



**Draft Watershed Plan—
Environmental Impact Statement
for
Logan River Watershed Project
Cache County, Utah**



Prepared By:

Lead Federal Agency:

U.S. Department of Agriculture
Natural Resources Conservation Service

In Cooperation With:

Cooperating Agencies:

U.S. Army Corps of Engineers
U.S. Environmental Protection Agency

Sponsoring Local Organization:

Cache Water District

Co-sponsoring Local Organizations:

Logan City, North Logan City, Hyde Park City,
Crockett Avenue Irrigation Company

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Utah’s 1st Congressional District
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Cache Water District
(Sponsor)

Logan City, North Logan City, Hyde Park City, and Crockett Avenue Irrigation Company
(Co-sponsors)

AUTHORITY

The watershed study and Draft Watershed Plan–Environmental Impact Statement (Draft Plan-EIS) have been prepared under the authority of the Watershed Protection and Flood Prevention Act of 1954 (Public Law [PL] 83-566) as amended and in accordance with the National Environmental Policy Act (NEPA) of 1969, PL 91-190, as amended (42 U.S.C. 4321 et seq.). The Plan-EIS would be implemented under the PL 83-566 authorized purposes of agricultural water management, flood prevention, and public recreation.

ABSTRACT

This document was developed to assess the effects of the Logan River Watershed Project (Proposed Project). The purpose and need of the Proposed Project is threefold 1) to improve agricultural water management by improving irrigation efficiency and water conservation and maintaining and enhancing environmental conditions and beneficial water use in the form of instream flows; 2) to prevent flooding because the existing canals do not have adequate flow capacity to transport the additional stormwater produced by large storm events; and 3) to enhance recreational opportunities because the rapidly growing area of Logan, North Logan, and Hyde Park has a limited trail system, and enhancements are needed to provide access to maintain key components of the pressure irrigation and flood prevention infrastructure as well as provide additional access points to the terrestrial and river trail system. The total project installation cost is estimated to be \$308,633,000, of which \$275,893,400 would be paid from U.S. Department of Agriculture–Natural Resources Conservation Service (USDA-NRCS) PL 83-566 funds and \$32,739,600 from local funds.

COMMENTS AND INQUIRIES

Comments and inquiries must be received within 45 days of publication of the Notice of Availability (NOA) for the Draft Plan-EIS in the Federal Register (Regulations.gov). Submit comments and inquiries to: Ammon Boswell, Watershed Program Manager, USDA, NRCS, 1950 West Main St., Tremonton, Utah 84337; telephone: (435) 459-1621; or email: ammon.boswell@usda.gov.

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ANCESTRAL LAND ACKNOWLEDGMENT

NRCS, through the review of the National Park Service 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 National Environmental Policy Act (NEPA) and National Historic Preservation Act (NHPA) consultations, identified four Federally Recognized Tribes. The Eastern Shoshone Tribe of the Wind River Reservation, Wyoming; the Shoshone-Bannock Tribes of the Fort Hall Reservation; the Ute Indian Tribe of the Uintah & Ouray Reservation, Utah; and the Northwest Band of the Shoshone Nation have ancestral land, traditional use, and/ or traditional cultural property claims within the project area and the immediate vicinities. Consultation with these four entities will continue throughout this plan's development; refer to Appendix A for that correspondence.

WATERSHED PLAN AGREEMENT
(TO BE INCLUDED IN FINAL PLAN–EIS)

Summary Office of Management and Budget (OMB) Fact Sheet

S-1 Title of Proposed Action

Draft Watershed Plan–Environmental Impact Statement (Draft Plan-EIS) for the Logan River Watershed Project

S-2 Watershed

Logan River Watershed

S-3 County, State

Cache County, Utah

S-4 Congressional District

Utah’s 1st Congressional District

S-5 Prepared By

United States (U.S.) Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS).

S-6 Authority

The NRCS prepared the Draft Plan–EIS for the Logan River Watershed Project (Proposed Project) under the authority of Section 1001 of the Watershed Protection and Flood Prevention Act (Public Law 83-566 [PL 83-566]) of 1954 (68 Statute 666 as amended; 16 United States Code [U.S.C.] Section 1001 et seq.) and in accordance with the National Environmental Policy Act (NEPA). The works of improvement would be installed under the PL 83-566 authorized purposes of agricultural water management, flood prevention, and public recreation.

This environmental document was initiated using the 40 CFR 1500-1508 (May 20, 2022) and 7 CFR 650 regulations. These regulations have recently been rescinded and replaced with USDA regulations found under 7 CFR 1b, published as a Final Rule in the Federal Register on April 3, 2026 (91 FR 17062). However, in a good-faith effort to fulfill NEPA’s requirements, including Congressional timeline and considerations of fiscal restraints, the agency decided to continue to use 40 CFR 1500-1508 (July 31, 2023) and 7 CFR 650. This is permissible per the USDA policy guidance issued in the Final Rule’s preamble. The Federal Register notice said: “If the NOI for an EIS published more than 90 days prior to the publication of this final rule, the USDA subcomponent has discretion to continue applying the versions of NEPA regulations being applied before publication of the NOI or to switch to applying 7 CFR 1b as published in this final rule.”

S-7 Sponsoring Local Organization

The Sponsor is Cache Water District (CWD), and the Co-sponsors are Logan City, North Logan City, Hyde Park City, and Crockett Avenue Irrigation Company (CAIC). CAIC is made up of ten

separate irrigation companies including: Benson Irrigation Company (BIC), Hyde Park Irrigation Company (HPIC), Logan Cow Pasture Irrigation Company, Logan Island Irrigation Company, Logan North Field Irrigation Company (LNFIC), Logan Northwest Field Irrigation Company, Logan Southwest Field Irrigation Company, Seventh Ward Irrigation Company, Sunday Water Users Ditch, and Thatcher Irrigation Company.

S-8 Cooperating Agencies

The NRCS formally invited agencies to become Cooperating Agencies for the Proposed Project. On January 13, 2021, the NRCS invited the U.S. Department of the Interior, U.S. Environmental Protection Agency (EPA), U.S. Army Corps of Engineers (USACE), U.S. Forest Service (USFS), and U.S. Fish and Wildlife Service (USFWS). The EPA and USACE agencies formally accepted. A Memorandum of Understanding (MOU) between NRCS, EPA, and USACE was signed on October 2, 2024.

S-9 Federal Objective

Investments in this proposed action reflect national priorities, encourage economic development, and protect the environment by: (1) seeking to maximize sustainable economic development; (2) seeking to avoid the unwise use of floodplains and flood-prone areas and minimizing adverse impacts and vulnerabilities in any case in which a floodplain or flood-prone area must be used; and (3) protecting and restoring the functions of natural systems and mitigating any unavoidable damage to natural systems.

S-10 Purpose and Need for Action

The purpose and need of the Proposed Project is threefold 1) to *improve agricultural water management* by improving irrigation efficiency and water conservation, to maintain and enhance environmental conditions and beneficial water use in the form of instream flows; 2) to *prevent flooding* because the existing canals do not have adequate flow capacity to transport the additional stormwater produced by large storm events; and 3) to *enhance recreational opportunities* because the rapidly growing area of Logan, North Logan, and Hyde Park has a limited trail system, and enhancements are needed to provide access to maintain key components of the pressure irrigation and flood prevention infrastructure.

S-11 Description of the Preferred Alternative

The Preferred Alternative (First Dam) activities include: relocation of the CAIC River diversion, creation of water storage and pump stations, installation of new hydropower turbines, installation of a new pressurized irrigation (PI) system, reconstruction of the Crockett Diversion, increased Logan River instream flows, maintained Little Logan base flows, improvements to floodwater overflow, and construction of recreation trails.

S-12 Resource Information

Relevant resource concerns that have been identified during scoping include: economics/socioeconomics, Clean Air Act (CAA)/National Ambient Air Quality Standards (NAAQS); greenhouse gases (GHG); energy; upland erosion and sedimentation; prime and unique farmland, and farmland of statewide importance; special status plant species including endangered and threatened plant species; riparian areas; noxious weeds and invasive plant

species; surface and ground water quality and quantity; Clean Water Act (CWA) and Waters of the U.S. (WOTUS); wetlands; Regional Water Management Plan; floodplain management; fish and wildlife and wildlife habitat; candidate, threatened, and endangered animal species; migratory birds and bald and golden eagles; cultural and historic resources; scientific resources; public health and safety; hazardous materials; transportation and infrastructure; noise; visual resources and scenic beauty; recreation; social issues; land use; and natural areas.

Table S-1 lists the resource information for the Proposed Project Area (Project Area). The descriptions include resources within the Project Area, unless otherwise specified.

Table S-1. Existing Resource Information

Resource	Description¹
Project Area Latitude/Longitude	Northernmost point (Hyde Park): 41.812768, -111.826650 Southernmost point (Logan River): 41.705037, -111.851109 Easternmost point (First Dam): 41.742687, -111.786813 Westernmost point (Benson): 41.747359, -111.934346
Watershed Hydrologic Unit Code (HUC) Number and Watershed Area	HUC 160102020703 Nebo Creek-Bear River (21,137 acres) HUC 160102030405 Fourmile Creek-Little Bear River (1,812 acres) HUC 160102030404 Blue Spring Creek (12,480 acres) HUC 160102030308 Little Logan River-Logan River (22,318 acres) HUC 160102020702 Hopkins Slough (28,820 acres) HUC 160102030307 Card Canyon-Logan River (16,835 acres) HUC 160102030306 Cottonwood Canyon-Logan River (17,804 acres) HUC 160102030305 Right Fork Logan Canyon (16,110 acres) HUC 160102030303 Temple Fork (10,243 acres) HUC 160102030304 Tony Grove Creek-Logan River (28,006 acres) HUC 160102030301 Beaver Creek (27,087 acres) HUC 160102030302 Hell's Kitchen Canyon-Logan River (21,366 acres) Combined area: 224,019 acres
Project Area Climate ²	Average high temperatures: 70.0°F Average low temperatures: 26.5°F
Topography	The elevation within the Project Area ranges from approximately 4,402 feet above mean sea level (AMSL) to 4,682 feet AMSL. The landscape throughout the Project Area is characteristic of the Cold North American Desert habitat type. Upper elevations within the watershed areas can reach up to approximately 8,000 feet AMSL and provide an important water source to the Project Area from snowmelt.
Watershed Size	224,019 acres
Project Area Annual Precipitation/ Annual Snowfall ³	19.67 inches/ 64.8 inches

Resource	Description ¹	
Project Area Land Uses	Developed: 5,877 acres (28.0%) Other Hay/ Non-Alfalfa: 4,007 acres (19.1%) Alfalfa: 3,453 acres (16.5%) Grassland/Pasture: 2,348 acres (11.2%) Developed/Open Space: 1,392 acres (6.6%) Corn: 620 acres (3.0%) Winter Wheat: 385 acres (1.8%) Barley: 346 acres (1.6%) Other: 2,553 acres (12.1%) <i>Total Project Area: 20,980 acres</i> Land uses in the <i>watershed areas</i> vary by ownership and include Cache National Forest, Utah State Lands, Utah State Wildlife Reserve, and private lands. Vegetation types within the watershed areas include conifer forests, aspen, mountain mahogany, sagebrush steppe, grasslands, riparian, meadows, and rocky areas. ⁴	
Project Area Land Ownership	Private 10,135.5 acres (48.3%) Local 10,756.2 acres (51.3%) State 88.3 acres (<1%) Federal 0.6 acres (<1%) <i>USFS only</i> <i>Total Project Area: 20,980 acres</i>	
Population ⁵	10,986 people (North Logan City) 52,778 people (Logan City) 5,234 people (Hyde Park City) 1,492 people (Benson Census-designated Population [CDP]) 133,154 people (Cache County)	
Cache County Demographics ^{5,6}	<u>Demographic</u>	<u>Cache County</u>
	White alone	84.7%
	African American	0.8%
	Native American and Native Alaskan	0.8%
	Asian	1.8%
	Native Hawaiian and Other Pacific Islanders	0.5%
	Two or More Races	6.1%
	Hispanic or Latino	5.2%
	White alone, not Hispanic or Latino	11.3%
Farms Present ⁷	1,378 farms (Cache County)	
Land in Farms ⁷	269,909 acres (Cache County)	
Average Farm Size ⁷	196 acres (Cache County)	

¹Total numbers may not equal 100% or correspond exactly due to rounding and mapping variations.

²National Oceanic and Atmospheric Administration (NOAA) 2024a.

³USDA-NRCS Wetlands Climate Analysis Tables (WETS) Table (NRCS 2024a).

⁴U.S. Geological Survey (USGS) and USDA Forest Service 2023.

⁵Table P1, 2020 Decennial Census (U.S. Census Bureau [Census] 2020a).

⁶Table P2, 2020 Decennial Census (Census 2020b).

⁷NRCS 2024b.

S-13 Alternative Plans Considered

All reasonable alternatives were evaluated in this Draft Plan–EIS to determine the locally preferred, environmentally preferred, and the national economic efficiency (NEE) alternatives. While a standalone nonstructural alternative could not be formulated to address the watershed problems while meeting the Sponsor’s objectives and avoiding constraints, nonstructural measures to meter water were included in the alternatives. Alternatives considered in this Draft Plan–EIS include the No Action Alternative or Future without Federal Investment (FWOFI), the First Dam Alternative, the Crockett Diversion Alternative, and Alternatives 1 and 2. Through the analysis conducted in the this Draft Plan–EIS, the First Dam Alternative was determined to be the Preferred Alternative/Future with Federal Investment (FWFI). All alternatives were evaluated against the purpose and need, the Principles, Requirements, and Guidelines (PR&G) Guiding Principles, and decision criteria. From that evaluation, Alternatives 1 and 2 were removed from detailed analysis, and only the No Action, the First Dam, and the Crockett Diversion Alternatives were carried forward. A description of each alternative follows. Avoidance and minimization measures, such as Best Management Practices (BMPs) and design criteria, mitigation to resolve the adverse effect to historic canals, and compensatory mitigation for aquatic resources would be implemented with each alternative.

- Under the ***No Action Alternative (FWOFI)***, the ten irrigation companies that comprise the CAIC would continue to divert water from the Logan River. Independent of the Proposed Project, CAIC will reconstruct the Crockett Diversion and replace a portion of the Crockett Canal to ensure operator safety, reduce slope failure risk, and maintain current service standards. These actions are not connected to the Proposed Project and are expected to occur regardless of whether the Draft Plan–EIS is implemented. In the future, the CAIC would line canals to reduce seepage; canal lining would occur in phases. All other existing structures would continue to operate in their current condition. Under the No Action Alternative, the Sponsor would not construct a new pressurized system, address stormwater overflowing canals, or construct recreational trails.

No PL 83-566 funds would be used under this alternative; therefore, the No Action Alternative is the FWOFI. The initial estimated installation costs for the FWOFI are \$5,050,000, the continued annual operations, maintenance, and replacement (OM&R) costs for the FWOFI are \$325,000. The average annualized OM&R costs and the flood damages costs are \$533,900.

- ***First Dam Alternative*** would change the main irrigation diversion location of the CAIC’s water rights to First Dam and add an additional point of diversion downstream on the western end of the Logan River near N 3200 W to pressurize the irrigation delivery system. This alternative would construct a PI distribution system that would reduce water losses and pumping requirements while enhancing secondary irrigation water connections to agricultural producers and residents in the service area. The existing, unused Logan City lagoons would be converted to a secondary irrigation water storage reservoir, and three pump stations would be constructed with hydropower generating capabilities to service water supply and withdrawals from the reservoir.

The Crockett Diversion would be reconstructed to allow river flows to continue to be diverted into the Little Logan. The Providence Pioneer Irrigation Company’s Diversion

would be removed to improve public safety, water quality, and river aesthetics, and to facilitate fish habitat and recreational opportunities.

This alternative would secure and manage instream flows while recognizing water rights by increasing the amount of flow in the Logan River above existing summer base flows for 14 miles during the irrigation season and ensuring base flows of up to 10 cubic feet per second (cfs) to the Little Logan during the irrigation season to maintain flow in City Parks.

This alternative would reduce flooding in the watershed by removing irrigation water from the canals and improving a portion of the existing canals to carry runoff flows to a newly constructed regional overflow facility (pipe) at 1800 North that would carry large flood flows to the west. This design would allow floodwater from storms that currently overflow the major canals that run north through Logan, North Logan, and Hyde Park cities to be safely transported to the west to Swift Slough.

Approximately 3,420 feet of recreational trails would be constructed along Canyon Road and along the Crockett Canal's right-of-way (ROW) corridor from 600 East to 200 East. Also, 1,010 feet of trail, including a 75-foot bridge, would be constructed from Sumac Drive across the Logan River through the southern side of River Hollow Park and adjacent to the open channel of the Little Logan to allow for increased recreational use in the area. These recreational development improvements are ancillary to replacing the existing canal where the canal water would be piped for the Canyon Road trail, reconstructing the Crockett Diversion for the Sumac Drive/River Hollow Park trail, and to providing access to maintain key components of the pressure irrigation system. The estimated installation cost for this alternative is \$308,633,000, and the estimated average annual costs, including installation and OM&R are \$1,910,000. The average annualized OM&R costs for the First Dam Alternative are estimated at \$14,860,700. The average annualized benefits are estimated at \$15,754,700.

- ***Crockett Diversion Alternative*** is similar in scope to First Dam Alternative, except that the current point of diversion for CAIC's water rights would not be moved to First Dam and the hydropower generators at the reservoir (lagoons) would not be installed. Consequently, a new trunkline between First Dam and the Crockett Avenue diversion would not be required, but more pumping would be required to operate the PI system because of the reduced elevation of the diversion location compared to the First Dam Alternative. The majority of CAIC's water rights would continue to be supplied by diverting water at the current Crockett Diversion, in addition to the new point of diversion along the western end of the Logan River near N 3200 W, like the First Dam Alternative.

Besides these differences and associated actions, the remainder of the irrigation improvements (i.e., constructing PI distribution system; converting lagoons to secondary irrigation water storage reservoir; constructing pump stations; removing Providence Pioneer dam; etc.) and all the flood control and recreational improvements would be the same as in the First Dam Alternative. The initial installation cost for this alternative is \$280,683,400, and the estimated annual cost, including installation and OM&R, is \$2,320,000. The average annualized OM&R costs for the Crockett Diversion Alternative

are estimated at \$13,579,100. The average annualized benefits are estimated at \$15,431,500.

- **Alternative 1** is similar in scope to First Dam Alternative, except Crockett Diversion would be removed and replaced with a series of steps and pools, instead of being reconstructed. Besides these differences and associated actions, the remainder of the irrigation improvements (i.e., constructing PI distribution system; converting lagoons to secondary irrigation water storage reservoir; constructing pump stations; removing Providence Pioneer dam; etc.) and all the flood control and recreational improvements would be the same as in First Dam Alternative.
- **Alternative 2**—the Western Pumping Alternative—would change the irrigation diversion location of the CAIC’s water rights downstream and west of Logan. This change requires the pumping of all water supplied to users in a two-stage pumping system (i.e., from the river to the storage reservoir and from the storage reservoir to the PI system). The unused Logan City lagoons would be converted to secondary irrigation water storage. Approximately 13.9 miles of the Logan River would experience an increase in flow throughout the irrigation season at the cost of pumping all irrigation water from the western end of the system. Additionally, under this alternative, the Crockett Diversion would be removed and replaced with a series of steps and pools. Besides these differences and associated actions, the remainder of the irrigation improvements (i.e., constructing PI distribution system; converting lagoons to secondary irrigation water storage reservoir; constructing pump stations; removing Providence Pioneer dam; etc.) and all the flood control and recreational improvements would be the same as in First Dam Alternative.

S-14 Project Costs and Funding Source

A breakdown of the estimated project costs for the FWFI is summarized in Table S-2. NRCS design engineering, construction management, and NRCS incurred administration costs are not cost-shared by the Sponsor. The construction costs include planning-level cost estimates for environmental compliance measures necessary to implement the authorized works of improvement under PL 83- 566. These measures include compensatory mitigation that may be required to obtain CWA Section 404 authorization and NHPA Section 106 compliance. Actual mitigation requirements and costs would be determined during permitting and design and do not pre-determine permit conditions. Any costs incurred for administration by the Sponsor would not be cost-shared by NRCS.

Table S-2. Estimated Preferred Alternative Project Costs Distribution, Logan River Watershed, Utah (2025 Dollars)

Works of Improvement	Item	Installation Cost ¹								Total
		Public Law 83-566 Funds ²				Other Funds				
		Flood Control	Agricultural Water Management	Recreation	Total	Flood Control	Agricultural Water Management	Recreation	Total	
First Dam Alternative	Construction ³	\$137,610,000	\$81,052,500	\$2,209,500	\$220,872,000	\$0	\$27,017,500	\$2,209,500	\$29,227,000	\$250,099,000
	Engineering	\$13,761,000	\$10,807,000	\$441,900	\$25,009,900	\$0	\$0	\$0	\$0	\$25,009,900
	Construction Engineering	\$13,761,000	\$10,807,000	\$441,900	\$25,009,900	\$0	\$0	\$0	\$0	\$25,009,900
	Permitting	\$0	\$0	\$0	\$0	\$1,328,200	\$2,161,400	\$15,000	\$3,504,600	\$3,504,600
	Administration	\$2,752,200	\$2,161,400	\$88,000	\$5,001,600	\$4,000	\$0	\$4,000	\$8,000	\$5,009,600
Total		\$167,884,200	\$104,827,900	\$3,181,300	\$275,893,400	\$1,332,200	\$29,178,900	\$2,228,500	\$32,739,600	\$308,633,000

¹Price base-2025 dollars. Totals may not sum due to rounding.

Prepared: January 2025.

²NRCS is the federal agency responsible for assisting in installation of works of improvement.

³Includes \$133,350 for cultural resource protection and CWA Section 404 mitigation measures. Mitigation costs represent planning-level estimates for mitigation that may be required to comply with NHPA Section 106 and CWA Section 404 permitting and do not pre-determine permit conditions. Actual mitigation requirements and costs would be determined during design and permitting.

S-15 Ecosystem Services Framework

An ecosystem services framework was used to evaluate benefits and costs for the Proposed Project. Ecosystem services is a broad term used to describe the multitude of benefits that nature provides to humans.

The four-category ecosystem framework adopted in the PR&G includes the following ecosystem service types—provisioning, regulating, cultural, and supporting services. Table S-3 summarizes the project alternatives and associated ecosystem services.

Table S-3. Summary of Project Alternatives and Associated Ecosystem Services

Item	FWOFI Alternative	FWFI First Dam Alternative	Crockett Diversion Alternative
Alternatives			
Locally Preferred		X	
Nonstructural		X	X
National Economic Efficiency		X	
Environmentally Preferable		X	
Guiding Principles			
Healthy and Resilient Ecosystems		X	X
Sustainable Economic Development		X	X
Watershed Approach		X	X
Public Safety		X	X
Floodplains		X	X
National Economic Efficiency (Average Annualized)¹			
Project Cost	\$0	\$14,860,700	\$13,579,100
Project Benefits	\$0	\$15,754,700	\$15,431,500
Ecosystem Services Addressed and Tradeoffs Identified¹			
Provisioning Services (Average Annualized)			
Increased hydroelectricity production ²	\$0	\$194,000	\$0
Reduction in power requirements during peak emissions	No reduction	Large reduction with hydropower production	Power requirements increase over existing condition
Clean air (carbon dioxide [CO ₂] tons/year of GHG emissions)	No change 1,048,000	430,000	6,280,000
Conserved water (acre-feet [ac-ft])	0	5,390	5,390

Item	FWOFI Alternative	FWFI First Dam Alternative	Crockett Diversion Alternative
<i>Regulating Services (Average Annualized)</i>			
Reduced property damage	\$0	\$10,134,900	\$10,134,900
Reduced road damage	No	Reduction of damage to 3,150 feet of roadway	Reduction of damage to 3,150 feet of roadway
Reduced damage to agricultural income	\$0	\$1,140,500	\$1,140,500
Reduced water treatment and supply expenses	\$0	\$2,000,000	\$2,000,000
Change in instream flows	No change	\$2,052,900	\$1,923,700
<i>Cultural Services (Average Annualized)</i>			
Recreation benefits	\$0	\$232,400	\$232,400

¹All monetary values are reported in 2025 dollars. Price base: 2025 dollars amortized over 50 years at a discount rate of 3.0 percent.

²Hydroelectricity production benefits only accrue to the First Dam Alternative.

S-16 Project Benefits

The planning policy used for this plan and environmental document—PR&G—states that Federal investments in water resources as a whole should strive to maximize public benefits, with appropriate consideration of costs. Multiple benefits would result from the implementation of the FWFI (Preferred Alternative). Monetized benefits are related to and include addressing water losses, water rights protection, reduced pumping requirements, and improved late-season water storage, and include reducing property damages, reducing damage to agricultural income, reducing water treatment and supply expenses, enhancing instream flows below First Dam, increasing hydroelectricity production, and recreation.

The FWFI would directly benefit many shareholders in the Cache Valley over the project lifetime. Higher crop yields, and reduced pumping and water losses from successful agricultural water management would benefit stakeholders within CAIC's service area.

The FWFI would positively affect regulating services in the watershed by reducing property damages, reducing road damage, reducing damage to agricultural income, reducing water treatment and supply expenses, enhancing instream flows below First Dam. The FWFI would positively affect provisioning services by increasing hydroelectricity production, reducing power requirements during peak emissions, reducing GHG emissions, and conserving water. The FWFI would also enhance recreation values compared to the FWOFI. In total, the FWFI would create average annualized benefits of approximately \$15,754,700 per year (Table S-4), of which approximately 99 percent of the benefits are agricultural related.

Table S-4. Economic Table 5a—Estimated Average Annualized Benefits and Reduced Damages in Logan River Watershed Project, Utah (2025 Dollars)

Benefit/Reduced Damage ^{1,2}	Non-Agricultural Related	Agricultural Related	Notes on Allocation of Benefits
Benefits Applying Equally to Both Action Alternatives			
Reduced property damage	-	\$10,134,900	Benefits are allocated 92% to the Agricultural Distribution and Stormwater increment and 8% to the Floodplain increment.
Reduced water treatment and supply expenses	-	\$2,000,000	Benefits are allocated 100% to the Agricultural Distribution and Stormwater increment.
Reduced damage to agricultural income	-	\$1,140,500	Benefits are allocated 100% to the Agricultural Distribution and Stormwater increment
Recreation	\$232,400	-	Benefits are allocated 100% to the Recreation increment.
Sub-Total of Benefits Applying Equally to Both Action Alternatives	\$232,400	\$13,275,400	
Benefits Varying by Action Alternative			
First Dam Alternative			
Additional instream flows in 15.1-mile reach of Logan River	-	\$2,052,900	Benefits are allocated 100% to the Agricultural Distribution and Stormwater increment
Increased hydroelectricity production ³	-	\$194,000	Benefits are allocated 100% to the Agricultural Distribution and Stormwater increment
Sub-Total of Benefits Applying to First Dam Alternative Only	\$0	\$2,246,900	
Crockett Alternative			
Additional instream flows in 13.1-mile reach of Logan River	-	\$1,923,700	Benefits are allocated 100% to the Agricultural Distribution and Stormwater increment
Sub-Total of Benefits Applying to Crockett Diversion Alternative Only	-	\$1,923,700	
Total Benefits by Action Alternative			
First Dam Alternative	\$232,400	\$15,522,300	Total Benefits: \$15,754,700
Crockett Diversion Alternative	\$232,400	\$15,199,100	Total Benefits: \$15,431,500

¹Totals may not sum due to rounding. Prepared January 2025.

²Price base: 2025 dollars amortized over 50 years at a 3.0 percent.

³Hydroelectricity production benefits only accrue to the First Dam Alternative.

S-17 Net Economic Benefits

The estimated average annualized project economic benefits are summarized in Table S-5. The FWFI improvements would generate economic returns greater than the upfront installation and ongoing management costs compared to the FWOFI. Under the FWOFI, CAIC would continue to underutilize its water supply due to transmission losses. Additionally, the canals would continue to pose a risk to human health and safety from flooding. CAIC would also continue to face expenses to replace its aging irrigation system.

To reduce these damages and address other opportunities in the watershed, the estimated project installation costs of the FWFI are \$308,633,000. The value of the regulating, provisioning, and cultural service benefits generated by the project is an average annualized \$15,754,700, compared to an average annualized cost of \$14,860,700, for a benefit-cost ratio (BCR) 1.1.

Table S-5. Economic Table 6—Comparison of Average Annualized Costs, Reduced Damages and Benefits

Increment	Agricultural Related ^{1,2}					Non-Agricultural Related	Average Annualized Benefit	Average Annualized Cost	Benefit Cost Ratio
	Reduced Property Damage	Reduced Water Supply Expenses	Increased Electricity Production	Reduced Damage to Agricultural Income	Instream Flow Increase	Recreation			
Floodplain	\$810,800	-	-	-	-	-	\$810,800	\$198,100	4.1
Agricultural Water Distribution & Stormwater	\$9,324,100	\$2,000,000	\$194,000	\$1,140,500	\$2,052,900	-	\$14,711,500	\$14,430,200	1.0
Recreation	-	-	-	-	-	\$232,400	\$232,400	\$232,400	1.0
Total	\$10,134,900	\$2,000,000	\$194,000	\$1,140,500	\$2,052,900	\$232,400	\$15,754,700	\$14,860,700	1.1

¹Totals may not sum due to rounding

²Price base: 2025 dollars amortized over 50 years at a 3.0 percent.

Prepared: January 2025

S-18 Funding Schedule

Funding Schedule: \$308,633,000

- Federal Funds: \$275,893,400
- Non-federal Funds: \$32,739,600

S-19 Period of Analysis

The period of analysis is 50 years.

S-20 Project Life

The life of the FWFI (Preferred Alternative) is estimated to be 50 years.

S-21 Discount Rate

Benefits and costs are discounted using the federal project discount rate of 3.0 percent for 2025.

S-22 Summary of Environmental Effects

Table S-6 lists the resources of concern, context and intensity, and the environmental effects associated with the FWFI (Preferred Alternative). Resources that would not be affected by the FWFI are not listed in this table.

Table S-6. Summary of Resource Concerns, Context and Intensity, and Environmental Effects

Resource of Concern	Context and Intensity	Summary of Environmental Effects for Future with Federal Investment (Preferred Alternative)
Economics/Socioeconomics		
Economics/ Socioeconomics— NEE PR&G	Addressing CAIC's water losses would ultimately increase the economic efficiency for producers in the Project Area.	Direct effects include the use of approximately \$32,739,600 in local match funds to construct the Proposed Project. The FWFI would temporarily create approximately 52 jobs within the Project Area during construction. The FWFI would require an average annualized cost of \$14,860,700 and provide \$15,754,700 in average annualized benefits, representing a BCR of 1.1.
Air Quality		
CAA/NAAQS	Proposed activities could affect air quality protected by the CAA.	During construction, minimal particulate and diesel emissions from heavy equipment operations would result in a temporary, negligible adverse effect to air quality. Once construction is complete, the required operations and maintenance (O&M) activities would decrease and the operation of the hydropower station would reduce particulate matter (PM _{2.5}) emissions below existing conditions, resulting in a long-term beneficial effect to air quality. Cache County would continue to meet NAAQS.
GHG	Temporary air emissions could contribute to the accumulation of GHG.	Project activities reduce GHGs to 760,000 pounds (lb) of CO ₂ emissions because of reduced local pumping and hydropower generation.
Energy		
Energy	Proposed activities could change the distribution method and amount of power consumed and generated.	The Preferred Alternative capitalizes on the gravitational flow of water, reducing its annual electrical power consumption. Additionally, the Preferred Alternative also includes a hydropower station, which is estimated to produce approximately 1,730,000 kilowatt-hour (kW/hr) per year, helping to offset existing power costs and prevent excessive rate hikes which would affect all shareholders' costs.
Soils & Geology		
Upland Erosion & Sedimentation	Soil disturbance from project activities may contribute to erosion or sedimentation.	Temporary, minor effects to soil resources would occur during construction due to soil disturbance and exposure of bare soils to erosion potential. BMPs, such as temporary erosion and sediment controls (TESCs), reduce potential sedimentation. All requirements for the Utah Pollutant Discharge Elimination

Resource of Concern	Context and Intensity	Summary of Environmental Effects for Future with Federal Investment (Preferred Alternative)
		System (UPDES) Program Permit would be followed, including developing a Storm Water Pollution Prevention Plan (SWPPP). Long-term benefits from 19,560 feet of ditch and canal improvements to stabilize soils.
Prime & Unique Farmland	Project activities have the potential to affect protected farmland of statewide importance.	Though activities would occur in areas classified as prime and unique farmlands, the activities would not remove the land from production, and no change is proposed in the configuration of CAIC irrigated lands. Increased water use efficiency and decreased flooding from canal breaching would have beneficial effects on these soils. Complies with the Federal Farmland Protection Policy Act (FPPA).
Vegetation		
Special Status Plant Species, including Endangered and Threatened Plant Species	Proposed activities could affect the designated threatened Maguire primrose (<i>Primula maguirei</i>) and the Ute ladies'-tresses (ULT; <i>Spiranthes diluvialis</i>).	Based on surveys performed, no suitable habitat and no individuals or populations were found within the Project Area for the Maguire primrose or the ULT. Therefore, the Preferred Alternative would have no effect on either species or their habitat in the Project Area. The USFWS agreed with the effects determination on July 15, 2024.

Resource of Concern	Context and Intensity	Summary of Environmental Effects for Future with Federal Investment (Preferred Alternative)
Riparian Areas	Proposed activities could cause minor short term direct effects to riparian areas associated with vegetation removal during construction, and minor long-term indirect effects from loss of hydrology.	Construction practices may remove vegetation and disturb grasses or riparian areas adjacent to the canals, temporarily disrupting riparian areas. Under the Preferred Alternative, approximately 9.2 acres of low-quality seepage-induced riparian vegetation would be indirectly affected and eventually lost along the Twin Canals and the Logan Northern Canal where the canals would be lined and where box culverts would be installed. Native riparian vegetation along the Logan River, Little Logan, Blue Spring Creek, and Swift Slough would not be removed or altered by the Preferred Alternative, except for vegetation that may need to be removed within the footprint of the Crockett Diversion during construction. Multiple BMPs would preserve existing vegetation when possible and rehabilitate all areas of ground disturbance with reseeding. Additionally, native site vegetation and plant communities would be protected, when practicable, and would be clearly marked, flagged, or fenced in areas where vegetation is to be protected. Overall, the Preferred Alternative would result in a loss of less than 3% of the total riparian vegetation within the Project Area, and the vegetation which would be lost is of low habitat quality. In the long term, the FWFI would improve water quality, water quantity, and downstream fish and wildlife benefits by conserving water, reducing sedimentation, and improving beneficial flows in the system, consistent with the Utah Division of Water Resources (UDWR) Central Region Wetlands Conservation Strategy (UDWR 2001).
Noxious Weeds & Invasive Plants	Proposed activities could increase the risk of spread, and introduction and establishment of invasive species, which are specifically prohibited by Executive Order (E.O.) 13112.	Temporary ground disturbance associated with construction would create conditions for noxious weeds in the area to spread within the approximate 575-acre footprint. However, BMPs would be implemented to control and prevent the introduction and spread of any invasive species or noxious weeds during construction. Disturbed areas would be reseeded to encourage the establishment of native vegetation. Current practices to control and prevent the introduction and establishment of noxious weeds and invasive species would continue to occur.

Resource of Concern	Context and Intensity	Summary of Environmental Effects for Future with Federal Investment (Preferred Alternative)
		Alternative complies with the Utah Noxious Weed Act and E.O. 13112.
Water Resources		
Surface & Ground Water Quality & Quantity	Project activities may affect water quality and quantity.	<u>Water Quality</u> Temporary effects during construction; BMPs modulate effects. Long-term improvements from removal of Providence Pioneer Diversion to restore natural flow conditions and improve sediment transport processes in the Logan River. Instream flows would improve dissolved oxygen and temperature, and State Water Quality Standards for Cold Water Fishery will be met more than 90% of the time. Logan River Conservation Action Plan (CAP) Water Quality Conditions rating Good for 15 river miles; complies with CWA. <u>Water Quantity</u> Temporary effects to water quantity from construction, but long-term improvements include enhanced base flows, conserved water (5,390 ac-ft annually), and restored aquatic habitats. Irrigation upgrades and a 300-acre reservoir would increase water efficiency and storage. <i>Enhanced flows</i> • Instream flows of 25 cfs in Logan River • Base flows of 5–10 cfs in Little Logan • CAP Summer Base Flow Rating Good for 15 river miles
CWA/ WOTUS	Project activities occur within and adjacent to potential jurisdictional waters.	Temporary and permanent effects to WOTUS, including wetlands and linear features below the OHWM, would occur. Effects would be avoided and mitigated to the extent practicable by the implementation of BMPs and compliance with applicable permitting requirements. The majority of effects to WOTUS—currently estimated at approximately 126.1 acres—would be temporary, as they result from construction activities, after which affected aquatic resource areas and hydrologic functions would be restored.

Resource of Concern	Context and Intensity	Summary of Environmental Effects for Future with Federal Investment (Preferred Alternative)
		Approximately 0.2 acres of WOTUS (0.003 acres of wetlands and 0.2 acres of linear features within the ordinary high-water mark [OHWM]) are currently identified as permanent loss due to the footprint of built infrastructure (such as the pump stations and the First Dam intake structure); however, these acreages are planning-level estimates and will be refined during the design and permitting stages. <i>(Note: Temporarily and permanently affected acreages will be refined during design and permitting stages).</i> Compensatory mitigation would be required only for those impacts determined by the USACE to result in permanent loss, and mitigation requirements would be finalized during CWA Section 404 permitting; not finalized in this Draft Plan-EIS. Planning-level mitigation assumptions are identified. Long-term benefits from irrigation modernization, improved instream flows, and water conservation enhance hydrological stability, aquatic habitat connectivity, and downstream WOTUS conditions.
Wetlands	Proposed activities may affect wetlands.	Temporary effects to 126.1 acres due to construction disturbances after which the aquatic feature would be restored and aquatic resource area and functions would return, with permanent loss of approximately 0.003 acres of wetlands and 0.2 acres of linear features within the OHWM. In addition, construction staging areas would temporarily disturb 37.6 acres of wetlands and 0.4 acres of linear features within the OHWM but would be restored post-construction. While seepage reduction may alter hydrology for some wetlands, the long-term increase in water availability would support wetland health and resilience by stabilizing hydrology, reducing seasonal drying, and improving groundwater recharge. This benefit is particularly true with the increased flows in the Logan River and the base flows in the Little Logan. Complies with E.O. 11990.
Regional Water Management Plan	The Utah State Water Plan prioritizes projects that preserve existing uses and rectify existing	The Preferred Alternative would conserve 5,390 ac-ft annually by piping canal water which is currently lost to seepage and evaporation, modernize irrigation systems, and improve storage and delivery efficiency within the Project Area,

Resource of Concern	Context and Intensity	Summary of Environmental Effects for Future with Federal Investment (Preferred Alternative)
	demands, needs, and shortages.	which would align with the top priorities identified in the Utah State Water Plan to preserve existing uses and rectify existing demands, needs, and shortages.
Floodplain Management	Proposed activities may affect floodplains.	Flood risks would be reduced. Replacement of the Crockett Diversion and placement of fill in Lots 1 and 2 would reduce flood risks through removal of outdated structures and improved floodplain functionality, reducing the number of homes inundated during a 100-year flood event to 15. Construction activities associated with the FWFI align with E.O. 11988, as they reduce flooding risks without introducing additional occupancy or modifications to the floodplain. This alternative enhances the floodplain's ability to moderate floods and maintain water quality. Conditional Letter of Map Revision (CLOMR)/Letter of Map Revision (LOMR) would be required. Additionally, approximately 10,350 acres of irrigated farmland outside the floodplain would be safeguarded against flooding caused by overtopping canals, reducing the risks of localized flooding events.

Resource of Concern	Context and Intensity	Summary of Environmental Effects for Future with Federal Investment (Preferred Alternative)
Wildlife		
Wildlife & Wildlife Habitat	Proposed activities may affect wildlife and habitat by disturbing wildlife during construction and by partially removing an open water source and associated riparian vegetation along the Twin Canals and the Logan Northern Canal.	Construction of the Preferred Alternative would temporarily increase ambient noise levels, but not all construction disturbance would rise above current levels and therefore would not be likely to majorly disturb present wildlife. Because of ambient levels of noise and disturbance within the Project Area due to the urban environment, busy roadways, agricultural activities, and a high level of human activity, wildlife that currently occupies the Project Area would likely be adapted to these current levels of disturbance. Sediment removal activities would create a risk to water quality and potential mortality to individual fish and mollusks and amphibians that may be present in the reservoir. Project BMPs ensure protections and avoidance of harm and nest abandonment for bird species, including requiring that nesting bird surveys occur prior to vegetation removal, and that construction activities would occur outside of nesting season for Migratory Bird Treaty Act (MBTA) and state protected bird species. Long term, pressurization of the irrigation system and stormwater improvements would remove hydrology that currently supports 9.2 acres of low-quality seepage-induced riparian habitat, which would affect nearby wildlife and fish habitat. Long-term, the FWFI would improve fish and wildlife habitat by improving water quality and quantity and maintaining flows in the Logan River and the Little Logan during the irrigation season.
Candidate, Threatened, and Endangered Animal Species, listed under Endangered Species Act (ESA)	Potential disturbance to federally listed and state sensitive species and habitat.	No effects would occur to ESA—listed animal species and state sensitive animal species based on the lack of suitable habitat and implementation of BMPs and conservation measures to reduce effects to vegetation in the Project Area. The USFWS agreed with the effects determination on July 15, 2024.

Resource of Concern	Context and Intensity	Summary of Environmental Effects for Future with Federal Investment (Preferred Alternative)
Migratory Birds and Bald and Golden Eagles	Potential disturbance to migratory birds and protected raptors in the Project Area.	No suitable breeding habitat for migratory birds or eagles would be removed or disturbed. Overall, the Project Area lacks mature forest habitat, and the concentration of trees and shrubs present is limited to a narrow strip with open pastureland—absent of trees or shrubs, common outside of suburban areas. BMPs would be implemented to minimize effects to habitat and incidental species occurrences by minimizing disturbance and avoiding removal of vegetation and trees during migratory bird breeding season; and conducting bird nesting surveys if vegetation disturbances would occur during the breeding and nesting periods. Because of the lack of suitable breeding habitat within the Project Area and the identified avoidance and conservation measures, the Preferred Alternative would have no effect to bird species protected under the MBTA and Bald and Golden Eagle Protection Act (BGEPA).
Human Environment		
Cultural and Historic Resources	The project activities have the potential to affect cultural and historic resources.	Section 106 consultation was initiated in October 2021 and is ongoing with the Eastern Shoshone Tribe of the Wind River Reservation, Wyoming; the Shoshone-Bannock Tribes of the Fort Hall Reservation; the Ute Indian Tribe of the Uintah & Ouray Reservation, Utah; and the Northwest Band of the Shoshone Nation. Five sites were determined eligible for the National Register of Historic Places (NRHP). The NRCS State Conservationist (STC), in consultation with the Utah State Historic Preservation Office (SHPO), Tribes/Tribal Historic Preservation Offices (THPOs), and other agencies determined that the project would have an Adverse Effect to Historic Properties (36 Code of Federal Regulation [CFR] 800.5(d)). NRCS prepared a draft Memorandum of Agreement (MOA) to resolve the adverse effects.
Scientific Resources	The project activities have the potential to affect paleontological resources.	No effect. The Utah Department of Natural Resources (UNDR)—Utah Geological Survey (UGS) determined no paleontological localities are located in or near the Proposed Project. Based on geologic records of the area, it is highly unlikely that paleontological resources would be discovered in the area.

Resource of Concern	Context and Intensity	Summary of Environmental Effects for Future with Federal Investment (Preferred Alternative)
Public Health and Safety	No known health concerns occur in the Project Area. Safety concerns in the area are related to the dangerous conditions of the aging diversion infrastructure, mainly of Crockett Diversion and its contributions to flooding, the Crockett Canal risk of failure, and the risk of flooding due to the inadequate capacity of canals to carry irrigation and flood water. Additionally, open canals may present safety concerns from moving water features, and existing infrastructure.	The FWFI would reduce flooding risks, eliminate a public safety risk, and improve public health and safety in the Project Area. Temporary, minor effects and traffic delays would occur due to construction. In the short and long term, the FWFI would address flood inundation associated with the aging Crockett Diversion structure, reducing the number of homes inundated during a 100-year flood event along the Logan River to 15 from 43. The flood water overflow proposed activities, including removing irrigation water from CAIC canals and providing floodwater overflow along 1800 N to the west, would prevent overtopping during high intensity runoff events, prevent flooding on 10,350 acres of agricultural land and 3,150 feet of road, and reduce the potential for flooding from the 100-year flood outside of the floodplain to 124 homes. By removing the irrigation water from the Crockett Canal and filling in a portion of the canal where the Canyon Trail recreation trail would be constructed, risks and safety concerns of slope failure along the hillside would be addressed. Notwithstanding the proposed changes to the Crockett Canal and approximately three miles of improvements to the Logan and Northern, Twin, and Northwest Field Canals associated with the flood water overflow activities, the remaining canal infrastructure would remain in place. However, irrigation water would be removed from the canals and laterals because it would be piped. No canals would be moved. Head gates and existing infrastructure would remain in place, although removal could be addressed during the design phase, if deemed necessary. Because the irrigation water would no longer run through the canals, safety concerns about open water would be removed in these sections during the irrigation season, however, the open canals would still be used to collect and move stormwater to reduce flooding.

Resource of Concern	Context and Intensity	Summary of Environmental Effects for Future with Federal Investment (Preferred Alternative)
Hazardous Materials	During construction activities, the project could disturb existing hazardous material sites and materials considered hazardous could be used and stored on site, such as gas or portable toilet facilities, and requirements to handle or dispose of them must be followed.	Ten hazardous waste facilities were identified within the Project Area during preliminary investigations. Because the Proposed Project would comply with contract provisions regarding hazardous or solid waste and they would also develop and implement the Spill Prevention, Control, and Countermeasure (SPCC) Plan and the SWPPP, handling of hazardous materials would comply with all applicable laws and regulations and would not cause health hazards or environmental concerns.
Transportation and Infrastructure	The proposed activities are designed to improve the existing irrigation infrastructure of the CAIC service area system.	Construction would require road crossings. CAIC would coordinate with the Cache County Public Works Road Division, City of Logan, North Logan City, Hyde Park City, and Utah Department of Transportation (UDOT) as necessary to obtain all necessary permits to establish easements, work within the designated State and local ROW, and implement appropriate traffic control measures during construction to minimize disturbance and reduce effects to local traffic. Construction of PI infrastructure outside of the existing system of open water canals, including 120 miles of distribution system pipeline, would allow a change from individual pumps to gravity pressurization. Long-term, permanent effects to Logan, North Logan, and Hyde Park’s culinary and sewer system from reduced sewer infiltration from seepage. Logan City would experience significant power savings and a reduction in O&M costs, and North Logan and Hyde Park would meet future irrigation needs and would reduce future water demands on both existing culinary water systems. Additionally, removing irrigation water from the canals would reduce flood risks in Logan, North Logan, Hyde Park, and Benson CDP, resulting in a beneficial effect to transportation and infrastructure.

Resource of Concern	Context and Intensity	Summary of Environmental Effects for Future with Federal Investment (Preferred Alternative)
		The power generation from the hydropower turbine would be significant enough to offset the loss of power generation at First Dam, as well as all pumping costs incurred by the construction of three new pumps. Excess power generated by the proposed West Lagoons hydropower station: 1,940,000 kW/hr.
Noise	Construction activities could cause temporary noise effects.	Construction noise would be temporary and minor, as it would not raise the level of noise in the area above the background level of rural and agricultural noise. The three pump stations would add to the noise level but would be located near agricultural land; due to nearby noise from agricultural equipment the noise increase would be minor.
Visual Resources & Scenic Beauty	The proposed activities could affect the visual resources within the Project Area.	The construction of the hydropower station and added fill in landscaping Lot 1 and 2 would affect visual resources. However, the Preferred Alternative would improve the system return flow and provide 25 cfs Logan River instream flows, which would benefit visual resources and scenic beauty.
Recreation	The project activities could affect recreational opportunities.	The FWFI may temporarily affect dispersed public recreation opportunities in the area during construction. All disturbed areas would be reclaimed and reseeded after construction. Construction of 4,430 feet of new pedestrian trails would provide additional recreational opportunities for community members, establish alternative travel routes among educational, recreational, and commercial facilities within the watershed, and improve access to the Logan River and the nearby Wasatch-Cache National Forest. For recreationists in the Logan River, the replacement of the diversion structure would remove the overhead safety concerns, as well as reduce the drop safety concern when the inflated weir is in the lowered position. When the inflatable weir is in the lowered position, the drop over the structure would still be about a 5-foot drop during annual high flows of 480 cfs. The proposed replacement design would not have any piers or walkways to be concerned about becoming hung up on. The diversion would not be passable for blue trail users during the irrigation season when the inflatable weir is in the raised position.

Resource of Concern	Context and Intensity	Summary of Environmental Effects for Future with Federal Investment (Preferred Alternative)
		The guaranteed instream flows in the Logan River would have net beneficial effects to blue trails. Instream flows support a variety of recreational activities such as fishing, swimming, and boating. Though concerns regarding recreational opportunities along the Little Logan were considered during scoping, it was beyond the scope of the project to determine improvements to the physical infrastructure of the Little Logan, including low bridges, lining to reduce seepage, or other similar measures. These measures would need to be identified and analyzed under a separate project.
Special Land Designations		
Land Use	CAIC must coordinate proposed activities, and activities must be consistent with zoning ordinances and adhere to county land use requirements, including Cache County's Countywide Comprehensive Plan.	All proposed activities would take place within previously disturbed lands or within the existing ROW for roadways. No land acquisition would be required for the Proposed Project. Cache County's Countywide Comprehensive Plan's goal to "improve the physical environment of the community as a setting for human activities" (Cache County 1998) would be met by the proposed activities because they improve agricultural water management, public safety, and recreational opportunities for CAIC shareholders within the Logan River Watershed.
Natural Areas	The proposed activities may benefit downstream natural areas, including the Bear River Migratory Bird Refuge and the Great Salt Lake.	The FWFI may cause negligible, temporary effects to water quality in downstream natural areas due to construction activities. BMPs would be implemented to minimize and eliminate effects to downstream areas. While the FWFI primarily focuses on local benefits, it could indirectly benefit downstream areas, including Bear River Migratory Bird Refuge and the Great Salt Lake, by enhancing water conservation and efficiency in the Logan River system.

Resource of Concern	Context and Intensity	Summary of Environmental Effects for Future with Federal Investment (Preferred Alternative)
Social Issues		
Social Issues	The proposed activities could change access to open water and change the summer base flow in the Little Logan. The proposed activities could affect existing vegetation.	The FWFI would maintain access to open water and maintain 5–10 cfs summer base flows during the irrigation season in the Little Logan. The FWFI would also maintain the existing flow from the Logan River into the Little Logan which would provide environmental benefits, recreational opportunities, and aesthetic value. To address the concern about preserving existing vegetation, this alternative includes multiple BMPs which would preserve existing vegetation when possible and rehabilitate all areas of ground disturbance. Additionally, native site vegetation and plant communities would be protected, when practicable and would be clearly marked, flagged, or fenced in areas where vegetation is to be protected.

S-23 Major Conclusions

The FWFI (Preferred Alternative) is the most feasible, practical, economical, and environmentally conscious alternative. This alternative is considered the Preferred Alternative, which is also the locally preferred, and the NEE Alternative.

S-24 Areas of Controversy and Issues to be Resolved

Public involvement for the Proposed Project is summarized in the Scoping Report. Nine hundred forty-one comments were received during scoping. The primary comment categories included concerns about piping the Little Logan, project plan purpose, agricultural water management and effects, flood control, recreation, alternatives, effects to wildlife and habitat, water flows, fish passage, effects to stakeholders and beneficiaries, effects to property and values, NEPA/Plan process and public input, requests for information, effects to recreation opportunities and human health, project costs and feasibility, legal concerns about water rights, community engagement, and interest in the process for decision making. By far, the most numerous comments were the requests to preserve the Little Logan, including base flows.

The project team met with several groups to discuss various aspects of the proposed improvements and held individual stakeholder meetings in response to the issue concerning the heightened interest in preserving water in the Little Logan. The outcome of these discussions involved the project Sponsor, Co-sponsors and the NRCS developing alternatives to incorporate preservation of the Little Logan. Specifically, the FWFI was chosen as the Preferred Alternative because it uses the natural hydrologic head at First Dam to move water and generate hydropower, which avoids significant pumping costs and enhances its appeal to potential subscribers by reducing their share of O&M costs due to the hydropower generation component, and this alternative includes measures to preserve water in the Little Logan to resolve controversy regarding this concern and address community priorities.

S-25 Evidence of Unusual Congressional or Local Interest

No evidence of unusual congressional interest exists for the proposed Logan River Watershed Project. Based on the number of comments regarding the preservation of the Little Logan, local interest in this topic is evidenced; however, many of the comments made concerning the Little Logan were based on incomplete project information concerning the preservation of the Little Logan. Additionally, the development and selection of the alternative that preserves the Little Logan ensures limited controversy surrounding this local interest.

S-26 In Compliance

Is this report in compliance with executive orders, public laws, and other statutes governing the formulation of water resource projects? X YES NO

Table of Contents

Summary Office of Management and Budget (OMB) Fact Sheet.....	i
Chapter 1 Watershed Planning Background.....	1
1.1 Study Authority.....	1
1.2 Study Sponsor.....	1
1.3 Cooperating Agencies.....	2
1.4 Planning Area.....	2
1.5 Planning Process and Study Scope	7
1.6 Related Projects and Studies.....	11
1.7 Document Organization.....	12
Chapter 2 Purpose and Need of the Project	15
2.1 Purpose.....	15
2.2 Need.....	18
Chapter 3 Affected Environment: Current and Future Conditions.....	27
3.1 Relevant Categories of Concern	27
3.2 Inventory of Ecosystem Services.....	34
3.3 Inventory of Existing Resources and Conditions.....	35
3.4 Forecast Future Conditions	73
Chapter 4 Alternatives	74
4.1 Formulation Process.....	74
4.2 Alternatives Considered.....	87
4.3 Alternatives Considered but Eliminated from Detailed Study.....	90
4.4 Final Array of Alternatives Considered for Detailed Study.....	96
Chapter 5 Environmental Consequences—Evaluation of Alternatives	101
5.1 Summary and Comparison of Alternatives—Planning Process.....	101
5.2 Summary and Comparison of Alternatives—Ecosystem Services	109
5.3 Summary and Comparison of Alternatives—Environmental Effects Related to Resource Concerns	122
Chapter 6 Preferred Alternative	215
6.1 Rationale for Preferred Alternative Selection.....	215
6.2 Measures to be Installed.....	215
6.3 Irreversible and Irretrievable Resource Commitments	221
6.4 Areas of Controversy	222
6.5 Permits and Compliance	222
6.6 Mitigation of Potential Effects	225
6.7 Costs and Cost-sharing	226
6.8 Ecosystem Services Benefits	227
6.9 Installation and Financing.....	228
6.10 Operations, Maintenance, and Replacement.....	229
6.11 Economic Tables and Structural Tables.....	229
Chapter 7 Consultation, Coordination and Public Participation.....	239
7.1 Consultation	239
7.2 Coordination	243
7.3 Public Involvement	246
7.4 Plan Development and Review	250
7.5 Distribution List.....	250
Chapter 8 References	253
Chapter 9 List of Preparers and Reviewers.....	260
Chapter 10 Acronyms, Abbreviations, and Short Forms.....	263

List of Tables

Table S-1. Existing Resource Information.....	iii
Table S-2. Estimated Preferred Alternative Project Costs Distribution, Logan River Watershed, Utah (2025 Dollars).....	viii
Table S-3. Summary of Project Alternatives and Associated Ecosystem Services	ix
Table S-4. Economic Table 5a—Estimated Average Annualized Benefits and Reduced Damages in Logan River Watershed Project, Utah (2025 Dollars).....	xi
Table S-5. Economic Table 6—Comparison of Average Annualized Costs, Reduced Damages and Benefits.....	xiii
Table S-6. Summary of Resource Concerns, Context and Intensity, and Environmental Effects	xv
Table 1-1. Subwatersheds in the Logan River Watershed	2
Table 1-2. Ecosystem Services Framework used to Evaluate Benefits and Costs.....	8
Table 1-3. Number, Name, and Key Information for Technical Memorandum	13
Table 2-1. Damage to Annual Net Farm Revenue under Existing Conditions of the Logan River Watershed Project, UT (\$ 2025).....	22
Table 3-1. Ecosystem Services Scoping Summary.....	27
Table 3-2. Resource Concerns and Issues based on Problems, Opportunities, Objectives, and Constraints	29
Table 3-3. Ecosystem Services to Be Considered in the Logan River Watershed Plan	34
Table 3-4. Physical Setting Summary of the Project Area.....	35
Table 3-5. Demographic Profile Comparison for 2020	38
Table 3-6. Past, Current, and Future Population.....	39
Table 3-7. Employment and Income Status	39
Table 3-8. Cache County Agricultural Census	40
Table 3-9. Average Power Consumption per Irrigation Season by Location	42
Table 3-10. Soil Classification Summary	45
Table 3-11. Plant Species Recorded within the Project Area	48
Table 3-12. Annual Water Loss Study Results for Project Components	53
Table 3-13. Water Conservation Summary.....	55
Table 3-14. Water Resources within the Project Area.....	55
Table 3-15. Utah State Protected Species with Potential to Occur within 2 Miles of the Project Area.....	58
Table 3-16. Endangered Species Act (ESA) Species.....	59
Table 3-17. Migratory Bird Treaty Act (MBTA) and Bald and Golden Eagle Protection Act (BGEPA) Protected Avian Species	61
Table 3-18. Identified Cultural Resources within the Area of Potential Effect	66
Table 4-1. Initial Approaches and Management Measures.....	76
Table 4-2. Measures Included in Each Alternative.....	85
Table 4-3. Summary of Initial Alternatives and First Screening Based on Objectives and Constraints.....	91
Table 4-4. Summary of Second Screening of Initial Array of Alternatives for Ecosystem Services and Economics	95
Table 4-5. Project Measures by Alternative and Purpose	99
Table 5-1. Summary and Comparison of Alternatives—Planning Process	101
Table 5-2. Summary and Comparison of Alternatives—Ecosystem Services.....	110
Table 5-3. Summary and Comparison of Alternatives—Environmental Effects Related to Resource Concerns	123
Table 5-4. First Dam Alternative Power Consumption by Pump Station.....	149
Table 5-5. First Dam Alternative Power Generation	149
Table 5-6. Summary of Estimated Power Consumption and Generation by Alternative	149
Table 5-7. Crockett Alternative Power Consumption by Pump Station	150
Table 5-8. Estimated Summer Base Flows by Reach in the Logan River by Alternative	160

Table 5-9. Floodplain Under Each Alternative in the 50-Year Event.....	168
Table 5-10. Floodplain Under Each Alternative in the 100-Year Event.....	168
Table 5-11. Floodplain Under Each Alternative in the 500-Year Event.....	168
Table 5-12. Conservation Action Plan Evaluation for Instream Habitat Conditions by Reach.....	173
Table 5-13. Historic Properties within the Area of Potential Effect, National Register of Historic Places Eligibility, and Effects	183
Table 5-14. Comparison of Structures Flooded by Flood Depth from 100-year Event for No Federal Action and Action Alternatives	189
Table 6-1. Permits, Authorizations, and Coordination	222
Table 6-2. Estimated Installation Costs (2025 Dollars).....	227
Table 6-3. Cost-share Table for Works of Improvement (2025 Dollars).....	227
Table 6-4. National Watershed Program Manual Economic Table 1—Estimated Preferred Alternative Installation Cost, Logan River Watershed, Utah (2025 Dollars).....	230
Table 6-5. National Watershed Program Manual Economic Table 2—Estimated Preferred Alternative Cost Distribution, Logan River Watershed, Utah (2025 Dollars)	231
Table 6-6. National Watershed Program Manual Economic Table 4—Estimated Average Annualized Costs by Increment, Logan River Watershed Project, Utah (2025 Dollars).....	232
Table 6-7. National Watershed Program Manual Economic Table 5a—Estimated Average Annualized Benefits and Reduced Damages by Increment, Logan River Watershed Project, Utah (2025 Dollars).	232
Table 6-8. National Watershed Program Manual Economic Table 6—Comparison of Average Annualized Costs, Reduced Damages and Benefits, Logan River Watershed, Utah (2025 Dollars)	235
Table 6-9. Structural Table 3b for Channel Work, Logan River Watershed, Utah	236
Table 6-10. Supplemental Structural Table for Piping	237
Table 6-11. Construction Cost Estimate of Recreational Facilities	238
Table 7-1. NRCS Record of Tribal Consultation.....	240
Table 7-2. Public Outreach Activities.....	247
Table 7-3. Plan–EIS Distribution List.....	251
Table 9-1. List of Preparers, Reviewers, and Contributors	260
Table 10-1. Acronyms, Abbreviations, and Short Forms Used in this Document.....	263

List of Figures

Figure 1-1. Logan River Watershed Map	3
Figure 1-2. Crockett Avenue Irrigation Company (CAIC) Service Area and Logan River Watershed Project Area	5
Figure 2-1. Existing Crockett Diversion with approximately 120 cubic feet per second (cfs) of water.....	18
Figure 2-2. Concept Comparison of Residential Total Water Rate Increase (from TM-018, p. 4)	21
Figure 2-3. Crockett Diversion at Flood Stage (1,790 cfs) on May 24, 2023	24

List of Appendices

Appendix A. Comments and Responses

- Logan River Watershed Plan Scoping Report
- Section 106 Consultation
 - SHPO Correspondence
 - SHPO Request for Concurrence
 - SHPO Concurrence
 - Tribal Consultation
 - Tribal Consultation Request
 - Tribal Follow-up Email
 - Agency Letters
 - U.S. Army Corps of Engineers (USACE)
 - U.S. Environmental Protection Agency (EPA)
 - ACHP Correspondence
 - ACHP Notification
 - ACHP Decline to Participate
 - Draft Memorandum of Agreement (MOA)
 - Draft MOA
 - USACE Review of MOA
- Agency Coordination and Consultation
 - Cooperating Agencies Status Letters and Replies
 - Memorandum of Understanding (MOU)
 - USACE Coordination
 - USFWS Consultation
 - Utah Department of Public Safety Floodplain Coordination
 - Utah Department of Natural Resources Paleontological Coordination

Appendix B. Project Map

- Map 1—Logan River Watershed Map
- Map 2—Preferred Alternative Map (First Dam Alternative-Future with Federal Investment [FWFI])
- Map 3—Benefited Area Map
- Map 4—No Federal Action Alternative Map (Future without Federal Investment [FWOFI])
- Map 5—Crockett Diversion Alternative Map
- Map 6—Cultural Area of Potential Effect—Direct Effects Map
- Map 7—Cultural Area of Potential Effect—Indirect Effects Map

Appendix C. Support Maps

- Map 1—Land Ownership Map
- Map 2—Utah Department of Environmental Quality (UDEQ) Hazardous Materials Map
- Map 3—Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) Panels
- Map 4—Alternative 1—First Dam with Crockett Diversion Removal Alternative Map
- Map 5—Alternative 2—Western Pumping Alternative Map

Appendix D. Investigations and Analyses Report

- Investigations and Analyses Report

Appendix E1. Other Supporting Information (ARD)

- Aquatic Resources Delineation (ARD)

Appendix E2. Other Supporting Information (BA-Emissions)

- Biological Assessment (BA)
- Logan River Watershed Plan National Economic Efficiency Benefit-Cost Analysis of Alternatives
- Cultural Resources Report, *redacted*
- Best Management Practices (BMPs)
- Emission Calculation Memorandum

Appendix E3. Other Supporting Information (TM-001 to TM-009)

- Technical Memorandum (TM)
 - TM-001 Project Area Existing Conditions
 - TM-002 Watershed Hydrology and Lower Logan River Hydraulics
 - TM-003 Logan River Water Rights
 - TM-004 Canal Transmission Losses
 - TM-005 Design Criteria
 - TM-006 Agricultural Alternative Definition
 - TM-007 Crockett Diversion Structure Removal Hydraulics and Habitat
 - TM-008 Agricultural Water Management Operational Scenarios
 - TM-009 First Dam Interconnect

Appendix E4. Other Supporting Information (TM-010to TM-015)

- Technical Memorandum (TM)
 - TM-010 Lagoon to Reservoir Storage Conversion
 - TM-011 Logan River Water Quality Modeling
 - TM-012 Secondary Irrigation System Effects
 - TM-013 Power Generation and Consumption Effects
 - TM-014 Agricultural Yield Effects
 - TM-015 Logan River Floodplain Effects

Appendix E5. Other Supporting Information (TM-016 to TM-021)

- Technical Memorandum (TM)
 - TM-016 Capital/Construction Costs Estimates
 - TM-017 Operation and Maintenance (O&M) Costs
 - TM-018 Project Benefits and Cost Share
 - TM-019 Flood Prevention
 - TM-020 Recreation
 - TM-021 Logan River Conservation Action Plan (CAP) Alternative Evaluation

Chapter 1 Watershed Planning Background

The United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) and the Environmental Protection Agency (EPA) and U.S. Army Corps of Engineers (USACE), as cooperating agencies, with Cache Water District (CWD) as the Sponsor, and Logan City, North Logan City, Hyde Park City, and Crockett Avenue Irrigation Company (CAIC) as the Co-sponsors, propose to use federal funds to implement the Logan River Watershed Project (Proposed Project). The planned components of the Proposed Project would be funded through the provisions of the Watershed and Flood Prevention Operations (WFPO) Program to address agricultural water management, to prevent flooding, and enhance recreation opportunities (NRCS 2023a).

1.1 Study Authority

The NRCS prepared the Draft Watershed Plan–Environmental Impact Statement (Draft Plan–EIS) for the Proposed Project under the authority of Section 1001 of the Watershed Protection and Flood Prevention Act (Public Law 83-566 [PL 83-566]) of 1954 (68 Statute 666 as amended; 16 United States Code [U.S.C.] Section 1001 et seq.) in accordance with the National Environmental Policy Act (NEPA). The works of improvement would be installed under PL 83-566 authorized purposes of agricultural water management, flood prevention, and public recreation.

This environmental document was initiated using the 40 CFR 1500-1508 (May 20, 2022) and 7 CFR 650 regulations. These regulations have recently been rescinded and replaced with USDA regulations found under 7 CFR 1b, published as a Final Rule in the Federal Register on April 3, 2026 (91 FR 17062). However, in a good-faith effort to fulfill NEPA’s requirements, including Congressional timeline and considerations of fiscal restraints, the agency decided to continue to use 40 CFR 1500-1508 (May 20, 2022) and 7 CFR 650. This is permissible per the USDA policy guidance issued in the Final Rule’s preamble. The Federal Register notice said: “If the NOI for an EIS published more than 90 days prior to the publication of this final rule, the USDA subcomponent has discretion to continue applying the versions of NEPA regulations being applied before publication of the NOI or to switch to applying 7 CFR 1b as published in this final rule.”

1.2 Study Sponsor

The non-federal Sponsor for this study and Proposed Project is CWD, and the Co-sponsors are Logan City, North Logan City, Hyde Park City, and CAIC. The Sponsor and Co-sponsors meet the eligibility requirements for Sponsors. The Sponsor and Co-sponsors are legally organized entities under Utah State law with the Power of Eminent Domain and Real Property Rights (7 Code of Federal Regulation [CFR] pt. 622.10(a)(1)). Logan City, North Logan City, and Hyde Park City have the authority to levy taxes. The Sponsor and Co-sponsors all have robust relationships with the public they represent and encourage the public to participate in the watershed project planning process. The Sponsor has drafted the Watershed Agreement, and the Co-sponsors have shown evidence of commitment for funding, installing, operating, and maintaining the Proposed Project.

1.3 Cooperating Agencies

The USDA NRCS as the lead federal agency, in cooperation with the CWD as the project Sponsor, coordinated and consulted with many local, state, and Federal agencies, and Tribal governments for the preparation of this Draft Plan–EIS. The EPA and the USACE have formally joined the project as cooperating agencies per the process described in the National Environmental Compliance Handbook (NECH) 610.61 (NRCS 2016).

1.4 Planning Area

The Proposed Project is located in the vicinity of Logan, North Logan, Hyde Park and unincorporated areas of Cache County, Utah.

1.4.1 Selected Watershed

The Logan River Watershed is contained entirely within Cache County, Utah, and the watershed limits evaluated in this Plan are confined within the Great Basin Region, specifically within the Little Bear-Logan (Hydrologic Unit Code [HUC] 16010203) and Middle Bear (HUC 16010202) Subbasins; and includes portions of twelve subwatersheds (Table 1-1; U.S. Geological Survey [USGS] 2024a).

Table 1-1. Subwatersheds in the Logan River Watershed

Subwatershed	Hydrologic Unit Code (HUC)	Total Size (acres)
Nebo Creek-Bear River	160102020703	21,137
Fourmile Creek-Little Bear River	160102030405	1,812
Blue Spring Creek	160102030404	12,480
Little Logan River-Logan River	160102030308	22,317
Hopkins Slough	160102020702	28,820
Card Canyon-Logan River	160102030307	16,836
Cottonwood Canyon-Logan River	160102030306	17,804
Right Fork Logan Canyon	160102030305	16,110
Temple Fork	160102030303	10,243
Tony Grove Creek-Logan River	160102030304	28,006
Beaver Creek	160102030301	27,087
Hell’s Kitchen Canyon-Logan River	160102030302	21,366
Total		224,019

The Logan River Watershed encompasses 224,019 acres and contains the limits of the 20,980-acre Proposed Project Area (Project Area) described below. The watershed boundary associated with this Draft Plan-EIS is shown in Figure 1-1 (also see Watershed Map in Appendix B).

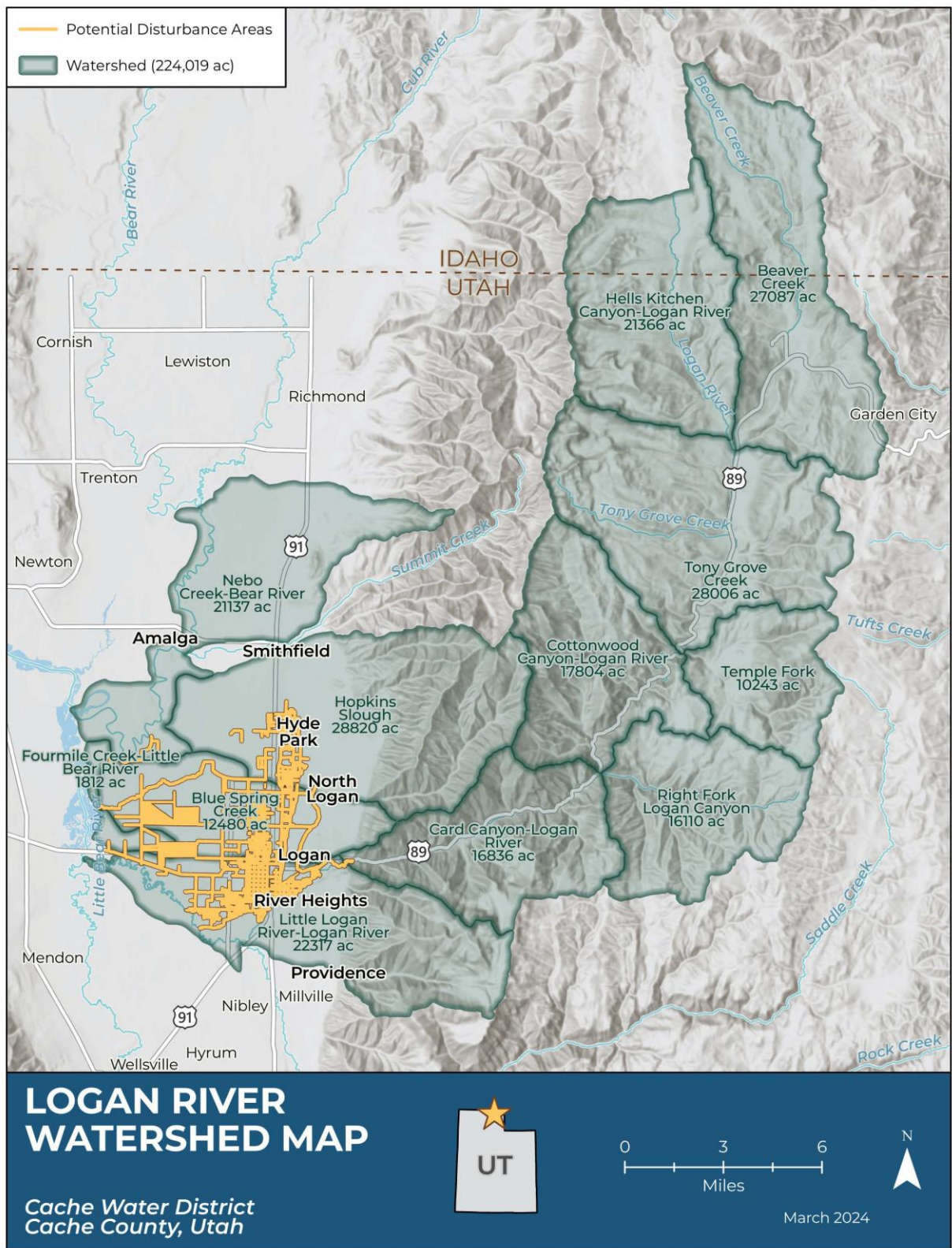


Figure 1-1. Logan River Watershed Map

1.4.2 Project (Study) Area

The Project Area is the portion of the Logan River Watershed that encompasses the benefitted areas as well as all areas necessary for the implementation of potential measures to address the watershed problems, including staging areas and construction access. The Project Area encompasses 20,980-acre and is contained within Township 12 North and Range 1 West, Sections 13, 14, 23, 24, 25, 26, 27, 35, and 36; Township 12 North and 1 East; Sections 3, 4, 9, 10, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, and 36; and Township 11 North and Range 1 East, Sections 3, 4, 5, 6, 7, 8, and 9; 26th Salt Lake Meridian, Cache County, Utah. The elevation of the Project Area ranges from approximately 4,437 to 4,732 feet above mean sea level (AMSL).

The Project Area consists of and is synonymous with the CAIC service area, which is made up of ten separate irrigation companies:

- Benson Irrigation Company (BIC)
- Hyde Park Irrigation Company (HPIC)
- Logan Cow Pasture Irrigation Company
- Logan Island Irrigation Company
- Logan North Field Irrigation Company (LNFIC)
- Logan Northwest Field Irrigation Company
- Logan Southwest Field Irrigation Company
- Seventh Ward Irrigation Company
- Sunday Water Users Ditch
- Thatcher Irrigation Company

The CAIC's service area covers approximately 15,560 acres of land, spread over 20,980 acres of Logan City, North Logan City, Hyde Park City, Benson census-designated place (CDP), and part of unincorporated Cache County. Of these 15,560 acres, approximately 10,350 acres receive water from the CAIC. The CAIC service area (Project Area) and each individual CAIC carrier's service area is shown in Figure 1-2 (see Appendix E3, Technical Memorandum [TM]-001 for individual service area details).

The USGS identifies the Project Area as lying within the Malad and Cache Valleys ecoregion (13i), which typically contains wide terraces, narrow floodplains, and alluvial fans, as well as mountain fed perennial streams and canals, and has a cooler, shorter growing season than other ecoregions in the area (Woods et al. 2001). This ecoregion is extensively farmed and more densely populated than other ecoregions in the area. The average winter temperature is 26.5°F, and average temperature in the summer is 70.0°F (National Oceanic and Atmospheric Administration [NOAA] 2024b).

The Proposed Project would take place within a previously disturbed agricultural and residential setting. The land use within the Project Area has transitioned from predominantly agricultural land to a mix of agricultural land and developed land for residential and commercial use, with development expected to continue to expand.

1.4.3 Areas of Potential Effect for National Historic Preservation Act Section 106 Compliance

In accordance with 36 CFR 800, and Utah Code Section 9-8-404, the Area of Potential Effect (APE) for cultural resources is defined by the Advisory Council on Historic Preservation (ACHP) as “the geographic area where a project could *directly* or *indirectly* affect historic properties.” Per 36 CFR 800.4, the NRCS, in consultation with the Utah State Historic Preservation Office (SHPO), EPA, USACE, applicable Tribes, and other consulting parties determined the direct APE to be 1,178.1 acres for potential direct effects (direct APE), and the indirect APE to be 645.8 acres for potential indirect effects associated with flood risk under the current conditions (indirect APE) (36 CFR 800.16(d)). For this undertaking, a 200-foot corridor centered on the canals and a 100-foot buffer centered on staging areas was considered for the direct APE.

The total survey area included 1,178.1 acres, and the strategy for the survey methodology included 1,178.1 acres of literature review (Class I), 38.0 acres of reconnaissance level survey (Class II survey), and 960.3 acres of intensive level survey (Class III survey). Due to access issues and surface conditions, 179.8 acres were excluded from reconnaissance-level or intensive surveys. For areas of the APE that only Class I surveys were conducted, the likelihood of encountering historic properties is extremely low, and per 36 CFR 800.4.b.1, NRCS and the consulting parties agreed that the level of effort (Class I, II, or III) meets “the reasonable and good faith effort to carry out appropriate identification efforts.” If previously unidentified cultural resources are encountered during construction, the project would follow the procedures in the NRCS Prototype Programmatic Agreement with the Utah SHPO (NRCS and SHPO 2025). The First Dam Alternative would potentially disturb approximately 575 acres, and the Crockett Diversion Alternative would potentially disturb approximately 415 acres. All proposed project components for both the First Dam Alternative and the Crockett Diversion Alternative are located within the direct APE boundary, including all staging areas and access roads. The direct APE is depicted in the Cultural Resources Direct APE Map in Appendix B.

The indirect APE for cultural resources is the portion of the Project Area that would be flooded in the current conditions which may benefit from reduced flooding because of the Proposed Project. This area has been defined as the 100-year floodplain for the Logan River and the Project Area acres that would be inundated by flooding from the canals in the 100-year storm

and consists of 645.8 acres. This indirect APE is depicted in the Cultural Resources Indirect APE Map in Appendix B.

1.5 Planning Process and Study Scope

The Project Area has a rich history of bringing water to local lands to develop and improve agriculture potential, starting in the late 1800s when the CAIC irrigation delivery system was constructed. CAIC diverts water from the Logan River to a service area of 15,560 acres. In recent years, much of the service area has been converted from agriculture to residences and the canal delivery system has many deficiencies that need repair. CAIC and the three intertwined cities, Logan, North Logan, and Hyde Park conducted multiple studies to develop options to improve the irrigation system culminating in the Crockett Pressurized Irrigation Master Plan which evaluated several system improvement alternatives (J-U-B ENGINEERS, Inc. [J-U-B] and Franson Civil Engineers [Franson Civil] 2019). The Master Plan identified the construction of a pressurized irrigation (PI) system to deliver water to shareholders and residential users as the most beneficial alternative to the community. This Draft Plan-EIS addresses the canal delivery deficiencies, including flooding issues, and ties together secondary irrigation water needs, water rights protection, and the environmental needs of the community.

1.5.1 Stepwise Planning Process

For the Draft Plan-EIS, the NRCS, the Sponsor and Co-sponsors, in coordination with the public, Tribes, and other agencies, followed a stepwise but iterative planning approach that identified and refined problems and opportunities, study scope, management measures, and alternatives; evaluated alternatives; and selected a recommended plan. This document presents that process and findings.

This Plan, as with all watershed project plans, is the product of three inter-related planning and evaluation processes, each with its own specific goals and requirements: 1) NRCS planning process; 2) Principles, Requirements, and Guidelines (PR&G) for Federal Investments in Water Resources; and 3) evaluation of alternatives and effects under NEPA. The process also incorporates Clean Water Act (CWA), Endangered Species Act (ESA), and National Historic Preservation Act (NHPA) requirements, among others.

The NRCS planning process consists of nine steps to develop and implement plans that protect, conserve, and enhance natural resources from a social and economic perspective (see NRCS planning policy, including National Planning Procedures and NECHs [NRCS 2016 and NRCS 2021]). PR&G watershed planning is an eight-step process analogous to that of the NRCS which ensures that formulation, evaluation, and implementation of agency activities incorporate the Federal Objective, Guiding Principles, and General Requirements within the context of an ecosystem services framework. Ecosystem services analysis is an analysis approach which traces the pathways of natural ecosystem processes to the benefits they grant to society in monetary and non-monetary terms. NEPA evaluation ensures that potential Federal actions consider reasonable alternatives, fairly evaluate the effect of those alternatives upon the human environment, and comply with applicable local, State, and Federal regulations.

Watershed planning, NEPA, and CWA permitting all require that the NRCS follows the Section 106 process as outlined in the NHPA of 1966 and 36 CFR 800. The Section 106 process requires early consultation with the SHPO and Federally Recognized Tribes in the determination

of the APEs, identification of historic properties, assessment of effects, and mitigation of adverse effects. This process is separate from NEPA but informs the effects analysis.

This Draft Plan-EIS follows NRCS procedures and formatting requirements outlined in the National Watershed Program Manual (NWPM) Part 501 (NRCS 2015) and the National Watershed Program Handbook (NWPH) Part 601 (NRCS 2014). These requirements provide a framework to ensure compliance with NEPA and NRCS procedures for complying with the NEPA at 7 CFR Part 650. The plan also adheres to the Principles and Requirements for Federal Investments in Water Resources (P&R) (Council on Environmental Quality [CEQ] 2013), relying primarily on the NRCS's intended use of the Guidance for Conducting Analyses Under the PR&G for Water and Land Related Resources Implementation Studies and Federal Water Resource Investments. This guidance is described in USDA Departmental Manual (DM) 9500-13 (USDA 2017a), Departmental Regulation (DR) 9500-13 (USDA 2017b), and the corresponding Interagency Guidelines (CEQ 2014), collectively referred to as the PR&G. Additionally, the plan aligns with Executive Orders (E.O.), the CFR, and PL 83-566. Updated NWPM manual guidance has been applied where appropriate (NRCS 2024c).

1.5.2 Ecosystem Services Framework

NRCS and the Sponsors worked within an Ecosystem Services Framework throughout the preliminary investigation and planning process. Ecosystem services is a broad term used to describe the benefits humanity receives from ecosystems as a byproduct of their functioning. The four-category ecosystem framework adopted in the PR&G, and used in this report, is shown in Table 1-2.

Table 1-2. Ecosystem Services Framework used to Evaluate Benefits and Costs

Service Type¹	Examples
Provisioning	The supply of food, fuel, fiber, water, timber, and genetic resources.
Regulating	The regulation of air, natural hazards, water quality, pests, and disease.
Cultural	Services that enhance cultural values, like aesthetics, recreation, tourism, and spiritual or religious values.
Supporting	Nutrient cycling, soil formation, and primary production.

¹Source: DM 9500-13; NRCS 2015.

NRCS and the Sponsors approached ecosystem services by applying a detailed ecosystem services evaluation framework for this project that includes quantitative and monetized analysis. They identified the types of services present in the watershed and then specified how those services could interact with (affect or be affected by) the project measures and how those services that could interact with potential management measures could address problems within the watershed. The public, Tribes, and other agencies were invited to identify and refine ecosystem services concerns during scoping and at other points of participation in the planning process. The robust development of an ecosystem service framework and resulting ecosystem services flows and the full accounting of monetized benefits and costs as well as non-monetized, quantifiable and unquantifiable effects is detailed in Sections 3.1.1, 3.2, 5.2, and especially Section 5.2.4, in which a tradeoff analysis of monetized and non-monetized benefits and costs was developed. Additionally, the Benefit-Cost Analysis (BCA) in Appendix E2 provides a detailed analysis of the ecosystem services and their valuation for the project.

1.5.3 Period of Analysis

The effects of the Action Alternatives were evaluated over a 50-year evaluation period, which reflects the expected duration of significant benefits from the proposed improvements. Benefits are assumed to begin accruing in the first year following project completion and continue through the end of the 50-year evaluation period. Interest during the 5-year construction phase was calculated using the mid-life full expenditure method. Because all project components have design lives of 50 years, replacement costs were excluded from the analysis, as the evaluation period does not extend beyond the life of the improvements.

1.5.4 Project Scope

The scope of the project refers to (1) specific watershed program requirements which limit the application of funding based on characteristics of the study area and project and (2) the specific issues considered throughout the NEPA analyses of the project per 7 CFR Part 650.

PL 83-566 projects are bounded in scope by the size of the watershed area, characteristics of the benefitted area, and size of potential measures considered. For this type of project, NRCS policy defines a watershed area as the areas that comprises all land and water within the confines of a drainage and follows hydrologic boundaries. Watershed projects implemented for the purpose of flood prevention are limited to a drainage area of 250,000 acres. All PL 83-566 projects must provide at least 20 percent of benefits directly related to agriculture, including rural communities with populations less than 50,000 people. Structural measures considered under this program are similarly restricted in capacity—no single structure can provide more than 12,500 acre-feet (ac-ft) of floodwater detention capacity and no more than 25,000 ac-ft of total capacity. Recreational development may be provided by PL 83-566 projects provided that any recreational development is ancillary to works of improvement funded for the following reasons: (1) flood prevention (including structural and land treatment measures), (2) the conservation, development, utilization, and disposal of water, or (3) the conservation and proper utilization of land; is demonstrated by need, as measured by anticipated use and existing regional outdoor water-based recreational developments; and the recreational development would be for minimum basic facilities needed for public health and safety, access to, and use of such reservoir or other area for such purposes (PL 83-566, Section 2 and Section 4).

The Draft Plan-EIS is in compliance with each of these requirements: 1) the total watershed size is approximately 224,019 acres; 2) the Project Area is situated in a rural area with irrigated cropland (only 28% of the Project Area is developed [see Section 3.3 Table 3-4]) and 99 percent of benefits are directly related to agriculture (i.e., reduced property damage, reduced water supply expenses, reduced damage to agricultural income, additional instream flows in the Logan River, maintained base flows in the Little Logan, and increased hydroelectricity production); 3) the project does not consider any structural measures exceeding 12,500-ac-ft of individual capacity or 25,000 ac-ft of combined capacity (no floodwater detention capacity is proposed; the lagoon capacity is 2,170 ac-ft and storage is minimal at First Dam [originally 70 ac-ft in the early 1900s but approximately 20 ac-ft in 2022 due to sedimentation]); and 4) the recreational development improvements are ancillary to replacing the existing canal where the canal water would be piped and to providing access to maintain key components of the pressure irrigation system.

NRCS and the Sponsor conducted internal scoping to evaluate the relevance of required resource considerations described in the NWPH Part 606.19, as well as the relevant resource concerns listed in NWPM 501.24.B and all applicable items required for compliance with the authorities listed at NWPM 500.32. Ecosystem services and resources that could be affected by or could affect measures to address the watershed problems were deemed relevant to the project. NRCS and the Sponsor then conducted external scoping as described in the following section.

1.5.5 External Scoping

In concert with ongoing public meetings to inform the Board and members on irrigation and water loss issues within their service area, CAIC developed their Crockett Pressurized Irrigation Master Plan to identify necessary improvements or replacements for the irrigation infrastructure in preparation for approval of the Master Plan (J-U-B and Franson Civil 2019). Public meetings were held throughout the planning process.

The NRCS began an Environmental Assessment (EA) for the Proposed Project in late 2020. The NRCS developed an initial Proposed Project based on the Master Plan, and then solicited input from numerous agencies, Tribes, and individuals to refine the Proposed Project, to identify relevant resources or environmental concerns to be analyzed in detail, and to determine which resources, if any, could be eliminated from further analysis (see Scoping Report in Appendix A). A government agency scoping meeting was held on January 20, 2021, and public scoping meeting was convened on January 28, 2021, both virtually. The meetings provided an opportunity for the public, county, agencies, and Tribes to express concerns and their relevance to the Proposed Project. Participants were invited to submit comments in writing by mail or email during the scoping comment period. The scoping period officially opened on January 14, 2021, and ended on March 16, 2021; a total of 60 days. Written comments were accepted via mail, e-mail, or comment card. The NRCS received seven hundred and eighty-one (781) scoping comments for the Watershed Plan (See Appendix A).

As the analysis process developed, the project team completed additional public and agency scoping, development of the initial design alternatives and review of those alternatives based on the purpose and need for the project. NRCS determined that preparation of an EIS was appropriate based on the potential for significant effects and the level of public and agency interest regarding key issues such as flood risk reduction measures, aquatic resource connectivity, and changes to flow conditions and open water features.

On March 11, 2024, a Notice of Intent (NOI) to prepare an EIS for the Proposed Project was published in the Federal Register (FR) by NRCS (FR 2024). The notice presented the preliminary proposed action and alternatives, a summary of expected effects, anticipated permits and authorizations, and information on how to submit comments. The NRCS asked for further public comment to help determine the range of actions, alternatives, and effects to be evaluated and included in the Draft Plan–EIS. The comment period officially opened on March 12, 2024, and ended on April 10, 2024; a total of 30 days. The NOI was mailed and/or emailed to the public and agency stakeholders, and Tribal governments. NRCS received one-hundred sixty (160) comments on the NOI (see Appendix A).

Comments were received on the Proposed Project in 2021 and from the NOI in 2024. Many comments emphasized the importance of preserving the Little Logan for its environmental benefits, recreational opportunities, and aesthetic values. There was a strong opposition to piping

or pressurizing the Little Logan. There were concerns about the environmental degradation, loss of natural scenery, effects to wildlife and their habitats, and potential negative effects on property values and community. Comments supported flood control and water conservation but argued that it should not come at the expense of the river's natural state. Some comments raised concerns about water rights and the legal implications of altering the river. Commentors asked for improved communication and transparency about the project's potential effects. Some residents asked for more recreational elements in the project, such as trails that allow for appreciation of nature and wildlife, including improving existing trails or adding new trails. Some asked for community involvement in the decision-making process. There was support for improving water management and efficiency combined with a balanced approach that considered stakeholders' needs and preserved the community's natural assets. See Appendix A for full comment text and a summary of comments.

Since scoping, the action alternatives were refined in response to public, Tribal, and agency input, with particular emphasis on maintaining summer base flows and open-water conditions in the Little Logan and preserving its existing hydraulic connection to the Logan River. These refinements directly address the primary concern raised during scoping. The NRCS and Sponsors developed the alternatives in this Draft Plan-EIS (see Chapter 4) and analyzed the potential effects of the alternatives on the economic, natural, and social environment (Chapter 5).

See Chapter 7 for a description of the public and agency scoping process. The Scoping Report in Appendix A includes the detailed scoping process, including letters, meetings, and comments to and from the public, stakeholders, agencies, and Tribes. Comments, including the names and addresses of those who commented, are considered part of the public record on this proposal.

1.6 Related Projects and Studies

The Project Area has a long history of water diversion to develop and improve agricultural potential, starting in 1859 when permanent residents in Cache Valley built diversions and canals. With additional population growth, diversions continued to be added for agricultural use, grain mills, municipal and industrial uses, and later, power generation. The Crockett Diversion has been replaced and modified numerous times since its original construction in 1860, most recently following a flooding event in 1984.

Water rights were established by the 1992 Utah District Court case of Utah Power and Light Company vs Richmond Irrigation Company et al., commonly known as the Kimball Decree. Following the decree, water right sales and changes have taken place on a regular basis, these changes have been regulated, monitored, permitted, and are currently published in the annual Logan River Distribution System report.

No connected actions were identified during the preparation of this Plan.

Ongoing and reasonably foreseeable projects that could potentially contribute interactive effects with the Plan-EIS are described in Section 5.3.11.

1.7 Document Organization

This Draft Plan–EIS has been organized into the following chapters:

- **Summary:** Office of Management and Budget (OMB) Fact Sheet—This chapter presents a summary of the entire document and the Proposed Project.
- **Chapter 1: Watershed Planning Background**—This chapter describes the authority, identifies the Sponsors and cooperating agencies, and describes the planning area, the planning process, the analysis period, and the scope of the Proposed Project.
- **Chapter 2: Purpose and Need of the Project**—This chapter describes the purpose and need for the Proposed Project, and identifies the objectives, constraints, problems, and opportunities.
- **Chapter 3: Affected Environment**—This chapter describes the affected environment of the Proposed Project, including the relevant ecosystem services and resource concerns, and provides an inventory of ecosystem services and existing resources.
- **Chapter 4: Alternatives**—This chapter describes the rationale of the Draft Plan–EIS formulation for the development and comparison of alternatives and describes the alternatives including those eliminated from detailed study. More detail on the Preferred Alternative—the First Dam Alternative—is included in Chapter 6.
- **Chapter 5: Environmental Consequences–Evaluation of Alternatives**—This chapter evaluates and compares alternatives in detail based on their performance against planning criteria, ecosystems services, and environmental effects.
- **Chapter 6: Preferred Alternative**—This chapter describes the Preferred Alternative—the First Dam Alternative—for the Proposed Project and presents the costs and cost sharing.
- **Chapter 7: Consultation, Coordination, and Public Participation**—This chapter summarizes steps taken to involve agencies, Tribes, and the public in development of the Proposed Project.
- **Chapter 8: References**—This chapter lists the references used in support of the information presented in this document.
- **Chapter 9: List of Preparers and Reviewers**—This chapter contains a list of the document preparers and reviewers, their respective agency or company, and their associated qualifications.
- **Chapter 10: Acronyms, Abbreviations, and Short Forms**—This chapter defines the acronyms, abbreviations, and short forms used in this plan.
- **Appendices**—This section provides supporting documentation for the information presented in the report. See Table of Contents for the list of appendices.

Twenty-one Technical Memorandum (TMs) were developed to quantify, and in some cases value, the changes the alternatives would have within the Project Area. To reduce redundancy, supporting information from the TMs—including maps, tables, and discussions—were incorporated into the analysis by reference. As a result, the Draft Plan–EIS only includes information from the TMs necessary to explain and discuss how it was used to analyze the alternatives. Individuals interested in additional detail on the Proposed Project and how the effects were quantified should refer to the TMs located in Appendices E2–E4. Table 1-3 displays the number, name, and key information contained in the TMs in Appendices E2–E4.

Table 1-3. Number, Name, and Key Information for Technical Memorandum

Number	Name	Key information
TM-001	<i>Project Area Existing Conditions</i>	Describes system facilities, with photos, provides figures of service areas and canals and a list of available data for analysis, and describes Project Area soil conditions.
TM-002	<i>Watershed Hydrology and Lower Logan River Hydraulics</i>	Describes Logan River Watershed hydrologic characteristics and the river reaches below First Dam (with photos); provides a list of available historical data; and discusses Logan River Conservation Action Plan (CAP) priorities and current water quality conditions.
TM-003	<i>Logan River Water Rights</i>	Describes all water rights on the Logan River and groundwater rights in the Project Area.
TM-004	<i>Canal Transmission Losses</i>	Describes the seepage study, quantification of transmission losses, and proposed water conservation.
TM-005	<i>Design Criteria</i>	Discusses design criteria to be used during the Design Phase of the project.
TM-006	<i>Agricultural Alternative Development</i>	Discusses agricultural water project measures and the development of the alternatives for analysis.
TM-007	<i>Crockett Diversion Structure Removal Hydraulics and Habitat</i>	Describes the 30% design of the Crockett Diversion replacement and/or removal and effects on recreation, water quality, floodplain management, fish passage, and aesthetics.
TM-008	<i>Agricultural Water Management Operational Scenarios</i>	Describes the proposed PI system operations under each alternative.
TM-009	<i>First Dam Interconnect</i>	Describes First Dam's current role and operation on the Logan River under the existing conditions and for the First Dam Alternative, and addresses questions from the dam owner and power generator—Utah State University (USU)—and the Utah Water Research Laboratory (UWRL) located directly downstream (with an intake structure at First Dam).
TM-010	<i>Lagoon to Reservoir Storage Conversion</i>	Describes the current conditions of the Logan Sewer Treatment Lagoons and the actions required to convert them to secondary irrigation water storage.
TM-011	<i>Logan River Water Quality Modeling</i>	Describes the development of a dynamic hydraulic routing and process-based temperature model for the affected sections of the Logan River using a very low flow summer period during 2022 for the existing conditions. Using the calibrated 2022 model, this TM describes the simulation of two different design alternatives—the First Dam and Crockett Diversion Alternatives—that would change the distribution of flows based on projected flows for each alternative throughout the study reach to quantify potential changes to temperatures and dissolved oxygen. The flows it models are equivalent to the flows that would occur in both the First Dam Alternative and the Crockett Diversion Alternative, analyzed in detail in the Plan-EIS, as well as the Alternative 1 (First Dam with Crockett Diversion Removal), not analyzed in detail.

Number	Name	Key information
<i>TM-012</i>	<i>Secondary Irrigation System Effects</i>	Describes the expected effects to the municipalities under each project alternative, including reduction in culinary demand and operational costs, reduction in treatment costs, and avoided infrastructure costs. Quantifies these costs and reductions based on the Crockett Pressurized Irrigation Master Plan.
<i>TM-013</i>	<i>Power Generation and Consumption Effects</i>	Discusses the pumping requirements under each alternative and the power generation under the First Dam Alternative; quantifies power costs and power generation revenue under each alternative; and correlates power consumption to greenhouse gas (GHG) emissions.
<i>TM-014</i>	<i>Agricultural Yield Effects</i>	Discusses crop yield effects and quantifies yield increases by canal company under each alternative.
<i>TM-015</i>	<i>Logan River Floodplain Effects</i>	Discusses floodplain effects along the Logan River under each alternative—quantifies number of homes and schools as well as length of road inundated in each scenario.
<i>TM-016</i>	<i>Capital/Construction Costs Estimates</i>	Quantifies intake, PI system, pump stations, water storage facility, hydropower, diversion reconstruction and removal, and flood control action construction costs anticipated under each alternative.
<i>TM-017</i>	<i>Operations and Maintenance (O&M) Costs</i>	Quantifies O&M for the PI system under each alternative.
<i>TM-018</i>	<i>Project Benefits and Cost Share</i>	Identifies and allocates project benefits and costs.
<i>TM-019</i>	<i>Flood Prevention</i>	Details flood control activities. Examines the hydrology and hydraulics of the canals and the contributing areas and the effects of the proposed floodwater prevention system.
<i>TM-020</i>	<i>Recreation</i>	Describes the design for the recreation activities.
<i>TM-021</i>	<i>Logan River CAP Alternative Evaluation</i>	Provides Logan River CAP alternative evaluations for summer base flow, water quality (temperature and dissolved oxygen), and instream habitat for each alternative compared to existing conditions.

Chapter 2 Purpose and Need of the Project

2.1 Purpose

The purpose of the Proposed Project is: 1) to improve irrigation efficiency and water conservation and to maintain and enhance environmental conditions and beneficial water use in the form of instream flows for CWD shareholders within the Crockett Avenue Irrigation and Distribution Inc. (Crockett Avenue Irrigation Company; CAIC) service area and the larger Logan River Watershed; the authorized purpose is *Agricultural Water Management*; 2) to improve flood management facilities within the Logan River and irrigation service area to provide flood control and reduce damages to the Cities of Logan, North Logan, and Hyde Park and portions of Cache County from flooding that occurs from large thunderstorms and rain on frozen ground events in the valley; the authorized purpose is *Flood Prevention*; and 3) to improve recreation facilities, trails, connectivity, and river access ancillary to replacing the existing canal where the canal water would be piped and to providing access to maintain key components of the pressure irrigation and flood prevention infrastructure within the Project Area; the authorized purpose is *Public Recreation*.

This Draft Plan–EIS consists of two sets of objectives: the Federal Objective, which every NRCS planning study shares; and the project objectives, which are developed on a per-project basis and are detailed in Section 2.1.2 below.

2.1.1 Federal Objective

The Federal Objective is the fundamental goal of Federal investments in water resources and is the same for every watershed plan in accordance with PR&G. The Federal Objective specifies that Federal water resource investments shall reflect national priorities, encourage economic development, and protect the environment by:

- Seeking to maximize sustainable economic development;
- Seeking to avoid the unwise use of floodplains and flood-prone areas and minimize adverse effects and vulnerabilities in any case in which a floodplain or flood-prone area may be used; and
- Protecting and restoring the functions of natural systems and mitigating any unavoidable damage to natural systems.

Given 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 the consideration of both quantified and unquantified measures.

2.1.2 Project Objectives

Project objectives were developed to address the problems and realize opportunities in the watershed. In coordination with the public, federally recognized Tribes, agencies, and other stakeholders, NRCS and the Sponsor established the following objectives for the Proposed Project:

- Objective 1: Address agricultural water management deficiencies by decreasing water losses associated with seepage and evaporation, and spillage from the aging canal system.
- Objective 2: Address agricultural water management deficiencies by reducing the costs of maintaining deteriorating infrastructure and replacement needs and improving capability of PI within the CAIC service area.
- Objective 3: Address agricultural water management deficiencies by improving secondary irrigation water efficiency to reduce culinary water supply strains.
- Objective 4: Address agricultural water management deficiencies by improving the Crockett Diversion and the canals' operation during high flow events.
- Objective 5: Address agricultural water management deficiencies by reducing the potential for failure of the Crockett Canal near Canyon Road.
- Objective 6: Address agricultural water management deficiencies by improving the operational efficiency and long-term sustainability of the irrigation system by incorporating features that reduce energy demands and enhance infrastructure performance.
- Objective 7: Address flood damage reduction by enhancing stormwater capacity in existing canals.
- Objective 8: Address flood damage reduction by improving the Crockett and Providence Pioneer diversions' operation during high flow events.
- Objective 9: Address flood damage reduction by reducing overflow into adjacent lots that contribute to flooding surrounding areas.
- Objective 10: Enhance recreational opportunities ancillary to replacing the existing canal where the canal water would be piped and to providing access to maintain key components of the pressure irrigation and flood prevention infrastructure by providing new trails.
- Objective 11: Enhance recreational opportunities by improving terrestrial and river trail connectivity, including public river access.

2.1.3 Constraints and Considerations

Constraints represent likely insurmountable physical or administrative restrictions pertinent to the formulation of alternative plans. Considerations are other obstacles that could affect costs, societal acceptability, or legal issues that should be noted and accounted for when examining and evaluating potential alternative plans. For this Draft Plan–EIS, the primary constraints are:

- Constraint 1: Resolve adverse effects to historic properties through implementation of a Memorandum of Agreement (MOA).
- Constraint 2: Minimize land access acquisition.
- Constraint 3: Maintain open water and base flows in the Little Logan.
- Constraint 4: Maintain the existing connection from the Logan River into the Little Logan for aquatic species and recreationists.
- Constraint 5: Maintain aquatic species passage from Logan River into the Little Logan.
- Constraint 6: Maintain recreational opportunities and aesthetic values in the Little Logan.
- Constraint 7: Reduce costs from crossing State roads to improve stream crossings and move flood waters to reduce infrastructure flood damage.
- Constraint 8: Use Logan City water shares to supply base flows for the Little Logan.

- Constraint 9: Maintain the existing hydraulic gradient and use existing bank stabilization at the Crockett Diversion to control erosion and prevent head cutting.

The Crockett Diversion, originally built in 1860 with numerous replacements and modifications since, is a failing piece of infrastructure which currently poses serious hazards to operations, homeowners living around the structure, and the public. The structure also limits recreational opportunities and is a barrier to fish passage. The structure controls the water level above the diversion with a series of four wood stop logs. Adjusting these boards during high flows can be very dangerous. Vertical steel supports for stop logs catch floating debris and trees that are washed downstream during flooding, causing nearly instantaneous emergencies by backing up the flows in the channel. Further, the nature of the structure caused upstream sediment and debris build-up, which has caused the river channel to rise over the years and shallowed the flood plain. The drop structure behind the Crockett Diversion consists of broken concrete and debris that fails to break up flow energy causing bank erosion on the north bank. The drop structure also has complicated fish passage and created a barrier to people floating the Logan River.

Urban development has encroached on the Crockett distribution systems' rights of way (ROW), often eliminating the ability of the canal company to access and maintain the canals with equipment. As a result, the canal system has rapidly deteriorated; vegetation growth fills canals and laterals with plants, debris, and other material, contributing to an estimated loss of 6,050 ac-ft of water each year through seepage, evaporation, and spillage (see Appendix E3, TM-001 Existing Conditions). These losses prevent agricultural producers from obtaining a full water share, truncate the growing season, and ultimately reduce crop yield. The loss of water is particularly detrimental to agricultural producers during drought years.

Currently, limited pressurized secondary irrigation water systems exist within the CAIC service area, mostly constrained to small neighborhood systems in the cities of Hyde Park and North Logan. The general lack of access to irrigation water from canals and ditches and generational shifts have led many to elect to use pressurized culinary water for outdoor use. Enhancing secondary irrigation water storage and connections to agricultural producers and residents in the service area would reduce water losses and pumping requirements from irrigation canals and ditches. Additionally, the lack of pressurized water systems does not support the potential conversion from flood to PI systems, continuing the loss of water due to inefficient flood irrigation.

One overarching concern of the community that was expressed through the scoping process is that of instream flows in the Logan River and the Little Logan. Several reaches of the Logan River currently experience periods of little to no flow, and a couple are even dry-dammed. Any proposed instream flow constitutes an improvement to the current conditions experienced downstream of the selected upper diversion.

The community has grown accustomed to flow in the Little Logan during the irrigation season which varies in quantity based on canal section and time of year with flows reducing at each turnout or canal split. Pressurization or enclosure could change the current conditions by reducing, eliminating, or obscuring flow in the channel. Extensive consideration was given to methods for integrating public input while maintaining the advantages offered by a pressurized system. Priority was given to instream flows in the Logan River due to its current classification and regulation by the State of Utah, while still considering base flows in the Little Logan.

2.2 Need

The Proposed Project is needed to *improve agricultural water management* by addressing deficiencies in the agricultural water delivery system from the aging canal system that contribute to water losses associated with seepage and evaporation, limit the potential for improving irrigation water management, such as conversion to PI from flood irrigation, and risk public safety from Crockett Diversion and Crockett Canal risk of failure; and improving irrigation efficiencies by pressurizing secondary irrigation water systems (non-potable irrigation water for rural and urban agriculture) to reduce water supply strains on existing culinary water supplies. Combined with the flood prevention need, efficiency improvements are needed to improve irrigation infrastructure as recent stormwater and flash floods have highlighted deficiencies in flood protection with high intensity runoff events overwhelming the existing diversion and canals. Crockett Diversion is an aging piece of infrastructure originally built in 1860 and it currently poses hazards to the irrigation company operating the diversion, city staff assisting operations during high runoff times to alleviate snags and emergency flooding, area homeowners, and the public, as well as limits recreation and is a barrier to fish passage (Figure 2-1). Additionally, the Crockett Canal near Canyon Road has historical upstream concerns, and structural changes are needed to reduce potential failure risk.



Figure 2-1. Existing Crockett Diversion with approximately 120 cubic feet per second (cfs) of water

The Proposed Project is needed to *prevent flooding* because the existing canals do not have adequate flow capacity to transport the additional stormwater produced by large storm events, and recent stormwater and flash floods have overwhelmed the existing diversion and canals causing flood damage in the Project Area. The existing irrigation canals in the past were used to deliver both irrigation water and stormwater runoff that occur during storm events. Recent

population growth has converted permeable farmland into impermeable surfaces, and these changes have increased storm water runoff.

The Proposed Project is needed to *enhance recreational facilities* because the rapidly growing area of Logan, North Logan, and Hyde Park has a limited trail system, and enhancements are needed to provide access to maintain key components of the pressure irrigation and flood prevention infrastructure as well as provide additional access points to the terrestrial and river trail systems to provide for safe and effective access for residents and visitors to nearby recreational facilities including U.S. Forest Service (USFS) public lands and their existing trail systems. The Logan River Task Force Conservation Action Plan (LRTF-CAP) identified access as one of the biggest barriers to recreation opportunities along the Logan River (Logan River Task Force 2016).

The following sections provide further detail on the purpose and need for the project by outlining the problems and opportunities of the project which—combined with the objectives, and constraints—bound the formulation of alternatives.

2.2.1 Problems

With the ongoing extensive water losses from seepage, increasing cost of O&M, increased flood risks, and encroachment of residential development, the ten irrigation company members of the CAIC and the three interlinked cities elected to pursue funding following flooding that occurred in 2011 and 2012 to investigate mitigating the following problems.

2.2.1.1 Agricultural Water Management

Deficiencies in the Agricultural Water Delivery System

The Crockett irrigation water distribution system consists of 11 main distribution canals with three major diversion points (see Figure 1-2 and Appendix E3, TM-001, Figure 24). The Crockett Avenue Irrigation and Distribution System, the Logan Hollow Canal, and the Logan Blacksmith Fork Irrigation Canal all divert water from the Logan River in gravity systems starting as early as April 1 and water diversion continues throughout the entire summer, typically reducing in October when it is only being used on pasture, winter wheat, and for stock watering. The water is completely turned out of the canals by October 31. See Appendix E3, TM-001 and Appendix E3, TM-004 for a complete description of the canals and canal seepage losses. Water conservation is a significant motivation for project development and can sometimes dictate funding.

Currently, the deficiencies in the agricultural water delivery system cause multiple problems:

- The aging canal system loses water to seepage and evaporation.
- The seepage infiltrates into the sewer system, increasing water treatment costs.
- The canal system is costly to maintain.
- The irrigation water is inaccessible or inconvenient to use, and agricultural producers and residents often use culinary water instead of irrigation water.
- The existing irrigation system relies heavily on external energy inputs and lacks integrated energy recovery mechanisms.
- Water-short conditions toward the end of the irrigation season limit crop yields, thereby damaging the incomes of farmers in the watershed.

- Current elevated water temperature and low dissolved oxygen levels in the Little Logan and the Logan River are contributing to poor water quality.
- Recent stormwater and flash floods have highlighted deficiencies in capacity and flood protection with high intensity runoff events overwhelming the existing diversion and canals.
- The primary method of irrigation to agricultural lands in the CAIC service area is flood irrigation and the potential for improving irrigation water management is limited.

Water Loss to Seepage and Evaporation

Head gates, diversion structures, culverts, and other system components are operational, but many are rundown and beyond their useful life, however, a complete inventory of structures in the canals has not been completed (Appendix E3, TM-001). The open channels in the system are overgrown with vegetation and lose an estimated 6,050 ac-ft of water each year through seepage and evaporation (see Section 3.3.6 and Appendix E3, TM-004 for details on how this estimate was developed). Seepage and evaporation losses are exacerbated by the need to move water over long distances with pumps.

Seepage Increases Water Treatment Costs

Currently, when irrigation water is conveyed through unlined canals, significant seepage infiltrates the surrounding soils and, in areas with high groundwater tables, can enter the sewer system through aging clay pipes with open joints. This unintended infiltration increases the volume of water requiring treatment at the wastewater treatment plant (WWTP), placing additional strain on infrastructure and resulting in higher O&M costs for local communities. Over time, this strain can accelerate the need for costly upgrades to treatment capacity and contribute to inefficiencies in both water and energy use.

Costly Maintenance

When the irrigation water distribution system was originally built, it was surrounded by farms and a few homes. However, over the last century and a half, development has encroached on the rights of way, often eliminating the ability of CAIC to access and maintain the canals with equipment. In many cases, maintenance is limited from road crossing to road crossing to hand crews each spring walking up the canal. As a result, many of the canals have lost capacity as they have been choked with vegetation and trees, as well as neighbors building into the right of way during the off season without permission. The result has been a rapidly deteriorating canal system that is difficult for the individual companies to maintain within city limits.

Irrigation Water is Inaccessible or Inconvenient to Use

Currently, limited opportunities for pressurized secondary irrigation systems exist within the CAIC service area, mostly constrained to small neighborhood systems in Hyde Park and North Logan. No active PI systems exist in Logan City. Agriculture producers and residents within the Project Area mainly use culinary water for outdoor use even though many have water rights. In some parts of town, irrigation water is used based on share ownership and accessibility. In many cases, development has eliminated the ability to access irrigation water from the canals and ditches. Additionally, generational shifts have led to many who elect to use the pressurized culinary water for convenience and availability rather than the irrigation water on turns that often require use in the middle of the night or at inconvenient hours of the day.

Without addressing these infrastructure deficiencies, the canal system would remain unable to deliver pressurized water for secondary irrigation systems. This limitation forces continued reliance on culinary water for irrigation, which is significantly more expensive due to treatment

and delivery costs. As a result, both agricultural producers and residents would face higher utility expenses, and municipalities would experience increased strain on potable water supplies. Over time, this strain could accelerate the need for costly expansions to culinary water infrastructure and lead to more frequent and substantial rate increases for end users.

The value of water would continue to rise as the valley grows and demand increases, which also would increase the cost of drinking water. Figure 2-2 compares the conceptual rate increases over time for culinary systems alone compared to culinary systems combined with secondary irrigation systems. The secondary irrigation system, while slightly more expensive at the beginning, maintains lower rates in the long term. See Appendix E5, TM-018 for additional details.

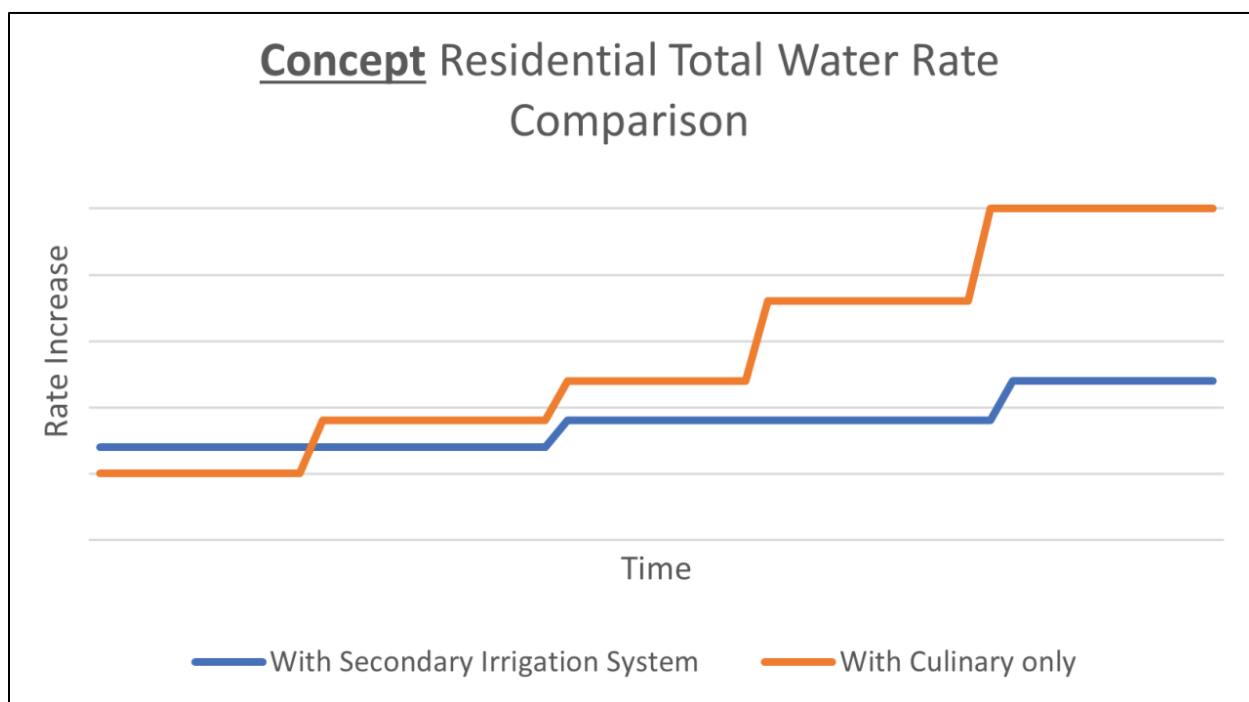


Figure 2-2. Concept Comparison of Residential Total Water Rate Increase (from TM-018, p. 4)

Irrigation System Relies on External Energy Inputs and Lacks Integrated Energy Recovery Mechanisms

The existing irrigation system relies on external energy inputs to operate pumps, which increases operational costs for agricultural producers and municipalities. This dependency on grid electricity reduces the long-term economic sustainability of the irrigation system.

The current irrigation system lacks integrated energy recovery mechanisms. Currently, energy used to move water through the system is lost, and opportunities to offset energy consumption through renewable generation are missed. For example, the Logan River's natural elevation drop at First Dam presents an opportunity to generate renewable energy. This potential remains untapped, representing a missed opportunity to maximize the efficiency of existing water infrastructure and agricultural need.

The current non-pressurized irrigation system requires significant capital investment. The system lacks a built-in mechanism to offset long-term operational costs, reducing its cost-effectiveness

and resilience. Additionally, the current system contributes to GHG emissions through solely using grid electricity consumption for pumping.

Water-short Conditions Limit Yields and Damage Incomes

CAIC water rights are often reduced by the Kimball Decree (explained in Appendix E3, TM-003) during the later part of the irrigation season due to declining flow in the Logan River. This occurrence reduces the amount of water available to shareholders for agricultural purposes in the months of July, August, and September. This reduction was experienced especially in recent drought years like 2021 and 2022, where the Kimball Decree was active during almost the entire irrigation season. These water-short conditions toward the end of the irrigation season limit yields, thereby damaging the incomes of farmers in the watershed. A desire for water storage to improve irrigation capabilities in the late season was expressed by project stakeholders. In addition, storage would be necessary for a PI system due to daily fluctuations in demand and the variable nature of secondary irrigation water use as observed by other secondary providers in northern Utah. Therefore, adequate storage would be required to meet these peak demands.

Within the CAIC service area, due to an unreliable source of water for irrigation for the intended crops of alfalfa, barley, silage corn and winter wheat that require irrigation water to ensure successful production, Table 2-1 shows the existing amount of damage to annual net farm revenue by crop under existing conditions from the current 5,390 ac-ft loss of water to seepage and evaporation with the Project Area, but excluding the 660 ac-ft of water loss in the Little Logan (see Section 3.3.6). This damage is occurring to the incomes to farmers from the reduced crop yields. The water-short conditions toward the end of the irrigation season limit yields, thereby damaging the incomes of farmers in the watershed. A total of \$1,140,453 damage is occurring annually within the CAIC service area.

Table 2-1. Damage to Annual Net Farm Revenue under Existing Conditions of the Logan River Watershed Project, UT (\$ 2025)

Crop	Unit	Yield Loss¹	Normalized Price¹	Marginal Cost¹	Net Damage
Alfalfa	Tons	5,849	\$220.83	\$45.82	\$1,023,633
Barley	Bushel	9,450	\$4.84	\$1.15	\$34,871
Silage Corn	Bushel	5,725	\$5.44	\$1.16	\$24,503
Winter Wheat	Bushel	11,220	\$6.30	\$1.18	\$57,446
Total	-	-	-	-	\$1,140,453

¹See Benefit-Cost Analysis in Appendix E2.

Elevated Water Temperature and Low Dissolved Oxygen Contribute to Poor Water Quality

Current elevated water temperature and low dissolved oxygen levels in the Logan River and the Little Logan are contributing to poor water quality. Future agricultural operations may face regulatory pressure to reduce impacts on beneficial uses including aquatic ecosystems. Because the lower portion of the Logan River within the Project Area experiences little to no flow during the irrigation season because water is diverted upstream for irrigation or other uses during the summer (dry dams), pollinator populations are declining and biodiversity is waning, which are essential for sustainable agriculture. Many agricultural communities in the Logan River watershed rely on ecosystem services provided by riparian zones, such as natural filtration and erosion control.

Deficiencies in Capacity Overwhelm Existing Diversion and Canals

Additional problems with the current status of the irrigation infrastructure include capacity problems. Recent stormwater and flash floods have highlighted deficiencies in flood protection with high intensity runoff events overwhelming the existing diversion and canals.

Furthermore, the Crockett Diversion is an aging piece of infrastructure originally built in 1860, and it currently poses hazards to the irrigation company operating the diversion, city staff assisting operations during high runoff times to alleviate snags and emergency flooding, and area homeowners and the public. The diversion also limits recreation and is a barrier to fish passage.

The structure consists of a series of four wood stop logs slots that are manually added and removed to control the water surface elevation (WSE) above the diversion. Adjusting these boards during high flows to manage the diversion in the channel north of the structure can be very dangerous. This adjustment often requires two individuals working together on the narrow catwalk without any safety harnesses or equipment and using poles with hooks on the ends to lift the boards out with what can be a couple of hundred pounds (lb) of force of resistance. Additionally, the vertical steel supports for the stop logs catch floating debris and trees that are washed downstream during flooding. These cause nearly instantaneous emergencies by backing up the flows in the channel. Additional efforts to prevent bank erosion have been taken on the south side of the river where property owners have built concrete and large bolder rock walls to protect or extend their property and protect it from the Logan River.

The Crockett Diversion was washed out during flooding in 1984 when a tree lodged into the crest of the dam, overflowed the diversion channel, and eroded a 70-foot-wide channel around the existing structure back to the river north of the existing structure. The Crockett Diversion structure was reconstructed by ten irrigation companies who jointly diverted water at this location and combined their resources to organize the Crockett Avenue Irrigation and Distribution System to jointly take responsibility financially to pay the loan to reconstruct the diversion and to maintain the main canal system.

The structure was almost washed out again in 2011 when flood flows approached the 15-year event based on an evaluation of data from the Logan River gauging station reported by the National Weather Service. The water levels exceeded the top of the concrete walls which were extended artificially by Logan City Public Works using large concrete blocks, sandbags, and plastic. This action artificially raised the elevation of the structure approximately 2 feet, which was nearly overtopped in late May and early June of that year. The overtopping was often associated with trees washing downstream and becoming wedged into the weir slots of the structure. Logan City was required to park large, tracked equipment with long reach capabilities to remove the trees and to provide 24-hour per day monitoring to protect the structure and the upstream homes from flooding. Additionally, the Crockett Canal near Canyon Road has historical upstream concerns, and structural changes are needed to reduce potential failure risk.

This structure was again in jeopardy in 2023 when the flows overtopped the existing concrete walls and were only held in check by an artificial concrete block wall, like in 2011 (Figure 2-3). Following the 2011 flooding, Logan City in cooperation with the Crockett Avenue Irrigation and Distribution System contracted with Anderson Consulting, Inc. to prepare a design to replace this structure with Obermeyer weirs. The Crockett Diversion structure continues to be a choke point in the river during flood stage. Due to the risk to property and life, the diversion has been

identified by the co-sponsors for replacement independent of this watershed plan, even if no action is taken.



Figure 2-3. Crockett Diversion at Flood Stage (1,790 cfs) on May 24, 2023

Previous Agricultural Water Management Alternative Development Efforts

CAIC has been experiencing challenges due to aging infrastructure and the ever-evolving needs of shareholders. Damage to the Crockett Diversion structure from flooding in 2011 prompted consideration of rehabilitation of the structure. However, before spending the money to complete the work, the CAIC board elected to analyze alternatives and determine if an alternative existed that would provide greater long-term benefits while still meeting the immediate challenges.

In 2016, CAIC contracted with J-U-B and Franson Civil to complete the Crockett Pressurized Irrigation Master Plan for the irrigation water distribution system. The Master Plan prepared several alternatives for analysis through discussion with a technical advisory committee (TAC) composed of CAIC representatives; Logan, North Logan, and Hyde Park Cities; CWD; USU; and the UWRL. These organizations were identified as being affected by proposed alternatives and were included in the development of alternatives.

The Crockett Pressurized Irrigation Master Plan was finished in 2019 and carried three alternatives through evaluation of benefits and costs (J-U-B and Franson Civil 2019). These alternatives included (1) a no-action alternative, (2) pressurization of the canals to the headgates of the individual canal companies, and (3) construction of a pressurized secondary irrigation

system. The alternative with the greatest benefit-cost ratio (BCR) was identified as the full pressurized secondary irrigation system alternative, which would provide secondary irrigation water to residents of Logan, North Logan, and Hyde Park located within the existing CAIC service area. This system would meet all the needs of the CAIC and provide more long-term benefits to stakeholders and residents in the Project Area. However, due to the size of the system, funding assistance would be required, both for initial and ongoing costs. See Appendix E3, TM-006 for additional details regarding the alternatives and analysis.

2.2.1.2 Flood Damage

The existing canals do not have adequate flow capacity to transport irrigation water and the additional stormwater produced by larger storm events and access is limited along the canal corridors for O&M. The existing irrigation canals in the past were used to deliver both irrigation water and stormwater runoff that occur during storm events. Recent population growth has converted permeable farmland into impermeable surfaces, and these changes have increased storm water runoff. These changes have resulted in frequent overtopping of canals, localized flooding, and associated damage to homes, roadways, and public infrastructure.

Under current conditions, approximately 43 homes and 3,150 feet of roadway are at risk during a 100-year flood event, contributing to \$16,146,200 in annualized damages to buildings. This flooding poses a recurring risk to public safety, disrupts local and regional traffic, and increases the burden on emergency response services. Road closures and detours caused by floodwaters can delay emergency vehicles, hinder access to critical services, and create hazardous driving conditions for residents and visitors alike. These flood risks not only threaten public safety and property but also increase long-term maintenance costs and reduce the resilience of the watershed's infrastructure.

The Crockett and Providence Pioneer diversions, in particular, poses a significant flood risk due to their vulnerability to debris accumulation and structural failure during storm events. The Crockett and Providence Pioneer diversions flood surrounding areas when high flow leads to tree blockage. The Crockett Diversion structure is outdated and requires operational risks during high-flow events. Sediment and gravel deposition have occurred behind the current diversion due to low flow velocity which has reduced flow capacity and raised the river channel bed elevation. The Crockett Diversion structure does not allow for passage of fish or natural sediment, and limits recreation.

Measures to reduce flooding in the vicinity of the Crockett Diversion were considered with measures to remove the diversion or replace the diversion. Besides the diversion itself, there are two other locations along Fox Farm Road where water leaves the canal and enters the roadway and neighborhood. The first undeveloped property upstream of the diversion (Lot 1, located at approximately 1100 Fox Farm Road) is one location and the second undeveloped property upstream of the diversion (Lot 2, located at approximately 1050 Fox Farm Road) is the other.

2.2.1.3 Limited Recreational Facilities and Connectivity

Because the Proposed Project would address agricultural water management and flood damage reduction, recreational opportunities ancillary and complementary to measures providing access to maintain key components of pressure irrigation and flood prevention infrastructure were explored. In their Crockett Pressurized Irrigation Master Plan efforts, CAIC identified a portion of the main Crockett Canal elevated on a hillside near Merlin Olsen Park at risk of canal or

hillside failure which needs to be addressed. Complementary to this need, the site would be an ideal location for a trail, if the canal is piped.

The rapidly growing area of Logan, North Logan, and Hyde Park has a limited trail system. Enhancements are needed to provide additional access points to the terrestrial and river trail systems to provide safe and effective access for residents and visitors to nearby recreational facilities including USFS public lands and their existing trail systems. The LRTF-CAP identified access as one of the biggest barriers to recreation opportunities along the Logan River (Logan River Task Force 2016).

Logan City has an existing city-wide network of shared use paths which connect recreational facilities inside and outside of City limits (see Appendix E5, TM-020, Figure 1). These shared-use paths are typically concrete paths 5 to 10 feet wide. There are also other isolated shared-use path routes within the City. There is an existing shared use path along Boulevard Street from 200 East at Merlin Olsen Park to 600 East at the foot of the USU Campus. This existing shared use path is non-compliant with Americans with Disabilities Act (ADA) accessibility requirements, featuring steep grades. There is currently no walkable connection between 200 East and 600 East along Canyon Road.

CAIC also identified replacement of the Crockett Diversion to address necessary irrigation inefficiencies. An existing pedestrian bridge is located immediately downstream of the diversion and partially located on private property, with the property owner expressing a desire to remove the bridge from said property. This existing bridge from Sumac Park to River Hollow Park is currently the only walkable connection east of Crockett Avenue across the Logan River and connects neighborhoods north and south of the Logan River. However, due to its low height and adjacency to the diversion, it is frequently subject to closure due to safety concerns during high flow conditions, and the Logan Parks and Recreation Department warned patrons to, “Please keep an eye on all small children” on account of the hazards (Herald Journal 2023).

Additionally, the Crockett Diversion is a barrier to recreation. Many people like to float the Logan River. However, due to the low spacing of the catwalk, narrowness of the stoplog slots, and the back water and under current effects of the scour hole, the structure becomes very dangerous to anyone trying to pass the structure on a kayak or other floatable device.

2.2.2 Opportunities

Opportunities represent goals to be achieved by the Proposed Project ancillary to its authorized purpose. The following opportunities may be realized while addressing the problem of inefficient agricultural water management:

- Opportunity 1: Improve instream flows and increase beneficial water use through the removal of barriers to fish passage and providing instream flows.
- Opportunity 2: Enhance community resilience to flooding through the implementation of project measures.
- Opportunity 3: Enhance recreational facilities by providing additional access points to terrestrial and river trail systems.
- Opportunity 4: Improve public safety by reducing the risk of failure in the Crockett Diversion and Crockett Canal.

Chapter 3 Affected Environment: Current and Future Conditions

The Affected Environment section provides the baseline for NEPA evaluation (current conditions) and planning evaluations (both current and future conditions). This section describes the current ecosystem service flows and physical, biological, ecological, economic, and social environment for the watershed as well as projected future conditions to the extent possible based on reasonably foreseeable trends and actions within the watershed. This section provides the context for the formulation of alternatives (Chapter 4) and for the determination of tradeoffs among ecosystem services and effects to the environment (Chapter 5) that will ultimately lead to the selection of a plan (Chapter 6). Resource concerns and ecosystem services that may affect or be affected by measures to address the problem, whether directly, indirectly, or cumulatively, are identified and discussed in the plan.

3.1 Relevant Categories of Concern

3.1.1 Relevant Ecosystem Services

The following five Guiding Principles identify required planning criteria to accomplish the Federal Objective and were used to guide the identification, formulation, and evaluation of measures: 1) healthy and resilient ecosystems, 2) sustainable economic development, 3) floodplains, 4) public safety, and 5) watershed approach. A summary of ecosystem services and their relevance to the Proposed Project is provided in Table 3-1. Irrelevant ecosystem services categories have been eliminated from detailed analysis. A discussion of relevant ecosystem services is described in Section 3.2.

Table 3-1. Ecosystem Services Scoping Summary

Ecosystem Services	Relevant to Proposed Action		Rationale
	Yes	No	
Provisioning Services			
Food		X	Not applicable to this project.
Fiber		X	Not applicable to this project; no fiber production is present.
Water	X		Project increases agricultural water use efficiency with hydroelectricity production and power requirements reduction. Project is crucial to irrigation water supply within the watershed.
Air	X		Project provides improved air quality by reducing GHG emissions through hydropower generation and decreased energy demand.
Timber		X	Not applicable to this project.
Biomass		X	Not applicable to this project.

Ecosystem Services	Relevant to Proposed Action		Rationale
	Yes	No	
Regulating Services			
Flood and Disease Control	X		Project addresses flood prevention.
Water			Project addresses damages caused by untimely water availability for crops.
Water Quality	X		Project addresses water treatment. Project addresses instream flows, especially in Logan River.
Crop Pollination		X	Not applicable to this project.
Cultural Services			
Recreational Experiences	X		Project provides recreational opportunities.
Spiritual		X	Not applicable to this project. No spiritual values were expressed by stakeholders or Tribes during scoping.
Aesthetic Viewsheds		X	Not applicable to this project.
Tribal Values		X	No Tribes responded during scoping, and no Tribal resource issues were expressed.
Supporting Services			
Nutrient Cycling		X	Not applicable to this project.
Soil Formation		X	Not applicable to this project.
Primary Production		X	Not applicable to this project.

3.1.2 Relevant Resource Concerns

A summary of resource concerns developed during the scoping process and their relevance to the Proposed Project is provided in Table 3-2. Resource categories for which implementation of the Proposed Project is deemed to result in negligible, or no effect, have been eliminated from detailed analysis in accordance with 7 CFR Part 650 and Section 501.35(B) of the NWPM (NRCS 2015). These categories include the following resource categories: Sole Source Aquifer, Essential Fish Habitat (EFH), Invasive Species–Animals, Civil Rights, Coastal Zone Management Areas, Coral Reefs, Forest Resources, Ecologically Critical Areas, Parklands, National Parks, Monuments, & Historic Sites, Wild & Scenic Rivers, and Other Concerns.

Table 3-2. Resource Concerns and Issues based on Problems, Opportunities, Objectives, and Constraints

Resource	Relevant to the Proposed Action?		Concerns and Issues: Problems, Opportunities, Objectives, and Constraints, and Rationale (Context and Intensity)
	Yes	No	
Economics			
Economics/Socioeconomics—National Economic Efficiency (NEE) PR&G	X		Proposed Project measures would require the use of local match funds and would improve agricultural water management, flood prevention, and recreational opportunities.
Air Quality			
Clean Air Act (CAA)/National Ambient Air Quality Standards (NAAQS)	X		Proposed activities could affect air quality protected by the CAA and Utah Department of Environmental Quality—Air Quality Division (UDEQ-AQD).
Greenhouse Gases (GHG)	X		Temporary air emissions from construction activities could contribute to the accumulation of GHG.
Energy			
Energy	X		The watershed has the potential for geothermal energy production, as well as existing hydropower plants in proximity (First, Second, and Third Dam), and an existing natural gas power plant (combustion turbine) is also located within the watershed (Utah Office of Energy Development and Utah Geological Survey [UGS] 2025). The Proposed Project does not propose any activities that would develop geothermal energy, nor does it preclude these activities from occurring, nor would it affect the existing natural gas power plant. However, the Proposed Project would affect hydropower within the watershed, and therefore, this aspect of the energy resource was analyzed in detail. The project would facilitate the transition to an energy-efficient irrigation system.
Soils & Geology			
Upland Erosion & Sedimentation	X		Soil disturbance from project activities may contribute to erosion and sedimentation.

Resource	Relevant to the Proposed Action?		Concerns and Issues: Problems, Opportunities, Objectives, and Constraints, and Rationale (Context and Intensity)
	Yes	No	
Prime & Unique Farmland, and Farmland of Statewide Importance	X		Project activities have the potential to affect protected farmland of local importance, farmland of statewide importance, and prime farmland if irrigated. Protected Farmlands are present in the Project Area (NRCS 2022; Appendix C—Soil Resource Report and Map).
Vegetation			
Special Status Plant Species including Endangered and Threatened Plant Species	X		Proposed activities could affect special status plant species protected under the ESA—the Maguire primrose (<i>Primula maguirei</i>) and the Ute ladies'-tresses (ULT; <i>Spiranthes diluvialis</i>) (U.S. Fish and Wildlife Service [USFWS] 2023a).
Riparian Areas	X		Proposed activities could affect riparian areas.
Noxious Weeds & Invasive Plant Species	X		Proposed activities could increase the risk of spread, introduction, and establishment of invasive species, which are specifically prohibited by E.O. 13112. Noxious weeds currently exist within the Project Area.
Water Resources			
Surface & Ground Water Quality & Quantity	X		The Proposed Project would reduce water seepage, thereby conserving water and improving water quality. Reducing water seepage would reduce the amount of salt in soils dissolved and transported to the Cutler Reservoir and Great Salt Lake. Reducing the amount of salts dissolved and transported would improve water quality and the health of the Logan River Watershed.
Clean Water Act (CWA) & Waters of the U.S. (WOTUS), including Specific Aquatic Sites	X		Project activities occur within and adjacent to potential jurisdictional waters and proposed activities could discharge pollutants into WOTUS.
Wetlands	X		Proposed activities could directly affect wetlands during construction activities and indirectly cause the loss of seepage-induced wetlands.

Resource	Relevant to the Proposed Action?		Concerns and Issues: Problems, Opportunities, Objectives, and Constraints, and Rationale (Context and Intensity)
	Yes	No	
Regional Water Management Plan	X		The proposed activities are designed to support Regional Water Management Plans, specifically, Utah Department of Natural Resources (UDNR) Division of Water Resources (UDWR) Water Resources Plan for the Bear River Basin. The Plan prioritizes conservation, storage, distribution, and use of water to meet Utah's growing population and water demand.
Floodplain Management	X		The proposed activities may affect floodplains protected under E.O. 11988.
Sole Source Aquifer		X	Sole source aquifers are those that supply at least 50% of the drinking water for their area and have no viable alternative sources if they become contaminated. No designated sole source aquifers occur within the Project Area, and this resource was eliminated from detailed analysis.
Wildlife			
Fish and Wildlife & Wildlife Habitat	X		Disturbances to wildlife and wildlife habitat would occur during construction. There are no wilderness areas or wildlife refuges in the Project Area.
Candidate, Threatened, and Endangered Animal Species, listed under ESA	X		The proposed activities have the potential to affect species protected under the ESA including, candidate, threatened, and endangered animal species and habitat.
Essential Fish Habitat		X	Designated EFH does not occur within the Project Area (NOAA Fisheries 2025), and this resource was eliminated from detailed analysis.
Invasive Animal Species		X	No potential for introduction of invasive animal species exists, and this resource was eliminated from detailed analysis.
Migratory Birds and Bald and Golden Eagles	X		The proposed activities have the potential to affect migratory birds, bald and golden eagles, and their habitat.
Human Environment			
Cultural & Historic Resources	X		The project activities have the potential to affect cultural and historic resources.
Scientific Resources	X		The project activities have the potential to affect paleontological resources

Resource	Relevant to the Proposed Action?		Concerns and Issues: Problems, Opportunities, Objectives, and Constraints, and Rationale (Context and Intensity)
	Yes	No	
Civil Rights		X	Full and fair participation by potentially affected communities would occur throughout the analysis process; and project benefits would be available to all individuals within and surrounding the Project Area consistent with Title VI of the Civil Rights Act, and this resource was eliminated from detailed analysis.
Public Health & Safety	X		Open canals may present safety concerns; and debris and sediment that enters the canals can cause canals to back up, overtop, and flood surrounding areas.
Hazardous Materials	X		Hazardous materials associated with construction (fuel, oil, etc.) would be present in the Project Area. A preliminary search identified 10 hazardous sites near the project measures.
Transportation & Infrastructure	X		The proposed activities are designed to improve the existing irrigation infrastructure of the Crockett system.
Noise	X		Temporary elevated noise levels are anticipated within the Project Area due to construction equipment and activities. The pump station would increase noise levels.
Visual Resources and Scenic Beauty	X		Temporary visual effects from construction equipment and materials would occur within the Project Area during construction. Permanent visual effects related to the installation of pump stations and added fill to the landscaping lots would also occur.
Recreation	X		Recreation facilities are located within the watershed. The Proposed Project would add recreational opportunities in the Project Area.
Social Issues	X		The public has interacted with the Sponsors, Co-sponsors and the project team and identified topics of concern that include summer base flows and access to open water in the Little Logan, and a desire to preserve existing vegetation.

Resource	Relevant to the Proposed Action?		Concerns and Issues: Problems, Opportunities, Objectives, and Constraints, and Rationale (Context and Intensity)
	Yes	No	
Special Land Designations			
Coastal Zone Plans; Coral Reefs		X	No coastal zones or coral reefs occur within or near the Project Area and no Coastal Zone Management Areas or Plans are applicable to the Proposed Project, therefore, no effects to coastal zones or coral reefs would occur from the Proposed Project. The project is consistent with PL 101-508 (Coastal Zone Management Act), and this resource was eliminated from detailed analysis.
Forest Resources		X	Though National Forest lands are located in the watershed (Map 1 in Appendix C), no project activities are proposed near these lands, therefore, no effects to forest lands would occur from the Proposed Project, and this resource was eliminated from detailed analysis.
Land Use	X		CAIC must coordinate proposed activities, and activities must be consistent with zoning ordinances and adhere to county land use requirements.
Natural Areas	X		The proposed activities may benefit downstream natural areas.
Ecologically Critical Areas		X	No ecologically critical areas are designated within the Project Area, and therefore, no effects to ecologically critical areas would occur from the Proposed Project, and this resource was eliminated from detailed analysis.
Parklands, National Parks, Monuments, & Historic Sites		X	No national parks occur within or near the Project Area, and no national parks, monuments, or historical sites are in or immediately near the Project Area based on National Natural Landmarks Directory, therefore, no effects to parklands, monuments, or historical sites would occur from the Proposed Project, and this resource was eliminated from detailed analysis.

Resource	Relevant to the Proposed Action?		Concerns and Issues: Problems, Opportunities, Objectives, and Constraints, and Rationale (Context and Intensity)
	Yes	No	
Wild & Scenic Rivers		X	No wild or scenic rivers are in or near the Project Area according to the National Wild and Scenic Rivers System Map, therefore, no effects to Wild and Scenic Rivers would occur from the Proposed Project. Project is consistent with PL 90-542 (Wild and Scenic Rivers Act), and this resource was eliminated from detailed analysis.
Other Concerns Identified by Sponsor, Agencies, and the Public			
Other Concerns Identified by Sponsor, Agencies, and the Public		X	No other concerns were raised by the Sponsor, agencies, public, or Tribes.

3.2 Inventory of Ecosystem Services

Table 3-3 describes the relevant ecosystem services present in the Project Area. The ecosystem services are related to the project purpose and need, as well as related to resources in the Project Area, and fall within the five guiding principles described in Section 3.1.1. In the comparison of alternatives, ecosystem service benefits were quantified to the extent possible using metrics representative of both the expected change in of the respective service flow and its societal effect. However, for those services where the exact relationship between ecosystem service flows and their societal benefit are controversial or not easily monetized, those changes in service flows are reported with non-monetary changes.

Table 3-3. Ecosystem Services to Be Considered in the Logan River Watershed Plan

Ecosystem Services	Rationale and Description	Evaluation Metric
<i>Provisioning Services</i>		
Water	Agricultural water use efficiency increased with hydroelectricity production	Change in energy revenue (\$)
Water	Agricultural water use efficiency reduces power requirements	Reduction in power requirements during peak emissions (qualitative)
Air	Clean air	GHG emission reduction (carbon dioxide [CO ₂] tons/year of greenhouse gas emissions)
Water	Provision of agricultural water	Conserved water (ac-ft)
<i>Regulating Services</i>		
Flood Prevention	Exposure to floods	Reduced property damage (\$)
Flood Prevention	Exposure to floods	Reduced road damage (feet)

Ecosystem Services	Rationale and Description	Evaluation Metric
Water	Addresses damage caused by untimely availability of water for crops	Value of reduced damage to agricultural income (\$)
Water Quality	Water treatment and supply	Reduced water treatment and supply expenses (\$)
Water Quality	Instream flows	Value of change in instream flows (\$)
<i>Cultural Services</i>		
Recreation benefits	Provides recreational opportunities; Change in land use	Increased recreation benefits (\$)

3.3 Inventory of Existing Resources and Conditions

The purpose of this section is to describe the resources that could be affected by the proposed alternatives. The purpose of describing the affected environment is to define the context in which the effects could occur. The environmental analysis process has been conducted in compliance with applicable federal, state, and local regulations.

The Project Area is identified in the project maps contained in Appendix B. The Proposed Project measures are within Cache County. Table 3-4 summarizes the physical setting of the Project Area.

Table 3-4. Physical Setting Summary of the Project Area

Physical Setting Information		Information Source
Location		
The Proposed Project is located within the 12-digit hydrologic units of Nebo Creek- Bear River, Fourmile Creek-Little Bear River, Blue Spring Creek, Little Logan River-Logan River, Hopkins Slough, Card Canyon-Logan River, Cottonwood Canyon-Logan River, Right Fork Logan Canyon, Temple Fork, Tony Grove Creek-Logan River, Beaver Creek, and Hell's Kitchen Canyon-Logan River. These subwatersheds encompass the communities of North Logan, Logan, Hyde Park, and Benson CDP in central Cache County, west of the Bear River Mountains and east of the Wellsville Mountains in Utah. The Logan River Watershed encompasses 224,019 acres and contains the 20,980-acre limits of the Project Area.		USGS 2024a
Topography		
Agricultural Water Distribution and Stormwater, Floodplain, and Recreation Increments	The elevation of the Project Area ranges from approximately 4,402 feet AMSL to 4,682 feet AMSL. The landscape throughout the Project Area is characteristic of Cold North American Desert habitat type.	USGS 2024a EPA 2021 Woods et.al. 2001

Physical Setting Information		Information Source
Geology		
Agricultural Water Distribution and Stormwater, Floodplain, and Recreation Increments	Three different geological units occur in the Project Area, largely dominated by the Lake Bonneville deposits-Quaternary, Alluvium, and Colluvium units.	USGS 2024b
Soil Characteristics		
Soil Type	A review of NRCS Web Soil Survey revealed that the Proposed Project is comprised of 41 soil map units. The five dominant soil types consist of Nibley Silt Clay Loam, Steed Gravelly Loam, Collett Silty Clay Loam, Greenson Loam, and Millville Silt Loam.	NRCS 2024d
Description	These soils are derived from river channels primarily from the Logan River and other small creeks, and the ancient shorelines of Lake Bonneville. The natural drainage class is primarily poor.	
Land Information		
Land Ownership	Private 10,135.5 acres (48.3%) Local 10,756.2 acres (51.3%) State 88.3 acres (<1%) Federal 0.6 acres (<1%) - <i>USFS: 0.6 acres (<1%)</i>	Map 1 in Appendix C
Land Use	Developed: 5,877 acres (28.0%) Other Hay/ Non-Alfalfa: 4,007 acres (19.1%) Alfalfa: 3,453 acres (16.5%) Grassland/Pasture: 2,348 acres (11.2%) Developed/Open Space: 1,392 acres (6.6%) Corn: 620 acres (3.0%) Winter Wheat: 385 acres (1.8%) Barley: 346 acres (1.6%) Other: 2,553 acres (12.1%) Land use in the watershed areas vary by ownership and include Cache National Forest, Utah State Lands, Utah State Wildlife Reserve, and private lands. Vegetation types within the watershed areas include conifer forests, aspen, mountain mahogany, sagebrush steppe, grasslands, riparian, meadows, and rocky areas.	NRCS 2024b USGS and USDA Forest Service 2023

3.3.1 Economics/Socioeconomics

3.3.1.1 *Economics*

Resource Issue & Indicator: The proposed activities are designed to increase the economic efficiency for producers in the Project Area and provide ecosystem services. The indicator to describe the economic effect is the BCR.

Agriculture is considered the economic backbone of the Project Area. However, CAIC sustains economic costs associated with maintenance and operations of the irrigation infrastructure. The current estimated annual O&M costs are \$325,000 and the estimated installation costs are \$5,050,000 (see BCA in Appendix E2).

3.3.1.2 *Socioeconomics*

Resource Issue & Indicator: The proposed activities are designed to improve the socioeconomics within the Project Area. Indicators to describe socioeconomics effects are the number of jobs created by proposed activities, and whether the benefits exceed the costs, as displayed by the BCR.

The project activities are situated within portions of North Logan City, Logan City, Hyde Park City and Benson CDP of Cache County, Utah. The following sections describe the current socioeconomic conditions of communities within the Project Area and Cache County, as compared to the State of Utah; the current demographics, employment, income, and poverty are represented.

Population Demographics

Population and demographic information estimated for North Logan City, Logan City, Hyde Park City, Benson CDP, Cache County, and the State of Utah are described in Table 3-5. Percentages for gender, age, sex, and race in North Logan City, Logan City, Hyde Park City, and Benson CDP are similar and consistent with Cache County and Utah.

Table 3-5. Demographic Profile Comparison for 2020

Socioeconomic Criteria		North Logan City	%	Logan City	%	Hyde Park City	%	Benson CDP	%	Cache County	%	Utah	%
Total Population		10,986	100	52,778	100	5,234	100	1,492	100	133,154	100	3,271,616	100
Gender ¹	Female	5,451	49.6	26,600	50.4	2,661	50.8	943	63.2	66,835	50.2	1,618,600	49.5
	Male	5,530	50.3	26,646	50.5	2,603	49.7	873	58.5	67,593	50.8	1,665,209	50.9
Age ¹	Under 18	3,108	28.3	12,212	22.9	1,872	35.6	572	31.5	39,835	29.6	935,997	28.5
	18 & Over	7,873	71.7	41,034	77.1	3,392	64.4	1,244	68.5	94,593	70.4	2,347,812	71.5
Race ²	White	9,278	84.5	41,841	79.3	4,785	91.4	1,346	90.2	112,842	84.7	2,573,413	78.7
	Black or African American	71	0.6	823	1.6	19	0.4	10	0.7	1,115	0.8	40,058	1.2
	American Indian or Alaskan Native	71	0.6	685	1.3	8	0.2	3	0.2	1,108	0.8	41,644	1.3
	Asian	326	3	1,460	2.8	56	1.1	7	0.5	2,353	1.8	80,438	2.5
	Native Hawaiian or Other Pacific Islander	50	0.5	452	0.9	5	0.1	8	0.5	705	0.5	36,930	1.1
	Two or More Races	728	6.6	3,955	7.5	257	4.9	64	4.3	8,121	6.1	279,013	8.5
	Other	462	4.2	3,562	6.7	104	2	54	3.6	6,910	5.2	220,120	6.7
Ethnicity ³	Latino/Hispanic	1,145	10.4	7,980	15.1	325	6.2	103	6.9	15,076	11.3	492,912	15.1
	Not Latino/Hispanic	9,841	89.6	44,798	84.9	4,909	93.8	1,389	93.1	118,078	88.7	2,778,704	84.9

Note: Totals may not equal 100 due to rounding

¹ Table S0101, 2022 American Community Survey (ACS) 5-Year Estimate (U.S. Census Bureau [Census] 2022a)

² Table P1, 2020 Decennial Census (Census 2020a)

³ Table P2, 2020 Decennial Census (Census 2020b)

According to the Census estimates, since 2010, North Logan City has grown by approximately 32.8%, Logan City by 8.7%, Hyde Park City by 26.8%, and Benson CDP by 0.5%. The population is anticipated to continue growing in the years to come. In 2022, a report and press prepared by the Census listed the Logan metro area as one of the top 10 fastest growing metro areas by percentage in the U.S. (Census 2022b). Past, current, and future population estimates for North Logan City, Logan City, Hyde Park City, Benson CDP, Cache County, the State of Utah, and the United States are summarized in Table 3-6.

Table 3-6. Past, Current, and Future Population

Population Year	North Logan City	Logan City	Hyde Park City	Benson CDP	Cache County	Utah	United States
Total Population 1990	Unknown	Unknown	Unknown	Unknown	70,560 ¹	1,729,271 ¹	248,709,873 ²
Total Population 2000	6,093	42,725	2,947	1,425	91,391 ³	2,233,169 ³	281,421,906 ³
Total Population 2010	8,269	48,174	3,833	1,485	112,656 ⁴	2,763,885 ⁴	308,745,538 ⁴
Total Population 2020	10,986	52,778	5,234	1,492	133,154 ⁵	3,271,616 ⁵	331,449,281 ⁵
Projected Population 2040	Unknown	Unknown	Unknown	Unknown	185,948 ⁶	4,440,560 ⁶	355,309,000 ⁷
Projected Population 2060	Unknown	Unknown	Unknown	Unknown	226,084 ⁶	5,450,598 ⁶	364,287,000 ⁷

¹Utah Economic Data Viewer (Department of Workforce Services 2024)

²1990 Census, General Population Characteristics (Census 1990)

³Table DP1, 2000 Decennial Census (Census 2000)

⁴Table P1, 2010 Decennial Census (Census 2010)

⁵Table P1, 2020 Decennial Census (Census 2020a)

⁶Kem C. Gardener Policy Institute (Kem) (Kem 2022)

⁷Census 2023 National Population Projections (Census 2023)

Employment, Income, and Poverty

The 2018-2022 ACS 5-year estimates for employment and income status in North Logan City, Logan City, Hyde Park City, Benson CDP, Cache County, and the State of Utah are provided in Table 3-7.

Table 3-7. Employment and Income Status

Characteristics	North Logan City	Logan City	Hyde Park City	Benson CDP	Cache County	Utah
Population 16 years and older ¹	8,191	38,876	3,536	1,256	95,251	2,412,320
Civilian labor force ¹	5,623	29,190	2,278	1,039	67,371	1,680,155
Employed ¹	5,502	28,461	2,201	961	65,718	1,624,460
Unemployed ¹	121	729	77	78	1,653	55,695

Characteristics	North Logan City	Logan City	Hyde Park City	Benson CDP	Cache County	Utah
Percent unemployed	2.2%	2.5%	3.4%	7.5%	2.5%	3.3%
Median household income ²	80,597	52,473	93,306	69,188	72,719	86,833
Mean household income ³	107,502	67,543	136,013	106,815	92,460	111,416
Families below poverty level ⁴	8.7%	15%	4.6%	1.4%	8.6%	5.7%

¹Table S1701, ACS 5-Year Estimate (Census 2022c)

²Table S1903, ACS 5-Year Estimate (Census 2022d)

³Table S1902, ACS 5-Year Estimate (Census 2022e)

⁴Table S1702, ACS 5-Year Estimate (Census 2022f)

Over 8% of families in Cache County are below the poverty line compared to less than 6% for the State of Utah (see Table 3-7; Census 2022f). Within the Project Area, 8.7% of families in North Logan City and 15% of families in Logan City are below the poverty line. Available county and local municipality capital may be limited for improvement projects, address flooding incidents, or apply towards maintenance of infrastructure, such as irrigation canals. The inability to invest capital in infrastructure and improvement projects also affects agricultural profitability in Cache County.

Agricultural Statistics

Although Cache County and the surrounding Logan metro area are growing quickly, Cache County has historically been an agricultural area. According to the USDA National Agricultural Statistics Service (NASS), as of 2022, sales from farms in Cache County included \$57.5 million for crops and over \$131 million for livestock, poultry, and other products (NRCS 2024b). Table 3-8 provides an overview of the agricultural census for Cache County.

Table 3-8. Cache County Agricultural Census

Resource	Description ¹
Number of Farms	1,378
Active Farmland (acres)	269,909
Irrigated Acres	66,509 (25%)
Average Farm Size (acres)	196
Farmland Use (acres)	Cropland: 113, 209 Pastureland: 145,265 Woodland: 3,576 Other: 7,859
Farmland Productivity	pastureland (53.8%) cropland (41.9%)
Primary Crops (acres)	Forage (hay/haylage): 57,400 Wheat (grain use): 12,626 Corn (silage/green chop): 6,139 Barley (grain use): 5,030 Safflower: 2,896
Percent of State Agricultural Sales (%)	8%

¹Source: NRCS 2024b

3.3.2 Air Quality

3.3.2.1 Clean Air Act/National Ambient Air Quality Standards

Resource Issue & Indicator: Proposed activities could affect air quality protected by the CAA. The indicators to describe air quality effects are the measures taken to protect air quality and the ability to meet NAAQS.

The NAAQS, established by the EPA under the CAA, specify limits for criteria air pollutants. Criteria pollutants include carbon monoxide (CO), nitrogen dioxide (NO₂), ozone (O₃), particulate matter (PM₁₀ and PM_{2.5}), sulfur dioxide (SO₂), and lead (Pb). The UDEQ-AQD is required by the federal government to ensure statewide compliance with the NAAQS (Utah Office of Administrative Rules 2021). The UDEQ-AQD maintains a network of ambient air quality monitoring stations across the state; the closest monitoring station to the Proposed Project is located at 675 W 220 N in Smithfield, approximately 7 miles north of the Project Area center (UDEQ-AQD 2024).

Under Title R307 of the Utah Administrative Code (UAC), emissions inventories must be undertaken to further characterize Utah's air quality and updated every three years. The most recent inventory was published in 2020 (UDEQ-AQD 2020). According to the UDEQ-AQD, Cache County meets the attainment requirements for the NAAQS, meaning all criteria pollutants are at safe levels and are below specific limits set under the CAA (EPA 2024a). However, the Project Area is located within the Logan, Utah–Franklin, ID PM_{2.5} Maintenance Area. PM_{2.5} is a fine particle, found in vehicle exhaust, wildfire smoke, and construction dust. PM_{2.5} is small enough to become imbedded in lung tissue and can cause or exacerbate respiratory diseases and cardiovascular problems. Additionally, PM_{2.5} can cause visibility issues during windy weather conditions and can accelerate the deterioration of structures. The EPA's PM_{2.5} standard was set in 2012 and is currently 12 micrograms per cubic meter (ug/m³) (UDEQ-AQD 2020). A Serious Area PM_{2.5} State Implementation Plan (SIP) was developed in 2017 and demonstrated attainment of the PM_{2.5} standard by the deadline of December 31, 2019. The EPA redesignated the Logan area from nonattainment to attainment on June 18, 2021. The Logan PM_{2.5} Maintenance Area currently meets the PM_{2.5} NAAQS standard and is in its first ten-year maintenance period (UDEQ-AQD 2024). As part of the area SIP and maintenance plan, all sources of PM_{2.5} must implement Best Available Control Technology (BACT) control strategies.

40 CFR Part 93 Subpart B of the CAA includes the General Conformity Regulations, which require federal agencies to ensure the emissions caused by federally funded activities would not interfere with a State or Tribe's ability to attain and maintain NAAQS standards. Additionally, federally funded activities must be consistent with any applicable SIPs, Tribal Implementation Plans, or Federal Implementation Plans (EPA 2025). As discussed in the PM_{2.5} Emissions Memo in Appendix E2, the General Conformity Regulations are applicable to the Proposed Project, thus the Proposed Project must comply with the regulations.

40 CFR §93.153 defines the *de minimis* threshold for a maintenance area as less than 100 tons/year (CFR 2025). Although the State of Utah's limits on PM_{2.5} emissions are not specifically defined for maintenance areas, Utah Administrative Rule R307-403-5(2)(b)(ii), defines a major source as one that emits or has the potential to emit 70 tons per year (t/yr) or more of direct PM_{2.5} emissions within a serious nonattainment area, which is the more restrictive of the two thresholds (UAR 2018). Additionally, in the State of Utah, R307-403-5(2)(c) defines a

significant emission increase or significant net emission increase as equaling or exceeding 10 t/yr of direct PM_{2.5}.

40 CFR §95.153 states that a “conformity determination is required for each criteria pollutant or precursor where the total of direct and indirect emissions of the criteria pollutant in a nonattainment or maintenance area caused by a Federal action would equal or exceed any the rates in paragraph (b)(1) or (2) of this section.”

Currently, minor effects to air quality occur from routine maintenance and operations of the CAIC irrigation system, including dust and exhaust from occasional travel in light vehicles along roads adjacent to the irrigation system, from agricultural activities in the Project Area, and from occasional canal and ditch cleaning and maintenance activities involving equipment.

Additionally, many individual users pump water from the canal for sprinkle application to agricultural land, and these pumps contribute to the existing air quality (Table 3-9). Table 3-9 does not account for all individual pump users, as that information is not available.

Table 3-9. Average Power Consumption per Irrigation Season by Location

Location	Average Power Consumption per Irrigation Season (April 1–October 15) (kilowatt-hour [kW/hr])
BIC pump station	442,000
Sprinkle irrigated land in the CAIC service area	1,210,000
Total	1,652,000

3.3.2.2 Greenhouse Gases

Resource Issue & Indicator: Proposed activities could contribute to the accumulation of GHG. The indicators to describe greenhouse gas effects are the proposed activities’ changes in GHG.

Gases that trap heat in the atmosphere are called GHG, and include CO₂, methane (CH₄), nitrous oxide (N₂O), and fluorinated gases, such as hydrofluorocarbons (HFC), perfluorocarbons (PFC), and sulfur hexafluoride (SF₆). These GHGs are introduced into the atmosphere by various sources, including electricity production, private and commercial transportation, oil and gas production, commercial and residential practices, and agriculture. The UDEQ proposed long-term maintenance and monitoring plans to the EPA and enforced several restrictions on transportation and vehicle-based emissions, including a vehicle inspection/maintenance program to reduce GHGs in the Project Area (UDEQ 2020). The main sources for GHG emissions as currently produced by the CAIC were identified to be the following (see Appendix E3, TM-001):

- CAIC watermaster and individual irrigation company personnel vehicle emissions.
- Canal maintenance and cleanup activities using power tools.
- Individual user pumps to pressurize canal water for sprinkle application.
- BIC pump station for pressurized system (constructed in 2018; began pumping in 2019).

Due to inconsistent or unavailable records, the only quantifiable source of emissions is the BIC pump station. Annual pumping totals for the years 2019 through 2022 were provided by the BIC and converted to estimated emissions using the EPA Greenhouse Gas calculator. The average annual emissions are estimated to be 2,800 lb of CO₂ annually and negligible CH₄.

3.3.3 Energy

The Proposed Project is not within any energy development areas.

Energy efficient agricultural operations are important in the setting of increasing costs. An important attribute in evaluating the effect of each alternative is the change in electrical power consumption. While the current canal system is mainly operated by gravity flow, a significant amount of power is used throughout the current system to run pumps. Changes to the distribution method and the amount of power consumed and generated are the indicators to explore this issue.

The current canal operations of the CAIC system are operated through gravity flow. However, many individual users pump water from the canal for sprinkle application to agricultural land. Recently, the BIC pressurized their canal system in 2018, removing individual pumps through the construction of a central pump station, and reducing their power consumption. Table 3-9 shows the estimated average power consumption per irrigation season for BIC and for the other CAIC canal companies (see Appendix E4, TM-013 for additional information). Additionally, USU generates hydropower from a turbine at First Dam.

3.3.4 Soils and Geology

3.3.4.1 Upland Erosion and Sedimentation

Resource Issue & Indicator: Soil disturbance from project activities may contribute to erosion and sedimentation. The indicators to describe erosion and sedimentation effects are the project design measures' ability to minimize or eliminate sediment in the temporary and long term, consistent with the UDEQ.

UDEQ requires a Utah Pollutant Discharge Elimination System (UPDES) Program Large Construction General Permit (CGP) administered under the National Pollution Discharge Elimination System (NPDES) for construction activities that disturb more than 1 acre of land. A Storm Water Pollution Prevention Plan (SWPPP) is included as part of the specific requirements for the discharge of stormwater associated with construction activities.

Soils within the Project Area are comprised primarily of Nibley Silty Clay Loam (14.8%), Steed Gravelly Loam (13.7), Collett Silty Clay Loam (8.6%), Greenon Loam (8.9%) and Millville Silt Loam (8%) (Table 3-10). The erosion potential within the Project Area is generally low, as the topography within the Project Area is relatively flat with approximately 280 feet of elevational difference. For example, within the Project Area, the Erosion Hazard Rating (EHR), which specifies the degree of hazard of soil loss from unsurfaced roads and trails, is generally slight (82.0% of Project Area), which indicates erosion is unlikely, to moderate (1.7% of Project Area), indicating that some erosion may occur and that simple erosion-control measures may be necessary (NRCS 2024d). No landforms contain a severe EHR, which indicates that erosion is unlikely. Historical data indicates the Project Area is stable and not prone to landslides (USGS 2024a).

However, flooding resulting from high intensity runoff events and aging infrastructure have caused localized erosion and sedimentation. For example, shortly before noon on July 11, 2009, a landslide occurred on the lower part of the Logan bluff, directly south of USU and U.S. Hwy. 89, destroying a house and killing three people (UGS 2009). The landslide occurred along a

hillside adjacent to Canyon Road in the City of Logan in Cache County, Utah. As a result of the landslide, a section of the Logan Northern Canal broke away. The landslide was primarily caused by the failure of the slope between the bottom of the bluff and the Logan Northern Canal. The initial landslide destroyed the access road and part of the canal, causing water to spill onto the slide area. This water flow exacerbated the landslide, leading to further upslope enlargement and the complete destruction of the canal. Besides the horrible tragedy, this canal breach prevented water distribution and required the indefinite closure of a section of the canal. The closure affected other parts of the local irrigation water delivery system, resulting in the canal not delivering all water allocated to local water shareholders (Cache Highline Water Association 2025). Another landslide in September 2005, just a short distance to the east occurred on the slope directly above the canal, temporarily blocking flow in the canal, and sending debris and water into a house below the canal. The timing of both landslides in the second half of the year is not typical for landslides in northern Utah, which usually occur in the spring (UGS 2009).

Erosion and sedimentation can also be seen around the Crockett Diversion structure. Additionally, grazing and pasturelands have bare and eroded land, and are subject to weathering.

Table 3-10. Soil Classification Summary

Map Unit Name	Percent of Project Area (%)	Landform	Slope (%)	Erosion Hazard Rating	Maximum Salinity (mmhos/cm) ¹	Prime/Unique Farmland
Ak—Airport silty clay loam	1.2	Lake terraces	0-3	Slight	Slightly saline to strongly saline (4.0 to 32.0)	Farmland of local importance
Am—Airport-Salt Lake complex	1.6	Lake terraces	0-1	Slight	Slightly saline to strongly saline (4.0 to 32.0)	Farmland of local importance
Cd—Cardon silty clay	3.9	Lake terraces	0-3	Slight	Nonsaline to very slightly saline (0.0 to 2.0)	Farmland of statewide importance
Ck—Collett silty clay loam	8.6	Lake terraces	0-3	Slight	Nonsaline to slightly saline (0.0 to 4.0)	Farmland of statewide importance
GrA—Green Canyon gravelly loam, 0 to 3 percent slopes	0.3	Fans	0-3	Slight	Nonsaline to very slightly saline (0.0 to 2.0)	Farmland of statewide importance
GsA—Greenon loam, 0 to 3 percent slopes	7.5	Lake terraces	0-3	Slight	Slightly saline to moderately saline (4.0 to 8.0)	Prime farmland if irrigated
GsB—Greenon loam, 3 to 6 percent slopes	0.5	Lake terraces	3-6	Slight	Slightly saline to moderately saline (4.0 to 8.0)	Prime farmland if irrigated
GsC—Greenon loam, 6 to 10 percent slopes	0.1	Lake terraces	6-10	Slight	Slightly saline to moderately saline (4.0 to 8.0)	Farmland of statewide importance
GuA—Greenon loam, deep over clay, 0 to 1 percent slopes	0.8	Lake terraces	0-1	Slight	Slightly saline to moderately saline (4.0 to 8.0)	Farmland of statewide importance
Lr—Logan silty clay loam	2.1	Lake terraces	0-3	Slight	Nonsaline to slightly saline (0.0 to 4.0)	Farmland of statewide importance
M-W—Miscellaneous water	14.5	-	-	Not rated	-	-
McA—Mcmurdie silt loam, 0 to 3 percent slopes	0.1	Lake terraces	0-3	Slight	Nonsaline to very slightly saline (0.0 to 2.0)	Prime farmland if irrigated
MLA—Millville silt loam, 0 to 2 percent slopes	7.0	Alluvial fans	0-2	Slight	Nonsaline to very slightly saline (0.0 to 2.0)	Prime farmland if irrigated
MLB—Millville silt loam, 2 to 4 percent slopes	1.0	Alluvial fans	2-4	Slight	Nonsaline to very slightly saline (0.0 to 2.0)	Prime farmland if irrigated
NcA—Nibley silty clay loam, 0 to 3 percent slopes	14.8	Lake terraces	0-3-	Slight	Nonsaline to very slightly saline (0.0 to 2.0)	Farmland of statewide importance
PaB—Parleys silt loam, 3 to 6 percent slopes	0.4	Lake terraces	3-6	Slight	Nonsaline to very slightly saline (0.0 to 2.0)	Prime farmland if irrigated
Pn—Payson silt loam	0.6	Lake plains	0-1	Slight	Moderately saline to strongly saline (8.0 to 32.0)	Not prime farmland
Pu—Provo loam	1.8	Flood plains	0-1	Slight	-	Farmland of local importance
Pv—Provo gravelly loam	1.9	Flood plains	0-3	Slight	-	Farmland of local importance
Qu—Quinney silt loam	0.0	Lake terraces	0-1	Slight	Slightly saline to moderately saline (4.0 to 8.0)	Farmland of statewide importance
RCG2—Richmond Very Stony Loam, 30 to 70 percent slopes, eroded	0.1	Mountain slopes	30-70	Moderate	Nonsaline to very slightly saline (0.0 to 2.0)	Not prime farmland
RhA—Ricks gravelly loam, 0 to 3 percent slopes	0.0	Lake terraces	0-3	Slight	Nonsaline to very slightly saline (0.0 to 2.0)	Farmland of statewide importance

Map Unit Name	Percent of Project Area (%)	Landform	Slope (%)	Erosion Hazard Rating	Maximum Salinity (mmhos/cm) ¹	Prime/Unique Farmland
RhB—Ricks gravelly loam, 3 to 6 percent slopes	0.0	Lake terraces	3-6	Slight	Nonsaline to very slightly saline (0.0 to 2.0)	Farmland of statewide importance
Rk—Riverwash	0.1	Flood plains	1-5	Not rated	-	Not prime farmland
Rs—Roshe Springs silt loam	1.3	Lake terraces	0-3	Slight	Nonsaline to slightly saline (0.0 to 4.0)	Farmland of statewide importance
Rt—Rough broken land	0.1	Drainageways	-	Not rated	-	-
Se—Salt Lake silty clay	3.3	Lake terraces	0-1	Slight	Very slightly saline to slightly saline (2.0 to 4.0)	Farmland of local importance
Sg—Salt Lake-Roshe Springs complex	0.8	Lake terraces	0-1	Slight	Very slightly saline to slightly saline (2.0 to 4.0)	Farmland of local importance
Sh—Salt Lake-Trenton complex	0.3	Lake terraces	0-1	Slight	Very slightly saline to slightly saline (2.0 to 4.0)	Farmland of local importance
Sm—Shay silty clay loam	0.0	Flood plains	0-1	Slight	Very slightly saline to slightly saline (2.0 to 4.0)	Farmland of statewide importance
SvA—Steed gravelly loam, 0 to 3 percent slopes	13.7	Alluvial fans	0-3	Slight	Nonsaline to very slightly saline (0.0 to 2.0)	Farmland of statewide importance
SwC—Sterling gravelly loam, 6 to 10 percent slopes	0.1	Lake terraces	6-10	Slight	Nonsaline to very slightly saline (0.0 to 2.0)	Farmland of statewide importance
SwD—Sterling gravelly loam, 10 to 20 percent slopes	0.0	Lake terraces	10-20	Slight	Nonsaline to very slightly saline (0.0 to 2.0)	Farmland of local importance
SwF2—Sterling gravelly loam, 20 to 50 percent slopes, eroded	1.6	Lake terraces	20-50	Moderate	Nonsaline to very slightly saline (0.0 to 2.0)	Not prime farmland
TmA—Timpanogos silt loam, 0 to 3 percent slopes	1.0	Lake terraces	0-3	Slight	Nonsaline to very slightly saline (0.0 to 2.0)	Prime farmland if irrigated
TnA—Timpanogos silt loam, deep water table, 0 to 3 percent slopes	1.0	Lake terraces	0-3	Slight	Nonsaline to very slightly saline (0.0 to 2.0)	Prime farmland if irrigated
TrA—Trenton silty clay loam, 0 to 2 percent slopes	0.7	Lake terraces	0-2	Slight	Very slightly saline to strongly saline (2.0 to 16.0)	Farmland of local importance
TtA—Trenton silty clay loam, moderately deep water table, 0 to 2 percent slopes	1.1	Lake terraces	0-2	Slight	Very slightly saline to strongly saline (2.0 to 16.0)	Not prime farmland
W—Water	1.5	-	-	Not rated	-	-
Wn—Winn silt loam	1.8	Flood plains	0-3	Slight	Nonsaline to very slightly saline (0.0 to 2.0)	Farmland of statewide importance
Wp—Winn-Provo complex	2.7	Flood plains	0-3	Slight	Nonsaline to very slightly saline (0.0 to 2.0)	Farmland of statewide importance

¹mmhos/cm=millimhos per centimeter; a unit used to display the ability of a material to conduct an electrical current.

3.3.4.2 Prime & Unique Farmland

Resource Issue & Indicator: Project activities have the potential to affect protected farmland of statewide importance. The indicators to describe the prime and unique farmland effects are construction acres that expand the footprint of the canals into protected farmlands, and compliance with the Federal Farmland Protection Policy Act (FPPA).

The FPPA requires federal agencies to “minimize the extent to which federal programs contribute to the unnecessary and irreversible conversion of farmland to nonagricultural uses, and to assure that federal programs are administered in a manner that, to the extent practicable, will be compatible with state, unit of local government, and private programs and policies to protect farmland” (NRCS 2022). For the purpose of FPPA, farmland can be designated prime farmland, unique farmland, and land of statewide or local importance.

The NRCS Web Soil Survey was used to identify soils and farmland designations within the Project Area, as shown in Table 3-10. A significant portion of the soils in the Project Area are considered agriculturally significant. The NRCS classified 11.6% of the Project Area as “farmland of local importance,” 50.2% as “farmland of statewide importance,” and 18.5% as “prime farmland if irrigated” (NRCS 2024d).

3.3.5 Vegetation

The Project Area falls within the Central Basin and Range—Malad and Cache Valleys ecoregion and contains the Cold North American Desert habitat type. This ecoregion is characterized by northerly trending, fault-block ranges and intervening, drier basins. It contains wide terraces, narrow floodplains, and alluvial fans (EPA 2021; Woods et. al. 2001).

The region has a warm summer continental climate with an average annual high temperature of 70.0°F and an average low temperature of 26.5°F (NOAA 2024b). The highest recorded temperature was 104° F, which occurred in July, and the coldest temperature was -44° F, which occurred in December. The average annual precipitation is 19.67 inches of rain and 64.8 inches of snowfall (NOAA 2024b).

Land uses in the surrounding area consist of agricultural, mixed industrial, commercial, and residential uses. Mountain-fed perennial streams and canals provide water to pastureland, municipalities, and hay, small grain, sugar beet, and fruit crops (EPA 2021).

The canal systems within the Project Area include both earthen and lined open channels which pass through both urban and agricultural areas and transport irrigation and stormwater. Homogenously across the Project Area, the vegetation assemblage along and within canals and ditches are dominated by reed canary grass (*Phalaris arundinacea*), cattail (*Typha* sp.), and other common agricultural weeds and riparian species which grow abundantly within and on the canals’ edges, and the canals are generally lined with riprap or other fill material.

Under the Proposed Project, a new pipeline would use the existing sewer ponds on the west side of the City of Logan as a secondary irrigation water storage reservoir. The existing ponds are lined with riprap, and cattail. Bulrush (*Schoenoplectus acutus*) and common reed (*Phragmites australis*) are dominant along the edges.

A proposed canal alignment section and diversion structure, connected to the Little Logan, is located adjacent to the Logan River in the south end of the Project Area. The proposed alignment

and diversion structure location is situated in a fallow, previously disturbed agricultural area that contains a variety of ruderal grass species. It is characterized by abundant horseweed (*Erigeron canadensis*), Canada thistle (*Cirsium arvense*), box elder (*Acer negundo*) and mature Fremont cottonwoods (*Populus fremontii*). Herbicide use on vegetation at this site is apparent by a clear line of horseweed dieback.

Surveys to assess habitat conditions within the Project Area were conducted on August 17 and 18, 2021, September 28, 2021, August 8 and 9, 2023, September 18 and 19, 2023, and on May 20–22, 2024, by J-U-B. During these site visits, dominant plant species were identified throughout the Project Area. Dominant plant species identified during the survey are listed in Table 3-11.

Table 3-11. Plant Species Recorded within the Project Area

Common Name	Scientific Name	Canal/ Riparian Area	Wetland Area	Grassland Area	Staging Area
alfalfa	<i>Medicago sativa</i>	X	X	X	X
American bulrush	<i>Schoenoplectus americanus</i>		X		
barnyard grass	<i>Echinochloa crus-galli</i>	X			X
basin wildrye	<i>Leymus cinereus</i>			X	
bedstraw	<i>Galium sp.</i>			X	
big toothed maple	<i>Acer grandidentatum</i>	X	X		
box elder	<i>Acer negundo</i>	X	X		
bulrush	<i>Schoenoplectus acutus</i>	X			
Canada thistle	<i>Cirsium arvense</i>	X	X	X	
cattail	<i>Typha sp.</i>	X	X		
cheatgrass	<i>Bromus tectorum</i>		X	X	
common reed	<i>Phragmites australis</i>	X			
common rush	<i>Juncus effusus</i>		X	X	
common spikerush	<i>Eleocharis palustris</i>	X	X		
common sunflower	<i>Helianthus annuus</i>	X			
common teasel	<i>Dipsacus fullonum</i>	X			
coyote willow	<i>Salix exigua</i>	X			
crested wheatgrass	<i>Agropyron cristatum</i>	X	X		
dandelion	<i>Taraxacum officinale</i>			X	
dyers woad	<i>Isatis tinctoria</i>			X	X
field horsetail	<i>Equisetum arvense</i>	X			
foxtail barley	<i>Hordeum jubatum</i>		X	X	
Fremont's cottonwood	<i>Populus fremontii</i>	X			
German madwort	<i>Asperugo procumbens</i>			X	
Goat's rue	<i>Tephrosia virginiana</i>		X	X	X
greater plantain	<i>Plantago major</i>	X			
gumweed	<i>Grindelia squarrosa</i>	X			X
horsetail	<i>Equisetum hyemale</i>	X	X	X	
horseweed	<i>Erigeron canadensis</i>	X			
inland saltgrass	<i>Distichlis spicata</i>	X		X	
Japanese knotweed	<i>Reynoutria japonica</i>		X	X	
jewelweed	<i>Impatiens capensis</i>			X	
Kentucky bluegrass	<i>Poa pratensis</i>		X	X	

Common Name	Scientific Name	Canal/ Riparian Area	Wetland Area	Grassland Area	Staging Area
longstyle rush	<i>Juncus longistylis</i>		X		
meadow foxtail	<i>Alopecurus pratensis</i>	X	X	X	
meadow thistle	<i>Cirsium scariosum</i>			X	
Nebraska sedge	<i>Carex nebrascensis</i>		X	X	
prickly lettuce	<i>Lactuca serriola</i>	X	X	X	
ragweed	<i>Bassia scoparia</i>	X			X
red clover	<i>Trifolium pratense</i>			X	
reed canary grass	<i>Phalaris arundinacea</i>	X	X	X	X
rubber rabbitbrush	<i>Ericameria nauseosa</i>	X			
Scotch thistle	<i>Onopordum acanthium</i>	X			
seaside arrowgrass	<i>Triglochin maritima</i>		X	X	
showy milkweed	<i>Asclepias speciosa</i>		X		
slough sedge	<i>Carex obnupta</i>		X	X	
streamside wild rye	<i>Elymus lanceolatus</i>	X		X	
sweet yellow clover	<i>Melilotus officinalis</i>	X		X	X
Timothy grass	<i>Phleum pratense</i>	X	X	X	
water hemlock	<i>Cicuta maculata</i>	X	X	X	
whitetop	<i>Lepidium draba</i>		X	X	
wild licorice	<i>Glycyrrhiza lepidota</i>	X			X
wild radish	<i>Raphanus raphanistrum</i>		X	X	X
Wood's rose	<i>Rosa woodsii</i>	X			
yarrow	<i>Achillea millefolium</i>			X	

3.3.5.1 Special Status Plant Species

Resource Issue & Indicator: Proposed activities could affect special status plant species protected under the ESA. The indicators to describe effects to special status plant species are the effects to designated critical and suitable habitat.

To identify special status plant species within the Project Area, an official species list was obtained from the USFWS Information for Planning and Consultation (IPaC) database on August 15, 2021, and updated on January 15, 2025 (see USFWS 2025; see BA in Appendix E2). Two ESA listed plant species have the potential to exist within the Project Area: the ULT and the Maguire primrose. No designated critical habitat (DCH) for either species occurs within the Project Area.

A species occurrence report was generated from the Utah Division of Wildlife Resources (UDWRwl) Utah Natural Heritage Program (UNHP) on January 9, 2024, and updated on June 12, 2024 (see BA in Appendix E2; UNHP 2024). No occurrences of the ULT were documented within 0.5 or 2 miles of the Project Area by UNHP. The UNHP identified that occurrences of the Maguire primrose are documented within 0.5-miles of the Project Area. The only population of the Maguire primrose in Cache County occurs in Logan Canyon, which is 0.5-miles to the east of the easternmost boundary of the Project Area.

Field surveys of the Project Area were conducted by a biologist with J-U-B on August 17 and 18, 2021, September 28, 2021, and August 8 and 9, 2023. The Project Area was assessed for suitable habitat for federal and state-protected species.

Coordination with the USFWS Utah Ecological Services Field Office Senior Botanist and Species Lead for the ULT, Rita Reisor, occurred on July 11, 2024. The meeting with USFWS included the NRCS Water Resources Coordinator Derek Hamilton, two Environmental Services Group Technical Leads from J-U-B, Autumn Davies and Suzanne Acton, and Environmental Specialist and Biologist from J-U-B, Becky Hendricks Miller. Agency coordination is located in Appendix A.

A Biological Assessment (BA) was prepared for the Proposed Project that identifies species characteristics, habitat requirements, and potential effects to federally listed species from implementing the Proposed Project (Appendix E2).

3.3.5.2 Riparian Areas

Resource Issue & Indicator: Project activities may affect riparian areas. The indicator to describe effects to riparian areas is the action taken to protect riparian areas, consistent with the UDWR Central Region Wetlands Conservation Strategy (UDWR 2001).

UDWR Central Region Wetlands Conservation Strategy stated goal is no net loss, and net gain where appropriate, of essential wetland habitat through conservation, restoration, and adaptive management. The conservation strategy noted that Utah's growing population depicts a long-term trend towards increased water demand and urban expansion which will continue to threaten wetlands in the future (UDWR 2001). Additionally, climactic records indicate Utah's water supply is likely to decrease due to higher temperatures, drier conditions, and increased drought frequency (EPA 2016).

The NRCS defines riparian areas as "ecotones that occur along streams, rivers, lakes, ponds, and wetlands" (NRCS 2017). The Project Area includes portions of the Logan and Northern Canal, the Little Logan, and the Hyde Park Irrigation Canal. Approximately 123 acres of narrow, low quality riparian fringe persists along the edges of ditches and canals within the Project Area. The Logan River, the Little Logan, Blue Spring Creek, and Swift Slough support approximately 245 acres of riparian fringe.

The highest quality riparian fringe vegetation occurs in a narrow corridor along the Logan River, varying from approximately 25 to 200 feet wide along the river. Vegetation along the Logan River is characterized by mature Fremont cottonwoods, box elder, big tooth maple, and crack willow which provide an intermittent overstory along the river corridor. Mid- and understory species in these locations include coyote willow, and low growing species like reed canary grass, Timothy grass, and horseweed. Overall, the structure of this riparian fringe is not complex. Tall wetland species grow in some canal areas, for example cattail, bulrush, and common rush. While providing higher habitat quality than other locations within the Project Area, the riparian vegetation along the Logan is still fragmented by urban and suburban areas and roadways, lacks overall structure in the mid- and overstory layers, contains many non-native species, and is overall highly disturbed.

3.3.5.3 Noxious Weeds and Invasive Plants

Resource Issue & Indicator: Proposed activities could increase the risk of introduction, establishment, and spread of invasive species. The indicators to describe the effects of noxious weeds and invasive plants are the measures taken to prevent the introduction or spread of invasive species to ensure consistency with E.O. 13112 and the Utah Noxious Weed Act.

E.O. 13112 states that a federal agency shall “not authorize, fund, or carry out actions that it believes are likely to cause or promote the introduction or spread of invasive species.” Noxious weeds and invasive plants are non-native species whose introduction does or is likely to cause economic or environmental harm or harm to human health.

The Utah Department of Agriculture and Food (UDAF) designated noxious weeds under the Utah Noxious Weed Act (Utah Administrative Code R68-9; Utah Code Annotated: Title 4, Chapter 17); 41 of which are on the Prioritized Noxious Weed List for Cache County (Cache County 2024a; UDAF 2024). Seven primary designated classes of noxious weeds occur in Cache County: Class 1A (Watch List), Class 1AE (Eradicated), Class A-1B (Aquatics), Class 1B (Early Detection Rapid Response [EDRR]), Class 2 (Control), Class 3 (Containment), and Class 4 (Prohibited for sale or propagation).

During field surveys, six of these Utah and Cache County designated noxious weeds were found in the Project Area (noxious weed classifications are reported using the Cache County classification system; state and county classification categories differ):

- Japanese knotweed (*Reynoutria japonica* [syn. *Fallopia japonica*]; Class 1B)
- Goat’s rue (*Tephrosia virginiana*; Class 2B)
- common reed (*Phragmites australis*; Class 2B)
- Scotch thistle (*Onopordum acanthium*; Class 3A)
- Dyer’s woad (*Isatis tinctoria*; Class 3A)
- Canada thistle (*Cirsium arvense*; Class 3B)

The Project Area contains these weed species in typical background concentrations. Activities on private lands, including the movement of livestock, application of contaminated seeds and irrigation water, and use of contaminated equipment, continue to create disturbed areas vulnerable to weed infestation and provide transport vectors that allow weeds to reach and colonize those areas. The open canals transport weed seeds downstream. CAIC is responsible for complying with the Utah Noxious Weed Act, and performs weed management along the canals, including mowing and herbicide application.

3.3.6 Water Resources

The Proposed Project occurs in Cache County, Utah, and is within the Great Basin Region. The proposed activities are confined within the Great Basin Region, specifically within the Little Bear-Logan (HUC 16010203) and Middle Bear (HUC 16010202) Subbasins; and includes portions of twelve subwatersheds (Table 1-1). The primary hydrologic inputs are the Logan River, Little Logan, and Blue Spring Creek.

Within the Project Area, there are 56 freshwater emergent wetlands, one freshwater scrub-shrub wetland, three ponds, four lakes, seven lagoons, and 178 linear water features present including the Logan River, Little Logan, Blue Spring Creek, and Swift Slough, 163 ditches, four streams, and seven canals. Collectively, 557.8 acres of wetlands and 178.5 acres (343,077 feet) of linear features were mapped within the Project Area.

The Logan River is a 53.7-mile-long tributary of the Little Bear River. It begins in the Bear River Mountains in Idaho, flows south through Logan Canyon, enters Cache Valley near Logan City, and joins the Little Bear River a few miles west of Logan. The river is dammed at the First, Second, and Third Dams near Logan Canyon.

The Little Logan is 16 miles long and diverges from the Logan River at the Crockett Diversion near River Hollow Park. The Little Logan primarily supports agricultural irrigation, with water diverted to irrigate residential, commercial, and agricultural land in the region. The Little Logan flows through multiple parks in Logan, Utah before rejoining the Logan River downstream.

Blue Spring Creek originates in Cache County, Utah. It is primarily fed by several natural springs, including Blue Spring, Tree Spring, and Jensen Spring. Blue Spring Creek provides hydrology for a large wetland complex before discharging into the Little Bear River.

Swift Slough is a lower perennial system that is permanently flooded. It is formed by groundwater discharge, agricultural return flows, and small spring-fed and irrigation channels in northern Cache County. It flows into Blue Spring Creek, which is a tributary to the Little Bear River.

3.3.6.1 Surface and Ground Water Quality & Quantity

Surface and Ground Water Quality

Resource Issue & Indicator: Project activities may temporarily affect water quality. The indicator to describe effects to surface and groundwater quality is the ability of the alternatives to comply with the Utah's Surface Water Quality Standards and the CWA (33 U.S.C. 1251 et seq.).

The UDEQ describes the state's water quality standards for all classified waters of the state in UAC R317-2, designed to protect and improve water quality for beneficial uses (i.e., drinking water, fish and aquatic life, wildlife, agricultural, industrial, and recreational uses). Logan River and tributaries' water use designation are classified as Class 2B (protected for infrequent primary contact recreation), Class 3A (protected for cold water aquatic life), Class 3D (protected for waterfowl, including the necessary aquatic organisms in their food chain), and Class 4 (protected for agricultural uses).

The Logan River is currently listed as impaired under CWA Section 303(d) for Aquatic Wildlife (Total Phosphorus) and Recreation and Aesthetics (*E. coli*). In 2010, the Utah Division of Water Quality (UDWQ) published a Total Maximum Daily Load (TMDL) for total phosphorus and dissolved oxygen for the Middle Bear River and Cutler Reservoir. As the Logan River is a tributary of the Bear River and Cutler Reservoir, this TMDL applies to the Logan River as well.

In an analysis conducted by BIO-WEST on the effects of the Proposed Project to the Logan River and its floodplain and riparian ecosystem based on the LRTF-CAP Water Quality criteria, although water quality is good (meets Utah State Standards more than 90% of the time) for the first reach of the Logan River right below First Dam, the rating declines with successive reaches to a poor rating at the lower reach, which indicates low summer base flows are causing water temperatures to exceed 20°C often, and water quality is being impacted from cattle and polluted runoff, and exceeds Utah State Standards. Previous USU maintenance activities at First Dam have caused sediment flushes from the dam which have temporary negative effects to water quality, aquatic biology, and recreation downstream (Logan River Task Force 2016).

Investigations documented in TM-011, indicate that the 8.1-mile reach of the Logan River, from the Utah Water Research Laboratory to Mendon Road, exhibits spatially variable thermal regimes under low flow conditions. Detailed field measurements during a two-day period in August 2022 recorded temperature and dissolved oxygen (DO) data across multiple monitoring stations. In the upper reach, measured temperatures align closely with model predictions based

on upstream boundary conditions and calibrated groundwater inputs (60.8°F in the upper section). In the lower reach, where dewatering due to significant diversions (e.g., via the Young Ward Canal) is evident, elevated water temperatures and reduced DO levels have been observed (with modeled DO saturation values exceeding 7.3 mg/L, yet field observations indicating values as low as 5.2 mg/L). These conditions, resulting in warmer waters and diminished DO, pose challenges to achieving compliance with Utah’s Surface Water Quality Standards for cold water fisheries.

Surface and Ground Water Quantity

Resource Issue & Indicator: The Project Area loses water to evaporation and canal seepage. The project is designed to address this issue, and the indicator to describe surface and groundwater quantity effects is the ac-ft of water conserved.

The Logan River Watershed headwaters originate in the Bear River Mountain range near the Utah-Idaho border. This portion of the basin is steep and flows through mostly natural land cover with little development. The majority of all surface water within the watershed is of snowmelt in origin, with peak flows observed in the months of April, May, and June (Neilson et al. 2021; USGS 2024c).

The CAIC was formed to supply irrigation, domestic, and municipal water to the Cache Valley Area. Water supplies in the CAIC’s service area are generally abundant from the start of the irrigation season (early April) until the middle of the irrigation season (early August), at which time the supplies are severely reduced, and diversion reduction management is needed for continued use during the remainder of the season. The principal crop is hay, which is a water-intensive crop (NRCS 2024b). Runoff from agricultural irrigation activities may contribute to aquifer recharge and ground water availability. Currently, there is limited information on groundwater contributions in this watershed.

Presently, the passage of water along the project canals and laterals experiences an estimated 6,050 ac-ft of water loss annually either due to evaporation, seepage, or spillage in the Project Area. A seepage loss study was conducted by Franson Civil. Canal flow measurements were taken on May 8, 2018 (see Appendix E3, TM-004). The date was selected during the early irrigation season before agricultural water use was requested to reduce system operation and diversion effects on the study. At this time, the canals were not flowing at full capacity, and losses were expressed as a percentage of the flow in each canal. The percentage loss was applied to the average historical diversion flow records for each canal from 1992 to 2021 to provide more representative losses for the entire irrigation season. The overall percentage loss for the Crockett Diversion Canal System is estimated to be 27%. Based on these estimations and assuming the average annual diversion of 19,260 ac-ft; the system is losing approximately 5,200 ac-ft of water per year due to seepage, allocated per project components as indicated in the following table (Table 3-12).

Table 3-12. Annual Water Loss Study Results for Project Components

Studied Component	Length (miles)	Annual Loss (ac-ft)¹
Crockett North Branch	1.0	1,340
Little Logan	4.8	660
Twins	8.8	2,010
Logan Northwest Field	3.3	620

Studied Component	Length (miles)	Annual Loss (ac-ft)¹
BIC	1.8	100
Logan Northfield 1	1.0	270
Logan Northfield 2	0.5	140
Logan Southwest Field 2*	1.0	0
Cow Pasture Canal	0.5	60
TOTAL	22.7	5,200

¹No seepage losses are estimated due to high groundwater in this area.

Investigations documented in TM-011, within the same 8.1-mile reach of the Logan River, indicate that the existing flow regime is highly dynamic and influenced by a complex network of diversions, inflows, and withdrawals. Detailed field measurements obtained during a two-day period in August 2022 document significant spatial variability in flow conditions. In the upper reach, sustained inflows from tributaries and distributed groundwater seepage help maintain channel flow. In contrast, the lower reach exhibits pronounced dewatering downstream of major diversions, such as the Young Ward Canal, where irrigation withdrawals substantially reduce water volumes in the mainstem.

Field data collected using acoustic doppler velocimetry and channel geometry surveys provided a basis for applying a flow balance approach across various sub-reaches. These analyses reveal that the loss of water due to diversion withdrawals is only partially offset by localized groundwater and minor tributary inputs. The result is a marked reduction in flow volumes in the lower reaches, which in turn compromises channel connectivity and adversely affects aquatic habitat conditions. Such existing water quantity conditions are critical to understanding the overall hydrologic dynamics in the watershed and form an essential baseline for evaluating water resource management within the Project Area.

TM-011 outlines that under existing conditions (Calibrated Model), approximately 65.1 cfs enters the Logan River from the UWRL. A small diversion to the Providence–Logan Canal removes 2.5 cfs, leaving 66.1 cfs by the time the river reaches the Crockett Diversion. Here, 58.6 cfs are withdrawn, reducing flows below the diversion at 100 N to only 9.0 cfs. Minor lateral inflows (e.g., 0.4 cfs near Denzel Park) and returns from small irrigation laterals gradually increase the flow to about 26.7 cfs above the Young Ward Canal Diversion. However, the Young Ward Canal removes another 5.7 cfs, and the 4 cfs contribution from the Little Logan brings the final flow near the Mendon Road Bridge to 25 cfs. This substantial reduction, from about 66.1 cfs above the Crockett Diversion to 25 cfs above the Mendon Road bridge, reflects the pronounced dewatering that currently impacts the middle and lower reaches.

Water conservation is a significant motivation for project development and can sometimes dictate funding. Existing system losses include seepage losses and carrier water losses, which come to a total of 6,050 ac-ft of annual water that is not put to the beneficial use for which it was diverted. Under the project alternatives, all canals except the Little Logan would either be enclosed or the irrigation water would be removed from them. The estimated seepage lost in the Little Logan is 660 ac-ft per year. Subtracting the ongoing seepage that will occur in the Little Logan provides an estimate of 5,390 ac-ft of conserved water annually from the project alternatives. These losses are summarized in Table 3-13 (see Appendix E3, TM-004). It should be noted that this estimate does not account for ditch and lateral losses and therefore is deemed to be conservative.

Table 3-13. Water Conservation Summary

Value	Quantity
Total Annual Canal Diversion	19,260 ac-ft
Total Annual Loss (seepage and carrier water losses)	6,050 ac-ft
Total Annual Water Conservation for the Proposed Project	5,390 ac-ft

In an analysis conducted by BIO-WEST on the effects of the Proposed Project to the Logan River and its floodplain and riparian ecosystem based on the LRTF-CAP criteria, current Summer Base Flows in the Logan River are 65 cfs in the reach upstream of Crockett Diversion, 9 cfs in the reach between Crockett and 100 East, 14 cfs in the middle reach, and 25 cfs in the lower reaches (see Appendix E5, TM-021). These flows limit water quality and aquatic habitat connectivity in downstream areas, with low flows in the middle and lower reaches contributing to warmer water temperatures, reduced dissolved oxygen levels, and diminished aquatic and riparian habitat conditions, indicating that Utah State Standards for Cold Water Fishery are currently not being met.

3.3.6.2 Clean Water Act and Waters of the U.S.

Resource Issue & Indicator: Project activities occur within and adjacent to potential jurisdictional waters and proposed activities could discharge pollutants into WOTUS. The indicators to describe the effects to the CWA and WOTUS are the measures to ensure jurisdictional consistency, and compliance with applicable permitting requirements for WOTUS.

The CWA establishes the framework for regulating discharges of pollutants into the WOTUS, which can include wetlands, and regulating quality standards for surface waters (EPA 2022). An Aquatic Resources Delineation (ARD) was conducted in July 2024 by J-U-B on 2,498 acres for the Proposed Project. See Appendix E1 for the ARD and methodology. As part of the ARD, field verification in accordance with the USACE 1987 Wetland Delineation Manual and the 2008 Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West (Version 2.0) for the ARD identified several WOTUS resources within the Project Area, as shown on Table 3-14. Photos of the identified resources are found in the ARD in Appendix E1.

Table 3-14. Water Resources within the Project Area

Resource Name	Resource Size (acres)	Resource Size (linear feet [LF])
Wetlands		
Freshwater Emergent Wetlands	90.73	N/A
Scrub-Shrub Wetlands	1.70	N/A
Lacustrine Wetlands	463.14	N/A
Aquatic Bed Wetlands	0.87	N/A
Unconsolidated Bottom Wetland	1.35	N/A
<i>Wetlands Sub-total</i>	<i>557.8</i>	<i>N/A</i>
Linear Features		
Blue Spring Creek	0.99	2,483
Little Logan	12.8	23,938
Logan River	114.43	85,191

Resource Name	Resource Size (acres)	Resource Size (linear feet [LF])
Swift Slough	0.12	261
Streams	0.50	1,026
Canals	25.85	89,572
Ditches	23.83	140,606
<i>Linear Feature Sub-total</i>	<i>178.52</i>	<i>343,077</i>
Total Water Resources	736.31	343,077

All the aquatic resources within the Study Area flow downstream and have a surface water connection with either the Logan River, Little Logan, Little Bear River, or the Bear River, all of which are known WOTUS, and therefore are expected to be jurisdictional. Collectively, 557.8 acres of wetlands and 178.5 acres (343,077 feet) of linear features were mapped within the Study Area (Table 3-14; see ARD in Appendix E1). The USACE has not yet verified the wetland delineation accuracy or completed the requested Aquatic Jurisdictional Determination (AJD).

3.3.6.3 Wetlands

Resource Issue & Indicator: The proposed activities could directly affect seepage-induced wetlands during construction activities and indirectly cause the loss of these wetlands. The indicators to describe the effects to wetlands are the measures to protect wetlands directly affected by construction activities, to minimize the destruction, loss, or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands, as required in E.O. 11990.

The ARD completed by J-U-B on September 11, 2024, identified approximately 557.8 acres of wetland features within the Project Area, as shown in Table 3-14. All of the wetland features identified are assumed to be WOTUS due to their connectivity to the Logan River, Little Logan, Little Bear River, or the Bear River.

3.3.6.4 Regional Water Management Plan

Resource Issue & Indicator: The proposed activities are designed to support state and Regional Water Management Plans. The indicator to describe effects to regional water management plans is the method in which the proposed activities support the priorities of the Utah State Water Plan.

The coordinated Utah state water planning process goes back to 1963, first outlined within the report titled “Developing a State Water Plan—Utah’s Water Resources, Problems, and Needs—A Challenge”, which consists of an overall statewide framework plan and plans for the state’s 11 river basins, including the Bear River Basin, in which the Logan River Watershed is located. The UDNR -UDWR 2021 Water Resources Plan focuses on projects for the conservation, storage, distribution, and use of water to meet Utah’s growing population and water demand (UDNR-UDWR 2021).

The Kimball Decree was issued February 21, 1922, and quantified and prioritized water rights in Utah.

3.3.6.5 Floodplain Management

Resource Issue & Indicator: The proposed activities may affect floodplains, which are protected under E.O. 11988. The indicator to describe effects to floodplain management is the capability of the alternatives to meet the E.O. 11988 by not adversely affecting floodplains.

NRCS responsibilities in floodplain management are directed by 7 CFR 650.25(c)(2)(v), which states, “NRCS will also avoid direct or indirect support of development in the base floodplain wherever there is a practicable alternative. Where appropriate, NRCS will require design modifications to minimize harm to or within the base floodplain.”

This regulation implements the intent of E.O. 11988, which directs federal agencies to avoid, to the extent possible, long- and short-term adverse impacts associated with the occupancy and modification of floodplains.

In practice, this regulation means:

- NRCS-funded projects must avoid encouraging or enabling new development in flood-prone areas.
- If floodplain impacts are unavoidable, the project must include design modifications (e.g., elevating structures, using erosion control, or relocating infrastructure) to minimize harm.
- The agency must demonstrate that no practicable alternative exists outside the floodplain.

The Federal Emergency Management Act (FEMA) Flood Insurance Rate Map (FIRM) Panels #49005C0360D, 49005C0225C, 49005C0250D, 49005C037D, 49005C0376C, 49005C0377C, 49005C0381C, 49005C0379D, and 49005C0378C for the Project Area indicate that several portions of the Project Area are within 100-year floodplains, situated close to Spring Creek and the Logan River, Cow Pasture Canal, Hyde Park Canyon Creek, and various wetland areas (Zone C and D; FEMA 2024a–2024i; FEMA FIRM Panels in Appendix C). Specifically, the Project Area predominantly overlaps with Zone A and Zone AE affiliated areas.

Existing flood inundation maps for the affected section of the Logan River for the 100-year and 500-year storms are shown in Attachment B of TM-015, Appendix E4.

Existing flood inundation maps *from overtopping canals* for the 100-year and 500-year storms are shown in Attachment 1 of TM-019, Appendix E5.

3.3.7 Wildlife

3.3.7.1 Fish and Wildlife and Wildlife Habitat

Resource Issue & Indicator: Proposed activities may affect wildlife and habitat by disturbing wildlife during construction and by partially removing an open water source and associated riparian vegetation along the Twin Canals and the Logan Northern Canal and may require coordination with wildlife agencies. The indicators to describe effects to fish and wildlife and wildlife habitat are available habitat and water within or around the Project Area. Additionally, proposed activities could affect 12 Utah state protected species animal species identified to occur within a 0.5-mile radius of the Project Area. The indicators to determine the degree of effects are the qualitative changes to habitat affected by project activities for these species.

A species occurrence report was generated from the UDWRw1, UNHP on January 9, 2024, and updated on June 12, 2024. The UNHP lists 5 mammals, 8 birds, 3 fish, 2 amphibians, 4 mollusks, and 1 insect that are designated species of greatest conservation need (SGCN) and may occur within the vicinity of the Project Area (UNHP 2024; see BA in Appendix E2). State protected species that may occur within 0.5-miles and 2- miles of the Project Area are presented in Table 3-15. Desktop analyses were performed with aerial imagery to determine the likelihood of the presence of habitat for federally and state protected species within the Project Area. Field surveys of the Project Area were conducted by a J-U-B biologist on August 17 and 18, 2021, September 28, 2021, August 8 and 9, 2023, September 18 and 19, 2023, and May 20–22, 2024. The Project Area was assessed for suitable habitat and potential effects to state protected species from the Proposed Action.

Given the mix of land uses, including agricultural, residential, and industrial, and the accompanying infrastructure within the Project Area, wildlife species in the vicinity include a range of native and non-native wildlife and bird species.

Table 3-15. Utah State Protected Species with Potential to Occur within 2 Miles of the Project Area

Species	Status ¹	Radius
Mammals		
fringed myotis (<i>Myotis thysanodes</i>)	SGCN	0.5 and 2 miles
little brown myotis (<i>Myotis lucifugus</i>)	SGCN	0.5 and 2 miles
long-eared myotis (<i>Myotis evotis</i>)	SGCN	2 miles
long-legged myotis (<i>Myotis volans</i>)	SGCN	2 miles
Townsend's big-eared Bat (<i>Corynorhinus townsendii</i>)	SGCN	2 miles
Birds		
American bittern (<i>Botaurus lentiginosus</i>)	SGCN	2 miles
black rosy-finch (<i>Leucosticte atrata</i>)	SGCN	2 miles
black swift (<i>Cypseloides niger</i>)	SGCN	0.5 and 2 miles
burrowing owl (<i>Athene cunicularia</i>)	SGCN	0.5 and 2 miles
Lewis' woodpecker (<i>Melanerpes lewis</i>)	SGCN	0.5 and 2 miles
peregrine falcon (<i>Falco peregrinus</i>)	SGCN	0.5 and 2 miles
Western yellow-billed cuckoo (<i>Coccyzus americanus occidentalis</i>)	SGCN and LT	0.5 and 2 miles
white-faced ibis (<i>Plegadis chihi</i>)	SGCN	2 miles
Fish		
Bonneville cutthroat trout (<i>Oncorhynchus clarkii utah</i>)	SGCN	2 miles
June sucker (<i>Chasmistes liorus</i>)	SGCN and LT	2 miles
least chub (<i>Lotichthys phlegethontis</i>)	SGCN	2 miles
Amphibians		
Northern leopard frog (<i>Lithobates pipens</i>)	SGCN	0.5 and 2 miles
Western toad (<i>Anaxyrus boreas</i>)	SGCN	0.5 and 2 miles
Insects		
Western bumble bee (<i>Bombus occidentalis</i>)	SGCN	0.5 and 2 miles
Mollusks		
Green River pebblesnail (<i>Fluminicola coloradoensis</i>)	SGCN	2 miles

Species	Status ¹	Radius
lyrate mountainsnail (<i>Oreohelix haydeni</i>)	SGCN	0.5 and 2 miles
mountain marshsnail (<i>Stagnicola montanensis</i>)	SGCN	0.5 and 2 miles
rustic ambersnail (<i>Succinea rusticana</i>)	SGCN	2 miles

¹SGCN: State Species of Greatest Conservation Need; LT: ESA Listed Threatened.

The Project Area was evaluated for big game migration corridors. Although a low use migration area for mule deer overlaps with approximately 0.7 acres of the easternmost portion of the Project Area near First Dam, no project activities would occur within the corridor. No medium or high use big game migration corridors occur within one mile of the Project Area. The nearest high use migration area occurs approximately 5.6 miles to the southeast of the Project Area.

Currently, 185 miles of water sources associated with CAIC's canals, laterals, and drainage ditches occur in the analysis area, as well as open water associated largely with the Logan River complex, Little Logan, Spring Creek, Blue Spring Creek, and Swift Slough. Other water sources in the area include numerous stock water tanks and facilities.

The numerous canals, laterals, and drainage ditches, and other natural sources provide seasonal and annual open water sources that wildlife use for drinking. Water levels and flows are maintained throughout the year, regulated by the Kimball Decree (Kimball 1922), supplying wildlife to access open water during the irrigation season. Riparian fringe habitat is common adjacent to riverine areas in the Project Area, wetland vegetation occurs along canals, and agricultural forage and pastureland provide some herbaceous vegetation and sparse shrubs and trees for wildlife forage and cover, although existing pastureland is heavily browsed.

The current Crockett Diversion structure drops about 6 vertical feet over approximately 50 feet of a concrete apron with no pools. Due to this structure, brown trout (*Salmo trutta*) and mountain whitefish (*Prosopium williamsoni*) (common species in this stretch of the river and representative of native fish species' needs) are prevented from migrating upstream as only large fish with the right conditions would be able to jump high enough to potentially pass the structure. The segmentation of the river above and below the diversion is not currently beneficial to fish populations, and First Dam is a physical barrier 1.2 miles upstream.

3.3.7.2 Candidate, Threatened, and Endangered Species Animal Species

Resource Issue & Indicator: The proposed activities have the potential to affect candidate, threatened, and endangered animal species and habitat. The indicators to describe effects to candidate, threatened, and endangered animal species are acres of suitable habitat affected and resulting implications for these species' populations.

The USFWS IPaC report identified three ESA-listed threatened animal species and two ESA-proposed threatened insect species as potentially occurring within the Project Area (Table 3-16) (USFWS 2025). No critical habitat for these species occurs within or near the Project Area.

Table 3-16. Endangered Species Act (ESA) Species

Species	ESA Designation
Canada lynx (<i>Lynx canadensis</i>)	Threatened
North American wolverine (<i>Gulo gulo luscus</i>)	Threatened
Yellow-billed cuckoo (<i>Coccyzus americanus</i>)	Threatened
monarch butterfly (<i>Danaus plexippus</i>)	Proposed Threatened

Species	ESA Designation
Suckley's cuckoo bumble bee (<i>Bombus suckleyi</i>)	Proposed Threatened

Habitat suitability assessments occurred for the Canada lynx, North American wolverine, and the Yellow-billed cuckoo (YBCU) within the Project Area on August 17, and 18, 2021, September 28, 2021, August 8 and 9, 2023, September 18 and 19, 2023, and May 20–22, 2024. The habitat suitability assessment for YBCU within the Project Area included a 0.5-mile buffer around the Project Area and used available aerial imagery and local regional data for a desktop analysis. The UNHP report documented occurrences of the YBCU within 0.5 miles and 2 miles of the Action Area (UNHP 2024).

Coordination with the USFWS Utah Ecological Services Field Office occurred on July 11, 2024. The meeting with USFWS included the USDA NRCS Water Resources Coordinator Derek Hamilton, two Environmental Services Group Technical Leads from J-U-B, Autumn Davies and Suzanne Acton, and Environmental Specialist and Biologist from J-U-B, Becky Hendricks Miller. Agency coordination is located in Appendix A.

A BA was prepared for the Proposed Project that identifies species characteristics, habitat requirements, and potential effects to federally listed species from implementing the Proposed Project (Appendix E2).

3.3.7.3 Migratory Birds and Bald and Golden Eagles

Resource Issue & Indicator: The proposed activities have the potential to affect migratory birds, bald and golden eagles, and habitat. The indicators to describe effects to migratory birds, bald and golden eagles, and habitat are the qualitative changes to habitat affected for each species and resulting implications for their populations.

Under the Migratory Bird Treaty Act (MBTA) (16 U.S.C. 703-712), it is considered “illegal to take, possess, import, export, transport, sell, purchase, barter, or offer for sale, purchase, or barter, any migratory bird, or the parts, nest, or eggs of such a bird except under the terms of a valid permit issued pursuant to federal regulations.” The Bald and Golden Eagle Protection Act of 1940 (BGEPA) forbids anyone from taking bald eagles, including their parts, nests, or eggs; take is defined as “pursue, shoot, shoot at, poison, wound, kill, capture, collect, molest or disturb” (CFR 50 Part 22).

The USFWS IPaC Report identified 29 avian species protected under the MBTA, including two species protected under the BGEPA as potentially occurring within the Project Area, presented in Table 3-17. The UNHP documented occurrences of the Lewis's woodpecker (*Melanerpes lewis*) within 0.5-miles of the Project Area (UNHP 2024). Incidental survey for presence of active nests or nesting behavior for 29 migratory bird species listed in the USFWS IPaC report occurred on August 17, and 18, 2021, September 28, 2021, August 8 and 9, 2023, September 18 and 19, 2023, and May 20–22, 2024, during breeding season for the MBTA-protected species most likely to nest there (March 1–August 31). No avian species from the USFWS IPaC MBTA bird species list were observed. No active nests, breeding or nesting behavior for any avian species were observed during the incidental survey.

Tree and shrub cover exist in the south side of the Project Area, along the Logan River, and intermittently along the Little Logan and Logan and Northern Canal, which would provide suitable nesting, perching, or stopover habitat for migratory and resident bird species. While

overstory and midstory exist within the Project Area, there is an absence of mature and complex forest structure, and the concentrations of trees and shrubs present is limited to fringe areas along either side of these canals. Outside of suburban areas, open pastureland, absent of trees or shrubs, is common, and ground nesting habitat is present. The Logan River corridor, where mature cottonwood trees are present, may provide nesting and foraging habitat for eagles.

Table 3-17. Migratory Bird Treaty Act (MBTA) and Bald and Golden Eagle Protection Act (BGEPA) Protected Avian Species

Common Name	Scientific Name
American avocet	<i>Recurvirostra americana</i>
American white pelican	<i>Pelecanus erythrorhynchos</i>
bald eagle ¹	<i>Haliaeetus leucocephalus</i>
black rosy-finch	<i>Leucosticte atrata</i>
black tern	<i>Chlidonias niger surinamensis</i>
bobolink	<i>Dolichonyx oryzivorus</i>
broad-tailed hummingbird	<i>Selasphorus platycercus</i>
California gull	<i>Larus californicus</i>
Calliope hummingbird	<i>Selasphorus calliope</i>
Cassin's finch	<i>Haemorhous cassinii</i>
Clark's grebe	<i>Aechmophorus clarkii</i>
evening grosbeak	<i>Coccothraustes vespertinus</i>
flamulated owl	<i>Psilosops flammeolus</i>
Forster's tern	<i>Sterna forsteri</i>
Franklin's gull	<i>Leucophaeus pipixcan</i>
golden eagle ¹	<i>Aquila chrysaetos</i>
lesser yellowlegs	<i>Tringa flavipes</i>
Lewis's Woodpecker	<i>Melanerpes lewis</i>
long-eared owl	<i>Asio otus</i>
marbled godwit	<i>Limosa fedoa</i>
northern harrier	<i>Circus hudsonius</i>
olive-sided flycatcher	<i>Contopus cooperi</i>
pectoral sandpiper	<i>Calidris melanotos</i>
pinyon jay	<i>Gymnorhinus cyanocephalus</i>
rufous hummingbird	<i>Selasphorus rufus</i>
sage thrasher	<i>Oreoscoptes montanus</i>
Virginia's warbler	<i>Leiothlypis virginiae</i>
western grebe	<i>Aechmophorus occidentalis</i>
willet	<i>Tringa semipalmata</i>

¹Species also protected under the BGEPA.

3.3.8 Human Environment

This section discusses resource categories within the Project Area related to the human environment, including cultural and historic resources, scientific resources, public health and safety, hazardous materials, transportation and infrastructure, noise, visual resources and scenic beauty, and recreation.

3.3.8.1 Cultural and Historic Properties

Resource Issue & Indicator: The purpose of the Section 106 process of the NHPA is to identify historic properties potentially affected by the undertaking, assess its effects and seek ways to avoid, minimize, or mitigate any adverse effects on historic properties (36 CFR 800.1). The indicators to describe effects to cultural and historic resources are the effects to these resources, and any subsequent resolution of effects.

The following sections provide information on regulatory overview, National Register of Historic Places (NRHP) evaluation criteria, Tribal consultation, agency and consulting party coordination, the APE, and cultural resources inventory results. Additional information on cultural resources can be found in Appendix A (Section 106 Consultation documents—including SHPO Concurrence, Tribal Section 106 letters, and the Cultural Memorandum of Agreement [MOA]), and in Appendix E2 (Cultural Resources Report [redacted]).

Regulatory Overview

Through Section 106 consultation, historic properties are identified and assessed for adverse effects. If there will be adverse effects to cultural resources, then through consultation a resolution of effects is determined, as agreed upon by the Utah SHPO, collaboration with Native American Tribes concerned with effects to cultural resources in the Project Area, and the protection of inadvertent discoveries.

Cultural resources are defined as physical or other expressions of human activity or occupation. Such resources include culturally significant landscapes, prehistoric and historic archaeological sites, isolated artifacts or features, traditional cultural properties, Native American and other sacred places, and artifacts and documents of cultural and historical significance.

Several federal statutes and E.O. direct the protection and consideration of cultural and historic resources, namely NEPA and the NHPA. Under NEPA, federal agencies must consider the effect of federal action upon historical, archeological, and paleontological resources. In addition, Section 106 of the NHPA requires federal agencies to consider the effects of their actions on historic properties. NHPA defines a historic property as “any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the NRHP...” (36 CFR 800.16).

Pursuant to Section 106 of the NHPA, the ACHP, SHPO, federally recognized Tribes, and/or Tribal Historic Preservation Offices (THPOs), and other identified consulting parties, must be consulted at all steps of the Section 106 process.

NRHP Evaluation Criteria

The criteria for evaluating cultural resources for inclusion in the NRHP are codified under the authority of the NHPA of 1966, as amended (36 CFR 60.4 [a–d]), and the ACHP has set forth guidelines to use in determining site eligibility which uses the Secretary of Interior’s (SOI) Standards and Guidelines (48 FR 44720–44726) for both identification and evaluation. These standards and guidelines were developed and set forth by the National Park Service (NPS) under the Department of the Interior (NPS 1995). Federal regulations indicate that “[t]he term ‘eligible for inclusion in the National Register’ includes both properties formally determined as such in accordance with regulations of the SOI and all other properties that meet National Register

criteria” (36 CFR 800.16(l)(2)). Based on the SOI Standards and Guidelines, developed by the NPS (48 FR 44720-44726), any cultural resource that is included in or eligible for inclusion in the National Register is a historic property.

Subsequent to the identification of relevant historical themes and related research questions, four criteria for eligibility are applied. 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, material, workmanship, feeling, and association and:

- **Criterion A:** that are associated with events that have made a significant contribution to the broad patterns of our history; or
- **Criterion B:** that are association with the lives of persons significant in our past; or
- **Criterion C:** that 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
- **Criterion D:** that have yielded, or may be likely to yield, information important in prehistory or history.

The objective of this analysis is, through Section 106 consultation, to identify historic properties that may be affected by the undertaking and if the effects are adverse, to resolve them (36 CFR 800.1). Criteria A, B, and C are typically associated with events that have made a significant contribution to the broad pattern of history, are associated with the lives of significant persons from the past, or that embody distinctive characteristics of a type, period, or method of construction. Criterion D is generally associated with prehistoric, but also historic-age, archeological sites and include sites that have yielded or are likely to yield important prehistory or history. This analysis identifies the location and defines both the horizontal and vertical extents of any cultural resources, documents and describes those resources, and then evaluates each for NRHP eligibility, and resolves any adverse effects.

Tribal Consultation

Per 36 CFR 800.3, the NRCS State Conservationist (STC) is responsible for assessing effects of activities, considering tribal interests, and assuring that tribal interests are considered in conjunction with federal activities and undertakings. NRCS has a responsibility to help fulfill the U.S. Government’s responsibilities toward tribes when considering actions that may affect tribal rights, resources, and assets. The ACHP is afforded the opportunity to comment as well.

Per 36 CFR 800.3 that outlines the initiation of the Section 106 process and defines how federal agencies must begin the process of considering the effects of their undertakings on historic properties, it is the lead federal agency’s responsibility to identify appropriate consulting parties. The NRCS identified the Utah SHPO, THPOs, federally recognized Tribes, and other consulting parties for the project.

Initiating the Section 106 process, in letters dated October 19, 2021, NRCS informed the Eastern Shoshone Tribe of the Wind River Reservation, Wyoming; the Shoshone-Bannock Tribes of the Fort Hall Reservation; the Ute Indian Tribe of the Uintah & Ouray Reservation, Utah; and the Northwest Band of the Shoshone Nation about the Proposed Project and requested information regarding historic properties or places of traditional religious and cultural importance near the

Project Area that should be considered as part of the analysis. The NRCS provided further opportunity for comment and participation in developing the watershed plan in letters dated March 8, 2024, in coordination and consultation with the Tribes.

The project team also prepared a public participation plan to include Tribes, the public, and other stakeholders in the process. The Tribes were invited to a scoping meeting held virtually on January 28, 2021, and the NRCS provided opportunity for additional comment and participation in developing the watershed plan in letters dated March 8, 2024, with these four federally recognized tribes and other consulting parties during the April 2024 scoping period.

NRCS consulted with the applicable Tribes on the delineation of the APE, site eligibility, and effects, and provided copies of the cultural resource survey report in letters dated December 17, 2024. Follow up with the Tribes was completed on February 21, 2025, via electronic mail. Tribes will be contacted again by forthcoming telephone calls. To date, no response has been received from any Tribes/THPOs. A complete summary of consultation with Tribes is provided in Chapter 7. The Section 106 consultation letters and the scoping report can be found in Appendix A.

Agency and Consulting Parties Coordination

The USACE and the EPA, both cooperating agencies for the Proposed Project, are serving as consulting parties for the Proposed Project. No other agency or organization was identified as a consulting party.

Cooperating Agencies

The NRCS as the Lead Agency signed a Memorandum of Understanding (MOU) with the EPA and USACE as Cooperating Agencies in the development of the Plan-EIS on October 2, 2024 (Appendix A). As detailed in the MOU, pursuant to 50 CFR Part 402.07 and 36 CFR 800.2(a)(2), the NRCS will serve as the agency official who shall act on behalf of the USACE, fulfilling their collective responsibilities for compliance with Section 106 of the NHPA. Additionally, NRCS will conduct consultations with the Utah SHPO, as well as the Tribes on behalf of the USACE. The USACE, in a letter dated July 7, 2023 and the EPA in a letter dated November 12, 2024 acknowledged that the NRCS is the lead federal agency for compliance with Section 106 of the NHPA, and pursuant to 36 CFR 800.2(a)(2), the USACE designated the NRCS to act on their behalf in any consultations conducted for compliance with NHPA; however, the R8 EPA NEPA Branch directed the NRCS to rely on the SHPOs and THPOs as their branch did not currently have NHPA expertise (see Appendix A for letters).

Although the SHPO and Tribes were not parties to the development of this MOU, they were formally notified of its contents and the designation of NRCS as the lead agency for Section 106 compliance through consultation letters. These letters communicated the roles and responsibilities outlined in the MOU and served as notification of NRCS's lead role in the Section 106 process. NRCS will continue to inform USACE and EPA of any consultations conducted for compliance with these laws.

SHPO and Tribal Consultation and Consulting Parties Coordination

Per 36 CFR 800.3, 36 CFR 800.4, and the MOU (Appendix A), NRCS initiated Section 106 consultation with the Utah SHPO and consulted with the applicable Tribes and cooperating agencies (USACE and EPA) on the delineation of the APE, site eligibility, and effects, and provided copies of the cultural resource survey report in letters dated December 17, 2024. Follow

up with the Tribes was completed on February 21, 2025, via electronic mail. Tribes will be contacted again by forthcoming telephone calls. To date, no response has been received from any Tribes/THPOs. A complete summary of consultation with Tribes is provided in Chapter 7.

SHPO concurrence was received on January 14, 2025. The SHPO concurred with the delineation of the APE, site eligibility, and finding of effects for this undertaking. NRCS contacted the ACHP on February 4, 2025. The ACHP responded in a letter dated February 14, 2025, in which they indicated their participation in the consultation to resolve adverse effects was not needed.

Area of Potential Effects

In accordance with 36 CFR 800, and Utah Code Section 9-8-404, the APE is defined by the ACHP as “the geographic area where a project could directly or indirectly affect historic properties.” See Section 1.4.3 for a complete description of the direct and indirect APEs and see Appendix B for the Cultural Resource APE Maps. The direct APE consists of 1,178.1 acres where potential for direct effects occurs.

The indirect APE for cultural resources is the portion of the Project Area that would be flooded in the current conditions which may benefit from reduced flooding because of the Proposed Project. This area has been defined as the 100-year floodplain for the Logan River and the Project Area acres that would be inundated by flooding from the canals overtopping in the 100-year storm and consists of approximately 645.8 acres as shown on the Cultural Resources Indirect APE Map in Appendix B. Three eligible historic buildings are located within the indirect APE, according to the Utah SHPO’s Historic Utah Building online database (Historic 2024; Appendix E2).

Cultural Resources Inventory Results

Per 36 CFR 800.4, a literature review (Class I), reconnaissance (Class II), and intensive (Class III) Cultural Resources Inventory was completed for the Proposed Project’s direct APE of 1,178.1 acres in September 2024 by Steven W. Carothers & Associates Environmental Consultants (SWCA), whose archaeologists meet the SOI’s Professional Qualifications in Archaeology per 36 CFR Part 61.

The entire direct APE was surveyed with Class I surveys. Within the APE, due to access issues and surface conditions, 179.8 acres were excluded from reconnaissance-level or intensive surveys (Class II or III surveys). For areas of the APE that only Class I surveys were conducted, the likelihood of encountering historic properties is extremely low, and per 36 CFR 800.4.b.1, NRCS and the consulting parties agreed that the level of effort (Class I, II, or III) meets “the reasonable and good faith effort to carry out appropriate identification efforts.” If previously unidentified cultural resources are encountered during construction, the project would follow the procedures in the NRCS Prototype Programmatic Agreement with the Utah SHPO (NRCS and SHPO 2025).

Examination of the area identified seven previously recorded sites, eleven newly recorded cultural sites, and twelve newly recorded isolated finds. Of these sites, five were determined eligible for listing on the NRHP. See Table 3-18 for a summary of the identified sites. Details can be found in the Cultural Resource Survey report, located in Appendix E2.

Table 3-18. Identified Cultural Resources within the Area of Potential Effect

Site Summary	Documentation Status	Site Description/Name	Eligibility Determination
42CA88	Update	Historic Railroad/Utah Northern Railroad	Eligible under Criterion A
42CA127	Full rerecord	Historic Canal/Logan and Hyde Park Canal	Eligible under Criterion A
42CA141	Update	Agricultural/subsistence	Not eligible
42CA143	Full rerecord	Historic Canal/Logan and Benson Canal	Eligible under Criterion A
42CA156	Update	Historic Canal/Logan Northern Canal	Eligible under Criterion A and C
42CA175	Full rerecord	Historic Diversion Structure/ Little Logan River Diversion Structure	Not eligible
42CA178	Full rerecord	Historic Canal/Cow Pasture Canal	Not eligible
42CA323	Newly recorded	Historic Mill/Anderson Lumber Mill	Eligible under Criterion A
42CA324	Newly recorded	Agricultural/subsistence	Not eligible
42CA325	Newly recorded	Agricultural/subsistence	Not eligible
42CA326	Newly recorded	Historic Road/Canyon Road	Not eligible
42CA327	Newly recorded	Historic Road/200 East Street	Not eligible
42CA328	Newly recorded	Agricultural/subsistence	Not eligible
42CA329	Newly recorded	Historic Railroad/ Benson Branch/Ballard Cutoff of the Oregon Short Line Railroad	Not eligible
42CA330	Newly recorded	Agricultural/subsistence	Not eligible
42CA331	Newly recorded	Historic Road/Airport Road	Not eligible
42CA332	Newly recorded	Historic Street/3400 North Street/3700 North Street/ Center Street	Not eligible
42CA333	Newly recorded	Historic Street/300 East Street	Not eligible
Isolated find	Newly recorded	Farm Implement	Not eligible
Isolated find	Newly recorded	Historic Corral	Not eligible
Isolated find	Newly recorded	Historic Two-track Road	Not eligible
Isolated find	Newly recorded	Two-track Road	Not eligible
Isolated find	Newly recorded	Paved and Graveled Road	Not eligible
Isolated find	Newly recorded	Paved Road	Not eligible
Isolated find	Newly recorded	Historic Road	Not eligible
Isolated find	Newly recorded	Historic Road	Not eligible
Isolated find	Newly recorded	Historic Road	Not eligible
Isolated find	Newly recorded	Historic Road	Not eligible
Isolated find	Newly recorded	Historic Road	Not eligible
Isolated find	Newly recorded	Historic Road	Not eligible

Applying the Criteria of Adverse Effect (36 CFR 800.5), the NRCS determined that the Proposed Project would result in an Adverse Effect to three historic properties (Historic Canal/Logan and Hyde Park Canal, Historic Canal/Logan and Benson Canal, and Historic Canal/Logan Northern Canal). NRCS NHPA Section 106 results, including the finding of effects and required

mitigation, consultation with SHPO, Tribes/THPOs, and other consulting parties, and concurrence from SHPO are discussed in detail in Section 5.3.8.1 and Chapter 7.

Copies of all Section 106 consultation letters are located in Appendix A. A copy of the redacted Cultural Resource Survey Report is located in Appendix E2.

3.3.8.2 Scientific Resources

Resource Issue & Indicator: The project activities have the potential to affect paleontological resources. The indicators to describe effects to paleontological resources are the likelihood of discovery of paleontological resources based on UDNR database.

NRCS considers resources that do not contain cultural material—but are valuable for other reasons—such as paleontological resources. The NRCS Title 190 National Cultural Resources Procedures Handbook Part 601, Subpart G, Section 601.70, describes paleontological resources as “plant and animal fossils that may be the original preserved organism, molds, and casts, and casts that have been completely replaced by minerals...and secondary fossils such as animal footprints and preserved burrows...”

Responsibility and procedures for handling these noncultural resources are defined in Title 210, National Engineering Manual (NEM), Part 531.4(5), which states, “Resources that may have historical, archeological, cultural, paleontological, or other scientific significance or value discovered during any type of investigation or construction must be immediately reported in accordance with NRCS policy” (210-NEM-531.4(5)).

Additionally, for federal lands, the Paleontological Resources Preservation Act of 2009 (PRPA) requires Department of Interior agencies to manage paleontological resources using scientific principles and expertise (43 CFR 49). Based on the scientific procedures identified in the “Potential Fossil Yield Classification System” (PFYC) (U.S. Bureau of Land Management [BLM] 2022), an initial assessment of paleontological resources for the Project Area was conducted.

The potential effect area for paleontological resources is consistent with the APE for cultural resources, as described in Section 3.3.8.1. The UDNR maintains a searchable literature database of recent findings and classifications of exposure within the State of Utah. A paleontological file search of this literature was completed for the APE (see Paleontological Coordination Letter in Appendix A). As indicated in the file search, the Project Area consists mainly of Quaternary, Neogene, and recent alluvial deposits. Where these deposits have been exposed along existing ROW, there is a low potential for yielding significant fossil localities (PFYC 2).

3.3.8.3 Public Health and Safety

Resource Issue & Indicator: No known health concerns occur in the Project Area. Safety concerns in the area are related to the dangerous conditions of the aging diversion infrastructure, mainly of Crockett Diversion structure and its contributions to flooding, the Crockett Canal risk of failure, and the risk of flooding due to the inadequate capacity of canals to carry irrigation and flood water. Additionally, open canals may present safety concerns. The indicators to describe effects to public health and safety are the infrastructure improvements to the irrigation system, and the number of houses protected from the reduced risk of flooding.

Safety concerns are associated with flooding in the Project Area as a result of the irrigation infrastructure. Currently, flooding occurs at the Crockett Diversion and from canals overtopping. The Crockett Diversion structure in the Logan River is prone to flooding due to debris accumulation during storm events. The structure consists of a series of four wood stop logs slots that are manually added and removed to control the WSE above the diversion. Adjusting these boards during high flows to manage the diversion in the channel north of the structure can be very dangerous. This action often requires two individuals working together on the narrow catwalk without any safety harnesses or equipment and using poles with hooks on the ends to lift the boards out with hundreds of lb of force of resistance. Additionally, the vertical steel supports the stop logs catch floating debris and trees that are washed downstream during flooding. These situations cause nearly instantaneous emergencies by backing up the flows in the channel. Currently, these flooding events affect 43 homes in a 100-year event.

Additional safety concerns are associated with flooding outside of the Logan River floodplain from canals overtopping from concentrated high runoff events, common in the area, because floodwater and irrigation water are conveyed within the same canal system, affecting approximately 3,620 feet of roadway at risk of flooding. Heavy storm events transport large debris flows within the irrigation canals, blocking and obstructing flow, and putting public and property at risk for flood damage. Persistent seepage and leaks in the canal system may also contribute to flooding of residential and agricultural properties, businesses, and roads. Overtopping occurs when floodwater exceeds the height of the canal and flows over its crown. The most dangerous events happen quickly during periods of high water or when debris blocks diversion infrastructure, which causes near immediate flooding events. Unfortunately, in the case of overtopping the canal system, severe flooding can occur due to the increased water velocity. Currently, in a 100-year flood event, 426 homes, 10,350 acres of agricultural land, and 3,150 feet of road would be flooded.

Persistent seepage contributes to canal failure. In 2009, the Crockett Canal, which is part of the CAIC irrigation system, was a part of a significant landslide. This landslide resulted in the deaths of three people: a mother and her two children. The blowout was caused by a combination of factors, including heavy rainfall and the saturation of the soil, which weakened the canal's structure. The water from the canal surged down the hillside, causing the ground to give way and burying the victims' home. In the aftermath, CAIC took emergency efforts to improve the safety and maintenance of the canal system to prevent such incidents from happening again, and the Proposed Project was designed to address the broader implications for the local infrastructure.

Within the Project Area, safety risks are associated with 185 miles of canals, laterals, and other open, moving water features, and existing infrastructure which can be dangerous. Fast-moving water in a narrow channel can knock a person off their feet. Even shallow water, if it is moving fast enough, could cause one to lose their balance and be carried away.

The Cache County Sheriff, the Logan City Fire Department, and the North Logan Fire Department safeguard the Project Area. The Logan City Police Department's 9-1-1 Dispatch Center is responsible for answering emergency calls and dispatching police, fire, emergency management services (EMS), and ambulance personnel throughout the county.

3.3.8.4 Hazardous Materials

Resource Issue & Indicator: During construction activities, materials considered hazardous could be used and stored on site, such as gas or portable toilet facilities, and requirements to handle or dispose of them must be followed. The project could disturb existing hazardous material sites. The indicators to describe effects include overlaps of disturbance with sites and measures to prevent disturbance or handle potential hazardous materials.

The Resource Conservation and Recovery Act (RCRA) is the primary statute established with the purpose of providing a structure for hazardous waste management. For a substance to be considered a hazardous waste, it must first be classified as a solid waste under RCRA. Any material that is abandoned, inherently waste-like, discarded military munition, or recycled in certain ways is considered a solid waste and is subject to RCRA. Hazardous waste is defined as any liquid, solid, gas, or sludge that poses a hazard to human health or the environment because of its quantity, concentration, or physical or chemical characteristics.

A review of the UDEQ Environmental Interactive Map was conducted to determine the presence of hazardous or solid waste disposal sites in the proximity of the Project Area. The UDEQ Environmental Interactive Map was mapped based on the Project Area of Interest, located in TM-001 Existing Conditions, in Appendix E3. In the review, 180 facilities and 70 incidents were identified near the Project Area (see UDEQ Hazardous Materials Map in Appendix C for location details). However, only 10 facilities and incidents are within 15 feet of the Project Area. These 10 facilities include: 1 Tier 2 facility, 4 environmental incidents, and 5 hazardous waste and used oil sites (UDEQ 2024). Tier 2 facilities have an aggregate aboveground oil storage capacity of 10,000 gallons or less and meet the oil discharge history criteria of the EPA. No petroleum storage tanks are located within 15 feet of the Project Area. Results of the database search are in Appendix C.

One project measure includes using existing sewer lagoons as secondary irrigation water reservoirs. The existing sewer lagoons are currently owned by Logan City. Toxicity testing was performed on the samples of all sludge containing cells. Lab testing was performed by Chemtech Ford. No toxins were found in sludge samples (see Appendix E4, TM-010).

3.3.8.5 Transportation and Infrastructure

Resource Issue & Indicator: The proposed activities are designed to improve the existing CAIC's agricultural irrigation infrastructure. The indicators to describe effects to transportation and infrastructure are miles of distribution system pipeline installed and the qualitative reduced occurrences of overtopping and flooding.

Infrastructure

Existing infrastructure in the Project Area includes transportation facilities, such as roads, structures, including business and residential buildings, and irrigation features. Transportation resources and access in the area include U.S. Highway 91 and 89, State Highway 30 and 252, and local roads. U.S. 91 provides access between Logan City and Hyde Park; State Highway 252 occurs parallel to U.S. 91. U.S. 89 provides southwestern access to U.S. Interstate 15 and access to Logan Canyon from Logan City. State Highway 30 provides east-west access to U.S. Interstate 15 from Logan City. Local roads in the area are developed on a grid system and provide local access and mobility for residents, and includes north-south roads between

N 1200 E to N 4000 W, and east-west roads between W 1800 S to E 4400 N. The arterial points of U.S. Highway 91, U.S. Highway 89, and State Highway 30, and State Highway 252 occur in the Project Area. Access and transportation to the Project Area are managed by various local, state, and federal agencies, including the Cache County Sheriff, Cache County Public Works Road Division, City of Logan, North Logan City, Hyde Park City, and the Utah Department of Transportation (UDOT). Approximately 22,727 housing units exist within the Project Area from Hyde Park to the north of River Heights.

CAIC service area covers land within three city boundaries (Logan City, North Logan City, and Hyde Park City), as well as Cache County. The existing diversion infrastructure within the Project Area includes Crockett Diversion structure, Benson Canal, Logan North Field Canal 1 and 2, Logan Northwest Field Canal, Twins Canal, Logan Cow Pasture Canal, Crockett Avenue (8th Ward) Canal, North Branch Crockett Avenue Canal, Little Logan Branch Crockett Avenue Canal, and Logan Southwest Field Canal 1, 2, and 3. The existing irrigation infrastructure is deteriorating and requires continued labor and capital to perform increasingly dangerous maintenance and operations activities. The open project canals and laterals are estimated to lose approximately 6,050 ac-ft of water to seepage and evaporation annually. These losses have reduced crop yield and have led to water shortages during the irrigation season.

Approximately 79 percent of the daily water being used per equivalent residential connection (ERC) on a summer day in Logan is for outdoor use (see Appendix E4, TM-012).

3.3.8.6 Noise

Resource Issue & Indicator: Construction activities could cause temporary noise effects. The pump stations could cause long-term noise effects. The indicator to describe noise effects is the mitigation taken to avoid conflicts with residents within the Project Area.

Various factors influence the perception of noise, such as volume, frequency, atmospheric conditions, background noise, and the nature of the activity generating the noise. Background noise (ambient noise) is associated with road traffic and the use of agricultural equipment. Special consideration must be given to noise sensitive areas and noise sensitive receptors within and adjacent to the Proposed Project. In these quiet areas, noise effects are more substantial. Numerous noise sensitive receptors, such as local parks, schools, and residential areas occur throughout the Project Area.

The City of Logan Code of Ordinances 8.16.600 states the maximum permissible sound levels by receiving land zone. For residential and manufactured home zones, the sound level limit from 10:00 p.m. to 7:00 a.m. is 50 decibels (dBA), from 7:00 p.m. to 10:00 p.m. is 55 dBA, and from 7:00 a.m. to 7:00 p.m. is 60 dBA (American Legal Publishing 2024).

3.3.8.7 Visual Resources and Scenic Beauty

Resource Issue & Indicator: The proposed activities have the potential to affect visual resources within the Project Area and would enhance the visual resources of the Crockett Diversion structure. The indicator to describe effects to visual resources and scenic beauty is the ability of the landscape to retain the existing characteristics, with a low level of change in any of the basic landscape elements due to management activities.

The land surrounding the Project Area contains a mix of agricultural, residential, industrial, and commercial land. The surrounding landscape consists of wide terraces, narrow floodplains, and

alluvial fans. The Logan River and Little Logan flow through many of these land cover types in the vicinity of the Project Area.

The BLM manages public lands to ensure that the scenic value of those lands is considered. The BLM's Visual Resource Management (VRM) system provides an inventory of scenic values and sets management objectives for those values. Once BLM land is inventoried, it is given a class designation from I (most protected) to IV (least protected). The Project Area is not within a BLM VRM class. The closest area with a class designation is located approximately 20 miles west of Logan and has a VRM Class IV designation. Class IV indicated low visual value and allows for management activities to dominate the view; however, attempts should be made to minimize effects (BLM 1986).

Current conditions at the Crockett Diversion include a concrete diversion, various blocks of rubble, and hazardous banks. Due to the diversion, natural river conditions are not present and thus the diversion detracts from the general aesthetics of the Logan River (see Appendix E3, TM-007).

3.3.8.8 Recreation

Resource Issue & Indicator: The proposed activities have the potential to affect recreational opportunities within the Project Area. The indicators to describe effects to recreation are trails and access.

A variety of recreational opportunities are present within the Project Area, such as the River Hollow and Sumac Parks adjacent to the Crockett Diversion, and Jens Johansen Park, Merlin Olsen Central Park, Willow Park, and Majestic Park along the Little Logan, and the Canyon Road Park along Canyon Road in Logan; and the North Logan City Park in North Logan, and 600 South Park in Hyde Park. Cache County has numerous parks, trails, and picnic facilities as well (Cache County 2024b). Within Logan City, a city-wide network of shared use paths exists, which connect recreational facilities within and outside of the city limits. These shared paths are typically concrete paths that allow both pedestrians and cyclists to use. Several of these existing shared paths are not ADA compliant and some feature steep grades. There is currently only one walkable connection from Sumac Park to River Hollow Park east of Crockett Avenue, a pedestrian bridge partially located on private property, which the property owner has indicated they would prefer to be moved to public property.

Rivers are considered blue trails. Current conditions above and below the Crockett Diversion do not allow for safe access or passage to this section of the Logan River. The diversion creates a steep drop over concrete and has a catwalk that creates an entrapment hazard. There is currently a bridge crossing the diversion that allows access to River Hollow Park. There is a desire to have access to the park continue after the project (see Appendix E3, TM-007 for details). No recreational criteria were obtained from Logan Parks and Recreation. During final design of a chosen alternative, input would be sought from trails and blue trails directors.

The LRTF-CAP identified access as one of the biggest barriers to recreation opportunities along the Logan River (Logan River Task Force 2016), and they specifically identified that public amenities should have facilities that enable appropriate access and use, connect/expand trails and parks, provide designated public river access locations, and address barriers to trail connectivity.

Though concerns regarding recreational opportunities along the Little Logan were considered during scoping, it was beyond the scope of the project to determine improvements to the physical

infrastructure of the Little Logan, including low bridges, lining to reduce seepage, or other similar measures. These measures would need to be identified and analyzed under a separate project.

3.3.9 Special Land Designations

3.3.9.1 *Land Use*

Resource Issue & Indicator: CAIC must coordinate proposed activities, and activities must be consistent with zoning ordinances and adhere to county land use requirements. The indicators to describe effects to land use are consistency with zoning and land use requirements, and consistency with the goals of the Cache County's Countywide Comprehensive Plan.

The Project Area contains a mix of land uses, including agriculture, residential, industrial, airport, and commercial.

3.3.9.2 *Natural Areas*

Resource Issue & Indicator: The proposed activities may benefit downstream natural areas. The indicator to describe effects to natural areas is water conservation within the watershed.

Natural areas are defined as land or water units where natural conditions are maintained to the extent possible (7 CFR 650.23(a)). The Logan River Watershed does not contain National Landscape Conservation System (NLCS) Wildernesses, Wilderness Study Areas, or Areas of Critical Environmental Concern; however, the watershed does include portions of the Uinta-Wasatch-Cache National Forest (BLM 2024).

One notable natural area, the Bear River Migratory Bird Refuge, and the adjacent Great Salt Lake, which are located approximately 16 miles southwest of the Project Area, are hydrologically connected to the water resources of the Project Area.

3.3.10 Social Issues

Resource Issue & Indicator: The Sponsors, Co-sponsors and the project team engaged the public to identify key social concerns. Public concerns related to summer base flows, access to open water, preservation of existing vegetation, and maintenance of the Little Logan as a visible community water feature. A portion of the CAIC canal below the Crockett Diversion is commonly referred to as the Little Logan and extends approximately 4.8 miles through Logan and surrounding communities. The indicator to evaluate effects to the public is how the team incorporated Little Logan management concerns into the project alternatives, such as how project alternatives maintain summer base flows, retain access to open water, preserve community-valued vegetation, and incorporate relevant design measures.

In 2019, the CAIC identified the need to improve agricultural water efficiency and address the aging condition of the Crockett Diversion structure. Potential activities to address this need included piping and pressurizing the existing main CAIC canal network and reconstructing the Crockett Diversion structure. In 2021, the project team—including Sponsor representatives, the NRCS, agency and public stakeholders, and environmental and engineering professionals, including a LRTF-CAP representative—identified methods to achieve these goals in the Watershed Plan proposal. The preliminary alternatives included moving the CAIC diversion to First Dam, removing the Crockett Diversion, and piping all of the canals in the CAIC system, or

alternatively, keeping the CAIC diversion at the Crockett diversion, pumping the water, and also piping the canals. Both of these preliminary alternatives included pressurizing and piping portions of the Little Logan section of the Crockett Canal and would have affected base flows and public access to open water in the Little Logan.

During the early scoping sessions, the public expressed obvious concern about the potential loss of open water on the Little Logan. Under existing conditions, flows in the Little Logan occur primarily during the irrigation season and vary by canal operation, turnout location, and time of year. Outside of the irrigation season, the Little Logan is largely dry, with limited spring or stormwater runoff in certain locations. Public access to open water during the irrigation season contributes to perceived natural beauty, informal recreation, and community identity.

The project team adjusted the combination of activities into two revised alternatives—neither of which included piping the Little Logan—including one that would remove the Crockett Diversion structure and replace it with a series of steps and pools in the Logan River while still providing water sourced from the new pipe to the Little Logan, including through Merlin Olsen Park, the Cache County Fairgrounds, and Willow Park. The other alternative would reconstruct the Crockett Diversion structure and provide flow to the Little Logan from the Logan River, including through River Hollow Park, Merlin Olsen Park, the Cache County Fairgrounds, and Willow Park. In 2024, the NOI presented these revised alternatives (Alternative 1 [First Dam Alternative with Crockett Diversion Removal] and Crockett Diversion Alternative) for public comments (see Chapter 4 for detailed information on alternative formulation).

Most of the public comments to the NOI were related to piping the Little Logan, despite neither revised alternative proposing the piping of the Little Logan. The public remained concerned that piping the Little Logan would destroy its natural beauty, harm wildlife habitats, and reduce recreational opportunities. The community expressed an overarching concern to maintain base flows in the Little Logan. Additional concerns with the project included a desire to preserve existing vegetation when possible and to rehabilitate disturbed areas.

Social concerns related to the Little Logan are closely tied to water quantity and visibility but are distinct from regulatory water resource classifications. The Water Resources section evaluates hydrologic conditions, and federal and state regulations, which informs how and when flows can be provided to the Little Logan and the Logan River.

3.4 Forecast Future Conditions

The No Action condition is the most likely future condition or set of conditions if no effort is made to resolve existing Project Area problems and maximize opportunities or address project objectives and eliminate constraints. It includes any changes expected to result directly, indirectly, or cumulatively from all reasonably foreseeable circumstances without alternative actions.

Chapter 4 Alternatives

This section describes the rationale of the Draft Plan–EIS formulation for the development and comparison of alternatives and describes the alternatives including those eliminated from detailed study.

4.1 Formulation Process

Early in the Proposed Project development, comments were requested and received from the public, and Tribes, as well as from local, state, and federal agencies. Information from the scoping process was used to define watershed problems, opportunities, project objectives, constraints, and resource concerns to consider in the alternative development process. The public scoping process is described in detail in Section 1.5.4 and additional information on the scoping process is included in the Scoping Report in Appendix A.

The Sponsor representatives, the NRCS, agency and public stakeholders, and environmental and engineering professionals, including a LRTF-CAP representative, the project team—followed an iterative process of plan formulation that included the following phases:

- Identification and evaluation of initial management measures, described in Section 4.1.2.
- Combination of management measures into initial alternatives, described in Section 4.2.2.
- Screening of initial alternatives, described in Section 4.3.
- Identification of final alternative plans, described in Section 4.4.

The project team developed the Proposed Project alternatives with input from stakeholders during the scoping phase. Addressing the problems in the watershed by meeting the project objectives while avoiding constraints was the primary consideration during the process, while adhering to NRCS procedures in the National Planning Procedures Handbook (NRCS 2021), the NWPM (NRCS 2015) Parts 500 through 505, the NWPH (NRCS 2014), and additional NRCS watershed planning policy, relying primarily on the NRCS PR&G as described in USDA DM 9500-13 (USDA 2017a).

4.1.1 Guiding Principles

The Federal Objective, as listed in USDA DR-9500-13 and described in Section 2.1.1, was used as a guide but not as a screen tool for the planning process. The Guiding Principles, as described in Section 3.1.1, guided the identification, formulation, and evaluation of measures. Additionally, Plan criteria, which include the following four criteria of completeness, effectiveness, efficiency, and acceptability, were used during the plan formulation but not screening criteria. Individual and combinations of project measures were selected to achieve the purpose and need, balance engineering complexity and feasibility, minimize economic and environmental effects, and adhere to budgetary constraints.

Risk and uncertainty are inherent in water resources planning and were considered both in the formulation and evaluation of alternatives. Risk refers to those outcomes which can be described using reasonably well-known probability distributions, such as the chance of extreme or adverse flood events. Uncertainty refers to potential outcomes that cannot be described in objectively known probability distributions, such as changes in land use that do not follow historical rates of

change. Risk and uncertainty naturally arise from the underlying variability of complex natural, social, and economic situations.

While the future is indeterminate, an approach of adaptive management allows NRCS, the Sponsors, and stakeholders to respond to unforeseen events in as timely and effective a manner as practicable. Adaptive management is an integral component of the action alternatives and is reflected in part in the Watershed Plan Agreement.

A robust development of an ecosystem services framework was used in the formulation of alternatives for the Proposed Project. Sections 3.1.1, 3.2, 5.2, and 5.2.4, and the BCA (Appendix E2) describe the ecosystem services framework in greater detail.

4.1.2 Alternative Formulation Criteria

Project management measures were identified and evaluated for agricultural water management, flood control, and recreation. Each project measure was screened for its ability to meet the purpose and need of the project. Table 4-1 displays if each project measure was excluded from incorporation into a proposed alternative and the reasoning behind its exclusion. Many of these project measures were screened in the preparation of the 2019 Crockett Pressurized Irrigation Master Plan. The remaining project measures were formulated into four proposed alternatives which are described in Section 4.2.2. See additional details in Appendix E3, TM-006—Agricultural Water Management Alternatives Development, and in Appendix E4, TM-015—Agricultural Water Alternative Impacts on the Logan River Floodplain, TM-019—Flood Prevention, and TM-020—Recreation Design Summary.

Table 4-1. Initial Approaches and Management Measures

Initial Approaches and Management Measures	Initial Qualitative Evaluation	Carried Forward
<i>Agricultural Water Management</i>		
Diversion Location		
First Dam—move diversion 1.3 miles upstream of current diversion	Moving the diversion upstream allows the CAIC to capitalize on elevation to pressurize their agricultural distribution system, reducing costs of pressurizing the system. Meets Federal objectives, purpose and need.	Yes
Crockett Diversion—maintain location of current diversion	Maintaining the Crockett Diversion location would allow the CAIC to pressurize their agricultural distribution system, but would require an additional pumping station and costs, and higher carbon emissions, and would not allow for hydropower generation because of the reduced pressure. Meets Federal objectives, purpose and need.	Yes
West River Pump Station—move diversion 13.8 miles downstream of current diversion	Moving the diversion location downstream, while improving instream flows significantly over the existing conditions, has higher tradeoffs in pumping costs and associated carbon emissions. Meets Federal objectives, purpose and need.	Yes
Intake Method		
No change	Maintaining the current CAIC intake method uses a diversion structure with removable stop logs. Because of the safety issues, the current intake method is not sustainable.	No
First Dam intake	Maintaining the two 54-inch penstocks located at First Dam. One is currently connected to a hydropower turbine to generate power and the other is unused. One or multiple of these penstocks could be used to supply water from First Dam to a distribution system. A combination of sediment removal, aquatic weed removal, and/or screening at the intake structure would be required to reduce operational effects which have been experienced by USU and the UWRL while operating their systems. This project measure, when paired with the pressurized secondary irrigation system project measure, would require decommissioning of the current USU hydropower turbine to provide adequate head to the system.	Yes
Crockett pump station with Crockett Diversion removal	This measure includes a safer diversion method that allows for fish passage and habitat restoration through the removal of the diversion structure and combined with a pressurized distribution system. It would entail the removal of the existing diversion structure and the construction of a pump station near the same location to supply water to the service area. While this measure addressed safety concerns, the pumping costs and reduced resiliency and sustainability of the pump station made implementing this measure not feasible. Additionally, this measure also required the acquisition of land from a private landowner, where other options included municipal agreements which have historically been easier to acquire.	No

Initial Approaches and Management Measures	Initial Qualitative Evaluation	Carried Forward
Crockett pump station—with diversion structure reconstruction combined with gravity flow distribution system	This measure includes rehabilitation of the current diversion structure with pneumatic overshot gates to improve safety and operations at the site combined with a gravity flow distribution system. However, the gravity-flow distribution system does not meet the project purpose and need and limits future agricultural efficiency improvements, so this measure was not carried forward.	No
Crockett pump station—with diversion structure reconstruction combined with pressurized distribution system	This measure was suggested to facilitate a safer diversion method that allowed for more controlled and resilient pumping. It includes rehabilitation of the existing structure to implement pneumatic overshot gates and a lower crest elevation, the construction of a pump station and would be combined with pressurized distribution system.	Yes
Western method	This measure involves intake of the water at a lower point of diversion for a pressurized system but requires a two-stage pumping system. One low-head pump would supply water from the Logan River to a holding area, and a high-head pump station would supply the distribution system with pressurized water.	Yes
Distribution Method		
Pressurized canal deliveries	This measure includes installation of a pressurized pipeline to deliver pressurized water throughout the CAIC system. The pipeline would be installed along the existing transmission canal alignment and would reduce seepage and evaporation losses. A large diameter or multiple parallel lines would be required to carry the full maximum CAIC water right (141 cfs).	Yes
Pressurized secondary irrigation system	This measure includes installation of a PI pipeline to deliver water to all CAIC shareholders and each residential lot within the CAIC service area. The pipe system would be sized to carry the full maximum CAIC water right (141 cfs) and supply each agricultural and residential user with water in accordance with system sizing criteria outlined in UAC R309-510 and local secondary irrigation water rate structures established by irrigation providers.	Yes
Lined open channel	This measure includes lining the existing transmission channels to reduce seepage water loss but would not include the lining of the delivery ditches. This measure would require little modification to the existing system but would entail significant effort to clean and line approximately 22.2 miles of canal. There would be little improvement to open channel safety issues. While the option reduces seepage, it does not meet full project purpose and need and limits future agricultural efficiency improvements.	No
Enclosed gravity flow	This measure included installation of a gravity flow pipeline to deliver water to existing ditches. The pipeline would be installed along the existing transmission canal alignment and would reduce seepage and evaporation losses. A large diameter or multiple parallel lines would be required to carry the full maximum CAIC water right (141 cfs). While the option reduces seepage, it does not meet full project purpose and need and limits future agricultural efficiency improvements.	No

Initial Approaches and Management Measures	Initial Qualitative Evaluation	Carried Forward
Water Storage Method		
First Dam	Storage is minimal at First Dam (originally 70 ac-ft in the early 1900s but approximately 20 ac-ft in 2022 due to sedimentation). UWRL holds non-consumptive water rights which are diverted just below First Dam, and they rely on a steady reservoir elevation to perform many research tests. This measure was not carried forward because it does not provide enough storage and elevation fluctuations would adversely affect other parties.	No
Second and Third Dams	Due to foreseen challenges with using First Dam as a regulating pond, another measure was discussed. Two other impoundments, Second and Third Dams, are located 2 and 3.5 miles upstream of First Dam, respectively. These facilities are used for Logan City hydropower generation. The option to meet regulation needs includes adjustments to the current operational releases at both reservoirs to reduce elevation fluctuations at First Dam. However, Second Dam is a fixed crest concrete diversion dam with no capability for flow regulation. Instead, to meet regulation needs, hydropower penstock throttling would be required, reducing power generation at the Hydro 2 facility, which is the most productive hydropower facility on the Logan River. Additionally, although Third Dam is equipped with pneumatic Obermeyer gates, there is little precision for releases from the gates, and precise flows would need to be throttled through the penstock, further reducing power generation. Similar to First Dam, the storage in these reservoirs is minimal; combined they currently store about 30 ac-ft, with original storage of 230 ac-ft. This measure was not carried forward because it does not provide enough storage and elevation fluctuations would adversely affect other parties.	No
Crockett Pond	Under the project measure of maintaining the current irrigation supply diversion, a small regulating pond at the current Crockett Diversion location was suggested. However, spatial constraints and high real-estate prices would allow little storage for high capital costs, and this measure was not carried forward.	No
Lagoons	Another suggestion for meeting water regulation needs included the retrofitting of unused wastewater treatment cells owned by Logan City for storage. Several treatment cells are currently unused by Logan City and were suggested for secondary irrigation water storage use. The availability of these lagoons coincided with the idea of a two-stage pumping system on the western end of the system. Estimated capacity from investigations and historical drawings suggest that the lagoons could provide approximately 2,100 ac-ft of storage to the system. The measure to convert the unused Logan City lagoons to secondary irrigation water storage was carried forward.	Yes

Initial Approaches and Management Measures	Initial Qualitative Evaluation	Carried Forward
Instream Flows		
Logan River Instream Flows	This measure would maintain water in the Logan River. <u>Instream Flow Location</u> The suggestion of providing an instream flow for the Logan River was developed concurrently with the diversion location project measures and would be dependent on which diversion location is selected. • If the First Dam Diversion is selected, instream flows would benefit 15.1 miles of the Logan River (Reaches 1 through 8). • If the Crockett Diversion is selected, instream flows would benefit 13.1 miles of the Logan River (Reaches 4 through 8). • If the Western Pump Station diversion location is selected, it would enable the passage of the entire CAIC diversion right as an instream flow through up to 15.1 miles of the Logan River, while still allowing beneficial use of the water by the CAIC. See Appendix E3, TM-006—Figure 4-2 for a map of the Logan River reaches used to describe the instream flow locations. <u>Instream Flow Rate</u> An instream flow rate of 25 cfs was selected and evaluated by Dr. Bethany Neilson at the UWRL in a water quality model of the Logan River below First Dam. Modeling efforts showed that a 25 cfs instream flow, in addition to the water being withdrawn from the river throughout these study reaches would result in bringing the affected river reaches into attainment of state water quality standards. See Appendix E3 for TM-002—River Hydrology and Hydraulics for photographs of the Logan River at various flow rates and Appendix E4 for TM-011—Water Quality Impacts for a discussion of the water quality analysis and anticipated effects of the proposed instream flow.	Yes

Initial Approaches and Management Measures	Initial Qualitative Evaluation	Carried Forward
Little Logan—Base Flows Reaches 1 through 6	This measure would provide water throughout the entire Little Logan to reduce operational complexity associated with intermittent delivery and recovery. This project measure would increase the amount of seepage loss and subsequent inflow and infiltration to the sewer system when compared to the following options. Under this option, the Little Logan channel may need to be narrowed in sections of Reach 1 to allow room for the main trunk line and recreation corridor, unless neighboring landowners are willing to provide the necessary easements. The details of this option would be identified during the design phase of the project. Any maintenance or repairs in this area may limit recreation access during that time. See Appendix E3, TM-006—Figure 4-2 for a map of the Little Logan reaches used to describe the base flow locations.	Yes
Little Logan—Park Base Flows (Reaches 3 and 5)	This measure would provide base flows in the Little Logan through Merlin Olson Park, Cache County Fairgrounds, and Willow Park to reduce the amount of seepage losses and subsequent inflow and infiltration to the sewer system and would deliver water at the upstream end of the parks and recover the water at the lower end of the parks. <u>Operational simplicity in the other proposed measures was preferred.</u>	No
Little Logan—Base Flows Reaches 2 through 6	The third option is a slight variation to the previous project measure, which would deliver water to the Little Logan just west of Crockett Avenue, in Reaches 2 through 6 of the Little Logan. This option would allow the Little Logan alignment in Reach 1 within the existing easement for the main supply line and recreation with additional space for maintenance and repairs.	Yes

Initial Approaches and Management Measures	Initial Qualitative Evaluation	Carried Forward
Hydropower		
Hydropower	This project measure was suggested in combination with the pressurized secondary irrigation system associated with the diversion at First Dam and storage at the converted lagoons. Currently, seepage and evaporation losses are exacerbated by the need to move water over long distances with pumps. Irrigation demands early in the irrigation season are low, and water is available for storage at the downstream reservoir (lagoons). A hydropower-integrated pressurized system supports piping and pressurization, which reduces these losses. This project measure would install an inline hydropower turbine at the western end of the pressurized secondary irrigation system. The hydroelectric equipment would create hydroelectricity on an ongoing basis to offset pumping costs of the rest of the irrigation system. The Logan River tends to run between 60 and 100 cfs during the winter months, with few to no diversions below First Dam for beneficial use. Under this measure, a non-consumptive water right for 20 cfs outside the irrigation season would allow for extended hydropower generation to offset pumping costs incurred by a pressurized secondary irrigation system needed for agricultural water management.	Yes
Additional Water Rights		
Additional Water Rights	This measure would incorporate the Cow Pasture Irrigation Company's (Cow Pasture) water rights into the CAIC system. The Cow Pasture has water rights sourced from the Logan River, the Fish Hatchery springs, Logan WWTP effluent, and other groundwater sources. A portion of their water rights (9 cfs) is delivered by the Crockett Canal. See Appendix E3, TM-003 Water Rights for details regarding Cow Pasture water rights. To consolidate delivery and add additional water supply to the pressurized secondary irrigation system, all Cow Pasture water rights (a mixture of spring, groundwater, and effluent rights; approximately 40 cfs) could be incorporated into the CAIC system. This action would entail pumping the water into the delivery system.	Yes
Diversion Removal		
Crockett Diversion	This measure would remove the Crockett Diversion in combination with pressurizing the irrigation system. A proposed project measure was to remove the dam, due to its effect on flooding hazards in the vicinity. In place of the diversion structure, Reach 3 would transition to Reach 4 via a series of steps and pools. This action would improve fish passage and recreational access in the area.	Yes

Initial Approaches and Management Measures	Initial Qualitative Evaluation	Carried Forward
Providence Logan	Under a diversion at First Dam, the Providence Logan Irrigation Company (Providence Logan) diversion would be affected, as it relies on a certain amount of flow to be able to divert water into the canal. Consequently, under the PI system with diversion at First Dam, the Providence Logan water would be diverted in the new diversion structure. A low-pressure line would be stubbed across the Logan River to provide water to the head of the Providence Logan canal.	Yes
Providence Pioneer	This measure would combine Providence Pioneer Irrigation Company's (Providence Pioneer) diversions into the CAIC system by supplying water to their canal near the River Heights bridge and removing their diversion structure. Under the PI system, including the Providence Pioneer diversions, this measure would reduce operational complexity to both the CAIC and the Providence Pioneer irrigation systems. This action would render the Providence Pioneer diversion obsolete and would improve fish passage and recreational access in the area.	Yes
<i>Flood Protection and Reduce Flood Damage (Flood Control)</i>		
Stormwater Flood Management		
Flood Option 1: Move water from east to west across 1800 North and then north to Swift Slough	This measure would move flood water from east to west across 1800 North and then north to Swift Slough. Preliminary investigations showed this option would have the least effects to aquatic resources, moderate construction costs, and would not contribute to flooding along the highways or the airport.	Yes
Flood Option 2: Move water from east to west along 2200 North, then south to 1800 North and then north to Swift Slough	This measure would move flood water from east to west along 2200 North, then south to 1800 North and then north to Swift Slough. Preliminary investigations showed this option would have additional effects to aquatic resources and higher construction costs compared to Option 1, and this option was not carried forward.	No
Flood Option 3: Move water from east to west along 2200 North, and then northwest by the airport to Swift Slough	This measure would move flood water from east to west along 2200 North, and then northwest by the airport to Swift Slough. Preliminary investigations showed this option would have the most effects to aquatic resources, the highest construction costs, and could contribute to flooding along the highways and airport, compared to Options 1 and 2, and this option was not carried forward.	No
Irrigation water removal from canals	This measure combined with all the measures involved with pressurizing the irrigation system would remove irrigation water from the distribution canals which contributes to the flooding problem in the CAIC system.	Yes
Logan River Flood Management		
Crockett Diversion replacement	This measure would replace the Crockett Diversion with an overshoot weir and lower crest elevation.	Yes
Crockett Diversion removal	This measure would fully remove the diversion structure and restore the river channel bottom with steps and pools.	Yes

Initial Approaches and Management Measures	Initial Qualitative Evaluation	Carried Forward
Providence Pioneer Diversion removal	This measure would remove the Providence Pioneer Diversion to prevent flooding of surrounding areas during high flow in the Logan River	Yes
Landscaping fill in Lot 1 and Lot 2	This measure would place landscaping fill on two lots, Lot 1 and Lot 2 to prevent overflows of the lots and flooding of the surrounding areas when the river backs up because of the low elevation of the two lots.	Yes
<i>Recreation</i>		
Recreational Opportunities and Safety		
New Canyon Road Trail	This measure would construct a trail in place of the Crockett Canal along a section of the canal that would no longer be used for irrigation delivery if the pressure irrigation measures are selected. The canal could be modified to allow a trail along a section of the canal from about 500 East to 200 East adjacent to Canyon Road. The canal between 500 East and 200 East would no longer carry irrigation water, but a pipe is planned under the trail along this alignment to drain water that would run off the canal and adjacent areas, as well as some periodic pump-to-waste flows from the city well house that is located on Center Street between 200 East and Canyon Road. This trail would provide access to maintain key components of the pressure irrigation and flood prevention infrastructure as well as provide recreational opportunities for residents.	Yes
New River Hollow Park Trail	This measure would construct a new trail at River Hollow Park. River Hollow Park Trail improvements would complement and enhance the agricultural water management improvements that would be made near River Hollow Park if the pressure irrigation measures are constructed. This trail would provide three points of access to River Hollow Park, including one new pedestrian bridge to cross the Logan River just upstream of the existing Crockett Diversion. This trail would provide access to maintain key components of the pressure irrigation and flood prevention infrastructure as well as provide recreational opportunities for residents.	Yes
Floating Passage on River	This measure would remove diversions to allow uninterrupted floating passage along the river. Addressing low level crossings on the Little Logan was considered outside the scope of the Proposed Project.	Yes
Provide river take out at River Hollow Park	This measure would maintain the Crockett Diversion to provide river access at River Hollow Park.	Yes
Constructing foot bridge across Logan River	This measure would construct a foot bridge across the Logan River at River Hollow Park to address safety on river crossings.	Yes

Initial Approaches and Management Measures	Initial Qualitative Evaluation	Carried Forward
Nonstructural Measures		
This approach includes measures that act upon people and property, rather than the infrastructure to improve agricultural water management. This nonstructural measure includes water metering.	Water metering can change behavior by making farmers or water users more aware of their irrigation water usage and the associated costs. This awareness can lead to behavioral changes such as fixing leaks in irrigation systems, using water-efficient irrigation methods, and reducing unnecessary water use. For example, a farmer may realize they are using too much water for crop irrigation and adjust their system to reduce consumption, thereby conserving water.	Yes
Other nonstructural measures include changing building codes, developing land-use planning laws and their enforcement, conducting research and assessment, and providing information resources and public awareness programs to change the way that people interact with the CAIC and irrigation and stormwater water.	These nonstructural measures were outside the scope of this project, but were discussed with Sponsors and involved entities, and they are incorporating them into their policies. For example, the municipalities expressed interest in collaborating through methods such as reevaluating culinary water rates to reflect the true cost of water (which would increase the number of potential future connections contributing payment toward the system) and potentially even placing requirements for landowners to connect to a secondary irrigation system when it becomes available to them.	No
Green Infrastructure		
Green infrastructure is an approach to water management that protects, restores, or mimics the natural water cycle (American Rivers 2024). Green infrastructure incorporates both the natural environment and engineered systems to provide clean water, conserve ecosystem values and functions, and provide a wide array of benefits to people and wildlife. Green infrastructure increases adaptive capacity in communities experiencing flooding, heat waves, and water quality challenges. Green infrastructure can be used in integrated planning to improve water quality, support stormwater management, and help comply with CWA requirements (EPA 2024b).	Upon initial evaluation, the most promising application of green infrastructure in the watershed was maintaining the instream flows in the Logan River to improve water quality in the Logan River. During very low flow summer periods, Logan River flow regimes commonly result in violations of the cold-water fisheries water quality standards for temperature and dissolved oxygen. Based on modeling described in Appendix E4, TM-011—Water Quality Effects and Appendix E5, TM-021—Logan River CAP Analysis, providing instream flows in the Logan River could improve water quality standards for both temperature and dissolved oxygen.	Yes

The measures that the project team carried forward were then compared pairwise to determine which were mutually exclusive or unnecessarily redundant and which could be combined into alternatives. The project team again evaluated the combinations qualitatively to inform the formulation of the initial array of alternative plans detailed in the next section. Table 4-2 illustrates this pairwise compatibility for the management measures and how they were carried forward into alternatives' development.

Table 4-2. Measures Included in Each Alternative

Management Measures	First Dam	Crockett Diversion	First Dam w/Crockett Removal	Western Pumping Station
<i>Agricultural Water Management</i>				
Diversion Location				
<u>First Dam</u> -Move diversion 1.3 miles upstream of current diversion	Yes	No	Yes	No
<u>Crockett Diversion</u> -maintain current location of diversion	No	No	Yes	No
<u>West River Pump Station</u> -move diversion 13.8 miles downstream of current diversion	Partially	Partially	Partially	Yes
Intake Method				
<u>First Dam method</u> —new intake	Yes	No	Yes	No
<u>Crockett pump station</u> —reconstruct Crockett Diversion and install pump station	No	Yes	No	No
<u>Western method</u> —new intake	Partially	Partially	Partially	Yes
Distribution Method				
Pressurized canal deliveries	Yes	Yes	Yes	Yes
Pressurized secondary irrigation system	Yes	Yes	Yes	Yes
Water Storage Method				
Lagoons	Yes	Yes	Yes	Yes
Instream Flows				
<u>Logan River</u> Instream Flows	Yes	Yes	Yes	Yes
<u>Little Logan</u> —Base Flows Reaches 1 through 6	Yes	Yes	No	No
<u>Little Logan</u> —Base Flows Reaches 2 through 6	No	No	Yes	No
Hydropower				
Hydropower	Yes	No	Yes	No
Additional Water Rights				
Additional Water Rights	Yes	No	Yes	Yes
Diversion Removal				
Crockett Diversion	No	No	Yes	Yes
Providence Logan	Yes	No	Yes	No
Providence Pioneer	Yes	Yes	Yes	Yes

Management Measures	First Dam	Crockett Diversion	First Dam w/Crockett Removal	Western Pumping Station
<i>Flood Protection and Reduce Flood Damage (Flood Control)</i>				
Stormwater Flood Management				
Option 1: Move water from east to west across 1800 North and then north to Swift Slough	Yes	Yes	Yes	Yes
Remove irrigation water from canals	Yes	Yes	Yes	Yes
Logan River Flood Management				
Crockett Diversion replacement	Yes	Yes	No	No
Crockett Diversion removal	No	No	Yes	Yes
Providence Pioneer Diversion removal	Yes	No	Yes	No
Landscaping fill in Lots 1 and 2	Yes (Lots 1 and 2)	Yes (Lots 1 and 2)	Yes (Lot 2)	Yes (Lot 2)
<i>Recreation</i>				
Recreational Opportunities and Safety				
New Canyon Road Trail	Yes	Yes	Yes	Yes
New River Hollow Park Trail	Yes	Yes	Yes	Yes
Floating Passage on River	No	No	Yes	Yes
Provide river take out at River Hollow Park	Yes	Yes	No	No
Constructing foot bridge across Logan River	Yes	Yes	Yes	Yes
Other Measures				
Nonstructural Measures				
Water metering	Yes	Yes	Yes	Yes
Green Infrastructure				
Instream flows	Yes	Yes	Yes	Yes

4.1.3 Risk and Uncertainty

The BCA required by NEPA involves both risk and uncertainty. The environmental evaluation required the use of best available science, technology, and information to make well-informed assumptions and predictions. However, existing conditions may change, the public's opinion of a project could evolve, or unexpected circumstances with construction, funding, or design may arise. Each of these differences could alter predictions of environmental consequences.

The quantitative analysis of the action alternatives on ecosystem flows and values is a “conservative” estimate of the benefits from the action alternatives for several reasons. Some benefits (i.e., overall infrastructure reliability, water right reliability, improved aquatic and recreation passage, etc.) are not feasible to estimate a quantitative benefit.

The types of activities associated with the action alternatives—PI installation and infrastructure removal and construction—are common and standard procedures and not considered highly uncertain or involving unique or unknown risks and would not set a precedent for future actions, nor are any of the activities in the action alternatives representing a decision in principle about a future consideration. The action alternatives detail the specific activities involved with the decision (Section 6.2).

4.2 Alternatives Considered

NWPH 601.37B requires alternatives for watershed plans to consist of either land treatment, nonstructural or structural measures, or combinations thereof that will help accomplish one or more of the authorized project purposes. Additionally, as outlined in DM 9500-013, PR&G requires the evaluation of specific alternatives in the initial alternative identification and evaluation, including a nonstructural alternative, an environmentally preferred alternative, and a locally preferred alternative. This section identifies:

- the required No Action Alternative;
- the initial array of alternatives that the team developed from the management measures detailed above; and
- common alternatives noted in DM 9500-013.

4.2.1 No Action Alternative

The No Action Alternative, also known as the Future Without Federal Investment (FWOFI) or the Future Without Project (FWOP), are the same alternative known by different names under NEPA, PR&G, and other guidance documents. The No Action Alternative (FWOFI) is a projection of future conditions and serves as a baseline for the evaluation and comparison of effects of the action alternatives. In this Watershed Plan, the No Action Alternative (FWOFI) is the projection of future conditions with current operations, maintenance, and replacement (OM&R), and independent of the Proposed Project, two new necessary current replacement activities—reconstructing the Crockett Diversion for operational safety, and replacing a portion of the main Crockett Canal that is elevated on a hillside near Merlin Olsen Park to reduce risk of canal or hillside failure, meet the insurance liability requirements, and to maintain current service standards for CAIC. These actions are not connected to the Proposed Project and are expected to occur regardless of whether the Plan–EIS is implemented. This alternative serves as a baseline for the evaluation and comparison of effects of action alternatives. This alternative entails no federal investment in the Project Area. This alternative has been carried through to the final array and is not covered in the evaluation of initial alternatives. This alternative is estimated to cost \$5,050,000. Map 4 in Appendix B illustrates the No Action Alternative.

4.2.2 Initial Array of Action Alternatives

Four action alternatives were formulated that addressed the purpose and need for the project, the project objectives, and the Federal Objective as listed in USDA DR-9500-13 (USDA 2017b). Additionally, alternatives were formulated with consideration to four criteria: 1) completeness, 2) effectiveness, 3) efficiency, and 4) acceptability. Individual and combinations of project measures were selected with regard to achieving the purpose and need, balancing engineering complexity and feasibility, minimizing economic and environmental effects, and adhering to budgetary constraints. The following initial array of alternatives was formulated using the combination of management measures, as identified above.

4.2.2.1 First Dam Alternative

First Dam Alternative improves agricultural water management by implementing measures to improve CAIC's ability to manage agricultural water, including incorporating changes in the diversion location upstream to First Dam as well as downstream at the end of Reach 8, creation

of water storage and pump stations, installation of new hydropower turbines, installation of a new PI system, increased Logan River instream flows, maintained Little Logan base flows, and reconstruction of the Crockett Diversion. Flood prevention is also improved by reconstructing the Crockett Diversion structure with a lower crest elevation, removing Providence Pioneer Diversion, placing fill in Lots 1 and 2, removing irrigation water from canals, and improving infrastructure capacity to move stormwater. Recreation opportunities and connectivity are increased by constructing two new trails by Canyon Road and River Hollow Park, including constructing a new foot bridge across Logan River, and providing river take out at River Hollow Park. First Dam Alternative is estimated to cost \$308,633,000. Map 2 in Appendix B illustrates the First Dam Alternative.

4.2.2.2 Crockett Diversion Alternative

The Crockett Diversion Alternative improves agricultural water management by implementing measures to improve CAIC's ability to manage agricultural water from the current Crockett Diversion location as well as downstream at the end of Reach 8, creation of water storage and pump stations, installation of a new PI system, increased Logan River instream flows, maintained Little Logan base flows, and reconstruction of the Crockett Diversion. Flood prevention is also improved by reconstructing Crockett Diversion with a lower crest elevation, removing Providence Pioneer Diversion, placing fill in Lots 1 and 2, removing irrigation water from canals, and improving infrastructure capacity to move stormwater. Recreation opportunities and connectivity are increased by constructing two new trails by Canyon Road and River Hollow Park, including constructing a new foot bridge across Logan River, and providing river take out at River Hollow Park. Crockett Diversion Alternative would cost \$280,683,400. Map 5 in Appendix B illustrates the Crockett Diversion Alternative.

4.2.2.3 Alternative 1 (First Dam Alternative with Crockett Diversion Removal)

Alternative 1 was presented in the NOI as the Proposed Action. Actions include changing the diversion location of the CAIC's water rights upstream from the existing Crockett Diversion to a new diversion at First Dam and adding an additional point of diversion downstream near the western end of the Logan River near N 3200 W. This alternative includes the removal of Crockett Diversion. A mixed piped and open channel overflow system would be constructed to control floodwaters that enter the Logan, Northern, Hyde Park, Logan North Field, and Logan Northwest Field Canals along the east side of Cache Valley between Logan City and Hyde Park City. Recreation opportunities and connectivity are improved by constructing new trails by Canyon Road and River Hollow Park, including constructing a new foot bridge across Logan River, and providing floating passage on the Logan River. Map 4 in Appendix C illustrates Alternative 1.

4.2.2.4 Alternative 2 (Western Pumping Alternative)

Alternative 2 would move all CAIC diversions west of Logan to improve agricultural water management and flood prevention. The Crockett Diversion would be removed and replaced with a series of steps and pools. The diversion removal would reduce the floodplain, benefit water quality, facilitate fish and recreational passage, and improve river aesthetics. To further reduce flooding, landscaping fill would be added to the south side of Lot 2. The Providence Pioneer diversion would be included in the PI system and the diversion would likewise be removed. This downstream diversion location would improve instream flows significantly over the existing

conditions but has higher tradeoffs in pumping costs and associated carbon emissions. Recreation opportunities and connectivity are increased by constructing new trails by Canyon Road and River Hollow Park, including constructing a new foot bridge across Logan River, and providing floating passage on Logan River. Map 5 in Appendix C illustrates Alternative 2.

4.2.3 Nonstructural Alternatives

No standalone nonstructural alternative was identified that would address the watershed problems while meeting the Sponsor's objectives and avoiding constraints, however, nonstructural measures to meter water were included in all the alternatives included in the final array. Other nonstructural measures to change building codes, develop land-use planning laws and their enforcement, conduct research and assessment, and provide information resources and public awareness programs to change the way that people interact with the CAIC and irrigation and stormwater water were considered, but were outside the scope of our project. These measures were not carried forward, but were discussed with Sponsors and involved entities, and they are incorporating them into their policies.

4.2.4 Locally Preferred Alternative

"In cooperation with local interests that have oversight or implementation authorities and responsibilities, agencies may identify a 'locally preferred' alternative" (DM-9500-013, Section 6(b)(4)(b)(3); USDA 2017a). This alternative may emerge from the collaborative process during agency and public scoping. The First Dam Alternative was created, modified, and supported through a public and local stakeholder process per PR&G. As part of this process, the public and other stakeholders were invited to provide comments and input on the proposed design and evaluation of alternatives. As a result of this input, the agricultural, flood prevention, and recreation infrastructure improvements from the First Dam Alternative would provide the greatest benefit to the community and addressed the hundreds of public comments received during the scoping period focused on providing continuity to the Little Logan while addressing project needs. The First Dam Alternative, subsequently, is the locally preferred alternative.

4.2.5 Agency Preferred Alternative

The "agency preferred alternative" in the WFPO Program under PL 83-566 refers to the option or plan that the NRCS identifies as the most suitable solution to address the specific watershed issues being considered. This alternative is selected based on a comprehensive evaluation of various factors, including environmental effects, economic benefits, technical feasibility, and public input. The First Dam Alternative is the agency preferred alternative.

4.2.6 Environmentally Preferred Alternative

The NEPA Environmentally Preferred Alternative is not a formulation, but rather it is identified through the comparison of alternatives. Based on analysis documented in Section 5.3, the First Dam Alternative was determined to be the environmentally preferred alternative.

4.2.7 National Economic Efficiency Alternative

The NEE Alternative is the alternative or combination of alternatives that reasonably maximizes the net benefit of the project while protecting sensitive environmental resources. The net economic benefit is the benefit minus the cost of the project. The term NEE is being used in this

Plan to identify the most economically efficient alternative. It fits within the “Additional Alternatives” category described in Section 6b(4)(b)5 of DM 9500-013 (USDA 2017a).

With the federal law passage of the 2007 Water Resources Development Act, Congress directed the federal government to update and consolidate its past guidance on evaluating the costs and benefits of federal investments. The original Principles and Guidelines (P&G) was replaced by PR&G as of April 2019. The PR&G allow for:

...maximizing public benefits (of all types) relative to costs, the use of quantified and unquantified information in the tradeoff analysis, flexibility in decision making to promote localized solutions, ability to rely on the best available science and objectivity, and advance transparency for Federal investments in water resources.

The PR&G further state:

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 the consideration of both quantified and unquantified measures.

Although the NEE Alternative terminology does not exist in the PR&G nor NWPM policy, DM 9500-013 refers to NEE in the context of beneficial effects resulting from a water resources investment. Efficiency is the extent to which an alternative alleviates the specified problems and realizes the specified opportunities at least cost. The PR&G and ecosystem services analysis allow for selecting an alternative that may not be the most economically efficient based on consideration of other economic, social, and environmental tradeoffs. Based on analysis documented in Sections 5.1, 5.2, and 5.3, the First Dam Alternative was determined to be the alternative that increases NEE.

4.3 Alternatives Considered but Eliminated from Detailed Study

In accordance with NEPA and NRCS planning policy, multiple alternatives were examined to address watershed problems, to identify potential opportunities, and to meet project objectives. The initial array of alternatives was first screened against the project objectives and constraints (Section 4.3.1) and the remaining initial alternatives were then screened against ecosystem services and economic considerations (Section 4.3.2) to arrive at the final array of alternative plans (Section 4.4).

4.3.1 Screen 1: Objectives and Constraints

Project objectives and constraints are identified in Section 2.1. Each of the alternatives was screened to determine if it met the project objectives and constraints as shown in Table 4-3.

Table 4-3. Summary of Initial Alternatives and First Screening Based on Objectives and Constraints

Criteria	First Dam Alternative	Crockett Diversion Alternative	Alternative 1 (First Dam with Crockett Diversion Removal)	Alternative 2 (Western Pumping)
Objectives				
Objective 1: Address agricultural water management issues (amount of conserved water)	Yes; 5,390 ac-ft	Yes; 5,390 ac-ft	Yes; 5,390 ac-ft	Yes; 5,390 ac-ft
Objective 2: Address agricultural water management maintenance, replacement needs, and costs (costs)	Yes; lowest cost	Yes; moderate cost	Yes; lowest cost	No; costs prohibitively high
Objective 2: Address agricultural water management by improving infrastructure and capability of PI (acres of agricultural land capable of pressure irrigating)	Yes; improves infrastructure and ensures capability of PI in entire CAIC service area	Yes; improves infrastructure and ensures capability of PI in entire CAIC service area	Yes; improves infrastructure and ensures capability of PI in entire CAIC service area	Yes; improves infrastructure and ensures capability of PI in entire CAIC service area
Objective 3: Address agricultural water management by improving secondary irrigation water efficiency to reduce culinary water supply strains (miles of secondary irrigation water)	Yes; improves secondary irrigation water efficiency	Yes; improves secondary irrigation water efficiency	Yes; improves secondary irrigation water efficiency	Yes; improves secondary irrigation water efficiency
Objective 4: Address agricultural water management by improving the Crockett Diversion and the canals' operation during high flow events (measures to address)	Yes; reconstructs Crockett Diversion with lower crest elevation	Yes; reconstructs Crockett Diversion with lower crest elevation	Yes; removes Crockett Diversion	Yes; removes Crockett Diversion
Objective 5: Address agricultural water management by reducing the potential for failure of the Crockett Canal near Canyon Road (measures to address)	Yes; Crockett Canal would no longer be used for irrigation delivery	Yes; Crockett Canal would no longer be used for irrigation delivery	Yes; Crockett Canal would no longer be used for irrigation delivery	Yes; Crockett Canal would no longer be used for irrigation delivery

Criteria	First Dam Alternative	Crockett Diversion Alternative	Alternative 1 (First Dam with Crockett Diversion Removal)	Alternative 2 (Western Pumping)
Objective 6: Address agricultural water management by improving the operational efficiency and long-term sustainability of the irrigation system by incorporating features that reduce energy demands and enhance infrastructure performance (measures to address)	Yes; the hydropower measure and the pressurized system would improve the long-term operational efficiency and sustainability of the irrigation system.	Yes; the PI system would improve the long-term operational efficiency and sustainability of the irrigation system.	Yes; the PI system would improve the long-term operational efficiency and sustainability of the irrigation system.	No; although the PI system would improve the long-term operational efficiency and sustainability of the irrigation system, this alternative would significantly increase energy demands by requiring a two-stage pumping system.
Objective 7: Address flood damage reduction by enhancing stormwater capacity in existing canals (miles of canal irrigation water removed and miles of enhanced stormwater capacity)	Yes; the irrigation water would be removed from the canals and appropriate infrastructure improvements enhance stormwater capacity	Yes; the irrigation water would be removed from the canals and appropriate infrastructure improvements enhance stormwater capacity	Yes; the irrigation water would be removed from the canals and appropriate infrastructure improvements enhance stormwater capacity	Yes; the irrigation water would be removed from the canals and appropriate infrastructure improvements enhance stormwater capacity
Objective 8: Address flood damage reduction by improving the Crockett and Providence Pioneer diversions' operation during high flow events (measures to address)	Yes; reconstructs Crockett Diversion with lower crest elevation and removes Providence Pioneer Diversion	Yes; reconstructs Crockett Diversion with lower crest elevation and removes Providence Pioneer Diversion	Yes; removes Crockett Diversion and Providence Pioneer Diversion	Yes; removes Crockett Diversion and Providence Pioneer Diversion
Objective 9: Address flood damage reduction by reducing overflow into adjacent lots that contribute to flooding surrounding areas (Y/N, Lot number with reduction).	Yes; Lots 1 and 2	Yes; Lots 1 and 2	Yes; Lot 2	Yes; Lot 2

Criteria	First Dam Alternative	Crockett Diversion Alternative	Alternative 1 (First Dam with Crockett Diversion Removal)	Alternative 2 (Western Pumping)
Objective 10: Enhance recreational opportunities ancillary to replacing the existing canal where the canal water would be piped and to providing access to maintain key components of the pressure irrigation and flood prevention infrastructure by providing new trails (feet of trail construction)	Yes; constructs 4,430 feet of trail (Canyon Road and River Hollow Park trails)	Yes; constructs 4,430 feet of trail (Canyon Road and River Hollow Park trails)	Yes; constructs 4,430 feet of trail (Canyon Road and River Hollow Park trails)	Yes; constructs 4,430 feet of trail (Canyon Road and River Hollow Park trails)
Objective 11: Enhance recreational opportunities by improving terrestrial and river trail connectivity, including public river access (Y/N, bridge construction across Logan River)	Yes; improves public river access at River Hollow Park, including constructing a bridge across the Logan River	Yes; improves public river access at River Hollow Park, including constructing a bridge across the Logan River	Yes; improves public river access at River Hollow Park, including constructing a bridge across the Logan River	Yes; improves public river access at River Hollow Park, including constructing a bridge across the Logan River
Constraints				
Constraint 1: Resolve adverse effects to historic properties through implementation of a MOA (canals for which Cultural Resources MOA needed)	Low	Low	Low	Low
Constraint 2: Minimize land access acquisition (acres of land acquisition)	Yes; no land acquisition needed	Yes; no land acquisition needed	Yes; no land acquisition needed	Yes; no land acquisition needed
Constraint 3: Maintain open water and base flows in the Little Logan (Yes/No)	Yes	Yes	Yes	No

Criteria	First Dam Alternative	Crockett Diversion Alternative	Alternative 1 (First Dam with Crockett Diversion Removal)	Alternative 2 (Western Pumping)
Constraint 4: Maintain the existing connection from the Logan River into the Little Logan for aquatic species and recreationists (Yes/No)	Yes	Yes	No	No
Constraint 5: Maintain aquatic species passage from Logan River into the Little Logan (Yes/No)	Yes	Yes	No	No
Constraint 6: Maintain recreational opportunities and aesthetic values in the Little Logan (Yes/No)	Yes	Yes	No	No
Constraint 7: Reduce costs on State roads to improve stream crossings and move flood waters to reduce infrastructure flood damage (Yes/No)	Yes	Yes	Yes	Yes
Constraint 8: Use Logan City water shares to supply base flows for the Little Logan (unknown)	Will need to be determined in design stage	Will need to be determined in design stage	Will need to be determined in design stage	Will need to be determined in design stage
Constraint 9: Maintain the existing hydraulic gradient and use existing bank stabilization at the Crockett Diversion to control erosion and prevent head cutting (Yes/No)	Yes	Yes	No	No
Alternative Carried Forward?	Yes	Yes	No	No

Alternative 1—the First Dam Alternative with the removal of Crockett Diversion—was eliminated from detailed study due to the public’s interest in maintaining the existing connection between the Little Logan and the Logan River—for recreationist as well as aquatic species, as captured in Constraints 3, 4, 5, and 9. The public submitted numerous comments concerning this connection and the Sponsors and NRCS responded by creating the First Dam Alternative which replaces the Crockett Diversion instead of removing it. As a result, Alternative 1 was dismissed from further study.

Alternative 2—the Western Pumping Alternative—was also eliminated from detailed study due to lack of stakeholder support to pay for the high pumping costs associated with this alternative. Alternative 2, while significantly improving instream flows in the Logan River over the existing conditions, has higher tradeoffs in pumping costs that made maintaining the desired efficiency and realizing the desired benefits with this alternative unfeasible, and the alternative failed to meet Objective 2. Additionally, though this alternative would improve operational efficiency through the development of a PI system, this alternative would significantly increase energy demands by requiring a two-stage pumping system preventing it from meeting Objective 6. Furthermore, the associated carbon emissions associated with the alternative made the environmental costs the highest of all the alternatives considered. As a result, Alternative 2 was dismissed from further study.

4.3.2 Screen 2: Ecosystem Services and Economic Considerations

After the preliminary screening of the initial array of alternatives using the project objectives and constraints, a preliminary economic and ecosystem services analysis was conducted to determine if the remaining alternative would meet economic requirements and the extent to which it would enrich or reduce ecosystem services. The process in this watershed plan used a two-step screening process in the initial array to avoid expenditures on further economic and ecosystem services analysis by eliminating alternatives from the initial array by first applying less rigorous screening criteria before moving forward with other more involved economic and ecosystem services analysis.

As part of the formulation of alternatives process, an Ecosystem Services Framework was used to evaluate benefits and costs for the Proposed Project (see Section 1.5.2). Ecosystem services were evaluated using rough approximations of potential service flows using professional judgement and knowledge of watershed resources and conditions. Economic analyses were based upon approximate estimates of costs and benefits based upon previous projects in similar conditions. Table 4-4 displays the outcome of these analyses and shows the estimated change in ecosystem service benefits (increase, consistent with expected future conditions, or a reduction).

This screen resulted in final selection of the First Dam and Crockett Diversion Alternatives to carry forward through the analysis.

Table 4-4. Summary of Second Screening of Initial Array of Alternatives for Ecosystem Services and Economics

Ecosystem Service	First Dam Alternative		Crockett Diversion Alternative	
	Value	Change in Ecosystem Service Benefit	Value	Change in Ecosystem Service Benefit
<i>Provisioning Services</i>				
Increased hydroelectricity production ¹	\$194,000	Increase	\$0	No change
Reduction in power requirements during peak emissions	Large reduction with hydropower production	Increase	Power requirements actually increase over existing condition	Decrease

Ecosystem Service	First Dam Alternative		Crockett Diversion Alternative	
	Value	Change in Ecosystem Service Benefit	Value	Change in Ecosystem Service Benefit
Clean air (CO ₂ tons/year of GHG emissions)	430,000	Increase	6,280,000	Decrease
Conserved water (ac-ft)	5,390 ac-ft	Increase	5,390 ac-ft	Increase
Regulating Services				
Reduced property damage ¹	\$10,134,900	Increase	\$10,134,900	Increase
Reduced road damage	Reduction of damage to 3,150 feet of roadway	Increase	Reduction of damage to 3,150 feet of roadway	Increase
Reduced damage to agricultural income ¹	\$1,140,500	Increase	\$1,140,500	Increase
Reduced water treatment and supply expenses ¹	\$2,000,000	Increase	\$2,000,000	Increase
Change in instream flows	Increased instream flows below Crockett Diversion	Increase	Increased instream flows above and below Crockett Diversion	Increase
Cultural Services				
Recreation ¹	\$232,400	Increase	\$232,400	Increase
Economic				
Benefit-cost ratio	1.1	Increase	1.1	Increase
Average annualized benefit ¹	\$15,754,700	Increase	\$15,431,500	Increase
Average annualized cost ¹	\$14,860,700	Increase	\$13,579,100	Increase
ALTERNATIVE CARRIED FORWARD?	Yes		Yes	

¹Price base: 2025 dollars amortized over 50 years at a discount rate of 3.0 percent.

4.4 Final Array of Alternatives Considered for Detailed Study

In this Draft Plan-EIS, the following alternatives considered for the Proposed Project were carried forward to study in greater detail: the No Action Alternative (FWOFI), First Dam Alternative, and Crockett Diversion Alternative. A description of these alternatives is presented below.

4.4.1 No Action Alternative (Future Without Federal Investment)

This alternative entails no federal investment in the Project Area. Under the No Action Alternative (FWOFI), the 10 irrigation companies that comprise the CAIC would continue to divert water from the Logan River. The Crockett Diversion structure would be reconstructed for improved operational flexibility and safety, and a portion of main Crockett Canal that is elevated on a hillside near Merlin Olsen Park would be replaced to reduce the risk of canal or hillside

failure, to meet the insurance liability requirements, and to maintain current service standards for CAIC. These actions are not connected to the Proposed Project and are expected to occur regardless of whether the Plan-EIS is implemented. The remaining infrastructure would continue to operate in its current condition but would be improved through future enclosure action over the next fifty years. Water would continue to be distributed through the existing canal systems. Existing river conditions would continue as described in Appendix E3, TM-002 River Hydrology and Hydraulics; no instream flows would be provided.

In the future, CAIC would enclose the majority of the canals for safety, maintenance, and conservation purposes. This action would likely occur through a phased approach, targeting key areas of high-water loss or maintenance challenges first. See Appendix E3, TM-004 for additional details regarding the anticipated phasing for future enclosure. Also inherent in the FWOFI is the assumption that all culinary projects listed in the municipal water master plans would be constructed in their currently anticipated timeline. These projects include transmission line construction/replacement as well as water storage and sourcing projects that would be avoided in the Logan River Watershed action alternatives. See Appendix E4, TM-012 for additional details regarding the municipal water master plans. The initial estimated installation cost for the FWOFI was \$5,050,000.

Under the No Action Alternative, very little would change operationally. The alternative includes a reconstruction of the current diversion and lining of a section of the canal. The proposed new diversion would include overshot gates to replace the existing stoplogs. Instead of placing stoplogs to regulate diversion, the gates would be raised and lowered pneumatically; this action would reduce hazards to system operators, reduce flood hazard potential, and facilitate the passing of debris that historically has jeopardized the structure. All other operations would continue.

4.4.2 First Dam Alternative

First Dam Alternative would change the main irrigation diversion location of the CAIC's water rights to First Dam and add an additional point of diversion downstream on the western end of the Logan River near N 3200 W to allow for PI opportunities that would reduce water losses and pumping requirements while enhancing secondary irrigation water connections to agricultural producers and residents in the service area. The existing, unused Logan City lagoons would be converted to a secondary irrigation water storage reservoir, and three pump stations would be constructed with hydropower generating capabilities to service water supply and withdrawals from the reservoir.

The Crockett Diversion would be reconstructed to allow river flows to continue to be diverted into the Little Logan and would include overflow gates to pass flood flows and debris in times of high runoff or storm events.

The Providence Pioneer Irrigation Company's diversion would be removed to improve public safety, water quality, and river aesthetics, and to facilitate fish habitat and recreational opportunities.

The alternative would secure and manage instream flows while recognizing water rights by increasing the amount of flow in the Logan River from the Crockett Diversion to the downstream western diversion point during the irrigation season and particularly ensuring base flow water to the entire Little Logan during the irrigation season.

This alternative would reduce flooding in the watershed by removing irrigation water from the canals and improving a portion of the existing canals to carry runoff flows to a newly constructed regional overflow facility (pipe) at 1800 North that would carry large flood flows to the west. This design would allow floodwater that currently overflows the major canals that run north through Logan, North Logan, and Hyde Park cities to be safely transported to the west to Swift Slough.

Approximately 3,420 feet of recreational trails would be constructed along Canyon Road and along the Crockett Canal's ROW corridor from 600 East to 200 East. Also, 1,010 feet of trail, including a 75-foot bridge, would be constructed from Sumac Drive across the Logan River through the southern side of River Hollow Park and adjacent to the open channel of the Little Logan to allow for increased recreational use in the area. These recreational development improvements are ancillary to replacing the existing canal where the canal water would be piped and to providing access to maintain key components of the pressure irrigation system. The estimated cost for this alternative is \$308,633,000. Additional details on this alternative are included in Chapter 6.

4.4.3 Crockett Diversion Alternative

Crockett Diversion Alternative is similar in scope to First Dam Alternative, except that hydropower generators at the reservoir (lagoons) would not be installed and the current point of diversion for CAIC's water rights would not be moved to First Dam. Consequently, a new trunkline between First Dam and the Crockett Avenue diversion would not be required, but more pumping—and the installation of an additional pump—would be required to operate the pressure irrigation system because of the reduced elevation of the diversion location compared to the First Dam Alternative. The majority of CAIC's water rights would continue to be supplied by diverting water at the current Crockett Diversion, in addition to the new point of diversion along the western end of the Logan River near N 3200 W, like the First Dam Alternative.

Besides these differences and associated actions, the remainder of the PI improvements (i.e., constructing PI distribution system; converting lagoons to secondary irrigation water storage reservoir; constructing pump stations; removing Providence Pioneer dam; etc.) and all the flood control and recreational improvements would be the same as in the First Dam Alternative. Crockett Diversion Alternative is estimated to cost \$280,683,400 to install.

4.4.4 Final Array of Alternatives Summary

Table 4-5 displays the project measures by alternative and purpose. The First Dam Alternative has an approximate 575-acre footprint, which includes providing 21 acres of instream and base flows for the Logan River and the Little Logan, and the Crockett Diversion Alternative has an approximate 415-acre footprint, which includes providing 19 acres of instream and base flows for the Logan River and the Little Logan.

Table 4-5. Project Measures by Alternative and Purpose

Project Measures	Purpose Addressed		
	Agricultural Water Management and Flood Prevention		Recreation
	Ag Water Distribution/ Stormwater	Floodplains	
NO FEDERAL ACTION ALTERNATIVE			
Rebuild Crockett Diversion according to Crockett Pressurized Irrigation Master Plan (acres) (0.5 acres total construction activity disturbance/ 0.3 acres temporary effects to aquatic resources)	0.3	-	-
Replace a portion of the Crockett Canal (feet)	2,500	-	-
FIRST DAM ALTERNATIVE			
Remove sediment from First Dam (cubic yards [CY]; acres)	85,000; 11	-	-
Rebuild intake screening at First Dam (acres)	<0.1	-	-
Install penstock connection pipe (feet)	60	-	-
Install outlet tee and connection for instream flows just below First Dam (feet)	8	-	-
Install supply line from First Dam to distribution system pipeline network (feet)	8,500	-	-
Install hydropower station (ft ²)	1,500	-	-
CROCKETT DIVERSION ALTERNATIVE			
Install Crockett pump station	Yes	-	-
CROCKETT DIVERSION AND FIRST DAM ALTERNATIVES			
Install distribution system pipeline network (miles)	120	-	-
Provide 25 cfs Logan River instream flows (miles)	15.1 First Dam Alt 13.1 Crockett Alt	-	-
Provide 5–10 cfs Little Logan base flows (miles)	4.8	-	-
Install Lagoons, Cow Pasture, and West River pump stations	Yes	-	-
Install pressurized connection to existing distribution system pipeline in Benson area	Yes	-	-
Improve and develop storage reservoir (acres)	300	-	-

Project Measures	Purpose Addressed		
	Agricultural Water Management and Flood Prevention		Recreation
	Ag Water Distribution/ Stormwater	Floodplains	
Improve system return flow from storage reservoir to the Logan River (feet)	6,650	-	-
Block NW Canal split	Yes	-	-
Improve earthen ditches or canals (feet)	3,600	-	-
Install new pipe (feet)	25,670	-	-
Line earthen ditches or canals (feet)	6,210	-	-
Install box culvert in Twin Canals (feet)	9,750	-	-
Construct diversion structures at 3 canals to divert flood water into transmission pipe (ft ²)	1,800	-	-
Construct Swift Slough outfall structure (ft ²)	500	-	-
Rebuild Crockett Diversion (acres)	-	0.3	-
Place fill in landscaping Lot 1 (CY)	-	183	-
Place fill in landscaping Lot 2 (CY)	-	89	-
Remove Providence Pioneer diversion	-	Yes	-
Construct trail (feet)	-	-	4,430
Construct pedestrian bridge over Logan River (feet) (included in the 4,430 feet of trail construction)	-	-	75
Associated Activities	No Federal Action Alternative	First Dam Alternative	Crockett Diversion Alternative
NO FEDERAL ACTION, CROCKETT DIVERSION, FIRST DAM ALTERNATIVES			
Staging areas (acres)	<1	90	90
Jobs during construction	4	52	52

For a summarized description—including major items used in the decision-making process—of the alternatives brought forward for detailed analysis, the No Action Alternative, First Dam Alternative, and Crockett Diversion Alternative, please see the following tables in Chapter 5:

- Table 5-1. Summary and Comparison of Alternatives—Planning Process
- Table 5-2. Summary and Comparison of Alternatives—Ecosystem Services
- Table 5-3. Summary and Comparison of Alternatives—Environmental Effects Related to Resource Concerns

Chapter 5 Environmental Consequences— Evaluation of Alternatives

This chapter of the plan evaluates and compares alternatives in detail based on their performance against planning criteria (Section 5.1), ecosystems services (Section 5.2), and environmental effects (Section 5.3).

5.1 Summary and Comparison of Alternatives—Planning Process

Table 5-1 compares the alternatives on how well they resolve the identified problems, examining their performance against the project objectives, constraints, and the evaluation criteria of completeness, acceptability, efficiency, and effectiveness. PR&G defines these evaluation criteria as follows:

- Completeness is the extent to which an alternative provides and accounts for all features, investments, and/or other actions necessary to realize the planned effects, including any necessary actions by others. It does not necessarily mean that alternative actions need to be large in scope or scale.
- Effectiveness is the extent to which an alternative alleviates the specified problems and achieves the specified opportunities.
- Efficiency is the extent to which an alternative alleviates the specified problems and realizes the specified opportunities at the least cost.
- Acceptability is the viability and appropriateness of an alternative from the perspective of the Nation’s 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.

Table 5-1. Summary and Comparison of Alternatives—Planning Process

Item of Concern	Alternative		
	No Action (FWOFI) Alternative	First Dam Alternative	Crockett Diversion Alternative
Measures by Authorized Purpose			
Agricultural Water Management	Addresses emergency replacement needs for agricultural water management but does not address the remainder of the infrastructure deficiencies.	Addresses agricultural water management by implementing measures to improve CAIC’s ability to manage agricultural water.	Addresses agricultural water management by implementing measures to improve CAIC’s ability to manage agricultural water.

Item of Concern	Alternative		
	No Action (FWOFI) Alternative	First Dam Alternative	Crockett Diversion Alternative
Flood prevention/flood damage reduction	Does not address flood prevention.	Addresses flood prevention by reconstructing Crockett Diversion with lower crest elevation, removing Providence Pioneer Diversion, placing fill in Lots 1 and 2, removing irrigation water from canals, and improving infrastructure capacity to move stormwater.	Addresses flood prevention by reconstructing Crockett Diversion with lower crest elevation, removing Providence Pioneer Diversion, placing fill in Lots 1 and 2, removing irrigation water from canals, and improving infrastructure capacity to move stormwater.
Recreation	Does not address recreation.	Addresses recreation by constructing 4,430 feet of trail (Canyon Road and River Hollow Park trails).	Addresses recreation by constructing 4,430 feet of trail (Canyon Road and River Hollow Park trails).
Objectives			
Objective 1: Address agricultural water management issues (amount of conserved water)	Does not address agricultural water management issues. The Project Area would continue to experience water loss from seepage.	Addresses agricultural water management issues by implementing measures which conserve 5,390 ac-ft of water annually by piping irrigation water.	Addresses agricultural water management issues by implementing measures which conserve 5,390 ac-ft of water annually by piping irrigation water.
Objective 2: Address agricultural water management maintenance, replacement needs, and costs (costs)	Would not reduce costs for O&M of laterals of \$325,000 annually. In total, average annualized costs under the FWOFI are approximately \$533,900 per year to simply maintain the current benefits of the system. In addition, there are approximately \$1,100,000 in damages to agricultural income. that could be reduced under the Action Alternatives.	Although O&M costs would increase to \$1,910,000 annually, new infrastructure for agriculture and culinary water would not need to be constructed.	Although O&M costs would increase to \$2,230,000 annually, new infrastructure for agriculture and culinary water would not need to be constructed.

Item of Concern	Alternative		
	No Action (FWOFI) Alternative	First Dam Alternative	Crockett Diversion Alternative
Objective 2: Address agricultural water management by improving infrastructure and capability of PI (acres of agricultural land capable of pressure irrigating)	Would not improve infrastructure, and 0 acres of agricultural land would be capable of PI.	Improves infrastructure and ensures capability of PI for 10,350 acres.	Improves infrastructure and ensures capability of PI for 10,350 acres.
Objective 3: Address agricultural water management by improving secondary irrigation water efficiency to reduce culinary water supply strains (miles of secondary irrigation water)	Would not improve secondary irrigation water efficiency and installs 0 miles of pipe for secondary irrigation water.	Would improve secondary irrigation water efficiency by installing 120 miles of pipe and associated infrastructure.	Would improve secondary irrigation water efficiency by installing 120 miles of pipe and associated infrastructure.
Objective 4: Address agricultural water management by improving the Crockett Diversion and the canals' operation during high flow events (measures to address)	Necessarily improves the Crockett Diversion and only addresses 2,500 feet of the North Branch Canal (Crockett Canal) but does not address the remainder of the deteriorating infrastructure.	Would reconstruct Crockett Diversion with lower crest elevation and remove irrigation water from canals.	Would reconstruct Crockett Diversion with lower crest elevation and remove irrigation water from canals.
Objective 5: Address agricultural water management by reducing the potential for failure of the Crockett Canal near Canyon Road (measures to address)	Would reduce the potential for failure by replacing 2,500 feet of the North Branch Canal (Crockett Canal) near Canyon Road.	Would eliminate the need for Crockett Canal to be used for irrigation delivery by piping the water. Would construct a trail with stormwater capacity in place of the canal.	Would eliminate the need for Crockett Canal to be used for irrigation delivery by piping the water. Would construct a trail with stormwater capacity in place of the canal.

Item of Concern	Alternative		
	No Action (FWOFI) Alternative	First Dam Alternative	Crockett Diversion Alternative
Objective 6: Address agricultural water management by improving the operational efficiency and long-term sustainability of the irrigation system by incorporating features that reduce energy demands and enhance infrastructure performance	Would not improve the operational efficiency and long-term sustainability of the irrigation system.	Would improve the operational efficiency and long-term sustainability of the irrigation system by incorporating a PI system and hydropower, capitalizing on the gravitational flow of water, which would reduce energy demand and enhance infrastructure performance. This alternative integrates energy recovery features that reduce reliance on external power sources, offset operational costs, and enhance the overall return on infrastructure investments.	Would improve the operational efficiency and long-term sustainability of the irrigation system by incorporating a PI system enhancing infrastructure performance.
Objective 7: Address flood damage reduction by enhancing stormwater capacity in existing canals (miles of canal irrigation water removed and miles of enhanced stormwater capacity)	Would not remove the irrigation water from the canals and they would still flood during storm events.	Would remove the irrigation water from the canals and make appropriate infrastructure improvements to enhance stormwater capacity.	Would remove the irrigation water from the canals and make appropriate infrastructure improvements to enhance stormwater capacity.
Objective 8: Address flood damage reduction by improving the Crockett and Providence Pioneer diversions' operation during high flow events (measures to address)	Would replace the Crockett Diversion to improve high flow performance but would not address Providence Pioneer's diversion.	Reconstructs Crockett Diversion with a lower crest elevation. and removes Providence Pioneer Diversion.	Reconstructs Crockett Diversion with a lower crest elevation. and removes Providence Pioneer Diversion.

Item of Concern	Alternative		
	No Action (FWOFI) Alternative	First Dam Alternative	Crockett Diversion Alternative
Objective 9: Address flood damage reduction by reducing overflow into adjacent lots that contribute to flooding surrounding areas (fill in Lots 1 and 2)	Would not place fill in Lots 1 and 2 and flows from the Logan River would continue to leave the channel during 100-year flood events.	Would place fill in Lots 1 and 2.	Would place fill in Lots 1 and 2.
Objective 10: Enhance recreational opportunities ancillary to replacing the existing canal where the canal water would be piped and to providing access to maintain key components of the pressure irrigation and flood prevention infrastructure by providing new trails (feet of trail construction)	Would not provide new trails.	Would construct 4,430 feet of trail (Canyon Road and River Hollow Park trails).	Would construct 4,430 feet of trail (Canyon Road and River Hollow Park trails).
Objective 11: Enhance recreational opportunities by improving terrestrial and river trail connectivity, including public river access (bridge construction across Logan River)	Would not improve public river access.	Improves public river access at River Hollow Park, including constructing a bridge across the Logan River.	Improves public river access at River Hollow Park, including constructing a bridge across the Logan River.

Item of Concern	Alternative		
	No Action (FWOFI) Alternative	First Dam Alternative	Crockett Diversion Alternative
Constraints			
Constraint 1: Resolve adverse effects to historic properties through implementation of a MOA (piping of canals for which a Cultural Resources MOA needed)	Would not address historic property management.	Though the First Dam Alternative would result in adverse effects (canal piping) to historic properties, those effects would be mitigated through a Cultural Resources MOA, consistent with 36 CFR 800.6. These mitigation stipulations are designed to conserve the value of the eligible cultural resources. Conserving the value of the eligible cultural resources would ensure that piping the canals would not result in the loss of knowledge of early irrigation systems, their design, or reduce the ability to gain knowledge of early irrigation systems into the future.	Though the Crockett Diversion Alternative would result in adverse effects (canal piping) to historic properties, those effects would be mitigated through a Cultural Resources MOA, consistent with 36 CFR 800.6. These stipulations are designed to conserve the value of the eligible cultural resources. Conserving the value of the eligible cultural resources would ensure that piping the canals would not result in the loss of knowledge of early irrigation systems, their design, or reduce the ability to gain knowledge of early irrigation systems into the future.
Constraint 2: Minimize land access acquisition (acres of land acquisition)	Would not require land acquisition.	The First Dam Alternative would not require land acquisition.	The Crockett Diversion Alternative would not require land acquisition.
Constraint 3: Maintain open water and base flows in the Little Logan	Would maintain open water in the Little Logan but provides no guarantee of base flows.	The First Dam Alternative would maintain open water in the Little Logan and provide 5-10 cfs base flows.	The Crockett Diversion Alternative would maintain open water in the Little Logan and provide 5-10 cfs base flows.
Constraint 4: Maintain the existing connection from the Logan River into the Little Logan for aquatic species and recreationists	Would maintain the existing connection from the Logan River into the Little Logan for aquatic species and recreationists.	Would maintain the existing connection from the Logan River into the Little Logan for aquatic species and recreationists.	Would maintain the existing connection from the Logan River into the Little Logan for aquatic species and recreationists.

Item of Concern	Alternative		
	No Action (FWOFI) Alternative	First Dam Alternative	Crockett Diversion Alternative
Constraint 5: Maintain aquatic species passage from Logan River into the Little Logan	Would maintain aquatic species passage from Logan River into the Little Logan.	Would maintain aquatic species passage from Logan River into the Little Logan.	Would maintain aquatic species passage from Logan River into the Little Logan.
Constraint 6: Maintain recreational opportunities and aesthetic values in the Little Logan	Would maintain recreational opportunities and aesthetic values in the Little Logan.	Would maintain recreational opportunities and aesthetic values in the Little Logan.	Would maintain recreational opportunities and aesthetic values in the Little Logan.
Constraint 7: Reduce costs on State roads to improve stream crossings and move flood waters to reduce infrastructure flood damage (feet)	Would not install stormwater infrastructure that reduces costs on State roads and moves flood waters to reduce infrastructure flood damage.	Would install stormwater infrastructure that reduces costs on State roads and moves flood waters to reduce infrastructure flood damage to 3,150 feet of roadway.	Would install stormwater infrastructure that reduces costs on State roads and moves flood waters to reduce infrastructure flood damage to 3,150 feet of roadway.
Constraint 8: Use Logan City water shares to supply base flows for the Little Logan	Would maintain open water in the Little Logan but provides no guarantee of base flows.	Would be determined in design stage	Would be determined in design stage
Constraint 9: Maintain the existing hydraulic gradient and use existing bank stabilization at the Crockett Diversion to control erosion and prevent head cutting	Would maintain the existing hydraulic gradient and use existing bank stabilization at the Crockett Diversion to control erosion and prevent head cutting.	Would maintain the existing hydraulic gradient and use existing bank stabilization at the Crockett Diversion to control erosion and prevent head cutting.	Would maintain the existing hydraulic gradient and use existing bank stabilization at the Crockett Diversion to control erosion and prevent head cutting.
Evaluation Criteria			
Completeness	Incomplete—though the FWOFI takes emergency actions, it does not account for all features, investments, and/or other actions necessary to realize the planned effects of addressing the watershed problems and objectives.	Complete—the First Dam Alternative is complete, in that it provides and accounts for all necessary investments to ensure the realization of the planned effects, including coordination with USACE and EPA.	Complete—the Crockett Diversion Alternative is complete, in that it provides and accounts for all necessary investments to ensure the realization of the planned effects, including coordination with USACE and EPA.

Item of Concern	Alternative		
	No Action (FWOFI) Alternative	First Dam Alternative	Crockett Diversion Alternative
Effectiveness	Ineffective—does not completely address the problem, achieve objectives, or avoid all the constraints.	Effective—addresses the problems, objectives, opportunities, and avoids constraints. The First Dam Alternative is effective and efficient in that it alleviates water losses due to seepage and reduces maintenance costs and develops the capability for PI and secondary irrigation water throughout the CAIC service area; reduces flood damage by addressing stormwater and high flow events concerns and improves recreation opportunities by constructing trails and access.	Effective—addresses the problems, objectives, opportunities, and avoids constraints. The Crockett Diversion Alternative is effective and efficient in that it alleviates water losses due to seepage and reduces maintenance costs and develops the capability for PI and secondary irrigation water throughout the CAIC service area; reduces flood damage by addressing stormwater and high flow events concerns and improves recreation opportunities by constructing trails and access.
Efficiency	Efficiency does not exist in the absence of effectiveness.	Efficient—A BCR of 1.1 and average annualized benefit of \$15,754,700 are considered efficient.	Efficient—A BCR of 1.1 and average annualized benefit of \$15,431,500 are considered efficient.

Item of Concern	Alternative		
	No Action (FWOFI) Alternative	First Dam Alternative	Crockett Diversion Alternative
Acceptability	The FWOFI is neither entirely acceptable nor entirely unacceptable as defined in PR&G. The FWOFI is a viable alternative from the national perspective as it is consistent with existing Federal laws, authorities, and policies. However, the FWOFI is not an appropriate alternative as it leaves considerable risk to life and property and continues to contribute to water quality violations.	Acceptable—the First Dam Alternative is also acceptable, in that controversy from the general public regarding the alternative was addressed, and it is consistent with existing federal laws, authorities, and public policies.	Acceptable—the Crockett Diversion Alternative is also acceptable, in that controversy from the general public regarding the alternative was addressed, and it is consistent with existing federal laws, authorities, and public policies.

5.2 Summary and Comparison of Alternatives—Ecosystem Services

This section provides the PR&G tradeoff analysis between the economic, environmental, and social goals. Alternatives were similarly compared in terms of their contribution to the Federal Objective and its Guiding Principles and economic costs and benefits. Table 5-2 depicts the results of this comparison.

Table 5-2. Summary and Comparison of Alternatives—Ecosystem Services

Item	No Action Alternative FWOFI	First Dam Alternative	Crockett Diversion Alternative
Alternatives			
Locally Preferred	While the FWOFI would maintain the existing conditions, it does not address the flood prevention and flood damage reduction need and would only provide limited agricultural infrastructure improvements.	The First Dam Alternative was created, modified, and supported through a public and local stakeholder process per PR&G. As part of this process, the public and other stakeholders were invited to provide comments and input on the proposed design and evaluation of alternatives. As a result of this input, the agricultural, flood prevention, and recreation infrastructure improvements from the First Dam Alternative would provide the greatest benefit to the community and addressed the hundreds of public comments received during the scoping period focused on providing continuity to the Little Logan while addressing project needs. The First Dam Alternative, subsequently, is the locally preferred alternative.	Though the Crockett Diversion Alternative was comparable in the quantified ecosystem services BCA compared to the First Dam Alternative, it was not locally preferred because the addition of the pump station near residential areas would have caused undesirable, though minor, noise effects, and the additional \$500,000 per year in electricity expenses and associated greenhouse gas emissions were unacceptable.
Nonstructural	The FWOFI would maintain the existing conditions in the Project Area.	There was no standalone nonstructural alternative that would address the watershed problems while meeting the Sponsor's objectives and avoiding constraints, however, nonstructural measures to meter water were included in this alternative.	There was no standalone nonstructural alternative that would address the watershed problems while meeting the Sponsor's objectives and avoiding constraints, however, nonstructural measures to meter water were included in this alternative.

Item	No Action Alternative FWOFI	First Dam Alternative	Crockett Diversion Alternative
NEE	The FWOFI would require no Federal project investment.	Based on analysis documented in Sections 5.1, 5.2 and 5.3, the First Dam Alternative was determined to be the alternative that increases NEE. The First Dam Alternative would require an average annualized cost of \$14,860,700, and provide \$15,754,700 in average annualized benefits, representing a BCR of 1.1.	This alternative would require an average annualized cost of \$13,579,100, and provide \$15,431,500 in average annualized benefits, representing a BCR of 1.1. Though the Crockett Diversion Alternative was comparable in the quantified ecosystem services BCA compared to the First Dam Alternative, it was not the NEE Alternative because the addition of the pump station near residential areas would have caused undesirable, though minor, noise effects, and the additional \$500,000 per year in electricity expenses and associated greenhouse gas emissions were unacceptable.
Environmentally Preferable	With the FWOFI, 6,050 ac-ft of annual seepage and carrier water losses would persist, leaving the watershed vulnerable to water fluctuations compared to the action alternatives. Current levels of GHGs would persist, including 1,048,000 lbs of CO₂ emissions. Additionally, the current CAP (TM-021) Summer Base Flow rating is Very Good for 1 river mile, but Poor for 14 river miles.	Based on analysis documented in Section 5.3, the First Dam Alternative was determined to be the environmentally preferred alternative. Compared to the FWOFI, this alternative conserves 5,390 ac-ft of water. Compared to the other alternatives, this alternative reduces GHGs to 760,000 lb of CO₂ emissions. Some minor environmental tradeoffs would occur with selection of this alternative. While this alternative has a CAP (TM-021) Summer Base Flow rating of Good for 15 river miles and Fair for 1 mile, and a Good rating for 14 miles for Instream	Compared to the FWOFI, this alternative conserves 5,390 ac-ft of water. Compared to the other alternatives, this alternative increases GHGs to 5,232,000 lb of CO₂ emissions. While this alternative has a CAP (TM-021) Summer Base Flow rating of Very Good for 1 river mile and Good for 14 river miles; a CAP Instream Habitat rating of Good for 15 miles, a CAP Water Quality rating of Good for 15 miles, and permanent loss of approximately 0.003 acres of wetlands and

Item	No Action Alternative FWOFI	First Dam Alternative	Crockett Diversion Alternative
	Water quality has a CAP rating of Good upstream of the Crockett Diversion, Fair between Crockett Diversion and 1000 West, and Poor in the lower reach. Instream habitat is in Fair Condition in all reaches under the FWOFI.	Habitat, and would cause permanent loss of 0.003 acres of wetlands and 0.2 acres of linear features within the OHWM, this alternative provides approximately 5 cfs more streamflow in all Logan River reaches downstream of Crockett Diversion compared to the Crockett Diversion Alternative offsetting these differences. Additionally, the First Dam Alternative is consistent with the criteria in the CAP and addresses TMDLs associated with dissolved oxygen in the Logan River, giving it a CAP rating of Good for water quality for all river reaches. Perhaps the most compelling case for the First Dam Alternative as the Environmentally Preferred Alternative is related to the power generation capabilities. The power generation from the hydropower turbine would be significant enough to offset the loss of power generation at First Dam, as well as pumping costs incurred by the construction of three new pumps. Excess power generated by the proposed West Lagoons hydropower station would be 1,940,000 kW/hr. Associated with this capability, this alternative does not require a pump within residential areas and would not have permanent noise effects.	0.2 acres of linear features within the OHWM, it would have approximately 5 cfs less streamflow than the First Dam Alternative in all Logan River reaches downstream of Crockett Diversion. Additionally, the Crockett Pump Station, necessary to pressurize the PI system, would significantly increase the power requirements of this alternative. This additional pump station adds approximately 6,760,000 kW/hr of electrical power consumption to the system. Associated with this power requirement, this alternative would have permanent, though minor, noise effects from the Crockett Pump Station. For these reasons, this alternative was not selected as the environmentally preferred alternative.
Guiding Principles			
Healthy and Resilient Ecosystems	The FWOFI would not generate ecosystem services benefits.	The quantified ecosystem services benefits of the First Dam Alternative would provide an average annualized benefit of \$15,754,700.	The quantified ecosystem services benefits of the Crockett Diversion Alternative would provide an

Item	No Action Alternative FWOFI	First Dam Alternative	Crockett Diversion Alternative
	With the FWOFI, 6,050 ac-ft of annual seepage & carrier water losses would persist and current levels of GHGs would persist including 1,048,000 lb of CO₂ emissions, compared to the action alternatives.	The First Dam Alternative would positively affect provisioning ecosystem services by increasing hydroelectricity production, reducing power requirements during peak emissions, providing clean air, and conserving 5,390 ac-ft of water annually. For regulating ecosystem services, enhanced summer flows in the Logan River and the Little Logan would benefit downstream waters by stabilizing hydrological conditions and supporting aquatic habitats and would ensure functioning aquatic resources and improve water quality impairment. Additionally, the First Dam Alternative would reduce property and road damage, reduce damage to agricultural income, reduce water treatment and supply expenses, as well as improve instream flows. For cultural ecosystem services, the First Dam Alternative improves recreational opportunities.	average annualize benefit of \$15,431,500. The Crockett Diversion Alternative would positively affect provisioning ecosystem services by conserving 5,390 ac-ft water annually. For regulating ecosystem services, enhanced summer flows in the Logan River and the Little Logan would benefit downstream waters by stabilizing hydrological conditions and supporting aquatic habitats and would ensure functioning aquatic resources and improve water quality impairment. Additionally, the Crockett Diversion Alternative would reduce property and road damage, reduce damage to agricultural income, and reduce water treatment and supply expenses, as well as improve instream flows. For cultural ecosystem services, the Crockett Diversion Alternative improves recreational opportunities.

Item	No Action Alternative FWOFI	First Dam Alternative	Crockett Diversion Alternative
Sustainable Economic Development	The FWOFI would not provide an economic investment for the better management of water resources in the Project Area.	An economic analysis was performed to ensure the First Dam Alternative encourages sustainable economic development. The First Dam Alternative would provide better management of water resources in the Project Area, while also being considered the NEE alternative.	An economic analysis was performed to ensure the Crockett Diversion Alternative encourages sustainable economic development. While the Crockett Diversion Alternative would provide better management of water resources in the Project Area, it was not considered the NEE alternative because the addition of the pump station near residential areas would have caused undesirable, though minor, noise effects, and the additional \$500,000 per year in electricity expenses and associated greenhouse gas emissions were unacceptable.
Watershed Approach	The FWOFI was analyzed using a complete watershed approach.	The First Dam Alternative was analyzed using a complete watershed approach.	The Crockett Diversion Alternative was analyzed using a complete watershed approach.
Public Safety	By reducing the amount of open water flowing through the irrigation system by replacing 2,500 feet of the North Branch Canal (Crockett Canal), risks, and safety concerns for that section of the canal would be addressed. However, risks and safety concerns associated with the remaining miles of open canals and the current flood risk from overtopping canals would remain the same with the	The First Dam Alternative would protect 10,350 acres of agricultural land and reduce the potential for flooding from the 100-year flood outside of the floodplain to 124 homes. Long-term, the First Dam Alternative would address flooding concerns by reconstructing the Crockett Diversion structure, which would improve public health and safety in the Project Area.	This alternative would protect 10,350 acres of agricultural land and reduce the potential for flooding from the 100-year flood outside of the floodplain to 124 homes. Long-term, this alternative would address flooding concerns by reconstructing the Crockett Diversion structure, which would improve public health and safety in the Project Area.

Item	No Action Alternative FWOFI	First Dam Alternative	Crockett Diversion Alternative
	potential to damage 10,350 acres of agricultural land; 426 homes would be flooded in the 100-year flood event from overtopping canals outside of the floodplain. By reconstructing the Crockett Diversion, flood risks in the surrounding floodplain are reduced, with 15 homes inundated during a 100-year flood event.		
Floodplains	Under existing conditions, in the 100-year flood event, 43 homes and 3,150 feet of roadway would be inundated. The FWOFI would not invest federal funds in the development of flood prone areas. Replacement of the Crockett Diversion—undertaken independent of federal investment to address infrastructure safety, reduce failure risk, and maintain irrigation service—would reduce flood risks but does not optimize floodplain function. Fifteen homes would remain at risk during 100-year flood events.	The First Dam Alternative would not invest federal funds in the development of flood prone areas. Replacement of the Crockett Diversion and placing fill in Lots 1 and 2 would reduce flood risks through removal of outdated structures and improved floodplain functionality, reducing 100-year flood inundation to 15 homes and zero linear feet of roadway. Flood risks are reduced. Construction activities associated with the First Dam Alternative reduce flooding risks without introducing additional occupancy or modifications to the floodplain. This alternative enhances the floodplain's ability to moderate floods and maintain water quality.	The Crockett Diversion Alternative would not invest federal funds in the development of flood prone areas. Replacement of the Crockett Diversion and placing fill in Lots 1 and 2 would reduce flood risks through removal of outdated structures and improved floodplain functionality, reducing 100-year flood inundation to 15 homes and zero linear feet of roadway. Flood risks are reduced. Construction activities associated with the Crockett Diversion Alternative reduce flooding risks without introducing additional occupancy or modifications to the floodplain. This alternative enhances the floodplain's ability to moderate floods and maintain water quality.

Item	No Action Alternative FWOFI	First Dam Alternative	Crockett Diversion Alternative
Item	No Action Alternative FWOFI	First Dam Alternative	Crockett Diversion Alternative
National Economic Efficiency Analysis (Average Annualized)¹			
Project Costs	\$0	\$14,860,700	\$13,579,100
Project Benefits	\$0	\$15,754,700	\$15,431,500
Ecosystem Services Addressed and Tradeoffs Identified			
<i>Provisioning Services (Average Annualized)¹</i>			
Increased hydroelectricity production	\$0	\$194,000	\$0
Reduction in power requirements during peak emissions	No reduction	Large reduction with hydropower production	Power requirements increase over existing condition
Clean air (CO ₂ tons/year of GHG emissions)	No change 1,048,000	430,000	6,280,000
Conserved water (ac-ft)	0 ac-ft	5,390 ac-ft	5,390 ac-ft
<i>Regulating Services (Average Annualized)¹</i>			
Reduced property damage	\$0	\$10,134,900	\$10,134,900
Reduced road damage	No reduction	Reduction of damage to 3,150 feet of roadway	Reduction of damage to 3,150 feet of roadway
Reduced damage to agricultural income	\$0	\$1,140,500	\$1,140,500
Reduced water supply expenses	\$0	\$2,000,000	\$2,000,000
Change in instream flows	No change	\$2,052,900	\$1,923,700

Item	No Action Alternative FWOFI	First Dam Alternative	Crockett Diversion Alternative
<i>Cultural Services (Average Annualized)¹</i>			
Increased recreation benefits	\$0	\$232,400	\$232,400
<i>Economic Analysis¹</i>			
<i>Costs</i>			
Total Project Cost	-	\$308,633,000	\$280,683,400
Annual Project Cost	-	\$12,950,700	\$11,258,400
Annual OM&R Costs	\$325,000	\$1,910,000	\$2,320,000
Total Annual Project Costs	-	\$14,860,700	\$13,579,100
<i>Monetized Benefits for Ecosystem Services (Average Annualized)¹</i>			
Provisioning	\$0	\$194,000	\$1,140,500
Regulating	\$0	\$15,328,300	\$15,199,120
Cultural	\$0	\$232,400	\$232,400
Supporting	\$0	\$0	\$0
Project Benefits	\$0	\$15,754,700	\$15,431,500
Project Costs	\$533,900	\$14,860,700	\$13,579,100
Benefit-Cost Ratio	N/A	1.1	1.1
Net Benefits	\$0	\$894,000	\$1,854,400
<i>Regional Economic Development/Economic Impact Assessment²</i>			
Regional Employment	N/A	N/A	N/A
Regional Income	N/A	N/A	N/A
Regional Impacts (Other)	N/A	N/A	N/A

¹All values reported in 2025 dollars, amortized over 50 years at a discount rate of 3 percent.

Prepared: January 2025

²Not performed for this plan.

5.2.1 No Action Alternative/FWOFI

Ecosystem service flow effects for the No Action Alternative (FWOFI) were projected assuming that current trends would continue to occur for the lifetime of the proposed program while considering the potential effects of all reasonably foreseeable changes within the watershed.

The average annualized damages and cost for the FWOFI is \$533,900 per year to simply maintain the current benefits of the system. In addition, there are approximately \$16,146,200 in flood damage to structures and their contents and \$944,300 in damage to agricultural income under the FWOFI. Approximately 3,150 feet of damage to roadways associated with 100-year flood events would persist. Compared to the First Dam and Crockett Diversion Alternatives, the FWOFI would not meaningfully change any ecosystem service within the watershed. Compared to the First Dam and Crockett Diversion Alternatives, the quantified change in ecosystem services of the FWOFI are \$0.

5.2.2 First Dam Alternative

The First Dam Alternative, which used a watershed approach to characterize problems and solutions in the watershed, meets the federal principles for investments in water resources, and provides multiple ecosystem services. Compared to the FWOFI and the Crockett Diversion Alternative, the quantified ecosystem services benefits of the First Dam Alternative are an average annualized benefit of \$15,754,700 (Table 5-2). No hierarchy exists among the economic, environmental, and social goals and, as a result, tradeoffs among alternatives are assessed. The First Dam Alternative would positively affect provisioning ecosystem services by increasing hydroelectricity production, reducing power requirements during peak emissions, providing clean air, and conserving 5,390 ac-ft of water. The conserved water would be stored to extend the irrigation season to address current irrigation shortages limiting agricultural production (See Appendix E3, TM-004).

For regulating ecosystem services, enhanced summer base flows in the Logan River and the Little Logan would benefit downstream waters by stabilizing hydrological conditions and supporting aquatic habitats and would ensure functioning aquatic resources and improve water quality impairment. Additionally, the First Dam Alternative would reduce property and road damage, reduce damage to agricultural income, reduce water treatment and supply expenses, as well as improve instream flows. For cultural ecosystem services, the First Dam Alternative improves recreational opportunities. The agricultural water management benefits would occur throughout the entire CAIC area, as illustrated in Map 3 in Appendix B, as the water savings and increased agricultural production would benefit the entire system.

The First Dam Alternative would yield economic returns exceeding its upfront and ongoing costs compared to the FWOFI. Investing an average annualized cost of \$14,860,700, the First Dam Alternative would reduce flood damage, enhance agricultural water efficiency, and reduce water supply expenses. It would also provide instream flows along sections of the Logan River and create new recreational trails. The average annualized benefits total \$15,754,700, exceeding the First Dam Alternative's costs.

5.2.3 Crockett Diversion Alternative

The Crockett Diversion Alternative, which used a watershed approach to characterize problems and solutions in the watershed, meets the federal principles for investments in water resources,

and provides multiple ecosystem services. Table 5-2 summarizes the Crockett Diversion Alternative's consideration of the PR&G Guiding Principles, NEE, and quantified ecosystem services.

No hierarchy exists among the economic, environmental, and social goals and, as a result, tradeoffs among alternatives are assessed. The Crockett Diversion Alternative would create average annualized ecosystem benefits and services of approximately \$15,431,500 per year (Table 5-2). The Crockett Diversion Alternative would positively affect provisioning ecosystem services by conserving 5,390 ac-ft of water. The agricultural water management benefits would occur throughout the entire CAIC area, as illustrated in Map 3 in Appendix B, as the water savings would benefit the entire system.

For regulating ecosystem services, the continuity of instream and base flows to the Logan River and the Little Logan would ensure functioning aquatic resources and improve water quality impairment. Additionally, the Crockett Diversion Alternative would reduce property and road damage, reduce damage to agricultural income, reduce water treatment and supply expenses, as well as improve instream flows. For cultural ecosystem services, the Crockett Diversion Alternative improves recreational opportunities.

5.2.4 Ecosystem Services Alternative Tradeoff Analysis

The effect of the action alternatives on ecosystem flows and values is shown in Table 5-2. The action alternatives would positively affect both regulating and provisioning services in the watershed by reduced property damage, reduced water supply expenses, reduced damage to agricultural income, additional instream flows in the Logan River and maintained base flows in the Little Logan, in addition to benefiting recreation values compared to the FWOFI. In addition, the action alternatives would enhance instream flows below First Dam and reduce road damage. In total, the action alternatives would create average annualized benefits of approximately \$15,754,700 per year under the First Dam Alternative and \$15,431,500 per year under the Crockett Diversion Alternative. For both alternatives, the benefits exceed the costs and the corresponding BCR is 1.1. One difference between the alternatives is the addition of the increased hydroelectricity production for the First Dam Alternative. Though the economic value of hydroelectricity production is relatively small, the implications of this component for the alternative are considerable.

For example, the BCA for the project did not fully account for inherent trade-offs between the action alternatives, particularly in terms of long-term operational costs and sustainability associated with the increased efficiency of the First Dam Alternative from capitalizing on the natural hydrologic head from First Dam and the reduction in power requirements because of the reduced pumping and the hydroelectricity production. While the NRCS BCA guidance requires costs to be carried forward in constant relative terms, this approach inadvertently favors the Crockett Diversion Alternative, which has a lower initial construction cost but higher operational demands due to its reliance on extensive pumping. In contrast, the First Dam Alternative uses the natural hydrologic head at First Dam to move water, avoiding significant pumping costs and generating its own power. This hydropower-integrated pressurized system supports piping and pressurization, which reduces seepage and evaporation losses and addresses water availability in the late season. If the BCA had accounted for rising electricity costs over time, the long-term O&M expenses for the Crockett Diversion Alternative would have been substantially higher,

likely changing the outcome of the analysis. The project Sponsors anticipate this difference and as a result, they favor the First Dam Alternative.

Lower operating costs not only make a project more sustainable over time—critical given the challenges of securing ongoing funding for public infrastructure—but also enhance its appeal to potential subscribers by reducing their share of OM&R costs. These OM&R cost reductions were not included in the monetized benefit stream. These cost savings are discussed qualitatively as part of local implementation considerations but are excluded from the national monetized BCA.

While higher electricity costs diminish the net benefits of the Crockett Diversion Alternative, they actually increase the benefits of the First Dam Alternative due to its hydropower generation component. By offsetting some OM&R costs with revenue from hydropower, First Dam becomes a more attractive and financially resilient option. A BCA that monetizes these trade-offs more comprehensively would likely lead to a larger monetary difference in alternatives, better reflecting their true costs and benefits over the project's lifecycle.

For example, both the First Dam and Crockett Diversion Alternatives provide similar levels of benefits to residents of the watershed, but the First Dam Alternative requires fewer tradeoffs when compared to the Crockett Diversion Alternative. The Crockett Diversion Alternative requires pressurizing the system at the intake, unlike the First Dam Alternative, which uses gravity to generate pressure.

Under the First Dam Alternative, the hydropower component is part of a broader system that includes piping and pressurization, which reduces seepage and evaporation losses—key goals of agricultural water conservation, and it is designed to generate electricity from irrigation flows; offset the energy required to operate three new pump stations; and provide excess power to reduce overall system costs for agricultural users. Economically, because the First Dam Alternative would install a new hydropower turbine, it would generate more power than the existing turbine at USU and it also requires less pumping than the Crockett Diversion Alternative, saving project participants almost \$500,000 per year in electricity expenses. In a future with unknown inflationary trends, the cost savings alone make the First Dam Alternative a more resilient choice. The advantage of using natural head for pressurization also outweighs risk of mechanical pump failure. Additionally, reduced pumping costs lead to lower rates for secondary and existing shareholders.

A large consideration that was not captured in the economic analysis is the costs to shareholders from each of the alternatives. While the FWOFI requires a smaller shareholder base to keep the system running, the irrigated area would continue to decrease, reducing the beneficial use of the water. The action alternatives would use the water efficiently—increasing irrigated acreage—by providing pressurized connections to all existing shareholders and providing 2,100 ac-ft of secondary irrigation water storage for improved late-season water availability but would require landowners to connect to the secondary irrigation system and would bill landowners for secondary irrigation water use. However, this secondary irrigation water would largely offset culinary water usage and the associated higher costs. Based on the increased power consumption requirements, the Crockett Diversion Alternative would increase shareholder assessments and secondary irrigation water rates significantly, whereas the First Dam Alternative increases shareholder assessments but less than under the FWOFI or the Crockett Diversion Alternative.

Additional considerations are the environmental tradeoffs. Both action alternatives would reduce floodplain impacts for 28 homes near the Logan River (reduced flooding impacts and insurance

requirements) and would conserve approximately 5,390 ac-ft of water per year (currently lost to seepage and carrier water). The conserved water would be stored to extend the irrigation season to address current irrigation shortages limiting agricultural production (See Appendix E3, TM-004). Both action alternatives improve the water quality in the Logan River compared to the FWOFI by providing enhanced summer base flows in the Logan River and the Little Logan, with improvements of 25 cfs and 5–10 cfs, respectively, which addresses agricultural sustainability problems with current elevated water temperature and low dissolved oxygen levels contributing to poor water quality. Higher instream flows reduce water temperature and increase dissolved oxygen levels, which improve water quality. Without these improvements, future agricultural operations may face regulatory pressure to reduce impacts on aquatic ecosystems. Enhancing instream flows can help meet environmental flow requirements, reducing the risk of regulatory penalties or restrictions on water use and benefiting downstream WOTUS by stabilizing hydrological conditions and supporting aquatic habitats.

The alternatives differ in their power consumption and resultant greenhouse gas emissions. The Crockett Diversion Alternative has one additional pump station when compared to the First Dam Alternative to supply water at an adequate pressure to the distribution system. This additional pump station adds approximately 6,000,000 kW/hr of electrical power consumption to the system. The First Dam Alternative includes a hydropower station, which is estimated to *produce* electricity, a significant improvement in power consumption compared to the Crockett Diversion Alternative, which requires nearly nine times the power consumption per irrigation season compared to the First Dam Alternative. Given the uncertainty of rising power rates, the Crockett Diversion Alternative poses significant challenges.

Resulting from the increase in power consumption for the Crockett Diversion Alternative is the increase in greenhouse gas emissions—nearly nine times compared to the First Dam Alternative. Conversely, the First Dam Alternative actually reduces greenhouse gas emissions compared to the FWOFI by capitalizing on the elevational difference between First Dam and the lagoons to generate hydropower. Additionally, the noise generated by the extra pump near the Crockett Diversion in a residential area would cause minor effects to local residents from the Crockett Diversion Alternative.

Socially, the action alternatives share many benefits, including the increase in recreational opportunities from the proposed trail construction. Both alternatives ensure the full and fair participation by all potentially affected communities in decision-making processes and make project benefits available to all individuals within and surrounding the Project Area.

In summary, the First Dam Alternative, which used a watershed approach to characterize problems and solutions in the watershed, meets the federal principles for investments in water resources. The First Dam Alternative is more sustainable than the Crockett Diversion Alternative because of its reduced pumping requirements and hydroelectricity production and would enhance the watershed's ability to regulate costs by reducing damage to buildings, reducing damage to agricultural income, and reducing water treatment and supply expenses that would occur in the absence of the project. The First Dam Alternative improves sustainable economic development by reducing damages, enhancing stream flows, providing new recreational opportunities, and improving the productivity of the watershed's agricultural land.

5.3 Summary and Comparison of Alternatives—Environmental Effects Related to Resource Concerns

Under NEPA, the NRCS is required to identify and address environmental and human health effects that may occur from implementing the alternatives. The purpose of this chapter is to describe the potential effects of each alternative on the environmental and human resource categories defined in the Inventory of Existing Resources and Conditions section. Unless otherwise noted, the area of analysis for each resource is the Project Area as described and depicted in Section 1.4. The effects analysis of the Proposed Project includes temporary (0–3 years), short-term (3–10 years), and long-term (10+ years) affect time frames. Effects are categorized as follows:

- Not Applicable (N/A)
- No Effect
- Negligible Effect (unmeasurable; any duration)
- Minor Effect (temporary [0-3 years])
- Minor Effect (short-term [3-10 years])
- Minor Effect (long-term [10+ years])
- Major Effect (any duration)

Three types of effects may occur and are discussed in this chapter:

- Direct Effect: Effects from a proposed action that occur at the same time and same place.
- Indirect Effect: Effects from a proposed action that occur later in time, at some distance from the project, and are changes due to cause and effect relationships.
- Cumulative Effect: Past, present, and reasonably foreseeable/probable effects from the proposed action, or other activities regardless of agency (DM 9500-13 Section 4.b.(2)(m) [USDA 2017a]).

Section 1.6 and Section 5.3.11 identify the known ongoing and reasonably foreseeable projects that could potentially contribute interactive or cumulative effects with the Proposed Project.

The No Action Alternative/FWOFI and the action alternatives have been compared against each other to identify tradeoffs between economic, environmental, and social goals for each of the alternatives (USDA 2017a). Table 5-3 presents a summary of this evaluation and detailed information as follows. Best management practices (BMPs) would be implemented on site during and post-construction to minimize and avoid effects to environmental resources. BMPs and mitigation measures are discussed in Section 0 and Appendix E2. Permits and other compliance actions are discussed in Section 6.5.

Table 5-3. Summary and Comparison of Alternatives—Environmental Effects Related to Resource Concerns

Resource Area	No Action Alternative (FWOFI)	First Dam Alternative	Crockett Diversion Alternative
Economics/Socioeconomics			
Economics/ Socioeconomics	No local match funds would be required as no construction would take place, and 4 temporary jobs would be created under the FWOFI. The Project Area would incur additional economic costs due to maintenance, repair activities, and water management inefficiency.	Direct effects include the use of approximately \$32,739,600 in local match funds to construct the Proposed Project. The First Dam Alternative would temporarily create approximately 52 jobs within the Project Area during construction. The First Dam Alternative would require an average annualized cost of \$14,860,700 and provide \$15,754,700 in average annualized benefits representing a BCR of 1.1.	Direct effects include the use of approximately \$26,653,800 in local match funds to construct the Proposed Project. This alternative would temporarily create approximately 52 jobs within the Project Area during construction. This alternative would require an average annualized cost of \$13,579,100 and provide \$15,431,500 in average annualized benefits representing a BCR of 1.1.
Air Quality			
CAA/NAAQS	Temporary effects to air quality from construction disturbance are negligible, Cache County would continue to meet NAAQS and remain in attainment with NAAQS.	Temporary effects to air quality from construction disturbance are negligible. Once construction is complete, the required operations and maintenance activities would decrease, and the operation of the hydropower station would reduce PM _{2.5} emissions below existing conditions, resulting in a long-term beneficial effect to air quality. Cache County would continue to meet NAAQS.	Temporary effects to air quality from construction disturbance are negligible; long-term effects to air quality from pump stations are negligible; and Cache County would continue to meet NAAQS.
GHG	6,050 ac-ft of annual seepage and carrier water losses would persist. Current levels of GHGs would persist including 1,048,000 lb of CO ₂ emissions.	Conserves 5,390 ac-ft of water. Reduces GHGs to 760,000 lb of CO ₂ emissions.	Conserves 5,390 ac-ft of water. Increases GHGs to 5,232,000 lb of CO ₂ emissions.

Resource Area	No Action Alternative (FWOFI)	First Dam Alternative	Crockett Diversion Alternative
Energy			
Energy	No changes in power consumption would be made. Net power requirements of 1,652,000 kW/hr.	Capitalizes on gravity and installs hydropower. Reduces power requirements. Net power requirements of 1,190,000 kW/hr.	Requires an additional pump compared to First Dam Alternative. Increases power requirements. Net power requirements of 9,860,000 kW/hr.
Soils and Geology			
Upland Erosion and Sedimentation	Temporary, minor effects on soil resources in the Project Area during reconstruction of the Crockett Diversion and the replacement of the North Branch Canal (Crockett Canal). The FWOFI would not address current issues with erosion and sedimentation during flood events.	Temporary, minor effects to soil resources would occur during construction due to soil disturbance and exposure of bare soils to erosion potential. BMPs, such as temporary erosion and sediment controls (TESCs), reduce potential sedimentation. All requirements for the UPDES Program Permit would be followed, including developing a SWPPP. Long-term benefits from 19,560 feet of ditch and canal improvements to stabilize soils.	Temporary, minor effects to soil resources would occur during construction due to soil disturbance and exposure of bare soils to erosion potential. BMPs, such as TESCs, reduce potential sedimentation. All requirements for the UPDES Program Permit would be followed, including developing a SWPPP. Long-term benefits from 19,560 feet of ditch and canal improvements to stabilize soils.
Prime and Unique Farmlands	Though activities would occur in areas classified as prime and unique farmlands, the activities would not remove the lands from production, and no change is proposed in the configuration of CAIC irrigated lands. Potential to damage approximately 10,350 acres of agricultural lands in the service area from canal breaching and flooding.	Though activities would occur in areas classified as prime and unique farmlands, the activities would not remove the lands from production, and no change is proposed in the configuration of CAIC irrigated lands. Increased water use efficiency and decreased flooding from canal breaching would have beneficial effects on these soils. Complies with FPPA.	Though activities would occur in areas classified as prime and unique farmlands, the activities would not remove the lands from production, and no change is proposed in the configuration of CAIC irrigated lands. Increased water use efficiency and decreased flooding from canal breaching would have beneficial effects on these soils. Complies with FPPA.

Resource Area	No Action Alternative (FWOFI)	First Dam Alternative	Crockett Diversion Alternative
Vegetation			
Special Status Plant Species	No suitable habitat is present in the Project Area; therefore, no effect would occur to the ULT or Maguire primrose.	No suitable habitat is present in the Project Area; therefore, no effect would occur to the ULT or Maguire primrose. The USFWS agreed with the effects determination on July 15, 2024.	No suitable habitat is present in the Project Area; therefore, no effect would occur to the ULT or Maguire primrose. The USFWS agreed with the effects determination on July 15, 2024.
Riparian Areas	Benchmark conditions may continue to degrade water quality and reduce wildlife benefits due to erosion and sedimentation.	Construction practices may remove vegetation and disturb grasses or riparian areas adjacent to the canals, temporarily disrupting riparian areas. Approximately 9.2 acres of low-quality seepage-induced riparian vegetation would be indirectly affected and eventually lost along the Twin Canals and the Logan Northern Canal where the canals would be lined and where box culverts would be installed, under this alternative. Native riparian vegetation along the Logan River, Little Logan, Blue Spring Creek, and Swift Slough would not be removed or altered, except for vegetation that may need to be removed within the footprint of the Crockett Diversion during construction. Multiple BMPs would preserve existing vegetation when possible and rehabilitate all areas of ground disturbance with reseeding. Additionally, native site vegetation and plant communities would be protected, when practicable, and would be clearly marked, flagged, or fenced in areas where vegetation is to be protected. Overall, this alternative would result in a loss of less than 3% of the total riparian vegetation	Construction practices may remove vegetation and disturb grasses or riparian areas adjacent to the canals, temporarily disrupting riparian areas. Approximately 9.2 acres of low-quality seepage-induced riparian vegetation would be indirectly affected and eventually lost along the Twin Canals and the Logan Northern Canal where the canals would be lined and where box culverts would be installed, under this alternative. Native riparian vegetation along the Logan River, Little Logan, Blue Spring Creek, and Swift Slough would not be removed or altered, except for vegetation that may need to be removed within the footprint of the Crockett Diversion during construction. Multiple BMPs would preserve existing vegetation when possible and rehabilitate all areas of ground disturbance with reseeding. Additionally, native site vegetation and plant communities would be protected, when practicable, and would be clearly marked, flagged, or fenced in areas where vegetation is to be protected. Overall, this alternative would result in a loss of less than 3% of the total riparian vegetation

Resource Area	No Action Alternative (FWOFI)	First Dam Alternative	Crockett Diversion Alternative
		within the Project Area, and the vegetation which would be lost is of low habitat quality. In the long term, the First Dam Alternative would improve water quality, water quantity, and downstream fish and wildlife benefits by conserving water, reducing sedimentation, and improving beneficial flows in the system, consistent with the UDWR Central Region Wetlands Conservation Strategy (UDWR 2001).	within the Project Area, and the vegetation which would be lost is of low habitat quality. In the long term, this alternative would improve water quality, water quantity, and downstream fish and wildlife benefits by conserving water, reducing sedimentation, and improving beneficial flows in the system, consistent with the UDWR Central Region Wetlands Conservation Strategy (UDWR 2001).
Noxious Weeds and Invasive Plant Species	Ongoing maintenance and vegetation clearing would continue in the existing CAIC system. Logan City, North Logan City, Hyde Park City, and CAIC would continue to comply with the Utah Noxious Weed Act and would continue existing invasive species management to control and prevent weed introduction and establishment.	Temporary ground disturbance associated with construction would create conditions for noxious weeds in the area to spread within the approximate 575-acre footprint. However, BMPs would be implemented to control and prevent the introduction and spread of any invasive species or noxious weeds during construction. Disturbed areas would be reseeded to encourage the establishment of native vegetation. Current practices to control and prevent the introduction and establishment of noxious weeds and invasive species would continue to occur. Alternative complies with Utah Noxious Weed Act and E.O. 13112.	Temporary ground disturbance associated with construction would create conditions for noxious weeds in the area to spread within the approximate 415-acre footprint. However, BMPs would be implemented to control and prevent the introduction and spread of any invasive species or noxious weeds during construction. Disturbed areas would be reseeded to encourage the establishment of native vegetation. Current practices to control and prevent the introduction and establishment of noxious weeds and invasive species would continue to occur. Alternative complies with Utah Noxious Weed Act and E.O. 13112.
Water Resources			
Surface and Ground Water Quality & Quantity	Water quality would be temporarily affected during reconstruction of the Crockett Diversion and canal lining. Persistent water losses	<u>Water Quality</u> Temporary effects during ground disturbance from construction; BMPs	<u>Water Quality</u> Temporary effects during ground disturbance from construction; BMPs

Resource Area	No Action Alternative (FWOFI)	First Dam Alternative	Crockett Diversion Alternative
	(6,050 ac-ft annually) would continue due to evaporation and seepage. Base flows in the Logan River remain low, limiting water quality and aquatic habitat. Logan River CAP, TM-021 Summer Base Flows rating from Very Good to Poor. CAP Water Quality Conditions rating from Good to Poor. Utah State Standards for Cold Water Fishery are currently not being met.	modulate effects, ensuring effects are minor. Long-term improvements from removal of Providence Pioneer Diversion to restore natural flow conditions and improve sediment transport in Logan River. Instream flows would improve dissolved oxygen and temperature, and State Water Quality Standards for Cold Water Fishery would be met more than 90% of the time. CAP Water Quality Conditions rating Good for 15 river miles (TM-021); complies with CWA. <u>Water Quantity</u> Long-term improvements include enhanced base flows, conserved water (5,390 ac-ft annually), and restored aquatic habitats. Irrigation upgrades and a 300-acre reservoir would increase water efficiency and storage. <i>Enhanced flows</i> • Instream flows of 25 cfs in Logan River • Base flows of 5–10 cfs in Little Logan • CAP Summer Base Flow Rating Good for 15 river miles	modulate effects, ensuring effects are minor. Long-term improvements from removal of Providence Pioneer Diversion to restore natural flow conditions and improve sediment transport in Logan River. Instream flows would improve dissolved oxygen and temperature, and State Water Quality Standards for Cold Water Fishery would be met more than 90% of the time. CAP Water Quality Conditions rating Good for 15 river miles (TM-021); complies with CWA. <u>Water Quantity</u> Long-term improvements include enhanced base flows, conserved water (5,390 ac-ft annually), and restored aquatic habitats. Irrigation upgrades and a 300-acre reservoir would increase water efficiency and storage. <i>Enhanced flows</i> • Instream flows of 25 cfs in Logan River • Base flows of 5–10 cfs in Little Logan • CAP Summer Base Flow Rating Very Good for 1 river mile and Good for 14 river miles

Clean Water Act/ WOTUS	No federal construction activities would be implemented; therefore, no direct federal effects to aquatic resources, including hydrological conditions or aquatic connectivity, would occur, and inefficiencies in the irrigation system would persist. Independent non-federal reconstruction activities may occur under existing authorities and would be subject to separate Section 404 and 401 permitting and compliance requirements.	Temporary and permanent effects to WOTUS, including wetlands and areas below the OHWM, would occur under the First Dam Alternative. Effects would be avoided and minimized to the extent practicable through implementation BMPs and compliance with applicable permitting requirements. The majority of effects to WOTUS (approximately 126.1 acres) would be temporary and associated with construction-related disturbances, after which affected aquatic resource areas and hydrologic functions would be restored. These effects are not treated as permanent loss because the aquatic resource area and function are expected to return post-construction. A limited portion of aquatic resource effects (approximately 0.2 acres) is currently treated as permanent loss, attributable to the footprint of built infrastructure where aquatic resource area would be converted for the long term, associated primarily with the West River Pump Station and related facilities. Temporary and permanent acreages presented here reflect effects categorization for environmental effects analysis and will be refined during design and permitting stages. Compensatory mitigation would be required only for those impacts determined by the USACE to result in permanent loss, and mitigation	Temporary and permanent effects to WOTUS, including wetlands and areas below the OHWM, would occur under the Crockett Diversion Alternative. The type, magnitude, and overall extent of aquatic resource effects would be similar to those described for the First Dam Alternative, and effects would be avoided and minimized to the extent practicable through implementation of BMPs and compliance with applicable permitting requirements. As with the First Dam Alternative, the majority of aquatic resource effects would consist of temporary construction-related disturbances, where the aquatic resource area and hydrologic function would recover and be restored after installation. A limited portion of aquatic resource effects (approximately 0.2 acres) would be treated as permanent loss, attributable to the footprint of built infrastructure where aquatic resource area would be converted for the long term, associated primarily with the West River Pump Station and the Crockett Pump Station and related facilities. The extent and location of permanent impacts would be refined during permitting. Compensatory mitigation would be required only for those impacts determined by the USACE to result in permanent loss, and mitigation

Resource Area	No Action Alternative (FWOFI)	First Dam Alternative	Crockett Diversion Alternative
		requirements would be finalized during CWA Section 404 permitting; and not finalized in this Draft Plan-EIS. Planning-level mitigation assumptions are discussed in Section 6.6.2. In the long term, irrigation modernization, improved instream flows, and water conservation would enhance hydrologic stability, aquatic habitat connectivity, and downstream WOTUS conditions.	requirements would be finalized during CWA Section 404 permitting; they are not finalized in this Draft Plan-EIS. Planning-level mitigation assumptions are discussed in Section 6.6.2. In the long term, irrigation modernization, improved instream flows, and water conservation would enhance hydrologic stability, aquatic habitat connectivity, and downstream WOTUS conditions.
Wetlands	Temporary disturbance to 1.1 acres of wetlands from reconstruction activities, with no permanent effects. Seepage, evaporation, and carrier water losses continue to limit wetland hydrology and broader ecological benefits.	Temporary effects to 126.1 acres due to construction disturbances after which the aquatic feature would be restored and aquatic resource area and functions would return, with permanent loss of 0.003 acres of wetlands and 0.2 acres of linear features within the OHWM. In addition, construction staging areas would temporarily disturb 37.6 acres of wetlands and 0.4 acres of linear features within the OHWM but would be restored post-construction. While seepage reduction may alter hydrology for some wetlands, the long-term increase in water availability would support wetland health and resilience. Complies with E.O. 11990.	Temporary effects to 126.1 acres due to construction disturbances after which the aquatic feature would be restored and aquatic resource area and functions would return, with permanent loss of 0.003 acres of wetlands and 0.2 acres of linear features within the OHWM. In addition, construction staging areas would temporarily disturb 37.6 acres of wetlands and 0.4 acres of linear features within the OHWM, with restoration planned post-construction. While seepage reduction may alter hydrology for some wetlands, the long-term increase in water availability would support wetland health and resilience. Complies with E.O. 11990.

Resource Area	No Action Alternative (FWOFI)	First Dam Alternative	Crockett Diversion Alternative
Regional Water Management Plans	No investment in infrastructure or water conservation. Persistent inefficiencies would continue, limiting achievement of Utah State Water Plan water management goals.	Aligned with Utah State Water Plan goals by conserving 5,390 ac-ft annually, modernizing irrigation systems, and improving storage and delivery efficiency. The conserved water would be stored to extend the irrigation season to address current irrigation shortages limiting agricultural production (See Appendix E3, TM-004).	Aligned with Utah State Water Plan goals by conserving 5,390 ac-ft annually, modernizing irrigation systems, and improving storage and delivery efficiency. The conserved water would be stored to extend the irrigation season to address current irrigation shortages limiting agricultural production (See Appendix E3, TM-004).
Floodplain Management	Replacement of the Crockett Diversion would reduce flood risks but does not optimize floodplain function. Fifteen homes remain at risk during 100-year flood events.	Flood risks would be reduced. Replacement of the Crockett Diversion and placement of fill in Lots 1 and 2 would reduce flood risks through removal of outdated structures and improved floodplain functionality, reducing the number of homes inundated during a 100-year flood event to 15. Construction activities associated with the First Dam Alternative align with E.O. 11988, as they reduce flooding risks without introducing additional occupancy or modifications to the floodplain. This alternative enhances the floodplain's ability to moderate floods and maintain water quality. Additionally, approximately 10,350 acres of irrigated farmland outside the floodplain would be safeguarded against flooding caused by overtopping canals, reducing the risks of localized flooding events. Conditional Letter of Map Revision (CLOMR)/Letter of Map Revision (LOMR) would be required.	Flood risks would be reduced. Replacement of the Crockett Diversion and placement of fill in Lots 1 and 2 would reduce flood risks through removal of outdated structures and improved floodplain functionality, reducing the number of homes inundated during a 100-year flood event to 15. Construction activities associated with the Crockett Diversion Alternative align with E.O. 11988, as they reduce flooding risks without introducing additional occupancy or modifications to the floodplain. This alternative enhances the floodplain's ability to moderate floods and maintain water quality. Additionally, approximately 10,350 acres of irrigated farmland outside the floodplain would be safeguarded against flooding caused by overtopping canals, reducing the risks of localized flooding events. CLOMR/LOMR would be required.

Resource Area	No Action Alternative (FWOFI)	First Dam Alternative	Crockett Diversion Alternative
Wildlife			
Fish and Wildlife Habitat	The FWOFI would continue to have a direct effect on wildlife and wildlife habitat in the Project Area by not addressing flooding and canal breaches or water quality concerns. Instream habitat for the CAP analysis was evaluated as having Fair Condition for all reaches.	Potential disturbances to wildlife and adjacent wildlife habitat would occur during construction. Sediment removal activities would create a risk to water quality and potential mortality to individual fish and mollusks and amphibians that may be present in the reservoir. Project BMPs ensure protections and avoidance of harm and nest abandonment for bird species, including requiring that nesting bird surveys would occur prior to vegetation removal, and that construction activities would occur outside of nesting season for MBTA and state protected bird species. Areas disturbed during construction would be reseeded to encourage the establishment of native vegetation. Long term, pressurization of the irrigation system and stormwater improvements would remove hydrology that currently supports 9.2 acres of low-quality seepage-induced riparian habitat, which would affect nearby wildlife and fish habitat. Long-term, the First Dam Alternative would improve fish and wildlife habitat by improving water quality and quantity and maintaining flows in the Logan River and the Little Logan during the irrigation season. CAP analysis for Instream Habitat rated Fair for 1 mile and Good for 14 miles.	Potential disturbances to wildlife and adjacent wildlife habitat would occur during construction. Sediment removal activities would create a risk to water quality and potential mortality to individual fish and mollusks and amphibians that may be present in the reservoir. Project BMPs ensure protections and avoidance of harm and nest abandonment for bird species, including requiring that nesting bird surveys would occur prior to vegetation removal, and that construction activities would occur outside of nesting season for MBTA and state protected bird species. Areas disturbed during construction would be reseeded to encourage the establishment of native vegetation. Long term, pressurization of the irrigation system and stormwater improvements would remove hydrology that currently supports 9.2 acres of low-quality seepage-induced riparian habitat, which would affect nearby wildlife and fish habitat. Long-term, this alternative would improve fish and wildlife habitat by improving water quality and quantity and maintaining flows in the Logan River and the Little Logan during the irrigation season. CAP analysis for Instream Habitat rated Good for 15 miles.

Resource Area	No Action Alternative (FWOFI)	First Dam Alternative	Crockett Diversion Alternative
Candidate, Threatened, and Endangered Animal Species	No effect based on the lack of suitable habitat in the Project Area for ESA-listed species. Indirectly, the FWOFI would affect fish and wildlife habitat by not addressing seepage and carrier water loss concerns long-term.	No effect based on the lack of suitable habitat for ESA-listed animal species in the Project Area documented in the BA determination for federal-listed animal species and state sensitive species. The USFWS agreed with the effects determination on July 15, 2024.	No effect based on the lack of suitable habitat for ESA-listed animal species in the Project Area documented in the BA determination for federal-listed animal species and state sensitive species. The USFWS agreed with the effects determination on July 15, 2024.
Migratory Birds and Bald and Golden Eagles	Construction practices may remove vegetation and disturb grasses or other vegetation adjacent to proposed activities. The FWOFI would have no long-term effects on migratory birds and bald and golden eagles.	Construction practices may remove vegetation and disturb grasses or other vegetation adjacent to canals. An incidental nesting survey would be completed before vegetation removal. Long term, the First Dam Alternative would improve water quantity and fish and wildlife benefits by reducing flood effects and improving water quality. Consistent with MBTA and BGEPA.	Construction practices may remove vegetation and disturb grasses or other vegetation adjacent to canals. An incidental nesting survey would be completed before vegetation removal. Long term, this alternative would improve water quantity and fish and wildlife benefits by reducing flood effects and improving water quality. Consistent with MBTA and BGEPA.

Resource Area	No Action Alternative (FWOFI)	First Dam Alternative	Crockett Diversion Alternative
Human Environment			
Cultural and Historic Resources	The FWOFI would have no direct effect to historic properties. However, ongoing flooding risks would continue, causing potential damages to cultural & historic properties in the area.	Section 106 consultation has been initiated. Consultation was initiated in October 2021 and is ongoing with the Eastern Shoshone Tribe of the Wind River Reservation, Wyoming; the Shoshone-Bannock Tribes of the Fort Hall Reservation; the Ute Indian Tribe of the Uintah & Ouray Reservation, Utah; and the Northwest Band of the Shoshone Nation. Eleven new cultural sites, seven previously recorded sites, and twelve new isolated finds were identified within the Direct APE during cultural surveys. Five were determined eligible for the NRHP. The NRCS STC, in consultation with the Utah SHPO, THPOs, other agencies, and consulting parties determined that the project would have an Adverse Effect to Historic Properties (36 CFR 800.5(d)). A draft MOA has been prepared to resolve the adverse effects. Copies of consultation and the Utah SHPO concurrence letter are located in Appendix A.	Section 106 consultation has been initiated. Consultation was initiated in October 2021 and is ongoing with the Eastern Shoshone Tribe of the Wind River Reservation, Wyoming; the Shoshone-Bannock Tribes of the Fort Hall Reservation; the Ute Indian Tribe of the Uintah & Ouray Reservation, Utah; and the Northwest Band of the Shoshone Nation. Eleven new cultural sites, seven previously recorded sites, and twelve new isolated finds were identified within the Direct APE during cultural surveys. Five were determined eligible for the NRHP. The NRCS STC, in consultation with the Utah SHPO, THPOs, other agencies, and consulting parties determined that the project would have an Adverse Effect to Historic Properties (36 CFR 800.5(d)). A draft MOA has been prepared to resolve the adverse effects. Copies of consultation and the Utah SHPO concurrence letter are located in Appendix A.
Scientific Resources	No effect. Based on geologic records of the area, it is highly unlikely that paleontological resources would be discovered in the area. See UDNR letter in Appendix A.	No effect. The UDNR–UGS determined no paleontological localities are located in or near the Proposed Project and based on geologic records of the area, it is highly unlikely that paleontological resources would be discovered in the area. See UDNR letter in Appendix A.	No effect. The UDNR–UGS determined no paleontological localities are located in or near the Proposed Project and based on geologic records of the area, it is highly unlikely that paleontological resources would be discovered in the area. See UDNR letter in Appendix A.

Resource Area	No Action Alternative (FWOFI)	First Dam Alternative	Crockett Diversion Alternative
Public Health and Safety	By reconstructing the Crockett Diversion, flood risks in the surrounding floodplain are reduced, with 15 homes inundated during a 100-year flood event. By reducing the amount of open water flowing through the irrigation system by replacing 2,500 feet of the North Branch Canal (Crockett Canal), risks and safety concerns for that section of the canal would be addressed. However, risks and safety concerns associated with the remaining miles of open canals and the current flood risk from overtopping canals would remain the same with the potential to damage 10,350 acres of agricultural land; 426 homes would be flooded in the 100-year flood event from overtopping canals outside of the floodplain.	Temporary, minor visual effects and traffic delays would occur due to construction. In the short and long term, the First Dam Alternative would reduce flooding risks, eliminate a public safety risk, and improve public health and safety in the Project Area. The First Dam Alternative would address flood inundation associated with the aging Crockett Diversion structure reducing the number of homes inundated during a 100-year flood event along the Logan River to 15 from 43. The flood water overflow proposed activities, including removing irrigation water from CAIC canals and providing floodwater overflow along 1800 N to the west, would prevent overtopping during high intensity runoff events, preventing flooding on 10,350 acres of agricultural land and 3,150 feet of road and reducing the potential for flooding from the 100-year flood outside of the floodplain to 124 homes. By removing the irrigation water from the Crockett Canal and filling in a portion of the canal where the Canyon Trail recreation trail would be constructed, risks and safety concerns of slope failure along the hillside would be addressed. Other than these changes to the Crockett Canal and approximately three miles of	Temporary, minor visual effects and traffic delays would occur due to construction. In the short and long term, the Crockett Diversion Alternative would reduce flooding risks, eliminate a public safety risk, and improve public health and safety in the Project Area. The Crockett Diversion Alternative would address flood inundation associated with the aging Crockett Diversion structure reducing the number of homes inundated during a 100-year flood event along the Logan River to 15 from 43. The flood water overflow proposed activities, including removing irrigation water from CAIC canals and providing floodwater overflow along 1800 N to the west, would prevent overtopping during high intensity runoff events, preventing flooding on 10,350 acres of agricultural land and 3,150 feet of road and reducing the potential for flooding from the 100-year flood outside of the floodplain to 124 homes. By removing the irrigation water from the Crockett Canal and filling in a portion of the canal where the Canyon Trail recreation trail would be constructed, risks and safety concerns of slope failure along the hillside would be addressed. Other than these changes to the Crockett Canal and approximately three miles of

Resource Area	No Action Alternative (FWOFI)	First Dam Alternative	Crockett Diversion Alternative
		improvements to the Logan and Northern, Twin, and Northwest Field Canals associated with the flood water overflow activities, though irrigation water would be removed from the canals and laterals because it would be piped, the remaining canal infrastructure would remain in place. No canals would be moved. Head gates and existing infrastructure would remain in place, although removal could be addressed during the design phase, if deemed necessary. Because the irrigation water would no longer run through the canals, safety concerns about open water would be removed in these sections during the irrigation season, however, the open canals would still be used to collect and move stormwater to reduce flooding.	improvements to the Logan and Northern, Twin, and Northwest Field Canals associated with the flood water overflow activities, though irrigation water would be removed from the canals and laterals because it would be piped, the remaining canal infrastructure would remain in place. No canals would be moved. Head gates and existing infrastructure would remain in place, although removal could be addressed during the design phase, if deemed necessary. Because the irrigation water would no longer run through the canals, safety concerns about open water would be removed in these sections during the irrigation season, however, the open canals would still be used to collect and move stormwater to reduce flooding.
Hazardous Materials	No direct effects to hazardous materials in the Project Area. Indirectly, ongoing flooding could disturb existing facilities and environmental incidents, as well as undocumented spills or environmental incidents.	No effect on hazardous materials in the vicinity of the Project Area. Ten features were identified within 15 feet of the Proposed Project measures. BMPs would be implemented at the sites to minimize potential disturbance of the identified site. No hazardous materials would be generated.	No effect on hazardous materials in the vicinity of the Project Area. Ten features were identified within 15 feet of the Proposed Project measures. BMPs would be implemented at the sites to minimize potential disturbance of the identified site. No hazardous materials would be generated.
Transportation and Infrastructure	If the FWOFI was implemented, road and residential development infrastructure would continue to be damaged and/or closed during large storm events and the existing infrastructure would continue to	Construction would require several road crossings. CAIC would coordinate with the Cache County Public Works Road Division, City of Logan, North Logan City, Hyde Park City, and UDOT as necessary to obtain all necessary permits to establish easements, work within the	Construction would require road crossings. CAIC would coordinate with the Cache County Public Works Road Division, City of Logan, North Logan City, Hyde Park City, and UDOT as necessary to obtain all necessary permits to establish easements, work within the

Resource Area	No Action Alternative (FWOFI)	First Dam Alternative	Crockett Diversion Alternative
	deteriorate, requiring higher O&M costs.	designated State and local ROW, and implement appropriate traffic control measures during construction to minimize disturbance and reduce effects to local traffic. Construction of PI infrastructure outside of the existing system of open water canals, including 120 miles of distribution system pipeline, would allow a change from individual pumps to gravity pressurization. Long-term, permanent effects to Logan, North Logan, and Hyde Park’s culinary and sewer system from reduced water treatment and supply expenses and reduced sewer infiltration from seepage. Logan City would experience significant power savings and a reduction in O&M costs, and North Logan and Hyde Park would meet future irrigation needs and would reduce future water demands on both existing culinary water systems. Additionally, removing irrigation water from the canals would reduce flood risks in Logan, North Logan, Hyde Park, and Benson CDP, resulting in a beneficial effect to transportation and infrastructure.	designated State and local ROW, and implement appropriate traffic control measures during construction to minimize disturbance and reduce effects to local traffic. Construction of PI infrastructure outside of the existing system of open water canals, including 120 miles of distribution system pipeline, would allow a change from individual pumps to gravity pressurization. Long-term, permanent effects to Logan, North Logan, and Hyde Park’s culinary and sewer system from reduced water treatment and supply expenses and reduced sewer infiltration from seepage. Logan City would experience significant power savings and a reduction in O&M costs, and North Logan and Hyde Park would meet future irrigation needs and would reduce future water demands on both existing culinary water systems. Additionally, removing irrigation water from the canals would reduce flood risks in Logan, North Logan, Hyde Park, and Benson CDP, resulting in a beneficial effect to transportation and infrastructure.

Resource Area	No Action Alternative (FWOFI)	First Dam Alternative	Crockett Diversion Alternative
Noise	Temporary increases in noise associated with construction equipment and vehicles would result from implementation. Background noise levels are associated with existing traffic and agricultural noise. The FWOFI would have no long-term effect on noise levels in the Project Area.	Temporary increases in noise associated with construction equipment and vehicles would result from implementation. Noise mitigation measures would be implemented during construction to minimize temporary noise effects. Permanent noise effects are expected from the First Dam Alternative due to the construction of three pump stations, but they are located outside of any residential area.	Temporary increases in noise associated with construction equipment and vehicles would result from implementation. Noise mitigation measures would be implemented during construction to minimize temporary noise effects. Permanent noise effects are expected from this alternative due to the construction of three pump stations, but they are located outside of any residential area. Permanent minor noise effects are expected from this alternative due to the construction of the Crockett Pump Station southwest of River Hollow Park. The Crockett Pump Station would be designed in accordance with the Logan City municipal code and would not exceed the allowable sound level limits. The pump would be contained in a masonry control house designed to reduce the noise level by approximately 25–35 dBA (FHWA [Federal Highway Administration] 2018). Combined with the existing surrounding noise, the noise attenuating effectiveness of the masonry control house, and the consistency with the Logan Code of Ordinance regarding sound, the long-term noise level increase from the pump station would be minor.

Resource Area	No Action Alternative (FWOFI)	First Dam Alternative	Crockett Diversion Alternative
Visual Resources and Scenic Beauty	The FWOFI would have temporary, minor direct effects to visual resources and scenic beauty during construction. Long-term, ongoing flooding could cause damage to nearby areas, which could indirectly affect visual resources and scenic beauty in the area.	Temporary effects to visual resources associated with construction disturbance. Minor long-term visual effects from the removal of vegetation during construction, the construction of the hydropower station, and the added fill in Landscaping Lots 1 and 2. Project activities and construction practices are typical for the surrounding area and would blend into the scenic quality of the general landscape. Improving the system return flows and providing 25 cfs Logan River instream flows, which would benefit visual resources and scenic beauty.	Temporary effects to visual resources associated with construction disturbance. Minor long-term visual effects from the removal of vegetation during construction, the construction of the Crockett Pump Station, and the added fill in Landscaping Lots 1 and 2. Project activities and construction practices are typical for the surrounding area and would blend into the scenic quality of the general landscape. Improving the system return flows and providing 25 cfs Logan River instream flows, which would benefit visual resources and scenic beauty.

Recreation	The FWOFI would have no direct effects to recreation. In the long term, ongoing flooding could cause damage to recreational areas and negatively affect recreational opportunities in the area due to reduced water quality.	The First Dam Alternative may temporarily affect dispersed public recreation opportunities in the area during construction. All disturbed areas would be reclaimed and reseeded after construction. Construction of 4,430 feet of new pedestrian trails would provide additional recreational opportunities for community members, establish alternative travel routes among educational, recreational, and commercial facilities within the watershed, and improve access to the Logan River and the Wasatch-Cache National Forest. For recreationists in the Logan River, the replacement of the diversion structure would remove the overhead safety concerns, as well as reduce the drop safety concern when the inflated weir is in the lowered position. The proposed replacement design would not have any piers or walkways to be concerned about becoming hung up on. The diversion would not be passable for blue trail users during the irrigation season when the inflatable weir is in the raised position. When the inflatable weir is in the lowered position, the drop over the structure would still be about a 5-foot drop during annual high flows of 480 cfs. The guaranteed instream flows in the Logan River would have net beneficial effects to blue trails. Instream flows support a variety of recreational activities such as fishing, swimming, and boating.	The Crockett Diversion Alternative may temporarily affect dispersed public recreation opportunities in the area during construction. All disturbed areas would be reclaimed and reseeded after construction. Construction of 4,430 feet of new pedestrian trails would provide additional recreational opportunities for community members, establish alternative travel routes among educational, recreational, and commercial facilities within the watershed, and improve access to the Logan River and the Wasatch-Cache National Forest. For recreationists in the Logan River, the replacement of the diversion structure would remove the overhead safety concerns, as well as reduce the drop safety concern when the inflated weir is in the lowered position. The proposed replacement design would not have any piers or walkways to be concerned about becoming hung up on. The diversion would not be passable for blue trail users during the irrigation season when the inflatable weir is in the raised position. When the inflatable weir is in the lowered position, the drop over the structure would still be about a 5-foot drop during annual high flows of 480 cfs. The guaranteed instream flows in the Logan River would have net beneficial effects to blue trails. Instream flows

Resource Area	No Action Alternative (FWOFI)	First Dam Alternative	Crockett Diversion Alternative
			support a variety of recreational activities such as fishing, swimming, and boating.
Special Designations			
Land Use	The FWOFI would have no direct effects to land use. However, ongoing flooding could cause damage to nearby structures and agricultural lands in the area, indirectly affecting land use.	All proposed activities would take place within previously disturbed lands or within the existing ROW for roadways. No land acquisition would be required for the Proposed Project. Cache County's Countywide Comprehensive Plan's goal to "improve the physical environment of the community as a setting for human activities" (Cache County 1998) would be met by the proposed activities because they improve agricultural water management, public safety, and recreational opportunities for CAIC shareholders within the Logan River Watershed.	All proposed activities would take place within previously disturbed lands or within the existing ROW for roadways. No land acquisition would be required for the Proposed Project. Cache County's Countywide Comprehensive Plan's goal to "improve the physical environment of the community as a setting for human activities" (Cache County 1998) would be met by the proposed activities because they improve agricultural water management, public safety, and recreational opportunities for CAIC shareholders within the Logan River Watershed.

Resource Area	No Action Alternative (FWOFI)	First Dam Alternative	Crockett Diversion Alternative
Natural Area	The FWOFI would have no direct effects to natural areas. However, ongoing seepage and evaporation water losses of 6,050 ac-ft annually could cause indirect effects to downstream natural areas by reducing available water.	The First Dam Alternative may cause negligible, temporary effects to water quality in downstream natural areas due to construction activities. BMPs would be implemented to minimize and eliminate effects to downstream areas. While the First Dam Alternative primarily focuses on local benefits, it could indirectly affect the downstream areas, including the Great Salt Lake by enhancing water conservation and efficiency in the Logan River system.	The Crockett Diversion Alternative may cause negligible, temporary effects to water quality in downstream natural areas due to construction activities. BMPs would be implemented to minimize and eliminate effects to downstream areas. While the Crockett Diversion Alternative primarily focuses on local benefits, it could indirectly affect the downstream areas, including the Great Salt Lake by enhancing water conservation and efficiency in the Logan River system.
Social Issues	The FWOFI would maintain access to open water in the Little Logan. The FWOFI would preserve existing vegetation.	This alternative would maintain access to open water and maintain a 5–10 cfs summer base flows during the irrigation season, in the Little Logan. The First Dam Alternative would also maintain the existing flow from the Logan River into the Little Logan which will provide environmental benefits, recreational opportunities, and aesthetic value. To address the concern about preserving existing vegetation, this alternative includes multiple BMPs which would preserve existing vegetation when possible and rehabilitate all areas of ground disturbance. Additionally, native site vegetation and plant communities would be protected, when practicable and would be clearly marked, flagged, or fenced in areas where vegetation is to be protected.	This alternative would maintain access to open water and maintain a 5–10 cfs summer base flows during the irrigation season, in the Little Logan. The Crockett Diversion Alternative would also maintain the existing flow from the Logan River into the Little Logan which will provide environmental benefits, recreational opportunities, and aesthetic value. To address the concern about preserving existing vegetation, this alternative includes multiple BMPs which would preserve existing vegetation when possible and rehabilitate all areas of ground disturbance. Additionally, native site vegetation and plant communities would be protected, when practicable and would be clearly marked, flagged, or fenced in areas where vegetation is to be protected.

5.3.1 Economics/Socioeconomics

5.3.1.1 Economics

No Action Alternative

Under the No Action Alternative, CAIC would rebuild the Crockett Diversion and replace 2,500 feet of the North Branch Canal (Crockett Canal). Additionally, CAIC would continue to conduct maintenance and operations on its system to improve flows, regulate the growth and spread of noxious weeds, maintain infrastructure, and replace aging infrastructure. Average annual costs of flood damage and agricultural income damage under the FWOFI were estimated to serve as a benchmark of comparison with the action alternatives. Approximately \$16,146,200 in flood damage to structures and their contents, \$1,100,000 in damages to agricultural income, and 3,150 feet of damage to roadways are occurring under the FWOFI. In total, average annualized costs under the FWOFI are approximately \$533,900 per year to simply maintain the current benefits of the system.

First Dam Alternative

To improve water use efficiency in the Logan River Watershed, the First Dam Alternative would have an average annualized cost of \$14,860,700 for installation and O&M associated with installation, operation, or replacement of project structures, but would generate average annualized benefits of \$15,754,700 from increased hydroelectricity production, reduced property damage, reduced damage to agricultural income, reduced water treatment and supply costs, increased instream flows, and recreation. The resulting BCR for the First Dam Alternative is 1.1. See Section 6.11 and the BCA (Appendix E2) for additional detail on the costs and benefits of the First Dam Alternative.

Additional considerations were not quantified in the economic analysis but have economic effects. Economically, the First Dam Alternative would install a new hydropower turbine with average annualized cost of \$145,000 and would provide an average annualized benefit in increased hydroelectricity production of \$194,000. This alternative would require less pumping than the Crockett Diversion Alternative and would save participants almost \$550,000 per year in costs associated with pumping (see Tables 2.2 and 2.4 in TM-017 in Appendix E5). In a future with unknown inflationary trends, these cost savings alone make the First Dam Alternative a more resilient choice.

The number of future secondary irrigation connections were found to be the single most impactful piece to creating a self-sustaining system. Because system revenue is dependent on the number of individuals within the service area that connect to the secondary irrigation system, this potential revenue was excluded from the economic analysis. During implementation, the entity that runs the secondary irrigation system would set user connection rates in coordination with the municipalities to offer competitive pricing while offsetting the outstanding O&M costs throughout the project lifetime. See Section 5.2.4 and Appendix E5, TM-018 for additional discussion.

Secondary irrigation connections would be made available to landowners whose properties have historically been irrigated by the CAIC member companies. While these connections would involve a monthly or annual fee, the use of secondary irrigation water for outdoor irrigation,

including rural and urban agriculture, offers a significant economic advantage. Specifically, it would reduce reliance on culinary water, which is typically more expensive and subject to higher treatment and delivery costs. This shift would help mitigate the financial burden on agricultural producers and residents by lowering overall water expenses and slowing the rate of future culinary water rate increases anticipated under the FWOFI scenario (see Figure 2-2). Additionally, the use of secondary irrigation water supports long-term water resource sustainability by preserving potable water supplies for essential indoor uses.

Although the cost to canal company shareholders would be raised, costs would be approximately 90% in the First Dam alternative compared to 95% in the Crockett Diversion alternative of the anticipated financial burden under the FWOFI. Irrigators would be receiving an improved product for less than what they would experience under the FWOFI, as well as contributing to the establishment of a much more efficient water distribution system in the community and restoring the beneficial use of their water right.

Crockett Diversion Alternative

To improve water use efficiency in the Logan River Watershed, the Crockett Diversion Alternative would have an average annualized cost of \$13,579,100 for installation and O&M associated with installation, operation, or replacement of project structures but would generate average annualized benefits of \$15,431,500 from reduced property damage, reduced damage to agricultural incomes, reduced water treatment and supply costs, increased instream flows, and recreation. The resulting BCR for the Crockett Diversion Alternative is 1.1. See Section 6.11 and the BCA (Appendix E2) for additional detail on the costs and benefits of the Crockett Diversion Alternative.

Similar to the First Dam Alternative, the economic analysis does not quantify the entirety of the benefits and costs because numerous factors could not be adequately quantified in the economic analysis. For example, the number of future secondary irrigation connections was found to be the single most impactful piece to creating a self-sustaining system. But, because system revenue is dependent on the number of individuals within the service area that connect to the secondary irrigation system, this potential revenue was excluded from the economic analysis. During implementation, the entity that runs the secondary irrigation system would set user connection rates in coordination with the municipalities to offer competitive pricing while offsetting the outstanding O&M costs throughout the project lifetime. See Section 5.2.4 and Appendix E5, TM-018 for additional discussion.

Additional considerations were not quantified in the economic analysis but have economic effects. Economically, the Crockett Diversion Alternative installs an additional pump station near residential areas, costing project participants almost \$550,000 per year in additional costs for the Crockett Pump expenses (see Table 2.4 in TM-017 in Appendix E5). This alternative requires more pumping than the First Dam Alternative.

Secondary irrigation connections would be made available to landowners whose properties have historically been irrigated by the CAIC member companies. While these connections would involve a monthly or annual fee, the use of secondary irrigation water for outdoor irrigation, including rural and urban agriculture, offers a significant economic advantage. Specifically, it would reduce reliance on culinary water, which is typically more expensive and subject to higher treatment and delivery costs. This shift would help mitigate the financial burden on residents and agricultural producers by lowering overall water expenses and slowing the rate of future culinary

water rate increases anticipated under the FWOFI scenario (see Figure 2-2). Additionally, the use of secondary irrigation water supports long-term water resource sustainability by preserving potable water supplies for essential indoor uses.

Although the cost to canal company shareholders would be raised, costs would be approximately 95% in the Crockett Diversion Alternative compared to 90% for the First Dam Alternative of the anticipated financial burden under the FWOFI. Irrigators would be receiving an improved product for less than what they would experience under the FWOFI, but more than the First Dam Alternative, as well as contributing to the establishment of a much more efficient water distribution system in the community and restoring the beneficial use of their water right.

5.3.1.2 Socioeconomics

No Action Alternative

Under the No Action Alternative, temporary effects to socioeconomics during construction include the creation of approximately 4 jobs. In the long term, the Crockett Diversion would be rebuilt according to the Crockett Pressurized Irrigation Master Plan, and 2,500 feet of the North Branch Canal (Crockett Canal) would be replaced. Average annualized costs under the FWOFI are approximately \$533,900 to simply maintain the current benefits of the system.

First Dam Alternative

Several direct and indirect effects to socioeconomics in the Project Area would result from the implementation of the First Dam Alternative. Direct effects of the First Dam Alternative include the creation of approximately 52 temporary jobs within the Project Area during construction, and the use of \$32,739,600 in local match funds to construct the Proposed Project. As discussed in Section 5.3.1.1 and determined by the BCA (Appendix E2), the BCR for the First Dam Alternative is 1.1.

Under the First Dam Alternative, a large storage reservoir would be developed on the west side of the project with a pump station to supply water to irrigators. This storage would allow greater flexibility to meet the seasonal demands of different crops. Additionally, the water storage would allow for supplemental pumping, which enables the transition from a turn-based system to a demand-based system. Under this scenario, daily and seasonal peak consumptive use can be met to further maximize yields.

The First Dam Alternative would generate varying economic benefits for the CAIC canal companies. See Figure 1-2 for locations of each individual canal company's service area within the Project Area. For some of the companies, the ability to provide secondary irrigation water would generate economic benefits. Other companies would see increased yields based on more reliable flows at peak periods and water availability later in the season. Additional discussions with shareholders indicate that some areas that are currently not irrigable using surface irrigation could be irrigated using pressurized water which would further increase yields. See Appendix E4, TM-014 for specific effects to each CAIC canal company.

Crockett Diversion Alternative

Similar to the First Dam Alternative, the Crockett Diversion Alternative would produce several direct and indirect effects to socioeconomics from implementation. Direct effects include the creation of approximately 52 temporary jobs within the Project Area during construction, and the

use of \$26,653,800 in local match funds to construct the Proposed Project. As discussed in Section 5.3.1.1 and determined by the BCA (Appendix E2), the BCR for the Crockett Diversion Alternative is 1.1.

Under the Crockett Diversion Alternative, a large storage reservoir would be developed on the west side of the project with a pump station to supply water to irrigators. This storage would allow greater flexibility to meet the seasonal demands of different crops. Additionally, the water storage allows for supplemental pumping, which enables the transition from a turn-based system to a demand-based system. Under this scenario, daily and seasonal peak consumptive use can be met to further maximize yields. Under the Crockett Diversion Alternative, each of the canal companies would be affected similarly as in the First Dam Alternative.

5.3.2 Air Quality

5.3.2.1 *Clean Air Act/National Ambient Air Quality Standards*

No Action Alternative

Under the No Action Alternative, temporary effects to air quality from construction disturbance for the Crockett Diversion reconstruction and the replacement of the earthen canal located along the hillside near Merlin Olsen Park to reduce the risk of canal or hillside failure would be negligible. BMPs to employ appropriate dust control measures during project implementation (see Section 6.4.1) would further reduce the temporary effects to air quality. Individual shareholders would continue to operate pumps and contribute to the existing condition of the air quality including contributing 0.02 tons of PM_{2.5} emissions from the known pumping sources. Once construction is complete, air quality would return to pre-construction baseline levels, with no long-term changes to air quality. Under the No Action Alternative, Cache County would continue existing practices that enable the county to meet NAAQS.

First Dam Alternative

During construction, the proposed trenching, excavation, and dirt work would produce minimal particulate and diesel emissions from the heavy equipment operating at the same time during the construction phase, resulting in temporary, negligible adverse effects to air quality. These effects would not be different from occasional local air quality effects associated with agricultural activities or routine canal maintenance. BMPs to employ appropriate dust control measures during project implementation (see Section 6.6.1) would further reduce the temporary effects to air quality. Once construction is complete, these effects to air quality would return to pre-construction baseline levels.

In the long term, the First Dam Alternative would reduce the emissions compared to the existing conditions because the PI system would reduce pumping requirements for shareholders and, with the addition of hydropower, the power requirements during peak emissions (kW/hr) would be significantly reduced from the existing conditions. Switching from fossil fuel-based power sources, such as internal combustion engines, to renewable energy sources like hydropower can improve air quality. The EPA highlights that transitioning to cleaner energy sources, including hydropower, reduces emissions of pollutants like SO₂, nitrogen oxides (NO_x), and PM, which are harmful to public health and the environment (EPA 2025). These reductions contribute to better air quality and lower health risks associated with air pollution.

As discussed in the PM_{2.5} Emissions Memo in Appendix E2, the General Conformity Regulations are applicable to the Proposed Project, thus the Project must comply with the regulations. As part of the PM_{2.5} emissions calculations, the memo reviewed two operational scenarios for the First Dam Alternative—normal pump operations of 24 hrs./day during the irrigation season (April 1-October 15 [6.5 months or ~198 days]) as well as a worst-case scenario where the pumps operate 24 hrs./day, 365 days/yr). Using the EPA's eGRID generation region's most recent average annual PM_{2.5} emissions, direct and indirect emissions of PM_{2.5} were calculated for both the normal operations and worst-case scenario. PM_{2.5} emissions were calculated at 118.3 lb/yr. or 0.06 tons/yr. for normal operations, while emissions of 218.1 lb/yr. or 0.1 tons/yr. were calculated for the worst-case scenario (see PM_{2.5} Emissions Calculation Memo in Appendix E2 for details). The First Dam Alternative includes a new hydropower station at the West Lagoons pump that would generate excess power, impacting the amount of energy available within the energy system and affecting how much energy would need to be generated from electrical sources. This excess energy was calculated to be 93.0 lb/yr. or 0.05 tons/yr. of PM_{2.5} emissions that would be avoided due to the additional hydropower from the First Dam Alternative.

The calculated PM_{2.5} emissions are well below the *de minimis* threshold defined at 40 CFR §93.153. Additionally, in either of the cases tested above, neither would equal or exceed the state limit for a significant emission increase or a net significant emissions increase (equaling or exceeding 10 t/yr of direct PM_{2.5}), thereby not requiring permitting or emissions offsets.

As discussed above, the PM_{2.5} direct emissions threshold for maintenance areas is 100 tons/yr (CFR 2025), and the action would NOT equal or exceed the stated rates. Therefore, a more detailed conformity determination is not required for the First Dam Alternative. According to the General Conformity Regulations, activities demonstrate conformity if a federal agency can document the annual net increase in emissions caused by the proposed activities and can demonstrate that the activities would not interfere with the State or Tribe's ability to attain or maintain NAAQS. In either the normal operations (24 hrs./day, 198 days/yr) or the worst-case scenario (24 hrs./day, 365 days/yr), the First Dam Alternative would not exceed PM_{2.5} emission levels for the *de minimis* threshold. In fact, the First Dam Alternative would result in less than 0.5% of the *de minimis* emissions limit, and therefore, would not interfere with the State or Tribe's ability to attain or maintain NAAQS.

Additionally, the First Dam Alternative provides an off-setting reduction of 0.05 t/yr. in potential PM_{2.5} emissions due to the operation of the West Lagoons Hydropower Station. This offset subtracted from the 0.06 tons/yr. in potential PM_{2.5} emissions for normal pump operations equates to 0.01 tons/yr. net PM_{2.5} emissions, which is lower than the existing condition of known emissions from pumping.

In conclusion, fugitive dust and GHG emission increases associated with construction of the First Dam Alternative would be minimized by implementation of applicable BMPs (see Section 6.6.1). Based on the emission calculations for First Dam Alternative, the emission rates would not increase in the Project Area over the long-term and no major, long-term effects to air quality would occur, particularly to PM_{2.5} emissions, nor would implementation of this alternative prevent or impede Cache County from meeting CAA standards or the maintenance phase of the SIP. The alternative would not violate the CAA or NAAQS.

Crockett Diversion Alternative

During construction of the Crockett Diversion Alternative, activities such as trenching, excavation, and earthwork would produce minor particulate and diesel emissions from operation of heavy equipment. These temporary emissions would cause negligible, short-term adverse effects on air quality, comparable to emissions from regular agricultural operations or routine canal maintenance. BMPs, such as dust suppression techniques (see Section 6.6.1), would be used to further minimize these effects during construction. Once construction is complete, air quality would return to pre-construction, background levels, with no long-term change in air quality.

As discussed in the PM_{2.5} Emissions Memo in Appendix E2, the General Conformity Regulations are applicable to the Proposed Project, thus the Proposed Project must comply with the regulations. As part of the PM_{2.5} emissions calculations, the memo reviewed two operational scenarios for the Crockett Diversion Alternative—normal pump operations of 24 hrs./day during the irrigation season (April 1–October 15 [6.5 months or ~198 days]) as well as a worst-case scenario where the pumps operate 24 hrs./day, 365 days/yr). PM_{2.5} emissions were calculated at 373.8 lb/yr. or 0.2 tons/yr. for normal operations, while emissions of 689.2 lb/yr. or 0.4 tons/yr. were calculated for the worst-case scenario (see PM_{2.5} Emissions Calculation Memo in Appendix E2 for details). In either case, calculated PM_{2.5} emissions are well below the *de minimis* threshold and neither would equal or exceed the state limit for a significant emission increase or a net significant emissions increase, thereby not requiring permitting or emissions offsets. Additionally, since the Crockett Diversion Alternative would NOT equal or exceed NAAQS, a more detailed conformity determination is not required for the Siphons Installation Alternative. Given the negligible, short-term adverse effects during construction, Cache County would continue to meet NAAQS and the maintenance phase of the SIP, remaining in attainment, and no long-term effects would occur.

5.3.2.2 Greenhouse Gases

No Action Alternative

Currently, the system produces approximately 1,048,000 lb of CO₂, 96 lb of CH₄, and 13 lb of N₂O per year during normal operation (see Table 4-1 of TM-013). The No Action Alternative would not contribute to or change levels of GHGs present within the Project Area, and current levels of GHGs in the Project Area would persist.

First Dam Alternative

The agricultural water improvements from the First Dam Alternative would improve irrigation efficiency by 5,390 ac-ft of annual reductions in seepage, evaporation, and carrier water addressing current irrigation shortages limiting agricultural production (see Appendix E3, TM-004). Furthermore, the water conservation and extended season of availability resulting from the First Dam Alternative would provide \$1,140,500 in increased farm production, addressing damages caused by untimely availability of water for crops, giving local agricultural producers more flexibility.

Under the First Dam Alternative, all of the shareholders and individual users would be supplied with pressurized water, with three supplemental pump stations being constructed at the western

end of the system. Additionally, a hydropower station would be constructed at the West Lagoons Pump Station to generate power with CAIC water.

Although project activities could cause temporary increases in GHGs from construction equipment emissions, these emissions would be temporary, minor, and localized, and would not interfere with the area achieving NAAQS requirements or statewide GHG goals. Once construction is complete, O&M activities would decrease, resulting in long-term beneficial reductions in GHG emissions.

In an analysis of the emission efficiency difference between the alternatives, greenhouse gas emissions were calculated based on pumping requirements (see Appendix E4, TM-013). This analysis was not a comprehensive emissions analysis of the project, as reduced/avoided culinary pumping, carbon sequestering in additional crop yield, and other significant emissions effects were not quantified. However, this analysis serves in illustrating the First Dam Alternative would produce significantly reduced quantities of greenhouse emissions compared to the other alternatives—producing approximately 760,000 lb of CO₂, 70 lb of CH₄, and 9 lb of N₂O per year, including emission offsets from the West Lagoon Hydropower Station (see Table 4-1 of TM-013)—resulting in a reduction of overall yearly emissions by approximately 288,000 lb of CO₂, 26 lb of CH₄, and 4 lb of N₂O per year per year from the FWOFI.

Crockett Diversion Alternative

The Crockett Diversion Alternative would supply all water users with pressurized water and construct four supplemental pump stations, as discussed in Section 4.4.3. The Crockett Diversion Alternative would reduce 5,390 ac-ft of seepage and carrier water losses, extend the seasonal availability of water, and provide \$1,140,500 in increased farm production, addressing damages caused by untimely availability of water for crops. However, the Crockett Diversion Alternative would not construct a hydropower station, and the four new pump stations would increase overall annual emissions by approximately 5,232,000 lb of CO₂, 478 lb of CH₄, and 66 lb of N₂O compared to the FWOFI. The Crockett Diversion Alternative would produce approximately 6,280,000 lb of CO₂, 574 lb of CH₄, and 66 lb of N₂O per year (Table 4-1 of TM-013). Construction activities would compound these increases temporarily. Though Cache County would continue to meet NAAQS and remain in attainment, increased GHG emissions from temporary and permanent sources could interfere with the area meeting NAAQS requirements and statewide GHG goals in the future.

5.3.3 Energy

5.3.3.1 No Action Alternative

Under the No Federal Action Alternative, no changes in power consumption would be made. The existing First Dam hydropower station would not be decommissioned.

5.3.3.2 First Dam Alternative

Under the First Dam Alternative, the BIC and all individual users would be supplied with pressurized water, transitioning the CAIC's irrigation system from individual pumps to gravity pressurization, with supplemental pump stations on the western end of the system (West River, Cow Pasture, and West Lagoons pump stations). Additionally, a hydropower station would be constructed at the West Lagoons pump station which would generate power with excess CAIC

water to offset pumping costs of the rest of the irrigation system. The existing hydropower turbine at First Dam owned by USU would be decommissioned to provide adequate pressure to system users. The proposed hydropower turbine would operate at a higher head and with an estimated 30 to 50% greater consistency than currently experienced at the existing First Dam hydropower station. Preliminary calculations show that generation at the West Lagoons hydropower turbine would be significant enough to offset the loss of power generation at First Dam, as well as the majority of pumping costs incurred by the construction of three new pumps proposed under this alternative (see Appendix E4, TM-013 for details). The estimated power consumption for each proposed pump station is shown in Table 5-4 and the estimated power generation for the First Dam Alternative is shown in Table 5-5. Table 5-6 shows a summary of the estimated power consumption and generation between the three alternatives.

Table 5-4. First Dam Alternative Power Consumption by Pump Station

Location	Power Consumption per Irrigation season (April 1–October 15, kW/hr)
BIC Pump Station	0
Sprinkle Irrigated Land in the CAIC Service Area	0
West River Pump Station	790,000
West Lagoons Pump Station	1,400,000
Cow Pasture Pump Station	940,000
Total	3,130,000

Table 5-5. First Dam Alternative Power Generation

Location	Power Generation (kW/hr)
USU Hydropower (decommissioned) (April 1–October 15)	-740,000
West Lagoons Hydropower Station During Irrigation Season (April 1–October 15)	+1,350,000
West Lagoons Hydropower Station Outside Irrigation Season (October 16–March 31)	+1,330,000
Total	+1,940,000

Table 5-6. Summary of Estimated Power Consumption and Generation by Alternative

Alternative	Power Consumption per Irrigation Season (April 1–October 15) (kW/hr)	Power Generation (Year Round) (kW/hr)	Net Power (kW/hr)
No Federal Action ¹	1,652,000	0	-1,652,000
First Dam	3,130,000	1,940,000	-1,190,000
Crockett Diversion	9,860,000	0	-9,860,000

¹The power consumption estimates for the No Federal Action scenario are conservative, as they only account for the known power usage associated with the BIC pump station and the sprinkle-irrigated land. Additional pumps are used within the Project Area; however, they have not been quantified due to insufficient data.

Two main differences related to energy exist between the action alternatives: the number of pump stations, and the inclusion of hydropower in the First Dam Alternative.

Because the First Dam Alternative capitalizes on the gravitational flow of water, it only requires pumps at the downstream locations to pressurize the irrigation system. The Crockett Diversion

Alternative loses additional head between First Dam and the Crockett Diversion and requires an additional pump station near the Crockett Diversion to adequately pressurize the irrigation distribution system. This additional pump station adds approximately 6,000,000 kW/hr of annual electrical power consumption to the system.

Besides using gravity to pressurize the system from the higher diversion point at First Dam, the First Dam Alternative also includes a hydropower station, which is estimated to produce approximately 1,940,000 kW/hr per year, helping to offset existing power costs and reduce future costs for the PI system. The hydropower turbine would be installed at the Logan City lagoon and would be owned by the Sponsor as a part of the larger PI system. Consistent with the PL 83-566, in which hydropower is explicitly mentioned as an authorized project purpose (7 CFR 622.2(c)), the inclusion of hydropower in the irrigation distribution system focuses on improving energy efficiency in agricultural operations by implementing practices that reduce energy consumption and enhance operational efficiency. The proposed hydropower installation would provide a renewable and sustainable energy source, thereby reducing reliance on fossil fuels and lowering greenhouse gas emissions (Conservation Practice Standard Energy Efficient Agricultural Operation [Code 374]).

The installation of hydropower and the electricity savings would have a significantly positive impact on the Sponsors. For example, with increases in fossil fuel prices, the local power company, Rocky Mountain Power, recently proposed a 30.6% increase in electricity rates over two years which was slightly reduced after public outcry (Cabrera 2024). The Sponsors investment in clean energy is the one of the best ways to prevent ongoing rate hikes which would affect all shareholders' costs.

5.3.3.3 Crockett Diversion Alternative

The Crockett Diversion Alternative would also remove individual and BIC pumping and includes the construction of four pump stations: Crockett Pump Station, West River Pump Station, Cow Pasture Pump Station, and West Lagoons Pump Station. Table 5-7 shows the estimated power consumption by each pump station.

Table 5-7. Crockett Alternative Power Consumption by Pump Station

Place of Use	Average Power Consumption per Irrigation season (April 1–October 15, kW/hr)
BIC Pump Station	0
Sprinkle irrigated land in the CAIC Service Area	0
Crockett Pump Station	6,760,000
West River Pump Station	790,000
West Lagoons Pump Station	1,370,000
Cow Pasture Pump Station	940,000
Total	9,860,000

As shown in Table 5-6, the Crockett Diversion Alternative requires nearly nine times the power consumption per irrigation season compared to the First Dam Alternative. Given the uncertainty of rising power rates, this alternative poses challenges.

For example, this increase means significantly higher energy costs for operating the irrigation system under the Crockett Diversion Alternative. With the uncertainty of rising power rates, the

higher energy consumption of the Crockett Diversion Alternative could lead to unpredictable and potentially escalating operational costs which could strain budgets and resources allocated for irrigation. Stakeholders might need to consider whether the benefits of this alternative justify the increased costs and risks associated with higher energy consumption.

Increased energy consumption also has environmental implications, such as a larger carbon footprint and greater demand on energy resources (see Section 5.3.2). These implications could be a concern for stakeholders prioritizing sustainability and environmental stewardship.

5.3.4 Soils and Geology

5.3.4.1 Upland Erosion and Sedimentation

No Action Alternative

Under the No Action Alternative, CAIC would reconstruct the Crockett Diversion and replace portion of main Crockett Canal that is elevated on a hillside near Merlin Olsen Park to reduce risk of canal or hillside failure and meet the insurance liability requirements for CAIC (see Section 4.4.1 and Appendix E3, TM-006). These activities would have temporary, minor effects on soil resources in the Project Area during construction activities but would improve soils in the long term by reducing seepage that potentially could contribute to erosion, especially during high runoff events, like those that occurred in the 2005 and 2009 landslides.

The No Action Alternative would not address current erosion and sedimentation associated with flood control issues with other canals. The other canals would continue to overtop during heavy precipitation events, and the resultant flooding would continue to cause localized erosion and sedimentation.

First Dam Alternative

The proposed activities that could affect soil resources are associated with construction activities which require the use of heavy machinery to manipulate the soil, including pipeline installation, canal lining, Crockett Diversion infrastructure reconstruction, and staging area improvements. In these areas, sedimentation could occur if rain causes soil runoff into waterways from construction sites. However, the First Dam Alternative would have minimal adverse effects to soil resources from these activities because temporary soil disturbance would primarily occur in previously disturbed canal prisms, road rights of way, and staging areas, and the disturbed areas would be restored following construction activities.

To further reduce the potential sedimentation, the First Dam Alternative includes numerous measures to minimize soil erosion, maintain and restore soil conditions, stabilize, and rehabilitate disturbed areas, and maintain soil productivity, as well as requirements for proper soil handling and site selection (see BMPs in Appendix E2). For example, to further minimize soil erosion during implementation, TESCOs, such as silt fencing, fiber wattles, or other erosion control mechanisms, would be installed and maintained; all requirements for the UPDES Program Permit would be followed, including developing a SWPPP; existing vegetation would be preserved that would filter construction sediment; and the construction activities would be confined to the designated Project Area footprint to minimize the amount of exposed soil without cover. Additional BMPs are identified in Appendix E2.

In the long term, the First Dam Alternative is designed to reduce erosion and sedimentation. Piping the irrigation water from the canals would significantly enhance slope stability in several ways. Specifically, the Logan Northern Canal would no longer carry irrigation water, and a portion of the canal would be converted to trail. Piping helps to minimize water seepage into the canal banks, which can weaken the soil structure and lead to slope failure. By containing the water within pipes, the risk of soil saturation and subsequent erosion is reduced (Jebelli and Meguid 2013). Piped systems allow for better control of water flow, reducing the likelihood of rapid drawdown conditions that can destabilize canal slopes. Additionally, piping prevents direct contact between water and the canal banks, thereby reducing erosion caused by water flow (Jebelli and Meguid 2013). The contouring, reclaiming, and revegetating of approximately 19,560 feet of earthen ditch and canal improvement, lining, and boxing in the CAIC service area would also help stabilize soils.

The reduction in the extent of open water channels, removing irrigation water from the canals, and improving a portion of the existing canals to carry runoff flows to the west would have the added benefit of reducing the risk of flooding from overtopping canals during extreme weather events which contributes to localized erosion and sedimentation. Combined with the project's BMPs, these actions would contribute to a beneficial, long-term effect on soil stability across the Project Area.

Crockett Diversion Alternative

The proposed activities that could affect soil resources are associated with construction activities which require the use of heavy machinery to manipulate the soil, including pipeline installation, canal lining, Crockett Diversion infrastructure reconstruction, and improvements to staging areas. In these areas, sediment could become an issue if rainwater causes soil runoff from construction sites into nearby waterways. However, the Crockett Diversion Alternative would result in minimal adverse effects to soil resources from these activities because temporary soil disturbance would primarily occur in the already impacted canal prisms, road rights of ways, and staging areas, and the disturbed areas would be restored following construction activities.

To further reduce the potential sedimentation, the Crockett Diversion Alternative incorporates numerous mitigation measures aimed at minimizing soil erosion, maintaining, and restoring soil conditions, stabilizing disturbed areas, and preserving soil productivity (see BMPs in Appendix E2). These measures include proper soil handling practices and careful site selection to reduce effects to soil resources. TESCOs, such as silt fencing, fiber wattles, and other mechanisms, would be installed to reduce erosion. Compliance with the UPDES Program Construction Stormwater Permit would also be ensured, including the development of a SWPPP. Construction would be confined to the designated project footprint, and existing vegetation would be preserved where feasible to filter construction-related sediment. Additional BMPs are identified in Appendix E2.

In the long term, this alternative is designed to reduce soil erosion and sedimentation. Piping the irrigation water from the canals would significantly enhance slope stability in several ways. Specifically, the Logan Northern Canal would no longer carry irrigation water, and a portion of the canal would be converted to trail. Piping helps to minimize water seepage into the canal banks, which can weaken the soil structure and lead to slope failure. By containing the water within pipes, the risk of soil saturation and subsequent erosion is reduced (Jebelli and Meguid 2013). Piped systems allow for better control of water flow, reducing the likelihood of

rapid drawdown conditions that can destabilize canal slopes. Additionally, piping prevents direct contact between water and the canal banks, thereby reducing erosion caused by water flow (Jebelli and Meguid 2013). The contouring, reclaiming, and revegetating of approximately 19,560 feet of earthen ditch and canal improvement, lining, and boxing in the CAIC service area would help stabilize soils.

The reduction in the extent of open water channels, removing irrigation water from the canals, and improving a portion of the existing canals to carry runoff flows to the west would have the added benefit of reducing the risk of flooding from overtopping canals during extreme weather events which contributes to localized erosion and sedimentation. Combined with the project's BMPs, these actions would contribute to a beneficial, long-term effect on soil stability across the Project Area.

5.3.4.2 Prime & Unique Farmland, and Farmland of Statewide Significance

No Action Alternative

Farmlands in the Project Area would continue to produce as in the past. The No Action Alternative would have no direct effect on agriculturally significant soils. However, the No Action Alternative would not address current flood control issues with erosion and sedimentation. The existing infrastructure would continue to overtop during heavy precipitation events, and the resultant flooding would continue to cause localized erosion and sedimentation, which could continue to damage 10,350 acres of agricultural lands.

First Dam Alternative

The First Dam Alternative would occur on land within and in the vicinity of agricultural lands, including lands with agriculturally significant soils. Under the First Dam Alternative, installation of the PI system and the reconstruction of the Crockett Diversion may cause temporary disturbance to soils that are classified as "prime farmland if irrigated," "farmland of local importance," "farmland of statewide importance," and "not prime farmland." However, the temporary effects would not remove the lands from production because construction would take place outside the irrigation season ensuring water availability, and diversion closures would be rotated, ensuring no effects to productivity on these important lands.

While the existing canal conveys irrigation water to agriculturally significant lands, no change in the configuration of CAIC irrigated lands would occur from the First Dam Alternative. The First Dam Alternative would not expand the footprint of the canals, nor would it temporarily or permanently remove any farmlands from production, and no farmlands of statewide or local importance would be converted from agricultural uses to other uses under the First Dam Alternative. Additionally, no interruption to agricultural production would occur and no part of the irrigation season would be lost during implementation of the First Dam Alternative. Increased water use efficiency and decreased flooding from canal breaching would have beneficial effects on these soils. Therefore, the First Dam Alternative would have no negative effects to agriculturally significant soils and would comply with the FPPA.

Crockett Diversion Alternative

The effects to agriculturally significant soils from the Crockett Diversion Alternative are the same as the First Dam Alternative.

5.3.5 Vegetation

5.3.5.1 *Special Status Plant Species*

No Action Alternative

No suitable habitat is present for either the ULT or the Maguire primrose within the Project Area. Under the No Action Alternative, existing vegetation and soils would be temporarily disturbed around the Crockett Diversion and the North Branch Canal (Crockett Canal), both of which are previously disturbed areas where suitable habitat for these special status plant species does not exist. Therefore, the No Action Alternative would not affect special status plant species in the Project Area.

First Dam Alternative

The First Dam Alternative would cause temporary soil disturbance which could affect special status plant species if present. This disturbance would be localized to areas within the existing canal footprints and previously disturbed agricultural and suburban and urban areas where piping and canal lining and boxing would occur as part of construction activities. First Dam Alternative activities occur on 575 acres. Restoration would occur after construction activities conclude, including long term, native seeding and native plantings and noxious weed control that would improve habitat and growing conditions for plant species across the Project Area.

Species-specific Effects—Ute ladies'-tresses

The First Dam Alternative would have no effect on the ULT. Throughout the Project Area, habitat suitability assessments were performed, and no vegetative or blooming ULTs were observed. Competition from aggressive plant species, incompatible soil and hydric conditions, and disturbance from cattle grazing make the habitat within the Project Area unsuitable and unlikely to support ULTs. Although the Project Area contains locations with similar conditions to the ULT reference population site in Mendon, Utah, these areas are not suitable because of competition, incompatible soil and hydric conditions, and grazing pressure. Additionally, after reviewing the Project Area and the specific project activities under the First Dam Alternative, USFWS agreed that a no effect determination was appropriate for the ULT (see USFWS letter in Appendix A).

Species-specific Effects—Maguire Primrose

Suitable habitat for the Maguire primrose is not present within the Action Area. During habitat suitability assessments of the Action Area, no ledges, crevices, overhanging limestone rocks, or associated plant species were identified within the Action Area. Therefore, suitable habitat for the Maguire primrose is not present within the Project Area and because no documented populations of this species occur within the Project Area, no potential suitable habitat for this species would be affected by construction activities, and the First Dam Alternative would have no effect to the Maguire Primrose.

Crockett Diversion Alternative

The Crockett Diversion Alternative would cause short term soil disturbance which could affect special status plant species if present. This disturbance would be localized to areas within the existing canal footprints and previously disturbed agricultural and suburban and urban areas

where piping and canal lining and boxing would occur as part of construction activities. Crockett Diversion Alternative occurs on 415 acres. Restoration would occur after construction activities conclude, including long term, native seeding and native plantings and noxious weed control that would improve habitat and growing conditions for plant species across the Project Area

The species-specific effects for the Crockett Diversion Alternative would be the same as for the First Dam Alternative.

5.3.5.2 Riparian Areas

No Action Alternative

Under the No Action Alternative, riparian areas and riparian vegetation would not be directly affected. However, approximately 9.2 acres of low-quality seepage-induced riparian vegetation would persist along the Twin Canals and the Logan Northern Canal, in addition to approximately 123 acres of riparian fringe associated with canals and ditches, and approximately 245 acres of riparian fringe associated with Blue Spring Creek, Little Logan, and the Logan River, for a total of approximately 377 acres of riparian habitat across the Project Area. The project components would continue to annually lose 6,050 ac-ft of water from seepage and evaporation, continuing to negatively affect downstream riparian areas.

First Dam Alternative

Under the First Dam Alternative, 9.2 acres of riparian fringe that depends on hydrology from seepage from canals that would be lined or boxed on the Twin Canals and the Logan Northern Canal would experience minor, short-term direct effects associated with vegetation removal, and long-term indirect effects from loss of hydrology. Specifically, the riparian areas associated with the approximately 2,640 feet of the Twin and 3,570 feet of the Logan Northern Canals' concrete lining, and the 3,570 feet of Twin Canals' new box culvert installation would be affected. However, this effect would be minor because these canals pass through urban areas, and the existing riparian fringe is considered low quality habitat because of the lack of structural complexity, the presence of ornamental species, dense grasses, and non-native weed species, and fragmentation because of the urban environment. Additionally, vegetation along the canals is managed using herbicide to control noxious weeds and vegetation overgrowth. Furthermore, the 9.2 acres of low-quality, riparian fringe represents only approximately 2.4% of the total 377 acres of riparian vegetation that falls within the Project Area.

Further reducing the effects, the native riparian vegetation along the Logan River, Little Logan, Blue Spring Creek, and Swift Slough would not be removed or altered by the First Dam Alternative, except for a select number of trees and shrubs that may need to be removed within the footprint of the Crockett Diversion during construction.

Implementing BMPs (Appendix E2) would also further reduce the direct and indirect effects to riparian vegetation including:

- All work would be completed within the designated Project Area, limiting the effects to the narrow corridor along the canals and at the Crockett Diversion footprint.
- To prevent the transportation of invasive species, all equipment would be pressure washed before arriving at the site to remove plant parts, soil, and other materials that may carry invasive and noxious weed seeds.

- SWPPP compliance would minimize erosion risk and protect water quality.
- Restoration would occur after construction activities conclude, including long term, native seeding and native plantings and noxious weed control that would improve habitat and growing conditions for plant species across the Project Area.

Despite some minor vegetation removal during construction and the eventual loss of 9.2 acres of low-quality riparian vegetation along the canal prisms where hydrology would be removed, the project is designed to improve overall water quantity and quality in the Project Area as described in Section 5.3.6.1, and is consistent with the priorities of the Utah State Central Region Wetlands Conservation Strategy (UDWR 2001).

Crockett Diversion Alternative

Under the Crockett Diversion Alternative, riparian areas would experience the same effects as under the First Dam Alternative. The same long-term eventual loss of 9.2 acres of riparian fringe vegetation that depends on hydrology from seepage from areas of the Twin Canals and the Logan Northern Canal would occur, and native riparian vegetation along the Logan River, Little Logan, Blue Spring Creek, and Swift Slough would not be removed or altered by the Crockett Diversion Alternative. Construction BMPs would minimize effects, and the design of the project would improve overall water quantity and quality, consistent with the priorities of the Utah State Central Region Wetlands Conservation Strategy (UDWR 2001).

5.3.5.3 Noxious Weeds & Invasive Plant Species

No Action Alternative

Under the No Action Alternative, temporary, minor effects would occur due to reconstruction of the Crockett Diversion and the replacement of the North Branch Canal (Crockett Canal). No long-term effects would occur to the existing vegetation from the No Action Alternative. Under the No Action Alternative, weeds would persist at current levels along the canal and access roads, and along riparian corridors. Ongoing maintenance and vegetation clearing would continue in the existing CAIC system. Logan City, North Logan City, Hyde Park City, and CAIC would continue to comply with the Utah Noxious Weed Act and would continue existing invasive species controls to manage and prevent weed introduction and establishment.

First Dam Alternative

Under the First Dam Alternative, current practices used by CAIC to control and prevent the introduction and establishment of noxious weeds and invasive species within the Project Area would continue. Temporary ground disturbance associated with construction would create conditions for noxious weeds in the area to spread within the approximate 575-acre footprint. However, project BMPs ensure that preventative measures would be used to mitigate the spread of noxious weed species, including the cleaning of construction equipment, protecting existing vegetation, and conducting post-construction site restoration activities that includes measures for treatment of noxious weeds for a minimum of 3 years post construction, in addition to native seeding and planting. These measures and additional BMPs are identified in Appendix E2.

With the boxing of the Logan Northern Canal, the First Dam Alternative would remove approximately 5.6 acres of open water, which provides hydrology for growing noxious weeds, and provides a method of invasive seed transport. Herbaceous and woody noxious weeds, which

rely on irrigation water and ditch seepage for hydrology, would no longer be supported. Certain sections of the Project Area where open water is removed would no longer require regular noxious weed maintenance after site restoration is complete, reducing the quantity of herbicide input into the watershed.

The First Dam Alternative construction BMPs, such as cleaning vehicles before bringing them onsite and treating weeds for 3 years post construction, would ultimately ensure project activities would not contribute to the presence of noxious weeds. The project would not cause or promote the introduction or spread of invasive species beyond what currently exists and would ultimately reduce noxious weed presence and improve management of these species and would minimize the risk of future weed infestation, ensuring the alternative complies with E.O. 13112.

Because the First Dam Alternative would not cause or promote the introduction or spread of invasive species beyond what currently exists and would ultimately reduce noxious weed presence and improve management of these species within the Project Area, permanent negative effects would not result from implementation of the First Dam Alternative.

Crockett Diversion Alternative

Under the Crockett Dam Alternative, current practices used by CAIC to control and prevent the introduction and establishment of noxious weeds and invasive species within the Project Area would continue. Temporary ground disturbance associated with construction would create conditions for noxious weeds in the area to spread within the approximate 415-acre footprint. However, project BMPs ensure that preventative measures would be used to mitigate the spread of noxious weed species, including the cleaning of construction equipment, protecting existing vegetation, and post-construction site restoration activities that includes measures for treatment of noxious weeds for a minimum of 3 years post construction, in addition to native seeding and planting. These measures and additional BMPs are identified in Appendix E2.

With the boxing of the Logan Northern Canal, the Crockett Diversion Alternative would remove approximately 5.6 acres of open water, which provides hydrology for growing noxious weeds, and provides a method of invasive seed transport. Herbaceous and woody noxious weeds, which rely on irrigation water and ditch seepage for hydrology, would no longer be supported. Certain sections of the Project Area where open water is removed would no longer require regular noxious weed maintenance after site restoration is complete, reducing the quantity of herbicide input into the watershed.

The Crockett Dam Alternative construction BMPs, such as cleaning vehicles before bringing them onsite and treating weeds for 3 years post construction, would ultimately reduce the presence of noxious weeds within the Project Area and minimize the risk of future weed infestation. Because of this minimization, the Crockett Dam Alternative would not promote the introduction or spread of noxious species beyond existing noxious weed levels and therefore complies with E.O. 13112.

Because the Crockett Dam Alternative would not cause or promote the introduction or spread of invasive species beyond what currently exists and would ultimately reduce noxious weed presence and improve management of these species within the Project Area, permanent negative effects would not result from implementation of the Crockett Dam Alternative.

5.3.6 Water Resources

5.3.6.1 Surface & Ground Water Quality & Quantity

No Action Alternative

Under the No Action Alternative, water quality and quantity would be temporarily affected during the reconstruction of the Crockett Diversion and the replacement of the North Branch Canal (Crockett Canal). CAIC would continue using the existing open canals and laterals for water delivery, and 6,050 ac-ft of annual losses due to evaporation and seepage would persist. Routine maintenance of the canal would continue, with no significant improvements to efficiency or reductions in water loss.

In an analysis conducted by BIO-WEST based on LRTF-CAP criteria, under the No Action Alternative, summer base flows in the Logan River would remain low in the middle and lower reaches of the Logan River (see Appendix E5, TM-021). The CAP analysis confirms that during extreme dry years, summer base flows below Crockett Diversion would drop to approximately 9 cfs, which is classified as Poor Condition (<10 cfs). Additionally, the Logan-Blacksmith Diversion, just upstream of Trapper Park, can divert all remaining streamflow, occasionally leaving portions of the lower reach dry in August and September. These flows would continue to limit water quality and aquatic habitat connectivity in downstream areas, with low flows in the middle and lower reaches contributing to warmer water temperatures, reduced dissolved oxygen levels, and diminished aquatic and riparian habitat conditions, further exacerbating periodic dewatering events that have historically occurred during droughts over the past several decades. These conditions would perpetuate Utah State Standards violations for Cold Water Fisheries.

The 2010 TMDL for Dissolved Oxygen and Total Phosphorus in the Logan River and Cutler Reservoir identifies nutrient enrichment as a major concern, leading to low dissolved oxygen levels and water quality degradation. Under the No Action Alternative, these impairments would likely persist, as no major improvements to water management, sediment transport, or nutrient load reduction would occur. The CAP analysis confirms that State Water Quality Standards for Cold Water Fisheries are currently exceeded in the middle and lower reaches when flows drop below 25 cfs in the middle reach and below 40 cfs in the lower reach (TM-021). Additionally, irrigation return flows upstream of 100 East introduce warmer water and nutrients, further degrading water quality and reducing aquatic habitat suitability. Furthermore, Appendix E4, TM-011 indicates that under these low-flow conditions, elevated water temperatures and reduced dissolved oxygen persist.

First Dam Alternative

Water Quality

Temporary effects to water quality could occur during construction activities within natural channels and riparian areas of the Logan River and the Little Logan. For example, reconstruction of the Crockett Diversion would involve 0.3 acres of disturbance, temporarily altering channel morphology, hydrologic conditions, and downstream flow. Sediment removal from First Dam would entail excavation of approximately 85,000 CY, restoring 11 acres of reservoir capacity, improving water storage, and reducing sediment buildup that affects water quality. This removal would decrease the downstream effects of periodic dam maintenance activities which lower the reservoir level and flush sediment. Rebuilding intake screening at First Dam would enhance

water flow efficiency and reduce debris entering irrigation systems. While Blue Spring Creek and Swift Slough are within the Project Area, no project activities would occur within their channels. A 500-square-foot Swift Slough outfall structure would control flow into sensitive aquatic areas, reducing erosion and protecting water quality. Wetland effects from irrigation-related actions would be minimized by confining construction to previously disturbed canal prisms. Additionally, BMPs would further minimize the extent of effects (Appendix E2).

Long-term benefits to water quality include the removal of the Providence Pioneer Diversion, which would restore natural flow conditions and improve sediment transport processes in the Logan River. Blocking the Northwest Canal split would optimize water delivery and reduce unnecessary diversions.

The proposed Crockett Diversion replacement design would have the same impact on water quality upstream of the diversion structure as the existing condition. Oxygenation of the water would occur when the inflatable weir is in the raised position and passing a minimum instream flow of 25 cfs. Water quality would improve downstream of the diversion structure due to the increased dissolved oxygen. Additionally, the increased instream base flows associated with this alternative would enhance water movement, reduce stagnation, and promote the natural dispersal of phosphorus. The additional flows would also lower water temperatures by approximately 1 to 2°C, which would enhance dissolved oxygen retention and aquatic habitat quality (see TM-011). Further, the removal of the Providence Pioneer Diversion would restore sediment transport and reduce stagnant areas where phosphorus accumulation can occur. The elimination of seepage losses from open canals would also reduce groundwater nutrient infiltration into the Logan River (see TM-004).

The increased dissolved oxygen in the water and minimum flow of 25 cfs downstream of the diversion structure would help protect the cold-water game fish species and the aquatic organisms that they feed on downstream of the structure. Additionally, these benefits address the TMDL for dissolved oxygen for the Middle Bear River and Cutler Reservoir. These water quality benefits would likewise protect the water for the other beneficial uses including infrequent primary contact through recreation, waterfowl and shore birds, and agricultural uses. See Appendix E3, TM-007 for additional information.

Based on the adapted CAP analysis and findings from TM-011 (see Table 5-8), the increased summer base flows in the Logan River would reduce water temperatures by approximately 2 degrees upstream of Blacksmith Fork confluence, and approximately 1 degree below Blacksmith Fork confluence. The instream flows also increase dissolved oxygen concentrations. The State Water Quality Standards for Cold Water Fishery would be met for water temperature and dissolved oxygen more than 90% of the time with the proposed instream flows for either action alternative.

Additionally, the proposed project aligns with the 2010 TMDL by enhancing base flows and reducing conditions that promote phosphorus accumulation (for the most recent CWA Section 305(b) integrated report, see:

<https://www.epa.gov/tmdl/Integrated%20Reporting%20Guidance%20under%20CWA%20Sections%20303%28d%29%2C%20305%28b%29%20and%20314>).

Water Quantity

This alternative includes substantial irrigation infrastructure upgrades to conserve water and reduce losses. Planned actions include installing 8,500 feet of supply pipeline and 120 miles of

closed irrigation pipelines, reducing seepage, evaporation, and carrier water losses to conserve approximately 5,390 ac-ft annually (See Appendix E3, TM-004). Additional improvements include 6,650 feet of return flow enhancements, 25,670 feet of new pipe installation, and 6,210 feet of earthen ditch lining to minimize seepage. Boxing 9,750 feet of Twin Canals would further reduce losses. The project also includes a 300-acre storage reservoir to increase water storage capacity and improve reliability during peak demand. Pump stations at the Lagoon, Cow Pasture and West River would optimize water distribution. Collectively, these upgrades modernize the irrigation system, enhancing efficiency and minimizing water loss.

Instream flow improvements of 25 cfs to the Logan River over 15.1 miles and 5–10 cfs to the Little Logan over 4.8 miles would enhance base flows, aquatic habitats, and water quality, critical for fish and other species. The estimated Logan River summer base flows by reach are shown in Table 5-8. Though the First Dam Alternative reduces summer base flows nearly in half between First Dam and Crockett Diversion, the First Dam Alternative increases summer base flows for 14 river miles. This increase is a significant improvement to flows of concern in the Logan River. As shown in Table 5-8, reach-weighted average stream flows under the No Action Alternative are about 25 cfs along the river reach from First Dam to the Proposed West River Pump Station, compared to about 40 cfs for the First Dam and Crockett Diversion Alternatives (see Appendix E5, TM-021 for analysis and additional information).

Table 5-8. Estimated Summer Base Flows by Reach in the Logan River by Alternative

Reach and Reach Length ¹	Logan River Estimated Summer Base Flow by Alternative (cfs)		
	No Action	First Dam	Crockett Diversion
Upper Reach (First Dam to Crockett) 1.2-mile reach	Very good 65 cfs	Good 30 cfs	Very Good 70 cfs
Upper Reach (Crockett to 100 East) 1.6-mile reach	Poor 10cfs	Good 32 cfs	Good 30 cfs
Middle Reach 2.5-mile reach	Fair 16 cfs	Good 38 cfs	Good 33 cfs
Lower Reach	Poor 25 cfs	Good 44 cfs	Good 39 cfs
Weighted Average River Flows Along Entire 15.1 Mile Reach	25 cfs	41 cfs	40 cfs
Increase in Average River Flows Compared to FWOFI	-	16 cfs	15 cfs
Increase in River Flows Measured in ac-ft	-	6,256	5,865

¹Source: Adapted from TM-011 Logan River Water Quality Impacts and TM-021 Logan River Conservation Action Plan Evaluation of Alternatives for the Logan River Watershed Plan-EIS.

²Note: Since 1 cfs equals 1.98 ac-ft per day, the total volume can be calculated for a season by multiplying 1.98 by the number of days in the season. For a 197-day season, which is the typical length of the irrigation season in the study area, this calculation results in approximately 391 ac-ft per cfs.

Additionally, TM-011 confirms that the increased flows in the First Dam Alternative lead to improved thermal regimes by reducing peak temperature variations, thereby further enhancing water quality over time and across different reaches.

Crockett Diversion Alternative

Water Quality

Temporary water quality effects would occur during the reconstruction of the Crockett Diversion on the Little Logan, which would involve 0.3 acres of disturbance, temporarily altering channel morphology and hydrologic conditions. The alternative includes installing a Crockett pump station to modernize irrigation infrastructure, transitioning to a PI network, and replacing inefficient open canals.

The removal of the Providence Pioneer Diversion would restore natural flow conditions and improve sediment transport. Blocking the Northwest Canal split would optimize water delivery, while the 500-square-foot Swift Slough Outfall Structure would protect sensitive aquatic areas.

During construction, BMPs, including the Spill Prevention, Control, and Countermeasure (SPCC) Plan and the SWPPP, would mitigate construction effects through sediment control, pollutant prevention, and site restoration. Compliance with UPDES permits and other regulatory frameworks ensures water quality standards are upheld, contributing to sustainable water resource management.

TM-011 indicates that with a maintained minimum flow of 25 cfs, the Crockett Diversion Alternative would lower water temperatures by approximately 1 to 2°C and enhance dissolved oxygen levels, resulting in a more stable thermal profile along the affected reach. This change represents a significant benefit compared to the continued high temperatures and low oxygen conditions under the No Action Alternative.

The Logan River's Total Phosphorus impairment and Aesthetics (*E. coli*) concerns are closely linked to sediment transport, nutrient loading, and base flow conditions. The Crockett Diversion Alternative would help mitigate these impairments by increasing instream flows, which enhance water movement and reduce the retention of phosphorus in stagnant areas. The removal of inefficient open canals and the transition to a PI system would decrease nutrient-laden return flows, further reducing phosphorus inputs to the Logan River.

The increased flows would also promote improved dissolved oxygen conditions by lowering water temperatures and enhancing aeration, which supports aquatic life and aligns with the 2010 TMDL for Dissolved Oxygen and Total Phosphorus. These improvements would ensure that water quality conditions in the Logan River better meet state standards for Aquatic Wildlife and Recreation and Aesthetics.

In the long term, water quality improvements include compliance with state standards for temperature and dissolved oxygen, maintaining temperatures below 20°C to prevent thermal stress on aquatic organisms based on the increased flows in the Logan River. These improvements also align with the 2010 TMDL by reducing phosphorus concentrations, stabilizing dissolved oxygen levels, and preventing conditions that promote excessive nutrient accumulation. Based on the CAP analysis in TM-021, the Crockett Diversion Alternative maintains water quality between First Dam and Crockett Diversion in Very Good condition and increases water quality below Crockett Diversion from Fair to Good for 14 river miles, similar to the First Dam Alternative.

Water Quantity

This alternative would install 120 miles of closed irrigation pipelines, conserving 5,390 ac-ft annually by reducing seepage, evaporation, and carrier water losses. Additional upgrades include 25,670 feet of new pipe installation, 6,210 feet of earthen ditch lining, and 9,750 feet of boxing Twin Canals. Enhancing 6,650 feet of return flows would further improve recycling efficiency. A 300-acre storage reservoir would enhance water availability during peak demand, supported by new pump stations at the Lagoon, Cow Pasture and West River to optimize water distribution. Collectively, these actions ensure more reliable water delivery and reduce overall water loss.

Instream flow improvements include providing 25 cfs to the Logan River over 13.9 miles and 5–10 cfs to the Little Logan over 4.8 miles, enhancing base flows, aquatic habitats, and water quality critical for aquatic species. Based on the CAP analysis, this alternative increases summer base flows between First Dam and Crockett Diversion, maintaining this reach in Very Good condition. It increases summer base flows below Crockett Diversion from Poor to Good for 14 river miles (Table 5-8) (see Appendix E5, TM-021 for analysis and additional information).

As shown in Table 5-8, reach-weighted average stream flows under the No Action Alternative are about 25 cfs between First Dam and the Proposed West River Pump Station, compared to about 40 cfs for the First Dam and Crockett Diversion Alternatives. These flows would enhance aquatic habitats, maintain cooler water temperatures, and improve dissolved oxygen levels. The increase in summer base flows would enhance the interaction between surface water and groundwater, stabilizing hydrological connections and supporting groundwater recharge in areas where the river and aquifer are connected. Additionally, while the modernization of the irrigation system may reduce seepage-induced groundwater recharge, improved water management would maintain overall hydrological stability in the Project Area.

Increased base flows would raise water depths by 5–7 inches across 13.9 miles, expanding aquatic habitat connectivity and improving conditions for trout and macroinvertebrate populations. Enhanced flood conveyance from lowered crest elevations at Crockett Diversion would reduce vegetation encroachment and improve riparian conditions. Increased soil moisture from higher base flows would support native species recruitment and reduce invasive species spread.

Additionally, TM-011 reinforces that these increased flows result in improved hydrologic stability and enhanced interactions between surface water and groundwater, which support groundwater recharge and contribute to a more resilient aquatic ecosystem compared to the No Action Alternative.

5.3.6.2 Clean Water Act / Waters of the U.S.

No Action Alternative

Under the No Action Alternative, temporary effects to water quality would occur during the reconstruction of the Crockett Diversion and the replacement of the North Branch Canal (Crockett Canal). These activities would involve work within WOTUS, triggering federal permitting requirements under Section 404 of the CWA for the discharge of dredged or fill material into WOTUS, as well as a Section 401 Water Quality Certification from the UDEQ.

Construction activities associated with these actions could introduce sediment into downstream WOTUS, including the Logan River. BMPs, such as erosion controls and spill prevention, would

be implemented to mitigate these temporary effects and ensure compliance with state and federal water quality standards.

In the long term, the continued use of open irrigation canals under the No Action Alternative would perpetuate water losses to seepage, evaporation, and carrier losses. These losses reduce the volume of water available for downstream WOTUS, indirectly affecting aquatic habitats and water quality in the Logan River watershed. No measures to conserve water or enhance hydrological conditions in the watershed would be undertaken, leaving current conditions unchanged.

First Dam Alternative

The First Dam Alternative includes actions such as sediment removal from First Dam, reconstruction of the Crockett Diversion, and irrigation system modernization. Temporary effects to jurisdictional WOTUS may occur during construction due to sedimentation, runoff, and hydrological disturbances. These effects would be addressed through compliance with the UPDES Construction Stormwater Permit and the implementation of BMPs such as sediment barriers, erosion controls, and spill prevention plans.

Pressurizing the irrigation system and replacing open canals with pipelines has the potential to reduce hydrology to wetlands within the watershed. However, this alternative would conserve approximately 5,390 ac-ft of water annually, increasing water availability in the watershed. Enhanced summer base flows in the Logan River and the Little Logan, with improvements to 25 cfs and 5–10 cfs, respectively, would benefit downstream WOTUS by stabilizing hydrological conditions, supporting aquatic habitats, and improving water quality.

The removal of the Providence Pioneer Diversion would restore natural flow regimes, improving sediment transport and connectivity for aquatic habitats downstream. Construction activities that involve dredging or filling in WOTUS would require Section 404 permitting from the USACE and Section 401 water quality certification from the UDEQ. Through these regulatory processes, any effects to WOTUS would be mitigated, ensuring compliance with the CWA. Long-term, this alternative would result in a net improvement to aquatic resource functions and services within the Logan River watershed.

Crockett Diversion Alternative

The Crockett Diversion Alternative involves reconstructing the Crockett Diversion and transitioning the existing irrigation infrastructure to a pressurized system. Construction activities, such as dam reconstruction and pipeline installation, may temporarily affect WOTUS through sedimentation, and alterations to hydrology, and channel morphology. These effects would be mitigated through compliance with the UPDES Construction Stormwater Permit and BMPs, including erosion and sediment control measures, spill prevention, and revegetation of disturbed areas.

As with the First Dam Alternative, replacing open canals with pipelines under the Crockett Diversion Alternative may reduce hydrology to wetlands within the watershed. However, the project aims to conserve water, reducing annual losses by approximately 5,390 ac-ft. Enhanced instream flows, including 25 cfs to the Logan River and 5–10 cfs to the Little Logan, would benefit aquatic habitats and stabilize hydrological conditions in connected WOTUS.

Additionally, the removal of the Providence Pioneer Diversion would restore sediment transport, reduce hydrological barriers, and improve aquatic connectivity downstream. Section 404 permitting, and Section 401 certification would be required to address potential effects to WOTUS during construction, ensuring compliance with the CWA. Long-term, this alternative would promote sustainable water management, improve aquatic habitat connectivity, and enhance ecological conditions within the Logan River watershed.

5.3.6.3 Wetlands

No Action Alternative

Under the No Action Alternative, wetlands within the Project Area would experience limited direct effects. Reconstruction of the Crockett Diversion and replacement of the North Branch Canal (Crockett Canal) would temporarily disturb approximately 1.1 acres of wetlands. These effects would be localized and confined to the construction footprint, with no anticipated permanent effects. Standard construction BMPs would mitigate temporary disturbances.

In the long term, the existing irrigation canals would continue to support wetland hydrology for some areas adjacent to the canals. However, ongoing water losses through seepage, evaporation, and carrier water would limit water conservation and broader ecological benefits for wetlands and aquatic habitats in the watershed. Coordination with the USACE has been ongoing to identify the appropriate permitting mechanism for the limited wetland effects associated with this alternative and to determine potential mitigation measures, ensuring compliance with Section 404 of the CWA.

First Dam Alternative

The First Dam Alternative would result in both temporary and permanent effects to wetlands. Of the 557.8 acres of wetland features and 178.5 acres of linear features identified within the Project Area, temporary effects would occur to approximately 126.1 acres due to construction-related disturbances, after which affected aquatic features would be restored and aquatic resource areas and functions would return. Permanent loss of approximately 0.003 acres of wetlands and 0.2 acres of linear features within the OHWM would occur, resulting from the installation of the First Dam intake, and pump station, stormwater, and recreation infrastructure.

Staging Areas

Construction staging areas under this alternative would temporarily disturb 37.6 acres of wetlands and 0.4 acres of linear features within OHWM. Following construction, these areas would be fully restored, with revegetation and erosion control measures to ensure wetland functionality is returned.

Irrigation Modernization and Wetland Hydrology

The modernization of the irrigation system to a pressurized network would eliminate seepage and potentially reduce hydrology to wetlands supported by the canals. However, this alternative conserves approximately 5,390 ac-ft of water annually, benefiting the watershed by enhancing water availability and supporting long-term ecological stability.

Summary and Mitigation

While direct effects to wetlands include both temporary and permanent disturbances, these effects would be minimized through BMPs, including revegetation, noxious weed prevention, and erosion control. Regulatory compliance with federal wetland protection standards under E.O. 11990 would ensure wetland conservation and enhancement. Long-term ecological benefits from increased water availability, improved aquatic habitat connectivity, and riparian vegetation recruitment would offset short-term disturbances. Coordination with the USACE has been ongoing to identify the appropriate permitting mechanism for the wetland effects associated with this alternative and to determine necessary mitigation measures, ensuring compliance with Section 404 of the CWA.

Crockett Diversion Alternative

The Crockett Diversion Alternative would result in similar temporary and permanent effects to wetlands and aquatic resources. Temporary disturbances would affect approximately 126.1 acres, while permanent effects would result in loss of approximately 0.003 acres of wetlands and 0.2 acres of linear features within the OHWM resulting from the installation of pump station, stormwater, and recreation infrastructure.

Staging Areas

Staging areas would temporarily disturb 37.6 acres of wetlands and 0.4 acres of linear features within OHWM under this alternative. These areas would be restored post-construction through revegetation and erosion control measures.

Irrigation Modernization and Wetland Hydrology

The installation of 120 miles of PI pipelines would conserve approximately 5,390 ac-ft of water annually, reducing seepage, evaporation, and carrier water losses. While this change may alter the hydrology of some wetlands, the overall increase in water availability within the watershed would stabilize hydrological connections and support wetland health in the long term.

Summary and Mitigation

Temporary and permanent effects to wetlands under the Crockett Diversion Alternative would be addressed through stringent BMPs, including restoration of staging areas and construction sites. Compliance with federal wetland protection standards would ensure that any loss or degradation of wetlands is minimized. Additionally, long-term water conservation benefits and habitat improvements, such as enhanced aquatic connectivity and riparian restoration, would contribute to the resilience of wetlands in the Project Area. Coordination with the USACE has been ongoing to identify the appropriate permitting mechanism for the limited wetland effects associated with this alternative and to determine necessary mitigation measures, ensuring compliance with Section 404 of the CWA.

5.3.6.4 Regional Water Management Plan

No Action Alternative

The No Action Alternative would maintain the current regional water management system, including its existing inefficiencies and challenges. Without modernization, the CAIC canals would continue to experience water losses due to seepage and evaporation. These inefficiencies

would reduce the overall water availability within the watershed and may negatively affect the long-term sustainability of agricultural water use in the region.

The reconstruction of the Crockett Diversion and the replacement of the North Branch Canal (Crockett Canal) would address some infrastructure issues but would not provide significant regional benefits to water conservation or storage capacity. This alternative would lack the integration of broader water conservation strategies necessary to meet regional water management goals, resulting in continued limitations on water availability and sustainability.

First Dam Alternative

The First Dam Alternative aligns closely with the Utah State Water Plan by addressing water conservation and efficiency goals. By transitioning to a PI system, the alternative would conserve approximately 5,390 ac-ft of water annually, significantly reducing water losses from seepage, evaporation, and carrier water. This conservation effort would directly support the region's objectives of maintaining sustainable water availability for agricultural and ecological needs.

Additional benefits include the development of a 300-acre storage reservoir, which would increase the capacity and reliability of water storage during periods of peak demand. Improvements to irrigation infrastructure, including 120 miles of closed irrigation pipelines and the removal of outdated diversions, would optimize water delivery systems and reduce operational inefficiencies.

The enhanced water conservation and storage capabilities under this alternative would ensure a more reliable water supply for agricultural, municipal, and ecological uses, supporting regional water sustainability goals.

Crockett Diversion Alternative

The Crockett Diversion Alternative contributes significantly to the Utah State Water Plan by focusing on water conservation, irrigation modernization, and ecological restoration. The alternative's transition to a PI system would conserve approximately 5,390 ac-ft of water annually, aligning with regional priorities for reducing water losses and improving delivery efficiency.

Key infrastructure improvements, such as a 300-acre storage reservoir and 120 miles of closed irrigation pipelines, would enhance water storage and distribution reliability. The removal of the Providence Pioneer Diversion and the addition of new pump stations would optimize water delivery while maintaining ecological balance in the Logan River watershed.

By prioritizing both water conservation and infrastructure upgrades, the Crockett Diversion Alternative supports the region's goal of sustainable water management, benefiting agricultural productivity, ecological health, and long-term water availability.

5.3.6.5 Floodplain Management

No Action Alternative

Under the No Action Alternative, the Crockett Diversion structure would be replaced, which improves floodplain functionality and reduces flood risks compared to existing conditions. Although this alternative does not include additional agricultural optimization or landscaping fill

measures, replacing the outdated diversion structure addresses key factors contributing to flooding in the area. By replacing the current structure, flood risks in the surrounding floodplain are reduced, with 15 homes inundated during a 100-year flood event and 16 homes during a 500-year flood event—a significant improvement from existing conditions, which would affect 43 homes in a 100-year event and 50 homes in a 500-year event.

This alternative complies with the requirements of E.O. 11988, as it reduces flood risks without introducing additional occupancy or permanent encroachments into the floodplain. By addressing flood risks, the No Action Alternative maintains the floodplain's natural capacity to moderate storm flows and contributes to water quality improvements.

The No Action Alternative would result in a measurable reduction in the number of homes within the 100- and 500-year floodplain compared to existing conditions. Due to these changes, a CLOMR would be required during the project design phase to document the proposed modifications and their effects on the floodplain. Following project completion, a LOMR would also be necessary to formally update the FEMA FIRM, ensuring that the documented reductions in flood risk are officially recognized.

First Dam Alternative

The First Dam Alternative has been designed in full compliance with 7 CFR 650.25(c)(2)(v) and E.O. 11988. These regulations require NRCS to avoid direct or indirect support of development in the base floodplain wherever there is a practicable alternative, and to minimize harm within the floodplain when avoidance is not possible. The First Dam Alternative was formulated with these principles in mind.

Avoidance of Development

The project avoids new occupancy or permanent encroachments into the floodplain to the maximum extent. All of the stormwater activities are outside of the FEMA floodplains. The majority of the agricultural water management and recreation activities are also outside of the FEMA floodplains, with the exception of a few unavoidable elements:

- Installation of the West River pump station—due to the small quantity of land between the river and the lagoons, no feasible alternative location exists for this pump station.
- Installation of a pedestrian bridge footing over the Logan River—due to the existing houses and development in this location, no feasible alternative location exists for the footing.
- Reconstruction of the existing Crockett Diversion—this activity is replacing an existing structure and is not a new encroachment.
- Removal of the Providence Pioneer diversion—this activity is removing a structure from the floodplain, a floodplain improvement.

Minimization of Harm

Where floodplain activities are unavoidable, the project incorporates BMPs, erosion control, and hydrologic improvements to minimize adverse effects. Fill placement in floodplain lots (Lots 1 and 2), which occurs outside of the floodplain, is strategically designed to reduce flood risks without introducing new development in the floodplain.

Floodplain Function Enhancement

The project enhances the floodplain's natural capacity to moderate floods and maintain water quality. For example, the First Dam Alternative proposes replacing the aging Crockett Diversion structure, which is currently prone to flooding due to debris accumulation during storm events. The existing diversion structure would be replaced with an overshoot weir with a lower crest elevation. This change allows for better management of floodwaters by improving channel flow conditions at the current diversion site and mitigating upstream backwater effects and significantly reduces the flood risk. As a result, floodplain inundation is reduced with the number of homes inundated during a 100-year flood event reduced to 15, and during a 500-year event to 16 homes. Table 5-9, Table 5-10, and Table 5-11 shows the numbers of homes, schools, and roads flooded by 50-, 100-, and 500-year flood events for each alternative, respectively. Additionally, the alternative improves instream and base flows that support ecological function in the floodplain.

Table 5-9. Floodplain Under Each Alternative in the 50-Year Event

50-Year Event			
Alternative	Homes Inundated >0.1 Feet	Schools Inundated >0.1 Feet	Roads Flooded (LF)
Existing Condition	29	0	2,540
No Federal Action	13	0	0
First Dam Alternative	12	0	0
Crockett Diversion Alternative	13	0	0
Western Pumping Alternative	12	0	0

Table 5-10. Floodplain Under Each Alternative in the 100-Year Event

100-Year Event			
Alternative	Homes Inundated >0.1 Feet	Schools Inundated >0.1 Feet	Roads Flooded (LF)
Existing Condition	43	0	3,150
No Federal Action	15	0	0
First Dam Alternative	15	0	0
Crockett Diversion Alternative	15	0	0
Western Pumping Alternative	15	0	0

Table 5-11. Floodplain Under Each Alternative in the 500-Year Event

500-Year Event			
Alternative	Homes Inundated >0.1 Feet	Schools Inundated >0.1 Feet	Roads Flooded (LF)
Existing Condition	50	1	3,620
No Federal Action	16	0	0
First Dam Alternative	16	0	0
Crockett Diversion Alternative	16	0	0
Western Pumping Alternative	16	0	0

Project staff met with the Utah Division of Emergency Management to discuss the project's effect on floodplains on October 30, 2024. Because the First Dam Alternative would result in a

measurable reduction in the number of homes within the 100- and 500-year floodplain compared to existing conditions, the Division determined that both a CLOMR and LOMR would be required for the Proposed Project to formally update the FEMA FIRMs ensuring that the documented reductions in flood risk are officially recognized (see Utah Department of Public Safety correspondence in the Agency Coordination and Consultation section in Appendix A).

In summary, the project avoids future development in the base floodplain to the extent possible, minimizes unavoidable impacts, and enhances the floodplain's function—fully aligning with the intent and requirements of 7 CFR 650.25 and E.O. 11988. This alternative enhances the floodplain's ability to moderate floods and maintain water quality, contributing positively to flood management in the Logan River area and the broader Bear River Basin.

Additionally, outside of the floodplain, approximately 10,350 acres of irrigated farmland would be safeguarded against flooding caused by overtopping canals, reducing the risks of localized flooding events.

Crockett Diversion Alternative

The Crockett Diversion Alternative has been designed in full compliance with 7 CFR 650.25(c)(2)(v) and E.O. 11988. These regulations require NRCS to avoid direct or indirect support of development in the base floodplain wherever there is a practicable alternative, and to minimize harm within the floodplain when avoidance is not possible. The Crockett Diversion Alternative was formulated with these principles in mind.

Avoidance of Development

The project avoids new occupancy or permanent encroachments into the floodplain to the maximum extent. All of the stormwater activities are outside of the FEMA floodplains. The majority of the agricultural water management and recreation activities are also outside of the FEMA floodplains, with the exception of a few unavoidable elements:

- Installation of the West River pump station—due to the small quantity of land between the river and the lagoons, no feasible alternative location exists for this pump station.
- Installation of a pedestrian bridge footing over the Logan River—due to the existing houses and development in this location, no feasible alternative location exists for the footing.
- Reconstruction of the existing Crockett Diversion—this activity is replacing an existing structure and is not a new encroachment.
- Removal of the Providence Pioneer diversion—this activity is removing a structure from the floodplain, a floodplain improvement.

Minimization of Harm

Where floodplain activities are unavoidable, the project incorporates BMPs, erosion control, and hydrologic improvements to minimize adverse effects. Fill placement in floodplain lots (Lots 1 and 2), which occurs outside of the floodplain, is strategically designed to reduce flood risks without introducing new development in the floodplain.

Floodplain Function Enhancement

The project enhances the floodplain's natural capacity to moderate floods and maintain water quality. For example, the Crockett Diversion Alternative proposes replacing the aging Crockett

Diversion structure, which is currently prone to flooding due to debris accumulation during storm events. The existing diversion structure would be replaced with an overshoot weir with a lower crest elevation. This change allows for better management of floodwaters by improving channel flow conditions at the current diversion site and mitigating upstream backwater effects and significantly reduces the flood risk. Under this alternative, the number of homes inundated during a 100-year flood event is reduced to 15, and during a 500-year event, to 16 homes. Table 5-9, Table 5-10, and Table 5-11 shows the number of homes, schools, and roads flooded by 50-, 100-, and 500-year flood events for each alternative, respectively. Additionally, the alternative improves instream and base flows that support ecological function.

Project staff met with the Utah Division of Emergency Management to discuss the project's effect on floodplains on October 30, 2024. Because the Crockett Diversion Alternative would result in a measurable reduction in the number of homes within the 100- and 500-year floodplain compared to existing conditions, the Division determined that both a CLOMR and LOMR would be required for the Proposed Project to formally update the FEMA FIRMs ensuring that the documented reductions in flood risk are officially recognized (see Utah Department of Public Safety correspondence in the Agency Coordination and Consultation section in Appendix A).

In summary, the project avoids future development in the base floodplain to the extent possible, minimizes unavoidable impacts, and enhances the floodplain's function—fully aligning with the intent and requirements of 7 CFR 650.25 and E.O. 11988. This alternative enhances the floodplain's ability to moderate floods and maintain water quality, contributing positively to flood management in the Logan River area and the broader Bear River Basin.

Additionally, outside of the floodplain, approximately 10,350 acres of irrigated farmland would be safeguarded against flooding caused by overtopping canals, reducing the risks of localized flooding events.

5.3.7 Wildlife

5.3.7.1 Fish and Wildlife Habitat

No Action Alternative

Under the No Action Alternative, water quality would be temporarily affected during the reconstruction of the Crockett Diversion and the replacement of the North Branch Canal (Crockett Canal). Long-term, the No Action Alternative would continue to directly affect fish or wildlife and adjacent wildlife habitat in the Project Area due to flooding, canal breaches, erosion and sedimentation issues, and pollutant build-up due to approximately 185 miles of open water associated with canals, laterals, and drainage ditches in the CAIC service area that would remain the same.

The No Action Alternative would not change instream habitat. Instream habitat for the CAP analysis was evaluated as having Fair Condition for all reaches (see Appendix E5, TM-021 for analysis). The 2024 existing condition of instream habitat is considered Fair in all reaches. The Upper Reach is currently impacted by sediments periodically being sluiced from First Dam, and two diversion fish barriers (Crockett and Pioneer-Providence Diversions).

First Dam Alternative

The First Dam Alternative could temporarily cause minor and localized effects to wildlife and fish habitat and could cause long-term but minor effects to wildlife habitat. Proposed activities would remove sediment at the First Dam, guarantee flows of 25 cfs in the Logan River during the irrigation season, rebuild the Crockett Diversion, install three new pumphouses, and line 6,210 feet of canals with concrete, and would install 3,570 feet of new box culvert within the existing Twin Canals. Lining and boxing these canal areas would cause immediate and eventual vegetation loss within the canal prisms from loss of hydrology and would remove an open water source within the Twin Canals. Seepage and carrier water losses would be reduced under the First Dam Alternative, ultimately conserve 5,390 ac-ft of water annually within the water delivery system. All other canals within the Project Area would remain open to convey storm and floodwaters.

Short-term Effects: Habitat Disturbance

Project activities may temporarily deter wildlife from occupying the Project Area during construction of the First Dam Alternative. Because the First Dam Alternative occurs across primarily urban areas, habitat for state protected mammal species, including myotis and bats, does not occur and therefore these animals are very unlikely to be present or affected by construction activities. Effects to individual small animals, including state-protected amphibians, would include displacement during canal lining and box culvert construction activities and potential mortality, but no population level harm would occur to these or any species in the Project Area. No migration corridor would be disrupted by project implementation. No fish passage would be impeded within the Project Area or in water bodies connected to the Project Area. No wildlife populations would experience impacts to habitat connectivity as a result of the project. Sediment removal activities would create a risk to water quality and potential mortality to individual fish and mollusks and amphibians that may be present in the reservoir.

Construction of the First Dam Alternative would temporarily increase ambient noise levels, but not all construction disturbance would rise above current levels and therefore would not be likely to majorly disturb present wildlife. Because of ambient levels of noise and disturbance within the Project Area, due to the urban environment, busy roadways, agricultural activities and a high level of human activity, wildlife that currently occupy the Project Area would be adapted to these current levels of disturbance. BMPs would be implemented within the entire Project Area to further minimize effects to wildlife species and habitat, such as limiting construction to daylight hours, which would reduce effects to nocturnal wildlife species.

State-protected bird species could be disturbed by project activities and would likely choose to move to an alternative habitat area while construction activities are present. Ample alternative habitat is available for migratory birds along the Logan River and across Cache County. Project BMPs ensure protections and avoidance of harm for bird species, including requiring that nesting bird surveys would occur prior to vegetation removal, and that construction activities would occur outside of nesting season for MBTA- and state protected bird species. These BMPs would reduce the risk of potential nest abandonment and mortality.

Short-term Effects: Aquatic Habitat and Water Quality

No fish habitat is present within the canals, laterals, or ditches within the Project Area. However, within the Logan River, fish and mollusk habitat is present, and temporary changes in turbidity

could affect aquatic habitat because of the First Dam Alternative. This change could affect three state protected fish species. Additionally, other state protected species including two amphibian species and four mollusk species, could be affected by changes in water quality within the Logan River. Dewatering of the river channel during the rebuilding of the Crockett Diversion would cause temporary disturbance within the prism of the Logan River. However, project BMPs would be in place to ensure that water quality is protected during dewatering activities, and all construction activities that would occur near or within open water sources. Overall, effects to wildlife species during construction of the First Dam Alternative would be temporary and minor.

Under the First Dam Alternative, the Crockett Diversion would be replaced but the fish passage through the Crockett Diversion structure would remain impeded at all flow levels. At 25 cfs, the drop height of the newly designed diversion structure is close to 8 feet which does not meet the design criteria for fish passage. Even with a water surface at a flow rate of 480 cfs over the diversion, the drop height is closer to 5 feet from headwater to tailwater water surface, which still does not meet the design criteria for fish passage. Adding in the velocities over the diversion at 480 cfs, which are greater than Brown Trout darting speeds, shows that this replacement design does not meet the requirements for fish passage. For this design to meet the requirements of fish passage, a separate fish passage structure would need to be implemented into the final design. See Appendix E3, TM-007 for modeling results.

Long-term Effects: Increased Flows

Under the First Dam Alternative, pump stations at Cow Pasture and West River would optimize water distribution, while a 500-square-foot Swift Slough Outfall Structure would control flow into sensitive aquatic areas, reducing erosion and protecting water quality. Instream flow improvements of 25 cfs to the Logan River over 15.1 miles and 5–10 cfs to the Little Logan over 4.8 miles would enhance base flows, aquatic habitats, and water quality, critical for fish and other species.

Environmental benefits include the removal of the Providence Pioneer Diversion, which would restore natural flow conditions and improve sediment transport. Blocking the Northwest Canal split would optimize water delivery and reduce unnecessary diversions. In an analysis conducted by BIO-WEST on the effects of the Proposed Project to the Logan River and its floodplain and riparian ecosystem based on the LRTF-CAP criteria, the First Dam Alternative is projected to maintain summer base flows in the Logan River which would enhance aquatic habitats, maintaining cooler water temperatures, and improving dissolved oxygen levels (Appendix E5, TM-021).

Long-term Effects: Instream Habitat

Based on the CAP analysis, the increased summer base flows associated with the two action alternatives would increase water depths between 5 to 8 inches compared to existing conditions (see TM-021 for analysis and additional information). The proposed instream flows also increase the wetted perimeter and wetted area for 14 river miles, improving instream habitat and conditions for fisheries, macroinvertebrates, riparian and wetland vegetation along the river, birds, and other terrestrial wildlife. There is approximately 1 inch difference in water depths between the two action alternatives. The additional instream flows better connect pools and other instream habitats that otherwise became isolated during extreme low flows when the river is traditionally dried up just above Trapper Park. The two action alternatives also include removal of the Pioneer-Providence Diversion, which is a barrier to fish and kayakers in Logan River.

The First Dam Alternative maintains Instream Habitat as Fair between First Dam and Crockett Diversion even with lower flows. The reduced flows would reduce water depths by approximately 7 inches for 1 river mile. Sluicing at First Dam releases tons of high sediment oxygen demand silt periodically that can cover the streambed and significantly affect instream habitat and water quality, until it gets washed downstream to Cutler Reservoir. Dredging the silt out of First Dam needed for the First Dam Alternative instead of sluicing improves instream habitat, water quality, and better conditions for aquatic species in all three reaches, but especially the Upper Reach immediately below First Dam. Below Crockett Diversion, the First Dam Alternative increases instream habitat from Fair condition to Good condition for 14 river miles (Table 5-12).

Table 5-12. Conservation Action Plan Evaluation for Instream Habitat Conditions by Reach

Alternative	Upper Reach (1st Dam to Crockett)	Upper Reach (Crockett to 100 East)	Middle Reach	Lower Reach
2024 Existing Condition	Fair Crockett Diversion barrier and First Dam sluicing impacting instream habitat	Fair	Fair	Fair
First Dam Alternative	Fair Remove Crockett Diversion barrier and reduce sediment impacts from First Dam sluicing, but reduce water depths by 7 inches	Good Remove Providence-Pioneer Diversion structure and increase water depths between 6–7 inches	Good Increase water depths between 6–7 inches	Good Increase water depths between 7–8 inches
Crockett Diversion Alternative	Good Remove Crockett Diversion and maintain near natural summer base flows	Good Remove Pioneer diversion structure and increase water depths by 5–6 inches	Good Increase water depths between 5–6 inches	Good Increase water depths between 6–7 inches

Long-term Effects: Vegetation Removal

Long term effects on wildlife habitat would occur as a result of piping activities where vegetation removal would occur. There would also be the removal of open water sources in some portions of the Project Area, and long-term, vegetation that is dependent on this hydrology would be lost.

In the long term, lining and boxing sections of the Twin Canals and the Logan Northern Canal irrigation system would remove seepage that supports approximately 9.2 acres of low-quality seepage-induced riparian vegetation, causing the eventual loss of this vegetation. However, the vegetation present along these canals has low habitat quality because it is largely ornamental and non-native, the areas contains many common weeds and the location of the canals are behind homes and along urban areas, which includes high disturbance from human activities, and is fragmented by urban and suburban landscape (See Section 5.3.5.2).

The landscape-level vegetation conditions following implementation would be substantially similar to existing habitat conditions in the surrounding area and on a regional landscape scale, ensuring population-level significant effects would not occur to any wildlife species, and the effects to wildlife from lining and boxing of canals, the installation of a PI system, and rebuilding of the Crockett Diversion structure would be minor.

While 9.2 acres of riparian vegetation may be lost because supporting hydrology would be removed, approximately 368 acres of vegetation associated with ditches, canals, and Blue Spring Creek, Little Logan and the Logan River would remain. No mature trees, shrubland or forest would be lost as a result of pressurizing these open canal and ditch areas.

Long-term Effects: Open Water Sources

The loss of the annual open water source from boxing 9,750 feet of the Twin Canals would cause minor localized effects to wildlife such as mule deer, and other wildlife species that may seasonally use the open water these canals as a drinking source. However, these canals pass through suburban and urban areas, where habitat is sparse and fragmented. It is unlikely that many deer would use the Twin Canals as a major water source, compared to nearby perennial sources of open water near higher quality habitat, such as the Logan River. Currently, the water in the Twin Canals is not perennially available due to controlled flows and distribution of water rights. The water availability within the canals occurs during irrigation season (April–October).

Additionally, the remaining open canals, laterals, and drainage ditches would continue to provide over 180 miles of open water within the CAIC system. Ample perennial alternative open water sources exist for wildlife within Cache County, including along the Logan River, the Little Logan, which would remain an open water source with base flows during the irrigation season, Big Spring Creek, and Swift Slough, and numerous smaller tributaries to the Bear River. Because of the limited water availability in the canals within the Project Area and the proximity to alternative water sources, the long-term effects of removing open water sources because of piping the open canals would be minor.

Within the Project Area, the Blue Spring Creek, Little Logan, and the Logan River provide the most robust habitat and open water sources for wildlife and are known wildlife corridors that provide habitat connectivity. These areas would not be lined or boxed, mature native vegetation would not be removed, and these locations would continue to provide water for wildlife and habitat connectivity. Along the Little Logan and the Logan River, mature cottonwoods and higher quality habitat for birds and wildlife would remain un-altered by project activities. Habitat connectivity would be conserved along the Little Logan, which would not be lined or boxed. Under the First Dam Alternative, base flows would be preserved during the irrigation season in the Little Logan that would improve the overall quality of wildlife habitat. Habitat connectivity would remain the same along the Logan River and flows would also increase within the Logan River under the First Dam Alternative.

These open water sources would remain available to wildlife, even as canals and ditches in other parts of the Project Area would be piped. Long term, the loss of vegetation and open water sources in some portions of the Project Area from the First Dam Alternative would not remove high quality wildlife habitat or impair wildlife corridors within the Project Area. Long term, increased flows in the Logan River would result in improvements to the existing aquatic habitat and have beneficial effect for fish, amphibians, and mollusk species. Additionally, restoration

activities would occur after construction to plant native vegetation in disturbed areas, improving the quality of habitat in these areas long term.

Though individual animals and insects may be at risk of displacement or mortality because these species have access to high quality habitat that would not be removed within the Project Area and within the surrounding areas, population effects would not occur, and the effects from the 575 acres of habitat disruption from project activities at the landscape-level would be minor.

Crockett Diversion Alternative

The Crockett Diversion Alternative could temporarily cause minor and localized effects to wildlife and fish habitat and could cause long-term but minor effects to wildlife habitat. Proposed activities would reduce flows downstream in the Logan River below the Crockett Diversion, rebuild the Crockett Diversion, install two new pumphouses, and would line approximately 6,210 feet of the Twin Canals and the Logan Northern Canal and construct a box culvert around 9,750 feet on the Twin Canals, which would affect open water availability, and would result in immediate and eventual vegetation loss of vegetation in these locations within the Project Area.

The Crockett Diversion alternative maintains instream habitat between First Dam and Crockett Diversion in Fair condition similar to existing conditions and increases instream habitat below Crockett Diversion from Fair to Good for 14 river miles, similar to the First Dam Alternative (Table 5-12). All other effects to Fish and Wildlife Habitat under the Crockett Diversion Alternative are the same as under the First Dam Alternative. A detailed discussion of these effects is presented in Sections 5.3.7.1.

5.3.7.2 Candidate, Threatened and Endangered Species Animal Species

No Action Alternative

The No Federal Action Alternative would have no direct effect on candidate, threatened, or endangered animal species in the Project Area. Habitat for special status animal species would remain unchanged under the No Action Alternative. However, seepage and carrier water losses from the irrigation system would continue, which could have long-term indirect effects on water resources and in-turn, on wildlife and habitat in the area.

First Dam Alternative

The First Dam Alternative would have no effect on proposed threatened, threatened, or endangered animal species or their habitat within the Project Area. The survey area for candidate, proposed, threatened, or endangered animal species included all potential areas of effect including species specific survey buffers where suitable habitat was likely to occur (Action Area). The Action Area includes a 0.5-mile buffer around the Project Area for potential effects to the YBCU. While temporary disturbance to vegetation and soils from construction activities within the Action Area would occur under the First Dam Alternative, suitable habitat was not found for any of the threatened or endangered animal species (TES) within the Action Area, no TES species are known or suspected to be present, and no DCH for TES is present within the Action Area (see BA in Appendix E2). Therefore, no effects on these species or their breeding populations would occur because of the First Dam Alternative. After reviewing the Project Area

and the specific project activities, USFWS agreed that a no effect determination was appropriate for the YBCU and its habitat on July 15, 2024 (see consultation letter in Appendix A).

Species-specific Effects—Canada lynx

While forested habitat exists approximately 2 miles to the east and 6 miles to the west of the Action Area, suitable habitat for the Canada lynx is not present within the Action Area, nor would potential habitat for this species be affected by First Dam Alternative activities. The boreal spruce-fir forest ecosystem that lynx are associated with is not present in or near the Action Area, and no forest type near the Action Area would provide suitable cover, nor support adequate densities of snowshoe hare populations to sustain Canada lynx.

The Action Area falls below an elevation of 8,000-feet where Canada lynx are expected to occur within Utah (Interagency Lynx Biology Team 2013). Additionally, because the Action Area includes suburban areas and busy roadways, it is unlikely that lynx would occupy the vicinity, preferring to avoid locations with high human activity. Given the absence of suitable habitat in or near the Action Area and the high level of vehicle and human disturbance within the Action Area, the First Dam Alternative would have no effect to the Canada lynx.

Species-specific Effects—North American wolverine

Habitat for the North American wolverine is not present within the Action Area, and it is unlikely that wolverines would occupy the vicinity. Snowpack level is the strongest indicator of suitable habitat for the North American wolverine, and they require a minimum snowpack depth of 60 inches lasting until April–May for successful denning (USFWS 2024). The alpine ecosystem, snowpack, and remoteness requirements needed for suitable breeding habitat for the North American wolverine is not present in or nearby the Action Area. Additionally, because the Action Area includes suburban areas and busy roadways, it is unlikely that wolverines would occupy the nearby area, preferring to avoid locations with high human activity. Because of the absence of suitable habitat and the unlikelihood that this species would occupy the Action Area, the First Dam Alternative would result in no effect to the North American wolverine.

Species-specific Effects—Yellow-billed cuckoo

Effects to the YBCU from the First Dam Alternative would be temporary and minor, since individual YBCU may use the Action Area for stopover habitat, but suitable breeding habitat for the YBCU is not present within the Action Area. Across the Action Area, only the Logan River contains a narrow riparian fringe which includes mature cottonwoods, which may contain low quality stopover habitat for the YBCU. Because of the proximity to urban and suburban areas, the low complexity of the riparian forest, and the narrowness and fragmentation of the fringe, it is unlikely that breeding YBCU would occupy this area. No other location within the Action Area supported a riparian corridor with the appropriate cover, vegetation stratification, and acreage to constitute suitable habitat for the YBCU. Urban, suburban, and agricultural areas dominate the landscape and infringe on the extent of contiguous riparian habitat within the communities of Logan and Hyde Park. The UNHP species data show past occurrences of the YBCU within 0.5- and 2 miles of the Action Area. However, the last observation year when the YBCU was documented in this area was in 1941. It is unlikely that YBCU would be present or affected by activities under the First Dam Alternative.

Temporarily, construction of the First Dam Alternative, and long term, the construction of the pump houses near the Logan River could increase noise above ambient levels and deter any

present YBCU from occupying habitat within 0.5-miles of the Action Area. Because the Action Area is near a busy roadway, regular traffic noise and disturbance occur and species that occupy the area would likely be adapted to pre-existing noise disturbance. However, if any present YBCU does leave the area due to construction activities from the First Dam Alternative, the effect would be minimal because this disturbance would be temporary, and the individual may return to the habitat once construction has concluded.

In the long term, noise levels would be affected by the Crockett Pump Station construction in the narrow riparian fringe along the Logan River which includes mature cottonwoods, which may contain low quality stopover habitat for the YBCU. The Crockett Pump Station would be designed in accordance with the Logan City municipal code and would not exceed the allowable sound level limits. For example, to mitigate noise levels, the Crockett Pump Station would be contained in a masonry control house designed to limit noise. The masonry would reduce the noise level by approximately 25–35 dBA (FHWA 2018). Combined with the existing surrounding noise, the noise attenuating effectiveness of the masonry control house, and the consistency with the Logan Code of Ordinance regarding sound, the long-term noise level increase from the pump station would be negligible, and unlikely to cause population level effects to YBCU.

Vegetation removal would occur under the First Dam Alternative, and may cause temporary, minor effects to the YBCU. However, no high quality YBCU habitat would be affected by vegetation removal activities, and areas like the Logan River corridor that contain the highest quality habitat would not be affected because no tree or vegetation removal would occur. Project BMPs limit vegetation removal to outside of the nesting season for migratory birds, including the YBCU (June 30–August 31), and require pre-construction surveys for nesting birds if vegetation removal does occur within this timeframe, minimizing any potential effects to nesting YBCU, if present. In the long term, restoration activities after construction has concluded would enhance native vegetation in the area, improving the overall quality of habitat for YBCU and other wildlife.

Lastly, potential effects to YBCU habitat were discussed with USFWS during a coordination meeting on July 11, 2024, and USFWS agreed that the First Dam Alternative would result in no effect to the YBCU or its habitat. Given the lack of suitable habitat for the species, the temporary and minor nature of proposed construction activities, the minor effects from vegetation removal, the long term improvement of habitat as a result of restoration with native species, the absence of YBCU individuals and nests during incidental surveys, and implementation of BMPs to avoid breeding and nesting season for the YBCU (June 30–August 31), the First Dam Alternative would result in no effect to the YBCU.

Species-specific Effects—Monarch butterfly

The First Dam Alternative would cause minor, long-term, and temporary effects to habitat for the monarch butterfly. Showy milkweed (*Asclepias speciosa*) milkweed was identified within the Action Area along ditches throughout the Action Area, indicating that potential breeding habitat for the monarch butterfly is present. Vegetation would be disturbed and removed along these ditches during construction activities, and long-term vegetation loss would likely occur due to loss of hydrology when the canals are piped. However, implementation of BMPs and conservation measures would reduce effects to vegetation and any location where milkweed species are found during construction. Disturbed areas within riparian zones and wetland areas

would be revegetated with native plantings and milkweed plants, where applicable. Additionally, milkweed grows commonly within the vicinity of the Action Area, so alternative habitat for the monarch butterfly occurs nearby.

While suitable habitat for the monarch butterfly was identified within the Action Area, because of avoidance and minimization measures to preserve and encourage the survival and persistence of milkweed species within the Action Area, the First Dam Alternative would have no effect to the Monarch butterfly or its habitat. Although the USFWS has recently decided the monarch butterfly should be protected under the ESA, a formal listing has not occurred as of November 2024, therefore the species remains a candidate species. As the species remains a candidate for listing, no formal consultation is necessary under the ESA.

Species-specific Effects—Suckley’s cuckoo bumble bee

The Suckley’s cuckoo bumble bee could occur within the Action Area, because of the widespread presence of nectarous plants and other bumble bee species. No individuals of this species were identified during field surveys, and project BMPs would protect native vegetation to the best extent practicable. Project BMPs would also rehabilitate disturbed areas with native seed, which would improve habitat for the Suckley’s cuckoo bumble bee and its hosts in the long term. Therefore, the Proposed Project would have No Effect to the Suckley’s cuckoo bumble bee.

Crockett Diversion Alternative

The Crockett Diversion Alternative would have no effect on candidate, threatened, or endangered animal species or their habitat within the Action Area.

While temporary disturbance to vegetation and soils from construction activities within the Action Area would occur under the Crockett Diversion Alternative, suitable habitat was not found for any of the TES within the Action Area, no TES species are known or suspected to be present, and no DCH for TES is present within the Action Area (see BA in Appendix E2). Therefore, no effects on these species or their breeding populations would occur because of the Crockett Diversion Alternative. The USFWS agreed with the effects determination on July 15, 2024 (see consultation letter in Appendix A).

Species-specific effects to Candidate, Threatened and Endangered Species are the same as the effects from the First Dam Alternative. A detailed discussion of species-specific effects to the Canada lynx, North American wolverine, YBCU, monarch butterfly, and Suckley’s cuckoo bumble bee are presented in Section 5.3.7.2.

5.3.7.3 Migratory Birds and Bald and Golden Eagles

No Action Alternative

Under the No Federal Action Alternative, nearby vegetation and potential avian species habitat would be temporarily affected during the reconstruction of the Crockett Diversion and the replacement of the North Branch Canal (Crockett Canal). Long-term, the No Action Alternative would have no effect on migratory birds or bald and golden eagles. Existing trees and vegetation that may provide stopover or nesting habitat for avian species would remain or be restored post-construction.

First Dam Alternative

The First Dam Alternative would have temporary and short-term, minor effects to 377 acres of habitat that could be utilized by migratory bird species. Temporary, minor effects include noise disturbance during construction activities. Short term, minor effects include vegetation removal and minimal tree removal at the Crockett Diversion site, and eventual long term vegetation loss where canals are lined and boxed and hydrology that supports trees and shrubs in those locations would be removed. Short term, minor effects may occur where soil is disturbed in areas where ground-nesting species could occupy. Project BMPs avoid and minimize the effects of the First Dam Alternative on migratory bird species and eagles, and the alternative is consistent with MBTA and BGEPA. Vegetation restoration activities under the First Dam Alternative would improve the quality of native vegetation and would benefit migratory bird species and other wildlife species in the long term.

Noise Disturbance

Noise effects from construction of the First Dam Alternative would be temporary and minor and would cease following construction. Along the Logan River, the construction of a pump house would create a temporary and minor noise disturbance that may affect bird species including eagles. According to the USFWS Utah Field Office Guideline for Raptor Protection from Human and Land Use Disturbances, “Nesting within or near human-altered environments may be a display of higher tolerance for disturbance by certain individuals or breeding pairs” (USFWS 2002). Raptors or eagles that are already nesting along the Logan River would be accustomed to regular human and vehicle disturbance that occurs in the area. Based on this tolerance, temporary noise from construction above ambient levels would be less impactful to birds already occupying the area. Additionally, BMPs would be implemented to ensure that work is only performed during daylight hours, limiting the duration of noise that would affect bird species. Overall, while construction activity would create temporary disturbance that could deter eagles and other avian species from using the area during project implementation, nesting and foraging bald eagle habitat along the Logan River would not be removed or disturbed under the Proposed Project.

Vegetation Removal and Vegetation Loss

The First Dam Alternative would have temporary and long term, and minor effects to habitat for migratory bird species from immediate vegetation removal and eventual vegetation loss. The First Dam Alternative would remove vegetation only within the footprint of the project activities. Habitat for nesting birds within the Action Area is variable, and is characterized by landscaped suburban trees and shrubs, narrow riparian fringe along the Logan River, and open agricultural fields. While the Action Area does provide suitable nesting, perching, and stopover habitat for migratory avian species that require cover from shrubs or trees, there is no mature forest habitat present which some species require.

Existing mature trees are limited to ornamental trees throughout suburban areas, and cottonwood trees along the Logan River corridor, where a narrow and fragmented riparian fringe exists, totaling approximately 195.6 acres. Sparse cottonwoods do occur generally across the Action Area. Nesting habitat for bald eagles may occur along the Logan River corridor, where mature cottonwood trees are present. While some project activities would occur adjacent to the Logan River, only a select few mature trees that eagles, raptors or other bird species would use would be removed at the location of the Crockett Diversion or where the PI system intersects with the

Logan River. Vegetation removal would not occur during migratory bird breeding season, unless nesting bird surveys are conducted beforehand to ensure no nesting birds would be disturbed.

Long term vegetation loss would occur in locations where open water canals and ditches are lined and boxed, and hydrology would be removed. This loss would occur along sections of the Twin Canals and the Logan Northern Canal, in suburban and urban areas. The vegetation that would be lost constitutes low quality habitat which is landscaped and adjacent to high levels of human activity and roadways. No major loss of high-quality nesting or stopover bird habitat would occur because of the First Dam Alternative.

Soil Disturbance

The First Dam Alternative would cause minor and short-term effects to ground nesting bird habitat as a result of ground disturbance to approximately 9.2 acres within the Action Area associated with removing open irrigation ditches and installing pressurized piping. In agricultural areas on the west side of the cities of Logan, North Logan and Hyde Park, pasture areas would experience ground disturbance where pressurized pipe would be buried.

Ground nesting avian species could nest in depressions on the ground in these open pastures and use nearby marshy areas and the Logan sewer ponds for nesting and foraging. While open pastureland is present within the Action Area, there are not preferred water interspersed characteristics typical of breeding habitat for ground nesting species. Tall, competitive grass species are common throughout the Action Area. Similarly, there is an absence of any semi-open woodlands. These qualities also reduce the suitability of the habitat present in the Action Area for ground nesting avian species. Additionally, pasture surveyed within the Action Area is heavily disturbed by agricultural activities and livestock grazing, which is not conducive to successful ground-nesting. Comparatively, ample open pasture areas exist in Cache County for ground nesting bird species to use, and the First Dam Alternative would not significantly reduce the available ground nesting habitat in the vicinity.

Nearby marshes and wetlands outside of the Action Area may provide stopover or breeding habitat for MBTA- protected species that nest near water bodies but no suitable marsh edge, lake or wetland breeding habitat exists within the Action Area. Large freshwater lakes do not occur within the Action Area. No islands occur within or near the Action Area, where American white pelicans, black terns or gulls would nest.

No nests or breeding behavior were incidentally observed during the survey, which occurred during breeding season for the MBTA-protected species most likely to nest there (March 1– August 31). Given the presence of nearby sources of open water and marsh areas, which could be used for foraging or nesting for some species, there is a probability that protected avian species could use the vicinity of the Action Area as stopover habitat, and breeding habitat. However, while portions of the Action Area have some suitable characteristics for ground-nesting species to use the Action Area as breeding habitat during nesting bird season, it is overall unsuitable due to the level of active disturbance from agricultural uses.

Nesting Season Avoidance

Temporal avoidance of nesting bird season is planned as part of the Proposed Project schedule, which would occur over winter months. If an active nest is discovered within the Action Area, construction and/or vegetation removal would halt, and USFWS would be contacted for guidance. If an active bald eagle nest were to be identified, a 1-mile buffer would be employed

around the active nest between January 1 and August 31, or until the nest is unoccupied. If a golden eagle nest were to be identified before or during construction, a 0.5-mile buffer would be employed around the active nest area between January 1 and August 31, or until the nest is unoccupied (USFWS 2002).

Crockett Diversion Alternative

The Crockett Diversion Alternative would have temporary and short-term, minor effects on habitat that could be used by migratory bird species. Temporary, minor effects include noise disturbance during construction activities. Short term, minor effects include vegetation removal and minimal tree removal at the Crockett Diversion site, and eventual long term vegetation loss where canals are piped and hydrology that supports trees and shrubs would be removed. Short term, minor effects may occur where soil is disturbed in areas where ground-nesting species could occupy. Project BMPs avoid and minimize the effects of the Crockett Diversion Alternative on migratory bird species. Vegetation restoration activities under the Crockett Diversion Alternative would improve the quality of native vegetation and would benefit migratory bird species and other wildlife species in the long term. The effects to migratory bird species from the Crockett Diversion Alternative are the same as those from the First Dam Alternative, and a more detailed discussion of these effects are presented in Section 5.3.7.3.

5.3.8 Human Environment

5.3.8.1 Cultural and Historic Resources

No Action Alternative

Under the No Action Alternative, no direct effects to cultural resources would occur because no activities would occur near existing cultural resources. However, cultural resources and historic properties would still be at risk from ongoing flooding. Three eligible historic structures are located within the indirect APE, according to the Utah SHPO's Historic Utah Building online database (Historic 2024). These historic structures, and any unknown cultural resources associated with them, would continue to be threatened by ongoing flooding.

First Dam Alternative

Finding of Effects

Per 36 CFR 800.4, a Cultural Resources Inventory was completed for the 1,178.1-acre APE in September 2024 by SWCA. A Class I literature review of both previously recorded archaeological and architectural properties was conducted for the entire APE. All portions of the APE on paved roads only required a Class I survey (literature review). All portions of the APE that consisted of corridors along unpaved roads required a Class I survey, and reconnaissance-level (Class II) survey performed from a vehicle. All other portions of the APE (including staging areas, trails, dams, and irrigation canals) required a Class I survey and an intensive-level (Class III) pedestrian survey. Due to access issues and surface conditions, 179.8 acres were excluded from reconnaissance-level or intensive surveys. For areas of the APE that only Class I surveys were conducted, the likelihood of encountering historic properties is extremely low, and per 36 CFR 800.4.b.1, NRCS and the consulting parties agreed that the level of effort (Class I, II, or III) meets "the reasonable and good faith effort to carry out appropriate identification efforts." If previously unidentified cultural resources are encountered during

construction, the project would follow the procedures in the NRCS Prototype Programmatic Agreement with the Utah SHPO (NRCS and SHPO 2025).

The purpose of the cultural resource survey was to locate, document, and evaluate buildings, districts, objects, sites, and structures that would be considered cultural sites within the APE to ensure that the proposed undertaking adheres to federal and state laws designed to protect historic properties, including the NHPA of 1966 (amended), the Utah State Antiquities Act of 1973 (amended 1990), and the Utah State Register (R212-6). The survey identified seven previously recorded cultural sites, eleven new cultural sites, and twelve new isolated finds within the APE. Cultural resources identified during the survey are shown on Table 3-18.

According to the Utah SHPO Historic Utah Building online database, no historic buildings occur within the direct APE (Historic 2024), and therefore, no direct effects would occur to historic buildings from project activities. Three eligible historic structures occur within the indirect APE—where existing flooding occurs—and these structures would benefit from the First Dam Alternative because it includes activities to reduce flooding that would protect the historic structures from any potential future flooding. One of these three eligible historic structures is located where S 100 E and the Logan River intersect. The historic structure was constructed in 1951 and consists of a concrete arch bridge. The remaining two eligible historic buildings are associated with the Logan-Cache Airport and are located near Airport Road. These historic buildings were constructed in 1945 and 1963. Although these three historic buildings are located near the First Dam Alternative’s construction area, no activities would occur within or immediately adjacent to their parcels. Because there is no ground disturbance, structural modification, or visual intrusion in proximity to these buildings, no direct or indirect effects to their historic integrity or setting would occur.

According to the Utah SHPO Historic Utah Building online database, 2,007 historic buildings do occur within 0.5 miles of the direct and indirect APEs. Visual effects to the three historic structures within the indirect APE and the 2,007 historic buildings within 0.5 miles of the APEs were assessed using a combination of desktop review and field verification to evaluate potential changes to setting, feeling, and association. The analysis concluded that no adverse visual effects would occur, as the proposed canal modifications would not alter the topography, remove contributing vegetation, or introduce visual intrusions into the historic viewshed.

Though lining and piping would directly and adversely affect the canals, no adverse visual effects would occur to the surrounding historic viewshed. This determination is based on the following considerations:

- **Preservation of Mature Vegetation:** The mature trees and vegetation that define the visual character of the canal corridors—particularly those associated with historic properties—would be preserved. These trees currently benefit from seepage and surface water from the canals. Under the First Dam Alternative, landowners would have access to secondary irrigation water connections, allowing them to continue irrigating these trees and maintaining the visual continuity of the landscape.
- **No Change to Topography or Landform:** The project does not propose grading, excavation, or structural changes that would alter the topography or spatial relationships that contribute to the historic setting.
- **Visual Continuity Maintained:** The canal corridors would remain visually intact from adjacent public rights-of-way and properties. While the hydrology would be enclosed, the

alignment and vegetation buffers would be preserved, ensuring that the visual experience of the historic setting remains consistent with existing conditions.

This approach ensures compliance with 36 CFR 800.4 and supports the finding that, while there is a direct adverse effect to the canal structures, the historic viewshed would remain intact and unimpaired.

Of the eighteen cultural sites and the twelve isolated finds identified within the direct APE, five cultural sites were determined eligible for listing in the NRHP. Proposed activities would adversely affect three of these five sites. For two sites—the proposed piping would be bored underneath the historic Utah Northern Railroad (42CA88), and the initially temporarily installed existing boards would be permanently installed at the historic Anderson Lumber Mill (42CA323)—proposed activities would not cause adverse effects. For the three eligible historic canals (Logan and Hyde Park Canal [42CA127], Logan and Benson Canal [42CA143], and Logan Northern Canal [42CA156]) which would be lined or piped, proposed activities would result in permanent, adverse effects.

Based on these findings, the NRCS STC, in consultation with the SHPO, applicable THPOs, and other consulting parties, determined the Proposed Project would result in these following Adverse Effects per 36 CFR Section 800.5(a) as shown in Table 5-13.

Table 5-13. Historic Properties within the Area of Potential Effect, National Register of Historic Places Eligibility, and Effects

Smithsonian No./ Site Name	NRHP Eligibility	Effects
42CA88/Utah Northern Railroad	Eligible under Criterion A	No adverse effect
42CA127/Logan and Hyde Park Canal	Eligible under Criterion A	Adverse effect
42CA143/Logan and Benson Canal	Eligible under Criterion A	Adverse effect
42CA156/Logan Northern Canal	Eligible under Criterion A and C	Adverse effect
42CA323/Anderson Lumber Mill	Eligible under Criterion A	No adverse effect

Concurrence with Findings

In letters dated December 17, 2024, the NRCS submitted their findings of effect with the cultural resources report to the Utah SHPO and the Eastern Shoshone Tribe of the Wind River Reservation, Wyoming; the Shoshone-Bannock Tribes of the Fort Hall Reservation; the Ute Indian Tribe of the Uintah & Ouray Reservation, Utah; and the Northwest Band of the Shoshone Nation to consult on the APE, identification of historic properties, and determination of effects, and to the USACE to notify the agency of the determinations. As noted in Section 3.3.8.1, the USACE and the EPA acknowledged that the NRCS is the lead federal agency for compliance with Section 106 of the NHPA. The USACE designated the NRCS to act on their behalf in any consultations conducted for compliance with NHPA; however, the R8 EPA NEPA Branch directed the NRCS to rely on the SHPOs and THPOs as their branch did not currently have NHPA expertise.

SHPO concurred on the delineation of the APE, site eligibility, and finding of effects in a letter dated January 14, 2025. To date, no response from any Tribes has been received. See Section 7.1.1 for details of ongoing Tribal consultations. While the USACE and EPA did not issue formal letters of concurrence, both agencies were provided the Section 106 findings for

review, raised no objections, and the USACE's role as a signatory to the MOA confirms their agreement with the findings (see below).

NRCS notified the ACHP on February 4, 2025, and on February 14, 2025, the ACHP agreed with the findings and declined to participate further.

Resolution of Adverse Effects

The NRCS developed a MOA to resolve adverse effects. In accordance with 36 CFR Part 800.6, NRCS designed mitigation to resolve the adverse effects to the canals through the draft MOA. Mitigation includes documentation of the historical context of the canals in relation to their involvement in the early settlement of the region, an aerial video recording of the canals, aerial photos of select structures, the development of an ArcGIS Story Map, and the re-evaluation of each canal's eligibility once construction is complete.

The NRCS consulted with the Utah SHPO, USACE, and the Eastern Shoshone Tribe of the Wind River Reservation, Wyoming; Northwest Band of the Shoshone Nation; Shoshone-Bannock Tribes of the Fort Hall Reservation; Ute Indian Tribe of the Uintah & Ouray Reservation, Utah in the development of the MOA. All tribes declined to respond to further participation in the development of the MOA, whereas the Utah SHPO and USACE agreed to participate in the development and as signatories of the MOA. The draft MOA and all records associated with Section 106 consultation are in Appendix A.

If construction activities uncover any materials of cultural or historical significance (i.e., bone fragments, pottery, stone tools, burial features, etc.), construction would halt, and procedures outlined in the NRCS Prototype Programmatic Agreement with the Utah SHPO would be followed.

Crockett Diversion Alternative

Finding of Effects

Per 36 CFR 800.4, a Cultural Resources Inventory was completed of the 1,178.1-acre APE in September 2024 by SWCA. A Class I literature review of both previously recorded archaeological and architectural properties was conducted for the entire APE. All portions of the APE on paved roads only required a Class I survey (literature review). All portions of the APE that consisted of corridors along unpaved roads required a Class I survey, and reconnaissance-level (Class II) survey performed from a vehicle. All other portions of the APE (including staging areas, trails, dams, and irrigation canals) required a Class I survey and an intensive-level (Class III) pedestrian survey. Due to access issues and surface conditions, 179.8 acres were excluded from reconnaissance-level or intensive surveys. For areas of the APE that only Class I surveys were conducted, the likelihood of encountering historic properties is extremely low, and per 36 CFR 800.4.b.1, NRCS and the consulting parties agreed that the level of effort (Class I, II, or III) meets "the reasonable and good faith effort to carry out appropriate identification efforts." If previously unidentified cultural resources are encountered during construction, the project would follow the procedures in the NRCS Prototype Programmatic Agreement with the Utah SHPO (NRCS and SHPO 2025).

The purpose of the cultural resource survey was to locate, document, and evaluate buildings, districts, objects, sites, and structures that would be considered cultural sites within the APE to ensure that the proposed undertaking adheres to federal and state laws designed to protect historic properties, including the NHPA of 1966 (amended), the Utah State Antiquities Act of 1973 (amended 1990), and the Utah State Register (R212-6). The survey identified seven

previously recorded cultural sites, eleven new cultural sites, and twelve new isolated finds within the APE. Cultural resources identified during the survey are shown on Table 3-18.

According to the Utah SHPO Historic Utah Building online database, no historic building occur within the direct APE (Historic 2024), and therefore, no direct effects would occur to historic buildings from project activities. Three eligible historic structures occur within the indirect APE—where existing flooding occurs—and these structures would benefit from the Crockett Diversion Alternative because it includes activities to reduce flooding that would protect the historic buildings from any potential future flooding. One of these three eligible historic structures is located where S 100 E and the Logan River intersect. The historic structure was constructed in 1951 and consists of a concrete arch bridge. The remaining two eligible historic buildings are associated with the Logan-Cache Airport and are located near Airport Road. These historic buildings were constructed in 1945 and 1963. Although these three historic buildings are located near the Crockett Diversion Alternative's construction area, no activities would occur within or immediately adjacent to their parcels. Because there is no ground disturbance, structural modification, or visual intrusion in proximity to these buildings, no direct or indirect effects to their historic integrity or setting would occur.

According to the Utah SHPO Historic Utah Building online database, 2,007 historic buildings do occur within 0.5 miles of the direct and indirect APEs. Visual effects to the three historic structures within the indirect APE and the 2,007 historic buildings within 0.5 miles of the APEs were assessed using a combination of desktop review and field verification to evaluate potential changes to setting, feeling, and association. The analysis concluded that no adverse visual effects would occur, as the proposed canal modifications would not alter the topography, remove contributing vegetation, or introduce visual intrusions into the historic viewshed.

Though lining and piping would directly and adversely affect the canals, no adverse visual effects would occur to the surrounding historic viewshed. This determination is based on the following considerations:

- **Preservation of Mature Vegetation:** The mature trees and vegetation that define the visual character of the canal corridors—particularly those associated with historic properties—would be preserved. These trees currently benefit from seepage and surface water from the canals. Under the Crockett Dam Alternative, landowners would have access to secondary irrigation water connections, allowing them to continue irrigating these trees and maintaining the visual continuity of the landscape.
- **No Change to Topography or Landform:** The project does not propose grading, excavation, or structural changes that would alter the topography or spatial relationships that contribute to the historic setting.
- **Visual Continuity Maintained:** The canal corridors would remain visually intact from adjacent public rights-of-way and properties. While the hydrology would be enclosed, the alignment and vegetation buffers would be preserved, ensuring that the visual experience of the historic setting remains consistent with existing conditions.

This approach ensures compliance with 36 CFR 800.4 and supports the finding that, while there is a direct adverse effect to the canal structures, the historic viewshed would remain intact and unimpaired.

Of the eighteen cultural sites and the twelve isolated sites identified within the direct APE, five cultural sites were determined eligible for listing in the NRHP. Proposed activities would

adversely affect three of these five sites. For two sites—the proposed piping would be bored underneath the historic railroad, and the initially temporarily installed existing boards would be permanently installed at the historic mill—proposed activities would not cause adverse effects. For the three eligible historic canals which would be lined or piped, proposed activities would result in permanent, adverse effects.

Based on these findings, the NRCS STC, in consultation with the SHPO, applicable Tribes/THPOs, and other consulting parties, determined the Proposed Project would result in Adverse Effect to Historic Properties per 36 CFR Section 800.5(b) as shown in Table 5-13.

Concurrence with Findings

In letters dated December 17, 2024, the NRCS submitted their findings of effect with the cultural resources report to the Utah SHPO and the Eastern Shoshone Tribe of the Wind River Reservation, Wyoming; the Shoshone-Bannock Tribes of the Fort Hall Reservation; the Ute Indian Tribe of the Uintah & Ouray Reservation, Utah; and the Northwest Band of the Shoshone Nation to consult on the APE, identification of historic properties, and determination of effects, and to the USACE to notify the agency of the determinations. As noted in Section 3.3.8.1, the USACE and the EPA acknowledged that the NRCS is the lead federal agency for compliance with Section 106 of the NHPA. The USACE designated the NRCS to act on their behalf in any consultations conducted for compliance with NHPA; however, the R8 EPA NEPA Branch directed the NRCS to rely on the SHPOs and THPOs as their branch did not currently have NHPA expertise.

SHPO concurred on the delineation of the APE, site eligibility, and finding of effects in a letter dated January 14, 2025. To date, no response from any Tribes has been received. See Section 7.1.1 for details of ongoing Tribal consultations.

NRCS notified the ACHP on February 4, 2025, and the ACHP agreed with the findings and declined to participate further on February 14, 2025. While the USACE and EPA did not issue formal letters of concurrence, both agencies were provided the Section 106 findings for review, raised no objections, and the USACE's role as a signatory to the MOA confirms their agreement with the findings (see below).

Resolution of Adverse Effects

The NRCS developed a MOA to resolve adverse effects. In accordance with 36 CFR Part 800.6, NRCS designed mitigation to resolve the adverse effects to the canals through a draft MOA. Mitigation includes documentation of the historical context of the canals in relation to their involvement in the early settlement of the region, an aerial video recording of the canals, aerial photos of select structures, the development of an ArcGIS Story Map, and the re-evaluation of each canal's eligibility once construction is complete.

The NRCS consulted with the Utah SHPO, USACE, and the Eastern Shoshone Tribe of the Wind River Reservation, Wyoming; Northwest Band of the Shoshone Nation; Shoshone-Bannock Tribes of the Fort Hall Reservation; and the Ute Indian Tribe of the Uintah & Ouray Reservation, Utah in the development of the MOA. All tribes declined to respond to further participation in the development of the MOA, whereas the Utah SHPO and USACE agreed to participate in the development and as signatories of the MOA. The draft MOA and all records associated with Section 106 consultation are located in Appendix A.

If construction activities uncover any materials of cultural or historical significance (i.e., bone fragments, pottery, stone tools, burial features, etc.), construction would halt, and procedures

outlined in the NRCS Prototype Programmatic Agreement with the Utah SHPO would be followed.

5.3.8.2 Scientific Resources

No Action Alternative

Under the No Action Alternative, ground disturbances would occur due to the reconstruction of the Crockett Diversion and the replacement of the North Branch Canal (Crockett Canal). Long-term, no direct or indirect effects to paleontological resources would occur due to the No Action Alternative.

First Dam Alternative

The Project Area is comprised mainly of Quaternary, Neogene, and alluvial deposits and is unlikely to contain paleontological resources, and project implementation of the First Dam Alternative is not expected to uncover significant fossils. (see UDNR concurrence letter in Appendix A). Unless fossils are discovered as a result of construction activities, the First Dam Alternative would have no effect on paleontological resources.

Crockett Diversion Alternative

The Project Area is comprised mainly of Quaternary, Neogene, and alluvial deposits and is unlikely to contain paleontological resources, and project implementation of the Crockett Diversion Alternative is not expected to uncover significant fossils. (see UDNR concurrence letter in Appendix A). Unless fossils are discovered as a result of construction activities, the Crockett Diversion Alternative would have no effect on paleontological resources.

5.3.8.3 Public Health and Safety

No Action Alternative

The No Action Alternative would have minor but permanent direct effects on public health and safety. Under the No Action Alternative, the Crockett Diversion structure would be replaced, which improves floodplain functionality and reduces flood risks compared to existing conditions. Although this alternative does not include additional agricultural optimization or landscaping fill measures, replacing the outdated diversion structure addresses key factors contributing to flooding in the area. By removing the current structure, flood risks in the surrounding floodplain are reduced, with 15 homes inundated during a 100-year flood event—an improvement from existing conditions, which would affect 43 homes in a 100-year event.

By reducing the amount of open water flowing through the irrigation system by replacing 2,500 feet of the North Branch Canal (Crockett Canal), risks and safety concerns for that section of the canal would be addressed. However, risks and safety concerns associated with the remaining miles of open canals and the current flood risk outside of the Logan River floodplain from overtopping canals would remain the same because these canals would continue to carry irrigation and stormwater and are prone to overtopping during storm events. At one foot flood depth in a 100-year event, 426 homes would be flooded in the No Action Alternative (Table 5-14).

First Dam Alternative

The purpose of the Proposed Project is to provide improved agricultural water management by reconstructing aging diversion infrastructure and installing a PI system, providing beneficial effects to public health and safety by decreasing the flood risk and reducing the open canal area.

During implementation of the First Dam Alternative, construction activities would temporarily cause brief, insignificant traffic delays along public roadways adjacent to the First Dam Alternative where the project elements intersect roads. Standard industry practices required in the specifications to the construction contractor (e.g., traffic control plans, coordination with local emergency responders, limiting work hours to daytime, marking and barricading active construction areas to prevent public access, dust abatement) would limit any additional effects to health and safety, and these measures are included in the BMPs for the project (Appendix E2). The Logan City Police Department's 9-1-1 Dispatch Center would continue to be responsible for answering emergency calls and dispatching police, fire, EMS, and ambulance personnel throughout the county. The Cache County Sheriff, the Logan City Fire Department, and the North Logan Fire Department would continue to cover the Project Area for emergency response and would not be hindered in their response. Service from the fire station would not be affected by the First Dam Alternative. Based on these measures, no significant effects to public safety would occur.

In the short and long term, under the First Dam Alternative, the Proposed Project would address flood inundation associated with the aging Crockett Diversion structure by rebuilding the existing Crockett Diversion and lowering the crest level, which would reduce flooding upstream. Additionally, the First Dam Alternative would add fill in two landscaping lots (Lots 1 and 2; see Appendix B–Project Maps and Appendix E4, TM-015, Section 3.0), which would reduce flows leaving the Logan River channel and redirect any flow back into the channel, further reducing the risks of flooding to upstream areas of the diversion. Under this alternative, the number of homes inundated during a 100-year flood event along the Logan River is reduced to 15 from 43.

To address stormwater and irrigation water overflows in canals, the flood water overflow proposed activities, including removing irrigation water from CAIC canals and providing floodwater overflow along 1800 N to the west, would prevent overtopping during high intensity runoff events and prevent localized flooding within the Project Area. Table 5-14 shows the reduction of flooded structures with implementation of the action alternatives. For example, at one foot flood depth, 426 homes would be flooded in the No Action Alternative compared to 302 for the action alternatives. Additionally, these actions would prevent flooding on 10,350 acres of agricultural land and 3,150 feet of road. This reduction improves the public safety in the Project Area by reducing flooding extent.

Table 5-14. Comparison of Structures Flooded by Flood Depth from 100-year Event for No Federal Action and Action Alternatives

Scenario	Flood Depth	Structures Flooded				
		Residential	Mobile Home	Commercial	Garage/Shed	Other
No Action Alternative 100-year	0-1 ft	426	56	93	119	8
	1-2 ft	32	0	12	6	2
	2-3 ft	3	0	2	4	0
	3-4 ft	4	0	0	1	0
	4-5 ft	3	0	0	0	0
First Dam and Crockett Diversion Alternatives 100-Year	0-1 ft	302	43	48	78	1
	1-2 ft	23	0	3	5	2
	2-3 ft	3	0	0	3	0
	3-4 ft	5	0	0	1	0
	4-5 ft	3	0	0	0	0

By removing the irrigation water from the Crockett Canal and filling in a portion of the canal where the Canyon Trail recreation trail would be constructed, risks and safety concerns of slope failure along the hillside would be addressed. Additionally, the 6,210 feet of concrete lining along the Logan and Northern Canal and Twin Canals and the installation of 9,750 feet of new box culvert within the existing Twin Canals would improve those canals' capacity to carry flood waters, and the construction of three diversion structures at each of the canals (Logan and Northern, Twins, and Northwest Field) would divert flood water from the canals into the new transmission pipe, reducing the flooding risk and improving public safety in Logan, North Logan, and Hyde Park.

Other than these changes to the Crockett Canal and approximately three miles of the Logan and Northern, Twin, and Northwest Field Canals associated with the flood water overflow activities, though irrigation water would be removed from the canals and laterals because it would be piped, the remaining canal infrastructure would remain in place. No canals would be moved in either of the action alternatives. Head gates and existing infrastructure would remain in place, although removal could be addressed during the design phase, if deemed necessary. Because the irrigation water would no longer run through the canals, safety concerns about open water would be removed in these sections during the irrigation season, however, the open canals would still be used to collect and move stormwater to reduce flooding.

Improvements to sections of the canals, laterals, and ditches in the CAIC service area from the First Dam Alternative would improve the capacity of the canals to convey floodwaters. The First Dam Alternative would reduce flooding risks, eliminate a public safety risk, and improve public health and safety in the Project Area. Therefore, the First Dam Alternative would result in net positive effects to public health and safety in the Project Area.

Crockett Diversion Alternative

Under the Crockett Diversion Alternative, the Proposed Project would provide improved agricultural water management by reconstructing aging diversion infrastructure and installing a PI system, providing beneficial effects to public health and safety by reducing the open canal area and decreasing the flood risk.

During implementation of the Crockett Diversion Alternative, construction activities would temporarily cause brief, insignificant traffic delays along public roadways adjacent to the Crockett Diversion Alternative where the project elements intersect roads. Standard industry practices required in the specifications to the construction contractor (e.g., traffic control plans, coordination with local emergency responders, limiting work hours to daytime, marking and barricading active construction areas to prevent public access, dust abatement) would limit any additional effects to health and safety, and these measures are included in the BMPs for the project (Appendix E2). The Logan City Police Department's 9-1-1 Dispatch Center would continue to be responsible for answering emergency calls and dispatching police, fire, EMS, and ambulance personnel throughout the county. The Cache County Sheriff, the Logan City Fire Department, and the North Logan Fire Department would continue to cover the Project Area for emergency response and would not be hindered in their response. Service from the fire station would not be affected by the Crockett Diversion Alternative. Based on these measures, no significant effects to public safety would occur.

In the short and long term, the Crockett Diversion Alternative would address flood inundation associated with the aging Crockett Diversion structure by rebuilding the existing Crockett Diversion and lowering the crest level, which would reduce flooding upstream. Additionally, the Crockett Diversion Alternative would add fill in two landscaping lots (Lots 1 and 2; see Project Maps in Appendix B), which would reduce flows leaving the Logan River channel and redirect any flow back into the channel, further reducing the risks of flooding to upstream areas of the diversion. Under this alternative, the number of homes inundated during a 100-year flood event along the Logan River is reduced to 15 from 43.

To address stormwater and irrigation water overflows in canals, the flood water overflow proposed activities, including removing irrigation water from CAIC canals and providing floodwater overflow along 1800 N to the west, would prevent overtopping during high intensity runoff events and prevent localized flooding within the Project Area. Table 5-14 shows the reduction of flooded structures with implementation of the action alternatives. For example, at one foot flood depth, 426 homes would be flooded in the No Action Alternative compared to 302 for the action alternatives. This reduction improves the public safety in the Project Area by reducing flooding extent.

By removing the irrigation water from the Crockett Canal and filling in a portion of the canal where the Canyon Trail recreation trail would be constructed, risks and safety concerns of slope failure along the hillside would be addressed. Additionally, the 6,210 feet of concrete lining along the Logan and Northern Canal and Twin Canals and the installation of 9,750 feet of new box culvert within the existing Twin Canals would improve those canals' capacity to carry flood waters, and the construction of three diversion structures at each of the canals (Logan and Northern, Twins, and Northwest Field) would divert flood water from the canals into the new transmission pipe, reducing the flooding risk and improving public safety in Logan, North Logan, and Hyde Park.

Other than these changes to the Crockett Canal and approximately three miles of the Logan and Northern, Twin, and Northwest Field Canals associated with the flood water overflow activities, though irrigation water would be removed from the canals and laterals because it would be piped, the remaining canal infrastructure would remain in place. No canals would be moved in either of the action alternatives. Head gates and existing infrastructure would remain in place, although removal could be addressed during the design phase, if deemed necessary. Because the

irrigation water would no longer run through the canals, safety concerns about open water would be removed in these sections during the irrigation season, however, the open canals would still be used to collect and move stormwater to reduce flooding.

Improvements to sections of the canals, laterals, and ditches in the CAIC service area from the Crockett Diversion Alternative would improve the capacity of the canals to convey floodwaters. The Crockett Diversion Alternative would reduce flooding risks, eliminate a public safety risk, and improve public health and safety in the Project Area. Therefore, the Crockett Diversion Alternative would result in net positive effects to public health and safety in the Project Area.

5.3.8.4 Hazardous Materials

No Action Alternative

Hazardous materials sites have been identified in the UDEQ database near the No Action Alternative. The No Action Alternative would not have direct effects on hazardous materials in the Project Area. The contractor would be required to apply for appropriate permits before construction and implement the SPCC Plan and SWPPP. However, long-term indirect effects are anticipated as ongoing flooding could disturb existing facilities and environmental incidents, as well as undocumented spills or environmental incidents in the surrounding community.

First Dam Alternative

For the First Dam Alternative, several hazardous materials sites identified in the UDEQ database are within close proximity to the Project Area. Construction activities in these areas would be confined to the smallest extent possible. Based on the UDEQ Hazardous Materials Map (Appendix C), underground storage tanks, petroleum hydrocarbon impacted soil, or groundwater would not be encountered. However, ten features, including one Tier2 Facility, five hazardous waste and used oil sites, as well as four environmental incidents were identified within 15 feet of project measures.

Ground disturbance from general construction activities has the potential to encounter the ten hazardous materials sites under the First Dam Alternative; however, the likelihood of encountering contaminated soil or groundwater within the Project Area is minimal because most construction would be confined to the roadway ROWs.

To ensure these sites are not disturbed, construction activities in these areas would be confined to the smallest extent possible. Additionally, BMPs would be implemented to minimize potential effects. These BMPs include minimizing soil disturbance, and if hazardous materials are encountered, notifying UDEQ, and handling site material appropriately.

During construction activities, fuels, oils, lubricants, and other potential environmentally deleterious materials supporting the construction activities may be stored and used on-site. A construction BMP includes containing all work activities, where possible, to upland areas to minimize potential effects to surface water quality. The contractor would be required to follow the UPDES General Construction Permit which manages stormwater runoff during construction. In addition, the contractor would also be required to follow an approved SWPPP and SPCC plan and comply with the plan when fueling, performing cleaning and maintenance, and storing or disposing of hazardous materials.

For the project measure to use existing sewer lagoons as secondary irrigation water reservoirs, though toxicity testing did not find toxins in the sludge, a permit from the UDWQ would still be required before the removal and disposal of sludge within the existing sewer lagoons prior to conversion to secondary irrigation storage. Logan City would continue to operate these areas under their current permit to produce class A biosolids with wastewater sludge. Should Logan River water mix with wastewater effluent in storage reservoirs in the future, outside of the scope of this project, UAC 317-3-11 would apply, which would govern appropriate effluent water quality limits. See Appendix E4, TM-010 for more details.

The alternatives are designed to minimize effects to existing hazardous materials and would not introduce new hazardous materials. Additionally, storage, use and disposal of fuel, oils, lubricants, and other construction materials would be subject to all applicable local, state, and federal regulations, ensuring only negligible effects to hazardous materials.

Crockett Diversion Alternative

For the Crockett Diversion Alternative, several hazardous materials sites identified in the UDEQ database are within close proximity to the Project Area. Construction activities in these areas would be confined to the smallest extent possible. Ten features, including one Tier2 Facility, five hazardous waste and used oil, as well as four environmental incidents were identified within 15 feet of project measures.

Ground disturbance from general construction activities has the potential to encounter the ten hazardous materials sites under the Crockett Diversion Alternative; however, the likelihood of encountering contaminated soil or groundwater within the Project Area is minimal because most construction would be confined to the roadway ROWs. It is not anticipated to encounter USTs, petroleum hydrocarbon impacted soil, or groundwater.

To ensure these sites are not disturbed, construction activities in these areas would be confined to the smallest extent possible. Additionally, BMPs would be implemented to minimize potential effects. These BMPs include minimizing soil disturbance, and if hazardous materials are encountered, notifying UDEQ, and handling site material appropriately.

During construction activities fuels, oils, lubricants, and other potential environmentally deleterious materials supporting the construction activities may be stored and used on-site. A construction BMP would include containing all work activities, where possible, to upland areas to minimize potential effects to surface water quality. The contractor would be required to follow the UPDES General Construction Permit which manages stormwater runoff during construction. In addition, the contractor would also be required to follow an approved SWPPP and SPCC plan and comply with the plan when fueling, performing cleaning and maintenance, and storing or disposing of hazardous materials.

The alternatives are designed to minimize effects to hazardous materials and would not introduce new hazardous materials. Additionally, storage, use and disposal of fuel, oils, lubricants, and other construction materials would be subject to all applicable local, state, and federal regulations, ensuring only negligible effects to hazardous materials.

5.3.8.5 Transportation and Infrastructure

No Action Alternative

Under the No Action Alternative, no changes to the access and transportation routes presently in operation would occur, and no direct effects would occur at a local or regional level. The existing First Dam hydropower station would not be decommissioned, no PI system would be constructed, and no water pumps would be installed. Temporary effects would occur during proposed construction activities, including rebuilding the Crockett Diversion and replacing 2,500 feet of the North Branch Canal (Crockett Canal). CAIC personnel would continue to use existing roads to access the irrigation system for O&M.

In the long term, the risk of floods overtopping the canals would persist, potentially affecting road infrastructure and residential development infrastructure in Logan, North Logan, Hyde Park, and Benson CDP. Additionally, much of the existing irrigation infrastructure would not be replaced or rehabilitated. The aging infrastructure system would require more frequent maintenance and repairs, increasing overall O&M costs.

First Dam Alternative

The First Dam Alternative would construct PI infrastructure outside of the existing system of open water canals, including 120 miles of distribution system pipeline, which would allow a change from individual pumps to gravity pressurization. Three supplemental pump stations would be constructed at the western end of the system (West River, Cow Pasture, and West Lagoons pump stations) to assist with system pressurization.

Temporary, short-term effects would occur to the transportation system during construction due to installation of the 120 miles of distribution piping within road ROWs, and related construction noise and traffic. Construction of the PI infrastructure would occur outside the irrigation season to reduce potential effects to system users. Existing infrastructure at USU, including the parking lot below First Dam and the UWRL parking lot would be temporarily affected by the construction of the proposed PI system. The existing USU parking lot below First Dam would be trenched for installation and then be returned to current or better conditions, per ongoing coordination with USU Facilities. The UWRL parking lot would be avoided during construction and BMPs would be implemented onsite to minimize any effects from nearby construction activities.

The construction of the proposed PI system would have long-term, permanent effects to Logan, North Logan, and Hyde Park's culinary and sewer system. Long-term, culinary water sales would decrease, as would capital costs currently used to handle culinary system improvements. Additionally, erosion and sediment infiltration from earthen canals into the sewer pipes would also decrease, thereby lowering capital costs.

Operational cost savings gained by reducing seepage, evaporation, and carrier water losses would allow CAIC to reduce the repair and replacement cost of the deteriorating canals, and maintenance of vegetation growth along the channel prisms.

Operational savings would be experienced by the cities as well. Logan City would experience significant power savings and a reduction in O&M costs from the construction of the proposed PI system. Currently, Logan City uses a significant amount of power to operate its culinary wells

to meet system demands each summer. By reducing the demand, less water would need to be pumped from the culinary wells and the city's power usage would decrease, resulting in an estimated immediate savings of \$130,000 annually and \$359,000 annually at build-out. The construction of the proposed PI system would remove irrigation water from Logan City's existing network of earthen canals, reducing seepage and infiltration into the sewer system. A reduction in irrigation infiltration would reduce inflow to the existing treatment plant, thereby reducing its required capacity. Long-term, this reduction would provide the benefit of allowing a delay in the construction of additional biological reactors, which Logan City estimate cost approximately \$20 million each to build. This significant capital cost for Logan City would be delayed, allowing the city to use these funds to complete other necessary upgrades and improvements to the existing sewer system. Additionally, construction of the proposed PI system would expose portions of the existing sewer system piping in Logan City, which would allow Logan City to perform any necessary maintenance and repairs on the sewer system concurrently with PI construction, providing additional indirect cost-saving benefits to Logan City.

The proposed PI system in North Logan and Hyde Park would meet future irrigation needs and would reduce future water demands on both existing culinary water systems. In Hyde Park, the proposed PI system would extend the capabilities of the municipality's water rights to meet the community's culinary demands, which would address their primary water challenge. Under the First Dam Alternative, all property would receive secondary irrigation water, regardless of irrigation water share availability. Revenue from culinary water would be expected to drop in all affected cities. Year-round culinary water revenue would mimic winter sales. The culinary water rate of each city would need to be revised upon completion of the proposed alternative. While Logan, North Logan, and Hyde Park would experience a loss in revenue from culinary water sales, the capital costs of the foregone culinary system improvements would provide significant savings.

Additionally, removing irrigation water from the canals would reduce flood risks in Logan, North Logan, Hyde Park, and Benson CDP, resulting in a beneficial effect to transportation and infrastructure (see Table 5-14). The Crockett Diversion reconstruction and Lot 1 and 2 fill would reduce flood damage to 3,150 feet of existing roadway and protect 43 housing units in the Logan River floodplain.

The First Dam Alternative would also decommission the existing hydropower turbine at First Dam, which is owned by USU. Removing this hydropower turbine at First Dam would provide adequate water pressure for the proposed PI system's water users. Long-term, the First Dam Alternative would eliminate the complexity of irrigation demand and power production for USU. USU would have fewer O&M costs associated with automation, improved operation at the Water Lab, hydropower operations, and would not have to choose between supplying water to the UWRL or hydropower production. Silt and sediment management would be improved through sediment removal activities at First Dam, improving the water quality and availability for UWRL. The increased instream flows in the Logan River would create positive public relations for USU. The First Dam Alternative would also eliminate a flooding issue with the Providence Logan Irrigation Company (Providence Logan) diversion and surrounding residences when USU releases higher flows to accommodate the UWRL. Coordination and documentation regarding irrigation water demands and operation would be necessary. Greater flexibility of high-flow experiments could be possible through appropriate negotiation and cooperation, due to the proposed additional secondary irrigation system storage. A legally binding MOU of management

and operational guidelines would need to be created and signed by the appropriate parties (USU, UWRL, Board of Crockett Avenue Irrigation Companies, Logan City, North Logan City, and Hyde Park City). This MOU would clarify and simplify various management responsibilities, thus decreasing the management complexity of the infrastructure.

The UWRL has a flow capacity of 100,000 gallon per minute (gpm) coupled with precise flow measurement equipment used to perform research and testing for many entities. This capacity is available due to the existing First Dam intake, and it is critical that this capacity be maintained during the non-irrigation season, and for a few hours each week during the irrigation season, as needed. Fluctuations by more than 6 inches from full pool in a 24-hour period could have adverse impacts on research in the laboratory. The First Dam Alternative would have no effect on the UWRL's ability to run these large flow experiments during the non-irrigation season. During the irrigation season, the West Pump Station and the storage capacity of the lagoons would allow operational flexibility that can meet demand in the irrigation system while these large flow experiments occur. With an MOU, this alternative would maintain and potentially improve UWRL's testing capacity and abilities.

Access to the Project Area would be achieved at numerous locations using public roads. Implementation of the First Dam Alternative may cause temporary, brief delays for residents and the public using U.S. Highway 91 and 89, State Highway 30 and 252, and local roads due to construction in the road ROWs and vehicles entering and exiting the access roads. To safely implement the First Dam Alternative, construction and access footprints would be limited to only those necessary. Construction vehicles and equipment would use existing infrastructure and transportation routes, and no access improvements are proposed.

To minimize local and regional effects to access, transportation, and public safety from the First Dam Alternative, CAIC and the contractor would coordinate with and obtain permits from the Cache County Public Works Road Division, City of Logan, North Logan City, Hyde Park City, and UDOT, as necessary. Additionally, Cache County and the Sheriff's department would be notified if traffic or access would be delayed (see Section 5.3.8.3 and BMPs in Appendix E2). An Encroachment Permit and Traffic Control Plans would be required from UDOT for project activities within the ROW of U.S. Highway 91 and 89, and State Highway 30 and 252, which are UDOT managed roads. Following the completion of pipe installation, all roads would be returned to equal or better condition than existing. Once construction is complete, traffic, access routes, and road crossings would return to their current state. Current traffic on local roads is light and would not be majorly affected by project implementation. The First Dam Alternative would not contribute to a regional trend in traffic levels, due to the absence of short- or long-term increases in vehicle travel to the Project Area.

Long term, the rehabilitation efforts of the First Dam Alternative would improve the CAIC infrastructure and reduce the flooding risk to the transportation system and buildings within the Project Area. The proposed activities to the irrigation infrastructure provide beneficial long-term effects for CAIC, reducing their O&M, emergency repair, and road and structure damage costs in the long term. Additional benefits would be received by Logan City, North Logan, Hyde Park, and USU as a result of the First Dam Alternative, including reduced O&M costs and reduced strain on existing systems, along with other indirect benefits.

Crockett Diversion Alternative

The Crockett Diversion Alternative would improve the existing CAIC infrastructure by installing PI infrastructure outside the existing system of open water canals, including 120 miles of distribution system pipeline. Operational cost savings gained by reducing seepage, evaporation, and carrier water losses would allow CAIC to reduce the repair and replacement cost of the deteriorating canals and reduce or eliminate maintenance of vegetation growth along the channel prisms.

Additionally, removing the water from canals by piping 120 miles of canals would reduce the flood risk and the flooding extent from overtopping canals, preventing over 124 homes from flooding in Logan, North Logan, Hyde Park, and Benson CDP, compared to the FWOFI, resulting in a beneficial effect to transportation and infrastructure (Table 5-14).

The Crockett Diversion reconstruction and Lot 1 and 2 fill would reduce flood damage from the Logan River to 3,150 feet of existing roadway and protect approximately 43 housing units and associated businesses, resulting in a beneficial effect to transportation and infrastructure.

Temporary, short-term effects would occur to the transportation system during construction due to installation of the 120 miles of distribution piping within road ROWs, and related construction noise and traffic. Construction of the PI infrastructure would occur outside the irrigation season to reduce potential effects to system users.

The construction of the proposed PI system would have long-term, permanent effects to Logan, North Logan, and Hyde Park's culinary and sewer system. Long-term, culinary water sales would decrease, as would capital costs currently used to handle culinary system improvements. However, erosion and sediment infiltration from earthen canals into the sewer pipes would also decrease, thereby lowering capital costs.

Operational cost savings gained by reducing seepage, evaporation, and carrier water losses would allow CAIC to reduce the repair and replacement cost of the deteriorating canals and reduce maintenance of vegetation growth along the channel prisms.

Operational savings would be experienced by the cities as well. Logan City would experience significant power savings and a reduction in O&M costs from the construction of the proposed PI system. Currently, Logan City uses a significant amount of power to operate its culinary wells to meet system demands each summer. By reducing the demand, less water would need to be pumped from the culinary wells and the city's power usage would decrease, resulting in an estimated immediate savings of \$130,000 annually and \$359,000 annually at build-out. The construction of the proposed PI system would remove irrigation water from Logan City's existing network of earthen canals, reducing seepage and infiltration into the sewer system. A reduction in irrigation infiltration would reduce inflow to the existing treatment plant, thereby reducing its required capacity. Long-term, this reduction would provide the benefit of allowing a delay in the construction of additional biological reactors, which Logan City estimate cost approximately \$20 million each to build. This significant capital cost for Logan City would be delayed, allowing the city to use these funds to complete other necessary upgrades and improvements to the existing sewer system. Additionally, construction of the proposed PI system would expose portions of the existing sewer system piping in Logan City, which would allow Logan City to perform any necessary maintenance and repairs on the sewer system concurrently with PI construction, providing additional indirect cost-saving benefits to Logan City.

The proposed PI system in North Logan and Hyde Park would meet future irrigation needs and would reduce future water demands on both existing culinary water systems. In Hyde Park, the proposed PI system would extend the capabilities of the municipality's water rights to meet the community's culinary demands, which would address their primary water challenge. Under the First Dam Alternative, all property would receive secondary irrigation water, regardless of irrigation water share availability. Revenue from culinary water would be expected to drop in all affected cities. Year-round culinary water revenue would mimic winter sales. The culinary water rate of each city would need to be revised upon completion of the proposed alternative. While Logan, North Logan, and Hyde Park would experience a loss in revenue from culinary water sales, the capital costs of the foregone culinary system improvements would provide significant savings.

Access to the Project Area would be achieved at numerous locations using public roads. Implementation of the Crockett Diversion Alternative may cause temporary, brief delays for residents and the public using U.S. Highway 91 and 89, State Highway 30 and 252, and local roads due to construction vehicles entering and exiting the access roads. To safely implement the Crockett Diversion Alternative, construction and access footprints would be limited to only those necessary. Construction vehicles and equipment would use existing infrastructure and transportation routes, and no access improvements are proposed.

To minimize local and regional effects to access, transportation, and public safety from the Crockett Diversion Alternative, CAIC and the contractor would coordinate with and obtain permits from the Cache County Public Works Road Division, City of Logan City of Logan, North Logan City, Hyde Park City, and UDOT, as necessary. Additionally, Cache County and the Sheriff's department would be notified if traffic or access would be delayed (see Section 7.5 and BMPs in Appendix E2). An Encroachment Permit and Traffic Control Plans would be required from UDOT for project activities within the ROW of U.S. Highway 91 and 89, and State Highway 30 and 252, which are UDOT managed roads. Following the completion of pipe installation, all roads would be returned to equal or better condition than existing. Once construction is complete, traffic, access routes, and road crossings would return to their current state. Current traffic on local roads is light and would not be majorly affected by project implementation. The Crockett Diversion Alternative would not contribute to a regional trend in traffic levels, due to the absence of short- or long-term increases in vehicle travel to the Project Area.

Long term, the rehabilitation efforts of the Crockett Diversion Alternative would reduce the flooding risk to the transportation system and buildings within the Project Area. The proposed activities to the irrigation infrastructure provide beneficial long-term effects for CAIC, reducing their O&M, emergency repair, and road and structure damage costs in the long term.

5.3.8.6 Noise

No Action Alternative

The Project Area contains agricultural and residential land uses. Numerous noise sensitive receptors are present surrounding the Project Area, including local parks, residential areas, and schools. Background noise levels are associated with existing traffic and agricultural noise. The No Action Alternative would have a temporary effect on noise levels in the Project Area due to the reconstruction of the diversion, the replacement of the North Branch Canal (Crockett Canal),

and canal maintenance. Backhoes, dump trucks, and crew trucks would be used for the No Action Alternative. Temporary noise effects would occur during construction. According to the Logan, Utah Code of Ordinances, construction falls under exemption from sound level limits. Construction would follow the municipal code regulations (American Legal Publishing 2024).

First Dam Alternative

During public scoping, several individuals were concerned about the construction noise from implementing the Proposed Project. Temporary noise effects would occur during construction, primarily due to the operation of construction equipment and vehicles. Backhoes, dump trucks, and crew trucks would be used for the First Dam Alternative. BMPs would be implemented to minimize noise during construction, including noise mitigation measures limiting construction work to established daytime working hours and requiring the use of properly functioning equipment mufflers. Due to the amount of time required to construct the First Dam Alternative (3–5 years), to minimize noise from construction, the contractor would work in sections to complete the project, and therefore, noise would only occur in limited, active construction areas, ensuring only minor, localized effects to noise from construction.

In the long term, the First Dam Alternative includes the installation of three pump stations. The installation of the Lagoons, Cow Pasture, and West River pump stations would permanently increase noise levels in localized areas around each pump. The pumps would be vertical turbine pumps with a 20–30 cfs capacity. However, these pumps would be located in agricultural areas and would not affect noise levels for residential areas after construction. Similar to the noise produced by agricultural equipment servicing the same fields the pumps are designed to service, the noise from the pump stations would be negligible compared to the surrounding noise already present in the area.

Crockett Diversion Alternative

During public scoping, in addition to the concern about the construction noise from implementing the Proposed Project, several individuals were also concerned about the added noise from the new pump station by River Hollow Park.

As in the First Dam Alternative, temporary noise effects would occur during construction primarily due to the operation of construction equipment and vehicles. Backhoes, dump trucks, and crew trucks would be used for the Crockett Diversion Alternative. Noise mitigation measures, such as established daytime working hours and the use of properly functioning equipment mufflers, would be implemented during construction to minimize temporary noise effects. Additionally, with the contractor working in sections to minimize noise and noise associated with the construction only occurring in the active construction area, construction noise effects would be minor and localized.

In the long term, the Crockett Diversion Alternative includes the installation of four pump stations. Similar to the First Dam Alternative, the West River, West Lagoons, and Cow Pasture Pump Stations would be located in agricultural areas and would not increase noise levels for residential areas after construction. Due to the noise produced by agricultural equipment servicing the same fields the pumps are designed to service, the noise from the pump stations would be negligible compared to the surrounding noise already present in the area.

The fourth pump—the Crockett Pump Station—would be installed southwest of River Hollow Park along the Little Logan, which is near a residential area. An existing road (Crockett Avenue) and associated traffic and the River Hollow Park contribute to existing noise levels. To address noise levels, the Crockett Pump Station would be designed in accordance with the Logan City municipal code and would not exceed the allowable sound level limits. For example, to mitigate noise levels, the Crockett Pump Station would be contained in a masonry control house designed to limit noise. The masonry would reduce the noise level by approximately 25–35 dBA (FHWA 2018). Combined with the existing surrounding noise, the noise attenuating effectiveness of the masonry control house, and the consistency with the Logan Code of Ordinance regarding sound, the long-term noise level increase from the pump station would be minor.

5.3.8.7 Visual Resources and Scenic Beauty

No Action Alternative

Under the No Action Alternative there would be effects to visual resources and scenic beauty during the reconstruction of the diversion, the replacement of the North Branch Canal (Crockett Canal), and canal maintenance, but these effects would only occur during construction. The reconstruction of the diversion would not have any added permanent visual effects because the diversion is already present. However, continued flooding of Logan City and nearby homes would continue, which could cause future changes to visual resources and scenic beauty in the area. Continued flooding could damage one historic home, affecting its pristine historic nature and the visual history of the area. Flooding would continue as a result of the No Action Alternative.

First Dam Alternative

During construction, temporary, short-term, minor visual effects would occur due to the presence of construction equipment and activities.

The reconstruction of the diversion would not have any added permanent visual effects because the diversion is already present. The connecting distribution in Benson would not have any added visual effects, as the proposed action would connect to the existing canals.

Minor permanent effects would occur to visual resources and scenic beauty under the First Dam Alternative. Earthen bottom canals would experience vegetation loss as the irrigation water is removed from the canal. To mitigate vegetation loss, appropriate native vegetation would be reestablished in areas disturbed. Indirectly, the water loss from the canals would be redistributed through the PI and secondary irrigation water systems to the surrounding vegetation, minimizing effects. The construction of the hydropower station would cause minor permanent effects to visual resources. In addition, there would be visual effects from the fill added in landscaping Lot 1 and 2. However, the addition of these lots would prevent flows from leaving the channel during a 100-year flood event which would also be a beneficial visual effect. The First Dam Alternative would also install Lagoons, Cow Pasture, and West River pump stations. The new construction would have a minor effect to visual resources.

The First Dam Alternative would provide 25 cfs of instream flows for 15.1 miles for the Logan River and 5–10 cfs of base flows for 4.8 miles for the Little Logan. The First Dam Alternative would also improve system return flow for 6,650 feet from the storage reservoir to the Logan

River. These actions would provide flow continuity and river aesthetics for city residents, which was a popular concern during the comment period.

Potential visual effects would be minimized by implementing BMPs to protect areas outside the active construction area, encourage the establishment of native vegetation, and preserve existing vegetation. Existing roads would be used to access the Project Area. BMPs are discussed in Section 0. Due to the implementation of BMPs the visual and scenic effects from the First Dam Alternative would be minor.

Crockett Diversion Alternative

During construction, temporary, minor visual effects would occur due to the presence of construction equipment and activities.

The connecting distribution in Benson would not have any added visual effects, as the proposed action would connect to the existing canal.

The reconstruction of the diversion would not have any added permanent visual effects because the diversion is already present. The proposed Crockett Diversion replacement design would remove some of the aged and broken concrete and rubble that make the diversion structure. A new pedestrian bridge and inflatable weir structure would help the structure look modernized, but otherwise the aesthetics would remain like what they are currently. Some further aesthetical features may be implemented into the final design per Logan City and other stakeholder input. For additional details, see Appendix E3, TM-007.

Minor permanent effects would occur from the Crockett Diversion Alternative. Earthen bottom canals would experience vegetation loss as the irrigation water is removed from the canal. To mitigate vegetation loss, appropriate native vegetation would be reestablished in areas disturbed. Indirectly, the water loss from the canals would be redistributed through the PI and secondary irrigation water systems to the surrounding vegetation, minimizing effects. There would be visual effects from the fill added in landscaping Lot 1 and 2. However, the addition of these lots would prevent flows from leaving the channel during a 100-year flood event. This addition would further reduce flooding and redirect flows back to the river channel. There would be a minor effect from the addition of the lots, however, because the lots would reduce flooding, there would also be a beneficial visual effect from the flow remaining in the channel for a longer period of time. The Crockett Diversion Alternative would also install Lagoons, Cow Pasture, West River, and Crockett pump stations. The new construction would have a minor effect to visual resources.

The Crockett Diversion Alternative would provide 25 cfs of instream flows for 13.1 miles for the Logan River and 5–10 cfs of base flows for 4.8 miles for the Little Logan. These actions would provide flow continuity and river aesthetics for city residents, which was a popular concern during the comment period.

Potential effects would be minimized by implementing BMPs to protect areas outside the active construction area, encourage the establishment of native vegetation, and preserving existing vegetation. Existing roads would be used to access the Project Area. BMPs are discussed in Section 0. Due to the implementation of BMPs the visual and scenic effects from the Crockett Diversion Alternative would be minor.

5.3.8.8 Recreation

No Action Alternative

The No Action Alternative would have minor, temporary effects on blue trails, specifically the Logan River, during the rebuilding of the Crockett Diversion. Construction activities would potentially cause temporary water quality effects and sedimentation to the Logan River. No long-term effects would occur due to the proposed construction activities. However, the No Action Alternative could have potentially negative long-term effects on recreational opportunities in the Project Area if flooding continues, which could damage recreational trails, blue trails, parks, and picnic areas. Additionally, continued degradation of water quality could negatively affect recreational opportunities such as fishing, hunting, camping, etc., within and downstream of the Project Area.

First Dam Alternative

New pedestrian trails would provide additional recreational opportunities for community members, establish alternative travel routes among educational, recreational, and commercial facilities within the watershed, and improve access to the Logan River and the Wasatch-Cache National Forest.

Several recreational areas exist near the Project Area. Although the First Dam Alternative would cause minor, temporary effects to recreation due to nearby construction activities, no recreational opportunities would be permanently negatively affected by the First Dam Alternative. All disturbed areas would be reclaimed and reseeded after construction. Existing roads would be used to access the Project Area.

The First Dam Alternative includes constructing two ADA compliant shared use paths located within Logan City. Approximately 4,430 feet of recreational trails, specifically Canyon Trail and River Hollow Park Trail, would be constructed. Improvements to these existing areas would provide additional path/trail access to existing recreational facilities for the community. Additionally, the improvements to these paths would provide walkable neighborhood connectivity. The burial of the PI system proposed as part of the action alternatives would provide a corridor for the construction of recreation trails to provide safe transportation and recreation opportunities in the community to the nearby USFS lands, thereby completing a vital recreation corridor for Cache Valley residents to access the Wasatch-Cache National Forest in Logan Canyon as described in detail in Appendix E5, TM-019. Approximately 3,420 feet of Canyon Trail Road would be improved to connect existing shared paths together. Starting at 600 East, the trail would run adjacent to Canyon Road, eventually intersecting the Crockett Canal near 500 East, and continuing to 200 E. Construction of approximately 1,010 feet of the River Hollow Park Trail, including a 75-foot bridge, would provide three points of access to River Hollow Park. The access from Sumac Drive would shift to the east to allow for a new pedestrian bridge to cross the Logan River just upstream of the existing Crockett Diversion to continue to provide access to River Hollow Park. Part of the bridge design would include determining minimum heights for the lower cord to provide safe passage to blue trail users (see Appendix E3, TM-007 for details). The trail would go to the west toward Riverside Drive just north of the Little Logan to the western edge of River Hollow Park, then shift to the south to allow for the trail to fit next to the Little Logan. A retaining wall would likely be needed along the south side of the trail to keep it from sloughing off into the open Little Logan channel.

For recreationists in the Logan River, the replacement of the diversion structure would remove the overhead safety concerns, as well as reduce the drop safety concern when the inflated weir is in the lowered position. The proposed replacement design would not have any piers or walkways to be concerned about becoming hung up on. The diversion would not be passable for blue trail users during the irrigation season when the inflatable weir is in the raised position. When the inflatable weir is in the lowered position, the drop over the structure would still be about a 5-foot drop during annual high flows of 480 cfs (see TM-007).

Additionally, the First Dam Alternative would guarantee instream flows in the Logan River from the First Dam to the downstream western diversion point and ensure base flows to the entire Little Logan throughout the irrigation season, which would have net beneficial effects to blue trails. Instream flows support a variety of recreational activities such as fishing, swimming, and boating. These activities provide opportunities for people to enjoy the natural beauty of Utah's rivers and streams and can enhance the quality of life for residents and visitors alike.

These instream flows correlate with Logan City's concept plans for a Blue Trail along the Logan River. Blue trail recreational facilities would need to accommodate alterations in flow. The minimum flow aspect of this alternative would provide improved flow for the Blue Trail.

With construction of these two trails, the First Dam Alternative would provide ADA compliant connectivity between existing shared paths. During construction, this alternative would cause minor, temporary effects to the existing facilities adjacent to the new path routes. However, no recreational opportunities would be permanently negatively affected by construction of the First Dam Alternative. The First Dam Alternative would provide permanent beneficial effects to recreational facilities by providing more connectivity and additional shared paths for community use.

Crockett Diversion Alternative

New pedestrian trails would provide additional recreational opportunities for community members, establish alternative travel routes among educational, recreational, and commercial facilities within the watershed, and improve access to the Logan River and the Wasatch-Cache National Forest.

Several recreational areas exist near the Project Area. Although the Crockett Diversion Alternative would cause minor, temporary effects to recreation due to nearby construction activities, no recreational opportunities would be permanently negatively affected by the Crockett Diversion Alternative. All disturbed areas would be reclaimed and reseeded after construction. Existing roads would be used to access the Project Area.

The Crockett Diversion Alternative includes constructing two ADA compliant shared use paths located within Logan City. Approximately 4,430 feet of the Canyon Trail and River Hollow Park Trail would be improved, providing additional path and trail access to existing recreational facilities for the community and providing walkable neighborhood connectivity. The burial of the PI system proposed as part of the action alternatives would provide a corridor for the construction of recreation trails to provide safe transportation and recreation opportunities in the community to the nearby USFS lands, thereby completing a vital recreation corridor for Cache Valley residents to access the Wasatch-Cache National Forest in Logan Canyon as described in detail in TM-019. As described above, approximately 3,420 feet of Canyon Trail Road would be improved from 600 East to 200 E, running adjacent to Canyon Road. Approximately 1,010 feet

of the River Hollow Park Trail would be constructed, providing multiple access points to River Hollow Park, along with a new pedestrian bridge just upstream of the existing Crockett Diversion. The pedestrian bridge would be included in the final design to continue to provide access to River Hollow Park after the project is complete. Part of the bridge design would include determining minimum heights for the lower cord to provide safe passage to blue trail users (see Appendix E3, TM-007 for details).

The replacement of the Crockett diversion structure would remove the overhead safety concerns, as well as reduce the drop safety concern when the inflated weir is in the lowered position for blue trail users. The proposed replacement design would not have any piers or walkways to be concerned about becoming hung up on. The diversion would not be passable for blue trail users during the irrigation season when the inflatable weir is in the raised position. When the inflatable weir is in the lowered position, the drop over the structure would still be about a 5-foot drop during annual high flows of 480 cfs (see Appendix E3, TM-007).

Additionally, the Crockett Diversion Alternative would guarantee instream flows in the Logan River from the Crockett Diversion to the downstream western diversion point and ensure base flows to the entire Little Logan throughout the irrigation season, which would have net beneficial effects to blue trails. Instream flows support a variety of recreational activities such as fishing, swimming, and boating. These activities provide opportunities for people to enjoy the natural beauty of Utah's rivers and streams and can enhance the quality of life for residents and visitors alike.

These instream flows correlate with Logan City's concept plans for a Blue Trail along the Logan River. Blue trail recreational facilities would need to accommodate alterations in flow. The minimum flow aspect of this alternative would provide improved flow for the Blue Trail.

With construction of these two trails, the Crockett Diversion Alternative would provide ADA compliant connectivity between existing shared paths. During construction, this alternative would cause minor, temporary effects to the existing facilities adjacent to the new path routes. However, no recreational opportunities would be permanently negatively affected by the Crockett Diversion Alternative. The Crockett Diversion Alternative would provide permanent beneficial effects to recreational facilities by providing more connectivity and additional shared paths for community use.

5.3.9 Special Land Designations

5.3.9.1 Land Use

No Action Alternative

CAIC would continue to operate and maintain the components of the canals, laterals, and ditches in the area of service. Under the No Action Alternative, no direct effect on land use designations in the Project Area would occur. However, The No Action Alternative would have long-term, indirect effects on land use designations in the Project Area if flooding and canal breaches are allowed to continue damaging nearby structures and agricultural lands.

First Dam Alternative

Under the First Dam Alternative, construction activities would occur on city and county administered land. CAIC has an existing O&M contract with Logan City, North Logan City,

Hyde Park City, and Cache County that allows them to perform maintenance including modernization of the existing features. The proposed activities in the First Dam Alternative would fall under that existing contract, and appropriate coordination, as described in Chapter 7 would occur.

Under the First Dam Alternative, land use within the Project Area would not change from existing agricultural, industrial, commercial, and residential uses, and a Land Use Change Permit would not be required. Cache County's Countywide Comprehensive Plan's goal to "improve the physical environment of the community as a setting for human activities" (Cache County 1998) would be met by the proposed activities because they improve agricultural water management, public safety, and recreational opportunities for CAIC shareholders within the Logan River Watershed. This alternative would have a substantial improvement on water conservation and reduced flooding risk for individuals living and working within the CAIC's service area.

Crockett Diversion Alternative

Under the Crockett Diversion Alternative, construction activities would occur on both city and county administered land. CAIC has an existing O&M contract with Logan City, North Logan City, Hyde Park City, and Cache County that allows them to perform maintenance including modernization of the existing features. The proposed activities in the Crockett Diversion Alternative would fall under that existing contract, and appropriate coordination, as described in Chapter 7 would occur.

Under the Crockett Diversion Alternative, land use within the Project Area would not change from existing agricultural, industrial, commercial, and residential uses, and a Land Use Change Permit would not be required. Cache County's Countywide Comprehensive Plan's goal to "improve the physical environment of the community as a setting for human activities" (Cache County 1998) would be met by the proposed activities because they improve agricultural water management, public safety, and recreational opportunities for CAIC shareholders within the Logan River Watershed. This alternative would have a substantial improvement on water conservation and reduced flooding risk for individuals living and working within the CAIC's service area.

5.3.9.2 Natural Areas

No Action Alternative

The No Action Alternative would have no direct effects on any designated natural areas within or near the Project Area. However, under the No Action Alternative approximately 6,050 ac-ft of water would continue to be lost to seepage, evaporation, and carrier water in the Cache Valley, which could indirectly affect downstream natural areas.

First Dam Alternative

Construction activities would not affect NLCS wildernesses, Wilderness Study Areas, or Areas of Critical Environmental Concern, because no project activities would occur within or near those designated natural areas. Temporary construction activities within channel prisms may temporarily affect the water quality of the Logan River, which flows into the Little Bear River, impounded by the Cutler Reservoir a few miles west of Logan, where it joins the main channel of the Bear River. The Bear River then continues its journey, ultimately reaching the Great Salt

Lake through the Bear River Migratory Bird Refuge, a natural area, approximately 16 miles southwest of the Project Area. It is unlikely the negligible sedimentation from proposed activities would affect the Refuge or the Great Salt Lake, as sedimentation of the agitated soils would likely settle before the affected waters reach the refuge. While the Proposed Project primarily focuses on local benefits, it could indirectly affect the Great Salt Lake by enhancing water conservation and efficiency in the Logan River system. Improved water management might help maintain or even increase the flow of water into the Great Salt Lake, which is crucial for its ecological health.

BMPs implemented during and post-construction would minimize affects to water quality. Overall, the First Dam Alternative would not significantly affect water quality or any designated natural areas.

Crockett Diversion Alternative

Construction activities would have no effects to any NLCS wildernesses, Wilderness Study Areas, or Areas of Critical Environmental Concern, because no project activities would occur within or near those designated natural areas. Temporary construction activities within channel prisms may temporarily affect the water quality of the Logan River, which flows into the Little Bear River, impounded by the Cutler Reservoir a few miles west of Logan, where it joins the main channel of the Bear River. The Bear River then continues its journey, ultimately reaching the Great Salt Lake through the Bear River Migratory Bird Refuge, a natural area, approximately 16 miles southwest of the Project Area. It is unlikely the negligible sedimentation from proposed activities would affect the Refuge or the Great Salt Lake, as sedimentation of the agitated soils would likely settle before the affected waters reach the refuge. While the Proposed Project primarily focuses on local benefits, it could indirectly affect the Great Salt Lake by enhancing water conservation and efficiency in the Logan River system. Improved water management might help maintain or even increase the flow of water into the Great Salt Lake, which is crucial for its ecological health.

BMPs implemented during and post-construction would minimize affects to water quality. Overall, the Crockett Diversion Alternative would not significantly affect water quality or any designated natural areas.

5.3.10 Social Issues

No Action Alternative

Under the No Action Alternative, no direct effect to summer base flows in the Little Logan would occur. Though in some areas, spring flow or intermittent stormwater provide a small quantity of water, the Little Logan is effectively dry from mid-October to April every year outside the irrigation season. This alternative would continue existing summer irrigation-season base flows in the Little Logan, estimated at approximately 9 cfs over 4.8 miles, with no flows occurring outside the irrigation season due to the absence of applicable water rights. The access to open water in Little Logan would continue. This alternative would maintain the current natural beauty, benefits to wildlife habitats, and recreational opportunities in the Little Logan.

First Dam Alternative

The First Dam Alternative was developed in response to the numerous comments regarding maintaining the connectivity of the Little Logan to the Logan River and maintaining base flows. The First Dam Alternative would replace the Crockett Diversion to address the public's concerns about that connectivity (Section 3.3.10). This alternative would have a direct and long-term beneficial effect to summer base flows in the Little Logan. Under this alternative, the Crockett Diversion would be reconstructed to allow river flows to continue to be diverted from the Logan River directly into the Little Logan and would include overflow gates to pass flood flows and debris in times of high runoff or storm events. This change would maintain open water and summer base flows in the Little Logan and maintain the existing streamflow from the Logan River into the Little Logan allowing for fish passage and recreational portage to River Hollow Park.

The First Dam Alternative would provide summer base flow in the Little Logan of approximately 5–10 cfs during the irrigation season only, as no water rights extend beyond the irrigation season. The water quantity would be adjusted based on CAIC water supply availability under the Kimball Decree, and no base flows would occur during extreme drought conditions (similar to what was done in 2021 on the Cache-Highline Canal through the Logan Country Club golf course). During time periods when excess water is available to the operating agency (when available water supply exceeds agricultural and system users' demands), 10 cfs would be diverted into the Little Logan as base flow. When demands exceed supply, a proportionate amount of water would be diverted with a minimum threshold of 5 cfs during the irrigation season, unless extreme drought conditions occur. Outside the irrigation season, as is done currently, no water would be supplied into the Little Logan. By maintaining the summer base flows under this alternative, the Little Logan would continue to function as an irrigation-season channel rather than a natural, perennial river system. Because CAIC only has water rights during the irrigation season, providing base flows outside of the irrigation season is outside the scope of the project. Therefore, under the First Dam Alternative, the access to open water in the Little Logan would continue. This alternative would maintain the current natural beauty, benefits to wildlife habitats, and recreational opportunities in the Little Logan. This alternative would address the social concern to maintain summer base flows in the Little Logan.

Additionally, to address the concern about preserving existing vegetation, this alternative includes multiple BMPs which would preserve existing vegetation when possible and rehabilitate all areas of ground disturbance. Disturbed areas would be rehabilitated and a native seed mix (99.9% noxious weed-free seed) approved by the NRCS would be used to reseed all areas where ground disturbance has occurred. Seed could be applied by hydroseeding, using a temporary erosion control mulch tackifier to provide stabilization, eliminate erosion concerns, and create vegetation recruitment opportunities. Additionally, native site vegetation and plant communities would be protected, when practicable and would be clearly marked, flagged, or fenced in areas where vegetation is to be protected.

Crockett Diversion Alternative

The Crockett Diversion Alternative would have the same effects to social issues as First Dam Alternative, because the Crockett Diversion would be reconstructed, and summer base flows in the Little Logan would be approximately 5–10 cfs. The access to open water in the Little Logan would continue. This alternative addresses the social concern to maintain summer base flows in

the Little Logan and includes BMPs to preserve existing vegetation and rehabilitate all areas of ground disturbance.

The Crockett Diversion Alternative would result in social effects similar to the First Dam Alternative, including maintenance of summer irrigation-season base flows (approximately 5–10 cfs), continued access to open water, and preservation of community-valued vegetation through implementation of BMPs.

5.3.11 Reasonably Foreseeable and Cumulative Effects

Federal agencies should analyze the reasonably foreseeable effects of the proposed action consistent with Section 102 of NEPA, which does not employ the term “cumulative effects;” NEPA instead requires consideration of “reasonably foreseeable” effects, regardless of whether or not those effects might be characterized as “cumulative” (42 U.S.C. 4332(2)(C)(i)).

The NRCS current PR&G direction requires consideration of cumulative effects as part of the evaluation process for Proposed Projects (DM 9500 4.b.(2)(m) [USDA 2017a]).

5.3.11.1 Reasonably Foreseeable Future Actions Considered in the Analysis

Within the Logan River Watershed, numerous factors have contributed to the current conditions of the watershed, including various past activities, such as canal and water system improvements conducted by CAIC and the other project Co-sponsors, trail and park improvements managed by the Logan River Task Force, and USU water management and improvement activities.

The current conditions of the Logan River Watershed are described in Chapter 3—Affected Environment. Section 3.3 provides an inventory of existing resources potentially affected by each alternative, and Section 5.3 analyzes the potential direct and indirect environmental effects to those existing resources by each alternative. The effects of past actions are captured under each resource’s Affected Environment section, given that past actions and their effects have contributed to the current condition of a resource. Present actions have also been incorporated into the Affected Environment for each resource. Ongoing or Reasonably Foreseeable Projects that could contribute effects with the Proposed Project are listed below.

Ongoing Projects

Canal Maintenance Activities (CAIC)—CAIC regularly conducts maintenance along the system canals, including ongoing vegetation management such as weed control and vegetation removal, and repairs.

First Dam Tank—Waterline and Canyon Road Improvements (Logan City)—Logan City Public Works is constructing a 10-million-gallon water storage tank and transmission waterline. Additional distribution water mains will provide redundancy, and significant streetscape improvements to Canyon Road are included.

Second Dam Project (Logan City Light and Power)—Logan City Light and Power is currently removing sediment at Second Dam.

Third Dam Project (Logan City Light and Power)—Logan City Light and Power planned for equipment replacement and sediment removal, though the project is presently delayed.

Logan River Restoration Project (Logan River Task Force)—This ongoing project is restoring natural habitats, improving water quality, and enhancing flood control measures between First Dam and Cutler Reservoir.

Logan River Observatory (USU)—This project involves monitoring and researching the river’s hydrology, water quality, and ecosystem health via eight aquatic monitoring stations.

Logan River Trail Enhancements (Logan City)—Current efforts focus on improving and expanding the trail system along the river for better accessibility to walking, biking, and other recreational activities.

Willow Lakes Subdivision (Willow Lakes Holdings LLC)—A private commerce initiative to construct a new subdivision with 130 homes, four condominium buildings, one assisted living building, and two internal lakes fed by the Logan River.

Reasonably Foreseeable Projects

Cache Valley Parkway (UDOT)—UDOT, with funding granted in March 2024, plans to construct a multi-modal road to accommodate future growth and alleviate traffic.

Cache Valley Transit District Expansion (CVTD)—Proposals are in place to expand public transportation to better serve the growing population and reduce traffic congestion.

Recreational Development (Logan City)—Projects would further develop recreational facilities along the river, including parks, picnic areas, and additional trails to promote outdoor activities and tourism. The Blue Trail Master Plan will be considered in these developments.

Logan River Bank Stabilization around UWRL (Logan City)—Logan City has concept plans and has applied for funding to stabilize riverbanks being undercut near the UWRL.

Wellsville-Mendon Watershed Project (NRCS)—NRCS’s Wellsville Canyon Watershed Plan will explore solutions for flood protection, reducing irrigation water loss, enhancing recreational facilities, and mitigating erosion and nutrient loading in the Little Bear River area affecting Wellsville and Mendon cities and parts of unincorporated Cache County.

Lower Bear River Watershed Project (NRCS)—Located outside and downstream of the Logan River Watershed, the Lower Bear River Watershed Plan would improve agricultural water management by addressing deficiencies in the agricultural water delivery system, and protect the watershed to reduce flooding, erosion, sediment, and agriculture-related pollution, and maintain and enhance wetlands and wildlife habitat.

North Cache Valley Watershed Project (NRCS)—Located outside and to the north of the Logan River Watershed, the North Cache Valley Project would prevent flooding in Lewiston City, ensure a reliable irrigation water supply, allow water to remain in the Bear River longer, and create recreational opportunities.

Population Growth and Economic Development (General)—According to the Census estimates, since 2010, North Logan City has grown by approximately 32.8%, Logan City by 8.7%, Hyde Park City by 26.8%, and Benson CDP by 0.5% (see Section 3.3.1.2). In 2022, a report and press prepared by the Census listed the Logan metro area as one of the top 10 fastest growing metro areas by percentage in the U.S. (Census 2022b). The population is anticipated to continue growing and parallel with this population growth would be an increasing demand for water.

Agricultural Development (General)—Overall, the agricultural trend in Cache County appears to be on a downward trajectory, with reductions in farm numbers and land use. Approximately 1,378 farms exist, and 269,909 acres are in agricultural production in Cache County, down from 1,397 farms and 276,273 acres in 2017, an approximate one percent decrease (NASS 2022). Managing water resources effectively remains a critical challenge, especially with the growing demand for agricultural and urban use. The adoption of new technologies and practices can help improve efficiency and productivity in the agricultural sector. However, ongoing challenges such as water management and the need for sustainable practices will continue to shape the future of agriculture in the region.

5.3.11.2 Reasonably Foreseeable Effects by Resource

The geographic extent of reasonably foreseeable and cumulative effects varies by the type of resource and effect. The timeframes, or temporal boundaries, for those effects for each resource are temporary (0-3 years); short term (3-10 years); and long term (15+ years).

The No Action Alternative outlines the reasonably foreseeable environmental trends within the Project Area, with the associated effects detailed in Section 5.3. Under this alternative, existing environmental trends in the Project Area are expected to persist as described in Section 5.3.

Economics/Socioeconomics

For Economics/Socioeconomics, reasonably foreseeable effects and cumulative effects were evaluated within the Project Area. The First Dam and Crockett Diversion Alternatives would contribute beneficial economic and socioeconomic effects when considered alongside all reasonably foreseeable projects. These projects would result in extensive capital expenditures of up to \$3.1 million—either without federal cost share (as is the case with the current condition)—or with federal cost share in the First Dam and Crockett Diversion Alternatives—and would directly benefit local labor firms. Contractor expenditures for supplies and labor would increase demand for these goods and services and indirectly benefit suppliers. Local retail and restaurants would experience temporarily increased demand from construction workers in the vicinity of construction sites. Additionally, given the scale of the First Dam and the Crockett Diversion Alternatives, the rippling effects of the economic investments in multiple cities with important retail and commerce and a major research institution would benefit the economies in and around the Project Area, contributing to short- and potentially long-term minor influences on retail and commerce, immigration, emigration, housing availability, or earnings. Any beneficial effects for the No Action Alternative would not persist beyond the duration of the construction period.

Air Quality

For Air Quality, reasonably foreseeable effects and cumulative effects were evaluated within the airshed. Given the minor and temporary nature of construction related air quality effects, the implementation of the First Dam and Crockett Diversion Alternatives would not result in degraded air quality which would contribute to reasonably foreseeable effects to air quality in the region.

When combined with other projects, the addition of three pumps and the hydropower in the First Dam Alternative would actually reduce emissions, but the addition of the fourth pump in the Crockett Diversion Alternative would increase emissions compared to the No Action Alternative. Even combined with other projects like the Willow Lakes Subdivision, the Wellsville-Mendon,

the Lower Bear River, and the North Cache Valley Watersheds Project, or canal maintenance that could affect air quality, the calculated PM_{2.5} emissions are well below the *de minimis* threshold defined in 40 CFR §93.153. Additionally, neither would equal or exceed the state limit for a significant emission increase or a net significant emissions increase, ensuring effects to air quality would be negligible and when combined would not cumulatively contribute to deteriorating air quality or the ability to meet NAAQS within the airshed.

Energy

For Energy, reasonably foreseeable effects and cumulative effects were evaluated within the Project Area. The two action alternatives have slightly different effects with respect to energy. For the First Dam Alternative, the inclusion of hydropower in the irrigation distribution system reduces the cumulative effects of population growth and pressure on the existing electric grid. The First Dam Alternative would reduce reliance on fossil fuels and lower greenhouse gas emissions. Conversely, the Crockett Diversion Alternative adds an additional pump station, and increases the effect of population growth on the existing electric grid.

Soils and Geology

For Soils and Geology, reasonably foreseeable and cumulative effects were evaluated within the Project Area. Combined with ongoing canal maintenance, the Second and Third Dam sediment removal, the Logan River Restoration Project, and the Logan River Bank Stabilization around UWRL Project, because the No Action, First Dam, and Crockett Diversion Alternatives would include replacing the canals with pipe or converting the canals to box culverts, including up to 19,560 feet of canal improvements to stabilize soils, and decreasing the future canal maintenance, a beneficial reasonably foreseeable effect of reducing erosion and sedimentation would occur—especially for the First Dam Alternative—which includes removing sediment from First Dam. Overall, the alternatives aim to mitigate negative effects on soils and geology through careful planning and the implementation of BMPs, ensuring long-term benefits and compliance with relevant regulations.

Vegetation

For Vegetation, reasonably foreseeable and cumulative effects were evaluated within the Watershed. Despite some minor vegetation removal during construction and the eventual loss of 9.2 acres of low-quality riparian vegetation along the canal prisms where hydrology would be removed, the project is designed to improve overall water quantity and quality in the Project Area as described in Section 5.3.6.1 and is aligned with the priorities of the Utah State Central Region Wetlands Conservation Strategy. The combined effects of the First Dam, or the Crockett Diversion Alternatives with the other projects—including canal maintenance activities, Logan River Restoration Project, Logan River Trail Enhancements, Willow Lakes Subdivision, Logan River Bank Stabilization, the Wellsville-Mendon Watershed Project, and agricultural development—would benefit vegetation in the long term.

Because the action alternatives would not affect ULT or Maguire primrose, as no suitable habitat occurs in the Project Area and individuals were not observed during surveys, no reasonably foreseeable or cumulative effects to these special status plant species would occur.

Water Resources

For Water Resources, reasonably foreseeable and cumulative effects were evaluated within the Watershed. When combining the First Dam or Crockett Diversion Alternatives with the other projects, especially the canal maintenance activities, First Dam Tank Waterline and Canyon Road Improvements, the Second and Third Dam Projects, Logan River Restoration, Logan River Trail Enhancements, Willow Lakes Subdivision, Logan River Bank Stabilization, and the Wellsville-Mendon, Lower Bear River, and North Cache Valley Watershed Projects, and agricultural development, several reasonably foreseeable effects on water would occur.

The integration of these projects is poised to create minor improvements in water quality and quantity within the region, including downstream of the Logan River Watershed. The Proposed Project would improve water quality by enhancing dissolved oxygen levels and stabilizing water temperature, ensuring compliance with the CWA. For example, the 41 to 54 cfs within the Logan River under the First Dam Alternative maintains water temperatures below 20 degrees Celsius (see Appendix E4, TM-011 and Appendix E5, TM-021). Additionally, in the First Dam Alternative, the First Dam sluicing impacts would be reduced. The action alternatives also increase water quantity by conserving 5,390 ac-ft annually and enhancing flows in the Logan River and Little Logan, with long-term benefits supporting wetland health and resilience. The additional flood prevention activities reduce flood risks and improve floodplain functionality, consistent with E.O. 11988. The project aligns with the Utah State Water Plan by conserving water and improving irrigation efficiency. These improvements would collectively lead to net positive effects on water resources, cumulatively benefiting WOTUS, wetlands, riparian habitats, and wildlife habitats downstream.

The combined efforts of these projects would enhance water quantity management. By reducing seepage and evaporative losses through piping irrigation water, there would be a substantial increase in water efficiency. The stabilization of critical canal sections would decrease water loss and maintain optimal water conveyance and storage efficiency.

The regional trend towards converting open canals to closed pipes would further control evaporation and seepage losses, improve the efficiency of water rights delivery, and enhance overall water quality in the greater GSL area. The alternatives combined with the other projects would contribute to increased water availability and reduced flooding risks, thereby supporting long-term water conservation and management goals.

Potential reasonably foreseeable effects of flood prevention activities include flow alteration such as changes to peak flows, flow depth, wetted surface width, and flow velocity. For the current condition, peak flows were modeled at 371 cfs in a 100-year event, and the action alternatives would reduce the flows to 192 cfs, with associated reductions in flow depth, wetted surface width, and velocity (see Appendix E5, TM-019 for model results). Combined with the Wellsville-Mendon, Lower Bear River, and North Cache Valley Watershed Projects, this hydromodification would reduce flooding, erosion, sediment, and agriculture-related pollution, and maintain and enhance wetlands and wildlife habitat. It is unlikely that any hydromodification associated with the Lower Bear River or North Cache Valley Watershed Projects would directly affect the Project Area of the Proposed Project because these projects are located downstream of the Proposed Project.

The First Dam and Crockett Diversion Alternatives are designed to enhance water conservation and efficiency within the Logan River system, which would negligibly, indirectly benefit

downstream areas, including the Great Salt Lake. By improving water conservation and quality, the alternatives, combined with other projects focused on restoring the Logan River and other water resources in the region, support the long-term sustainability of the Great Salt Lake by stabilizing hydrology and reducing seasonal drying. This increased water availability helps maintain the health and resilience of the Great Salt Lake's ecosystem, ensuring its sustainability for future generations.

These improvements collectively contribute to achieving regional goals for sustainable water management, and would result in improved water quality, reduced erosion and sedimentation, enhanced aquatic and wetland habitats, and increased water efficiency and availability, ultimately benefiting agricultural productivity, municipal water supply, and ecological health in the region.

Wildlife—Fish and Wildlife Habitat

The reasonably foreseeable and cumulative effects to wildlife were examined at the watershed scale to account for the varying habitat size of different species. The combination of the Proposed Project alternatives with other reasonably foreseeable projects—including the canal maintenance activities, Second and Third Dam Projects, Logan River Restoration, Logan River Bank Stabilization, and the Wellsville-Mendon, Lower Bear River, North Cache Valley Watershed Projects, as well as population growth and economic development and agricultural development—would have both positive and negative reasonably foreseeable effects on wildlife, including migratory birds.

Temporary habitat disturbances and species displacement are expected during construction, and, in the long term, the partial removal of an open water source and associated riparian vegetation along the Twin Canals and Logan Northern Canal would negatively affect wildlife, however, long-term benefits from improved water management—including water quality and quantity, and especially from maintaining flows in the Logan River and Little Logan during the irrigation season would have long-term beneficial effects on fish and wildlife habitat. For example, the proposed instream flows increase the wetted perimeter and wetted area for up to 14 river miles, improving instream habitat and conditions for fisheries, macroinvertebrates, riparian and wetland vegetation, and birds and other terrestrial wildlife. Combined with other reasonably foreseeable habitat improvement projects, beneficial effects would compound.

Because the action alternatives would not affect proposed threatened, threatened, or endangered animal species or their habitat within the Project Area because no suitable habitat occurs in the Project Area and individuals were not observed during surveys, no reasonably foreseeable or cumulative effects to these special status animal species would occur.

Human Environment

The reasonably foreseeable and cumulative effects to the human environment were examined at the Project Area scale. Combined with other reasonably foreseeable projects, the action alternatives would conserve the value of the cultural resources related to the alternatives and other projects. Though other proposed projects may also have adverse effects to cultural resources, because the First Dam and Crockett Diversion Alternatives require stipulations designed to conserve the value of the eligible cultural resources, modifying these canals would not result in the cumulative loss of knowledge of early irrigation systems, their design, or reduce the ability to gain knowledge of early irrigation systems into the future. Because the value of the

cultural resources related to the action alternatives would be conserved, no significant cumulative effects to cultural resources would occur from implementing the First Dam and the Crockett Diversion Alternatives.

Because the alternatives would reduce the risk of canal breaches and flooding—including to historic resources—and reduce the open water, combined with the canal maintenance activities, First Dam Tank Waterline and Canyon Road Improvements, Second and Third Dam Projects, Logan River Restoration, Logan River Observatory, Cache Valley Parkway, CVTD Expansion, and Logan River Bank Stabilization, the alternatives would improve public health and safety. The reasonably foreseeable effects of the alternatives combined with the other projects are an increase in efficiency in water usage throughout the Project Area. Improving agricultural water management and delivery efficiency through construction of piping systems and rehabilitation of the CAIC irrigation system would provide a more reliable water source for more than 10,350 acres of agricultural land and would complement the other infrastructure projects to improve agricultural and transportation services within the Project Area.

Combined with the other projects, the inclusion of the fourth pump in the Crockett Diversion Alternative would produce a minor increase in noise that would be attenuated because the pump would be enclosed in a masonry pump house designed to mitigate noise. Because Logan City has a sound ordinance and projects would be designed to meet the ordinance, the cumulative effect of this increase combined with other development would be minor.

The instream and base flows for the Logan River and the Little Logan would provide flow continuity and river aesthetics for city residents, which addresses a popular concern raised during the comment periods. Combined with the other projects—particularly, the Logan River Trail Enhancement and Recreational Development—the action alternatives would cumulatively improve the aesthetics, recreational values, and wildlife resources associated with this high-quality river.

Special Land Designations

The reasonably foreseeable effects to special land designations were examined at the Project Area scale. Because the action alternatives meet Cache County's Countywide Comprehensive Plan's goal to "improve the physical environment of the community as a setting for human activities" (Cache County 1998), combined with the other projects in the Project Area—particularly the canal maintenance activities, the First Dam Tank Waterline and Canyon Road Improvements, the Second and Third Dam Projects, the Logan River Restoration, the Logan River Trail Enhancements, the Willow Lakes Subdivision, the Cache Valley Parkway and Transit Expansion, recreational development, and Logan River Bank Stabilization—the action alternatives improve agricultural water management, public safety, and recreational opportunities. The action alternatives would have a substantial improvement on water conservation and reduced flooding risk for individuals living and working within the CAIC's service area.

Social Issues

The reasonably foreseeable effects to social issues were examined at the Project Area scale. All the alternatives—the First Dam and the Crockett Diversion Alternatives—would maintain the access to open water in the Little Logan and maintain the current natural beauty, benefits to wildlife habitats, and recreational opportunities with minimal effects to vegetation. Combined

with the Logan River Restoration, Logan River Trail Enhancements, particularly Blue Trail plans, and other recreational development, the action alternatives would cumulatively enhance river access at River Hollow Park and other launch/take-out locations, facilitate passage by fish, and improve floatability by kayaks, especially improving floating conditions during low flow because of the increased water depths.

Chapter 6 Preferred Alternative

Based on the analysis in Chapter 5, the First Dam Alternative was determined to be the Preferred Alternative—and is now considered the Future with Federal Investment (FWFI)—because of its ability to meet the purpose and need for the project, to have the least effects to environmental and social resources, and to have the greatest net economic benefits when considering all quantified and unquantified factors of the available alternatives.

6.1 Rationale for Preferred Alternative Selection

The First Dam Alternative is considered the Preferred Alternative and is described in detail in Section 6.2 and displayed in Map 2 in Appendix B. Though the BCA indicates that the national economic effects of the First Dam and Crockett Diversion alternatives are very similar, tradeoffs of each alternative that, while not incorporated into the BCA, were important considerations for decision makers in choosing the First Dam Alternative. This alternative was selected as it meets the purpose and need for the project, increases shareholder assessments the least, includes renewable energy production, requires less pumping over the project lifetime, and the benefits exceed the costs.

The Crockett Diversion Alternative would increase shareholder assessments and secondary irrigation water rates significantly, whereas the First Dam Alternative would increase shareholder assessments but less than under the FWOFI or the Crockett Diversion Alternative. Because the Preferred Alternative would install a new hydropower turbine, it would generate more power than the existing turbine at USU and it also requires less pumping than the Crockett Diversion Alternative, saving project participants almost \$500,000 per year in electricity expenses. In a future with unknown inflationary trends, these cost savings alone make the Preferred Alternative a more resilient choice. See Section 5.2.4 for additional information on the Preferred Alternative choice.

6.2 Measures to be Installed

The proposed measures for the Preferred Alternative would be designed to NRCS conservation practice and safety standards. Map 2 in Appendix B displays the locations of the measures to be installed for the Preferred Alternative. The TMs in Appendices E2-E4 contains additional detail on each measure.

The Preferred Alternative measures to be installed include:

- Relocation of the CAIC river diversion from the existing location adjacent to River Hollow Park to First Dam and to a location west of Logan where additional flow in the river will be returned to the irrigation system.
- Creation of 2,100 ac-ft of water storage in several unused wastewater treatment lagoons and construction of pump stations to deliver this water to system users when seasonal river flows decline.
- Construction of new hydropower turbines at the new water storage facility to generate more power than the existing hydropower turbines at First Dam.

- Construction of a PI system through the entire service area includes all components to the meter. Shareholders and landowners would be responsible for connections between the meter and their irrigation system.
- Reconstruction of the existing Crockett Diversion in the Logan River with overflow gates to allow for natural flow to enter the Little Logan, and associated actions.
- Providing 25 cfs instream flows above existing summer base flows for 15.1 miles of the Logan River, during the irrigation season (April 1 to October 15), when water rights are available.
- Providing 5–10 cfs base flows for the entire length of the Little Logan during the irrigation season (April 1 to October 15), when water rights are available.
- Removing irrigation water from CAIC canals and providing floodwater overflow along 1800 N to the west to reduce floodwater damage in the service area from runoff carried in the canals.
- Constructing a recreation trail along a half mile of Canyon Road and a new bridge and trail connection between River Hollow and Sumac Park.

These operations would be subject to allowable diversion in the Logan River, based on water rights or the Kimball Decree Schedule A, when applicable.

6.2.1 Diversion Change

First Dam Alternative would incorporate a change in diversion location upstream to First Dam through a water right change application. Water is proposed to be supplied to the CAIC PI system by abandoning the USU hydropower facility and connecting into the two existing 54-inch penstocks at First Dam, as well as the construction of a two-stage pump station on the west end of the system at the Logan City wastewater lagoons.

Operational changes would be coordinated with the Logan River Water Users Association (LRWUA) and Utah Division of Water Rights (UDWRi) to ensure successful operations of the entire Logan River distribution system. The foundation of operations would be a supervisory control and data acquisition (SCADA) system which would automate reporting, measurement, and gate and valve adjustment for flow controls based upon a set of operation rules defined by water right priorities and the Kimball Decree. Specific activities include the following.

- Remove approximately 85,000 CY of sediment from First Dam, an 11-acre reservoir to reduce sediment at the intake structure and throughout the system. Sediment would be taken to a previously disturbed location. Sediment removal would reduce the amount of debris being screened at the UWRL and the proposed CAIC intake.
- Rebuild the intake screening on less than 0.1 acres to reduce operational effects.
- Install 60 feet of penstock connection pipe to connect to existing penstock. Currently, two 54-inch penstocks are located at First Dam. One is currently connected to a hydropower turbine to generate power and the other is unused. One or both of these penstocks would be used to supply water from First Dam to the distribution system.
- Install approximately 8 feet of outlet tee and connection for instream flows just below First Dam.
- Install 8,500 feet of supply line from First Dam to the PI distribution system to supply water from the Logan River to supply the distribution system with pressurized water. Additionally, one low-head pump would supply water from the Logan River to a holding

area, and a high-head pump station would supply the distribution system with pressurized water.

6.2.2 Water Storage and Pump Stations

The Logan City wastewater lagoons would be converted to approximately 2,100 ac-ft of secondary irrigation water storage. Water would be conveyed through a pressurized distribution system that would operate with reduced infiltration losses and individual pumping requirements for shareholders throughout the system. The pressurized system would also allow the West Pump Station and new storage facility lagoons to serve as the regulatory reservoir in the system to manage variable system demands, reducing WSE fluctuations experienced at First Dam. Specific activities include the following.

- Develop storage reservoir by improving the existing lagoons to provide a 300-acre storage reservoir for the pressurized distribution system. To increase storage capacity and provide clean storage, existing sludge would be removed from each cell that would compose the secondary irrigation storage facility. Inside berm removal would facilitate the movement of water throughout the reservoir, create additional storage, and increase the ease of maintenance. Material from the removal of interior berms would be used to modify outside walls pending testing and approval by engineer of record.
- Construct a passive ramped concrete spillway to comply with Utah Dam Safety permitting and regulation, minimize cost, and allow for continued use of the berm as a maintenance road.
- Improve 6,650 feet of system return flow to allow overflow spill from the storage reservoir to return to the Logan River when the reservoir storage is full and water availability exceeds secondary irrigation system demands.
- Install pump stations. The West River Pump Station would supply water to the storage reservoir from the western end of the Logan River; the Cow Pasture Pump Station would supply water from the external Cow Pasture rights to the storage reservoir; and the Lagoons Pump Station would supply water from the storage facility to the distribution system. The West River pump station would only operate when one of the following conditions is met:
 - An instream flow or base flow is being passed through the Logan River and Little Logan and is needed to supply the distribution system or storage reservoir with water to meet demands.
 - Distribution system demands or water rights exceed the capacity of the upstream intake combined with Cow Pasture Irrigation Company available water (possible under potential high demand peaking scenarios).
 - Diversion would not exceed maximum water right.

6.2.3 Hydropower

A hydropower turbine would be installed at the western end of the system to generate power with the water used to fill the storage facility—excess water available under current CAIC water rights—and a proposed additional 20 cfs outside the irrigation season (would require an additional water right change application).

- Install a 150 ft² hydropower station with an inline hydropower turbine at the western end of the pressurized system. A non-consumptive water right for 20 cfs outside the irrigation

season would allow for extended hydropower generation to offset pumping costs incurred by the pressurized secondary irrigation system.

6.2.4 Pressurized Irrigation System

The PI system involves installation of a 120-mile distribution system pipeline network. Water would be supplied to the distribution system from the upper intake structure at First Dam and the West Lagoons pump station, as needed. During the majority of spring runoff, demand would be met entirely from the upper intake. When the PI system demands exceed the allowable upper diversion, supplemental water would be provided from the storage reservoir to keep First Dam reservoir elevation within a target range to reduce effects to other water users on the Logan River. A valve and bypass line would be installed at the West Lagoon pump station to allow flow to pass into the reservoir or maintain system pressure during hydropower generation. Conservation/curtailment practices would be implemented on an as-needed basis as developed by the operating agency. These practices would be a blend of current culinary/irrigation practices. All connections would be metered and supplied with data transmission devices to allow for remote data. The irrigation water distribution SCADA system would be programmed to maintain pressure in the system while meeting demands. Specific activities include the following.

- Install 120 miles of distribution system pipeline network; the West Lagoon Pump Station would supply water from the storage facility to the distribution system.
- Install pressurized pipe and connections to existing pressurized pipe network to provide connectivity to the Benson canal service area.
- Remove Providence Pioneer Diversion and incorporate the Providence Pioneer diversion and the Logan Hollow diversion into the PI system. The main supply line from the intake at First Dam is proposed to follow the current Logan Hollow gravity pipeline alignment. Therefore, Logan Hollow diversions would be incorporated into the new system diversions at the First Dam intake and deliveries would be made to existing turnout locations.
- Block NW Canal Split (Benson Canal) by installing appropriate material where the NW Canal heads north from the Little Logan at the Anderson Mill to prevent flows from entering the NW Canal. This flow prevention could be achieved using stop logs in the current structure or an earthen berm downstream of the diversion structure to limit flow into the canal.

6.2.5 Crockett Diversion Reconstruction and Associated Flood Prevention Activities

Crockett Diversion would be reconstructed on approximately 0.3 acres and would feature a lower crest elevation which would reduce flooding upstream of the diversion. Additional activities include:

- Adding approximately 183 CY of fill to Lot 1 to prevent flows from leaving the channel during a 100-year flood event.
- Adding approximately 89 CY of fill to the south side of Lot 2 to further reduce flooding and redirect flows back to the river channel.

6.2.6 Logan River Instream Flows

A minimum instream flow of 25 cfs would be allocated to provide improved security of water quality and aesthetics in the Logan River from First Dam almost to Cutler Reservoir.

- Provide 25 cfs instream flows below First Dam along 15.1 miles of the Logan River. The proposed instream flow is to maintain a minimum of 25 cfs in the Logan River between the upper intake and the West River pump station during the irrigation season. This flow may be met by natural surplus flow or un-diverted water by upstream entities. When these sources fail to provide 25 cfs as an instream flow, the difference would be provided by a newly formed operating agency to maintain 25 cfs in the river beyond that which could be used by the downstream water users.
- The flow allocated as instream flow would be shepherded through the Logan River to the West River pump station. This flow allocation is possible since the Logan River has been shown to be a gaining river below First Dam based on historical measurements and studies completed by multiple investigations (see Appendix E3, TM-002 for details).
- Because CAIC only has water rights during the irrigation season, providing instream flows outside of the irrigation season is outside the scope of the project.

6.2.7 Little Logan Base Flows

To meet strong public desire for water in the Little Logan, especially in key areas such as Merlin Olsen Park, the Cache County Fairgrounds, Willow Park, Jens Johansen, and other parks, a portion of water would be allocated to flow through the Little Logan. Specifically, 5–10 cfs base flows would be provided to maintain flow through the Little Logan for 4.8 miles during the irrigation season.

- A legally binding MOU between any associated parties would be completed as part of the project that outlines operations, limits, and boundaries for base flow. Negotiations for the party or parties responsible for water consumption costs or pumping costs associated with the recovery of the Little Logan baseflow would be required as part of the organizational discussions under way.
- The following baseflow scenario was proposed for implementation during the irrigation season only, as no water rights extend beyond the irrigation season.
 - Approximately 5–10 cfs of base flow under full water right availability.
 - Cutbacks proportional to CAIC water supply availability under the Kimball Decree.
 - No base flow during extreme drought conditions (similar to what was done in 2021 on the Cache-Highline Canal through the Logan Country Club golf course).
- Providing base flows would require delivery through continued diversion with the improved Crockett Diversion. Any available water after baseflow use could potentially be recovered and provided to the storage facility or distribution system if it is quantified at the confluence with the Logan River.
- During time periods when excess water is available to the operating agency (when available water supply exceeds agricultural and secondary irrigation system users' demands), 10 cfs would be diverted into the canal as base flow. When demands exceed supply, a proportionate amount of water would be diverted with a minimum threshold of

5 cfs during the irrigation season, unless extreme drought conditions occur. Outside the irrigation season, as is done currently, no water would be supplied into the Little Logan.

- A flow measurement device near the outlet of the Little Logan would measure the amount of return flow from the provided base flow that would be diverted by the West River pump station into the Logan Lagoons.
- Because CAIC only has water rights during the irrigation season, providing base flows outside of the irrigation season is outside the scope of the project.

6.2.8 Floodwater Overflow Activities

The Preferred Alternative would remove irrigation water from CAIC canals and provide floodwater overflow along 1800 N to the west to reduce floodwater damage in the service area from runoff carried in the canals, specifically:

- Improve earthen ditches—dredge 3,600 feet of earthen canal along the west side of 2400 West from 1800 North to the Swift Slough.
- Install new transmission pipe—install 25,670 feet of new transmission pipe to convey flood water flows to the west. The new pipe includes 2,580 feet of 24-inch pipe at 2200 North from the Logan and Northern Canal to the Twin Canals. It also includes transmission pipe in 1800 north consisting of 3,920 feet of 48-inch pipe from the Logan Northern Canal to the Twin Canals, 4,670 feet of 54-inch from the Twin Canals to the Northwest Field Canal, and 14,500 feet of 72-inch pipe from the Northwest Field Canal to 2400 West.
- Line earthen ditches or canals—line 6,210 feet of canal with concrete lining along the Logan Northern Canal and Twin Canals to improve the canals' capacity to carry flood waters. Specifically, line 2,640 feet along the Twin Canals from 2200 North to 1800 North in North Logan, and line 3,570 feet along the Logan Northern Canal from 1400 N to 1800 N in Logan and North Logan.
- Box the Twin Canals—install 9,750 feet of new box culvert within the existing Twin Canals to improve the canals' capacity to carry flood waters, specifically, install 650 feet of 4 foot x 7 foot box culvert from 400 North to 500 North, 700 feet of 4 foot x 8 foot box culvert from 500 North to 600 North, 650 feet of 5 foot x 7 foot box culvert from 600 North to 700 North, 1,400 feet of 5 foot x 8 foot box culvert from 700 North to 900 North, and 6,350 feet of 6 foot x 8 foot box culvert from 900 North to 1800 North.
- Construct diversion structures—Construct three diversion structures at each of the canals (Logan and Northern, Twins, and Northwest Field) to divert flood water from the canals into the transmission pipe; each structure footprint would be approximately 600 ft², for a total footprint of 1800 ft².
- Construct Swift Slough outfall structure—construct an approximate 500 ft² outfall structure to protect the outfall location of the flood water from channel erosion.

6.2.9 Recreation

Recreation specific activities to provide access to support the new pressure irrigation and flood prevention infrastructure as well as to provide additional recreation access points to the terrestrial and river trail systems for residents and visitors include:

- Construct two new trails, one along Canyon Road with a total trail length of 3,420 feet and one within River Hollow Park with a total trail length of 1,010 feet. A 75-foot pedestrian bridge would be constructed over the Logan River to connect the two divided sections of River Hollow Park.

6.2.10 General Construction, Access, and Time Frame

Trackhoes, excavators, haul trucks, and other smaller construction vehicles and equipment would be used to implement the proposed activities. Access to the Project Area would be achieved at numerous locations using public roads. Construction vehicles and equipment would use existing infrastructure and transportation routes. Approximately 90 acres of staging areas would be used to implement the project. The majority of secondary irrigation system pipelines would be installed in public roadways or ROWs. Access routes and roads would be returned to their current or better conditions following implementation.

The Sponsors anticipate that construction would take at least 3 years to complete but may extend to 5 years. Construction activities affecting irrigation deliveries would occur outside of the irrigation season beginning in the fall after the irrigation season with substantial completion by each spring. Installation sequencing would be planned during the design phase to minimize effects to shareholders, stakeholders, and residents, as well as to maximize the number of connections to the secondary irrigation system each year.

6.3 Irreversible and Irretrievable Resource Commitments

Pursuant to the requirements of NEPA, environmental analysis must identify "...any irreversible and irretrievable commitments of resources, which could be involved in the Proposed Action should it be implemented." Irreversible can be described as a loss of future options; irreversible resource commitments involve the use of natural and human-made resources like metals, building materials, water, fossil fuels, electricity etc. that cannot be recovered, or take a long time to regenerate. Irretrievable resource commitments generally refer to the alternation or destruction of resources that cannot be restored, such as the extinction of a protected species. Irreversible and irretrievable resource commitments are not mutually exclusive. This section discloses irreversible and irretrievable resource commitments.

Implementing the First Dam Alternative would require the immediate and irreversible commitment of natural, physical, capital, and labor resources. Fossil fuels, financial and human resources, and construction materials would be consumed to complete the First Dam Alternative. Generally, such resources are not considered reversible.

Irretrievable resources from the implementation of the First Dam Alternative include the adverse effects to the historic canals. The MOA will outline stipulations designed to conserve the value of all applicable eligible cultural resources. Conserving the value of the eligible cultural resources would ensure that piping or lining the canals would not result in the loss of knowledge of early irrigation systems, their design, or reduce the ability to gain knowledge of early irrigation systems into the future. When analyzing the value of saving these irreversible resources compared to the benefit of using these resources to construct the First Dam Alternative and provide flood prevention for multiple homes, business, and churches, the benefits of implementing the alternative outweigh the commitments that would be used in implementation.

6.4 Areas of Controversy

Public involvement for the Proposed Project is summarized in the Scoping Report. Nine hundred forty-one comments were received, mainly concerning opposition to piping the Little Logan, project purpose, flood control, agricultural water management, wildlife effects, and recreation. The most common request was preserving the Little Logan, including base flows.

The project team met with several groups to discuss various aspects of the proposed improvements and held individual stakeholder meetings in response to the issue concerning the heightened interest in preserving the Little Logan. The outcome of these discussions involved the project Sponsor, Co-sponsors and the NRCS developing the First Dam Alternative to incorporate preservation of the Little Logan. Specifically, the FWFI was chosen as the Preferred Alternative because it uses the natural hydrologic head at First Dam to move water and generate hydropower, which avoids significant pumping costs and enhances its appeal to potential subscribers by reducing their share of O&M costs due to the hydropower generation component, and this alternative includes measures to preserve the Little Logan to resolve controversy regarding this concern and address community priorities.

6.5 Permits and Compliance

The following permits, authorizations, and coordination would be required before project implementation (Table 6-1).

Table 6-1. Permits, Authorizations, and Coordination

Authorizing Agency or Authority	Purpose of Permit/Authorization	Responsible Entity
Federal		
U.S. Army Corps of Engineers	• CWA Section 404 Permitting would be required for discharges of dredged or fill material into WOTUS, including areas below the OHWM, associated with construction of measures under the Preferred Alternative. • Based on planning-level analysis and USACE coordination, approximately 0.2 acres of aquatic resource effects associated with the Preferred Alternative are currently treated as permanent loss, with an assumed planning-level compensatory mitigation requirement of approximately 1.0 mitigation acre using a conservative 5:1 ratio for budgeting and cost share evaluation.¹ Temporary impacts and restored features are not treated as permanent loss and are not assumed to require compensatory mitigation. • See Section 6.6.2—Compensatory Mitigation, for detailed discussion of aquatic resource impact categorization, basis for permanent loss determination, mitigation assumptions, and watershed scale benefits. • Actual compensatory mitigation requirements, including mitigation design, mitigation ratios, mitigation approach	Sponsor

Authorizing Agency or Authority	Purpose of Permit/Authorization	Responsible Entity
	would be determined during project design and in coordination with the USACE during the CWA Section 404 permitting process. This Draft Plan EIS does not pre-determine permit level mitigation requirements but identifies the planning level assumptions and analytical basis used to evaluate mitigation feasibility and cost-sharing.	
U.S. Fish and Wildlife Service	A BA was completed for the Proposed Project that determined the Proposed Project would have no effect on any ESA-listed species or habitat and therefore complies with Section 7 of the ESA (Appendix E2). No official concurrence is necessary, and, informally, the USFWS reviewed the determinations and agreed with them (Appendix A).	Sponsor
Tribal		
Tribal Historic Preservation Office	Consultation with THPOs is ongoing (see Table 7-1 and Appendix A). NRCS prepared a draft MOA to resolve adverse effects to cultural resources and provided it to federally recognized tribes as part of consultation; no responses or requests for participation were received.	NRCS
State		
Utah State Historic Preservation Office	Consultation with Utah SHPO is ongoing. Coordination to ensure MOA stipulations are fulfilled (see Appendix A).	NRCS/ Sponsor
Utah Department of Transportation	Coordination to implement appropriate traffic control measures during construction to minimize disturbance and reduce effects to local traffic. An Encroachment Permit and Traffic Control Plan would be needed.	Sponsor
Utah Division of Water Quality	- Section 401 Water Quality Certification is required from the UDWQ to ensure federally permitted activities comply with the State of Utah's discharge and water quality requirements. - A UPDES permit from the UDWQ will be required before beginning any construction activities that would disturb more than 1 acre of land. A SWPPP is required as part of the UPDES authorization. - If construction dewatering is required as part of the Proposed Project, a Construction Dewatering Permit would be required from the UDWQ through the EPA's online portal. A Dewatering Plan would also be required. - A permit from the UDWQ is also required before the removal and disposal of sludge within the existing sewer lagoons prior to conversion to secondary irrigation storage.	Contractor

Authorizing Agency or Authority	Purpose of Permit/Authorization	Responsible Entity
	Logan City would continue to operate these areas under their current permit to produce class A biosolids with wastewater sludge. Should Logan River water mix with wastewater effluent in storage reservoirs in the future, outside of the scope of this project, UAC 317-3-11 would apply, which would govern appropriate effluent water quality limits. See Appendix E4, TM-010 for more details.	
Utah Division of Water Rights	Any change in operations of the Logan River would require approval by the UDWRi.	Sponsor
Utah Division of Emergency Management	Coordination during the project design and construction phases to address floodplain changes. A CLOMR and LOMR will be required. The Proposed Project will need to be designed for the 100-year (1 percent) event. Flooding for the 100- and 500-year (2 percent) events will need to be mapped before construction. Following construction, drawings and documentation are required.	Sponsor
Utah Dam Safety	Coordination and permits from Utah Dam Safety would be necessary to convert the existing sewer lagoons to secondary irrigation storage. Utah Dam Safety requires all storage facilities greater than 20 ac-ft to comply with their permitting and regulations; this compliance includes spillways, low-level outlets, and reservoir freeboard. See Appendix E4, TM-010 for more details.	Sponsor
Local		
Cache County	Coordination with Cache County Public Works Road Department for necessary construction utility clearances, road crossings, and permits.	Contractor
Cache County	Coordination with Cache County and the Sheriff departments if traffic or access would be delayed.	Contractor
City of Logan	Coordination with the City of Logan's Street Maintenance Division for necessary construction utility clearances, road crossings, and permits.	Contractor
North Logan City	Coordination with the North Logan City's Community Development, Street, and/or Public Utilities Departments for all necessary construction utility clearances, encroachment or road crossing permits, and any other applicable permits.	Contractor
Hyde Park City	Coordination with the Hyde Park City's Planning, Public Works, and/or Public Utilities Departments for all necessary construction utility clearances, excavation or road crossing permits, and any other applicable permits.	Contractor
Local utilities	Utility clearances before construction activities	Contractor

Authorizing Agency or Authority	Purpose of Permit/Authorization	Responsible Entity
Utah State University	Coordination with USU Facilities Department during CAIC diversion change to First Dam and pavement trenching through USU property.	Contractor

¹Mitigation acreages are planning-level assumptions used for cost-share evaluation and do not represent final CWA Section 404 permit level mitigation requirements.

6.6 Mitigation of Potential Effects

6.6.1 Avoidance and Minimization

BMPs and design criteria as described in Appendix E2 would be implemented during and post-construction to avoid and minimize effects to resources in the Project Area when implementing the Preferred Alternative. The majority of practices would be implemented by the contractor and included in construction specifications.

NRCS designed mitigation to resolve the adverse effects to the historic canals through a draft MOA, and is coordinating with the USACE, Sponsors, Tribes, and SHPO to complete it. The draft MOA is included in Appendix A.

6.6.2 Compensatory Mitigation

The USACE requires compensatory mitigation when a project's effects on aquatic resources, such as wetlands, streams, or other bodies of water, cannot be avoided or minimized to a sufficient degree. The USACE district engineer determines the need for compensatory mitigation based on the proposed activity and any proposed mitigation measures.

For the Preferred Alternative, the NRCS and the Sponsors coordinated closely with the USACE, a cooperating agency, to incorporate the principles of good stewardship into project planning and design. Coordination has included multiple meetings and site visits to evaluate jurisdictional issues and potential mitigation needs: a site visit on April 23, 2024, a coordination meeting on November 15, 2024, and a follow-up site visit in June 2025 (see Appendix A, USACE Agency Coordination).

On September 16, 2024, J-U-B, on behalf of NRCS and the Sponsors, submitted an Approved Jurisdictional Determination (AJD) request to USACE, which provides information necessary for the District Engineer to evaluate aquatic resource jurisdiction and potential compensatory mitigation requirements.

Aquatic resources of concern include the Logan River, its tributaries, and adjacent wetlands. Consistent with USACE mitigation policy and principles of good stewardship, the Preferred Alternative applies the following hierarchical approach:

1. Avoid impacts where practicable;
2. Minimize and restore impacts where avoidance is not feasible;
3. Implement on-site mitigation where necessary; and
4. Use off-site mitigation only when no other options are available.

The Preferred Alternative could alter watershed hydrology through proposed activities within wetlands and areas below the OHWM. These changes may be offset by measurable aquatic benefits, including approximately 15.1 miles of enhanced Logan River habitat resulting from the provision of 25 cfs of instream flow, as quantified through UWRL hydraulic and hydrologic modeling (Appendix E4, TM-011).

Any unavoidable effects to waters of the United States, including wetlands and areas below the OHWM, would be addressed during subsequent CWA Section 404 permitting in coordination with USACE. Compensatory mitigation would be implemented, as required, in accordance with the Compensatory Mitigation for Losses of Aquatic Resources Final Rule (33 CFR Part 332) and applicable USACE guidance. Temporary construction disturbances where aquatic area and function are restored would not be treated as permanent loss for mitigation purposes.

Further coordination with USACE, on January 6, 2026, focused on identifying potential permanent losses of aquatic resources associated with specific project components, including the West River, West Lagoon, and Cow Pasture pump stations; the First Dam intake; Swift Slough water deposition; and recreational trail replacement (Table 6-2).

Under NRCS watershed program policy, compensatory mitigation required as a permit condition and integral to project construction is considered part of installation costs. Accordingly, planning-level estimates for potential compensatory mitigation associated with CWA Section 404 compliance are included in the construction cost estimates for the Preferred Alternative (Table 6-2 through Table 6-5). These estimates are provided for planning and cost-share evaluation purposes only and do not predetermine final mitigation design, mitigation ratios, or permit conditions.

Final compensatory mitigation requirements, cost allocations, and federal and non-federal cost-share eligibility would be determined during final design and Section 404 permitting with USACE and documented in the Watershed Plan Agreement and associated cost-share schedules, consistent with PL 83-566 authorities and NRCS policy.

6.7 Costs and Cost-sharing

Table 6-2 describes the estimated cost of the Preferred Alternative (FWFI) and the breakdown of federal funds and Sponsor participation. The estimated construction costs for project measures total \$308,633,000. The Sponsors' estimated cost of construction is \$32,739,600, and the estimated cost of construction eligible for PL 83-566 funding is \$275,893,400.

Table 6-3 shows the cost-share table for works of improvement. NRCS design engineering, construction management, and NRCS incurred administration costs are not cost-shared by the Sponsor. Any costs incurred for administration by the Sponsor would not be cost-shared by NRCS.

The Proposed Project includes planning-level cost estimates for regulatory compliance measures required to implement authorized works under PL 83-566, including compensatory mitigation that may be required under NHPA Section 106 and CWA Section 404. Estimated installation costs for the Preferred Alternative (Table 6-2) include conservative, planning-level allowances for such regulatory compliance measures and do not pre-determine permit conditions, mitigation design, or final cost-share determinations. Final mitigation requirements and federal and

non-federal cost-share eligibility would be determined during project design and Section 404 permitting with USACE and documented in the Watershed Plan Agreement.

Table 6-2. Estimated Installation Costs (2025 Dollars)

Works of Improvement ¹	Public Law 83-566 Funding	Applicant Participation	Total
First Dam Intake ²	\$12,348,100	\$3,437,100	\$15,785,200
Pressurized Irrigation System	\$71,877,000	\$20,007,000	\$91,884,000
West River Pump Station ²	\$2,977,900	\$828,900	\$3,806,800
West Lagoon Pump Station ²	\$2,250,400	\$626,400	\$2,876,800
Water Storage Facility	\$9,748,500	\$2,713,500	\$12,462,000
Hydropower Equipment	\$1,678,100	\$467,100	\$2,145,200
Cow Pasture Pump Station ²	\$2,842,100	\$791,100	\$3,633,200
Crockett Diversion Reconstruction	\$834,200	\$232,200	\$1,066,400
Removal of Providence Pioneer Diversion	\$242,500	\$67,500	\$310,000
Flood Control Actions	\$29,100	\$8,100	\$37,200
Urban Flood Control ²	\$167,884,200	\$1,332,200	\$169,216,400
Recreation ²	\$3,181,300	\$2,228,500	\$5,409,800
Total¹	\$275,893,400	\$32,739,600	\$308,633,000

¹Totals may not sum due to rounding. Price base: 2025 dollars. Prepared January 2025.

²Includes compensatory mitigation costs potentially needed for permanent loss of aquatic resources from the proposed works of improvement. Compensatory mitigation costs represent planning-level estimates for regulatory compliance required to implement the authorized works of improvement and do not pre-determine CWA Section 404 permit conditions.

Table 6-3. Cost-share Table for Works of Improvement (2025 Dollars)

Works of Improvement	NRCS		Sponsors		Total
	Percent	Cost	Percent	Cost	Cost
Cost-Shareable Items					
<i>Proposed Measures by Purpose and Rate of Assistance</i>					
Agricultural Water Management	75	\$81,052,500	25	\$27,017,500	\$108,070,000
Flood Prevention	100	\$137,610,000	0	\$0	\$137,610,000
Recreation	50	\$2,209,500	50	\$2,209,500	\$4,419,000
<i>Subtotal: Cost-shareable Costs¹</i>		<i>\$220,872,000</i>		<i>\$29,227,000</i>	<i>\$250,099,000</i>
Non-Cost-Shareable Items²					
NRCS Technical Assistance/Engineering		\$50,019,800		\$0	\$50,019,800
Project Administration ³		\$5,001,600		\$8,000	\$5,009,600
Federal, State, and Local Permits		\$0		\$3,504,600	\$3,504,600
<i>Subtotal: Non-cost-shareable Costs</i>		<i>\$55,021,400</i>		<i>\$3,512,600</i>	<i>\$58,534,000</i>
Total:		\$275,893,400		\$32,739,600	\$308,633,000

¹Includes \$133,350 for cultural resource protection and CWA Section 404 mitigation measures. Mitigation costs represent planning-level estimates for mitigation that may be required to comply with NHPA Section 106 and CWA Section 404 permitting and do not pre-determine permit conditions. Actual mitigation requirements and costs would be determined during design and permitting.

²If actual non-cost-shareable item expenditures vary from these figures, the party responsible will bear the change.

³The sponsors and NRCS will each bear the costs of project administration that each incurs. Sponsor costs for project administration include relocation assistance advisory service.

6.8 Ecosystem Services Benefits

The effect of the Preferred Alternatives on ecosystem flows and values is shown in Table 5-2. The First Dam Alternative is sustainable because of its reduced pumping requirements and

hydroelectricity production and would enhance the watershed's ability to regulate costs by reducing damage to buildings, agricultural income, and water treatment and supply expenses that would occur in the absence of the project. The First Dam Alternative improves sustainable economic development by reducing damages, enhancing stream flows, providing new recreational opportunities, and improving the productivity of the watershed's agricultural land.

Specifically, the Preferred Alternative would provide *regulating ecosystem services* including reduced property damage valued at \$10,134,900, reduced water supply expenses of \$2,000,000, reduced damage to agricultural income of \$1,140,500, and additional instream flows in the 15.1-mile reach of Logan River valued at \$2,052,900; *provisioning ecosystem services* including increased hydroelectricity production valued at \$194,000; and *cultural ecosystem services* including recreation benefits valued at \$232,400. The total quantified ecosystem benefits for the FWFI are \$15,754,700.

6.9 Installation and Financing

6.9.1 Planned Sequence of Installation

Design would begin upon authorization from NRCS. Construction contract procurement would follow final design. The Sponsors anticipate that construction would take at least 3 years to complete but may extend to 5 years. Construction activities affecting irrigation deliveries would occur outside of the irrigation season beginning in the fall after the irrigation season with substantial completion by each spring. Installation sequencing would be planned during the design phase to minimize effects to shareholders, stakeholders, residents, etc., as well as to maximize the number of connections to the secondary irrigation system each year.

6.9.2 Responsibilities

The Sponsors and any identified partners would coordinate together as they plan, design, and construct the Preferred Alternative. The Sponsors would be responsible for procuring the necessary funds for improvement measure implementation and providing in-kind services.

If project implementation is funded by NRCS, the Sponsors and NRCS would enter into a cooperative agreement (Project Agreement) that describes each entity's responsibilities during the implementation phase and provides for the transfer of the federal share of implementation funds to the Sponsors. The Sponsors and its partners would work in cooperation with cooperating agencies and other interested agencies to meet environmental, permitting, and public process requirements.

6.9.3 Contracting

All work associated with the Preferred Alternative would be properly procured by the Sponsors using awarded contracts. The Sponsors, coordinating with NRCS, would oversee and administer the Proposed Project construction as described in the Project Agreement.

6.9.4 Real Property and Relocations

No real property acquisitions or relocations have been identified through the alternative development. All landowners affected by private property crossings from the Proposed Project

have been contacted personally and have expressed a willingness to negotiate with the Sponsors during the project design phase for property access and/or easements.

6.10 Operations, Maintenance, and Replacement

O&M of the irrigation infrastructure would be managed by the Sponsors or a new entity developed to maintain the system. Operation of these facilities would include administration, management, billing, and performance of non-maintenance actions needed to keep the facilities operational and safe. Maintenance includes performance of work, recording instrumentation data, preventing deterioration of structures, and repairing damage or replacement of the structure, as needed to prevent failure. Damages to completed structures caused by normal deterioration, droughts, flooding, or vandalism are considered maintenance. Before the start of construction, NRCS and the Sponsors would enter into an O&M Agreement lasting for the installation period and evaluated life of the project (55 years). An O&M plan included in the agreement would identify the specific responsibilities for each entity. Annual O&M costs for the Preferred Alternative are estimated to be \$1,910,000.

6.10.1 Cultural Resources

As described in Section 5.3.8.1, the MOA outlines the stipulations to resolve the adverse effects that canal piping and lining pose to canal segments eligible for inclusion in the NRHP consistent with 36 CFR 800.6 (Appendix A). If construction activities uncover any materials of cultural or historic significance (i.e., bone fragments, pottery, stone tools, burial features, etc.), construction would halt, and procedures outlined in the NRCS Prototype Programmatic Agreement with the Utah SHPO would be followed.

6.10.2 Financing and Conditions for Providing Assistance

Potential funding sources include approximately \$2,000,000 in Agricultural Water Optimization Grants from the UDAF toward the capital costs, approximately \$300,000 a year from a Trout Unlimited “endowment” for O&M to pay for pumping costs from Logan River back into the system, and potentially another \$500,000 from State agencies, such as UDWR or UDWQ and their various funding sources.

Additionally, a loan from the UDWR could be used, with the loan rate dependent on the percentage of municipal irrigation in the system. Other funding sources for cost sharing include grants or low-interest loans, state and local agency funds, and donations for labor, material, equipment, services, or money. Lastly, a private market loan with an assumed 4% bonding could also be acquired. The total out of pocket installation cost for the Sponsors is estimated to be \$32,739,600 (Table 6-4).

6.11 Economic Tables and Structural Tables

Table 6-4 and Table 6-5 describe the estimated project installation cost of the Preferred Alternative, and how those costs would be shared. The costs, flood damage reduction, and benefits of the Preferred Alternative are presented in Table 6-6 and Table 6-7.

Table 6-4. National Watershed Program Manual Economic Table 1—Estimated Preferred Alternative Installation Cost, Logan River Watershed, Utah (2025 Dollars)

Works of Improvement	Unit	Number			Estimated Cost (Dollars) ^{1,2}						
					Public Law 83-566 Funds ³			Other Funds			Total
		Federal Land	Non-Federal Land	Total	Federal Land	Non-federal Land	Total	Federal Land	Non-federal Land	Total	
First Dam Intake	Each	0	1	1	\$0	\$12,348,100	\$12,348,100	\$0	\$3,437,100	\$3,437,100	\$15,785,200
Pressurized Irrigation System	Miles	0	120	120	\$0	\$71,877,000	\$71,877,000	\$0	\$20,007,000	\$20,007,000	\$91,884,000
West River Pump Station	Each	0	1	1	\$0	\$2,977,900	\$2,977,900	\$0	\$828,900	\$828,900	\$3,806,800
West Lagoon Pump Station	Each	0	1	1	\$0	\$2,250,400	\$2,250,400	\$0	\$626,400	\$626,400	\$2,876,800
Water Storage Facility	Each	0	1	1	\$0	\$9,748,500	\$9,748,500	\$0	\$2,713,500	\$2,713,500	\$12,462,000
Hydropower Equipment	Each	0	1	1	\$0	\$1,678,100	\$1,678,100	\$0	\$467,100	\$467,100	\$2,145,200
Cow Pasture Pump Station	Each	0	1	1	\$0	\$2,842,100	\$2,842,100	\$0	\$791,100	\$791,100	\$3,633,200
Crockett Diversion Reconstruction	Each	0	1	1	\$0	\$834,200	\$834,200	\$0	\$232,200	\$232,200	\$1,066,400
Removal of Providence Pioneer Diversion	Each	0	1	1	\$0	\$242,500	\$242,500	\$0	\$67,500	\$67,500	\$310,000
Flood Control Actions	Each	0	1	1	\$0	\$29,100	\$29,100	\$0	\$8,100	\$8,100	\$37,200
Urban Flood Control	Miles	0	8.6	8.6	\$0	\$167,884,200	\$167,884,200	\$0	\$1,332,200	\$1,332,200	\$169,216,400
Recreation	Feet	0	4,430	4,430	\$0	\$3,181,300	\$3,181,300	\$0	\$2,228,500	\$2,228,500	\$5,409,800
Total					\$0	\$275,893,400	\$275,893,400	\$0	\$32,739,600	\$32,739,600	\$308,633,000

¹Price base: 2025 dollars. Totals may not sum due to rounding.

Prepared: January 2025.

²Includes \$133,350 for cultural resource protection and CWA Section 404 mitigation measures. Mitigation costs represent planning-level estimates for mitigation that may be required to comply with NHPA Section 106 and CWA Section 404 permitting and do not pre-determine permit conditions. Actual mitigation requirements and costs would be determined during permitting and design.

³NRCS is the federal agency responsible for assisting in installation of works of improvement.

Table 6-5. National Watershed Program Manual Economic Table 2—Estimated Preferred Alternative Cost Distribution, Logan River Watershed, Utah (2025 Dollars)

Works of Improvement	Item	Installation Cost ¹								Total
		Public Law 83-566 Funds ²				Other Funds				
		Flood Control	Agriculture Water Management	Recreation	Total	Flood Control	Agriculture Water Management	Recreation	Total	
Logan River Watershed Project	Construction ³	\$137,610,000	\$81,052,500	\$2,209,500	\$220,872,000	\$0	\$27,017,500	\$2,209,500	\$29,227,000	\$250,099,000
	Engineering	\$13,761,000	\$10,807,000	\$441,900	\$25,009,900	\$0	\$0	\$0	\$0	\$25,009,900
	Construction Engineering	\$13,761,000	\$10,807,000	\$441,900	\$25,009,900	\$0	\$0	\$0	\$0	\$25,009,900
	Permitting	\$0	\$0	\$0	\$0	\$1,328,200	\$2,161,400	\$15,000	\$3,504,600	\$3,504,600
	Administration	\$2,752,200	\$2,161,400	\$88,000	\$5,001,600	\$4,000	\$0	\$4,000	\$8,000	\$5,009,600
Total		\$167,884,200	\$104,827,900	\$3,181,300	\$275,893,400	\$1,332,200	\$29,178,900	\$2,228,500	\$32,739,600	\$308,633,000

¹Price base: 2025 dollars. Totals may not sum due to rounding. Project cost prepared by J-U-B.

Prepared: January 2025.

²NRCS is the federal agency responsible for assisting in installation of works of improvement.

³Includes \$133,350 for cultural resource protection and CWA Section 404 mitigation measures. Mitigation costs represent planning-level estimates for mitigation that may be required to comply with NHPA Section 106 and CWA Section 404 permitting and do not pre-determine permit conditions. Actual mitigation requirements and costs would be determined during design and permitting.

Table 6-6. National Watershed Program Manual Economic Table 4—Estimated Average Annualized Costs by Increment, Logan River Watershed Project, Utah (2025 Dollars)

Works of Improvement	Project Outlays (Amortization of Installation Cost) ¹	Other Direct Costs ²	Total Cost
Increments			
Agriculture Water Distribution & Stormwater	\$12,611,900	\$1,871,400	\$14,483,300
Floodplain	\$90,000	\$55,000	\$145,000
Recreation	\$227,000	\$5,400	\$232,400
Total¹	\$12,928,900	\$1,931,800	\$14,860,700

¹Totals may not sum due to rounding. Price base: 2025 dollars; amortized over 50 years at a discount of 3.0 percent. Prepared: January 2025.

²Other direct costs include annual O&M associated with installation, operation, or replacement of project structures.

Table 6-7. National Watershed Program Manual Economic Table 5a—Estimated Average Annualized Benefits and Reduced Damages by Increment, Logan River Watershed Project, Utah (2025 Dollars).

Benefit/Reduced Damage	Non-Agricultural Related ¹	Agricultural Related ¹	Notes on Allocation of Benefits
Reduced property damage	-	\$10,134,900	Benefits are allocated 92% to the Agricultural Distribution and Stormwater increment and 8% to the Floodplain increment.
Reduced water supply expenses	-	\$2,000,000	Benefits are allocated 100% to the Agricultural Distribution and Stormwater increment.
Reduced damage to agricultural income	-	\$1,140,500	Benefits are allocated 100% to the Agricultural Distribution and Stormwater increment
Recreation	\$232,400	-	Benefits are allocated 100% to the Recreation increment.
Additional instream flows in 15.1-mile reach of Logan River	-	\$2,052,900	Benefits are allocated 100% to the Agricultural Distribution and Stormwater increment
Increased hydroelectricity production	-	\$194,000	Benefits are allocated 100% to the Agricultural Distribution and Stormwater increment
Total Benefits			
First Dam Alternative	\$232,400	\$15,522,300	Total Benefits: \$15,754,700

¹Totals may not sum due to rounding. Prepared: January 2025. Price base: 2025 dollars amortized over 50 years at a discount rate of 3.0 percent.

The economic effect of the Preferred Alternative on ecosystem flows and values is shown in Table 6-7. The Preferred Alternative would positively affect both regulating and provisioning services in the watershed by reducing property damage, reducing water supply expenses, reducing damage to agricultural income, providing additional instream flows in the Logan River and maintaining base flows in the Little Logan, increasing hydroelectricity production in addition to benefiting recreation values. In addition, the Preferred Alternative would reduce power requirements during peak emissions, reduce greenhouse gas emissions, conserve water, and reduce road damage. However, these benefits were not monetized as discussed previously. In

total, the Preferred Alternative would create an average annualized benefit of approximately \$15,754,700 per year.

As noted in Section 1.5.4, 99 percent of the benefits are related to agriculture. Table 6-7 shows that all the monetized benefits—reduced property damage, reduced water supply expenses, reduced damage to agricultural income, additional instream flows in the Logan River, maintained base flows in the Little Logan, and increased hydroelectricity production—except for recreation are directly related to agricultural.

- ***Reduced property damage*** (\$10,134,900) is an agricultural benefit that addresses the problem that the existing canals do not have adequate flow capacity to transport irrigation water and the additional stormwater produced by larger storm events. The irrigation water is used for agricultural purposes, so the benefit of reduced property damage is directly related to agricultural.
- ***Reduced water supply expenses*** (\$2,000,000) are an agricultural benefit that addresses multiple problems. When irrigation water is conveyed via unlined canals, significant seepage infiltrates the soil and enters the sewer system through existing clay pipes with open joints, particularly in areas with high groundwater tables. This seepage results in higher flow volumes at the WWTP and the need for expensive water treatment. Additionally, water treatment costs are exacerbated as many users opt to use pressurized culinary water due to its convenience and availability, rather than using irrigation water during less convenient times. Since culinary water is treated prior to use, this practice incurs substantial expenses. The savings achieved are primarily attributed to reductions in outdoor culinary water use by agricultural operations, urban agriculture, and local residents.
- ***Reduced damage to agricultural income*** (\$1,140,500) is an agricultural benefit that addresses late-season water shortages that lower crop yields and reduce farmers' income in the watershed.
- ***Additional instream flows in the Little Logan and Logan River*** (\$2,052,900) are an agricultural benefit that addresses agricultural sustainability problems. Current elevated water temperature and low dissolved oxygen levels in the Little Logan and the Logan River are contributing to poor water quality. Higher instream flows reduce water temperature and increase dissolved oxygen levels, which would improve water quality. Future agricultural operations may face regulatory pressure to reduce impacts on aquatic ecosystems. Enhancing instream flows can help meet environmental flow requirements, reducing the risk of regulatory penalties or restrictions on water use. Because much of the Logan River dry dams in the summer, pollinator populations are declining, and biodiversity is waning. Instream flows address the health of the Little Logan and Logan River ecosystems, and support declining pollinator populations and biodiversity, which are essential for sustainable agriculture. Additionally, many agricultural communities in the Logan River watershed rely on ecosystem services provided by riparian zones, such as natural filtration and erosion control. Indirectly, projects that support instream flows often qualify for state and federal conservation funding, which can be used to support on-farm improvements like efficient irrigation. Participation in such programs can offset costs for producers and improve long-term water security.
- ***Increased hydroelectricity production*** (\$194,000) is an agricultural benefit that addresses agricultural efficiency and conservation problems. The hydropower component is part of

a broader system that includes piping and pressurization, which reduces seepage and evaporation losses—key goals of agricultural water conservation. The hydropower component is physically and operationally integrated with the irrigation system. It is located at the downstream end of the PI network and is designed to generate electricity from irrigation flows; offset the energy required to operate three new pump stations; and provide excess power to reduce overall system costs for agricultural users.

In total, the First Dam Alternative accrues \$15,754,700 in benefits, of which \$232,400 are recreational benefits and \$15,522,300 are agricultural related, for approximately 99 percent agricultural benefits. This alternative meets the Section 2 of PL 83-566 (16 U.S.C. Section 1002) requirement that each project contain benefits directly related to agriculture that account for at least 20 percent of the total benefits of the project.

Using the resulting benefits and costs from the previous two tables, Table 6-8 presents a comparison of the average annualized benefits and average annualized costs for the Preferred Alternative. In total, the First Dam Alternative would generate average annualized benefits of \$15,754,700 compared to average annualized costs of \$14,860,700, for a BCR of approximately 1.1.

Table 6-8. National Watershed Program Manual Economic Table 6—Comparison of Average Annualized Costs, Reduced Damages and Benefits, Logan River Watershed, Utah (2025 Dollars)

Increment	Agricultural Related ¹					Non-Agricultural Related ¹	Average Annualized Benefit ¹	Average Annualized Cost ¹	Benefit Cost Ratio
	Reduced Property Damage	Reduced Water Supply Expenses	Increased Electricity Production	Reduced Damage to Agricultural Income	Instream Flow Increase	Recreation			
Floodplain	\$810,800	-	-	-	-	-	\$810,800	\$198,100	4.1
Agricultural Water Distribution & Stormwater	\$9,324,100	\$2,000,000	\$194,000	\$1,140,500	\$2,052,900	-	\$14,711,500	\$14,430,200	1.0
Recreation	-	-	-	-	-	\$232,400	\$232,400	\$232,400	1.0
Total	\$10,134,900	\$2,000,000	\$194,000	\$1,140,500	\$2,052,900	\$232,400	\$15,754,700	\$14,860,700	1.1

¹Totals may not sum due to rounding. Price base: 2025 dollars amortized over 50 years at a discount rate of 3.0 percent.

Prepared: January 2025.

Table 6-9 displays the Structural Table 3b for channel work for flood channels, irrigation canals, and drainage channels of the Preferred Alternative by channel reach (NWPM 506.17 [NRCS 2015]).

Table 6-9. Structural Table 3b for Channel Work, Logan River Watershed, Utah

Channel Information						Channel Dimensions				n Value		Velocities (ft/s)		Work			
Channel Name (reach)	Station (Start Station 10+00)	Drain area (mi ²)	Design discharge (ft ³ /sec)	Water surface elevation feet (msl)	Hydraulic Gradient (ft/ft)	Gradient (ft/ft)	Bottom width (ft)	Elev. (ft/ msl)	Side slope	aged	as built	aged **	as built	Excavation volume	Type of work ¹	Existing channel type ²	Present flow condition ³
Twin Canal	400 N–1800 N	N/A	82	Na	0.001	0.001	6	N/A	Varies	0.035	0.13	1.6	4	N/A	III	M (unknown)	I
Twin Canal	1800 N–2200 N	N/A	56	N/A	0.0009	0.0009	6	N/A	Varies	0.035	0.13	1.2	2.8	N/A	III	M (unknown)	I
Logan Northern Canal	1400 N–1800 N	N/A	94	N/A	0.001	0.001	6	N/A	Varies	0.035	0.13	2.0	2.8	N/A	III	M (unknown)	I

¹II—Enlargement or realignment of existing channel or stream.

III—Cleaning out natural or manmade channel (including bar removal and major clearing and snagging operations).

IV—Clearing and removal of loose debris within channel section.

V—Stabilization as primary purpose (by continuous treatment or localized problem areas—present capacity adequate)

²N—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.

³Pr—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.

Table 6-10 displays the characteristics of the existing channel and proposed piping of the Preferred Alternative, by channel reach.

Table 6-10. Supplemental Structural Table for Piping

Existing Channel Characteristics							Proposed Piping Characteristics						
Channel Name (reach)	Location or Stationing	Reach Length (ft)	Maximum Discharge (ft ³ /sec)	Gradient (ft/ft)	Bottom Width (ft)	Side Slope (H:V)	Average Manning's N	Average Velocity (feet/sec)	Existing Channel Type	Present Flow Condition	Material ¹	Box or Pipe Size (ft)	Average Velocity (feet/sec)
Twin Canal	400 N–500 N	702	66	0.0016	6	varies	0.035	3.0	Manmade	Intermittent	Concrete	4x7	3.1
Twin Canal	500 N–600 N	732	66	0.0014	6	Varies	0.035	1.6	Manmade	Intermittent	Concrete	4x8	3.2
Twin Canal	600 N–700 N	693	66	0.0019	6	Varies	0.035	3.5	Manmade	Intermittent	Concrete	5x7	3.4
Twin Canal	700 N–800 N	724	66	0.0010	6	Varies	0.035	2.3	Manmade	Intermittent	Concrete	5x8	3.5
Twin Canal	800 N–900 N	695	66	0.0011	6	Varies	0.035	1.5	Manmade	Intermittent	Concrete	5x8	3.5
Twin Canal	900 N–1000 N	600	66	0.0015	6	Varies	0.035	2.5	Manmade	Intermittent	Concrete	6x8	3.8
Twin Canal	1000 N–1400 N	2834	66	0.0010	6	Varies	0.035	2.9	Manmade	Intermittent	Concrete	7x9	4.2
Twin Canal	1400 N–1800 N	3037	66	0.0018	6	Varies	0.035	3.3	Manmade	Intermittent	Concrete	7x9	4.2
1800 N	23200	3900	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	RCP	4	9.2
1800 N	18500	4700	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	RCP	4.5	9.8
1800 N	4000	14500	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	RCP	6	12.1
2200 N	2200 N	2600	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	RCP	2	5.8

¹RCP=reinforced concrete pipe

Table 6-11 displays the estimated construction cost of recreational facilities. The table shows the number, estimated unit construction cost, NRCS and Sponsor cost share, and total cost for each type of recreational facility. This table is included if recreational development is an integral part of the plan and recreational benefits for a planned development are evaluated monetarily.

Table 6-11. Construction Cost Estimate of Recreational Facilities

Works of Improvement	Number¹	Estimated Unit Cost¹	Total Construction Cost	Total Cost²
Canyon Road Trail	3420	\$950/LF	\$3,250,000	\$3,974,500
River Hollow Trail	1010	\$1161/LF	\$1,169,000	\$1,435,300
Total	4430	\$2221/LF	\$4,419,000	\$5,409,800

¹The length of trail and estimated unit cost are estimated and subject to minor variation.

²The total federal costs are \$3,181,300 and the total nonfederal costs are \$2,228,500 of works to be constructed. Total costs include design, permitting, administration, and construction costs. Prepared January 2025.

Chapter 7 Consultation, Coordination and Public Participation

This chapter describes the public and agency coordination efforts for the Proposed Project. The intent of the Proposed Project is to implement a solution that would improve agricultural water management, prevent flooding, and enhance recreational opportunities for the Project Area.

7.1 Consultation

7.1.1 National Historic Preservation Act Section 106 Consultation

In accordance with Section 106 of the NHPA, amongst other applicable laws and regulations, NRCS is responsible for assessing the effects of activities, considering tribal interests, and assuring that tribal interests are considered in conjunction with federal activities and undertakings. NRCS recognizes that tribal governments are sovereign nations located within the United States. NRCS has responsibility to help fulfill the U.S. government's responsibilities toward Tribes when considering actions that may affect tribal rights, resources, and assets. In summary, and in accordance with 36 CFR 800.2-800.5 and Section 106 of the NHPA, SHPOs, THPOs, and federally recognized Tribes, and other consulting parties must be identified and consulted at all steps of the process. All Section 106 consultation records are in Appendix A.

Section 3.3.8.1 describes the regulatory overview, NRHP evaluation criteria, Tribal consultation and agency and consulting parties' coordination, APE, and results of the cultural resource inventory that was completed for the Proposed Project.

Section 5.3.8.1 describes the NRCS NHPA Section 106 results, including the finding of effects consultation and concurrence with SHPO, Tribes/THPOs, and other consulting parties, and the resolution of adverse effects.

7.1.1.1 Federally Recognized Tribes

Tribes who hold ancestral land, traditional use, and/or traditional cultural property claims in and near the Project Area were identified using the former NPS Native American Graves Protection and Repatriation Act Native American Consultation Database (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 Utah Division of Indian Affairs (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 include:

- The Eastern Shoshone Tribe of the Wind River Reservation, Wyoming
- The Shoshone-Bannock Tribes of the Fort Hall Reservation
- The Ute Indian Tribe of the Uintah & Ouray Reservation, Utah
- The Northwest Band of the Shoshone Nation

Table 7-1 presents the current NRCS record of Tribal consultation.

Table 7-1. NRCS Record of Tribal Consultation

NRCS Record of Tribal Consultation
Project/Reason for Initiating Consultation: Logan River Watershed Draft Plan-EIS (NEPA)
Program: NRCS Watershed and Flood Prevention Operations Program

Tribe Information			Cons Initiated ^{1,2}	Cultural Resource Report Consultation Packages ³			Consultation Follow Up ²				Tribe Cons Completed (Date)
Federally Recognized Tribe	Contact Name, Title	Address	Letter Date	NRCS Mailed to Tribe ³	Received by Tribe ⁴	Tribe Response	Follow Up #1 Type (Date)	Response #1 Type (Date)	Follow Up #2 Type (Date)	Response #2 Type (Date)	
Eastern Shoshone Tribe of the Wind River Reservation, Wyoming	John St. Clair, Chairman	P.O. Box 538 Fort Washakie, Wyoming 82514	10/19/2021 3/8/2024	12/17/2024	12/28/2024	None	<u>2/21/2025</u>				
	Joshua Mann, THPO		3/8/2024	12/17/2024	12/28/2024	None	2/21/2025				
Shoshone-Bannock Tribes of the Fort Hall Reservation	Mr. Devon Boyer, Chairman	P.O. Box 306 Fort Hall, Idaho 83203	10/19/20213 /8/2024	NA	NA	None					
	Mr. Lee Juan Tyler, Chairman		NA	12/17/2024	12/28/2024	None	2/21/2025				
	Louise E. Dixey, Cultural Resources Director		10/19/20213 /8/2024	NA	NA	None					
	Mr. Nathan Small Council Member, Fort Hall Business Council		10/19/2021 3/8/2024	NA	NA	None					
	Ms. Carolyn Smith, Section 106 Compliance		10/19/20213 /8/2024	12/17/2024	12/26/2024	None	2/21/2025				
Ute Indian Tribe of the Uintah & Ouray Reservation, Utah	Mr. Luke Duncan, Chairman	P.O. Box 190 Fort Duchesne, Utah 84026	10/19/2021 3/8/2024	NA	NA	None	<u>2/21/2025</u>				
	Mr. Julius Murray, Chairman			12/17/2024	12/26/2024	None	<u>2/21/2025</u>				
	Ms. Betsy Chapoose Director/THPO, Cultural Rights Protection Department		10/19/20213 /8/2024	12/17/2024	12/26/2024	None	<u>2/21/2025</u>				
	Ms. Luana Thompson, Natural Resource Director			12/17/2024	12/26/2024	None	<u>2/21/2025</u>				
Northwest Band of the Shoshone Nation	Shane Warner/Dennis Alex Chairmen	2575 Commerce Way Ogden, Utah 84401	10/19/2021, 3/8/2024	12/17/2024	12/26/2024	None	<u>2/21/2025</u>				
	Ms. Patti Timbimboo-Madsen, Cultural Resources		10/19/2021, 3/8/2024	12/17/2024	12/26/2024	None	<u>2/21/2025</u>				
	Brad Parry, Vice Chair			12/17/2024	12/26/2024	None	2/21/2025				

¹ Cons = Consultation, THPO = Tribal Historic Preservation Officer
²Tribal Consultation was initiated separately and during scoping and is documented in the Scoping Report included in Appendix A.
³Documentation is included in Appendix A.
⁴Date of receipt of mail delivery to Tribe.

Initiating the Section 106 process, in letters dated October 19, 2021, NRCS informed the Eastern Shoshone Tribe of the Wind River Reservation, Wyoming; the Shoshone-Bannock Tribes of the Fort Hall Reservation; the Ute Indian Tribe of the Uintah & Ouray Reservation, Utah; and the Northwest Band of the Shoshone Nation about the Proposed Project and requested information regarding historic properties or places of traditional religious and cultural importance near the Project Area that should be considered as part of the analysis. The NRCS provided further opportunity for comment and participation in developing the watershed plan in letters dated March 8, 2024, in coordination and consultation with the Tribes.

The project team also prepared a public participation plan to include Tribes, the public, and other stakeholders in the process. The Tribes were invited to a scoping meeting held virtually on January 28, 2021, and the NRCS provided opportunity for additional comment and participation in developing the watershed plan in letters dated March 8, 2024, with these four federally recognized tribes and other consulting parties during the April 2024 scoping period.

NRCS consulted with the applicable Tribes on the delineation of the APE, site eligibility, and effects, and provided copies of the cultural resource survey report in letters dated December 17, 2024. Follow up with the Tribes was completed on February 21, 2025, via electronic mail. Tribes will be contacted again by forthcoming telephone calls. To date, no response has been received from any Tribes/THPOs. The Section 106 consultation letters can be found in Appendix A. Consultation is ongoing and will be documented in Table 7-1.

7.1.1.2 Agency and Consulting Party Consultation

Cooperating Agencies

The NRCS as the Lead Agency signed a MOU with the EPA and USACE as Cooperating Agencies in the development of the Plan-EIS on October 2, 2024 (Appendix A). As detailed in the MOU, pursuant to 50 CFR Part 402.07 and 36 CFR 800.2(a)(2), the NRCS will serve as the agency official who shall act on behalf of the USACE, fulfilling their collective responsibilities for compliance with Section 106 of the NHPA. Additionally, NRCS will conduct consultations with the Utah SHPO, as well as the Tribes on behalf of the USACE. The USACE, in a letter dated July 7, 2023 and the EPA in a letter dated November 12, 2024 acknowledged that the NRCS is the lead federal agency for compliance with Section 106 of the NHPA, and pursuant to 36 CFR 800.2(a)(2), the USACE designated the NRCS to act on their behalf in any consultations conducted for compliance with NHPA; however, the R8 EPA NEPA Branch directed the NRCS to rely on the SHPOs and THPOs as their branch did not currently have NHPA expertise (see Appendix A for letters).

Although the SHPO and Tribes were not parties to the development of this MOU, they were formally notified of its contents and the designation of NRCS as the lead agency for Section 106 compliance through consultation letters. These letters communicated the roles and responsibilities outlined in the MOU and served as notification of NRCS's lead role in the Section 106 process. NRCS will continue to inform USACE and EPA of any consultations conducted for compliance with these laws.

SHPO and Consulting Parties Coordination

Per 36 CFR 800.3, 36 CFR 800.4, and the MOU (Appendix A), NRCS initiated Section 106 consultation with the Utah SHPO and consulted with the applicable Tribes and cooperating

agencies (USACE and EPA) on the delineation of the APE, site eligibility, and effects, and provided copies of the cultural resource survey report in letters dated December 17, 2024.

SHPO concurrence was received on January 14, 2025. The SHPO concurred with the delineation of the APE, site eligibility, and finding of effects for this undertaking. While the USACE and EPA did not issue formal letters of concurrence, both agencies were provided the Section 106 findings for review, raised no objections, and the USACE's role as a signatory to the MOA confirms their agreement with the findings (see below). NRCS contacted the ACHP on February 4, 2025. The ACHP responded in a letter dated February 14, 2025, in which agreed with the findings and declined to participate further.

7.1.1.3 Resolution of Adverse Effects

The NRCS developed a MOA to resolve adverse effects. In accordance with 36 CFR Part 800.6, NRCS designed mitigation to resolve the adverse effects to the canals through the draft MOA. Mitigation includes documentation of the historical context of the canals in relation to their involvement in the early settlement of the region, an aerial video recording of the canals, aerial photos of select structures, the development of an ArcGIS Story Map, and the re-evaluation of each canal's eligibility once construction is complete.

The NRCS consulted with the Utah SHPO, USACE, and the Eastern Shoshone Tribe of the Wind River Reservation, Wyoming; Northwest Band of the Shoshone Nation; Shoshone-Bannock Tribes of the Fort Hall Reservation; and the Ute Indian Tribe of the Uintah & Ouray Reservation, Utah in the development of the MOA. All tribes declined to respond to further participation in the development of the MOA, whereas the Utah SHPO and USACE agreed to participate in the development and as signatories of the MOA. The draft MOA and all records associated with Section 106 consultation are in Appendix A.

7.1.2 United States Army Corps of Engineers

The USACE has jurisdiction over work in WOTUS under Section 404 of the CWA. The USACE was invited to comment on the project during the scoping period in January 2021. NRCS requested that USACE be a Cooperating Agency for the Proposed Project and the USACE accepted on July 7, 2023. An MOU between NRCS, the EPA, and the USACE was signed on October 2, 2024.

The USACE has been actively involved in the Section 106 process as a consulting party in accordance with 36 CFR 800.2. The USACE, in a letter dated July 7, 2023, acknowledged that the NRCS is the lead federal agency for compliance with Section 106 of the NHPA, and pursuant to 36 CFR 800.2(a)(2), they designated the NRCS to act on their behalf in any consultations conducted for compliance with NHPA (see Appendix A for letters). NRCS has kept the USACE informed of all consultations conducted for compliance with NHPA. In a letter dated December 17, 2024, the NRCS submitted their finding of effect with the cultural resources report to the USACE to notify the agency of the determinations. In accordance with 36 CFR 800.6, the NRCS developed a MOA to resolve adverse effects identified during the Section 106 process. The USACE is a signatory to this MOA, which outlines the cultural mitigation requirements for the Proposed Project, and is included in Appendix A.

The NRCS has been in close coordination with the USACE Cooperating Agency Representative regarding the development of the Logan River project and alternatives, including conducting a site visit on April 23, 2024, with multiple follow-up meetings. The USACE reviewed and

provided comments on the Draft Plan-EIS in February 2025. In June 2025, the USACE visited the Project Area to assess jurisdictional issues and potential mitigation needs. Copies of agency correspondence are included in Appendix A.

Based on the findings of the ARD and the site visits, some waters within the Project Area are likely jurisdictional. Coordination with the USACE regarding Section 404 permitting is pending (Appendix A).

7.1.3 United States Environmental Protection Agency

The EPA was invited to comment on the project during the scoping period in January 2021. NRCS requested that EPA be a Cooperating Agency for the Proposed Project on January 14, 2021; EPA declined on February 3, 2021. Following redesign of the Proposed Project, EPA was again invited to become a Cooperating Agency and accepted on June 27, 2023. The EPA has actively participated in the development of the Draft Plan-EIS. The EPA provided comments on the project during the second scoping period in March 2024. An MOU between NRCS, the EPA, and the USACE was signed on October 2, 2024. The EPA reviewed and provided comments on the Draft Plan-EIS in February 2025. Copies of agency correspondence are included in Appendix A.

The EPA, in a letter dated November 12, 2024, acknowledged that the NRCS is the lead federal agency for compliance with Section 106 of the NHPA, and pursuant to 36 CFR 800.2(a)(2), they designated the NRCS to act on their behalf in any consultations conducted for compliance with NHPA (see Appendix A for letters). The NRCS will inform the EPA of any consultations conducted for compliance with these laws. The EPA is not a signatory to the MOA.

7.1.4 United States Department of Interior, Fish and Wildlife Service

NRCS invited USFWS to comment on the project during the scoping period in January 2021. In May 2024, NRCS notified USFWS in accordance with Section 12 of the WFPO (PL 83-566) inviting the USFWS to submit survey reports or investigations regarding wildlife resources that would be considered in the development of the Draft Plan-EIS and welcomed USFWS participation in the preparation of the Draft Plan-EIS. Coordination with the USFWS Utah Ecological Services Field Office occurred on July 11, 2024, based on a field survey and subsequent BA. After reviewing the Project Area and the specific project activities, USFWS agreed that a no effect determination was appropriate for ESA-listed species, including the ULT and the YBCU and its habitat on July 15, 2024. USFWS coordination details are in Appendix A.

7.2 Coordination

7.2.1 United States Department of Agriculture, Forest Service

The USFS was invited to comment on the project during the scoping period in January 2021. NRCS requested that the USFS be a Cooperating Agency for the Proposed Project on June 26, 2023. Following a discussion of the Proposed Project and anticipated effects, the USFS declined to be a Cooperating Agency on June 27, 2023. Although approximately 0.6 acres of USFS-administered lands are within the Project Area and no effects to USFS lands are anticipated because of the Proposed Project. Copies of agency correspondence are included in Appendix A.

7.2.2 Utah Department of Transportation

The UDOT was invited to comment on the project during the scoping periods in January 2021 and April 2024. Coordination with UDOT is ongoing. If necessary, an Encroachment Permit would be obtained, and a Traffic Control Plan would be prepared prior to beginning construction activities within UDOT's ROW.

7.2.3 Utah Department of Public Safety, Division of Emergency Management

The Utah Division of Emergency Management was invited to comment on the project during the scoping period in January 2021. Utah Division of Emergency Management manages floodplain development permitting in Utah. The Proposed Project would have direct and indirect effects on the floodplain. Representatives from the Utah Division of Emergency Management attended an agency meeting on July 9, 2024, to discuss potential effects from the Proposed Project. Further coordination with the Utah Division of Emergency Management occurred on October 30, 2024, when a determination that both a CLOMR and LOMR would be required for the Proposed Project due to the proposed reduction of lands within the floodplain as a result of the Preferred Alternative (see Utah Department of Public Safety correspondence in the Agency Coordination and Consultation section in Appendix A). Coordination with the Utah Division of Emergency Management on permitting requirements for the Proposed Project is ongoing.

7.2.4 Utah Division of Water Quality

The UDWQ was invited to comment on the project during the scoping periods in January 2021 and April 2024. A UPDES permit from the UDWQ will be required prior to beginning any construction activities that would disturb more than 1 acre of land. Coordination with the UDWQ is pending.

7.2.5 Utah Division of Water Resources

The UDWR was invited to comment on the project during the scoping periods in January 2021 and April 2024.

7.2.6 Utah Division of Water Rights

The UDWRi was invited to comment on the project during the scoping periods in January 2021 and April 2024. Any change in operations of the Logan River is subject to approval by the UDWRi. Coordination with the UDWRi is pending.

7.2.7 Utah Division of Wildlife Resources

The UDWRwl was invited to comment on the project during the scoping periods in January 2021 and April 2024. A state sensitive species list was obtained as part of the biological resource analysis and the BA determined that no effects would occur to state sensitive species from the implementation of the Proposed Project.

7.2.8 Utah Department of Natural Resources

The Paleontological Assistant for the UDNR–UGS reviewed the Proposed Project on October 3, 2024, and determined no paleontological localities are located in or near the Proposed

Project. See UDNR correspondence in the Agency Coordination and Consultation section in Appendix A.

7.2.9 Utah State University and Utah Water Research Laboratory

The NRCS and Sponsors have been coordinating with USU and UWRL since the inception of the project, and details are provided in Appendix E3, TM-009. The USU and UWRL were members of the TAC for the master planning efforts for the Crockett Pressurized Irrigation Master Plan which recommended constructing the PI system (J-U-B and Franson Civil Engineers 2019). The UWRL also provided the water modeling for flow rates, water temperature, and dissolved oxygen for the Plan-EIS analysis (see Appendix E3, TM-002) and Bethany Neilson of the UWRL wrote TM-011—Water Quality Impacts with F. Michael Lasswell, Logan River Water Commissioner (in Appendix E4).

Logan River First Dam (First Dam) is a small concrete dam that was built from 1911 to 1914, and is owned, operated, and maintained by USU. Two phases of rehabilitation of the First Dam were completed in 1993 and 2002. USU generates hydropower from a low head turbine generator at First Dam and the 350 kilowatts is fed directly into the campus power grid. Power produced by the First Dam turbine generator is a small but profitable contribution to USU's overall power requirement. First Dam supplies water to the UWRL and local irrigation companies, including CAIC. The Utah legislature authorized the establishment of the UWRL in 1959. UWRL's unique facility can pass up to 250 cfs of water, enabling testing and calibrating flow meters, valves and pipes, and any imaginable hydraulic equipment, as well as running scale models of dams and spillways.

The First Dam Alternative was developed to enhance water quality and fulfill the irrigation requirements of the CAIC system, while safeguarding UWRL research and operations, and ensuring that USU maintains access to green energy as part of its commitment to achieving net carbon-zero status.

Most recently, CWD and J-U-B met with USU and UWRL staff on July 7, 2025, to discuss the Draft Plan-EIS, concerns, and benefits of the project. USU and UWRL staff identified the project benefits including dredging, instream flows, automation, ease of operation at UWRL, power generation transfer, green energy credits, and addressing diversion flood issues. The CWD and USU discussed developing a Cooperative Agreement during the planning phase of the Proposed Project to preliminarily identify First Dam operations and autonomy and in preparation for the transition to the MOU (see next paragraph). The agreement would cover the financial input to O&M; insurance and risk; public relations; design review for automation and operations; and the consideration of debris removal. It also would include the previously enumerated benefits.

After the decision and before construction, USU, UWRL, Board of CAIC, Logan City, North Logan City, and Hyde Park City will develop an MOU as to the operation of First Dam, the PI system, and UWRL flow capacity requirements. This MOU will clarify and simplify various management responsibilities, thus decreasing management complexity of the infrastructure.

7.2.10 CAIC Technical Advisory Committee (TAC)

During early project planning, a TAC was formed to gather critical information, address stakeholders' needs, and regularly update stakeholders about the evaluation progress. The TAC

included staff and political representatives from CAIC including a member from each irrigation company, Logan City, North Logan City, Hyde Park City, the CWD, USU, and the UWRL.

During master planning efforts, the TAC determined that the most beneficial alternative was to build a complete pressure irrigation system (J-U-B and Franson Civil Engineers 2019). The Logan River Watershed Project team has actively coordinated with the members of the TAC throughout the planning process.

7.2.11 Cache County

Coordination with Cache County is ongoing. If necessary, an encroachment permit would be obtained from the Cache County Public Works Road Division would be prepared before beginning construction activities within Cache County's ROW. Cache County and the Sheriff's Department would be notified if traffic or access would be delayed due to construction activities.

7.2.12 Logan City

Coordination with the City of Logan is ongoing, as Logan City is a Co-sponsor of the Proposed Project. If necessary, an encroachment permit would be obtained from the City of Logan's Street Maintenance Division before beginning construction activities within the city's ROW.

7.2.13 North Logan City

Coordination with North Logan City is ongoing, as North Logan City is a Co-sponsor of the Proposed Project. Coordination with North Logan City on permitting requirements for the Proposed Project are ongoing.

7.2.14 Hyde Park City

Coordination with Hyde Park City is ongoing, as Hyde Park City is a Co-sponsor of the Proposed Project. Coordination with Hyde Park City on permitting requirements for the Proposed Project are ongoing.

7.2.15 Crockett Avenue Irrigation Company

CAIC is made up of ten separate irrigation companies including: BIC, HPIC, Logan Cow Pasture Irrigation Company, Logan Island Irrigation Company, LNFIC, Logan Northwest Field Irrigation Company, Logan Southwest Field Irrigation Company, Seventh Ward Irrigation Company, Sunday Water Users Ditch and Thatcher Irrigation Company.

Coordination with CAIC is ongoing, as CAIC is a Co-sponsor of the Proposed Project. CAIC proposes to use federal funds to implement the Proposed Project.

7.3 Public Involvement

7.3.1 Public Participation

The main goal of public participation is to involve diverse groups of the public, Tribes, and government agency representatives to solicit input and provide relevant and timely information throughout the NEPA review process. Public participation is meant to engage all demographics of the public in the NEPA review process who may be potentially affected by the Proposed Project. Outreach methods are described in the following section. Table 7-2 lists the project's

completed public outreach activities to date and pending activities. The Logan Creek Watershed Scoping Report in Appendix A includes the detailed scoping process, including letters, meetings, and comments from the public, stakeholders, and agencies.

The NRCS regularly updated the Logan River Watershed Project webpage throughout the planning process at: <https://www.nrcs.usda.gov/conservation-basics/conservation-by-state/utah/logan-river-watershed-project>.

Table 7-2. Public Outreach Activities

Date	Activity	Type
December 4, 2020	Preliminary Kick-off Meeting	Meeting
January 8, 2021	Virtual Key Stakeholder Pre-Scoping Meeting	Meeting
January 12, 2021	Agency Scoping Letters Mailed	Mailing
January 14, 2021, and January 21, 2021	Public Notice Published in the Logan Herald Journal	Newspaper Publication
January 14, 2021	Public Scoping Comment Period Opened	Comment Period
January 15, 2021	Public Scoping Postcards Mailed	Mailing
January 20, 2021	Virtual Agency Scoping Meeting	Meeting
January 28, 2021	Virtual Public Scoping Meeting	Meeting
February 16, 2021	Property Owner Postcards Mailed	Mailing
March 4, 2021	Virtual Property Owners Meeting	Meeting
March 7, 2024	NRCS website updated	Online Notification
March 11, 2024	NOI to prepare EIS and Proposed Action published Logan River Watershed Plan in the FR	FR Notice
March 12, 2024	Public Notice of NOI Published in the Logan Herald Journal	Newspaper Publication
March 13, 2024	NOI public mailer sent	Mailing
March 16, 2021	Scoping Period Closed	Comment Period
April 10, 2024	Scoping Public Comment Period Closed, as stated in FR	Comment Period
November 14, 2024	Public Open House Meeting email invitation sent	Mailing
November 18, 2024	Logan River Public Open House Meeting, at Cache County Council Chambers, with virtual attendance option	Meeting
May 8, 2026	Notice of Availability (NOA) of Logan River Watershed Draft Plan–EIS published in the FR	FR Notice
May 8, 2026	Notice of Draft Plan–EIS Public Comment Period Open, 45-day comment period	Mailing, Newspaper and Online Notification
TBD	Draft Plan–EIS Meetings	Meeting
June 22, 2026	Draft Plan–EIS Public Comment Period Closed	Comment Period
TBD	NOA of Logan River Watershed Final Plan–EIS published in the FR. Beginning of EPA 45-day administrative action period.	FR Notice

Date	Activity	Type
TBD	Notice of Final Plan-EIS	Mailing, Newspaper and Online Notification
TBD	Sign Record of Decision (ROD)	ROD
TBD	NOA of Logan River Watershed Record of Decision published in the FR	FR Notice

7.3.2 Project Scoping

Chapter 1 describes the scoping process for the Proposed Project in detail. The scoping procedure for the formulation of this Draft Plan–EIS followed the general procedures outlined in the NRCS NWPH (NRCS 2014) and the NRCS NWPM (NRCS 2015). NRCS procedures require that the NRCS use a scoping process early in the planning phase to identify issues, concerns, and potential effects that require analysis.

7.3.3 Public Outreach

The scoping notice on the proposed action was published on January 14, 2021, and January 21, 2021. Participants were invited to submit comments in writing by mail or email during the scoping comment period. The scoping period officially opened on January 14, 2021, and ended on March 16, 2021, a total of 60 days. Seven hundred and eighty-one (781) scoping comments were received during the scoping comment period. Comments received during scoping included the following topics:

- Project plan purpose
- Agricultural water management and effects
- Flood control
- Recreation
- Alternatives
- Effects to wildlife and habitat, water flows, fish passage
- Effects to stakeholders and beneficiaries
- Effects to property and values
- NEPA/Plan process and public input
- Requests for information.

The NOI to prepare an EIS was published on March 11, 2024, in the FR. The 30-day public comment period ended on April 10, 2024. Participants were invited to submit comments in writing by mail or email during the comment period. One hundred and sixty (160) comments were received during the scoping period. Comments received during scoping were similar to comments received in 2021, but also included the following topics:

- Alternative proposals
- Preservation of the Little Logan, base and low flows
- Opposition to piping
- Effect to recreation opportunities
- Effect to the human health

- Project costs and feasibility
- Legal concerns about water rights
- Community engagement
- Interest in the process for decision making.

See Appendix E3, TM-009 for USU Facilities Comments and Concerns.

On November 18, 2024, the Project Team invited agencies, stakeholders, and the public to attend a project update meeting. The meeting was held at the Cache County Council Chambers, from 6:00 p.m. to 8:00 p.m., with a virtual attendance option. The presentation included: information about the project, status of the planning effort, alternative development, estimate residential water rates, Logan River flow estimate, Little Logan, and the project schedule. There was an opportunity to ask questions. Approximately 80 people attended the meeting in person and another 60 attended online.

7.3.4 Agency Involvement

The NRCS coordinated with local, state, and federal agencies regarding subjects pertinent to their jurisdiction, authority, and expertise. Prior to initial scoping, the NRCS approved a scoping letter and project map developed by J-U-B. Federal, state, and local agencies participated in the project formulation and were given the opportunity to comment on the Proposed Project. Agency coordination occurred via telephone, email, and written letters. A project scoping letter was mailed on January 12, 2021, to 42 government agencies as detailed in the Scoping Report (Appendix A). The purpose of the scoping letter was to inform agencies of the Proposed Project and to request preliminary comments on the proposal.

Similar to the request for comment on the Proposed Project scoping letter, federal, state, and local agencies participated in the project formulation and were given the opportunity to comment on the NOI to prepare an EIS that was published in the FR on March 11, 2024. A project letter was mailed to government agencies as detailed in the Scoping Report (Appendix A).

Formal coordination and consultation with Tribes, SHPO, USACE, and EPA were initiated and will be completed by NRCS; see Section 7.1.

Additionally, consistent with E.O. 12372, letters were mailed to the Utah Governor's office with project information on February 22, 2021, and in March 2024.

The following agencies received a project scoping letter and/or NOI:

- Federal
 - Bureau of Land Management (BLM), Pinedale Field Office
 - Bureau of Reclamation (Reclamation), Provo Area Office
 - EPA, Region 8 (*Cooperating Agency*)
 - U.S. Army Corps of Engineers (USACE), Bountiful Regulatory Office (*Cooperating Agency*)
 - U.S. Fish and Wildlife Service (USFWS)
 - U.S. Forest Service (USFS), Uinta-Wasatch-Cache National Forest, Logan Ranger District
- State & Local
 - Bear River Watershed Coordinator
 - Cache County

- Hyde Park City
- Logan City
- Logan City, Storm, Water and Wastewater Advisory Board
- Logan River Task Force
- North Logan City
- Utah Department of Transportation (UDOT), Region One
- Utah Department of Public Safety, Division of Emergency Management
- Utah Department of Environmental Quality (UDEQ)
- Utah Division of Homeland Security
- Utah Division of State History
- Utah Division of Water Quality (UDWQ)
- Utah Division of Water Resources (UDWR)
- Utah Division of Water Rights (UDWRi), Northern Regional Office
- Utah Division of Wildlife Resources (UDWRwl)
- Utah Governor's Office of Planning and Budget
- Utah Public Lands Policy Coordinating Office (PLPCO)
- Utah State Clearinghouse
- Utah State Historic Preservation Office (SHPO)
- Utah Trust Lands Administration (UTLA)

7.4 Plan Development and Review

NRCS, USACE, and EPA reviewed and commented on the Draft Plan–EIS before issuing it for public review. Agency comments on the Draft Plan–EIS were addressed before it was issued to the public.

7.4.1 Draft Plan–EIS Public Comment Period

A NOA of the Draft Plan–EIS will be published in the FR on May 8, 2026. A 45-day comment period will begin on the date that EPA publishes the NOA. The Draft Plan-EIS will be distributed to Tribes, other federal agencies, state and local agencies, organizations, groups, and individuals. All public comments will be included in Appendix A of the Final Plan–EIS.

7.4.2 Final Plan–EIS Public Comment Period

[Pending] A NOA of the Final Plan–EIS will be published in the FR by the NRCS. This publication will begin EPA's 45-day administrative action period. There will be no public comment period on the Final Plan–EIS. The Final Plan-EIS will be distributed to Tribes, other federal agencies, state and local agencies, organizations, groups, and individuals. Appendix A of the Final Plan–EIS will include comments received on the Draft Plan-EIS and the responses to those comments.

7.5 Distribution List

A NOA for the Plan–EIS will be distributed to the following Tribes, federal and state agencies, and local governments and organizations (Table 7-3). The names and addresses of individuals who will receive notice of the Plan–EIS are not listed in this chapter for privacy purposes.

Table 7-3. Plan–EIS Distribution List

Type of Agency or Organization	Name of Agency or Organization
Tribe	Eastern Shoshone Tribe of the Wind River Reservation, Wyoming
Tribe	Northwest Band of the Shoshone Nation
Tribe	Shoshone-Bannock Tribes of the Fort Hall Reservation
Tribe	Ute Indian Tribe of the Uintah & Ouray Reservation, Utah
Federal	Bureau of Land Management (BLM), Pinedale Field Office
Federal	Bureau of Reclamation (Reclamation), Provo Area Office
Federal	Environmental Protection Agency (EPA), Region 8 (<i>Cooperating Agency</i>)
Federal	USDA Forest Service (USFS), Uinta-Wasatch-Cache National Forest, Logan Ranger District
Federal	USDA-Natural Resource Conservation Service (NRCS) (<i>Lead Agency</i>)
Federal	U.S. Army Corps of Engineers (USACE), Bountiful Regulatory Office (<i>Cooperating Agency</i>)
Federal	U.S. Fish and Wildlife Service (USFWS)
State	Utah Department of Transportation (UDOT), Region One
State	Utah Department of Public Safety
State	Utah Department of Cultural and Community Engagement
State	Utah Department of Environmental Quality (UDEQ)
State	Utah Division of Emergency Management, Flood Management Program
State	Utah Division of Homeland Security
State	Utah Division of Water Quality (UDWQ)
State	Utah Division of Water Resources (UDWR)
State	Utah Division of Water Rights (UDWRi), Northern Regional Office
State	Utah Division of Wildlife Resources (UDWRwl)
State	Utah Governor’s Office of Planning and Budget
State	Utah Public Lands Policy Coordinating Office (PLPCO)
State	Utah State Clearinghouse
State	Utah State Historic Preservation Office (SHPO)
State	Utah Trust Lands Administration (UTLA)
State	Utah State University (USU)
State	Bear River Watershed Coordinator
State	Blacksmith Fork Soil and Conservation District
State	North Cache Soil and Conservation District
County	Cache County
City	Logan City (<i>Co-Sponsor</i>)
City	Logan City, Storm, Water and Wastewater Advisory Board
City	North Logan City (<i>Co-Sponsor</i>)
City	Hyde Park City (<i>Co-Sponsor</i>)
Local	Cache Water District (<i>Co-Sponsor</i>)
Local	Cache Highline Canal/Logan River Water Users
Local	Crockett Avenue Irrigation Company (CAIC) (<i>Co-sponsor</i>)
Local	Crockett Avenue Irrigation/Benson Irrigation Company (BIC)

Type of Agency or Organization	Name of Agency or Organization
Local	Crockett Avenue Irrigation/Logan Southwest Field
Local	Hyde Park Irrigation Company (HPIC)
Local	Hyde Park Canal Co.
Local	Irrigation Shareholders
Local	Logan Cow Pasture
Local	Logan Island Irrigation
Local	Logan North Field Irrigation Company (LNFIC)
Local	Logan Northwest Field
Local	Seventh Ward Irrigation
Local	Sunday Water Users Irrigation
Local	Thatcher Irrigation
Local	Logan River Task Force
Local	Neighborhood Councils
Local	Adams Neighborhood
Local	Hillcrest Neighborhood
Local	Wilson Neighborhood
Local	Woodruff Neighborhood
Local	Audubon Society
Local	Bear River Land Conservancy
Local	Cache County Trail Coordinator
Local	Cache Valley Anglers
Local	Kayakers
Local	Nature Conservancy
Local	PacifiCorp
Local	Trout Unlimited
Local	River Point Homeowners Association (HOA)

Chapter 8 References

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Chapter 9 List of Preparers and Reviewers

The Draft Plan–EIS was reviewed and concurred with by State staff specialists having responsibility for engineering, conservation partnerships, and cultural resources. This review was followed by a review by the National Water Management Center (NWMC). Table 9-1 lists the individuals who assisted in preparing and the NRCS State staff specialists who assisted in reviewing this Draft Plan–EIS.

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Chapter 10 Acronyms, Abbreviations, and Short Forms

The following table lists the acronyms, abbreviations, or short forms used in this Draft Plan–EIS and the terms they represent (Table 10-1).

Table 10-1. Acronyms, Abbreviations, and Short Forms Used in this Document

Acronym or Abbreviation	Term
ac-ft	acre-feet
ACHP	Advisory Council on Historic Preservation
ACS	American Community Survey
ADA	Americans with Disabilities Act
AICP	American Institute of Certified Planners
AMSL	above mean sea level
APE	area of potential effects
ARD	Aquatic Resources Delineation
B.A.	Bachelor of Arts
BA	Biological Assessment
BACT	Best Available Control Technology
BCA	benefit-cost analysis
BCR	benefit-cost ratio
BGEPA	Bald and Golden Eagle Protection Act
BIA	Bureau of Indian Affairs
BIC	Benson Irrigation Company
BLM	U.S. Bureau of Land Management
BMP	best management practice
B.S.	Bachelor of Science
CAA	Clean Air Act
CAIC	Crockett Avenue Irrigation Company
CAP	Conservation Action Plan
CDP	Census-designated Population
Census	U.S. Census Bureau
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulation
cfs	cubic feet per second
CGP	Construction General Permit
CH ₄	methane
CO	carbon monoxide
CO ₂	carbon dioxide
CLOMR	Conditional Letter of Map Revision
CVTD	Cache Valley Transit District
CWA	Clean Water Act
CWD	Cache Water District

Acronym or Abbreviation	Term
CY	cubic yard
dBA	decibels
DCH	designated critical habitat
DM	Departmental Manual
DR	Departmental Regulation
EA	Environmental Assessment
EDRR	Early Detection Rapid Response
EFH	Essential Fish Habitat
EHR	Erosion Hazard Rating
EIS	Environmental Impact Statement
EMS	emergency management services
E.O.	Executive Order
EPA	U.S. Environmental Protection Agency
ERC	equivalent residential connection
ESA	Endangered Species Act
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
FIRM	Flood Insurance Rate Map
FPPA	Federal Farmland Protection Policy Act
FR	Federal Register
FWFI	Future With Federal Investment
FWOFI	Future Without Federal Investment
FWOP	Future Without Project
GHG	greenhouse gases
gpm	gallon per minute
HFC	hydrofluorocarbons
HOA	Homeowners Association
HPIC	Hyde Park Irrigation Company
HUC	Hydrologic Unit Code
IPaC	Information for Planning and Consultation
J-U-B	J-U-B ENGINEERS, Inc.
Kem	Kem C. Gardener Policy Institute
kW/hr	kilowatt-hour
lb	pounds
LF	Linear feet
LNFIC	Logan North Field Irrigation Company
LRTF-CAP	Logan River Task Force Conservation Action Plan
LRWUA	Logan River Water Users Association
LT	Listed Threatened
LOMR	Letter of Map Revision
M.A.	Master of Arts
M.A.S.	Master of Applied Science
M.B.A.	Master of Business Administration

Acronym or Abbreviation	Term
MBTA	Migratory Bird Treaty Act
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
mmhos/cm	millimhos per centimeter
M.S.	Master of Science
N ₂ O	nitrous oxide
NAAQS	National Ambient Air Quality Standards
NACD	Native American Consultation Database
NASS	National Agricultural Statistics Service
NECH	National Environmental Compliance Handbook
NEE	national economic efficiency
NEM	National Engineering Manual
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NLCS	National Landscape Conservation System
NO ₂	nitrogen dioxide
NOA	Notice of Availability
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent
NPDES	National Pollution Discharge Elimination System
NPS	National Park Service
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NWMC	National Water Management Center
NWPH	National Watershed Program Handbook
NWPM	National Watershed Program Manual
O ₃	ozone
O&M	Operations and Maintenance
OM&R	Operations, Maintenance, and Replacement
OMB	Office of Management and Budget
Pb	lead
P&R	Principles and Requirements for Federal Investments in Water Resources (see CEQ 2013)
P.E.	Professional Engineer
PFC	perfluorocarbons
PFYC	Potential Fossil Yield Classification
Ph.D.	Doctor of Philosophy
PI	Pressurized irrigation
PL	public law
PL 83-566	Watershed Protection and Flood Prevention Act; Public Law 83-566
Draft Plan–EIS	Draft Watershed Plan–Environmental Impact Statement
PLPCO	Public Lands Policy Coordinating Office
PM	particulate matter

Acronym or Abbreviation	Term
PR&G	Principles, Requirements, and Guidelines
Project Area	Proposed Project Area
Proposed Project	Logan River Watershed Project
PRPA	Paleontological Resources Preservation Act of 2009
RCP	reinforced concrete pipe
RCRA	Resource Conservation and Recovery Act
Reclamation	U.S. Bureau of Reclamation
ROW	right-of-way
RPA	Registered Professional Archaeologist
SCADA	supervisory control and data acquisition
SF ₆	sulfur hexafluoride
SGCN	Species of Greatest Conservation Need
SHPO	State Historic Preservation Office
SIP	State Implementation Plan
SO ₂	sulfur dioxide
SOI	Secretary of Interior
SPCC	Spill Prevention, Control, and Countermeasure
STC	State Conservationist
SWCA	Steven W. Carothers & Associates Environmental Consultants
SWPPP	Storm Water Pollution Prevention Plan
t/yr	tons per year
TAC	technical advisory committee
TBD	to be determined
TDAT	Tribal Directory Assessment Tool
TESCs	temporary erosion and sediment controls
THPO	Tribal Historic Preservation Office
TM	Technical memorandum
TMDL	Total Maximum Daily Load
UAC	Utah Administrative Code
UDAF	Utah Department of Agriculture and Food
UDEQ	Utah Department of Environmental Quality
UDEQ-AQD	Utah Department of Environmental Quality–Air Quality Division
UDIA	Utah Division of Indian Affairs
UDNR	Utah Department of Natural Resources
UDOT	Utah Department of Transportation
UDWR	Utah Division of Water Resources
UDWRi	Utah Division of Water Rights
UDWRwl	Utah Division of Wildlife Resources
UGS	Utah Geological Survey
UIN	NEPA Unique Identification Number
ULT	Ute Ladies’-tresses (<i>Spiranthes diluvialis</i>)
UNHP	Utah Natural Heritage Program
UPDES	Utah Pollutant Discharge Elimination System

Acronym or Abbreviation	Term
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
USU	Utah State University
UTLA	Utah Trust Lands Administration
UWRL	Utah Water Research Laboratory
VRM	Visual Resource Management
WETS	Wetlands Climate Analysis Tables
WFPO	Watershed and Flood Prevention Operations
WOTUS	Waters of the U.S.
WSE	water surface elevation
WWTP	Wastewater treatment plant
YBCU	Yellow-billed cuckoo