting information on known sites, and inviting them to the public meeting:

- Confederated Tribes of the Goshute Reservation
- Skull Valley Band of Goshute Indians
- Ute Indian Tribe of the Uintah & Ouray Reservation
- Shoshone-Bannock Tribes of the Fort Hall Reservation

It was identified that the Shoshone-Bannock Tribes of the Fort Hall reservation had been inadvertently missed in initial scoping and consultation. The Tribe was added as a Section 106 consulting party by NRCS in an initiation letter sent on November 12, 2024. Additionally, updates to the cultural resource report were made following review by the National Water Management Center (NWMC). Because of this, the Cultural Resources Inventory was re-submitted to SHPO and Tribes for concurrence on the APE, site eligibility, and determination of effects on November 12, 2024, including to the Shoshone-Bannock Tribes of the Fort Hall Reservation. A Scoping Report, dated June 2021, provides the scoping process in detail (Appendix A). Tribal scoping letters are in Appendix A and detailed in Table 7-1.

1.6 Related Projects and Studies

"In defining the scope of issues to be addressed in the watershed project plan, detail and attention must be focused on connected and cumulative actions associated with the proposed action" (NWPM 501.39(F)). A list of known past, present, or reasonably foreseeable future actions in the vicinity of the study area are provided below.

- Past NRCS PL-566 rehabilitation projects on these waterways have included improvements to dams and reservoirs upstream including Silver Lake, Silver Lake Flat, and Tibble Fork on the American Fork River which has increased reservoir capacities improving flood prevention.
- An ongoing project is a diversion structure at the mouth of American Fork Canyon which diverts water from the American Fork River to several local users.
- Dry Creek Reservoir upstream of the project was completed in 2021 providing additional capacity for flood prevention.
- Lehi City has made improvements alongside other sections of Waste Ditch adding gabion baskets to increase channel capacity within residential locations.
- A foreseeable future project includes the replacement of an undersized undercrossing within American Fork City at 400 North and 400 East; the existing dual parallel reinforced concrete pipes is anticipated to be replaced with a larger capacity box culvert.

2 Purpose and Need

2.1 Purpose

The purpose of the project is to reduce potential risk of personal injury and flood damage to municipal and private properties, agricultural enterprises, and public infrastructure along certain waterways within the American Fork-Dry Creek Watershed that are subject to flooding events during spring runoff and after storms.

2.1.1 Federal Objective

Water resources investments shall reflect national priorities, encourage economic development, and protect the environment by:

(i) seeking to maximize sustainable economic development.
(ii) 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; and
(iii) protecting and restoring the functions of natural systems and mitigating any unavoidable damage to natural systems.

The Act also directed the federal government to update and consolidate its past guidance to ensure investments meet the Federal Objective, resulting in the Guidance for Conducting Analyses Under the PR&G, which is a comprehensive policy and guidance for projects. The PR&G states that "in consideration of the many competing demands for limited Federal resources, it is intended that Federal investments in water resources as a whole should strive to maximize public benefits, with appropriate consideration of costs. Public benefits encompass environmental, economic, and social goals, include monetary and non-monetary effects and allow for consideration of both quantified and unquantified measures."

2.1.2 Project Objectives

The project objectives are to solve the problems identified in Section 2.2.1 by using the opportunities described in Section 2.2.2. Objectives for this project include (it is assumed that construction would occur over 2-years and that improvements are designed for a lifespan of 50-years):

- Objective 1: Address flood control problems at identified locations in American Fork, Lehi, and Saratoga Springs cities to effectively manage high flows and prevent damage to homes, businesses, and agricultural fields through the year 2080,
- Objective 2: Address streambank erosion in the study area to prevent deterioration of surface water quality in the waterbodies associated with the study area through the year 2080.
- Objective 3: Adress current threats to public safety resulting from flood events, which pose a threat to life and property, at the identified locations within American Fork, Lehi, and Saratoga Springs cities through the year 2080.

2.1.3 Constraints and Considerations

In any planning process, there are certain restrictions that limit the extent to which the implementation of a project would achieve the project objectives. They may include natural environmental conditions, economic factors, social or cultural circumstances, or a combination of these. The constraints and considerations for the project include:

- Constraint 1: Minimize disruptions to existing residential and commercial properties during the construction of the project in American Fork, Lehi, and Saratoga Springs cities.
- Constraint 2: Minimize adverse impacts to cultural and historic resources to the maximum extent possible during construction of the project
- Constraint 3: Minimize water pollution and sedimentation of waterways during construction activities to protect aquatic ecosystems in the waterbodies within the study area.
- Constraint 4: Avoid all impacts that would directly or indirectly adversely impact or degrade potential habitat for the June Sucker, a Federally listed fish species.

2.2 Need

The project is needed since prior flooding events associated with the identified waterways have resulted in damage to structures and also jeopardized the safety of the public in American Fork City, Lehi City, and Saratoga Springs City. The study area is defined in Section 1.4.2.

2.2.1 Problems

Identifying problems within a watershed begins the process for project planning. Once the problems are identified, opportunities can be found to address them. Within the watershed, flood control of the river and waterways are critical for protection of infrastructure, homes, commercial properties, etc. The specific problems identified include areas that have flooded or are at risk for flooding that impact structures.

Flooding Problems in American Fork City

The American Fork River is an intermittent stream that flows from American Fork Canyon south through American Fork City until it discharges into Utah Lake. The river varies in width between 10 and 18 feet as it flows through the urbanized areas of the city. There are many areas of the river where the flow has been channelized to accommodate urban growth. American Fork City has had increasing concerns about the flood potential of four locations along the river. Results from a hydraulic model indicate that flooding occurs at the majority of road crossings during the 50-year storm event with the severity increasing with a 100-year storm event. The modeling of the 100-year storm event shows this storm would inundate a total of 54 mobile homes, 102 residential homes, 57 commercial buildings, one school building, three churches, and nine other buildings. Observations of the high runoff for 2023 validate those results with channels being at or near

capacity and flows almost reaching the 50-year storm event, see Figures 2-1 through 2-4. Details of the modeling results can be found in *TM005 – Hydraulic Analysis* (Appendix D).

Figure 2-1 American Fork River at 100 North.

Figure 2-2 American Fork River at 400 South.

Figure 2-3 American Fork River at 200 South.

Figure 2-4 American Fork River at 300 North.

Flooding Problems in Lehi City and Saratoga Springs City

Dry Creek is an intermittent stream in the watershed, varying in width between 13 and 20 feet, that flows through Lehi and Saratoga Springs cities to Utah Lake. Waste Ditch is a man-made secondary channel that diverts excess water from Dry Creek near Lehi Elementary School and conveys it west to the Jordan River, an outflow from Utah Lake. The ditch varies in width between 6 and 20 feet.

Developed areas in Lehi City and Saratoga Springs City have been flooded or are at risk for flooding along Dry Creek and Waste Ditch, which is also represented in the hydraulic model for the 50- and 100-year storm events. Results from a hydraulic model indicate that flooding occurs at the majority of road crossings during the 100-year storm event and would inundate the number of structures identified in Table 2-1. Observations of the high runoff for 2023 showed channels being at or near capacity and flows reaching the 10-year storm event. Details of the modeling results can be found in *TM005 – Hydraulic Analysis* (Appendix D).

Table 2-1 Inundated Structures for the 100-year Storm Event.

Waterbody	Mobile Homes	Homes	Commercial	Other
Upper Dry Creek and Waste Ditch	5	682	40	35
Lower Waste Ditch	0	147	0	4

In recent years, Lehi City, in partnership with private landowners and state agencies, has invested millions of dollars in improving Dry Creek's channel and Waste Ditch at various locations throughout the city. High flows have posed an increasing threat to residential structures and Lehi Elementary School in the sections of the channel that have not been improved due to lack of sufficient financial resources, see Figures 2-5 through 2-9. In particular, the Dry Creek channel near Lehi Elementary School is restricted by the channel size and a culvert. In the past and again in 2023, high spring runoff have caused flooding of the elementary school and homes in the area as shown below.

Figure 2-5 Waste Ditch Flooding in School Playground.

Figure 2-6 Dry Creek Flooding.

Figure 2-7 Lehi Elementary School flooding.

Figure 2-8 Dry Creek at 600 North

2.2.2 Opportunities

Opportunities represent goals that a project seeks to achieve in alignment with its authorized purpose(s). The project presents the following opportunities as a means of resolving immediate problems (stressors) and promoting positive, long-term stability, and change in large-scale issues (drivers) affecting the study area:

- Opportunity 1: Enhance safety and community resilience to flood risks through the implementation of project measures.
- Opportunity 2: Provide improved flood protection for structures through the implementation of project measures.
- Opportunity 3: Reduce streambank erosion in the study area through the implementation of project measures.

3 Affected Environment: Current & Future Conditions

3.1 Resource Categories of Concern

During the scoping process, relevant resources or environmental concerns were identified to be analyzed in detail and to identify which resources should be eliminated from detailed study. Resource concerns were identified for the project based on required scoping concerns in the NWPM and from additional concerns identified by the SLO, public, stakeholders, Tribes, or agencies during scoping meetings or the 30-day public comment period. Table 3-1 identifies the resource categories of concern and their relevance to the Plan-EA. Additionally, the table identifies the ecosystem services established during scoping.

The project is located in the American Fork—Dry Creek Watershed (comprised of two sub-watersheds as described in Section 1.4) starting high in the Wasatch Mountains with tributaries ending at Utah Lake (Utah Lake Watershed - HUC 16020201) in Utah County. The combined watershed area is approximately 118,200 acres with elevation ranging between 4,500 feet and 10,400 feet above sea level. The communities of American Fork City, Lehi, and Saratoga Springs cities are located within the valley of the watershed with elevation ranges between 4,500 feet and 4,660 feet. (See Appendix B, Map B-1).

Table 3-1 Resource Categories of Concern and Ecosystem Services Identified During Scoping

ITEM/CONCERN	RELEVANT TO THE PROPOSED ACTION (YES/NO)	RATIONALE
Soil-Related Concerns		
Soil Resources	YES	Soil disturbance would occur as a result of the project measures.
Prime & Unique Farmland, and Farmland oof Statewide or Local Importance	NO	There are prime or unique farmlands within the watershed area. However, no farmland would be converted to non-agricultural use; therefore, there would be no effect to designated farmlands.
Water-Related Concerns		
Water Resources	NO	The quantity of water in the watershed area would not change. In the channel sections where PVC coated gabion baskets are proposed, there could be damaged baskets and scattered rock as the baskets break down if they have been damaged by impacting debris, or after exceeding its expected 30 -year design life.
Sole Source Aquifers (SSA)	NO	There are no sole source aquifers in the watershed.
Water Quality	YES	Construction activities would occur in drainages and near water sources.

ITEM/CONCERN	RELEVANT TO THE PROPOSED ACTION (YES/NO)	RATIONALE
Floodplain Management	YES	The purpose of the project is for the long-term benefit of floodplain management. Project actions would not result in any change in flow into or out of the basin.
Coastal Zone Management Area	NO	The study area is not located near a coastline.
Waters of the U.S., Wetlands, & Special Aquatic Sites	YES	.There are approximately 4.14 acres of Waters of the U.S. (WOTUS) that are assumed jurisdictional along the American Fork River, Dry Creek, and Waste Ditch. This finding is based on the Aquatic Resources Delineation in Appendix E which assumes the WOTUS would be considered jurisdictional under the Clean Water Act (CWA). No wetlands are present in the study area. All of the aquatic sites are WOTUS/linear features, and the acreage does not contain wetlands.
Coral Reefs	NO	There are no coral reefs in the watershed area.
Regional Water Resource Plans	YES	The project measures would support regional water management plans including the Utah Lake Basin Planning for the Future (June 2014) and the Utah State Water Resources Plan (December 2021). Buffer development away from channels to reduce impacts of flooding.
Wild & Scenic Rivers	NO	There are no Wild and Scenic Rivers designated within the watershed according to the National Wild and Scenic Rivers System (NWSRS 2024). The Nationwide Rivers Inventory lists "American Fork Creek" within American Fork Canyon, between Timpanogos Cave and mouth of the canyon, for its recreational and scenic values (NPS 2024). The project measures are located below this river section, and it would not be impacted by the project.
Air-Related Concerns		
Air Quality	YES	Local Air Quality could be affected by emissions from construction equipment, as well as fugitive dust.
Plant and Animal-Related Concerns		
Endangered & Threatened Species	YES	An official species list was acquired from the U.S. Fish and Wildlife Service (USFWS) IPaC system on March 24, 2023 (see Appendix E). There are no critical habitats in the study area. Federally listed species may occur within the analysis area and could be impacted by project outcomes.
Migratory Birds	YES	Migratory birds are likely to occur within the watershed. The group is addressed with "Fish and Wildlife" in the Plan-EA.
Bald & Golden Eagles	YES	Eagles have the potential to occur in the watershed. The resource is addressed with "Fish and Wildlife" in the Plan-EA.
Essential Fish Habitat	NO	There is no Essential Fish Habitat in the watershed area (NOAA, 2024).

ITEM/CONCERN	RELEVANT TO THE PROPOSED ACTION (YES/NO)	RATIONALE
Ecologically Critical Areas	NO	There are no ecologically critical areas located within the study area.
Invasive Species	YES	Due to construction activities, there is the potential to spread invasive species.
Fish & Wildlife	YES	The study area was evaluated in the Utah Natural Heritage Program on October 5, 2021 (see Appendix E); state species of conservation concern may occur within the study area. Utah Division of Wildlife Resources (UDWR)-mapped big game habitat also occurs within the analysis area. Where present within the watershed, fish and wildlife could be impacted by project outcomes.
Natural Areas	NO	Natural Areas are not designated within the study area.
Riparian Areas	YES	Riparian areas occur in association with tributaries to Utah Lake and the Jordan River, including the American Fork River and Dry Creek.
Forest Resources	NO	Forested lands are not located in or near the study area.
Human Use-Related Concerns		
Cultural Resources/Historic Properties & Tribal/NHO Consultation	YES	Several historical sites were noted during the 2021 and 2022 surveys including a total of seven sites and two architectural resources. SHPO concurred with site eligibility recommendations on 11/06/2024. No effects are expected to occur to historic properties.
Social Issues	NO	There are no major social issues in the watershed area.
Local, Regional, and National Economy	NO	There are no major changes expected from any potential action on the local, regional, or national economies.
Public Health and Safety	NO	Public health and safety concerns would be improved by limiting flooding and reducing potential structure failures.
Scenic Beauty	YES	Disturbed grounds and heavy equipment were present during construction. Impacts to visual resources could occur from construction of project measures.
Parklands (including National Parks, Monuments, and Historical Sites)	NO	No national or state parks or historical sites are located in or near study areas according to National Parks Map (National Park Service [NPS] 2018a) and Utah Parks Map (Utah Department of Natural Resources (UDNR 2018)
Significant Scientific Resources	NO	There are no known scientific resources in or near the watershed area.
Land Use	YES	Project measures would require land acquisition and easements by the SLOs. NRCS would not be involved in agreement with the PL-566 Program regulations.
Scoped Ecosystem Services of Concern		
Provisioning Services	YES	There are provisioning services in the study area.

ITEM/CONCERN	RELEVANT TO THE PROPOSED ACTION (YES/NO)	RATIONALE
Regulating Services	YES	There are regulating services in the study area
Supporting Services	NO	Supporting Services are categorized as an intermediate ecosystem service. As an intermediate service, their service is already included in the final ecosystem service, which mainly consists of benefits derived from Provisioning, Regulating, and Cultural Services. Because there is no measurable benefit associated with Supporting Services, it is not included in the ecosystem services analysis.
Cultural Services	YES	There are cultural services in the study area.
Other Concerns Identified by SLO, Agencies, and the Public		
Utah Lake	NO	Although Utah Lake, located near the study area, is impaired by issues such as eutrophication, the project would not have any impact on Utah Lake.

3.2 Inventory of Existing Resources

The inventory of existing resources provides the environmental baseline in NEPA terms and describes the overall physical, biological, social, and economic conditions of the watershed in PR&G terms. To the extent possible, reasonably foreseeable future conditions are also projected for each evaluated resource concern identified in Section 3.1. All resources identified during the external scoping process are presented in the following subsections. The resources have been presented at a level of detail commensurate with the available data pertaining to that resource within the watershed. Figures, tables, and maps have been included where applicable to provide additional information on certain resource concerns.

3.2.1 Soils

The soil types for the area were obtained from the NRCS Custom Soil Resource Report on August 30, 2021, as referenced in the *Aquatic Resources Delineation Report* (Horrocks Engineers, June 2022). There are eight soil mapping units, with the dominant soil types include Chipman-McBeth complex (35.3-percent), McBeth silt loam (32.2-percent), and Cobbly alluvial land (9.1-percent), all three of which are poorly drained hydric soils (USDA 2010), which would make these areas prone to flooding. Other soils include Lakewin gravelly fine sandy loam on 1 to 6-percent slopes (6.9%) which is well-drained, Welby silt loam on 0 to 1-percent slopes (5.4-percent) which is also well-drained, Riverwash (5.2-percent) which is poorly drained, Steed gravelly sandy loam (4.0-percent) which is well-drained, and Sunset loam with gravelly substratum (2.0-percent) which is moderately well-drained.

Soil erosion involves the breakdown, detachment, transport, and redistribution of soil particles by forces of water, wind, or gravity. Changes in stream flows can also lead to or increase erosion within these water channels. Stream bank and stream bed erosion are a source of sediment pollution in the waterways.

While some areas of the American Fork River, Waste Ditch, and Dry Creek are channelized with culverts and concrete channels, the concrete in some of these culverts and channels is deteriorating, leading to streambed erosion. The areas along these waterways that are natural channels are prone to both stream bank and streambed erosion. Lehi City has been using gabions in these channels for years, where space constraints require channel banks to be maintained at near-vertical slopes. The life expectancy of the gabions is 30+ years.

3.2.2 Water Quality

The Clean Water Act (CWA), as amended (1972), establishes the basic structure for regulating quality standards for surface waters. Surface waters of the State of Utah, namely, rivers or streams, lakes, reservoirs, creeks, and canals are classified according to their designated beneficial uses to protect against controllable pollution. EPA is charged with regulating its implementation and has delegated certain portion of its authority to the U.S. Army Corps of Engineers (USACE) and the Utah Department of Environmental Quality (UDEQ), which includes the Utah Division of Water Quality (UDWQ) and the Utah Division of Drinking Water (UDDW). UDWQ is responsible to classify each water body, through Utah Administrative Code (UAC) R317-2-13 as unimpaired or impaired, which designation requires further analysis to determine pollutants and remedial actions, if necessary. The EPA's *Data Basin* website identifies its Office of Water 303 (d) list of impaired waters (last updated in 2011) which lists that the American Fork River, Dry Creek and Waste Ditch are not impaired. *Utah's Final 2022 Integrated Report* by UDWQ confirms that these waters are not impaired. Surface water quality problems mainly arise from sedimentation. Some of the primary sources of sediment include in-stream channel erosion, stream bank erosion, changes in stream flows, as well as erosion from bare land.

The American Fork River is classified as "fully supporting" meaning all its designated beneficial uses have been assessed against one or more numeric criteria and found to meet all applicable water quality standards. Dry Creek has not been identified as either "supporting" or "not supporting".

3.2.3 Floodplain Management

The Federal Emergency Management Agency (FEMA) categorizes flood hazard areas and the severity or type of flooding that could occur, which are depicted on a community's Flood Insurance Rate Map (FIRM). Special flood hazard areas, Zone A, are defined as areas that have a one percent or greater chance of being inundated by a flood event in any given year. Zone A flood areas are usually refined into other zones with more distinct labels on FIRMs including Zones AO, AH, A1-A30, AE, etc. The 1-percent annual chance flood is also referred to as the base flood or 100-year flood. Moderate flood hazard areas are areas between the limits of the base flood and the 0.2-percent annual-chance (or 500-year) flood. Minimal flood hazard areas are those outside the Special Flood Hazard Area (SFHA) and have a less than 0.2 percent chance of the 500-year flood occurring (FEMA 2020).

The areas at risk for flooding associated with the American Fork River, Upper Dry Creek, and the upper portions of Waste Ditch are mapped on FIRM Panels, all with effective dates of June 19, 2020, and include Zones AE, AO, and X. The FIRMs depict the areas at risk during the 0.2% annual chance flood event associated with the study area; some portions of Waste Ditch are currently unmapped by FEMA and are labeled as outside the limits of study.

The FIRM panel numbers, effective dates, and flood hazard zones in the study area are listed in Table 3-2:

Table 3-2 FEMA FIRM Panels in the Study Area Summary Table

FIRM Panel No.	Map Effective Date	Flood Hazard Zone
49049C0135F	06/19/2020	Zone AE
49049C0145F	06/19/2020	Zone AE
49049C0302F	06/19/2020	Zone AE
49049C0150F	06/19/2020	Zone X
49049C0155F	06/19/2020	Zone X
49049C0307F	06/19/2020	Zone X
49049C0168F	06/19/2020	Zone AE
49049C0162F	06/19/2020	Zone AE
49049C0164F	06/19/2020	Zone AO
49049C0169F	06/19/2020	Zone X
49049C0161F	06/19/2020	Zone AE
49049C0163F	06/19/2020	Zone AE
49049C0301F	06/19/2020	Zone AE
49049C0285F	06/19/2020	Zone AE
49049C0306F	06/19/2020	Zone AE
49049C0308F	06/19/2020	Zone AE
49049C0166F	06/19/2020	Zone AE
49049C0167F	06/19/2020	Zone X

An analysis was performed to determine flood extents for the existing conditions and conditions post project for a 24-hour event for the 10-, 25-, 50-, 100-, 200-, 500- year flood events. Refer to Appendix C – Maps C1 through C10 for flood inundation extents in American Fork City and Maps C11 through C31 for Lehi/Saratoga Springs cities. Details on the flooding for the three areas are identified below.

3.2.3.1 American Fork

During the existing conditions of the 50-year storm event, flooding starts to occur at the majority of road crossings, and the severity of flooding increases for less frequent storm events. The 100-year storm event inundated a total of 54 mobile homes, 102 residential homes, 57 commercial buildings, one school building, three churches, and nine other buildings.

3.2.3.2 Lehi City – Upper Dry Creek and Waste Ditch

During the existing conditions, there is significant flooding near Lehi Elementary School. Flooding also crosses the Union Pacific and Utah Transit Authority railroad and inundates approximately 5 mobile homes, 762 residential homes, 48 commercial buildings, 7 school buildings, and 27 other structures during the 50-year flood event.

3.2.3.3 Lehi City and Saratoga Springs City – Lower Dry Creek

Dry Creek crosses Pioneer Crossing, a major road, which separates Dry Creek into upper Dry Creek and lower Dry Creek. The road provides a separation of flooding extents on the lower portion of Dry Creek, which causes flooding of several homes upstream of Pioneer Crossing. Downstream of Pioneer Crossing, there is existing flooding on newly developed residential homes and several acres of agricultural land that could likely be developed in the future. Existing flooding for the 50-year storm event includes approximately 129 residential homes and/or plots and 4 other structures and 154 residential homes under the 100-year storm event.

3.2.4 Special Aquatic Sites and Waters of the United States (WOTUS)

Waters of the U.S. (WOTUS) are defined in 33 CFR §328.3 and include oceans, rivers, streams, lakes, creeks, marshes, and wetlands with a continuous surface water connection. They are considered "jurisdictional" under the CWA and are within the regulatory jurisdiction of the USACE.

The *Aquatic Resources Delineation Report* (Horrocks Engineers, June 2022), see Appendix E, identified four waters of the WOTUS in the study area. During the delineation, two sample points were taken to determine if wetlands were present and they were not. The report states that all the aquatic resources identified within the study area are most likely jurisdictional waters due to their connection to a navigable WOTUS and due to their relatively permanent flow and presence of standing water. Although the report was prepared prior to the Supreme Court ruling in *Sackett v. EPA*, the assumed jurisdictional WOTUS within the study area would still be classified as jurisdictional under the ruling. The watershed covers approximately 118,200 acres which is equivalent to 184.7 square miles. The delineated WOTUS areas total 19,530 linear feet or 4.14 acres within the total 35.7-acre delineation study area. Other ditches branch off from the American Fork River, Dry Creek, and Waste Ditch to carry irrigation water to other end users, which are not addressed in this Plan-EA.

3.2.4.1 American Fork River

The American Fork River, an intermittent stream, begins in the Wasatch Mountain range and flows down American Fork Canyon through the cities of Cedar Hills, Highland, and American Fork to Utah Lake on the northern shore and is classified as R4SBCx (riverine, intermittent, streambed, seasonally flooded and excavated). Water is diverted year-round for stock water and for irrigation during the irrigation season by various irrigation companies and water right appropriators.

Typically, only high spring runoff water and excess winter water above diversions reaches Utah Lake. The delineated section of the American Fork River is about 2,716 linear feet and covers about 0.73 acres.

3.2.4.2 Dry Creek

Dry Creek, an intermittent stream, also begins in the Wasatch Mountain range and flows downstream through the Alpine City and Lehi City to Utah Lake north of where the American Fork River discharges and is classified as R4SBC (riverine, intermittent, streambed, and seasonally flooded). The delineated section of Dry Creek is about 13,811 linear feet with an area extent of 2.46 acres. Where Dry Creek discharges to Utah Lake, this is classified as L2ABF (lacustrine, littoral, aquatic bed, semi permanently flooded) with a delineated section of Utah Lake of 134 linear feet and covers about 0.24 acres.

3.2.4.3 Waste Ditch

A diversion on Dry Creek in Lehi City diverts excess creek flows into Waste Ditch, which flows to the Jordan River. Waste Ditch is classified as R5UBFx (riverine, unknown perennial, unconsolidated bottom, semi-permanently flooded and excavated) and Utah Lake is classified as L2ABF (lacustrine, littoral, aquatic bed, semi permanently flooded). The delineated section of Waste Ditch is about 2,896 linear feet and covers about 0.72 acres.

Based on the waterways' connection to either Utah Lake or the Jordan River, which flows to the Great Salt Lake, they are assumed to be jurisdictional waterways. The official decision regarding being jurisdictional would be made by USACE in the design/permitting process.

3.2.5 Regional Water Resource Plans

The watershed is under the purview of the following regional water management plans:

- Utah Lake Basin Planning for the Future (June 2014)
- Utah State Water Resources Plan (December 2021).

Although these plans are in effect and all goals should be met, the study area does not fully meet the goals outlined in these plans. As existing conditions continue, the watershed will continue to fall out of compliance with the plans unless actions are taken to help enhance the area.

3.2.6 Air Quality

The Clean Air Act (CAA) is a federal law that regulates air pollution nationwide. The CAA Amendments of 1990 (42 USC 7401 et seq.) requires the Environmental Protection Agency (EPA) to institute National Ambient Air Quality Standards (NAAQS) for six primary air pollutants to protect public health and welfare. These pollutants include carbon monoxide, particulate matter, ozone, nitrogen dioxide, lead, and sulfur dioxide (EPA 2018). Particulate matter includes fine particles that are 2.5 micrometers or smaller ($PM_{2.5}$) and fine particles that are 10 micrometers or smaller (PM_{10}). The CAAA requires that air quality conditions within all areas of a state be designated with respect to the NAAQS as attainment, maintenance, nonattainment, or unclassifiable. Areas that do not exceed the NAAQS are designated as attainment, while areas that exceed the standards are designated as nonattainment. A maintenance area is an area previously designated as a nonattainment area where a state or local government has developed a plan to reduce the criteria pollutant concentrations to levels below NAAQS standards.

The watershed area is in Utah County along the Wasatch Front, which also includes the counties of Salt Lake, Davis, Weber, and Tooele. In 2009, the EPA designated the Wasatch Front as a nonattainment area for particulate matter (PM_{10} and $PM_{2.5}$). According to the EPA, PM_{10} has not exceeded the standards since 2019 and is in maintenance status and $PM_{2.5}$ has exceeded the standards since 2009. In 2020, the Wasatch Front was re-designated as a marginal nonattainment area, which means that air quality standards were exceeded by only a small margin. This was attributed to a reduction in emissions by about 27 percent over the past 15 years despite a population growth of an average of 2.5 percent between 2010 and 2022. Utah has three years to find ways to meet the standard. The marginal nonattainment classification is the least stringent classification and does not require a formal State Implementation Plan (SIP).

3.2.7 Threatened and Endangered Plant and Animal Species

The Endangered Species Act (ESA) provides protection to federally listed threatened and endangered species and their designated critical habitats, under the jurisdiction of the U.S. Fish and Wildlife Service (USFWS). An official species list was obtained from the USFWS Information for Planning and Consultation (IPaC) system on March 24, 2023, and is included in the official Biological Assessment (BA) in Appendix E. The official species list identified the following species as potentially present within the watershed, however there are no critical habitats identified. The results of the BA are included in Chapter 5, which discusses the environmental consequences of the resource concerns considered.

3.2.7.1 Ute Ladies'-Tresses (*Spiranthes diluvialis*)

Ute ladies'-tresses (S*piranthes diluvialis*) are listed as Threatened. Modeled suitable habitat occurs throughout the lower elevations of the watershed, in association with water courses and irrigated land. Suitable habitat as described by Fertig et al. (2005) was not identified within 300 feet of the study areas. The species will not be considered further.

3.2.7.2 Canada Lynx (*Lynx canadensis*)

Canada lynx (*Lynx canadensis*) is listed as Threatened. Suitable high-elevation, remote forest habitat (Interagency Lynx Biology Team 2013) occurs within the watershed, but not at the lower elevations where the study area is located. The species will not be considered further.

3.2.7.3. Western Yellow-Billed Cuckoo (*Coccyzus americanus occidentalis*)

Yellow-billed cuckoo (*Coccyzus americanus*); Threatened: Suitable riparian nesting habitat of appropriate patch size and configuration below 8,500 feet in elevation (USFWS 2017) does not occur within the watershed due to the extent of development and fragmentation of riparian areas. The nearest proposed critical habitat is over 80 miles from the watershed area. The species will not be considered further.

3.2.7.4 Monarch Butterfly (*Danaus plexippus*)

The Monarch butterfly (*Danaus plexippus*) is a Candidate species. Monarch butterflies require milkweed, nectar sources, overwintering habitat, and migration habitat (USFWS 2020); the watershed provides nectar sources, but botanical surveys conducted in 2021 and 2022 did not identify milkweed in the study area and overwintering occurs along the Pacific Coast. The species will not be considered further.

3.2.7.5 June Sucker (*Chasmistes liorus*)

June sucker (*Chasmistes liorus*) is listed as Threatened. June suckers are known to spawn in the American Fork River when sufficient flows are present typically in May and June. Spawning habitat is characterized by "moderately deep runs and riffles moderately deep runs and riffles in slow to moderate current with a substrate composed of 4–8 in (100–200 mm) coarse gravel or small cobble that is free of silt and algae" (USFWS 2021).

Individuals have been recorded spawning in the American Fork River when sufficient flows are present. There are no known barriers downstream of Location 3 (200 South), but immediately upstream of Location 3, the river is concrete lined for about one-half (0.5) mile with scarce vegetative cover or shade; this length of channel is likely a barrier to further fish passage. The barrier at Location 3 is approximately 12,000 feet upstream from Utah Lake. During a sufficient water year, June sucker could likely reach Locations 3 and 4.

The segment of Dry Creek (Location 8) from 1900 South to Utah Lake is approximately 0.3 miles long and may provide suitable habitat for June suckers. The 0.6-mile-long segment of the creek between 1900 South and 1700 West lacks vegetative cover and shade and portions are concrete lined. It is unknown if the existing culverts at 1900 South or 1700 West are barriers, but the channel between them is likely a barrier to fish passage.

3.2.8 Fish and Wildlife/Migratory Birds/Bald and Golden Eagles

The watershed area may include a range of native and non-native migratory birds, resident birds, mammals, amphibians, reptiles, and aquatic species. Fish and wildlife species (including migratory birds) and habitats are managed on multiple federal and state levels. Species of concern that may occur in the watershed area were identified from the following data sets: Utah species of greatest conservation need (SGCN); see Utah Natural Heritage Program Online Species Search Report from October 5, 2021; Utah Division of Wildlife Resources (UDWR) big game habitat coverages, and additional migratory birds (see BA in Appendix E). The comprehensive list of species, suitable habitat, and rationale for further consideration in this document is provided in Appendix E. Eight species that could be impacted by the project were further considered as described below, those with common habitats were combined.

3.2.8.1 Bald Eagle (*Haliaeetus leucocephalus*)

Bald eagles *(Haliaeetus leucocephalus)* have been observed within the watershed and may hunt or scavenge throughout the area, particularly in association with the Jordan River and Utah Lake. There are no known nests within the study area.

3.2.8.2 Black Swift (*Cypseloides niger*)

The Black swift *(Cypseloides niger)* is a migratory bird that nest in association with waterfalls. They may forage in lowland riparian habitats including along the channels where insects are available within the watershed (Parrish et al. 2002).

3.2.8.3 Lewis's Woodpecker (*Melanerpes lewis*) and Long-Eared Owl (*Asio otus*)

Lewis's woodpeckers *(Melanerpes lewis)* and long-eared owls *(Asio-otus)*, migratory birds, nest in the mature trees such as ponderosa pine and/or breed in lowland riparian habitats, such as those that line the channels throughout the study area (Parrish et al. 2002).

3.2.8.4 Litte Brown Myotis (*Myotis lucifugus*) and Townsend's Big-Eared Bat (*Corynorhinus townsendii*)

The Little brown myotis *(Myotis lucifugus)* and Townsend's big-eared bat *(Corynorhinus-townsendii)* are bat species that may roost in trees associated with the channels and forage along the channels within the study area where insects are available (Oliver 2000, Gruver and Keinath 2006).

3.2.8.5 Peregrine Falcon (*Falco peregrinus anatum*)

Peregrine falcons *(Falco peregrinus anatum)* could occur throughout the study area, particularly in association with the Jordan River and Utah Lake (USFWS 1984). There are no known nests within the study area.

3.2.8.6 Rufous Hummingbird (*Selasphorus rufus*)

The Rufous hummingbird (*Selasphorus rufus*) is a migratory bird that is not known to breed in Utah however they are known to migrate through the watershed during migration (Sibley 2003).

3.2.9 Invasive Species and Noxious Weeds

Invasive species are defined as non-native to the ecosystem and whose introduction or presence can likely cause economic or environmental harm, or harm to human health. Invasive species compete directly with native species for moisture, sunlight, nutrients, and space. Federal agencies were directed in Executive Order 13112 to expand and coordinate their efforts to combat the introduction and spread of plants not native to the United States. Noxious, or invasive weeds are plants designated by a federal, state, or county government as injurious to public health, agriculture, recreation, wildlife, or property. Utah County uses the State of Utah Noxious Weed List as shown in Table 3-3.

Table 3-3 2023 State of Utah Noxious Weed List.

Weed	Weed	Weed	Weed
Common Crupina	Giant Reed	Yellow Starthistle	Quackgrass
African Rue	Japanese Knotweed	Yellow Toadflax	Jointed Goatgrass
Small Bugloss	Vipers Bugloss	Diffuse Knapweed	Bermudagrass
Mediterranean Sage	Elongated Mustard	Black Hebane	Perennial
Spring Milletgrass	Common St.	Dalmatian Toadflax	Russian Olive
Syrian Beancaper	Oxeye Daisy	Russian Knapweed	Scotch Thistle
Ventenata	Cutleaf Vipergrass	Houndstongue	Field Bindweed
Plumeless Thistle	Leafy Spurge	Perennial	Puncturevine
Malta Starthistle	Medusahead Rye	Phragmites	Cogongrass
Camelthorn	Rush Skeletonweed	Tamarisk	Myrtle Spurge
Garlic Mustard	Spotted Knapweed	Hoary Cress	Dame's Rocket
Purple Starthistle	Purple Loosestrife	Canada Thistle	Scotch Broom
Goatsrue	Squarrose Knapweed	Poison Hemlock	Common Reed
Sahara Mustard	Dyers Woad	Musk Thistle	-

Russian olive *(Elaeagnus angustifolia)*,Cheatgrass *(Bromus tectorum*), Purple loosestrife (*Lythrum salicaria*), and Common Reed (*Phragmites australis*) are known to occur in the watershed and within the study area. Other invasive species may occur within the watershed but are not prevalent.

3.2.10 Riparian Areas

Riparian areas are ecotones that occur along streams, rivers, lakes, ponds, and wetlands. They are distinctively different from the surrounding lands because of unique soil and vegetative characteristics that are strongly influenced by free or unbound water in the soil. Riparian ecosystems occupy the transitional area between the terrestrial and aquatic ecosystems. Typical examples include floodplains, stream banks, and lakeshores. Riparian areas may exist within all land uses, such as cropland, hay land, pastureland, rangeland, and forestland Riparian areas are characterized by different vegetative species than the adjoining terrestrial ecosystems and exhibit more vigorous growth due to shallow groundwater. These areas are habitats for a diversity of wildlife species that rely on them for food, cover, and water. In the watershed, the dominate riparian vegetation consists of cottonwood *(Populus)*, willow *(Salix)*, and dogbane *(Apocynum cannabinum)*. Other vegetation within the study area consists mainly of ornamental landscapes, Cheatgrass (B*romus tectorum)*, Scotch thistle (*Onopordum acanthium)*, Madwort (*Asperugo procumbens*).

It is important to note that no significant aquatic or wildlife habitat exists within the study area. If such habitat were present, the project project would require a transition to a Plan-Environmental Impact Statement (Plan-EIS). However, this is not necessary for this Plan-EA as no applicable habitat exists.

Figure 3-1 American Fork River looking south in channel north of 400 North.

Figure 3-2 Dry Creek looking downstream towards Utah Lake.

3.2.11 Cultural and Historic Resources and Tribal Consultation

Cultural resources refer to historic, aesthetic, and cultural aspects of the human environment. Section 106 of the National Historic Preservation Act of 1966, as amended (NHPA), mandates that the potential effects of a proposed federal undertaking on historic properties be considered by a Federal agency. Historic properties are a subset of cultural resources that include prehistoric or historic districts, sites, buildings, structures, or objects that are at least 50 years of age and are included in, or eligible for, inclusion in the National Register of Historic Places (NRHP).

The affected environment for cultural resources is identified as the area of potential effects (APE), in compliance with the regulations found in Section 106 of the NHPA (36 CFR §800.16(d)). The APE is defined as "the geographic area or areas within an undertaking may directly or indirectly cause alterations in the character or use of historic properties". The APE for the Action Alternative includes the area that could be physically affected by any of the proposed project alternatives including six staging areas (the maximum limit of disturbance).

To be eligible for listing on the NRHP, the cultural resource must possess integrity of the quality of significance in American history, architecture, archeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, association, and that:

A. Are associated with events that have made a significant contribution to the broad patterns of our history; or
B. Are associated with the lives of significant persons in our past; or
C. Embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or
D. Have yielded, or may be likely to yield, information important in prehistory or history.

Cultural resource inventories were conducted for the APE in Summer 2021, Spring 2022, and Spring 2024 by Horrocks Engineers to identify cultural resources that could be affected by the proposed project measures. Surveyors meet the Secretary of the Interior's Standards for Archeology and Historic Preservation. First, existing information on historic properties was researched by conducting a literature search on the Utah Division of State History's (UDSH) SHPO's online database, SEGO, to identify previously documented archaeological sites or areas of historic importance with the APE and a ½ mile radius beyond the APE. Seven previously recorded sites were identified in the APE.

The field survey was performed by evaluating exposed portions of the canals and ditches in the APE. These exposures were examined for historic features. Railroads and other previously recorded archaeological resources were revisited. Aerial photographs and a GPS unit were used to confirm transects. Sites were defined as areas containing a minimum of 10 artifacts within 10 meters. Sites were recorded using the UDSH Guidelines and the Utah Professional Archaeological Council's (UPAC) 2008 "Linear Sites: Guidance for Identifying and Recording under Section 106 of the National Historic Preservation Act". A total of seven cultural resource sites and two architectural resources were noted during the survey and documented in the Cultural Resources Inventory (CRI) as shown in Table 3-4, see Appendix E for a redacted copy.

Per 36 CFR §800.4, the NRCS made determinations of site eligibility based on Horrocks recommendations. The NRCS consulted in a letter dated June 26, 2023, including a description of the APE, site eligibility, and project effects with, SHPO and the following tribes: Confederated Tribes of the Goshute Reservation, Skull Valley Band of Goshute Indians, Ute Indian Tribe of the Uintah and Ouray Reservation, and Shoshone-Bannock Tribes of the Fort Hall Reservation. SHPO concurred on July 11, 2023. Tribal follow-up emails were sent on October 30, 2023, and phone calls made on January 8, 2024. Tribal consultation was reinitiated with an updated report and the addition of the Shoshone-Bannock Tribe as a consulting party. SHPO concurred on November 6,

2024, and Section 106 letters were mailed to the Tribes on November 12, 2024, with follow-up emails sent on January 13, 2025. Tribal consultation is summarized in Table 7-1.

Table 3-4 Cultural and Historic Resources.

Site Number	Description	APE	Eligibility Determination	Survey Type
42UT1029	Utah Southern/Union Pacific Railroad	Viewshed	Eligible	Updated
42UT1908	Lehi Pioneer Cemetery	Viewshed	Eligible	Revisited
42UT1909	Waste Ditch	Viewshed	Not Eligible	Updated
42UT1101	Denver & Rio Grande Western Railroad	Viewshed	Eligible	Updated
42UT592	Lithic Scatter	Viewshed	Eligible	Revisited
42UT1725	Spring Ditch	Viewshed	Not Eligible	Updated
42UT2309	Unnamed Ditch	Viewshed	Not Eligible	Revisited
049001D	Box Culvert Bridge 100 E. 200 S. American Fork (Historic Structure)	Viewshed	Not Eligible	Revisited
Not Assigned	Box Culvert Bridge 100 E. 220 E. American Fork (Historic Structure)	Viewshed	Not Eligible	Newly Recorded

3.2.13 Scenic Beauty and Visual Resources

The natural and constructed features contribute to the visual resources within the watershed, including mountain views and vegetation along open waterways. Viewers, including local residents and recreationists, have a perception of the existing physical characteristics and quality of the environment. The viewshed consists of residential and commercial properties, with some agricultural lands adjacent to sections of lower Dry Creek.

3.2.14 Land Use

Most of the land used in the watershed area includes private lands that are highly disturbed from development including private residential and commercial development. There are some agricultural land and public lands in Lehi City and Saratoga Springs City. Willow Park is owned by Utah County and leased by Lehi City.

3.2.15 Ecosystem Services

As set forth in the PR&Gs (USDA-NRCS, 2017), an ecosystem services framework is required. Ecosystem services are those benefits that people, and their communities derive from their natural environment. For example, the ecosystem can break down pollutants through plants cleaning the air and filtering water that humans consume contributing to social well-being. By evaluating the connections between ecological systems and social well-being, to the extent possible, negative

effects from the project can be minimized and benefits from nature, which may not be valued, can be acknowledged. As described in the PR&G, the following are the four categories of ecosystem services (USDA-NRCS, 2017):

- **Provisioning services**: Tangible goods provided for direct human use and consumption, such as food, fiber, water timber or biomass.
- **Regulating services**: Services that maintain a world in which it is possible for people to live, providing critical benefits that buffer against environmental catastrophes - examples include flood and disease control, water filtration, climate stabilization, or crop pollination.
- **Cultural services**: Services that make the world a place in which people want to live - examples include spiritual, aesthetic viewsheds, or tribal values.
- **Supporting services**: Services that refer to the underlying processes maintaining conditions for life on Earth, including nutrient cycling, soil formation, and primary production.

The scoping process identified the existing ecosystem service benefits in the watershed including, provisioning, regulating, and cultural services. Supporting services were identified as an intermediate ecosystem service, which is already included in the benefits derived from the other services. Therefore, it was not carried forward in the ecosystem services analysis. The entire ecosystem services analysis is documented in the PR&G Ecosystem Services Scoping and Evaluation Worksheet located in Appendix E.

Provisioning services primarily derive from instream fish species, which can provide food for direct human use and consumption. There is also an additional provisioning service of water used for agriculture, which promotes food production.

Regulating services include the flood risk and management of flood risk currently in place (which is not satisfactory), the quality of the surface water, and the presence of Wetlands/WOTUS which all play a role in buffering against environmental catastrophes (i.e., flooding, drinking water, and ecosystem health).

Cultural services in the watershed include the visual/scenic aesthetics, existing public safety measures, and the overall viability and quality of the ecosystem itself.

3.3 Forecast Future Conditions

Forecasting future conditions in the watershed provides an analytic baseline for comparing project alternatives. This forecast considers all reasonably foreseeable large-scale processes in natural, human, and economic environments. These forecasts are used to determine reasonably foreseeable impacts under the No Action/Future Without Federal Investment (FWOFI) Alternatives. The following subsections summarize the forecasted future conditions within the watershed in response to ongoing long-term processes.

3.3.1 Environment

The Utah State Hazard Mitigation Plan (SHMP) includes a chapter on climate change and provides documentation of the expected future conditions for the state based on ongoing climate trends. It states that Utah will experience temperature increases, although how much increase is not known (SHMP, 2019). These same models predict an overall decrease in precipitation throughout the southwestern United States (SHMP, 2019). If these forecasts hold true, Utah will experience

increased drought frequency as a result of the increasing temperatures. A nationwide trend of climate change is the expectation of more extreme weather patterns, resulting in both increased drought frequency and a higher likelihood of flooding. In Utah, extreme precipitation from monsoonal rainfall and warming temperatures is projected to lead to more frequent flood events (SHMP, 2019). If existing conditions in the watershed continue, it is reasonable to predict that flood events would continue to occur in the study area and would likely increase in frequency and intensity based on long-term climate data.

3.3.2 Society

As flood events continue to occur and become more frequent as a result of long-term climate trends, the watershed would continue to endure risks to life, injury, property, and agricultural fields. Additionally, the functionality and sustainability of the floodplain would continue to be impeded and hindered by flood events, which is not in line with the PR&G Guiding Principles of Floodplain protection.

3.3.3 Economy

Future flood damage would impose ongoing costs to the local community to mitigate. Without action under this project, the local economic conditions would continue to bear the financial burden of flood damage, which is not in line with the PR&G Guiding Principle of Sustainable Economic Development.

3.3.4 Ecosystem Services

The provision of the three ecosystem services considered would continue to degrade if existing conditions were allowed to continue. More information on the forecasted conditions for the scoped ecosystem services is detailed in the Ecosystem Services Worksheet located in Appendix E.

Provisioning services would deteriorate as poor water quality during storm events may hinder proliferation of the instream fish species. Agricultural water would remain in similar quantities in the foreseeable future so no significant changes to cropping would occur. However, over time, long-term climate trends such as increased drought frequency may degrade the agriculture provisioning service.

Regulating services would remain in poor condition and would likely become more desperately needed in light of increased flood frequency predicted by long-term climate trends. Erosion and sedimentation into the waterways would continue in their current condition if no change were to occur. Wetlands would continue to serve as a natural buffer to catastrophe at their current levels. Overall, however, regulating services would be diminished in the study area should existing conditions continue.

Cultural services would also decline as public safety continues to be disrupted by flood events and the viewshed being cumulatively impacted by long-term and continued damages from flood events. Flood damage and their associated impacts on various ecosystem service categories would decrease the overall ecological viability of the area and diminish the ecosystem's functionality.

Additional information on future ecosystem services forecasts may be found in the Ecosystem Services worksheet located in Appendix E.

4 Formation of Alternatives

4.1 Alternative Formulation Process

Numerous action options were identified in the development of action alternatives to address the problems, opportunities, and purpose and need. The process of formulating alternatives was the basis for selecting combinations of options to include as the Proposed Action.

The alternative development process for this Plan-EA followed the procedures outlined in the NRCS NWPM (NRCS 2024) Parts 500 through 506 and NRCS National Watershed Program Handbook (NWPH) (NRCS 2014) Parts 600 through 606, Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies (U.S. Water Resources Council [USWRC] 1983), PR&G (USDA NRCS DM 9500-013, 2017) and other applicable NRCS watershed planning policies.

Conceptual flood prevention management measures were identified and presented to the public and interested agencies at a public scoping meeting. These measures were then screened for pairwise compatibility and combined into an initial array of alternatives. The initial array was then taken through two rounds of screening to arrive at the final array of alternatives.

An important component of alternative formulation is understanding how the entire PR&G planning framework fits into the process. The PR&G allows for the development of a wide array of alternative plans which are evaluated based on planning criteria (i.e., objectives, constraints, completeness, effectiveness, efficiency, acceptability, etc.) and which are linked to the scoped ecosystem services framework and six Guiding Principles of the PR&G. The ecosystem framework, when implemented, would allow for an alternative plan to be selected that brings about a social value through the improvement of the provision of the services in the watershed.

4.1.1 Guiding Principles

Alternatives were developed in accordance with the PL-566 Program guidelines to address the purpose and need and the following guiding principles of the PR&G (USDA-NRCS, pg. 21):

Healthy and Resilient Ecosystems: A primary objective is to identify alternatives that would protect and restore the ecosystem functionality by 1) avoiding adverse impact, then 2) minimization of impacts with mitigation of any unavoidable damage, and finally 3) full mitigation to offset environmental damage. Mitigation must be included in the alternative development, design, and costs.

Sustainable Economic Development: The alternatives should consider both the quantity and quality of water for both present and future generations as part of a larger economic and environmental evaluation to ensure that future projects are both economically feasible and sustainable for both the local and national best interests. The alternative should reduce uncertainty and risks, allowing a full range of adaptable management options to maintain the project feasibility in the future.

Floodplains: The alternatives must seek to avoid adverse impacts to flood prone areas and floodplains, and where possible improve floodplain sustainability and functionality.

Public Safety: DM 9500-013 states, “An objective of PR&G is to reduce the risks to people including life, injury, property essential public services, and environmental threats concerning air

and water quality." Public safety, and the improvement to public safety, using nonstructural and structural options must be considered.

Watershed-Scale Approach: This approach recognizes that there may be impacts both upstream and downstream of the study area and the applicable political or administrative boundaries. Under most conditions, it is necessary to evaluate the impacts beyond just a single hydrologic unit.

The PR&G mandates that a wide range of alternatives be developed including a No Action (FWOFI) Alternative, a Nonstructural Alternative (for flood prevention projects), a Locally Preferred Alternative, and an Environmentally Preferred Alternative (from NEPA). The locally and environmentally preferred alternatives. A more detailed description of each alternative required to be developed is provided below.

- No Action Alternative (FWOFI): This is the baseline against which all other alternatives are compared and evaluated. This is required by NEPA and should always be included as part of PR&G.
- Nonstructural Alternatives: These are alternatives that alter the use of existing infrastructure or human activities to avoid or minimize adverse changes to existing hydrologic, geomorphic, and ecological processes. They usually include modifications to public policy, regulatory policy, pricing policy, management practices, land cover practices, or the use of green infrastructure.
- Locally Preferred Alternative: This alternative is developed in cooperation with sponsors and local interests that have oversight or implementation authorities and responsibilities.
- Environmentally Preferable Alternative (from NEPA) and Least Environmentally Damaging Practicable Alternative (LEDPA) (USACE): An environmentally preferable alternative is required by the NEPA process. Additionally, if a Clean Water Act section 404 permit (any potential impacts to wetlands or waters of the United States) is required, the principles of LEDPA should be followed and complied with during the development of alternatives. This is best accomplished via the principles of first, avoidance, then, minimization, then, and only then, mitigation.
- Additional Alternatives: These are alternatives that are needed to address additional federal, state, or local concerns not addressed by the alternatives above.

4.1.2 Alternative Formulation Criteria

The sponsors, NRCS, and agency/public stakeholders adhered to the following alternative plan formulation process that included the following iterative phases:

- Phase I: Identification of deficiencies resulting from the watershed problem(s).
- Phase II: Formulation of potentially suitable management measures to address each identified deficiency.
- Phase III: Evaluation of pairwise compatibility for each measure against one another to form a viable alternative that addresses all problems, opportunities, and the purpose and need.
- Phase IV: Combination of the remaining measures into an initial array of alternatives.
- Phase V: First screening of the initial array against the Federal/Project Objectives and the Constraints.
- Phase VI: Second screening of the initial array against the ecosystem services and the Benefit-Cost Ratio (BCR)/Net Benefits.

- Phase VII: Identification of the Final Array of Alternatives

The PR&G plan criteria (DM9500-013, 6b(4)(a)) include completeness, effectiveness, efficiency, and acceptability. These criteria were used during the screening of the final array of alternatives as a metric to help identify the Preferred Alternative. These criteria, however, were used only as targets and not as formal screening criteria during the screening of the initial array of alternatives (which relies more on objectives, constraints, ecosystem services, and economic benefits).

4.1.3 Risk and Uncertainty

Risk and uncertainty are inherent in the watershed planning process (NRCS NWPM 2024 501.42B(1)(b)). Risk refers to those outcomes that can be described using well-known probability distributions and uncertainty refers to potential outcomes that cannot be described in objectively known probability distributions. Risk and uncertainty are inherent as they originate from the underlying variability of complex natural, social, and economic conditions.

It can be predicted that climate change plays the largest role in introducing risk and uncertainty into the project. Although it can be predicted that extreme weather events including drought and floods will increase over time, the exact frequency and intensity of these events cannot be known. Depending on the actual future conditions, the project/alternatives may be less effective at solving the identified problems. Other factors that introduce risk for this project include flood risks, water demand, and population growth in the area.

A 50-year project life was assumed for alternative costs and economic evaluations. A certain degree of risk and uncertainty is involved with estimating alternative costs and benefits. Decisions are made during the planning process with information that is uncertain, including errors in measurements and climatic changes that could alter rainfall storm events. Assumptions made are based on the best available science, technology, and information available. Alternative costs are estimated based on computed work quantities multiplied by an appropriate unit cost for that work and materials, which are based on current market prices from similar projects. The degree of risk and uncertainty is increased due to external factors including high market fluctuations in materials and construction as well as time delays between the planning process and construction. Unpredictable economic factors can increase costs and decrease the availability of materials.

The project's economic benefits are based on values of floodplain property, structures (residential and commercial), infrastructure, equipment, and services. It is difficult to predict future economic conditions, but these items are expected to become more valuable in the future.

4.1.4 Formulation Process

This subsection presents the formulation of alternatives in more detail, drawing upon the results of the seven-phase formulation criteria plan presented in Section 4.1.2. The full alternative formulation process is documented in the Alternative Formulation & Screening Matrix located in Appendix E.

4.1.4.1 Phase I: Identification of Deficiencies

In Phase I, the SLOs and stakeholders identified areas within the watershed that experience issues which are detailed in Section 2.2.1 and shown in Table 4-1.

Table 4-1 Identified Deficiencies

Number	Deficiency Description

1	Flooding at Locations in American Fork City
2	Flooding at Locations in Lehi City and Saratoga Springs City

4.1.4.2 Phase II: Formulation of Potentially Suitable Management Measures

Phase II identified potential management measures for each of the deficiencies identified in Phase I and qualitatively evaluated them for their suitability as a potential component of a fully fleshed out alternative plan. Certain measures were eliminated based on a variety of factors which are detailed in Section 4.3. A total of 12 potential management measures were carried forward for Phase III. The qualitative evaluation of all considered measures is documented in the Alternative Formulation & Screening Matrix located in Appendix E.

4.1.4.3 Phase III: Pairwise Compatibility of Each Measure

Phase III took each of the 12 potential management measures and screened them for pairwise compatibility that addresses all problems, opportunities, and the purpose and need to be combined into a full alternative plan. This project needed to combine enough measures to address the problem and opportunities in a single alternative plan. Most of the measures were compatible with one another as an alternative component. However, certain measures were only compatible with a particular set of measures (i.e., nonstructural measures) and so, warranted their carrying forward to generate other unique alternatives. Other measures were mutually exclusive. The full pairwise compatibility assessment is documented in the Alternative Formulation & Screening Matrix in Appendix E.

4.1.4.4 Phase IV: Combination of Measures into Initial Array of Alternatives.

Phase IV took each of the management measures deemed to be compatible with one another as a component/increment of a full alternative and identified a wide initial array of alternatives that each, in theory, addressed the project problem and opportunities. The initial array of alternatives is listed in Table 4-2.

Table 4-2 Initial Array of Alternatives

Alternative Name	Where Described in Plan-EIS
No Action/FWOFI Alternative	See Section 4.2.1
Flood Reduction Alternative	See Section 4.2.3
Property Buyouts Alternative	See Section 4.2.4
500-Year Storm Event Alternative	See Section 4.3

4.1.4.5 Phase V: First Screening of the Initial Array

Phase V includes the first screening of the initial array of alternatives against the following PR&G criteria:

A. The Federal Objective (see Section 2.1.1)
B. The Project Objectives (see Section 2.1.2)
C. The Project Constraints (see Section 2.1.3)

This screening was also qualitative and assessed the ability of each alternative to meet the project objectives and meet the avoidance/minimization criteria of the project constraints. The full

screening is documented in the Alternative Formulation & Screening Matrix in Appendix E. The results of the first screening are described in Table 4-3.

Table 4-3 Results of First Screening of Initial Array of Alternatives

Alternative	Carried Forward?	Rationale
No Action/FWOFI Alternative	Yes	Although this plan would not address the problems and opportunities, would not meet any objectives, and only meets half of the constraints, it would still be carried forward as it is required to be in the final array by NEPA and the PR&G.
Flood Reduction Alternative	Yes	This plan would meet all of the planning objectives and constraints, including the Federal Objective. Carried forward to the next screening.
Property Buyouts Alternative	Yes	This plan would not meet the erosion reduction objective or the property disruptions and sedimentation constraints. However, as it would address the problem of flooding through nonstructural measures and a nonstructural alternative is required in the final array under PR&G, this alternative was carried forward.
500-Year Storm Event Alternative	No	This plan would only meet a single project objective and would not meet the constraint of property disruptions due to the additional flooding it would likely generate in new locations. Not carried forward.

4.1.4.6 Phase VI: Second Screening of the Initial Array

Phase VI includes the second screening of the initial array of alternatives against the following criteria:

A. The Four Ecosystem Service Categories (provisioning, regulating, supporting, & cultural)
B. The Benefit-Cost Ratio (BCR) and Net Economic Benefits

This screening was both qualitative (ecosystem services) and quantitative (economics) and assessed the ability of each alternative to improve the provision of each ecosystem service category and meet the minimum BCR of 1.0 or higher. The full screening is documented in the Alternative Formulation & Screening Matrix in Appendix E. The results of the second screening are described in Table 4-4.

Table 4-4 Results of Second Screening of Initial Array of Alternatives

Alternative	Carried Forward?	Rationale
No Action/FWOFI Alternative	Yes	Although this alternative would not improve the delivery of any ecosystem services and would not meet the minimum BCR ratio of 1.0, it is still carried into the Final Array because it is required by NEPA and PR&G.
Flood Reduction Alternative	Yes	This plan would improve the delivery of all scoped ecosystem services in the watershed and

		would have a BCR far exceeding the minimum of 1.0. Carried forward to the Final Array of Alternatives.
Property Buyouts Alternative	Yes	This plan would only improve the provision of regulating and cultural ecosystem services and would not meet the minimum BCR of 1.0 due to the exorbitant cost to conduct property buyouts. However, a nonstructural plan is required to be included in the Final Array of Alternatives under PR&G, regardless of its feasibility. For this reason, it was carried forward into the Final Array of Alternatives.

4.1.4.7 Phase VII: Identification of the Final Array of Alternatives

The final plan formulation phase identified the Final Array of Alternatives based on the two screening processes conducted and also identified the:

- Environmentally Preferred/LEDPA Alternative (from NEPA), and
- the Locally Preferred Alternative (PR&G)

The Final Array of Alternatives is described in Section 4.4.

The alternatives in the final array were considered based on meeting the Project's purpose and need and these additional PR&G screening criteria —completeness, effectiveness, efficiency, and acceptability as described below.

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

4.2 Alternatives Considered

Analysis of the alternatives, including the No Action Alternative is required to determine feasible methods that can meet the project's purpose and need. Three alternatives were developed; the No Action Alternative, the Flood Reduction Alternative, and the Property Buyouts Alternative which addresses flooding issues along the waterways. Alternative cost estimates were developed to provide a level of detail judged appropriate for the purpose of identifying the National Economic Efficiency (NEE) Alternative between the alternatives considered. Project costs include installation costs (construction, engineering, permitting, and administration) for installing the project measures of improvement to be incurred after the project is authorized for installation.

4.2.1 Alternative 1 – No Action Alternative – FWOFI

The No Action Alternative describes the most likely future condition with no federal technical and/or financial assistance through the Watershed and Flood Prevention Operations (WFPO) Program. The No Action Alternative is required under NEPA to be included in the environmental analysis to compare with other alternatives by providing a reference to evaluate changes caused by the alternatives and determine the magnitude of benefits and adverse effects (40 CFR 1500-1508).

It consists of no improvements along the waterways, including neither concrete-lined nor unlined portions. No construction or permits would be required, nor would there be a need for on-going maintenance of constructed facilities. Existing conditions and trends would continue into the future. The cities would continue to experience flood damage and address issues on a case-by-case basis. Flood flows would pass through the same historic channels, waterways, and culverts with continuation of potential flooding and the associated risk to public health and safety, Routine operational and maintenance (O&M) activities by each respective city would continue, such as cleaning of the channels by removing debris and vegetation before spring runoff and anticipated large storm events and upkeep of culverts. The estimated annual O&M costs for all locations in American Fork City and Lehi City/ Saratoga Springs City is $8,600 and $28,900, respectively, for a total annual OM&R cost of $37,500 (assuming a discount rate of 2.75% with a 52-year period of analysis).

The No Action Alternative would not meet the purpose and need for the project. It would not achieve the Federal Objective to protect the environment or meet the six Guiding Principle (USDA-NRCS, 2017).

4.2.2 Alternative 2 – Proposed Action – Flood Reduction Alternative

The Flood Reduction Alternative is the Action Alternative which structurally addresses the flooding issues along the waterways in accordance with each city's design standards. The Alternative includes four locations in American Fork, three locations in Lehi City, and one location along lower Dry Creek that stretches between Lehi City and Saratoga Springs City.

This Alternative defines the watershed area that contain proposed project features as the following fifth-level watersheds - American Fork Canyon (1602020108) and Dry Creek-Jordan River (1602020110) Watersheds which start high in the Wasatch Mountains with tributaries ending at Utah Lake (Utah Lake Watershed - HUC 16020201) in Utah County, as shown in the various project maps in Appendix B. The total watershed area is approximately 118,200 acres.

Aligning with the purpose and need, the Flood Reduction Alternative includes four locations in American Fork City along the American Fork River and three locations in Lehi City along Dry Creek and Waste Ditch and one location along lower Dry Creek that stretches between Lehi City and Saratoga Springs City that would be included. See Map B-2, Appendix B for project locations. These project measures address flooding issues along the waterways. The Action Alternative's total installation cost is estimated at $16,207,000. See *Economics Investigations and Analysis Report* in Appendix E for cost estimate details and assumptions.

Hydrologic and hydraulic analyses were completed in accordance with NRCS requirements and standards to evaluate and verify that this alternative meets the purpose and need of the project. Ensuring that improvements do not cause induced flooding downstream was a major consideration in the evaluation. The analyses were reviewed by the study team to identify the locations that

needed replacement or rehabilitation due to the flooding events. Close coordination with NRCS was ongoing during the technical development of the alternatives. Technical Memos, *TM003 – Hydrology* and *TM005 – Hydraulic Analysis*, detail the analyses are found in Appendix D.

Project measures for channel improvements include two methods, an earthen channel or gabion baskets, to address flooding concerns and improve public safety along the waterways. It is less expensive to construct earthen channel improvements. However, each location was evaluated to select the most feasible solution that meets all the functionality and needs based on location and the space available for the necessary improvements to meet each city's design standards. Figure 4-1 shows the difference in space required between the earthen channel and gabion basket.

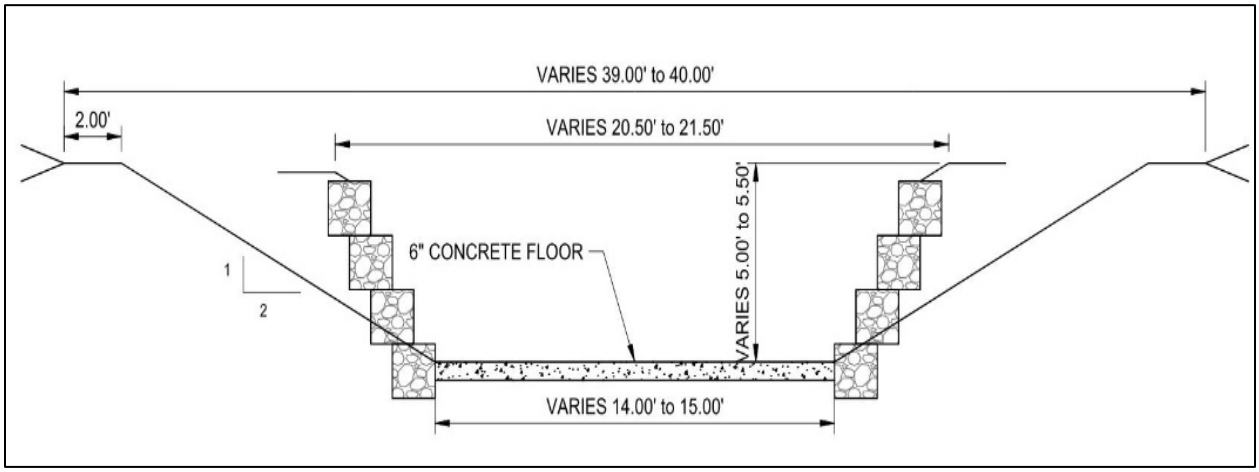

Figure 4-1 Earthen Channel vs. Gabion Basket Cross-Section.

4.2.2.1 Gabion Baskets

Gabion baskets or riprap would be used in locations where the easement or available width is constrained, typically within residential neighborhoods. See Figure 4-2 for a typical cross-section.

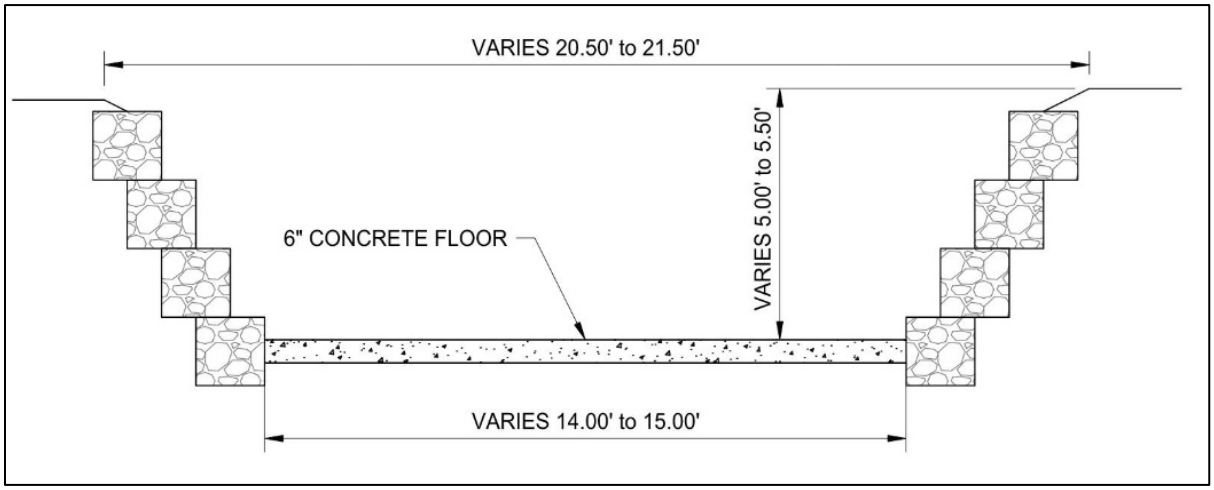

Figure 4-2 Gabion Basket Channel Cross-Section.

4.2.2.2 Earthen Channel

Earthen channels would be used in locations where channel width is not an issue such as in agricultural fields. See Figure 4-3 for a typical cross-section.

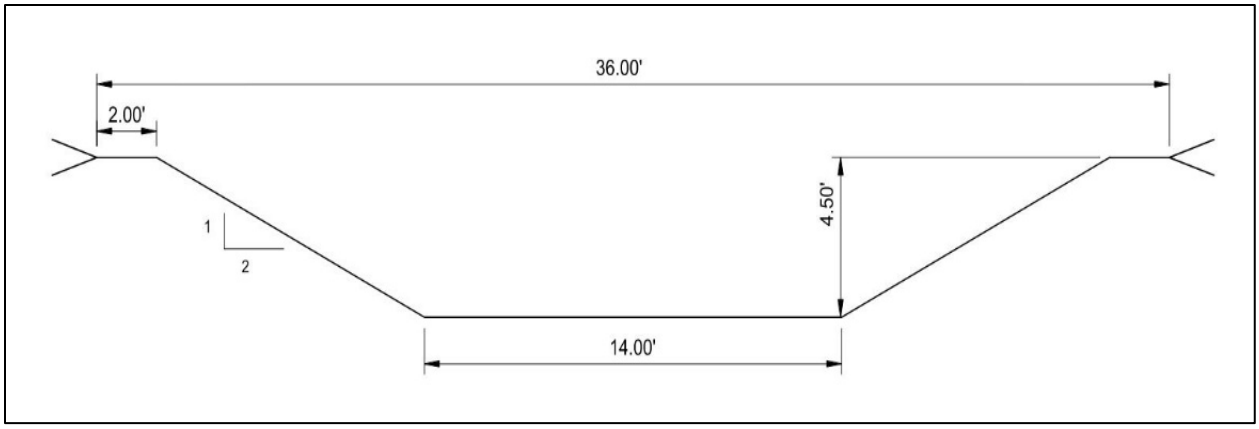

Figure 4-3 Earthen Channel Cross-Section.

The design standards for each city were used in determining which storm event to design for in addition to assessing the extent of project measures required. American Fork City designs its structures and improvements for the 100-year storm event. Lehi City and Saratoga Springs City design its structures and improvements for the 50-year storm event. Project measures proposed for each location are described below.

4.2.2.3 Location 1: Channel Improvements at 300 North in American Fork City

At this location, the upstream channel needs improvements to contain the flows and direct water to the existing box culvert under 300 North. The proposed improvements at this location include improving the embankments, constructing new upstream and downstream wing walls and a new concrete apron on the downstream side at the outlet to protect against erosion. The embankments would be armored with gabions or riprap to protect against erosion. These channel improvements would allow the 100-year flood to pass without any flooding upstream. See maps in Appendix B.

4.2.2.4 Location 2: Channel Improvements at 100 North and 200 East in American Fork City

Channel improvements are needed to contain the flows and direct water to the existing box culvert beneath the intersection of 100 North and 200 East. The proposed improvements include reconstructing the embankments and creating a new transition into the existing box culvert. The embankments would be armored with gabions or riprap to protect against erosion. These channel improvements would allow the 100-year flood to pass without any flooding upstream. See maps in Appendix B.

4.2.2.5 Location 3: Channel Improvements at 200 South in American Fork City

At this location, project measures would consist of removing energy dissipation baffle blocks that catch debris and cause backups in the channel. Riprap would be placed as erosion protection on the downstream banks instead of the baffle blocks. The existing culvert is anticipated to be replaced in the future under a separate action. Other channel improvements would include modifications to the channel slope and channel width. These channel improvements would allow the 100-year flood to pass without any flooding upstream. See maps in Appendix B.

4.2.2.6 Location 4: Channel Improvements at 400 South in American Fork City

At this location, the upstream channel needs improvements to contain the flows and direct water to the existing box culvert under 400 South. The proposed improvement includes widening the upstream channel and raising the riverbanks using gabions. These improvements would allow the passage of the 100-year flood and would prevent flooding the houses near the river. See maps in Appendix B.

4.2.2.7 Location 5: Upper Dry Creek in Lehi City

Additional capacity is needed at this project location by Lehi Elementary School to handle the 50-year flood flows. Existing culvert structures [36-inch corrugated metal pipe (CMP) in parking lot of Lehi Elementary School (Dry Creek) and a 48-inch CMP (Waste Ditch that runs through the playground/field area behind the school] would be replaced to provide more capacity and the downstream channel would be improved. Other channel improvements include gabion baskets. Implementation of the proposed improvements would contain flood water within the channel to reduce the flooding in the area surrounding Upper Dry Creek by nearly 100%. This flood reduction would prevent flooding of houses, roadways, and other critical infrastructure. See maps in Appendix B.

4.2.2.8 Location 6: Upper Waste Ditch in Lehi City

Additional capacity is needed at this project location to handle the 50-year flood flows. Existing structures would be replaced to provide more capacity, and the downstream channel would be improved. Proposed improvements provide near 100-percent flood reduction in this area and would prevent flooding of houses, roadways, and other critical infrastructure. See maps in Appendix B.

4.2.2.9 Location 7: Waste Ditch at Willow Park in Lehi City

Unimproved sections of Waste Ditch would be excavated and expanded to match the upstream capacity and an undersized box culvert at 300 North in Willow Park would be replaced. The downstream channel would be improved to provide more capacity. Proposed improvements provide nearly 100% flood reduction in this area and would prevent flooding of roadways and other critical infrastructure. See maps in Appendix B.

4.2.2.10 Location 8: Lower Dry Creek in Lehi City and Saratoga Springs City

Dry Creek through this area would be improved with a combination of channel clearing (dredging channel and restoring natural channel capacity) and gabion-lined channel sections. Proposed improvements provide near 100% flood reduction in this area and would prevent flooding of houses, roadways, and other critical infrastructure. See maps in Appendix B.

4.2.2.11 Conservation Practice Standards (CPS)

NRCS uses Conservation Practice Standards (CPS) for the conservation of soil, water, air, animals, and energy resources. The following CPS were incorporated in the projects' 30-percent design.

- CPS 468 – Lined Waterways or Outlet
- CPS 582 – Open Channel

4.2.2.12 Project Design Elements

Project Design Elements were developed as proactive environmental protection measures and best management practices (BMPs) that are considered part of the proposed project measures, which are aimed at avoiding or minimizing adverse impacts to the environment from project measures. They are based on the best management practices (BMPs) and standard operating procedures that have proven effective in similar circumstances and conditions. The elements detailed in Table 4-5 are considered an integrated part of the Alternative 2 – Flood Reduction Alternative.

Table 4-5 Project Design Elements.

Resource Area	Project Design Element
Air Quality 1	Soil within the study area would be sprayed with water (no chemicals, reclaimed production water, or oil field brine). The quantity of water used for dust control would be minimized to prevent water from leaving the site.
Air Quality 2	Procedures to reduce emissions during material transportation or handling may include wetting materials hauled in trucks, providing adequate freeboard (space from the top of the material to the top of the truck), or covering loads.
Air Quality 3	Stabilized construction exits would be established at appropriate locations to reduce soil track-out onto the adjacent roadway network. Procedures may include wheel washing or rattle plates to remove sediment prior to vehicle exit from the site.
Air Quality 4	Material stockpiles would be wet to prevent wind-blown emissions.
Air Quality 5	Vegetative cover would be established on bare ground as soon as possible after grading to reduce wind-blown dust.
Air Quality 6	Appropriate emission-control devices would be required for all construction equipment.
Air Quality 7	The use of cleaner burning fuels would be required.
Air Quality 8	Only properly operating, well-maintained construction equipment would be used.
Construction Staging and Access 1	Staging locations adjacent to roadways were identified by many of the site locations. The staging areas consist of disturbed vacant lands and would be used to store supplies, equipment, and materials during construction.
Cultural 1	If any human remains/funerary objects are encountered, all activity would stop. At all times, human remains must be treated with the utmost dignity and respect. Human remains and associated artifacts would be left in place and not disturbed. Law enforcement and the NRCS shall follow procedures described in the Prototype Programmatic Agreement with the Utah SHPO. For additional details see 36 CFR 800.13 and/or Title 190 Part 601.29.
Cultural 2	If cultural resources are inadvertently discovered, work must cease, the NRCS archeologist must be notified, and the NRCS shall follow procedures described in the Prototype Programmatic Agreement with the Utah SHPO.
Fish 1	Work in channels would occur during low- or no-flow conditions, outside of known June sucker *(Chasmistes liorus)* spawning seasons (May-June).

Resource Area	Project Design Element
Material Disposal 1	All waste and construction debris would be properly disposed of at an offsite permitted disposal location in accordance with local, state, and federal regulations.
Invasive Species 1	Equipment will be cleaned to remove noxious weeds/seeds and petroleum products prior to accessing project sites.
Invasive Species 2	Disturbed areas will be monitored for noxious and undesirable plant species during construction and will be controlled using approved methods and materials to prevent spread.
Invasive Species 3	The disturbed area would be reconstructed by using native topsoil, native seeds collected from grubbing and replacing organic matter.
Invasive Species 4	Fill materials would be free of waste, pollutants, and noxious weeds and seeds.
Paleontology 1	If any paleontological resources are discovered during the project implementation action, work must stop at that location. The NRCS State Geologist must be notified to evaluate the find.
Reclamation 1	Topsoil would be salvaged, stockpiled, and placed on the sides of the channel for native soil replacement. BMPs would restore soil temporarily disturbed.
Reclamation 2	Embankments would be seeded with an appropriate seed mix per NRCS Practice Standard 402 and coordination with the appropriate city.
Soils 1	Temporary erosion control measures such as the use of straw bales, straw wattles, silt curtains, or any other suitable methods, would be employed to minimize soil erosion. These would be removed at the end of the project.
Soils 2	After completion of the construction and restoration activities, disturbed areas would be smoothed, shaped, and contoured to as near pre-project conditions as practicable.
Soils 3	The disturbed areas would be seeded at appropriate times with weed-free, native seed mixes consisting of a variety of appropriate species to stabilize soils, reduce erosion, and appropriate for respective land use and soil conditions. This would help hold the soil around structures, prevent excessive erosion, and help maintain other riverine and riparian functions.
Water Quality 1	Fueling of machinery will occur in confined, designated upland areas to prevent spillage into waterways and wetlands. All fueling areas will have spill cleanup kits available. The project would comply with state and federal water quality standards and toxic effluent standards to minimize any potential adverse impacts from discharges to WOTUS.
Water Quality 2	A stormwater pollution prevention plan (SWPPP) would be prepared by the construction contractor prior to initiation of ground disturbance. The SWPPP would detail the BMPs and site-specific control features to prevent sediment and other pollutants from discharging off the site during construction. BMPs may include silt fences, fiber wattles, and earthen berms.
Water Quality 3	No construction materials or chemicals would be stockpiled or wasted in or near any waterways.

Resource Area	Project Design Element
Water Quality 4	Dedicated concrete wash-out areas would be used upland from water sources for any concrete clean-up operations. Concrete remnants would be legally disposed of off-site upon completion of all concrete operations.
Wildlife 1	Tree removal would be minimized as much as practicable. Construction limits would be flagged onsite to avoid unnecessary plant loss or ground disturbance. Disturbed vegetation/habitat would be restored as close as possible to pre-existing conditions on completion of the project.
Wildlife 2	Where practicable, vegetation would be removed during the fall and winter to avoid impacts during the breeding bird season (March 1 – August 31). If vegetation removal activities occur between March 1 and August 31, clearance surveys for migratory birds within 10 days prior by a qualified biologist would be required. Appropriate spatial and temporal buffers would be applied in coordination with USFWS.
Wildlife 3	All project personnel would be educated about the sensitive nature of the habitats, instructed to stay within the authorized project limits, and instructed on the specific avoidance and minimization measures implemented.
Wildlife 4	Sediment curtains would be installed at the outflows of Dry Creek and the American Fork River into Utah Lake during in-stream work for the respective channel to reduce erosion into the lake and to reduce the potential for June Suckers to enter the worksites.
Wildlife 5	Only water (no chemicals, reclaimed production water, or oil field brine) would be used for dust abatement measures.

4.2.3 Alternative 3 – Proposed Action – Property Buyouts Alternative

The Property Buyouts Alternative is nonstructural and involves acquisition of downstream properties within the 100-year inundation area and demolishing structures to prevent recurring flood damages. The impacted areas downstream of American Fork River, Dry Creek, and Waste Ditch were evaluated to determine the number of lands and damaged structures, including mobile homes, permanent homes, commercial buildings, and "other" (churches, schools, libraries, and government offices). Between American Fork and Lehi Cities this alternative would buyout 994 residences, 91 commercial businesses, and 4 public properties in the 100-year floodplain. Costs for such buyouts include the purchase of new property for the relocated items, the logistical labor, and material costs associated with relocation and constructing new facilities, and the demolition and cleanup of the existing improvements and structures. Costs to complete this have been estimated at two-times the current assessed value of the properties. Performing property buyouts for the affected properties in all three sub-basins would require costs of almost $394,346,259. Further, the demolition and cleanup of the existing properties and the new development of properties elsewhere create a larger impact on the environment and communities. Flood damage reduction benefits under this alternative would be equivalent to those under Alternative 2, at a significantly higher economic and environmental cost. By acquiring properties, the problem of flood prevention would be addressed, and the purpose and need of the project would be fulfilled. The PR&G requires full consideration and reporting of at least one nonstructural alternative in the final array of alternative plans for flood prevention projects.

4.2.4 Locally Preferred Alternative

Under the PR&G, it is required to identify an alternative plan that is locally preferred. This alternative was developed with sponsors and local interests that have oversight or implementation authorities and responsibilities. In the case of this project, the locally preferred alternatives in Alternative 2 – Proposed Action – Flood Reduction Alternative.

4.2.5 Environmentally Preferred Alternative

The NEPA process mandates that an environmentally preferred alternative be identified as a part of the planning process. Additionally, if a CWA Section 404 permit (any potential impacts to WOTUS) is required, the principles of the U.S. Army Corps of Engineers (USACE) Least Environmentally Damaging Practicable Alternative (LEDPA) should be followed and complied with during the development of alternative plans. LEDPA principles are best adhered to using the framework of first, avoidance, then, minimization, then, and only then, mitigation. Alternative 2 – Proposed Action – Flood Reduction Alternative is the environmentally preferable/LEDPA alternative for this Plan-EA.

4.2.6 National Economic Efficiency Alternative (NEE)

The NEE Alternative is not an independent option but is the alternative that reasonably maximizes economic, environmental, and social benefits. It is the alternative or combination of alternatives that reasonably maximizes the net economic benefit of the project consistent with protecting the Nation's environment with the least adverse impacts. The net economic benefit is the benefit minus the cost. The NEE Alternative for the project was determined to be the Action Alternative because it is the federally assisted alternative with the greatest economic benefit. See Chapter 5 for a summary and comparison of the alternatives. Alternative 2 –Flood Reduction Alternative is the NEE Alternative and is also the Preferred Alternative of the local sponsors for the following reasons:

- It provides flood reduction benefits and fulfills the project purpose and need.
- It has minimal impact on natural resources (see Chapter 5).
- It has the highest benefit to cost ratio of the alternatives considered (4.07).
- It maximizes net economic benefits consistent with protecting the nation's environment

4.3 Alternatives Considered but Eliminated from Detailed Study

This section describes the 500-year Storm Event Alternative, and the Floodproofing Alternative considered during the formulation process, but which was removed from detailed study due to varying factors including costs, feasibility, real property rights, and the PR&G screenings shown in detail in the Alternative Formulation & Screening Matrix in Appendix E.

4.3.1 Alternative 4 – Proposed Action – 500-Year Storm Event

This alternative evaluates channel improvements for the 500-year storm event for the waterways through the use of the hydraulic model, see *TM005 – Hydraulic Analysis*, in Appendix D. The projects in each of the cities were evaluated.

4.3.1.1 American Fork City

The American Fork River system and design of the proposed channel improvements included an analysis of designing to the 50-year and 500-year flood flow, see *TM005 – Hydraulic Analysis*, in

Appendix D. The hydraulic model determined approximate water levels resulting from these storm events. A preliminary analysis of channel improvements needed to contain the 500-year storm event was completed. The 500-year storm event would create a flow in the American Fork River of approximately 1,199 cfs, which is more than the 100-year storm flow of approximately 934 cfs. In order to contain the additional flow, it was estimated that the channel banks would have to be increased one foot higher than to contain the 100-year storm event. The channel improvements would also have to be extended upstream approximately 50 feet further than for the 100-year storm event for each improvement area. These additional improvements would decrease the potential flood area at an increased overall project cost.

American Fork City requires all city infrastructure projects (bridges, culverts, pipes, roadway crossings)that cross the American Fork River to be designed to the 100-year storm event. If the project were to be designed for the 500-year storm event instead of the 100-year event, the increased flood capacity of the improved sections would direct more water into the unimproved stretches of the river, causing greater damage and generating new flooding problems along the river during storm events. Along those same lines, designing to the 500-year storm event would not meet American Fork City's minimum design requirements and would leave these areas of concern at risk for additional flooding in the future. Due to the impracticality of the 500-year Storm Event Alternative and the potential for causing increased flooding in other areas, this alternative was not analyzed further.

4.3.1.2 Lehi City

Waste Ditch has seen significant improvements by developers in recent years as new subdivisions are built in the area. Dry Creek, however, runs through areas of the city that were developed several decades ago, and the channel has deficiencies. Due to high cost and impractical design requirements for flood flow containment, these segments of Dry Creek were not considered in the project. Modeling shows flooding would still occur in these areas, but the flooding was not induced by any included project measures nor was the flooding as extensive as the areas included in the project. The design of the proposed improvements for Dry Creek and Waste Ditch drainage systems included an analysis of both the 100-year and the 500-year storm event, in addition to the selected 50-year storm event. The hydraulic model determined the approximate water levels resulting from each of these storm events. A preliminary analysis of channel improvements needed to contain each storm flow was completed.

The 100-year storm event creates flows in Dry Creek of approximately 422 cfs and 632 cfs in Waste Ditch. Additionally, the 500-year storm event creates flows in Dry Creek of approximately 503 cfs and 754 cfs in Waste Ditch. The selected 50-year storm event creates flows in Dry Creek of approximately 369 cfs and 553 cfs in Waste Ditch. To contain the additional flow of the 100-year storm event, it was estimated the banks of the channel would need to be raised an additional 0.5 ft than what is required to contain the 50-year storm event. To contain the additional flow of the 500-year storm event, it was estimated the banks of the channel would need to be raised an additional 1.5 ft than what is required to contain the 50-year storm event. Additionally, the 500-year storm event approximately doubles each improvement area along the channel. These additional improvements decrease the potentially flooded areas but increase the overall cost of the project. Lehi City requires all city infrastructure (bridges, culverts, pipes, and roadway crossings) in Dry Creek and Waste Ditch to be designed to the 50-year storm event. If the project were to be designed to the 100-year or 500-year storm event instead of the 50-year event, the increased flood capacity of the improved sections would direct more water into the unimproved stretches of the

river, causing greater damage and generating new flooding problems along the river during storm events.

4.3.2 Floodproofing Alternative

To protect areas that are affected by flooding, individual properties could be floodproofed, or floodwalls could be constructed within the floodplain boundary. The area protected includes portions of the communities of American Fork and Lehi. Floodproofed structures would include 994 residences, 91 commercial businesses, and 4 public properties in the 100-year floodplain. Floodwalls would be required along roadways and developed areas throughout the floodplain. Floodproofing structures and several miles of floodwalls with dozens of penetrations would be required. This alternative is unreasonable because the community and environmental impacts are significantly greater than in other alternatives. Additionally, floodproofing structures is not feasible given the sheer amount of structures that would have to be floodproofed. If a nonstructural option is to be considered, relocation of properties makes more sense than floodproofing, although both plans present significant concerns related to economic and environmental impacts and feasibility. Due to the impracticality of both the 100-year and 500-year storm event and floodproofing alternatives, and the potential to increase flooding in other areas of Lehi, these alternatives were not investigated further. Designing the improvements based on the 50-year storm event meets Lehi City's requirements for the Dry Creek and Waste Ditch drainage systems and prevents increased flooding in other areas in Lehi City.

4.4 Final Array of Alternatives

The final array of alternative plans, or the alternatives considered in Section 4.2, are listed in tabular format below as described by NWPM 501.42(B)(4). The table also describes the ability of each alternative plan in the final array to meet the PR&G evaluation criteria of completeness, effectiveness, efficiency, and acceptability, which is the final screening of plans before a Preferred Alternative is selected. Table cells that are shaded in **Green** indicate that the alternative met the specified criteria, table cells that are shaded in **Red** indicate that alternative did not meet the specified criteria.

Table 4-6 Summary of Alternatives Preliminary Screening Evaluation

Plan Description	No Action/FWOFI	Flood Reduction Alternative	Property Buyouts Alternative
NEPA Purpose & Need	Does not meet the Purpose and Need.	Meets the Purpose and Need	Meets the Purpose and Need
Contribution to Planning Objectives	**No Action/FWOFI (Analytic Baseline)**	**Flood Reduction Alternative**	**Property Buyouts Alternative**
Objective 1 – Flood Control Problems	It would not address flood control infrastructure problems. Flood damage would not be prevented and would continue to occur. Objectives would not be met.	Flood risks would be significantly reduced at all identified locations in the study area as a result of the implementation of project measures. Objectives would be met.	Conducting property relocations in the study area would eliminate the risks of damage associated with flood events in the study area. Objectives would be met.

Objective 2 – Erosion Reduction	Would not address issues related to streambank erosion and/or sedimentation of waterways. Sedimentation would continue to occur. Objectives would not be met.	Streambank erosion and sedimentation problems would be reduced in the study area as a result of implementation of project measures. Objectives would be met.	Conducting property relocations would do nothing to prevent the issues related to streambank erosion and sedimentation. Existing conditions would continue. Objectives would not be met.
Objective 3 – Protect Public Safety	Would not protect or improve public safety conditions. Risks to life and structures associated with intense flood events would continue to occur. Objectives would not be met.	Public safety would be significantly improved in the study area as a result of the flood prevention measures implemented at the identified locations. Objectives would be met.	By relocating all residents, they would no longer experience risks and threats to public safety associated with flooding. Objectives would be met.
Response to Planning Constraints	**No Action/FWOFI**	**Flood Reduction Alternative**	**Property Buyouts Alternative**
Constraint 1 – Disruptions to Property	No construction would occur under this alternative, and so, disruptions to property would continue to occur as a result of flooding. Constraint would not be met.	This alternative would not disrupt any properties during implementation outside of unavoidable noise disruptions, which would be minimized with BMPs. Constraint would be met.	This alternative would require the purchasing and relocation of all properties/structures within the floodplain as a nonstructural solution to the problems. Constraint would not be met.
Constraint 2 – Cultural/Historic Site Impacts	By not installing any flood control infrastructure, no cultural or historic sites/properties would be damaged as a result of implementation. Constraint would be met.	This plan would not have any adverse impacts on any historic/cultural properties/sites as a result of construction. BMPs would be followed should a discovery be made. Constraint would be met.	This plan would not have any adverse impacts on any historic/cultural properties/sites as a result of implementation. Constraint would be met.
Constraint 3 – Sedimentation Impacts	No construction would occur under this alternative, and so, no improvement would be made to the sedimentation and erosion of banks. Constraint would not be met.	This alternative would reduce the amount of streambank erosion and sedimentation in the waterways in the study area. Constraint would be met.	This plan would not reduce the amount of streambank erosion and/or sedimentation in the waterways in the study area. Constraint would not be met.
Constraint 4 – June Sucker Impacts	No construction would occur under this alternative, and so, no impacts to the June Sucker would occur.	There would be no impact to the June Sucker during implementation and BMPs would be used to adhere to the conservation measures in	There would be no impact to the June Sucker during implementation and BMPs would be used to adhere to the conservation measures in

			the BA. Constraint would
Contribution to Ecosystem Services	**No Action/FWOFI**	**Flood Reduction Alternative**	**Property Buyouts Alternative**
Provisioning Services	Habitat for instream fish species would continue to be degraded during flood events. Agricultural water would be delivered at a similar level to the current levels unless impacted by increased drought frequency.	The water quantity would not change. Water quality may improve providing better habitat for native fish species. The area would become more resilient to long-term climate trends, safeguarding agricultural production in the area.	degraded during flood events. Long-term climate agricultural production in
Regulating Services	The study area would continue to experience flooding, and the damage associated with it. Riverbanks would continue to be vulnerable to bank erosion and sediment deposition into the water. WOTUS would continue in their current condition.	There would be significant flood damage reduction improvements by 504 structures. Riverbanks would be stabilized with gabions or rock lining to reduce erosion and sediment deposition. Better conveyance of flows would be provided to reduce flooding and provide a more sustainable habitat for fish and wildlife.	the floodplain would damage to structures and the by the flooding. However,
Cultural Services	No changes would occur to the visual aesthetics, ecosystem quality/viability or public safety conditions.	As part of riverbank stabilization and channel improvements, the aesthetics may change with the removal of trees and vegetation. Reduced visual appeal may occur to residents in the floodplain. Reduction of flooding provides better public safety conditions and greater peace of mind to residents during flood events. The ecosystem quality would also improve as there would be reduced erosion and sediment depositions.	Buyout and removal of structures in the floodplain The safety of the public quality would not be improved under this
Supporting Services	Evaluated as an intermediate service.	Evaluated as an intermediate service	Evaluated as an intermediate service.
Results of Economic Analysis	**No Action/FWOFI**	**Flood Reduction Alternative**	**Property Buyouts Alternative**
Benefit-Cost Ratio	0	4.07	0.51
Net Annual Project Benefits	$0	$2,013,390	-$7,210,215
Response to Evaluation Criteria	**No Action/FWOFI**	**Flood Reduction Alternative**	**Property Buyouts Alternative**

Completeness	This alternative would not constitute a complete alternative as no problems would be addressed.	This alternative would account for all necessary investments to achieve the planned effects. Constitutes a complete solution.	This alternative would account for all necessary investments to achieve the planned effects. Constitutes a complete solution.
Effectiveness	This alternative would not constitute an effective solution as no problems would be solved and no objective would be met.	This alternative would address all the identified problems and meet all of the project objectives to constitute an effective solution.	This alternative, while addressing the problem, would not meet all the project objectives, thus it does not constitute an effective solution.
Efficiency	This alternative would not cost anything to implement and so would constitute a cost-efficient solution.	This alternative is the NEE alternative and has net positive benefits and a BCR of 4.07. This alternative constitutes an efficient solution.	This alternative does not have net positive benefits and a BCR of 0.51 due to the exorbitant cost of $394,346,259 to conduct property buyouts in the floodplain. It is not an efficient solution.
Acceptability	This alternative would not be acceptable or consistent with existing Federal laws as it would not protect the environment and would not address any of the problems in the watershed.	This alternative would comply with all Federal and State regulatory frameworks and is the environmentally preferred alternative to NEPA and the locally preferred alternative. The problems in the watershed would be addressed. This alternative constitutes an acceptable solution.	This alternative would not be acceptable as it is highly unlikely that property buyouts could be conducted on an entirely voluntary basis, requiring the use of eminent domain to accomplish it. This alternative does not constitute an acceptable solution.

5 Environmental Consequences: Evaluation of Alternatives

The NRCS has a responsibility under NEPA to consider the potential effects on the environment that may result from implementation of the alternative plans. This Plan-EA includes the No Action (FWOFI) and the Flood Reduction Alternatives. Unless otherwise stated, the existing conditions would be assumed to continue under the No Action Alternative (FWOFI). This chapter describes the potential effects and cumulative impacts of the alternatives within each resource category, as their existing conditions were defined in Chapter 3. Consistent with CEQ regulations (CEQ, 2020), effects and impacts are used synonymously.

5.1 Summary and Comparison of Alternatives-Planning Process

Table 5-1 below compares how well the No Action Alternative (FWOFI), Flood Reduction Alternative, and Property Buyouts Alternative resolve the identified problem of Flood Prevention. Each alternative is evaluated in comparative form in substantial and equal detail.

Table 5-1 Summary and Comparison of Alternatives – Planning Process

Item or Concern	No Action (FWOFI)	Flood Reduction Alternative	Property Buyouts Alternative
Alternative Major Features/Works of Improvement by Authorized Purpose			
Flood Prevention			
Deficiency 1 – Flooding & Erosion Problems in American Fork City	This alternative would not address the problem of Flood Prevention and would not address this deficiency.	This alternative would address this deficiency through structural measures. These would include various channel improvements at 300 North, 100 Nort/200 East, 200 South, and 400 South in American Fork City.	This alternative would address this deficiency through a nonstructural management measure. This measure would include the conducting of property buyouts and relocations for structures in the floodplain in American Fork City at an estimated cost of $394,346,259.
Deficiency 2 – Flooding & Erosion Problems in Lehi & Saratoga Sprins Cities	This alternative would not address the problem of Flood Prevention and would not address this deficiency.	This alternative would address this deficiency through structural measures. These would include various channel improvements to Upper & Lower Dry Creek, Upper Waste Ditch, & a segment of Waste Ditch at Willow Park in both	This alternative would address this deficiency through a nonstructural management measure. This measure would include the conducting of property buyouts and relocations for structures in the floodplain in Lehi City at an estimated cost of $394,346,259.

Item or Concern	No Action (FWOFI)	Flood Reduction Alternative	Property Buyouts Alternative
		Lehi & Saratoga Springs Cities.	
Project Objectives			
Green indicates the objective was met; **Red** indicates it was not. More detail can be seen in Table 4-6 of this Plan-EA			
Federal Objective (PR&G)	NO	YES	YES
Objective 1 – Flood Control	NO	YES	YES
Objective 2 – Erosion Reduction	NO	YES	NO
Objective 3 – Public Safety	NO	YES	YES
Constraints			
Green indicates the constraint was met; **Red** indicates it was not. More detail can be seen in Table 4-6 of this Plan-EA			
Constraint 1 – Property Disruptions	NO	YES	NO
Constraint 2 – Cultural Site Impacts	YES	YES	YES
Constraint 3 – Sedimentation Impacts	NO	YES	NO
Constraint 4 – June Sucker Impacts	YES	YES	YES
Evaluation Criteria			
Green indicates the criteria that was met; **Red** indicates it was not. More detail can be seen in Table 4-6 of this Plan-EA			
Completeness	NO	YES	YES
Efficiency	YES	YES	NO
Effectiveness	NO	YES	NO
Acceptability	NO	YES	NO

5.2 Summary and Comparison of Alternatives-Ecosystem Services

Ecosystem service flow impacts for the No Action (FWOFI) were projected assuming that current conditions/trends would continue to occur for the entire period of analysis while considering all reasonably forecasted future conditions within the watershed. Table 5-2 below compares how well the No Action Alternative (FWOFI), Piping Alternative, and Lining & Buyouts Alternative impact the ecosystem service flows in the watershed as well as how they meet the Guiding Principles of the PR&G.

Table 5-2 Summary and Comparison of Alternatives – Ecosystem Services Tradeoff

Criterion	No Action (FWOFI)	Flood Reduction Alternative	Property Buyouts Alternative
Alternative I.D.			
Locally Preferred	NA	X	NA
Nonstructural	NA	NA	X
Environmentally Preferred	NA	X	NA
National Economic Efficiency	NA	X	NA
Preferred Alternative	NA	X	NA
Guiding Principles			
The alternative marked with X and colored **green** is the plan that best meets the specified Guiding Principles of the PR&G			
Healthy/Resilient Ecosystems	NA	X	NA
Sustainable Economic Devel.	NA	X	NA
Floodplains	NA	X	NA
Public Safety	NA	X	NA
Watershed Approach	NA	X	NA
Ecosystem Services Effects			
The alternatives colored **green** indicates improvement in Service provision, red indicates impairment.			
Provisioning Services			
Instream Fish Species (Non-Monetized)	NO	YES	NO
Regulating Services			
Flood Control (Monetized – Damage Reduction Benefit)	NO	YES	YES
Water Quality (Non-Monetized)	NO	YES	NO
Wetlands/WOTUS (Non-Monetized)	NO	NO	NO
Cultural Services			
Aesthetic Value of Watershed (Non-Monetized)	NO	YES	NO
Public Safety (Non-Monetized)	NO	YES	NO
Ecosystem Viability (Non-Monetized)	NO	YES	NO
Supporting Services			

Criterion	No Action (FWOFI)	Flood Reduction Alternative	Property Buyouts Alternative
Not Evaluated in this Plan-EIS	NA	NA	NA
Economic Analysis			
Costs			
Total Project Investment	$0	$16,207,000	$394,346,259
Annual Project Investment	$0	$619,300	$14,606,948
Annual OM&R Costs	$37,500	$37,500	$0
Total Annual Project Costs	$37,500	$656,800	$14,606,948
Monetized Benefits for Ecosystem Services			
Provisioning	Not Monetized in Plan	Not Monetized in Plan	Not Monetized in Plan
Regulating	$0	$2,670,190	$2,670,190
Cultural	Not Monetized in Plan	Not Monetized in Plan	Not Monetized in Plan
Supporting	Not Monetized in Plan	Not Monetized in Plan	Not Monetized in Plan
Total Annual Monetized Benefits	$0	$2,670,190	$7,396,733
Total Annual Monetized Costs	$37,500	$656,800	$14,606,948
Benefit-Cost Ratio	0.0	4.07	0.51
Annual Monetized Net Benefit	$0	$2,013,390	-$7,210,215
Regional Economic Development/Economic Impact Assessment	Not Performed for this Plan-EA		
Regional Employment	NA	NA	NA
Regional Income	NA	NA	NA
Regional Impacts (Other)	NA	NA	NA

5.3 Effects of Individual Alternatives Relative to Resource Concerns

Effects can be differentiated by direct, indirect, and cumulative and have adverse or beneficial effects over time. Direct effects would be caused by implementation of an Action Alternative and indirect effects would be caused by implementation at a later time. The cumulative effects describe the effects of the project when added together for the reasonably foreseeable future. The terminology used to describe effects or impacts are shown in Table 5-3

Table 5-3 . Effects/Impacts Type.

Effects/Impacts Type	Description
Direct	Effects caused by an action and occurring at the same time and place (40 CFR §1508.8).
Indirect	Effects caused by an action that is later in time or farther removed in distance but are still reasonably foreseeable (40 CFR §1508.8). Indirect effects are generally less quantifiable but can be reasonably predicted to occur.
Cumulative	Effects on the environment that result from the incremental effect of an action when added to the effects of other past, present, and reasonably foreseeable future actions, regardless of what agency (federal or non-federal) or person is undertaking such other actions (40 CFR §1508.7).

Impacts may be temporary or permanent. Temporary impacts are those that are not lasting, and the affected resource would be expected to return or be restored to its pre-project state. Permanent impacts are those in which the affected resource would not return to its pre-project state but would remain in the affected condition indefinitely. Impacts on a resource can be beneficial or adverse over the short- or long-term. For this evaluation, short-term impacts are those that last for the duration of construction and shortly thereafter; this is estimated to be 2 years based on the time for vegetation to establish on reseeded areas. Long-term impacts are those that last for an extended duration of time. For this evaluation, long-term impacts are considered to be up to 50 years, based on the design life of the project measures. The terminology used to describe the durations is shown in Table 5-4.

Table 5-4 Effect/Impact Duration.

Duration	Description
Temporary and Permanent	Temporary impacts are not lasting, and the affected resource would return or be restored to its pre-project state. Permanent impacts are lasting, and the affected resource would not return to its previous state within one's lifetime.
Short- and Long-Term	Short-term impacts last during the duration of construction and shortly after (duration of impact is approximately 2 years). Long-term impacts last for an extended duration of time (beyond year 2 up to the evaluated life of the project (52 years).

The intensity for which impacts can have on resources are described in Table 5-5.

Table 5-5 Effect/Impact Intensity.

Intensity	Description
No Impact	Resource conditions would not change.
Negligible	Resource conditions changes would be so slight there would be no measurable or perceptible consequence to the resource.
Minor	A small measurable effect on the resource, but localized, small, and of little consequence to the resource. Mitigation measures, if needed to offset adverse

Intensity	Description
	effects, would be easily implemented and successful based on knowledge and experience.
Moderate	A measurable effect to the resource from the alternative actions. Mitigation measures would likely be needed to offset adverse effects and could be extensive, moderately complicated to implement, and probably successful based on knowledge and experience.
Substantial	A large, measurable effect on the resource from the alternative actions. Mitigation measures would be needed to offset adverse effects and could be extensive and complicated to implement.

If an Action Alternative will not cause direct or indirect impacts or has minimal impacts of short duration, it will not contribute to a cumulative effect on that resource. Cumulative effects are changes to the environment caused by the combined impact of the Action Alternative when added to other past, present, and reasonably foreseeable future human activities and natural processes. It takes all actions, associated disturbances, and the compounding effects on a resource, ecosystem, or human community into account over time.

Environmental impacts that could result from the implementation of any alternative are quantified for each resource where possible. In the absence of quantifiable data, the professional judgment of knowledgeable sources was used. Impacts may be described using ranges of potential impacts or in qualitative terms, if appropriate.

5.3.1 Soil Resources

5.3.1.1 Alternative 1 – No Action – FWOFI Alternative

Under the No Action Alternative, erosion in the channels would continue and the soil would continue to erode away. The study area would remain susceptible to soil loss, loss of topsoil productivity, and exposure to erosion, especially during flood events. The impact on the soil is therefore expected to be long-term and potentially permanent if no solutions are implemented in the future. Thus, the magnitude of impacts for this resource would be:

- Type: Direct
- Duration: Permanent/Long-Term
- Intensity: Moderate

5.3.1.2 Alternative 2 – Proposed Action – Flood Reduction Alternative

There would be a direct impact to soil within the study area due to construction activities. Ground disturbance of up to 1.65 acres in American Fork City and 21.14 acres in Lehi City of native soils would result from implementation of the Action Alternative. The area of disturbance would be susceptible to soil loss, vegetation removal and mixing of soils, loss of topsoil productivity, soil compaction, and increased exposure for erosion. Over time, soil loss would likely diminish as soil gradually becomes revegetated or reclaimed. The impact on the soil is therefore expected to be temporary. Furthermore, the use of gabions in Lehi City would be similar to gabions used historically by the city. The gabions would be PVC coated to extend their life span to 30 years, and possibly beyond. Thus, the magnitude of impacts for this resource would be:

- Type: Direct
- Duration: Temporary/Short-Term
- Intensity: Minor

5.3.1.3 Alternative 3 – Proposed Action – Property Buyouts Alternative (Nonstructural)

While there would be no construction under this alternative, as it is a nonstructural solution, there would still be direct impacts to soils within the study area. Streambank erosion in the channels would continue and the soil would continue to erode away. The study area would remain susceptible to soil loss, loss of topsoil productivity, and exposure to erosion, especially during flood events. The impact on the soil is therefore expected to be long-term and potentially permanent if no additional solutions are implemented in the future. Thus, the magnitude of impacts for this resource would be:

- Type: Direct
- Duration: Permanent/Long-Term
- Intensity: Moderate

5.3.2 Water Quality

5.3.2.1 Alternative 1 – No Action – FWOFI Alternative

The No Action Alternative would have no effect on current water quality conditions. Under the No Action Alternative, there would be no effect on water quality due to no changes to the current conditions. Since no construction would occur, there would be no new construction-related water quality impacts. Potential sedimentation water quality impacts would continue to occur. Thus, the magnitude of impacts for this resource would be:

- Type: Indirect
- Duration: Permanent/Long-Term
- Intensity: Minor

5.3.2.2 Alternative 2 – Proposed Action – Flood Reduction Alternative

Construction of the Action Alternative would disrupt soils, which could potentially lead to increased erosion and sedimentation of the disturbed soils into the waterways, thereby temporarily impacting surface water flows and increasing pollution of surface waters. A SWPPP would be prepared prior to installation of ground disturbance per design element Water Quality 2 to reduce sedimentation and the risk of pollution to surface waters during construction. The plan would detail the BMPs and site-specific measures to prevent sediment and other pollutants from discharging into surface waters during construction. Seeding disturbed areas after construction would also reduce erosion and sedimentation in the long-term. The impact on water quality is therefore expected to be temporary. The current sedimentation into the waterways during flood events would be largely mitigated for the long-term following construction. Thus, the magnitude of impacts for this resource would be:

- Type: Direct Impact and Indirect Benefit
- Duration: Temporary/Short-Term Impact and Permanent/Long-Term Benefit
- Intensity: Minor Impact and Minor Benefit

5.3.2.3 Alternative 3 – Proposed Action – Property Buyouts Alternative (Nonstructural)

The Property Buyouts Alternative would have no effect on current water quality conditions. Under the nonstructural plan, there would be no changes to the current conditions. Since no construction would occur, this being a nonstructural solution, there would be no new construction-related water quality impacts. Potential sedimentation water quality impacts would continue to occur. Thus, the magnitude of impacts for this resource would be:

- Type: Indirect
- Duration: Permanent/Long-Term
- Intensity: Minor

5.3.3 Floodplain Management

5.3.3.1 Alternative 1 – No Action – FWOFI Alternative

Under the No Action Alternative, there would be a continuation of existing land use and management. There would be no changes to the current conditions, and they would not provide any flood prevention measures. Flooding would continue to occur within the floodplain in American Fork, Lehi, and Saratoga Springs cities. Damages to structures in the floodplain would continue to occur. Thus, the magnitude of impacts for this resource would be:

- Type: Direct
- Duration: Permanent/Long-Term

5.3.3.2 Intensity: Substantial Alternative 2 – Proposed Action – Flood Reduction Alternative

All of the Action Alternative's improvements would be constructed for flood prevention purposes and are anticipated to provide long-term beneficial impacts due to decreased risk to life and property from flood events. An analysis was performed to determine flood extents for the conditions post project for a 24-hour event for the 10-, 25-, 50-, 100-, 200-, 500- year flood events. Refer to Appendix C – Maps C1 through C10 for flood inundation extents in American Fork City and Maps C11-C31 for Lehi and Saratoga Springs cities. The post project 10-year and 25-year storm event inundation maps were not created due to their similar mapping to the 50-year storm event. The proposed improvements would result in significant reduction of flooding Additionally, there would not be any locations that would experience induced flooding as a result of the alternative's implementation. . Details on the flooding for the three areas are identified below, including the magnitude of impacts for each location.

American Fork City

The conditions after the proposed improvements contain the majority of the 100-year storm even within the river and there is no induced flooding downstream of I-15. The total of inundated structures for the 100-year storm event with proposed improvements is reduced to one residential home, 10 commercial buildings (located downstream of I-15), and one other building. Thus, the magnitude of impacts in American Fork City for this resource would be:

- Type: Direct Benefit
- Duration: Permanent/Long-Term
- Intensity: Substantial Benefit

Lehi City – Upper Dry Creek and Waste Ditch

The conditions after the proposed improvements successfully provide protection for the 50-year storm event, and significant improvements for the 100-year storm event. The total of inundated structures for the 50-year storm event with proposed improvements is reduced to 620 residential homes, 36 commercial buildings, 3 school buildings (which include Lehi Elementary School buildings), and 8 other structures. Thus, the magnitude of impacts in Lehi City – Upper Dry Creek and Waste Ditch for this resource would be:

- Type: Direct Benefit
- Duration: Permanent/Long-Term
- Intensity: Substantial Benefit

Lehi City/Saratoga Springs City – Lower Dry Creek

The conditions after the proposed improvements would remove all mentioned residential homes and other structures from flooding the 50-year storm event. The proposed improvements also provide significant flood protection during higher flood events; for example, the 100-year storm event reduces the number of inundated residential homes to 10. Thus, the magnitude of impacts in Lehi City/Saratoga Springs City – Lower Dry Creek would be:

- Type: Direct Benefit
- Duration: Permanent/Long-Term
- Intensity: Substantial Benefit

5.3.3.3 Alternative 3 – Proposed Action – Property Buyouts Alternative (Nonstructural)

The Property Buyouts Alternative is being considered as a fully nonstructural solution to the flood prevention problems and is anticipated to provide long-term beneficial impacts due to decreased risk to life and property from flood events that would result from conducting property buyouts/relocations. The relocations would be conducted for structures within the floodplain and would eliminate the possibility of damage and risk to life due to flooding. This option would be costly, however, with an expected cost of approximately $394,346,259. There would be no ecological protection of the floodplain, but the risks associated with flood events, which would continue, would be eliminated, significantly improving conditions for this resource concern at all locations. Thus, the magnitude of impacts at all three locations for this resources would be:

- Type: Direct Benefit
- Duration: Permanent/Long-Term
- Intensity: Substantial Benefit

5.3.4 Special Aquatic Sites/WOTUS

5.3.4.1 Alternative 1 – No Action – FWOFI Alternative

The No Action Alternative would not impact WOTUS. All current delineated aquatic sites/WOTUS, assumed to be jurisdictional during the planning process and to be formally delineated during the design/permitting phase, would remain in their current condition but could potentially sustain damage during intense flood events. Damage would reduce the ecological viability of the study area, which is an identified regulating ecosystem service in the watershed. Thus, the magnitude of impacts for this alternative would be:

- Type: Indirect (continued impacts)
- Duration: Permanent/Long-Term (continued impacts)

- Intensity: No Impact (continued impacts)

5.3.4.2 Alternative 2 – Proposed Action – Flood Reduction Alternative

Under the Action Alternative, construction could temporarily impact surface water flows in the American Fork River, Dry Creek, and Waste Ditch. Construction would be completed during the late summer through winter months when there are historically low or no flows in the channels. Construction would occur during low flow periods (less than 10 cfs) using coffer dams to dewater the channels to route water to the opposite side of the channel from where work is occurring. Sump pumps may also be used for dewatering as needed throughout the construction process. Within Lehi City, water would be diverted into either Dry Creek or Waste Ditch while work is occurring in the other waterway to reduce flows. Where gabions are being installed, the improvements would include excavating to expand the channel prior to placing the gabions thereby maintaining or increasing the current channel capacity. The amount of sediment created would be minimal and would not add fill to the channels below the ordinary high-water (OHW) mark. The cross section of the channels would be permanently reshaped but would not have negative impacts on the actual flows. Table 5-6 identifies the temporary and permanent impacts to the waterways.

Table 5-6 Impacts to Waterways

Waterway	Temporary Impact	Permanent Impact
American Fork River	2,716 linear feet (0.73 acres)	1,000 linear feet. Channels will permanently be reshaped below the OHW
Waste Ditch	2,896 linear feet (0.72 acres)	1,829 linear feet (0.45 acres). Channels will permanently be reshaped below the OHW
Dry Creek	13,811 linear feet (2.46 acres)	6,070 linear feet (1.08 acres). Channels will permanently be reshaped below the OHW
Utah Lake (where Dry Creek terminates)	134 linear feet (0.24 acres)	No Permanent Impact

It is assumed that the waterways are jurisdictional due to the location and connectivity to Utah Lake and Jordan River, a tributary to the Great Salt Lake. USACE provides the final determination for jurisdictional waters. CWA Section 404 permits would be acquired prior to construction within jurisdictional waters. It is anticipated that a single Section 404 nationwide permit would be submitted to USACE, with each waterway being looked at as a separate and distinct location. Operation and maintenance activities would be authorized under the maintenance conditions of the permits. As shown in the Table 5-6 above, there would be both temporary and permanent impacts to waterways/aquatic sites within the study area as a result of implementation of this plan. Thus, the magnitude of impacts for this resource concern would be:

- Type: Direct Impacts
- Duration(s): Temporary and Permanent Impacts
- Intensity: Negligible (Temporary Impacts) and Minor (Permanent Impacts)

5.3.4.3 Alternative 3 – Proposed Action – Property Buyouts Alternative (Nonstructural)

Under the Nonstructural Alternative, all current delineated aquatic sites/WOTUS, assumed to be jurisdictional during the planning process and to be formally delineated during the design and permitting phase, would continue to exist in their current condition but could potentially sustain

damage during intense flood events. Damage would reduce the ecological viability of the study area, which is an identified regulating ecosystem service for the watershed. Thus, the magnitude of impacts for this alternative would be:

- Type: Indirect (continued impacts)
- Duration: Permanent/Long-Term (continued impacts)
- Intensity: No Impact (continued impacts)

5.3.5 Regional Water Resource Plans

5.3.5.1 Alternative 1 – No Action – FWOFI Alternative

Under the No Action Alternative, there would be a continuation of existing conditions for compliance with applicable regional water management plans. The watershed would continue to fail to meet all the goals outlined in the plans identified in Chapter 3. Thus, the magnitude of impacts for this resource concern would be:

- Type: Indirect (continued impacts)
- Duration: Permanent/Long-Term (continued impacts)
- Intensity: No Effect (continued impacts)

5.3.5.2 Alternative 2 – Proposed Action – Flood Reduction Alternative

The Action Alternative would help the watershed comply with regional water management plans and goals outlined in the plans identified in Chapter 3. Although this action alone may not provide full compliance with every goal or aspect of the plans, it will improve environmental conditions and help to promote full compliance with the plans. Thus, the magnitude of impacts for this resource concern would be:

- Type: Cumulative Benefit
- Duration: Permanent/Long-Term
- Intensity: Minor Benefit

5.3.5.3 Alternative 3 – Proposed Action – Property Buyouts Alternative (Nonstructural)

Under the Property Buyouts Alternative, flooding in the study area would not improve; however, the relocations would significantly reduce the damage and risks associated with the flooding. Although there would be improvements to the conditions for residents, there would be no increased compliance with the regional water resource plans identified in Chapter 3. Thus, the magnitude of impacts for this resource concern would be:

- Type: Indirect (continued impacts)
- Duration: Permanent/Long-Term (continued impacts)
- Intensity: No Effect (continued impacts)

5.3.6 Air Quality

5.3.6.1 Alternative 1 – No Action – FWOFI Alternative

Under the No Action Alternative, there would be no change to the existing air quality conditions around the study area. Thus, the magnitude of impacts for this resource concern would be:

- Type: None
- Duration: None

- Intensity: No Effect

5.3.6.2 Alternative 2 – Proposed Action – Flood Reduction Alternative

The Action Alternative would have temporary effects on air quality during construction localized near the construction areas. Dust from ground disturbance and emission of fumes from construction equipment is expected for the short-term during implementation of the Action Alternative, however, the magnitude of effects would be reduced as a result of implementing BMPs. Pollutants such as $PM_{2.5}$, CO, SOx, NOx, and other greenhouse gases would be generated from heavy-duty diesel engines used by construction equipment. PM_{10} emissions would come mainly from the dust created from demolition, land clearing, ground excavation, cut-and-fill operations, and road works. Construction emissions are greatest during the earthwork phases because of the dust associated with this activity. Fugitive dust could also be produced by winds blowing through the construction site and by trucks carrying uncovered loads. Additionally, mud tracked out onto paved roads leading to and from the construction site would be a source of fugitive dust (i.e., road dust) after it dries. Thus, the magnitude of impacts for this resource concern would be:

- Type: Direct
- Duration: Temporary/Short-Term
- Intensity: Negligible Impacts

5.3.6.3 Alternative 3 – Proposed Action – Property Buyouts Alternative (Nonstructural)

Under the Nonstructural Alternative, there would be no change to the existing air quality conditions around the study area. Thus, the magnitude of impacts for this resource concern would be:

- Type: None
- Duration: None
- Intensity: No Effect

5.3.7 Threatened and Endangered Plant and Animal Species

5.3.7.1 Alternative 1 – No Action – FWOFI Alternative

Under the No Action Alternative, there would be no impact to federally listed species or critical habitat. Thus, the magnitude of impacts for this resource concern would be:

- Type: None
- Duration: None
- Intensity: No Effect

5.3.7.2 Alternative 2 – Proposed Action – Flood Reduction Alternative

Endangered and threatened species were evaluated for known presence or suitable habitat within the study area and the potential to be impacted by project measures. The analysis is summarized from the BA in Appendix E. The BA was submitted to USFWS for informal consultation on February 29, 2024. The USFWS concurred with the determination for the Project on March 22, 2024.

The effects determination for the June Sucker is a May Affect Not Likely to Adversely Affect determination (MANLAA), and more information is included below. All other species analyzed

in the BA were given a No Effect determination and are not considered in this chapter. Only those species that could be impacted by an Action Alternative are addressed here. The magnitude of impacts for each Federally listed species is discussed below.

June sucker

Project Design Element Fish 1 would be applied to minimize or avoid adverse impacts to June suckers during construction; work in the channels would occur outside of known June sucker spawning season and their presence in the study area would be unlikely at these times.

Since June suckers within the American Fork River are unlikely to be able to pass upstream of Location 3 (200 South), project measures at Locations 1 or 2 (upstream of Location 3) would not directly affect June sucker habitat or use of the river. The proposed improvements at Location 3 would not remove the passage barrier nor improve habitat conditions. Although June suckers could reach Location 3, approximately 730 feet of the channel downstream of 200 South does not have mature trees that would provide effective cover or shade. Removal of the vegetation along the channel at Location 3 would not affect habitat for June suckers.

Location 4 (400 South) is downstream of the barrier at Location 3. At Location 4, the channel would be widened, and the riverbanks would be raised to contain the flows. Tree removal for up to 900 feet along the channel could reduce habitat suitability by removing cover and shade along the river. This segment of the river is the most upstream segment that provides accessible and suitable habitat for June sucker. Approximately 10,000 feet of channel that could provide suitable habitat occurs downstream of Location 4 (between I-15 and Utah Lake) and would not be affected by the project. Since suckers are unlikely to use the river upstream of Location 4 and this segment represents less than 10 percent of the total passable river length, the loss of vegetation along the most-upstream 900 feet of suitable habitat would not have an adverse impact on June sucker use of the American Fork River.

Since June suckers in Dry Creek at Location 8 are unlikely to be able to pass upstream of 1900 South, project measures upstream of that crossing would not directly affect June sucker habitat or use of the creek. Below 1900 South, approximately 0.3 miles (1,670 feet) of channel would be cleared to increase conveyance capacity; approximately 28 large trees would be removed along this length as part of the clearing. Approximately 300 feet of channel immediately downstream of 1900 South would be lined with gabion baskets, and the culvert at 1900 South would be replaced with a new box culvert. Channel modifications could reduce suitability for June suckers in Dry Creek; however, some mature trees would remain adjacent to the channel and natural stream channel substrate would remain for the majority of the segment.

Due to the localized and temporary nature of construction disturbance at each location and the application of conservation measures, implementation of the project has an effects determination of MANLAA for the June sucker. Thus, the magnitude of impacts for the June Sucker would be:

- Type: Indirect (if any)
- Duration: Temporary/Short-Term (if any)
- Intensity: Negligible Impacts (if any) (MANLAA)

5.3.7.3 Alternative 3 -- Proposed Action – Property Buyouts Alternative (Nonstructural)

Endangered and threatened species were evaluated for known presence or suitable habitat within the study area and the potential to be impacted by project measures. The analysis is summarized

from the BA in Appendix E. The magnitude of impacts for each Federally listed species considered is discussed below.

June Sucker

Because this alternative would not implement any structural measures to address flooding, there would be no impacts to the June Sucker. Thus, the magnitude of impacts would be:

- Type: None
- Duration: None
- Intensity: No Effect

5.3.8 Fish and Wildlife/Migratory Birds/Bald and Golden Eagles

5.3.8.1 Alternative 1 – No Action – FWOFI Alternative

Under the No Action Alternative, there would be no effect on fish or wildlife because there would be no project-related impacts. Thus, the magnitude of impacts on fish and wildlife, migratory birds, and eagles would be:

- Type: None
- Duration: None
- Intensity: No Effect

5.3.8.2 Alternative 2 – Proposed Action – Flood Reduction Alternative

Species of concern were evaluated for known presence or suitable habitat within the study area and the potential to be impacted by project measures; the analysis is summarized in Appendix E. Species may be grouped based on similar habitat characteristics and behaviors, as potential impacts are more likely to be similar for those species that share habitats and behaviors. The magnitude of impacts for the species/groupings are discussed below.

Bald Eagle

Bald eagles could occur throughout the study area, particularly in association with the Jordan River and Utah Lake near Locations 7 and 8. There are no known nests within the study area, but eagles could fish in the waterways, scavenge throughout the study area, and roost in the trees within or near the study area.

Tree removal would be localized to segments of Waste Ditch and Dry Creek channels, and roost trees would remain adjacent to the study areas. Because project activities would be localized to each project measure, eagles could avoid the immediate area of project disturbance and continue to hunt and scavenge during construction, operation, and maintenance activities.

With implementation of the Project Design Elements specific to wildlife resources and because the impacts to suitable habitat would be localized and similar habitat is abundant in the area, there would be no adverse effect to bald eagles from implementation of the Action Alternative. Thus, the magnitude of impacts for eagles would be:

- Type: None
- Duration: None
- Intensity: No Effect

Black Swift

Black swifts may forage along the channels within the study area where insects are available. Because project activities would be localized to each project measure, swifts could avoid the immediate area of project disturbance and continue to forage during construction, operation, and maintenance activities. Prey insects would be available in both disturbed and undisturbed areas. Because impacts to foraging habitat would be localized and alternate foraging habitat is abundant in the area, there would be no adverse effect to black swift from implementation of the Action Alternative. Thus, the magnitude of impacts to the Black Swift would be:

- Type: None
- Duration: None
- Intensity: No Effect

Lewis's Woodpecker and Long-Eared Owl

Lewis's woodpeckers and Long-eared owls may nest in the mature trees that line the channels throughout the study area. Tree removal would be minimized as much as practicable by implementation of Project Design Element Wildlife 1 and would occur outside of nesting season with implementation of Wildlife 2 (see Table 4-5). Alternate habitat is abundant, as mature trees occur throughout the area in association with municipal and residential landscaping. With implementation of the Project Design Elements and because the impacts to suitable habitat would be localized and similar habitat is abundant in the area, there would be no adverse effect to Lewis's woodpecker or long-eared owls from implementation of the Action Alternative. Thus, the magnitude of impacts to the Lewis's Woodpecker and the Long-Eared Owl would be:

- Type: None
- Duration: None
- Intensity: No Effect

Little Brown Myotis and Townsend's Big-Eared Bat

Little brown myotis and Townsend's big-eared bat species may roost in trees associated with the channels and forage along the channels within the study area where insects are available. Tree removal would be minimized as much as practicable by implementation of Project Design Element Wildlife 1. Bats could continue to forage within the study area; there would be little risk of disturbance as the nocturnal bats would be roosting during daytime activities, and prey insects would be available in both disturbed and undisturbed areas. The implementation of the Action Alternative would not adversely affect bat species. Thus, the impacts to the Little Brown Myotis and Townsend's Big-Eared Bat would be:

- Type: None
- Duration: None
- Intensity: No Effect

Peregrine Falcon

Peregrine falcons could occur throughout the study area, particularly in association with the Jordan River and Utah Lake near Locations 8 and 9. There are no known nests within the study area, but falcons could hunt for waterfowl in the waterways and perch in the trees within or near the study area.

Project activities would be localized to each project measure, and waterfowl or other prey species would likely avoid the immediate area of project disturbance. Falcons would be able to continue hunting during construction, operation, and maintenance activities.

Because the impacts to suitable habitat would be localized and alternate habitat is abundant in the area, there would be no adverse effect to peregrine falcons from implementation of the Action Alternative. Thus, the magnitude of impacts to the Peregrine Falcon would be:

- Type: None
- Duration: None
- Intensity: No Effect

Rufous Hummingbird

Rufous hummingbirds are not known to breed in Utah but may fly through the study area during migration. Nectar sources are limited within the study area. project measures and removal of vegetation would be localized to each project measure, and hummingbirds would likely avoid the immediate area of project disturbance. Due to the scarcity of suitable nectar sources in the localized study areas, there would be no adverse effect to rufous hummingbirds from implementation of the Action Alternative. Thus, the magnitude of impacts to the Rufous Hummingbird would be:

- Type: None
- Duration: None
- Intensity: No Effect

5.3.8.3 Alternative 3 -- Proposed Action – Property Buyouts Alternative (Nonstructural)

Species of concern were evaluated for known presence or suitable habitat within the study area, as well as their potential to be impacted by project measures; the analysis is summarized in Appendix E. Species may be grouped based on similar habitat characteristics and behaviors, as potential impacts are more likely to be similar for those species that share habitats and behaviors. The magnitude of impacts for the species/groupings are discussed below.

Bald Eagle

Bald eagles could occur throughout the study area, particularly in association with the Jordan River and Utah Lake near Locations 7 and 8. There are no known nests within the study area, but eagles could fish in the waterways, scavenge throughout the study area, and roost in the trees within or near the study area. The property relocation would have no impact on the current conditions for the Bald Eagle. Thus, the magnitude of impacts would be:

- Type: None
- Duration: None
- Intensity: No Effect

Black Swift

Black swifts may forage along the channels within the study area. The property relocations would have no impact on the current conditions for the species. The magnitude of impacts would be:

- Type: None
- Duration: None
- Intensity: No Effect

Lewis's Woodpecker and Long-Eared Owl

Lewis's woodpeckers and Long-eared owls may nest in the mature trees that line the channels throughout the study area. The property relocations would have no impact on the current conditions for the species. Thus, the magnitude of impacts would be:

- Type: None
- Duration: None
- Intensity: No Effect

Little Brown Myotis and Townsend's Big-Eared Bat

Little brown myotis and Townsend's big-eared bat species may roost in trees associated with the channels and forage along the channels within the study area where insects are available. The property relocations would have no impact on the current conditions for the species. Thus, the magnitude of impacts would be:

- Type: None
- Duration: None
- Intensity: No Effect

Peregrine Falcon

Peregrine falcons could occur throughout the study area, particularly in association with the Jordan River and Utah Lake near Locations 8 and 9. There are no known nests within the study area, but falcons could hunt for waterfowl in the waterways and perch in the trees within or near the study area. The property relocations would have no impact on the current conditions for the species. Thus, the magnitude of impacts would be:

- Type: None
- Duration: None
- Intensity: No Effect

Rufous Hummingbird

Rufous hummingbirds are not known to breed in Utah but may fly through the study area during migration. Nectar sources are limited within the study area. The property relocations would have no impact on the current conditions for the species. Thus, the magnitude of impacts would be:

- Type: None
- Duration: None
- Intensity: No Effect

5.3.9 Invasive Species and Noxious Weeds

5.3.9.1 Alternative 1 – No Action – FWOFI Alternative

Under the No Action Alternative, the existing conditions regarding invasive plant species within the study area would not change. Russian olive *(Elaeagnus angustifolia)* and cheatgrass *(Bromus tectorum*) would continue to occur in the study area. Thus, the magnitude of impacts for this resource concern would be:

- Type: Indirect (continued impacts)
- Duration: Permanent/Long-Term (continued impacts)

- Intensity: Minor Impacts (continued impacts)

5.3.9.2 Alternative 2 – Proposed Action – Flood Reduction Alternative

The Action Alternative would include construction activities that would disturb vegetation which could create a direct and temporary opportunity for the spread of invasive species. The Utah Department of Agriculture and Food (UDAF) identified Purple loosestrife (*Lythrum salicaria*) and Common Reed (*Phragmites australis*) as being likely to occur in the study area, meaning they are more likely to be spread as a result of construction activities (UDAF, 2024). The risk of spreading weeds during construction would be temporary but would reduce as reclamation was completed and disturbed surfaces were re-established with desirable vegetation.

As described in Chapter 4, several Project Design Elements would be implemented to safeguard against the spread of invasive species including

(1) cleaning of equipment prior to accessing project sites,
(2) monitoring disturbed areas for noxious/undesirable species during construction, and
(3) restoring the disturbed areas with native topsoil and native seeds collected from grubbing.
(4) Ensuring fill material is free of waste, pollutants, and noxious weeds and seeds.

The process of collecting native seeds during grubbing would include evaluating the sites beforehand for areas that contain significant native vegetation, collecting seeds or entire seed heads to maximize the number of native seeds collected, and minimizing the mixing of different seed species to the maximum extent possible. This process would effectively collect native species for post-construction restoration efforts while also allowing for the removal of any invasive species identified during grubbing. This further supports the minor and temporary nature of the impacts to this resource concern.

The potential extent for invasive species to spread would be throughout the entire study area/watershed, where they are already prevalent. The overall risk of significantly increasing the presence of invasive species beyond their current levels in the area is very low and unlikely.

The native species that currently experience the most competition from the Purple loosestrife and Common Reed include cattails (*Typha spp.*), willows (*Salix spp.*), Spike rushes (*Eleocharis spp.*), and Bulrushes (*Schoenoplectus spp.*). These invasive species form dense stands that can alter riparian hydrology and degrade the habitat for native understory/riparian species.

Based on this information, the magnitude of impacts on this resource concern would be:

- Type: Indirect
- Duration: Temporary/Short-Term
- Intensity: Minor Impacts

5.3.9.3 Alternative 3 – Proposed Action – Property Buyouts Alternative (Nonstructural)

Under the Nonstructural Alternative, the existing conditions regarding invasive plant species within the study area would not change. Russian olive *(Elaeagnus angustifolia)* and cheatgrass *(Bromus tectorum*) would continue to occur in the study area. Thus, the magnitude of impacts for this resource concern would be:

- Type: Indirect (continued impacts)
- Duration: Permanent/Long-Term (continued impacts)
- Intensity: Minor Impacts (continued impacts)

5.3.10 Riparian Areas

5.3.10.1 Alternative 1 – No Action – FWOFI Alternative

Under the No Action Alternative, the existing conditions of the riparian areas are expected to remain as described in the Affected Environment chapter. Thus, the magnitude of impacts for this resource concern would be:

- Type: None
- Duration: None
- Intensity: No Effect

5.3.10.2 Alternative 2 – Proposed Action – Flood Reduction Alternative

The Action Alternative would include construction activities that would disturb riparian vegetation along the waterways. The ground disturbance would be short-term and temporary. After construction, reclamation would be completed, and disturbed surfaces would be re-established with desirable vegetation for long-term beneficial impacts from the reestablishment of native riparian vegetation and habitat diversity in the riparian corridor. The armoring or previously unarmored embankments would result in a direct, long-term impact as vegetation is re-established. Thus, the magnitude of impacts for this resource concern would be:

- Type: Direct Impacts and Benefits
- Duration: Temporary/Short-Term (Impacts) and Permanent/Long-Term (Benefits)
- Intensity: Minor Impacts and Moderate Benefits

5.3.10.3 Alternative 3 -- Proposed Action – Property Buyouts Alternative (Nonstructural)

Under the No Action Alternative, the existing conditions of the riparian areas are expected to remain as described in the Affected Environment chapter. Thus, the magnitude of impacts for this resource concern would be:

- Type: None
- Duration: None
- Intensity: No Effect

5.3.11 Cultural and Historic Resources and Tribal Consultation

5.3.11.1 Alternative 1 – No Action – FWOFI Alternative

Under the No Action Alternative, historic architectural properties would continue to be affected by flooding. There are approximately 18 historic buildings in American Fork City and 58 in Lehi City that are eligible for the NRHP within the 100-year storm event flood zone. The properties are listed in Appendix E. Thus, the magnitude of impacts for this alternative would be:

- Type: Direct (continued impacts)
- Duration: Permanent/Long-Term (continued impacts)
- Intensity: Moderate Impacts

5.3.11.2 Alternative 2 – Proposed Action – Flood Reduction Alternative

Pursuant to 36 CFR §800 of the NHPA (1966, as amended in 2000), and the regulations of the Advisory Council on Historic Preservation (ACHP) implementing Section 106 of the NHPA (54

USC 306108), federal agencies must take into account the potential effect of an undertaking on "historic properties", which refers to cultural resources listed in, or eligible for listing in the NRHP.

The Action Alternative would not adversely affect the identified historic properties due to site avoidance. A total of four eligible historic properties are located within the APE. Each of these four sites would be avoided by the Action Alternative. The 18 NRHP-eligible historic architectural properties would benefit from the Action Alternative by the reduction of effects from flooding.

Table 5-7 Cultural and Historic Resources Impact Comparison

Site Number	Description	Eligibility Recommendation	Potential Effect
42UT1029	Utah Southern/Union Pacific Railroad	Eligible	None
42UT1908	Lehi Pioneer Cemetery	Eligible	None
42UT1909	Waste Ditch	Not Eligible	None
42UT1101	Denver & Rio Grande Western Railroad	Eligible	None
42UT592	Lithic Scatter	Eligible	None
42UT1725	Spring Ditch	Not Eligible	None
42UT2309	Unnamed Ditch	Not Eligible	None
049001D	Box Culvert Bridge 100 E. 200 S. American Fork	Not Eligible	None
Not Assigned	Box Culvert Bridge 100 E. 220 E. American Fork	Not Eligible	None

Per 36 CFR 800.5(b), the NRCS made a No Adverse Effect to Historic Properties determination for the project, in consultation with the Utah SHPO and the Confederated Tribes of the Goshute Reservation, Skull Valley Band of Goshute Indians, Shoshone-Bannock Tribes of the Fort Hall Reservation, and the Ute Indian Tribe of the Uintah & Ouray Reservation. The determination of effects letter was submitted to SHPO and the tribes on June 26, 2023. SHPO concurred with the determination in a letter dated July 11, 2023. Tribal follow-up emails were sent on October 30, 2023, and phone calls were made on January 8, 2024. Tribal consultation was reinitiated with an updated report and the addition of the Shoshone-Bannock Tribe as a consulting party. SHPO concurred on November 6, 2024. Section 106 letters were mailed to the Tribes on November 12, 2024, with follow-up emails sent on January 13, 2025. Tribal consultation is summarized in Table 7-1, Thus, the magnitude of impacts for cultural and historic resources in the project area would be:

- Type: Direct Benefit
- Duration: Permanent/Long-Term Benefit
- Intensity: Moderate Benefit

5.3.11.3 Alternative 3 -- Proposed Action – Property Buyouts Alternative (Nonstructural)

Under the Nonstructural Alternative, historic architectural properties would continue to be affected by flooding. There are approximately 18 historic buildings in American Fork City and 58 in Lehi City that are eligible for the NRHP within the 100-year storm event flood zone. The properties are listed in Appendix E. Thus, the magnitude of impacts for this alternative would be:

- Type: Direct (continued impacts)

- Duration: Permanent/Long-Term (continued impacts)
- Intensity: Moderate Impacts

5.3.12 Scenic Beauty and Visual Resources

5.3.12.1 Alternative 1 – No Action – FWOFI Alternative

The No Action Alternative would allow for continued flooding which would continue to incur damage to structures and the ecosystem within the study area. Thus, the magnitude of impacts for this resource concern would be:

- Type: Indirect (continued impacts)
- Duration: Permanent/Long-Term (continued impacts)
- Intensity: Moderate Impacts

5.3.12.2 Alternative 2 – Proposed Action – Flood Reduction Alternative

Under the Action Alternative, there would be changes to the existing visual conditions directly adjacent to the waterways. There would be temporary soil disturbance that would be revegetated and would have similar visual aspects after site restoration at the end of the project. The visual character of the close-range to mid-range would be impacted where trees that infringe on the waterways would be removed within the immediate construction corridor. For the long-range viewers, there would be minimal construction impacts to the overall visual character. All plant disturbance related to construction would be regraded and revegetated as discussed in the BMPs described in the Plan-EA. Further, the study area would experience temporary impacts during construction due to construction-related activities, such as construction equipment, staging areas, and earth moving. There would be changes to the aesthetics of the study area that would be perceived as adverse in the short-term and as beneficial in the long-term. Thus, the magnitude of impacts would be:

- Type: Direct Impacts and Benefits
- Duration: Temporary/Short-Term Impacts and Permanent/Long-Term Benefits
- Intensity: Minor Impacts and Benefits

5.3.12.3 Alternative 3 -- Proposed Action – Property Buyouts Alternative

The Property Buyouts Alternative would relocate all the structures in the floodplain and conduct property buyouts. The plan would then demolish the affected structures, removing them from the floodplain and the viewshed. This impact would likely be perceived by local residents as beneficial to the aesthetic quality as it would generate a more natural "look" for the area. However, continued damages to lands and the ecosystem as a result of flooding would create adverse impacts to the aesthetics. Thus, the magnitude of impacts for this resource concern would be:

- Type: Direct Benefits and Indirect Impacts
- Duration: Permanent/Long-Term Benefits and Impacts
- Intensity: Substantial Benefits and Moderate Impacts

5.3.13 Land Use

5.3.13.1 Alternative 1 – No Action – FWOFI Alternative

The No Action Alternative would have no effect on the existing land use in the area. Thus, the magnitude of impacts would be:

- Type: None
- Duration: None
- Intensity: No Effect

5.3.13.2 Alternative 2 – Proposed Action – Flood Reduction Alternative

The Action Alternative would require acquisition of land and easements for construction activities. The surrounding land would be temporarily disturbed but would not have any long-term impacts to land use. Thus, the magnitude of impacts for this alternative plan would be:

- Type: Direct Impacts
- Duration: Temporary/Short-Term Impacts
- Intensity: Minor Impacts

5.3.13.3 Alternative 3 -- Proposed Action – Property Buyouts Alternative (Nonstructural)

The Nonstructural Alternative would require the acquisition of all structures and properties in the floodplain as a nonstructural solution to the problem of flooding. This action would be costly ($394,346,259) and would likely require the use of eminent domain as it is highly unlikely that all property owners would be willing to participate in voluntary property relocations. The relocation would result in significant changes in land use in the study area. Thus, the magnitude of impacts under this alternative would be:

- Type: Direct Impact
- Duration: Permanent/Long-Term
- Intensity: Substantial Impact

5.3.14 Cumulative Effects

A list of known past, present, or reasonably foreseeable future actions in the vicinity of the study area are provided below.

- Past NRCS PL-566 rehabilitation projects on these waterways have included improvements to dams and reservoirs upstream including Silver Lake, Silver Lake Flat, and Tibble Fork on the American Fork River which has increased reservoir capacities improving flood prevention. An ongoing project on American Fork River is a diversion structure at the mouth of American Fork Canyon which diverts water from the river to several local users. The Dry Creek Reservoir upstream of the Project was completed this past winter providing additional capacity for flood prevention. Lehi City has made improvements along other sections of Waste Ditch adding gabion baskets to increase channel capacity within residential locations. None of these past projects have had long-term watershed impacts but have benefited the communities downstream.
- A foreseeable future project includes the replacement of an undersized undercrossing within American Fork City at 400 North and 400 East; the existing dual parallel reinforced concrete pipes is anticipated to be replaced with a larger capacity box culvert. It is not anticipated that this project would have any long-term watershed impact.

5.3.14.1 Alternative 1 – No Action – FWOFI Alternative

The No Action Alternative consists of continued O&M of the waterways. Due to the temporary and limited nature of disturbance from O&M activities, no measurable cumulative impacts are anticipated to the resources when combined with the other actions described in Chapter 4.

5.3.14.2 Alternative 2 – Proposed Action – Flood Reduction Alternative

Cumulative effects — changes to the environment caused by the combined impact of the Action Alternative when added to other past, present, and reasonably foreseeable future human activities and natural processes — were evaluated for each identified resource. The resources described below warrant evaluation. Except for the beneficial impact and potential reduction to floodplain management, there would be no changes to existing O&M related to these resources.

Soil

With implementation of the Project Design Elements, no long-term or cumulative impacts due to implementation of the Action Alternative would be anticipated.

Water

The Action Alternative measures and ongoing O&M for those improvements would contribute to a long-term cumulative benefit by decreasing flooding to developed areas. There would be no adverse cumulative impacts to floodplains in the study area. FEMA and National Flood Insurance Program floodplain designations may change as a result of the project.

The cumulative impact area for WOTUS is the 118,200-acre watershed plan area. Other WOTUS within the cumulative impact area would not be affected by project measures, as construction would be localized to the waterways in the study area. Each area would be considered a separate project for the purposes of permitting under the CWA. The potential adverse impacts would be temporary during construction, therefore with adherence to Project Design Elements, Section 404, and Stream Alteration Permits, implementation of the Action Alternative would not result in significant cumulative impacts to the WOTUS.

Implementation of the project would have the cumulative impact of making the area more compliant with the identified regional water resource plans in Chapter 3. Additionally, there would be no cumulative impacts on water quality as a result of implementation.

Air

The impact of the Action Alternative on air quality would be temporary and concentrated mainly around the construction sites. Due to the short duration of equipment operation to complete the work, construction activities are not expected to violate air quality standards. The Project Design Elements described in Chapter 4 would help minimize this impact during project implementation.

Plants/Animals

The Project Design Elements described in Chapter 4 would help minimize any impact on endangered or threatened species during project implementation. The BA (see Appendix E) was submitted to the USFWS on May 3, 2023, with an effects determination of MANLAA for the June sucker and would have No Effect on all other species on the official list nor on designated critical habitat. The USFWS concurred with the determination for the project on March 22, 2024 (Concurrence located in Appendix A).

Within the study area, fish and wildlife have been impacted by widespread municipal and residential development. Possible effects of these actions include displacement into less suitable habitats, behavioral disruption, and stress due to noise and human activity. The impacts of temporary disturbance during construction or maintenance of the Action Alternative would add cumulatively to the disturbance impacts from present and future actions; however, the species of

concern would likely avoid areas where project disturbance is occurring, and abundant suitable habitat is accessible within the cumulative impact area. Due to the temporary nature of disturbance associated with the project and the abundance of accessible alternate habitat, implementation of the Action Alternative would not result in cumulative adverse impacts to fish or wildlife.

As the Project Design Elements are implemented under the Action Alternative, cumulative impacts due to the spread of weeds are not expected in the study area. Any long-term negative impacts could be resolved using various weed control methods. As the Project Design Elements are implemented and the site is restored as closely as possible to pre-existing conditions, no cumulative effect of the Action Alternative is expected on the riparian areas adjacent to construction sites.

Human

Under the Action Alternative, there would not be any cumulative impacts to cultural or historic properties as all adverse impacts would be avoided under this plan. The Action Alternative would not be expected to contribute to cumulative impacts on scenic beauty and visual resources. The disturbed area would be restored as closely as possible to pre-existing conditions. Although there would be some temporary impacts on land use in the study area, it would not have any interactive or additive effects that would make the impacts cumulative.

5.3.14.3 Alternative 3 – Proposed Action – Property Buyouts Alternative (Nonstructural)

Soil

There would be no cumulative impacts to soil resources under this alternative.

Water

There would be no cumulative impacts to any water-related resources under this alternative.

Air

There would be no interactive or additive effects on any air-related resources under this alternative.

Plants/Animals

There would be no cumulative effects on any plant or animal related resource concerns under this alternative.

Human

The substantial change in land use under this alternative as a result of the property buyouts/relocations would generate a significant cumulative adverse effect as it would leave large areas in American Fork, Lehi, and Saratoga Springs cities without a designated land use.

The cumulative impact of buying and relocating properties could include significant social and economic disruptions, such as community displacement, changes in local demographics, and potential loss of cultural or historical connections to the area.

6 Preferred Alternative

The Preferred Alternative for the project is Alternative 2 - Flood Reduction Alternative as described in Chapter 4. This alternative meets the purpose and need of the project, meets the Federal Objective and Guiding Principles (USDA-NRCS, 2017), provides the most beneficial effects on environment, social, and economic resources, and the greatest net benefit of the considered alternatives. The Preferred Alternative is also the NEE Alternative. See *PR&G and Economic Analysis* in Appendix E for benefit comparisons between the alternatives considered for detailed study.

The watershed area associated with the Preferred Alternative is 118,200 acres and is defined by the boundaries of the fifth-level watersheds that contain the project features (American Fork Canyon [HUC 1602020108] and Dry Creek-Jordan River [HUC 1602020110]) as shown on Map B-1 in Appendix B.

6.1 Rationale for the Preferred Alternative

The project would meet the purpose and need by reconstructing existing channels to improve and increase channel capacities and hydraulics to reduce flooding in American Fork, Lehi, and Saratoga Springs cities. Tradeoffs and economic analysis were considered when selecting the Preferred Alternative per the requirements of the PR&G as described in the *PR&G and Economic Analysis* in Appendix E. The Project Design Elements listed in Table 4-5 are also incorporated into the Preferred Alternative, which would provide environmental protection measures, enhance safety and operation, reduce potential risk of personal injury and flood damage to municipal and private properties, and minimize the effects of the project.

6.2 Measures to be Installed

6.2.1 Project Measures/Components

The Preferred Alternative's specific measures are identified in Table 6-1 and described below. The Project Design Elements are also incorporated into the Preferred Alternative, see Table 4-5. Summaries of the design details are summarized in Structural Table 3b. Project location maps are shown in Appendix B. Additional project details are available in Appendix D. Additionally, it is important to note that no significant aquatic or wildlife habitat exists within the study area. If such a habitat were present, the Plan-EA would need to transition to a Plan-EIS.

Table 6-1 Project Locations and Project Measures.

Location	Project Measures
American Fork City Location 1: Channel Improvements at 300 North	Implement upstream channel improvements including removing vegetation and armor embankments with gabions or riprap by 1.5-feet for 350 feet Construct upstream and downstream wing walls Concrete apron on downstream culvert outlet Other channel improvements would include modifications to the channel slope and channel width for up to 680 feet.

Location	Project Measures
American Fork City Location 2: Channel Improvements at 100 North and 200 East	Implement upstream channel improvements including removing vegetation and raising riverbanks by 2.5-feet for 350 feet. Construct transition into existing box culvert Armor embankments with gabions or riprap to protect against erosion Other channel improvements would include modifications to the channel slope and channel width for up to 700 feet.
American Fork City Location 3: Channel Improvements at 200 South	Remove dissipation baffle blocks place riprap as erosion protection on the downstream banks Other channel improvements would include modifications to the channel slope and channel width for up to 150 feet.
American Fork City Location 4: Channel Improvements at 400 South	Implement upstream channel improvements including widening channel and raising riverbanks from 5 feet to 8 feet for 300 feet upstream using gabion baskets Other channel improvements would include modifications to the channel slope and channel width for up to 900 feet.
Lehi City Location 5: Upper Dry Creek	Enlarge channel to a 15-foot-wide concrete-lined channel bottom with 5.5-foot-tall gabion basket channel banks for 381 feet Removing existing 36’ corrugated metal pipe (CMP) culvert and replacing with new 12’ by 5’ culvert. Culverts are not funded under PL-566 and so this work would be paid for separately by the SLO.
Lehi City Location 6: Upper Waste Ditch	Enlarge downstream channel to a 15-foot-wide concrete-lined channel bottom with 5.5-foot-tall gabion basket channel banks for 550 feet Remove culvert Install a new 20-foot-wide by 4-foot-tall box culvert with trash rack and intake structure
Lehi City Location 7: Waste Ditch at Willow Park	Enlarge upstream channel to a 15-foot-wide concrete-lined channel bottom with 5.5-foot-tall gabion basket channel banks Create floodplain diversions along lower portion of channel Remove culvert Install a new 20-foot-wide by 4-foot-tall box culvert
Lehi City/Saratoga Springs City Location 8: Lower Dry Creek	Implement channel improvements to enlarge and restore flow capacity including channel dredging and 14 and 15-foot-wide concrete-lined channel bottom with 5.5-foot-tall gabion basket channel banks (wider cross section would be used in area where milder channel slope exists) Remove culverts at 1700 West, and 1900 South 1700 West: Install a new 12-foot-wide by 5-foot-tall box culvert 1900 South: Install a new 14-foot-wide by 5-foot-tall box culvert

6.2.1.1 American Fork City

Location 1: Channel improvements at 300 North

The proposed measures at this location include improving the channel by raising the riverbanks by 1.5 feet for approximately 350 feet upstream of 300 North and constructing new upstream and downstream wingwalls. A new concrete apron would be placed on the downstream side at the outlet to protect against erosion. The embankments would be armored with gabions or riprap to protect against erosion. Other channel improvements could include modifications to the channel slope and channel width for up to 680 feet. Trees and vegetation would be removed within the

flow area. The total area of disturbance would be up to 0.9 acres. These channel improvements would allow the 100-year flood to pass without any flooding upstream. See maps in Appendix B.

Location 2: Channel Improvements at 100 North and 200 East

The proposed measures at this location include improving the channel by raising the riverbanks by 2.5 feet for approximately 350 feet upstream of 100 North and creating a new transition into the existing box culvert. The embankments would be armored with gabions or riprap to protect against erosion. Other channel improvements could include modifications to the channel slope and channel width for up to 700 feet. Trees and vegetation would be removed within the flow area. The total area of disturbance would be up to 1.2 acres. These channel improvements would allow the 100-year flood to pass without any flooding upstream. See maps in Appendix B.

Location 3: Channel Improvements at 200 South

At this location, project measures would consist of removing energy dissipation baffle blocks that catch debris and cause backups in the channel. Riprap would be placed as erosion protection on the downstream banks instead of the baffle blocks. The existing culvert is anticipated to be replaced in the future under a separate action. Other channel improvements would include modifications to the channel side slopes and channel width for approximately 150 feet. Trees and vegetation would be removed within the flow area. The total area of disturbance would be approximately 0.3 acres. These improvements would allow the 100-year flood to pass without any flooding. See maps in Appendix B.

Location 4: Channel Improvements at 400 South

The proposed measures at this location consist of widening the upstream channel and raising the riverbanks from 5 feet to 8 feet for approximately 300 feet using gabion baskets. Other channel improvements could include modifications to the channel slope and channel width for up to 900 feet. Trees and vegetation would be removed within the flow area. The total area of disturbance would be up to 0.9 acres. These improvements would allow the passage of the 100-year flood and would prevent flooding the houses near the river. See maps in Appendix B.

6.2.1.2 Lehi City and Saratoga Springs City

Location 5: Upper Dry Creek

As Dry Creek passes Lehi Elementary School, the existing 510-foot-long culvert would be replaced with a 12-foot-wide by 5-foot-tall concrete box culvert. The box culvert would be fitted with a trash rack and intake structure to prevent plugging.

The channel downstream of the box culvert would be improved to handle the design flow as well as the next box culvert downstream at 600 North (12-foot-wide by 5-foot-tall concrete box culvert). Channel improvements are proposed to include a 15-foot-wide concrete-lined channel bottom with 5.5-foot-tall gabion basket channel banks for approximately 381 feet. Channel slopes would match the existing channel slope, with a minimum of 0.3 percent. Trees and vegetation would be removed within the flow area. The total area of disturbance would be up to 2.6 acres.

Proposed improvements contain the water within the channel and nearly eliminate flooding from the 50-year flood to the surrounding areas. This includes preventing flooding of houses, roadways, and other critical infrastructure. See maps in Appendix B.

Location 6: Upper Waste Ditch

As the Waste Ditch passes the school, it enters a 42-inch-diameter corrugated metal pipe, is conveyed under a portion of lawn for approximately 348 feet, and discharges back into the open channel. The existing pipe would be replaced with a 20-foot-wide by 4-foot-tall concrete box culvert to provide more capacity. The box culvert would also be fitted with a trash rack and intake structure to prevent plugging.

The downstream channel would be improved to handle the design flow. Channel improvements would include a 15-foot-wide concrete-lined channel bottom with 5.5-foot-tall gabion basket channel banks for approximately 550 feet. Channel slopes would match the existing channel slope, with a minimum of minimum of 0.3 percent. Trees and vegetation would be removed within the flow area. The total area of disturbance would be up to 3.2 acres. Proposed improvements contain the flood water within the channel and nearly eliminate flooding from the 50-year flood to the surrounding areas. This would include preventing flooding of houses, roadways, and other critical infrastructure. See maps in Appendix B.

Location 7: Waste Ditch at Willow Park

Approximately 1,279 feet of unimproved sections of the Waste Ditch channel would be excavated and expanded to match the upstream capacity and an undersized box culvert at 300 North in Willow Park would be replaced. The new box culvert would be a 20-foot-wide by 4-foot-tall concrete box culvert. The channel improvements would be the same as the channel improvements at the elementary school, including a 15-foot-wide concrete-lined channel bottom with 5.5-foot-tall gabion basket channel banks. Channel slopes would match the existing channel slope, with a minimum of 0.3 percent.

Floodplain diversions would also be constructed along the lower portion of the channel. Fill material would be imported and compacted into berms to contain flows adjacent to the channel. This area is a large park in an area that is not currently mapped. The proposed improvements won't reduce the floodplain in a future FEMA mapping effort; however, the diversions will prevent flooding in the park and are not protecting homes. The total area of disturbance would be up to 8.1 acres. Proposed improvements contain the flood water within the channel and nearly eliminate flooding from the 50-year flood to the surrounding areas. . See maps in Appendix B.

Location 8: Lower Dry Creek

Approximately 4,150 feet of the Dry Creek channel between 1100 West and Utah Lake would be improved with a combination of channel clearing (dredging channel and restoring natural channel capacity) and gabion-lined channel sections. The minimum slope of this channel would be 0.3 percent. Several large trees would be removed from the channel to restore hydraulic capacity. Channel dredging would extend up to 2 feet below the existing channel flow line. Culverts would be upsized at 1700 West (12-foot-wide by 5-foot-tall) and 1900 South (14-foot-wide by 5-foot-tall). The total area of disturbance would be up to 19.4 acres. Proposed improvements contain the flood water within the channel and nearly eliminate flooding from the 50-year flood to the surrounding areas. This would include preventing flooding of houses, roadways, and other critical infrastructure. See maps in Appendix B.

6.3 Irreversible or Irretrievable Commitment of Resources

NEPA requires that an environmental analysis includes a discussion of the irreversible and irretrievable commitments of resource which may occur should the Action Alternative be

implemented. Irreversible and irretrievable commitments are related to the use of nonrenewable resources and the effects this could have on future generations. Irreversible commitments of resources are those that cause the direct or indirect use of a natural resource that cannot be restored ore returned to their original condition. Irretrievable commitments of resources are the loss in value of an affected resource that cannot be restored.

The Preferred Alternative would result in progressively greater irreversible and irretrievable commitment to energy and material resources during project construction, operation, and maintenance, in the following forms: energy expended in the form of electricity, gasoline, diesel fuel, and oil for equipment and transportation vehicles, construction materials, and labor.

It is expected that a minimal portion of the region's nonrenewable resources would be used but would not affect the availability of these resources for other needs within the region. The commitment of these resources would be based on the benefits of post-construction conditions to the cities, residents and businesses in the immediate area and the region.

6.4 Areas of Controversy

There are no known areas of controversy. No significant issues or controversy would be anticipated resulting from the implementation of the Action Alternative.

6.5 Permits and Compliance

The Federal, state, and local permits or authorizations that may be required prior to construction of the Preferred Alternative are described in this section. A Watershed Agreement and a Memorandum of Understanding would be completed and signed by the NRCS and SLOs prior to the obligation of construction funds for the project.

6.5.1 Federal

6.5.1.1 U.S. Army Corps of Engineers (USACE)

A jurisdictional determination from USACE would need to be made for potential WOTUS. If waters are determined to be jurisdictional, a Section 404 permit would be required. It is anticipated that a single Section 404 nationwide permit would be submitted to USACE, with each waterway being looked at as a separate and distinct location.

6.5.1.2 Federal Emergency Management Agency (FEMA)

The following FEMA permits are expected to be obtained during the permitting/design process:

- Conditional Letter of Map Revision (CLOMR)
- No-Rise Study
- Letter of Map Revision (LOMR)

6.5.2 State of Utah

6.5.2.1 Stream Alteration Permit

Section 73-3-29 of the Utah Code requires any person, governmental agency, or other organization wishing to alter the bed or banks of a natural stream to obtain written authorization from the State Engineer prior to beginning work.

6.5.2.2 Utah Pollutant Discharge Elimination System (UPDES)

Under Section 402 of the CWA, a UPDES Storm Water General Permit for Construction Activities is required for construction activities that disturb more than one acre of land and discharge pollutants to surface waters. A SWPPP would be developed, including submitting a Notice of Intent to the Utah Division of Water Quality.

6.5.3 Local

6.5.3.1 Union Pacific Railroad

Consultation with the Union Pacific Railroad would be required for Location 3 in American Fork to obtain the necessary permit.

6.5.3.2 Utilities

Utility easement encroachment permits would be acquired from local utility companies where necessary. Any additional county and local permits required for the project would be obtained prior to construction.

6.6 Mitigation of Potential Effects

Project Design Elements, detailed in Table 4-5, are proactive environmental protection measures and BMPs that are considered part of the proposed project which are aimed to avoid or prevent adverse impacts that could otherwise result from implementation of the Preferred Alternative. With implementation of the Project Design Elements, no compensatory or construction related mitigation measures have been identified for the Preferred Alternative.

6.7 Costs and Cost-Sharing

NRCS's PL-566 Program would fund the total costs for design, engineering, construction management, permitting, administration, and construction for the Preferred Alternative. The SLOs would finance all property acquisitions and real property improvements including culvert improvements. Operation and maintenance of the project measures would be funded by the SLOs from normal tax-based revenues.

6.8 Ecosystem Services Benefits

As described in previous sections, the Preferred Alternative (Flood Reduction Alternative) would significantly increase the provision and delivery of the scoped ecosystem services for the project area.

Benefits to provisioning services would be expected through the reduction in sedimentation and streambank erosion expected with the Preferred Alternative, which would improve aquatic habitat for instream fish species. The other scoped provisioning service, agricultural production, would not change in its delivery, but would be protected from damage related to continued flood events.

Benefits to regulating services would most obviously include the damage reduction benefits associated with the flood prevention management measures, making the project a safer place to live. Additionally, the erosion reduction measures would improve the surface water quality in the affected waterbodies, making them more suitable for fish and wildlife as well as human use.

Finally, there would be no change in the quantity of wetlands in the study area as none would be impacted by implementation, allowing those areas to continue serving as natural buffers against environmental catastrophe.

Cultural services would also be improved and benefit from the Preferred Alternative. The aesthetic/visual quality would be improved as there would be no more negative impacts to the scenic quality from flooding. Additionally, there would be significant improvements to public safety through flood prevention management measure implementation. Finally, the overall ecological viability and functionality would be protected and improved through construction of measures and cumulative benefits from the other improved ecosystem service categories.

The supporting services were not analyzed separately in this Plan-EA as they were scoped as an intermediate ecosystem service, meaning they are inherently linked and provided for in the analysis of the three other ecosystem service categories.

6.9 Installation and Financing

6.9.1 Installation

The SLOs would complete all approvals and permits for the project prior to the start of construction of a given project measure. Construction schedules would be sequenced to complete critical path items first. Project measures could be constructed concurrently or in succession, depending on permitting or property acquisition.

6.9.2 Responsibilities

The roles and responsibilities for NRCS and the SLOs would continue in accordance with this Plan-EA, the Watershed Agreement, and the Memorandum of Understanding. NRCS is responsible for leading the planning efforts and providing engineering support. The SLOs are responsible for environmental permits and construction implementation. The NRCS and SLOs are responsible for the project design. NRCS and SLOs would jointly manage awarding and negotiation of contracts and construction of the project. NRCS would assist the SLOs during construction by providing oversight and certifying completion of the project.

6.9.3 Contracting

Contract awards would be procured for the construction of project measures. SLOs would oversee and administer construction of the project in coordination with NRCS.

6.9.4 Real Property Rights

The total costs for design, engineering, construction management, permitting, administration, and construction for the Preferred Alternative's flood mitigation measures would be funded 100 percent through NRCS's PL-566 Program. The SLOs would finance all property acquisitions and real property improvements including culvert improvements. The SLO would request bids based on a competitive process to select the contractor.

6.10 Operation, Maintenance, and Replacement

Maintenance includes preventing deterioration of project measures and repairing damage or replacing the measure as needed to prevent failure. Normal deterioration, droughts, flooding, or vandalism that cause damage to completed measures are considered maintenance, which can

include both routine and as-needed work. Inspection of the structures is needed to verify that the structures are safe and functioning properly. The SLOs would be responsible for inspecting the structures in their respective cities on an annual basis, as well as after major events such as floods or earthquakes. The estimated annual operation and maintenance cost is $8,600 for American Fork City and $28,900 for Lehi City for a total annual OM&R cost for the Preferred Alternative of $37,500.

6.11 Economic Tables and Structural Tables

The installation cost estimate (includes design, engineering, permitting, administration, and construction) for the Preferred Alternative (Preferred and NEE Alternative) is $16,207,000, or $2,728,000 for American Fork City and $13,479,000 for Lehi/Saratoga Springs Cities, as detailed in Table 6-2. Lehi City has costs for land rights as listed under "Other Funds". There are no Federal lands associated with the project.

Table 6-2 Estimated Installation Costs American Fork-Dry Creek Watershed, Utah (2024 Dollars) [1]

Works of Improvement	Unit	Number			Estimated Cost (2024 Dollars)[1]						
					Public Law 83-566 Funds			Other Funds			Total
		Federal Land	Non-Federal Land	Total	Federal Land	Non-Federal Land	Total	Federal Land	Non-Federal Land	Total	
Structural Measures											
Flood Protection											
American Fork	Acres	0	1,305	1,305	$0	$2,728,000	$2,728,000	$0	$0	$0	$2,728,000
Lehi Upstream	Acres	0	2,323	2,323	$0	$5,718,000	$5,718,000	$0	$865,000	$865,000	$6,583,000
Lehi Downstream	Acres	0	284	284	$0	$4,817,000	$4,817,000	$0	$2,079,000	$2,079,000	$6,896,000
Total Project					$0	$13,263,000	$13,263,000	$0	$2,944,000	$2,944,000	**$16,207,000**

[1] Price base: 2024

The estimated cost distribution in Table 6-3 shows the estimated costs for project measures between PL-566 funds and the costs borne by the SLOs.

Table 6-3 Estimated Cost Distribution American Fork-Dry Creek Watershed, Utah (2024Dollars) 1/.

Works of Improvement	Installation Cost—Public Law 83-566						Installation Cost—Other Funds							Total
	Construction[3]	Engineering[6]	Real Property Rights[4,5]	Relocation Payments	Project Admin.	Total Public Law 566	Construction[3]	Engineering[6]	Real Property Rights[4,5]	Water Rights	Relocation Payments	Project Admin.[2]	Total Other	Installation Costs
American Fork	$2,387,000	$341,000	$0	$0	$0	$2,728,000	$0	$0	$0	$0	$0	$0	$0	$2,728,000
Lehi Upstream	$4,968,000	$750,000	$0	$0	$0	$5,718,000	$0	$0	$865,000	$0	$0	$0	$865,000	$6,583,000
Lehi Downstream	$4,187,000	$630,000	$0	$0	$0	$4,817,000	$0	$0	$2,079,000	$0	$0	$0	$2,079,000	$6,896,000
Total	$11,542,000	$1,721,000	$0	$0	$0	$13,263,000	$0	$0	$2,944,000	$0	$0	$0	$2,944,000	$16,207,000

1 Price base: 2024

2 Includes $0 for relocation assistance advisory service.

3 Includes $___ of Public Law 83-566 funds and $___ of other funds for cultural resource protection and mitigation measures.

4 Includes $0 of real property cost for mitigation.

5 Includes $___ or surveys, legal fees, other costs.

6 Engineering services contract cost to be borne: $3,066,477 by Public Law 83-566 funds and $0 by other funds.

The estimated cost distribution allocated by purpose; the entirety of the project is flood damage reduction is shown in Table 6-4.

Table 6-4 Cost Allocation and Cost Sharing Summary, Flood Reduction Project Measures American Fork-Dry Creek Watershed, Utah (Dollars) 1/.

	PL-566 Funds		Other Funds		Total Funds	
	Flood Protection	Total	Flood Protection	Total	Flood Protection	Total
Structural Measures						
Construction	$11,542,000	$11,542,000	$0	$0	$11,542,000	$11,542,000
Engineering	$1,721,000	$1,721,000	$0	$0	$1,721,000	$1,721,000
Real property rights	$0	$0	$2,944,000	$2,944,000	$2,944,000	$2,944,000
Relocation Payments	$0	$0	$0	$0	$0	$0
Project admin.	$0	$0	$0	$0	$0	$0
Total		$13,263,000		$2,944,000		$16,207,000

[1] Price base: 2024

[2] Method of cost allocation:

Table 6-5 is the Structural Table 3b for Channel Work detailing the measures for each project location. All the work falls into the category of establishment of a new channel including the necessary stabilization measures.

Table 6-5 Structural Table 3b. Structural Data – Channel Work.

					Channel Dimensions								
Channel Name (reach)	**Drainage Area (mi)**	**(100) Year Freq Design Discharge (ft^3/s)**	**Water Surface Elev (feet msl)**	**Hyd. Gradient (ft/ft)**	**Gradient (ft/ft)**	**Bottom Width (ft)**	**Elev. (feet msl)**	**Side Slopes (h:v)**	**n Value**	**Velocities (ft/s)[3]**	**Excavation Volume (yd^3)**	**Existing Channel Type [1]**	**Present Flow Cond. [2]**
American Fork City: Location 1	67.1	934	4652.8	0.010	0.010	14-15	4648	1:1	0.013 – 0.028	9.6	NA	N	I
American Fork City: Location 2	67.1	934	4618.4	0.002	0.002	14-15	4610	1:1	0.013 – 0.028	5.4	NA	N	I
American Fork City: Location 3	67.1	934	4585.5	0.010	0.010	14-15	4580	1:1	0.013 – 0.028	9.6	NA	M	I
American Fork City: Location 4	67.1	934	4585.3	0.005	0.005	14-15	4577	1:1	0.013 – 0.028	7.5	NA	M	I
Lehi City Upper Dry Creek: Location 5	41.3	369	4576.2	0.007	0.007	15	4572	2:1	0.013 – 0.028	9.6	NA	N	I
Lehi City Upper Waste Ditch: Location 6	41.3	553	4568.8	0.008	0.008	15	4564	2:1	0.013 – 0.028	6.2	NA	M	I
Lehi City Waste Ditch at Willow Park; Location 7	41.3	553	4501.1	0.010	0.010	15	4497	2:1	0.013 – 0.028	5.3	NA	M	I
Lehi City/Saratoga Springs City Lower Dry Creek; Location 8	41.3	369	4499.5	0.002	0.002	15	4493	2:1	0.013 – 0.028	5.5	NA	N	I

Date Prepared: May 2023

1 N An unmodified, well-defined natural channel or stream.
M Manmade ditch or previously modified channel or stream (show approximate date of original construction in parenthesis).
O None or practically no defined channel."

2 Pr Perennial-Flows at all times except during extreme drought.
I Intermittent-Continuous flow through some seasons of the year.
E Ephemeral-Flows only during periods of surface runoff, otherwise dry.
S Ponded water with no noticeable flow-Caused by lack of outlet or high groundwater table.

3 Discharge velocities are based on design discharge (100-year).

4 Velocity at sheet pile drop structure.

6.11.1 Incremental Economic Analysis

Tables specified in Part 506 of the NWPM (2024) have been included to present information relevant to the costs and benefits of the Action Alternative. Calculations are based on a 50-year evaluation period, 52-year period of analysis, and a discount rate of 2.75 percent (the Federal Water Resources FY 2024 discount rate). Table 6-6 shows the estimated average annual costs for each project measure.

Table 6-6 Estimated Average Annual Costs AF-Dry Creek Watershed, Utah (2024) 1/.

Works of Improvement	Amortization of Installation Cost	Operation, Maintenance and Replacement Cost[2]	Other Direct Costs	Total
American Fork	$104,000	$8,600	$0	$112,600
Lehi Upstream	$251,400	$14,200	$0	$265,600
Lehi Downstream	$263,900	$14,700	$0	$278,600
Total	**$619,300**	**$37,500**	**$0**	**$656,800**

1 Price base: 2024, amortized over 52-years at a discount rate of 2.75 percent.

2 Includes $0 for operation, maintenance, and replacement for recreational development.

3 Costs for technical assistance to install measures in this evaluation unit are included.

Table 6-7summarizes the results of the flood damage reduction analysis conducted for this project.

Table 6-7. Estimated Average Annual Flood Damage Reduction Benefits American Fork-Dry Creek Watershed, Utah (Dollars) 1/.

Item	Estimated Average Annual Damage				Damage Reduction Benefit[3,4]	
	Without Project		With Project			
	Agriculture-related[2]	Non-agriculture-related	Agriculture-related[2]	Non-agriculture-related	Agriculture-related[2]	Non-agriculture-related
Flood Protection Improvements						
Structure, Contents & Vehicles						
American Fork	$781,766	$0	$246,810	$0	$534,956	$0
Lehi Upstream	$5,419,884	$0	$4,445,151	$0	$974,733	$0
Lehi Downstream	$1,195,123	$0	$34,622	$0	$1,160,501	$0
Grand Total	$7,396,773	$0	$4,726,583	$0	$2,670,190	$0

[1] Price base: 2024

[2] Agriculture-related damage includes damage to rural communities.

[3] Includes effects of land-treatment measures.

[4] Costs and benefits for on-farmland treatment have been netted out.

Table 6-8 below summarizes the annual onsite watershed protection damage reduction benefits for the project.

Table 6-8 Estimated Average Annual Watershed Protection Damage Reduction Benefits Dry Creek Watershed, Utah [2024 Dollars][1/].

Item	Damage Reduction Benefit, Average Annual	
	Agriculture-related	Non-agriculture-related
Onsite		
Structure, Contents & Vehicles	$2,670,190	
Total	$2,670,190	$0
[1] Price base: 2024		

The economic analysis of the proposed measures indicates an overall positive benefit cost ratio based on projected benefits from the reduction of flooding. Table 6-9 summarizes the benefits and costs of the project and documents the overall benefit to cost ratio of the proposed measures located within each of the three areas: American Fork River, upper Dry Creek and Waste Ditch, and lower Dry Creek. The project measures for each waterway were combined because of their connectivity and the direct correlation of project measures with one another and associated benefits in reduction in flooding.

Table 6-9 Comparison of Annual Benefits and Costs American Fork-Dry Creek Watershed, Utah (Dollars) [1/].

Works of Improvement	Agricultural Damage Reduction Flood Reduction	Non-Agricultural Other	Average Annual Benefits	Average Annual Costs[2]	Benefit Cost Ratio
Land Treatment—acres					
American Fork	$534,956	$0	$534,956	$112,600	4.75
Lehi Upstream	$974,733	$0	$974,733	$265,600	3.67
Lehi Downstream	$1,160,501	$0	$1,160,501	$278,600	4.17
Total	**$2,670,190**	**$0**	**$2,670,190**	**$656,800**	**4.07**
[1] Price base: 2024					
[2] From Table 2					

7 Consultation, Coordination, and Public Participation

This chapter details other consultation and coordination between NRCS and other federal, state, and local Government Agencies, Native American Tribes, and the public during the preparation of this Plan-EA. Compliance with NEPA, is a federal responsibility that involves the participation of each of these entities in the planning process. NEPA requires full disclosure concerning major actions taken by federal agencies and accompanying alternatives, impacts, and the potential mitigation of impacts. The scoping process is summarized in Chapter 2 with a detailed report in Appendix A.

7.1 Consultation

7.1.1 Standard Requirements

Standard consultation requirements include NHPA Section 106 consultation, NEPA consultation, and Biological consultation (i.e., ESA section 7 and PL 566 section 12).

7.1.1.1 NHPA Consultation

SHPO

The NRCS' consulted with SHPO on determinations of site eligibility and that the Project would have No Adverse Effect on historic properties. SHPO concurred on site eligibility and project effects in a letter dated July 11, 2023 (Appendix A). In the event that cultural/archaeological resources or human remains/funerary objects are found during construction activities, construction would stop, and the appropriate agencies would be notified according to NRCS protocol outlined in the 2015 Prototype Programmatic Agreement between the Utah NRCS and Utah SHPO. SHPO was consulted with a second time and concurred with the APE, site eligibility, and determination of effects on November 6, 2024.

Tribal Consultation

Tribes who hold ancestral land, traditional use, and/or traditional cultural property claims in and near the study area were identified using as a baseline the National Park Service's NAGPRA Native American Consultation Database (NACD), through which any Federally recognized Tribe could identify those counties in Utah where they had consultation interests. The Bureau of Indian Affairs and the Utah Division of Indian Affairs (UDIA) websites were also used as sources. During scoping, the NRCS reached out to the assembled list of Tribes asking if any additional Tribes should be contacted and if they would like to share information regarding any historic properties or places of traditional religious and cultural importance near the proposed study area that should be considered as part of the analysis. A reasonable and good faith effort (per 36 CFR pt. 800.3(f)(2)) was made to consult with these Tribes via letter, email, and telephone. See Table 7-1 for Tribal consultation conducted. Refer to Appendix A for all consultation correspondence.

- Skull Valley Band of Goshute Indians
- Confederated Tribes of the Goshute Reservation
- Ute Indian Tribe of the Uintah & Ouray Reservation
- Shoshone-Bannock Tribes of the Fort Hall Reservation

Table 7-1 NRCS Record of Tribal Consultations.

Tribe Information		Cons Initiated[1]	Cultural Resource Report Consultation Package			Consultation Follow Up				Tribe Cons Result (Date)
Federally Recognized Tribe Address	Contact Name Email / Phone		NRCS Mailed to Tribe	Received by Tribe[2]	Tribe Response	Follow Up #1 Type (Date)	Response #1	Follow Up #2 Type (Date)	Response #2	
Skull Valley Band of Goshute Indians 1198 N. Main Street Tooele, UT 84029	Mr. Daniel Moon (Chairman) danielm@svgoshutes.com 435-882-4532	1/6/2021	6/26/2023 11/12/2024	Y	None	Email (10/30/2023) (01/14/2025)	None	Phone (01/08/2024)	Non-working number	No Response (01/08/2024)
Confederated Tribes of the Goshute Reservation HC61 Box 6104 195 Tribal Center Road Ibapah, UT 84034	Mr. Amos Murphy (Chairman) Amos.murphy@ctgr.us 435-234-1138	1/6/2021	6/26/2023 11/12/2024	Y	None	Email (10/30/2023) (01/14/2025)	None	Phone (01/08/2024) Left message	None	No Response (01/08/2024)
	Mr. Clell Pete Environmental Protection Department clell.pete@ctgr.us 435-234-1138x7	1/6/2021	6/26/2023 11/12/2024	Y	None	Email (10/30/2023) (01/14/2025)	None	Phone (01/08/2024) Left message	None	
Ute Indian Tribe of the Uintah & Ouray Reservation, Utah P.O. Box 190 Fort Duchesne, Utah 84026	Luke Duncan (Chairman) luked@utetribe.com 435-722-5141	1/6/2021	6/26/2023 11/12/2024	Y	None	Email (10/30/2023) (01/14/2025)	None	Phone (01/08/2024) Left message	None	No Concerns (01/08/2024)
	Betsy Chapoose (THPO) betsyc@utetribe.com 435-725-4826	1/6/2021	6/26/2023 11/12/2024	Y	None	Email (10/30/2023) (01/13/2025)	None	Phone (01/08/2024)	No concerns	
Shoshone-Bannock Tribes of the Fort Hall Reservation, Idaho P.O. Box 306 Fort Hall, ID 83203	Mr. Lee Juan Tyler (Chairman) ltyler@sbtribes.com	11/12/24	11/12/2024	Y	None	Email (01/13/2025)	None	None	None	No Response 1/14/2025
	Carolyn Smith CR Coordinator Carolyn.smith@sbtribes.com	11/12/24	11/12/2024	Y	None	Email (01/13/2025)	None	None	None	

Notes: Cons = Consultation, THPO = Tribal Historic Preservation Officer

1 – Tribe consultation was initiated as part of the Scoping process and is documented in the Scoping Report included in Appendix A.

2 – Date of receipt of mail delivery to Tribe.

7.1.1.2 NEPA Consultation

Tribal Scoping for NEPA

Tribes who hold ancestral land, traditional use, and/or traditional cultural property claims in and near the study area were identified using the NPS Native American Graves Protection and Repatriation Act NACD, a database through which any federally recognized tribe could identify those counties in Utah where they had consultation interests. The U.S. Department of Housing and Urban Development Tribal Directory Assessment Tool (TDAT), the Bureau of Indian Affairs (BIA) website, and the UDIA website were used as supplemental sources to identify tribes with consultation interests. The assembled list of tribes identified from the NACD, TDAT, BIA website, and UDIA website are listed below.

Consultation was initiated during the NEPA scoping process when the NRCS reached out to the assembled list of tribes regarding known historic properties or places of traditional religious and cultural importance near the Project area. The following Tribes were contacted:

- Confederated Tribes of the Goshute Reservation
- Skull Valley band of Goshute Indians
- Ute Indian Tribe of the Uintah & Ouray Reservation
- Shoshone-Bannock Tribes of the Fort Hall Reservation

7.1.1.3 Biological Consultation

Section 12 of Public Law (PL) 83-566

PL-566 Section 12 "Notification of Secretary of the Interior (USFWS) or approval of assistance" and 7 CFR 622.4 "Relationship to other agencies" consultation was conducted. Evidence of this consultation is included in Appendix A.

Section 7 of the Endangered Species Act (ESA) – USFWS

The study area was evaluated for the potential occurrence of federally listed threatened, endangered, or candidate plant and animal species or their habitat. The USFWS IPaC site was accessed, and a BA was completed for the project. The analysis determined that June sucker may occur in the area and may be affected but are not likely to be adversely affected. All other species were determined to have No Effect under the Preferred Alternative. The BA was submitted to the USFWS on May 3, 2023 (Appendix E), with a determination of May Affect Not Likely to Adversely Affect (MANLAA) the June sucker and No Effect on all other species on the official list nor on designated critical habitat. The USFWS concurred with the determination on March 22, 2024(Appendix A).

7.2 Coordination

7.2.1 Cooperating Agencies Coordination

Letters were sent to interested agencies and key stakeholders as listed in Table 7-2 to invite their participation as a cooperating agency.

Table 7-2 Cooperating Agencies.

Agency	Accepted/Declined
U.S. Army Corps of Engineers (USACE)	No Response Received
Environmental Protection Agency (EPA)	Declined
U.S. Fish and Wildlife Service (USFWS)	No Response Received
Bureau of Land Management (BLM)	Declined
U.S. Forest Service (USFS)	Declined

7.3 Public Involvement and External Scoping

Scoping meetings were held as part of the early formal scoping period to present the Plan-EA/NEPA process in order to maximize coordination understanding and processes; to gather input for project concerns, opinions, possible obstacles/opposition; and to discuss possible/proposed alternatives. A diverse group of participants, including public, stakeholders, and government agencies at local, county, and state levels, were invited to participate in the scoping process to identify issues and resource concerns.

During the scoping process, project-related input, documents, and comments were requested. Throughout the development of the Plan-EA, ongoing communication will be maintained with interested public, stakeholders, agencies, and tribes. Interested parties used a form found on the project website (https://www.fransoncivil.com/american-fork-plan-ea) to request inclusion on project updates. All public scoping activities, meetings, and comments were documented to ensure NEPA, CEQ, and NRCS scoping requirements have been met. The *Scoping Report* (Appendix A) presents the scoping plan, efforts, and comments received during the 30-day comment period (January 13, 2021, to February 12, 2021).

7.3.1 Public Scoping Meeting

A public scoping meeting was held virtually on January 27, 2021, at 5:30 p.m. to present an overview of the NRCS funding, NEPA process, project issues, and to solicit information and comments. There were four presenters, nine panelists, and fourteen public attendees at the public meeting. Participants of the scoping meetings were invited to submit comments via online form, email, or physical letter. One comment was received during the public scoping period from the UDWR relating to the June sucker and its potential presence in the American Fork River channel upstream of Utah Lake.

7.3.2 Agency Coordination and Scoping Meeting

Scoping notices and agency invitations were sent to agencies, including cooperating agencies via email on January 6, 2021, and by mail on January 7, 2021, and January 13, 2021, for an agency scoping meeting held virtually on January 21, 2021. The information was also placed on the project website at www.fransoncivil.com/american-fork-plan-ea/ and on the Utah NRCS website.

A virtual agency scoping meeting was held on January 21, 2021, via Microsoft Teams to provide information and solicit information in the study area. Six attendees participated in the meeting in addition to the study team.

7.4 Plan Development and Review

This Plan-EA was developed in close coordination with multiple agencies and the public underwent the following informal and formal reviews, detailed below:

- Public and Agency Scoping (Plan-EA): January 2021
- State-Level Preliminary Review: July 2022
- National Level Technical Review: February 2024
- Programmatic Review: [INSERT DATE]
- Public and Agency Review: [INSERT DATE]
- Programmatic Review, Final: [INSERT DATE]

7.5 Distribution List

A notice of availability for the Draft Plan-EA was distributed to the following government agencies/staff and organizations.

7.5.1 Agencies

- Federal Emergency Management Agency - FEMA
- U.S. Army Corps of Engineers – USACE
- U.S. Bureau of Reclamation - USBR
- U.S. Environmental Protection Agency - EPA
- U.S. Fish & Wildlife Service - USFWS
- U.S. Forest Service – USFS
- U.S. Geologic Service - USGS

7.5.2 Tribes

- Confederated Tribes of the Goshute Reservation
- Skull Valley Band of Goshute Indians
- Ute Indian Tribe of the Uintah & Ouray Reservation
- Shoshone-Bannock Tribes of the Fort Hall Reservation

7.5.3 State Entities

- State Representatives
- State Senators
- U.S. Representatives
- U.S. Senators
- State of Utah - Office of the Governor
- Utah Department of Environmental Quality - UDEQ
- Utah Department of Natural Resources - UDNR
- Utah Department of Transportation - UDOT
- Utah Department of Water Resources – UDWRe
- Utah Division of Water Rights - UDWRi
- Utah Division of Wildlife Resources – UDWR
- Utah Natural Heritage Program - UNHP
- Utah State Historic Preservation Office - SHPO

7.5.4 Local Government

- American Fork City
- Lehi City
- Saratoga Springs City
- Utah County

7.5.5 Private Parties

Property owners and residents within the study area. The names and addresses of private parties who received notices of the Plan-EA are not listed in this chapter for privacy reasons.

8 References

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9 List of Preparers

9.1 Preparers

The Plan-EA was reviewed by NRCS-Utah resource specialists and the NRCS's National Water Management Center (NWMC).

Table 9-1. Plan-EA Preparers.

Name	Current Title & Years of Experience	Education	Other Pertinent Qualifications, Professional Licenses
Derek Hamilton NRCS-Utah	Watershed Coordinator 25+ Years	BS Geography MS Environmental Science	
Aimee Rohner, PE NRCS-Utah	Project Engineer 20+ Years	BS Civil Engineering MS Civil Engineering	PE registration (UT, AK)
Tara Hoffmann NRCS-Utah	Archaeologist 15+ Years	BS Interdisciplinary Studies MA Anthropology	
Eric Franson, PE Franson Civil Engineers	Project Manager 20+ Years	BS Civil Engineering	PE registration (UT)
Vince Hogge, PE Franson Civil Engineers	Project Engineer 20+ Years	BS Civil Engineering	PE registration (UT)
Patricia Ayaa Franson Civil Engineers	Engineer In Training 1 Year	BS Civil Engineering PhD Civil Engineering	
Landon Richins Franson Civil Engineers	Environmental Specialist 2+ Years	BS Environmental Science & Management	
Monique Robbins, PE Horrocks Engineers	Environmental Coordinator 25+ Years	BS Civil Engineering	PE registration (CA)
Jenna Jorgensen Jones and DeMille Engineering	Environmental/ Biologist 15+ Years	BS, Biology/Zoology MS, Wildlife and Wildlands Conservation	
Parker Vercimak, PE Jones and DeMille Engineering	Project Engineer 5+ Years	BS Civil Engineering	PE registration (UT)
Hal Gordon Retired - NRCS	Economist 25+ Years	BS Economics	

10 Appendices

Appendix A. Comments and Responses

Appendix B. Project Maps

Appendix C. Support Maps

Appendix D. Investigation and Analysis Report

Appendix E. Other Supporting Information.