USDA United States Department of Agriculture

Draft Supplemental Watershed Plan and Environmental Assessment

Warner Draw Watershed and Flood Operations Project

Warner Draw Watershed Washington County, Utah

Lead Federal Agency:
USDA Natural Resources Conservation Services

Sponsoring Local Organizations:
Washington County | City of Hurricane | Washington City | City of St. George
Washington County Water Conservancy District | The Nature Conservancy

December 2021

Utah State Office
Natural Resources Conservation Service
nrcs.usda.gov/

Draft
Supplemental Watershed Plan No. 9 and Environmental Assessment for the Warner Draw Watershed and Flood Prevention Operations Project Warner Draw Watershed Washington County, Utah

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

Cooperating Agency: None

Sponsoring Local Organization (SLO): Washington County, City of Hurricane, Washington City, City of St. George, Washington County Water Conservancy District, and The Nature Conservancy.

Authority: This Supplemental Watershed Plan No. 9 and Environmental Assessment (Plan-EA) has been prepared under the authority of the NRCS Watershed and Flood Prevention Operations Program, which includes the Flood Prevention Operations Program authorized by the Flood Control Act of 1944 (Public Law [PL] 78-534) and the provisions of the Watershed Protection and Flood Prevention Act of 1954 [Public Law 83-566 (PL 83-566) Stat. 666 as amended (16 U.S.C Section 1001 et seq.).

Abstract: The original Watershed Work Plan for the Warner Draw Watershed was developed in 1968 for watershed protection and flood prevention measures to protect urban and agricultural areas, and for agricultural water management. Development, urbanization, and changed land use conditions within the watershed have affected the health of the Virgin River and have increased flood damages. The purpose of the project is to improve flood prevention, watershed protection, public recreation, and agricultural water management in the Warner Draw Watershed. There is a need to reduce flood damages to developed and agricultural areas of St. George and Washington City; to improve irrigation water delivery efficiency for the existing flood irrigation systems in Hurricane that would also benefit Virgin River water quantities; to expand trail systems for recreation, education, and public safety; and to improve Virgin River ecosystems. The improvements proposed at five sites across the Warner Draw Watershed consist of: 1) Constructing debris basins upstream of Main Street in Washington City; 2) Habitat improvements and conservation education opportunities along a section of the Virgin River in St. George; 3) Piping an open drainage channel (Y-Drain) in St. George and Washington City; 4) Adding water conveyance capacity to the Warner Valley Disposal System in St. George; and 5) Installing a pressurized irrigation system in Hurricane. The installation cost for this project is estimated at $36,778,000. NRCS would fund $23,638,500 of the installation cost and the SLOs would be responsible for $13,139,500.

Comments: NRCS has completed this Draft Supplemental Watershed Plan No. 9 and Environmental Assessment (Plan-EA) in accordance with the National Environmental Policy Act (NEPA) and NRCS guidelines and standards. Reviewers should provide their comments to NRCS during the allotted Draft Plan-EA review period. Comments need to be submitted by February 14, 2022, to become part of the Administrative Record. Please send comments to NRCS on behalf of:

Jamie Tsandes – Bowen Collins & Associates
154 E 14075 South, Draper, UT 84020
801-495-2224
warnerwatershed@bowencollins.com

Further information may also be obtained for this project by contacting the following NRCS personnel:

Derek Hamilton – NRCS Water Resources Coordinator
125 South State Street, Room 4010, Salt Lake City, UT 84138-1100
801-524-4560

derek.hamilton@usda.gov

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

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

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

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

SUPPLEMENTAL WATERSHED PLAN AGREEMENT NO. 9
(TO BE INCLUDED IN FINAL PLAN-EA)

Table of Contents

List of Tables

List of Figures

Appendices

Summary (Office of Management and Budget Fact Sheet)

S-1. Title of Proposed Action

Draft Supplemental Watershed Plan No. 9 and Environmental Assessment (Plan-EA) for the Warner Draw Watershed and Flood Prevention Operations Project (Project)

S-2. Watershed Name

Warner Draw Watershed

S-3. County, State

Washington County, Utah

S-4. Congressional District

Utah Congressional District 2

S-5. Sponsoring Local Organization

The Sponsoring Local Organizations (SLOs) for the Project are Washington County, City of Hurricane, Washington City, City of St. George, Washington County Water Conservancy District, and The Nature Conservancy.

S-6. Cooperating Agencies

None

S-7. Authority

This Plan-EA has been prepared under the authority of United States Department of Agriculture Natural Resources Conservation Service (NRCS) Watershed and Flood Prevention Operations (WFPO) Program, which authorizes funding to help urban and rural communities protect, improve, and develop land resources in watersheds up to 250,000 acres in size. The WFPO Program includes the Flood Prevention Operations Program authorized by Flood Control Act of 1944 (Public Law [PL] 78-534) and the provisions of the Watershed Protection and Flood Prevention Act of 1954 (PL 83-566) Stat. 666 as amended (16 U.S.C. Section 1001 et seq.). The Plan-EA has been prepared in accordance with Section 102(2)(c) of the National Environmental Policy Act (NEPA) of 1969, Public Law 91-190, as amended (42 U.S.C. 43221 et seq.).

S-8. Purpose and Need for Action

The purpose of the Project is to improve flood prevention, watershed protection, public recreation, and agricultural water management in the Warner Draw Watershed. There is a need to reduce flood damages to developed and agricultural areas of St. George and Washington City; to improve irrigation water delivery efficiency for the existing flood irrigation systems in Hurricane that would also benefit Virgin River water quantities; to expand trail systems for recreation, education, and public safety; and to improve Virgin River ecosystems.

S-9. Description of Preferred Alternative

The preferred alternative for the Project consists of 1) Constructing debris basins upstream of Main Street in Washington City; 2) Habitat and recreation improvements that provide education opportunities along a section of the Virgin River in St. George; 3) Piping an open drainage channel (Y-Drain) and constructing a public trail in St. George and Washington City; 4) Adding water conveyance capacity to the Warner Valley Disposal System and constructing a public trail in St. George; and 5) Installing a pressurized irrigation system in Hurricane.

S-10. Resource Information

Table S-1 lists the relevant resource information for the Project.

Table S - 1. Existing Resource Information

Feature	Description
Latitude / Longitude (WGS84)	
Site 1 (Main Street Debris Basins)	37.146280° / -113.506273°
Site 2 (Seegmiller Marsh)	37.093151° / -113.534903°
Site 3 (Y-Drain)	37.097142° / -113.521195°
Site 4 (Warner Valley Disposal System)	37.163421° / -113.300941°
Site 5 (Hurricane Water Efficiency)	37.061653° / -113.518921°
Hydrologic Unit Number	1501000809 (Gould Wash-Virgin River)
Climate[1]	July average high/low: 102°F / 75°F January average high/low: 54°F / 31°F Annual precipitation: 8.85 inches
Watershed Topography	Steep mountainous terrain with flat-topped mesas (east of Hurricane Cliffs) / Lowlands with floodplains and alluvial fans surrounded by badland-type topography (west of Hurricane Cliffs) Elevation Range: 2,500 to 8,000 feet
Warner Draw Watershed Area	298 square miles
Land Uses (Warner Draw Watershed)[2]	Undeveloped: 85% Developed: 11% Agricultural: 3% Open Water 1%
Land Ownership (Warner Draw Watershed)	Private: 46% State: 11% Federal: 43%
Population (Washington County)[3]	151,959
Demographics (Washington County)[3]	White: 91.2% African American: <0.6% American Indian and Alaska Native: <1.4% Asian: 0.7% Native Hawaiian and Pacific Islanders: 0.8% Other: 2.9% Two or More Races: 2.3%

Feature	Description
Farms Present (Washington County)[4]	537
Land in Farms (Washington County)[4]	155,047 acres
Average Farm Size (Washington County)[4]	289 acres
Relevant Resource Concerns	See Table S-4

[1] Source: St George Chamber of Commerce 2018
[2] Undeveloped land consist of barren land, forests, wetlands, shrub/scrub lands, and herbaceous lands. Developed lands consist of low-high intensity developed areas and developed open space areas. Agricultural land consists of cultivated crops and pasture/hay areas.
[3] Source: U.S. Census Bureau (Census Bureau) 2016
[4] Source: USDA 2017

S-11. Alternative Plans Considered

Alternative plans considered in detailed study and evaluated in this Plan-EA include the No Action Alternative and the Action Alternative for Sites 1 through 5. The Action Alternative at Sites 1 through 5 is the preferred alternative and is the National Economic Development (NED) Alternative for the Project. Several other alternatives were considered during the planning process but were eliminated from detailed study due to environmental impacts; if they were considered infeasible, had exorbitant costs, or did not meet the purpose and need of the Project; or other critical factors. A description of the alternatives analyzed in detailed study and associated installation and operation and maintenance (O&M) costs are included below. The installation costs for the alternatives were prepared to equal levels of detail judged appropriate for identification of the NED alternative. Installation costs are to include, as applicable, construction, engineering, real property rights, natural resource rights, permitting, replacement in-kind relocation payments, and administration costs.

No Action Alternative – The No Action Alternative consists of the most likely future condition if none of the federally assisted action alternatives are selected. The No Action Alternative measures at each site are described below. The installation cost for this alternative was estimated at $5,117,500 and would be funded by the SLOs.

- Main Street Debris Basin (Site 1): The Sponsors would not construct any improvements at this site, but the existing facilities would be regularly maintained.
- Seegmiller Marsh (Site 2): The Sponsors would construct an asphalt and gravel recreation trail with bird viewing stations and purchase approximately 80 acres of land to protect and conserve the existing Virgin River floodplain. The installation cost for this alternative is estimated $1,561,000
- Y-Drain (Site 3): The open channel section of the Y-Drain would be fenced by the Sponsors at an installation cost of approximately $26,500.
- Warner Valley Disposal System (Site 4): The Sponsors would construct asphalt pedestrian and unpaved equestrian trails along the Warner Valley Disposal System alignment, with an installation cost of $3,530,000.
- Hurricane Water Efficiency (Site 5): The Sponsors would not construct any improvements at this site, but the existing facilities would be regularly maintained.

Action Alternative – This alternative would consist of measures at five sites across the Warner Draw Watershed to reduce flood damages, enhance Virgin River ecosystems, improve water delivery efficiency, and add recreational/educational opportunities. The total installation cost for this action is approximately $36,778,000, with NRCS funding approximately $23,638,500 and the SLOs funding approximately $13,139,500. A breakdown of cost by site and item are included in Table S-2.

- Site 1: Two new debris basins would be constructed upstream of Main Street in Washington City to provide flood prevention for the downstream community. The basins would be capable of attenuating flood flows up to and including a 100-year storm event. In addition, four new catch basins would be installed, 740 feet of associated piping installed, and 150 feet of piping replaced. Installation costs are estimated at $3,098,000.
- Site 2: Several measures would be performed to enhance riparian habitat, improve water quality, and conserve and develop recreation and scenic resources at Seegmiller Marsh. Sediment would be removed along the east side of the Virgin River for improved flood conveyance and to reduce lateral erosion. Riprap erosion protection would be installed on the west side of the Virgin River to protect adjoining lands and reduce bank erosion. Upland areas on the east side of the Virgin River would be regraded with conveyance channels and revegetated with native riparian and wetland plant species to increase and enhance riparian and marsh habitat. A sediment trap would be installed to decrease sediment and trash entering the new riparian/marsh area from the Washington Fields Drain. Trails and educational signage would be constructed along select areas of the site. Permanent easements or property rights would need to be obtained for approximately 80 acres of land to conserve and protect the riparian habitat. Installation costs are estimated at $6,509,000.
- Site 3: Approximately 1,125 linear feet of pipe would be installed along the Y-Drain to pipe an existing open section of the drain and approximately 80 linear of feet of pipe replaced. A new asphalt trail would be installed adjoining the pipe alignment. Piping the channel and installing a trail would decrease sediment and contaminants draining into the channel, provide better conveyance for water, reduce flooding, and decrease the public health and safety hazard. Installation costs are estimated at $1,323,000.
- Site 4: Two new detention basins would be installed to provide additional capacity for the Warner Valley Disposal System to reduce flooding for up to and including the 100-year storm event. Modification along the approximately 13,650 linear feet disposal system alignment would also include replacing 1,100 linear feet of pipe, piping 1,225 linear feet of open channel, installing a new outfall at Fort Pearce Wash, raising six manholes, and constructing new pedestrian and equestrian trails adjoining the disposal system alignment. Installation costs are estimated at $7,411,000.
- Site 5: Portions of Hurricane City would be converted from a flood irrigation system to a pressurized irrigation system to improve irrigation water delivery efficiency and benefit Virgin River water quantities. Approximately 56,150 linear feet of irrigation piping would be installed throughout the town and a new pump station constructed. The pump station would consist of two 3-million-gallon storage ponds, a sludge pond, and a booster pump station. Installation costs are estimated at $18,437,000.

S-12. Project Costs and Funding Source

The breakdown of the estimated installation cost of for the preferred and NED Alternative (Action Alternative) is provided in Table S-2. NRCS provides PL 83-566 funding for construction, engineering, and wetland/floodplain conservation easements. NRCS and the SLOs are responsible for their own administrative time.

Table S - 2. Estimated Project Installation Cost

Item	PL 83-566 Funds		Other Funds		Total	
Site 1: Main Street Debris Basins						
Construction (Flood Prevention)	$2,659,000	100%	$0	0%	$2,659,000	86%
Engineering	$266,000	100%	$0	0%	$266,000	9%
Permits	$0	0%	$40,000	100%	$40,000	1%
Project Administration	$66,500	50%	$66,500	50%	$133,000	4%
Subtotal	**$2,991,500**	97%	**$106,500**	3%	**$3,098,000**	100%
Site 2: Seegmiller Marsh						
Construction (Watershed Protection)	$3,184,000	65%	$1,715,000	35%	$4,899,000	75%
Engineering	$490,000	100%	$0	0%	$490,000	8%
Permits	$0	0%	$25,000	100%	$25,000	<1%
Project Administration	$122,500	50%	$122,500	50%	$245,000	4%
Real Property Rights[1]	$415,000	50%	$415,000	50%	$830,000	13%
Water Rights	$0	0%	$20,000	100%	$20,000	<1%
Subtotal	**$4,211,500**	65%	**$2,297,500**	35%	**$6,509,000**	100%
Site 3: Y-Drain						
Construction (Flood Prevention)	$1,089,000	100%	$0	0%	$1,089,000	82%
Construction (Public Recreation)	$24,000	50%	$24,000	50%	$48,000	4%
Engineering	$114,000	100%	$0	0%	$114,000	9%
Permits	$0	0%	$15,000	100%	$15,000	1%
Project Administration	$28,500	50%	$28,500	50%	$57,000	4%
Subtotal	**$1,255,500**	95%	**$67,500**	5%	**$1,323,000**	100%

Item	PL 83-566 Funds		Other Funds		Total	
Site 4: Warner Valley Disposal System						
Construction (Flood Prevention)	$3,500,000	100%	$0	0%	$3,500,000	47%
Construction (Public Recreation)	$920,500	50%	$920,500	50%	$1,841,000	25%
Engineering	$535,000	100%	$0	0%	$535,000	7%
Permits	$0	0%	$25,000	100%	$25,000	<1%
Project Administration	$134,000	50%	$134,000	50%	$268,000	4%
Real Property Rights	$0	0%	$1,242,000	100%	$1,242,000	17%
Subtotal	**$5,089,500**	69%	**$2,321,500**	31%	**$7,411,000**	100%
Site 5: Hurricane Water Efficiency						
Construction (Agricultural Water Management)	$8,648,000	75%	$2,883,000	25%	$11,531,000	63%
Engineering	$1,154,000	100%	$0	0%	$1,154,000	6%
Permits	$0	0%	$35,000	100%	$35,000	<1%
Project Administration	$288,500	50%	$288,500	50%	$577,000	3%
Real Property Rights	$0	0%	$140,000	100%	$140,000	1%
Water Rights	$0	0%	$5,000,000	100%	$5,000,000	27%
Subtotal	**$10,090,500**	55%	**$8,346,500**	45%	**$18,437,000**	100%
Total	**$23,638,500**	64%	**$13,139,500**	36%	**$36,778,000**	100%

[1] Wetland/floodplain conservation easement

S-13. Project Benefits

Benefits from implementation of the preferred and NED Alternatives were calculated from flood reduction, water savings, and recreation. The total annual benefits are estimated to be $2,999,100 and include $190,200 for flood damage reduction, $1,894,400 for water savings, and $914,500 for recreation. The alternative benefits, costs, and the benefit-cost ratio are provided in Table S-3 below.

S-14. Net Economic Benefits

The estimated annual economic benefits for the Action Alternative are summarized in Table S-3. This Alternative is the NED Alternative for the Project since it has the greatest net economic benefit.

Table S - 3. Estimated Annual Net Economic Benefits

Site	Total Annual Benefits	Total Annual Costs	Benefit-Cost Ratio	Net Economic Benefits
Site 1	$181,000	$123,100	1.5	$57,900
Site 2	$378,200	$268,000	1.4	$110,200
Site 3	$95,900	$56,800	1.7	$39,100
Site 4	$449,600	$326,800	1.4	$122,800
Site 5	$1,894,400	$680,400	2.8	$1,214,000
Total Project	**$2,999,100**	**$1,455,100**	**2.1**	**$1,544,000**

S-15. Period of Analysis

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

S-16. Project Life

The Project would meet a life of 50 years.

S-17. Environmental Impacts

Table S-4 lists the resources of concern and associated environmental consequences associated with the Action Alternative. Resources that would not be affected by the Project are not listed in this table.

Table S - 4. Summary of Resource Concerns and Impacts

Resource Concern	Summary of Concern	Environmental Consequence
Soils		
Upland Erosion	Disturbance to soils from alternative measures	Proper construction BMPs[1] would be installed during and after construction to prevent and control soil erosion.
Sedimentation	Sediment accumulation in the debris basin	Alternative measures would capture approximately 0.92 ac-ft of sediment annually (0.36 at the Main Street Debris Basins and 0.56 ac-ft at Seegmiller Marsh), reducing sedimentation to Seegmiller Marsh, the Virgin River, and developed areas.
Prime and Unique Farmland	Construction activities on lands classified as “prime farmland if irrigated.”	Approximately 2.82 acres would be temporarily disturbed, and 0.58 acres would be permanently disturbed on irrigated lands with soils designated as “prime farmland if irrigated.”

Resource Concern	Summary of Concern	Environmental Consequence
Water		
Surface Water Quality	Construction activities to occur near drainages	Construction activities may impact surface water quality over the short-term, but BMPs[1] would be used during construction and impacts would be minor. There would be long-term benefits to surface water quality from decreased sediment loads to surface water and increased water quantities into the Virgin River.
Waters of the U.S.	Disturbance to waters of the U.S.	Approximately 4,106 linear feet (LF) of channels/ditches and 0.23 acres of pond that are potential jurisdictional waters of the U.S would be affected. The alternative would add 5,640 LF of new channel at Seegmiller Marsh.
Wetlands	Disturbance to wetlands	Removes 0.13 acres of emergent wetland and creates 14.23 acres of new wetland. Long-term beneficial impacts are anticipated with a net increase to wetlands of 14.1 acres.
Floodplain Management	Changes to flooding conditions	Removes flooding to 162 acres of land containing 200 residences, 16 commercial/office buildings, 36 roads, and one major interstate up to and including a 100-year flood, which provides a long-term benefit that decreases the risk to life and property.
Groundwater	Changes in groundwater quantity and quality	Minor fluctuations would occur to local shallow groundwater conditions influenced by piping drainage/ irrigation ditches and new detention basins.
Air		
Air Quality	Emissions from construction activities	Construction activities are not expected to violate air quality standards, due to the implementation of BMPs[1] and the short duration of construction.
Plants		
Noxious Weeds and Invasive Plant Species	Increased potential for establishment of invasive plant species on disturbed soils	BMPs would be implemented to minimize the minor short-term impacts associated with construction activities, and a PCRP[1] would be developed to further minimize impacts. Non-native and N&I[1] plant species would be removed in sensitive riparian habitat at Seegmiller Marsh and replaced with native vegetation.
Riparian areas	Removal of vegetation as a result of construction activities	Removal of 1.04 acres of riparian vegetation and adding 5.53 acres of new riparian vegetation would take place. Approximately 10.35 acres of riparian habitat would be converted to new water and wetland habitat areas. There would be short-term adverse impacts to riparian areas during construction and long-term beneficial impacts from the reestablishment of native riparian vegetation and habitat diversity in the riparian corridor.
Animals		
Wildlife and Wildlife Habitat	Disturbance to general wildlife habitat	Moderate temporary disturbance to 36.21 acres of habitat would take place during construction that could displace wildlife to adjacent habitats. Permanent disturbance to 13.15 acres of urban/agricultural landscape that could provide limited low-quality habitat for various species would also occur. Minor long-term benefits are anticipated due to habitat enhancements at Seegmiller Marsh and water quality/quantity improvements to the Virgin River.

Resource Concern	Summary of Concern	Environmental Consequence
Special Status Animal Species	Construction disturbance in habitat	There would be short-term impacts from temporary and permanent disturbance to ESA[1] southwestern willow flycatcher, woundfin, and Virgin River chub DCH[1], and to ESA[1] yellow-billed cuckoo suitable habitat. Modifications would enhance habitat, which is anticipated to have short-term adverse impacts to species and DCH/suitable habitat but would have long-term beneficial impacts to the species and DCH[1]/suitable habitat. Temporary disturbance to ESA[1] desert tortoise suitable habitat is anticipated, but disturbance is within unoccupied habitat based on surveys performed. A BA[1] was submitted to the USFWS to comply with Section 7 of the ESA (Appendix E), and the USFWS issued a BO[1] dated June 16, 2021 (Appendix A). Short-term minor impacts to state sensitive species could occur. Avoidance and minimization measures would be in place for all ESA- and state-listed species (see Section 8.3).
Migratory Birds/Bald and Golden Eagles	Construction disturbance in potential habitat	Migratory birds and bald eagles could be present in the Project area. Preconstruction surveys would be performed, and spatial buffers would be established as necessary in coordination with USFWS[1] and NRCS. Impacts to migratory birds/bald eagles and associated habitat would be short-term and minor based on the duration of construction, restoration of disturbed areas, construction timing, abundant suitable habitat in the surrounding area, and avoidance/minimization measures in place.
Human		
Socioeconomics	Economic and social implications to the downstream community	Socioeconomic benefits would be incurred from additional employment requirements that may be necessary during construction. There would be indirect long-term benefits from reduced risk to life and property from flood prevention measures at Sites 1, 3, and 4.
Historic Properties/ Cultural Resources	Historic properties are located within the Project area	Two historic canals would be modified due to alternative actions. Approximately 1,425 feet of the St. George and Washington Canal and 680 feet of the Hurricane Canal would be piped, but these segments were determined to be non-contributing to the overall eligibility for the National Register of Historic Places due to modern alterations. The alternative was determined to have No Adverse Effect to historic properties, and the determination was submitted to SHPO[1] to comply with Section 106 of the NHPA[1]. SHPO[1] concurred with the determination in a letter dated March 3, 2021 (Appendix A). Tribal consultation has been completed to comply with EO 13175 and the NHPA[1] (Appendix A).
Public Health and Safety	Inhabitants located downstream of a dam not meeting current engineering standards	This alternative removes flooding to 162 acres of land containing 200 residences, 16 commercial/office buildings, 36 roads, and one major interstate up to and including a 100-year flood, which provides a long-term benefit that decreases the risk to life and property. It also removes risk of harm or injury related to the open ditch at Site 3.

Resource Concern	Summary of Concern	Environmental Consequence
Recreation	Interference with recreational opportunities	Improves recreation opportunities over the long term through construction of new public trails.
Land use	Conversion of land to other uses	Agricultural and disturbed urban lands would be converted to public trail systems and areas of open state lands converted for use as flood detention basins.
Visual Resources and Scenic Beauty	Construction disturbance and equipment during construction	Short-term impacts would occur during construction from temporary disturbance and construction equipment. Construction of a new trail system would offer a long-term benefit from increased opportunity to view scenic areas of the Virgin River corridor.
Transportation Infrastructure	Roads and highways located downstream of a dam not meeting current engineering standards	Short-term road closures/detours may occur during construction, resulting in minor commuting delays. Reduced flood damage to transportation infrastructure is anticipated over the long-term for approximately 36 roads and for I-15.
Noise	Construction activities would produce noise	Short-term minor impacts are anticipated, due to the duration of construction and implementation of BMPs.

[1] BMPs = Best Management Practices; PCRP = Post-Construction Restoration Plan; ESA = Endangered Species Act; DCH = Designated Critical Habitat; BA = Biological Assessment; BO = Biological Opinion; N&I = noxious and invasive; USFWS = U.S. Fish and Wildlife Service; SHPO = State Historic Preservation Office; NHPA=National Historic Preservation Act.

S-18. Major Conclusions

The Action Alternative meets the purpose and need of the Project, as well as the goals and objectives. The adverse effects from alternative actions are mostly minor and/or short-term during construction. Long-term beneficial effects would result from implementing the Action Alternative.

S-19. Areas of Controversy and Issues to be Resolved

There are no known areas of controversy. The following are issues to be resolved for the Project:

- Land Easements – Easements on private lands would need to be secured by the SLOs for alternative modifications.
- O&M Agreements would be developed with the SLOs for each site. The new O&M Agreement would be signed before the Project Agreement is signed.
- Water/natural resource/real property rights would need to be secured by the SLO for alternative measures.
- An agreement would need to be established for water savings used for in-stream benefits in the Virgin River from the Hurricane Water Efficiency alternative measures.

S-20. Evidence of Unusual Congressional or Local Interest

There is no known evidence of unusual congressional or local interest in the Project.

S-21. In Compliance

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

1.0 Changes Requiring the Preparation of a Supplemental Watershed Plan

1.1 Introduction

As the lead federal agency, the United States Department of Agriculture-Natural Resources Conservation Service (NRCS), along with the Sponsoring Local Organizations (SLOs) (City of Hurricane, Washington City, City of St. George, Washington County, Washington County Water Conservancy District [WCWCD], and The Nature Conservancy), are proposing to provide additional flood prevention, watershed protection, public recreation, and agricultural water management measures in the Warner Draw Watershed. This Supplemental Watershed Plan No. 9 and Environmental Assessment (Plan-EA) for the Warner Draw Watershed and Flood Prevention Operations Project (Project) addresses the changed conditions within the Warner Draw Watershed and the proposed measures to address these changes.

Federal funding for the Project is being authorized through the Watershed and Flood Prevention Operations Program, which helps urban and rural communities protect, improve, and develop land resources in watersheds of up to 250,000 acres in size. This Plan-EA was prepared for NRCS to comply with the requirements of the National Environmental Policy Act (NEPA) of 1969 and its implementing regulations, which are set forth in the Council on Environmental Quality regulations 40 CFR Parts 1500-1508; the Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies (March 10, 1983) established pursuant to the Water Resources Planning Act of 1965 (Public Law [PL] 89-80) as amended by Executive Order 12322 (September 17, 1981); and NRCS policy and guidelines (NRCS 2010 and 2011). The format of this document follows the plan format outline that must be followed for Supplemental Watershed Project Plans as outlined in the NRCS National Watershed Program Manual (NWPM) Parts 500 through 506 (NRCS 2015), and as guided by the NRCS National Watershed Program Handbook (NWPH), Parts 600 through 606 (NRCS 2014a). The Plan-EA assists NRCS in determining if the selected alternative would have a significant impact on the quality of the environment and if preparation of an Environmental Impact Statement is required.

1.2 Warner Draw Watershed Background

The Warner Draw Watershed is in the south-central portion of Washington County, Utah, and comprises approximately 298 square miles (sq-mi) (Appendix B – Map B1). The original Watershed Work Plan for the Warner Draw Watershed (Dixie Soil Conservation District et al. 1968) was developed in 1968 for watershed protection and flood prevention measures to protect urban and agricultural areas, and for agricultural water management. The plan identified high-intensity rainstorms, easily erodible soils, and desert conditions in the Warner Draw Watershed that caused frequent flood damage to cropland, water conveyance systems, and cultural developments. Agricultural water management problems were centered around high seepage losses and sediment deposition in irrigation distribution systems and on farmlands (Dixie Soil Conservation District et al. 1968).

The 1968 Watershed Work Plan proposed construction of 11 debris basins, 6 miles of single-purpose diversions, 3.5 miles of floodwater disposal channels, and two multipurpose structures channels to reduce flood and sediment damages in the Warner Draw Watershed. Approximately 29 miles of irrigation system improvements and installation of 5 miles of drainage systems were also planned.

Since the original plan was developed, eight Supplemental Watershed Work Plans have been developed and are summarized below:

- Supplemental Watershed Work Plan No 1 (Soil Conservation Service (SCS) 1971): This supplement clarified the cost-share for relocation and real property rights costs for measures proposed in the original Watershed Plan. It also included information for SLO adherence to the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (PL91-646, 84 Sta/ 1894).
- Supplemental Watershed Work Plan No. 2 (SCS 1975): This supplement consisted of removing Little Valley flood prevention measures and the Price Bench irrigation system improvements and changed the capacity of the St/ George-Washington Canal. The associated costs were also updated.
- Supplemental Watershed Work Plan No. 3 (NRCS 2014b): This supplement consisted of removing Washington County, Bloomington Canal Company, St. George-Clara Field Canal Company, and Bench Lake Irrigation Company as SLOs. Washington County Flood Control Authority and Hurricane City were added as SLOs. The Sugarloaf debris basin, Red Hills diversion, Golf Course debris basin, Golf Course North debris basin, Ivins debris basin, Blue Bowl debris basin, St. George-Clara Fields irrigation system improvements, Bloomington Canal Company irrigation system improvements, and Washington Fields drainage system were removed from the plan.
- Supplemental Watershed Work Plan No. 4 (NRCS 2016): This supplement described the rehabilitation of Gypsum Wash debris basin.
- Supplemental Watershed Work Plan No. 5 (NRCS 2017a): This supplement described the rehabilitation of Ivins debris basins 1-6.
- Supplemental Watershed Work Plan No. 6 (NRCS 2017b): This supplement described the rehabilitation of Warner Draw debris basin.
- Supplemental Watershed Work Plan No. 7 (NRCS 2017c): This supplement described the rehabilitation of Stucki debris basin.
- Supplemental Watershed Work Plan No. 8 (NRCS 2019): This supplement described the rehabilitation of Frog Hollow debris basin.

1.3 Supplemental Watershed Plan Changes

The Warner Draw Watershed has experienced a substantial change in land use from development since the original Watershed Work Plan was produced in 1968. The Warner Draw Watershed was estimated to have a population of approximately 7,680 people in 1968 (Dixie Soil Conservation District et al. 1968), which has increased to an estimated 144,860 people (estimated from Census Bureau 2017). Approximately 1 percent (about 3 sq-mi) of the watershed was developed around 1968, which has increased to approximately 11 percent of the watershed (about 33 sq-mi) today. Nearly all the development has occurred within the lowland areas of the watershed, which are more susceptible to flooding during extreme rain events. Additionally, impervious surfaces from urbanization have altered runoff patterns and quantities, adding to flood damage issues.

Agricultural lands and rural areas using flood irrigation practices have been converted to a more urban setting where continued flood irrigation practices result in irrigation inefficiencies. Croplands have been developed and have decreased from approximately 10 percent of the watershed in 1968 to approximately 3 percent today. Measures are needed to address flood prevention, watershed protection, public recreation, and agricultural water management for the changed conditions of the Warner Draw Watershed.

1.4 Decision Matrix

NRCS must identify the federally assisted alternative with the greatest net benefits, otherwise known as the National Economic Development (NED) plan. NRCS must also decide if the selected alternative would or would not constitute a major federal action that significantly affects the quality of the environment. If the NRCS State Conservationist (responsible federal official) determines that the selected alternative would not significantly affect the quality of the environment, then the NRCS State Conservationist will prepare and sign a Finding of No Significant Impact (FONSI), and the Project may proceed. If the NRCS State Conservationist determines that the selected alternative would significantly affect the quality of the environment, then an Environmental Impact Statement (EIS) and a Record of Decision (ROD) must be prepared and signed before the Project can proceed.

2.0 Purpose and Need

2.1 Purpose and Need Statement

The purpose of the Project is to improve flood prevention, watershed protection, public recreation, and agricultural water management in the Warner Draw Watershed. There is a need to reduce flood damages to developed and agricultural areas of St. George and Washington City; to improve irrigation water delivery efficiency for the existing flood irrigation systems in Hurricane that would also benefit Virgin River water quantities; to expand trail systems for recreation, education, and public safety; and to improve Virgin River ecosystems.

2.1.1 Support for Purpose and Need

The following are goals and objectives identified by SLOs, agencies, organizations, and the public during development of the Plan-EA. Five sites across the Warner Draw Watershed (Appendix B-Map 2) were identified for improvements to support the goals and objectives identified. The problems identified within these five sites are described in Section 2.1.2.

- Decrease flood damages to developed areas along Main Street in Washington City for up to and including a 100-year storm event.
- Enhance riparian habitat around Seegmiller Marsh to benefit the health of the Virgin River and the aquatic/terrestrial species using the river corridor, including Endangered Species Act (ESA)-listed species.
- Improve water quality of water entering the Virgin River from stormwater runoff drainage systems (Seegmiller Drain, Middle Drain, and Washington Fields Drain), and from lateral erosion of the Virgin River near Seegmiller Marsh.
- Provide riparian health educational opportunities and conserve and develop recreation and scenic resources at Seegmiller Marsh.
- Remove the threat of flooding for up to and including a 100-year storm event along an open channel section of the Y-Drain, decrease the public health and safety hazard the channel creates, decrease sediment in water, and extend a pathway through the area.
- Remove the threat of flooding for up to and including a 100-year storm event along the Warner Valley Disposal System, decrease sediment in water due to channel erosion, and extend a recreation trail system through the area.
- Conserve water and improve irrigation water delivery efficiency in Hurricane City and use water savings to support Virgin River water quantities.

2.1.2 Watershed Problems

The Warner Draw Watershed has experienced dramatic population increases since 1968, when the original Watershed Work Plan was prepared. Based on a review of census data (U.S. Census Bureau [Census Bureau] 1996 and Census Bureau 2017) the average increase in population for Washington County, Utah, from 1970 to 2017 was approximately 5.5 percent annually, compared to approximately 2.4 percent annually for the State of Utah and approximately 1 percent annually for the United States. The population within the watershed experienced an average increase over similar years (1968 to 2017) of approximately

6.3 percent annually. Developed areas of the watershed covered approximately 3 sq-mi in 1968 and are estimated to cover approximately 33 sq-mi based on a 2015 National Land Cover Database (Homer et al. 2015).

Urbanization of former agricultural and undeveloped lands have altered water runoff patterns, increasing runoff quantities from impervious surfaces in developed areas and changing flow patterns. This urbanization has occurred in lowland areas of the Warner Draw Watershed, which contain more suitable gradients for development. Flooding and associated damages have become increasingly concerning due to expanding development. The health of the main river through the watershed (Virgin River) has also suffered from decreased water quantities, development encroachment, invasion of non-native species, and increased pollutant sources. Problems and problem areas identified within the watershed during the scoping process are described below.

2.1.2.1 Washington City Main Street Flooding

Main Street is a surface road with a north-south orientation running through Washington City, Utah. It is one of the few roads in the city that extends under the northeast-southwest trending Interstate 15 (I-15), providing a traffic connection between the newly developed areas north of I-15 with the downstream older developed areas south of I-15. Three drainage areas (Brio Drainage, Main Street Drainage, and Buena Vista Drainage) occur upstream of I-15 that convey surface water runoff downstream to the Main Street underpass at I-15 (Figure 2-1). Combined, the three drainage areas cover approximately 844 acres (1.32 sq-mi).

During precipitation events, surface water runoff from the three drainages converges near the intersection of Buena Vista Boulevard and Main Street and continues down Main Street under I-15. Existing stormwater systems do not have enough capacity to handle conveyance from the drainage areas for larger local and 24-hour storms, resulting in flooding of surface roads and developed residential areas along Main Street. The existing drainage system consists of curb and gutter along the east side and partial curb and gutter along the west side of Main Street; a small irrigation ditch on the west side of Main Street; catch basins; and an 18-inch storm drain pipe. The storm drain pipe has approximately 15 cubic feet per second (cfs) capacity and the road is limited in some locations to approximately 8 cfs capacity. This is due to the lack of curb and gutter, and homes that are built lower than the road.

Arid conditions, badland topography, and sparse vegetation in the upstream drainage basins are conducive to significant erosion, and large amounts of sediment are carried and deposited during storm events. After flooding, sediment deposits in streets, gutters, stormwater systems, and on residential properties. The streets and residential areas south of I-15 along Main Street have historically experienced damaging floods, with the most recent flooding and damages occurring from two separate rain events in July and August 2018. Figures 2-2 through Figure 2-5 below show flood flows during these rain events and the subsequent runoff, erosion, and sediment damages.

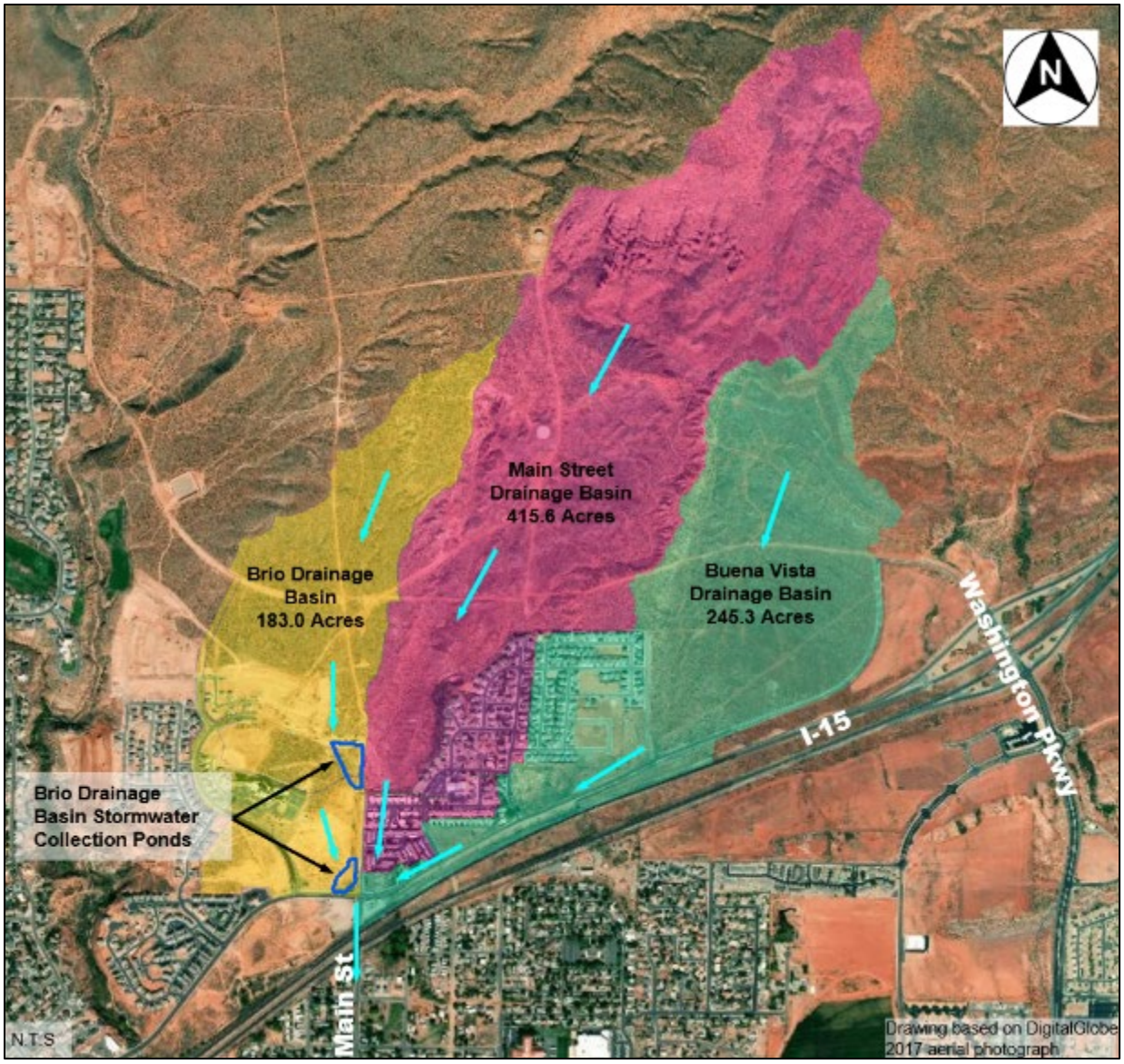

Figure 2-1. Drainage Basins Upstream of Main Street

Figure 2-2. Main Street at I-15
(Standing upstream of I-15 looking south down Main Street)

Figure 2-3. Main Street Drainage Basin at Intersection with Main Street

Figure 2-4. Main Street Flood Damage Downstream from I-15

Figure 2-5. Main Street Flood Damage Downstream of I-15

Modeling was performed for various 24-hour storms (Bowen Collins 2019a) from the upstream drainage areas and results of inundation to structures and roadways is provided in Table 2-1. During a 100-year event, 188 residential structures, 16 commercial/office buildings, a church, 30 roads, and I-15 would be inundated and incur flood damages. Maps C1.1A and C1.1B in Appendix C show the flood extents for the 100- and 500-year storm events. Flooding and damages would also occur for much smaller events.

Table 2-1. Main Street Structure Inundation Summary

Storm Event	Residential Structures	Commercial/ Office Structures	Churches	Road/Minor Highways	Major Interstate Highways
2-Year	1	-	-	7	-
5-Year	4	-	-	8	1
10-Year	11	-	-	12	1
25-Year	87	5	-	19	1
50-Year	130	9	1	19	1
100-Year	188	16	1	30	1
500-Year	241	22	1	30	1

In the summer of 2019 and subsequent to Project flood modeling, the Sponsors graded two debris basin structures to capture floodwater from the Main Street and Buena Vista drainage areas as part of an emergency action. See Appendix B-Map B3.1A for the disturbance boundary associated with construction of the new basins. The new basins can attenuate an approximate 10-year flood event and do not provide sediment storage capacity.

2.1.2.2 Virgin River

The Virgin River is approximately 162 miles long and extends from the confluence of the North Fork Virgin River near Rockville, Utah, to Lake Mead near Overton, Nevada. In Utah, the watershed occupies approximately 2,800 sq-mi of Washington, Kane, and Iron Counties, with 76 percent occurring in Washington County (Author Unknown 2006). There is an increasing concern for health of the Virgin River and maintaining water quality and quantity are the driving force of river health. There are many contributing factors that play a role in water quality and quantity, including soil characteristics, geology, vegetation, land use, development, and water management practices, among others.

Erodibility and composition of geologic units and soils play an important role in water quality. Many soil types and geologic units within the Warner Draw Watershed are easily eroded and contain naturally occurring soluble minerals, primarily salts. This introduces large amounts of sediment into the Virgin River and increases the river salinity. Geologic processes also contribute to water quality from geothermal activities. A hot spring (Pah Tempe Hot Springs) exists on the Virgin River near the City of Hurricane, and the waters contain a large amount of total dissolved solids (TDS). This hot spring discharges into the Virgin River and contributes approximately 95,000 tons of dissolved solids annually (U.S. Geological Survey [USGS] 2014). The 106.7˚ F hot springs water increases water temperatures in the Virgin River from 79.9˚ F (measured above the springs) to 86˚ F (measured below the springs) during low flow conditions in August, and from 54.5˚ F (measured above the springs) to 56.3˚ F (measured below the springs) during high-flow conditions in May (Author Unknown 2006).

Vegetation types and amount of vegetative cover can influence water quality and quantities directly from transpiration and excretions, and indirectly by factors influencing erosion and wildfires. Non-native vegetation has taken over much of the riparian corridor, tamarisk (*Tamarix ramosissima*) being one of the most problematic invasive species for river health. Tamarisk consumes large amounts of water and secretes salts. Areas of the Virgin River now contain dominant tamarisk communities that can reduce river flows and increase salinity in the river. Reduction in riparian habitat and introduction of non-native species have greatly diminished the health of the river and affected the species that rely on those habitats. Seegmiller Marsh has been identified as an important habitat along the Virgin River that has been taken over by tamarisk and other non-native plant species (Figure 2-6).

Figure 2-6. Tamarisk-Dominated Habitat at Seegmiller Marsh

Human influence from land use, development, and water management practices have greatly affected water quantities of the Virgin River. Based on census data, St. George was determined to be the fastest-growing metropolitan area in the nation between 2016 and 2017. The demand for water is at an all-time high, and the Virgin River is one of the main water sources used to meet municipal and agricultural water demands. The area has experienced frequent water shortages and reduced flows in the Virgin River. The decreased flow regime affects aquatic and riparian habitat and the species that occupy the riparian corridor. Human channel modifications have further added to habitat issues affecting riparian corridor health, wildlife, and floodplain functions. Livestock management, agricultural practices, wastewater disposal, and urban runoff lead to water quality degradation. Pollutants (nutrients, dissolved solids, bacteria, sediment, and chemicals) from these sources also affect the water quality of the Virgin River and other stream systems in the Warner Draw Watershed. Figure 2-7 depicts the Virgin River through the St. George metropolitan area and development/changed land use conditions between 1993 and 2017.

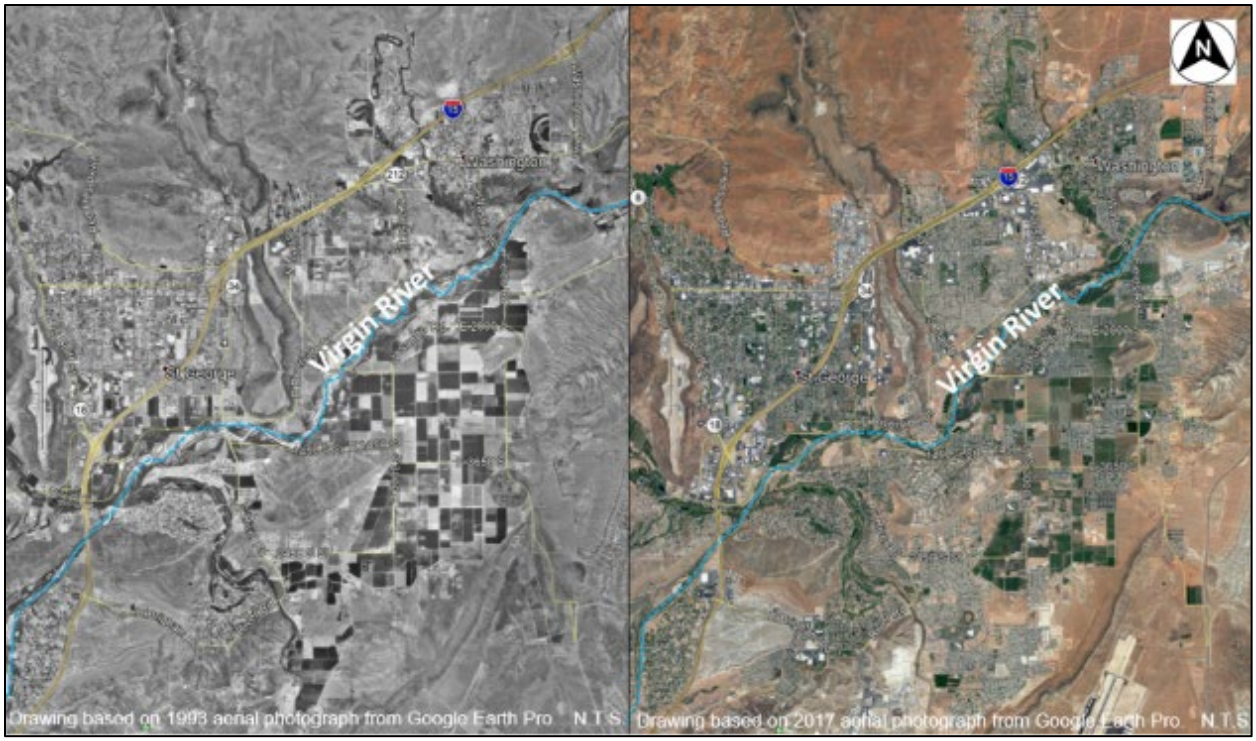

Figure 2-7. St. George Metropolitan Area 1993 and 2017

Problem areas within the Warner Draw Watershed identified as potential opportunities to improve the Virgin River water quality, quantity, and riparian health include Seegmiller Marsh and the associated drains contributing flow to the area including Seegmiller Drain, Middle Drain, and Washington Fields Drain/Y-Drain (Appendix B – Map B3.2), the City of Hurricane flood irrigation system (Appendix B – Maps 3.4A through 3.4F), and the Warner Valley Disposal System (Appendix B – Maps B3.3A through B3.3C).

2.1.2.3 Y-Drain

The Y-Drain is a water conveyance system for irrigation and stormwater runoff. It was installed in the early 1900s to convey irrigation agricultural water runoff and rainfall runoff from the adjoining agricultural lands. In 2016, the northern half of the Y-Drain was piped; the southern half of the Y-Drain is still an open channel and has been surrounded by residential and commercial development. Figure 2-8 below includes aerial photographs from 1993 and 2017 along the drain alignment to the Virgin River and shows the development of the area.

The Y-Drain discharges into the Washington Fields Drain, then into the Virgin River (Figure 2-8). The Washington Fields Drain is a large open channel storm water conveyance system that has a capacity of approximately 1,100 cfs and upstream drainage area of approximately 7.47 square miles. The Y-Drain is estimated to have a peak 100-year flow of 137 cfs with an upstream drainage area of approximately 0.28 square miles. The open channel section of the Y-Drain (approximately 1,125 linear feet) has a capacity of approximate 47 cfs. The open channel flows into a 36-inch culvert at S. Sandia Road, which has a maximum capacity of 52 cfs. This section of the Y-Drain has been identified as a problematic area for risk of flooding due to the lack of capacity. Modeling performed for the Y-Drain at a 100-year storm event (Bowen Collins 2019c) shows that nine residences would be affected from flooding (Appendix C Map C1.2). In addition, an

elementary school has been constructed on the south adjoining lands, and the steep banks and channel pose a public health and safety risk to students. Other issues identified for the open channel consist of erosion and introduction of saline soils into the water from the adjoining channel banks.

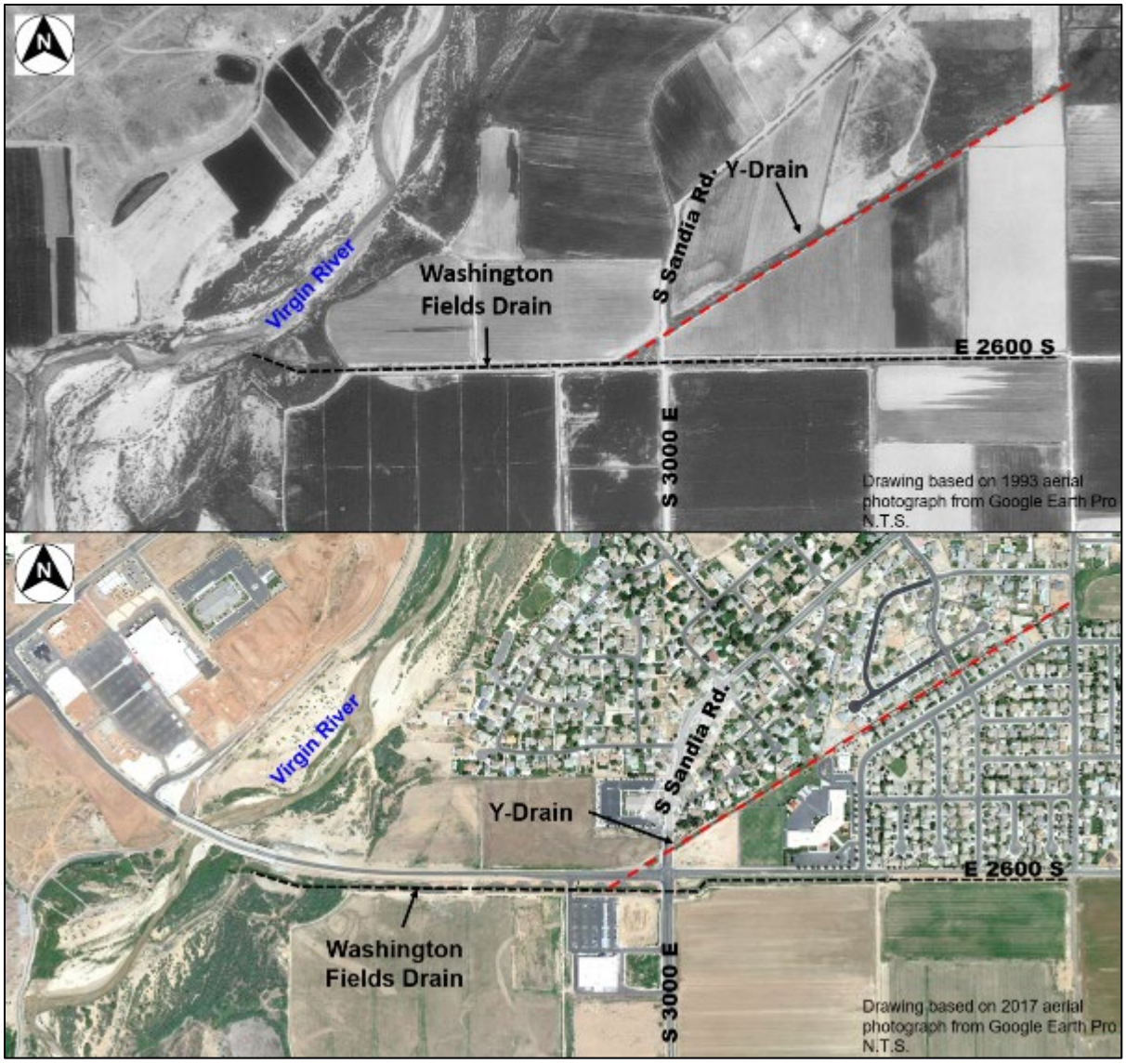

Figure 2-8. Y-Drain 1993 and 2017 Aerial Photographs

2.1.2.4 Warner Valley Disposal System

A water conveyance channel, the Warner Valley Disposal System (system), has been identified as a problematic area for flooding due to recent development, increased stormwater demand on the system, and system deficiencies. Open-channel sections of the system also increase sediment in water conveyed through it. The system was installed around 1975 when three upstream debris basins were constructed (Warner Draw, Stucki, and Gypsum Wash). It was designed to collect stormwater runoff from the principal spillway flows of the three upstream debris basins and convey them through reinforced concrete pipe into the St. George and Washington Canal. The pipe extends from the basins to the St. George and Washington

Canal (formerly an open canal) at the intersection 3870 E Street and 2760 S Street. This canal was an open channel that extended from 3870 E, generally west to Fort Pearce Wash, which drains to the Virgin River. In 2007, an approximately 2.2-mile section of the canal was piped from 3870 E to 2110 E due to expanding development of the area and changed land use. Figure 2-9 below includes aerial photographs from 1993 and 2017 along the system from Washington Fields Road to Fort Pearce Wash and shows the development of the area.

The existing system of concern consists of approximately 13,650 linear feet of open channel, reinforced concrete pipe (RCP), and reinforced concrete box extending from S 3870 E street to Fort Pearce Wash (Figure 2-9). There is a 42-inch RCP that extends from Washington Fields Road to S 3870 E Street that is proposed to be upsized as part of a separate project and is not being considered for improvements as part of this Project. Due to development pressure, the existing system does not have capacity to convey the anticipated flows from the upstream debris basins and the existing and proposed stormwater runoff from the surrounding developed areas. Additional capacity in the system and improvements are needed to accommodate stormwater runoff conveyance from the upstream drainage basins and adjoining developed areas.

Modeling performed for the system at a 100-year storm event (Bowen Collins 2019b) show two segments of open channel overtopping and water flowing out of two manholes, flooding the surrounding areas (Appendix C Maps C1.3). Approximately three homes and five roadways are flooded during this event. The flooded area has been transitioning from cultivated agricultural lands to residential subdivisions, and development in this area is anticipated to continue. Only approximately 2 acres of the 41 acres flooded during the 100-year event are currently developed with residential subdivisions. If the remaining 39 acres transition to residential development, future flooding could affect an additional estimated 120 homes. Additional issues identified along the disposal system alignment include surcharge of the disposal pipe, resulting in backwatering and sedimentation near Fort Pearce Wash (Figure 2-10) due to storm drain infrastructure being installed with rim elevations lower than the high-water elevation in the wash; and an adverse slope in an approximately 1,100-foot piped section of the system. It is unclear what caused the adverse slope in this section of the existing pipeline. The design drawings for the system show installation with a positive slope but based on field survey it appears to have an adverse slope.

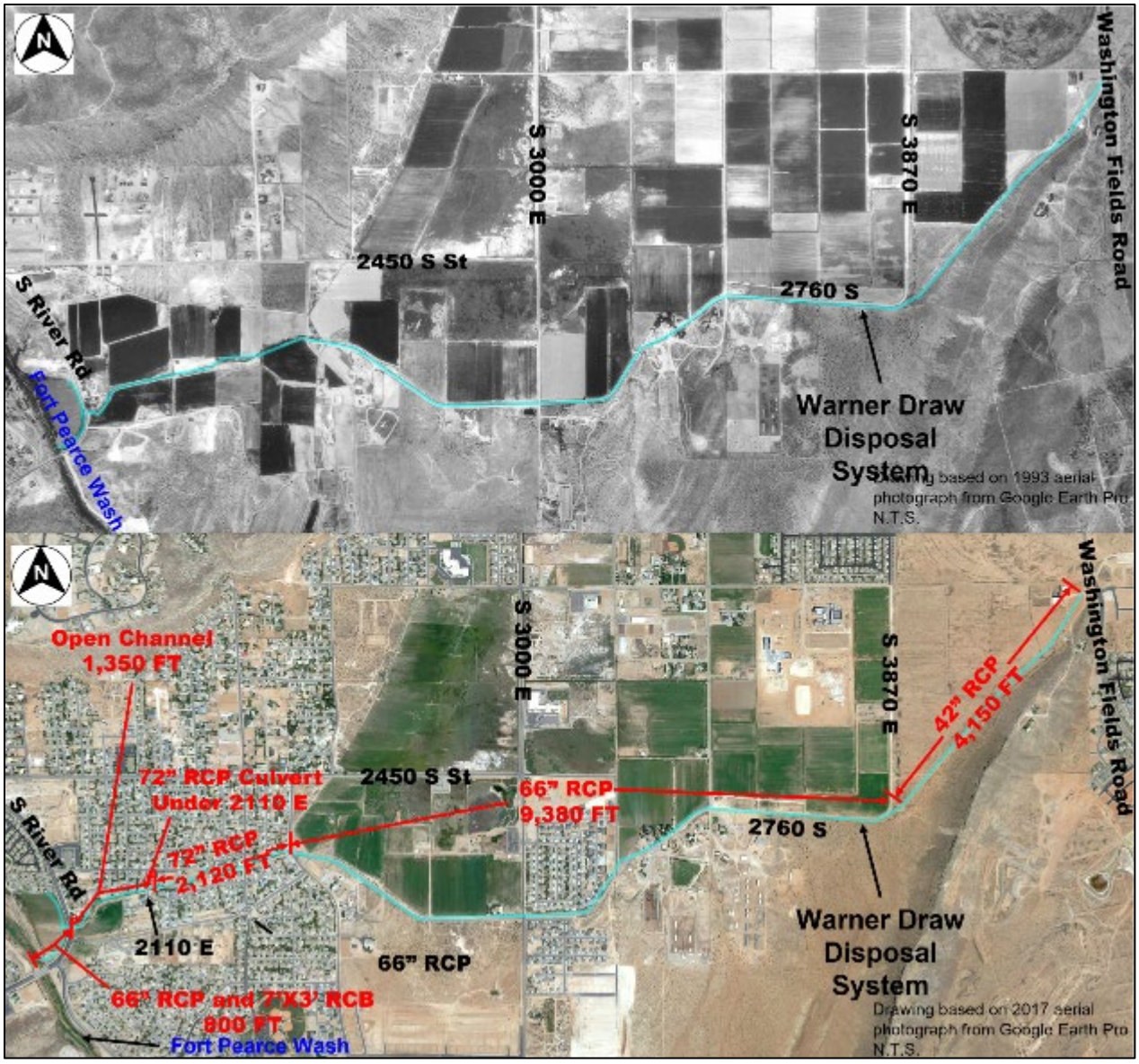

Figure 2-9. Warner Valley Disposal System 1993 and 2017 Aerial Photographs

Figure 2-10. Warner Valley Disposal Pipeline Flooding
(Looking at flooding along River Road near the disposal pipeline outlet at Fort Pearce Wash)

2.1.2.5 Hurricane Irrigation System

Washington County is a fast growing, semi-arid region with limited water resources. Conservation of water resources are necessary to help sustain water demands. The City of Hurricane has identified a need to convert flood irrigation systems to a pressurized irrigation system to help conserve water resources and provide more efficient water delivery. A large portion of the City of Hurricane, primarily the areas south of Gould Wash, still uses a flood irrigation system. Most of the area north of Gould Wash is provided pressurized irrigation. Areas south of Gould Wash were primarily agricultural lands but are quickly being converted or have been converted to residential subdivisions. Figure 2-11 shows the difference in development of Hurricane between 1981 and 2017.

The source of this irrigation water, both now and in the future, is the Virgin River. The Hurricane Canal Company owns water rights on the Virgin River that service the Canal Company's shareholders. In addition, the Canal Company has a conveyance agreement with WCWCD, wherein the WCWCD agrees to deliver up to 15,000 acre-feet (ac-ft) of water annually in normal water years, and up to 12,000 ac-ft annually in below average water years. Hurricane City has purchased shares in the Hurricane Canal Company and would purchase additional shares in the future as existing flood-irrigated agriculture land is converted to sprinkler-irrigated agricultural and/or residential neighborhoods with municipal irrigation demands.

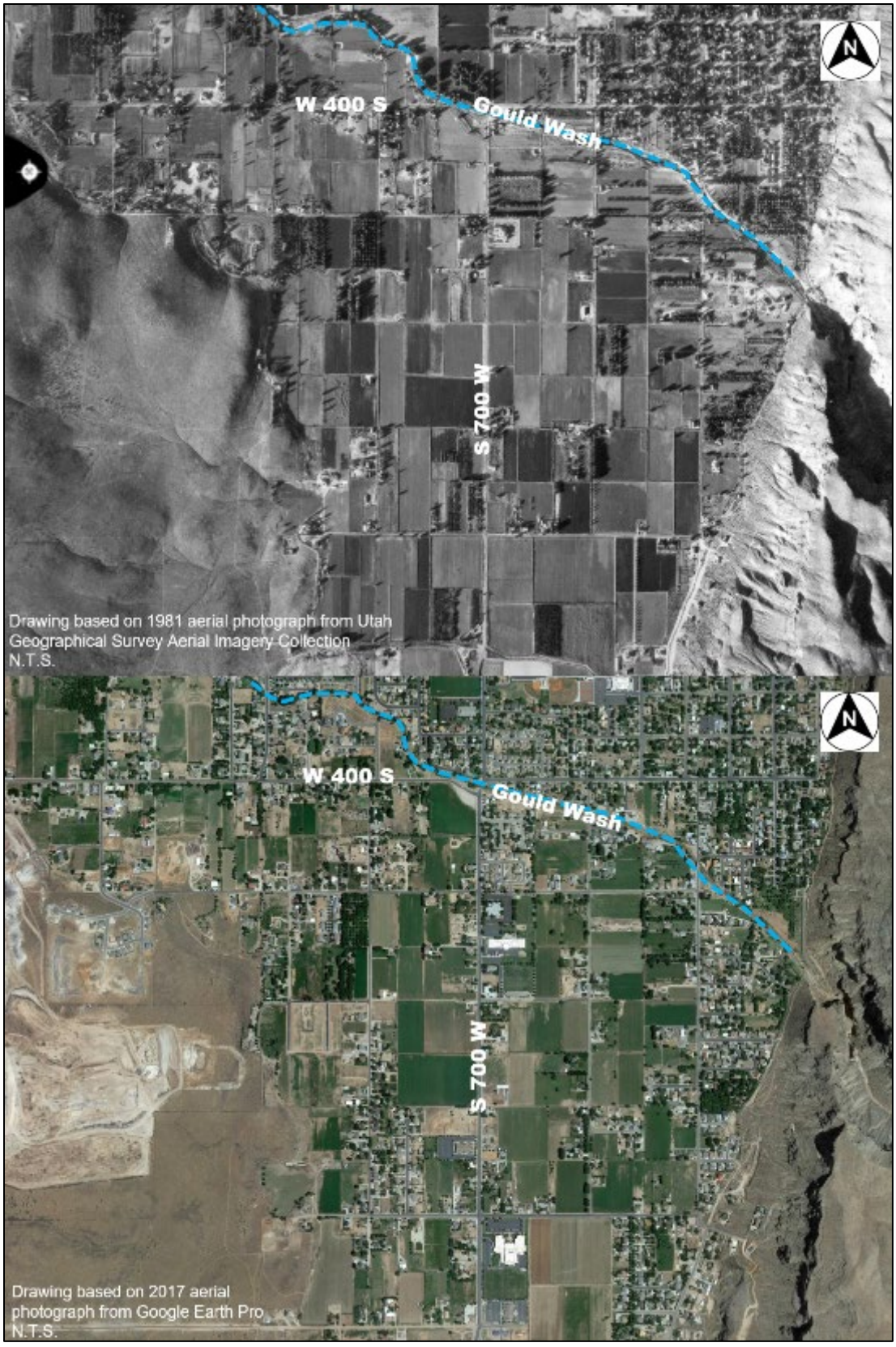

Figure 2-11. Hurricane 1981 and 2017 Aerial Photographs

Changed land use through development and recent county water shortages is creating a need for a new water delivery system. Flood irrigation is not an efficient water delivery system. The existing flood irrigation system delivers water through a series of low-pressure pipelines with service turnouts. This flood irrigation water is then routed through individual fields using ditches. This delivery method results in additional water losses through infiltration, ditch leakage, and evapotranspiration. Water losses also occur from overwatering during flood irrigation, which can result in nuisance flooding. Nuisance flooding occurs when an irrigator overwaters their own property, spilling water onto neighboring properties (Figure 2-12). A water loss study conducted for the Hurricane irrigation system (Todea 2017) estimated that approximately 37 percent water savings could be achieved by converting flood irrigation to a pivot system, and approximately 26 percent water savings could be achieved by converting flood irrigation to a sprinkler system. Another analysis completed for the City of Hurricane (Bowen Collins 2019d) estimated that conversion to a pressurized irrigation system would be approximately 20 to 30 percent more efficient than the flood irrigation system, equating to approximately 800 to 1,200 ac-ft per year of water savings and up to 1,050 to 1,600 ac-ft per year in a wet year. The point of demarcation for the proposed pressurized irrigation system is Hurricane City's right-of-way (ROW) lines. Once the system is installed, individual field owners would connect to the system and replace conveyance ditches with pipelines.

Figure 2-12. Nuisance Flooding

A comparison of existing, and buildout annual demands for the City of Hurricane is provided in Table 2-2. Existing irrigation usage is made up of both municipal sprinkler irrigation and agriculture flood irrigation. Over time as Hurricane City is built out, it is assumed that all the existing agriculture land will be converted to residential/commercial use.

Table 2-2. Existing and Future Annual Demands by Water Use Type

Water Use Type	Existing Annual Demand (ac-ft)	Buildout Annual Demand (ac-ft)
Municipal Irrigation	1,540	3,950
Agriculture Irrigation	12,400	0

3.0 Scope of the Plan-EA

A scoping process was completed to identify relevant resources or environmental concerns to be analyzed in detail and to determine which resources or concerns could be eliminated from detailed study. Resource concerns were identified for the Project based on required scoping concerns outlined in the NWPM Section 501.24 B (NRCS 2015) and from any additional concerns identified by the public, the SLOs, or agencies during the scoping meeting and/or other planning or public meetings.

A scoping meeting for the Project was held on May 29, 2018, at the Washington County building in St. George, Utah, and another scoping meeting was held on May 30, 2018, at the City Office in Hurricane, Utah. The meetings provided opportunities for the public, SLOs, agencies, and any other attendees to express specific concerns and their relevance to the proposed action. Four comments were received during the announced open comment period (May 15, 2018, through June 14, 2018) for the Project. A Scoping Report that provides a summary of the scoping process and comments received can be found in Appendix E.

A summary of resource concerns and their relevance to the proposed action is provided in Table 3-1 below. Resource items determined to not be relevant to the proposed action have been eliminated from detailed study. Resource items determined to be relevant to the proposed action have been included in detailed studies described in this Plan-EA.

Table 3-1. Resource Concerns Summary

Resource Concern	Relevant to the Proposed Action		Rationale
	Yes	No	
Soils			
Upland Erosion	X		Construction disturbance could increase erosion potential.
Sedimentation	X		Sedimentation issues identified in the watershed.
Prime and Unique Farmland	X		Prime farmland is located within the Project area.
Water			
Surface Water Quality	X		Construction ground disturbance could affect surface-water quality.
Groundwater	X		Water conveyance modifications could influence groundwater conditions.
Waters of the U.S. (Clean Water Act)	X		Waters of the U.S. were identified within the Project area.
Regional Water Mgmt. Plans and Coastal Zone Management Areas		X	No regional water management plans have been found for the Project area. Coastal Zone Management Areas are not applicable (N/A) for the Project area.

Resource Concern	Relevant to the Proposed Action		Rationale
	Yes	No	
Floodplain Management	X		Changes to water conveyance affect floodplain management.
Wetlands	X		Wetlands were identified within the Project area.
Wild and Scenic Rivers		X	None in or near the Project area, according to National Wild and Scenic Rivers System (NWSRS) Map (NWSRS 2018).
Sole Source Aquifers		X	No sole-source aquifers are in or near the Project area, according to U.S. Environmental Protection Agency (EPA) Sole Source Aquifer interactive map (EPA 2018).
Air			
Air Quality	X		Construction activities produce emissions and fugitive dust.
Clean Air Act		X	Permits will not be required.
Plants			
Special Status Plant Species		X	There are no ESA-listed plant species within the Project area and a No Effect determination has been made (Appendix E).
Forest Resources		X	Forested lands are not located in or near the Project area.
Noxious Weeds and Invasive Plant Species	X		Construction disturbance increases the risk of noxious weeds and invasive species becoming established.
Protected Natural Areas		X	There are no protected natural areas or Areas of Critical Environmental Concern located within the Project area.
Riparian Areas	X		Riparian areas are present in the Project area.
Animals			
Essential Fish Habitat		X	Essential fish habitat is not present within the Project area.
Fish and Wildlife Habitat	X		General wildlife terrestrial habitat and fish/aquatic species habitat are present within the Project area.
Coral Reefs		X	Not applicable
Special Status Animal Species	X		Habitats for ESA species and state species of concern are located within the Project area.
Invasive Animal Species		X	No potential for introduction of invasive animal species.
Migratory Birds / Bald and Golden Eagles	X		Migratory birds, bald eagles, and associated habitat are present within the Project area.

Resource Concern	Relevant to the Proposed Action		Rationale
	Yes	No	
Human			
Socioeconomics	X		The Project areas are in populated areas that could be affected by Project actions.
Historic Properties / Cultural Resources	X		Cultural and historic resources are present within the Project area.
Hazardous Materials		X	Hazardous materials within the Project area do not appear to be a concern at this time, but on-site surveys would be necessary to ensure the absence of potential hazardous materials prior to construction. Equipment and associated fuels would be working/stored on-site during construction, but effects would be negligible based on adherence to applicable laws and regulations. See Section 8.3 for avoidance and minimization measures.
Environmental Justice and Civil Rights		X	No disproportionately high or adverse human health or environmental effects on minority or low-income populations are anticipated. Project actions are intended to benefit subject populations.
Public Health and Safety	X		Public health and safety concerns to be addressed.
Recreation	X		Recreation activities occur on lands within the Project area.
Land Use	X		Land use changes are anticipated.
Visual Resources and Scenic Beauty	X		Visual/scenic resources are in the Project area
Parklands		X	No national or state parks located in or near the Project area according to National Parks Map (National Park Service [NPS] 2018a) and Utah Parks Map (Utah Department of Natural Resources [UDNR] 2018a).
Transportation Infrastructure	X		Transportation infrastructure would be affected by a change in floodwater conveyance.
Noise	X		Construction noise is anticipated.
Ecological Critical Areas		X	There are no ecological critical areas located in or near the Project area.
National Parks and Monuments		X	No national parks or monuments are located in or near the Project area, based on National Natural Landmarks Map (NPS 2018b) and National Parks/Monuments Map (NPS 2018a).
Scientific Resources		X	No scientific resources are located in the Project area.

4.0 Affected Environment

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

The Project area is located within the Warner Draw Watershed (Appendix B – Map B1) and includes five different Project sites for improvement (Appendix B – Map B2). The existing conditions for each Project site are depicted in Appendix B – Maps B3.1 through B3.4). The Warner Draw Watershed consists of 298 square miles situated in southern Washington County, Utah. The watershed is characterized by steep mountainous terrain with flat-topped mesas east of the Hurricane Cliffs, and lowlands with floodplains and alluvial fans surrounded by badland-type topography west of the Hurricane Cliffs. Table 4-1 summarizes the physical setting within the Project area.

Table 4-1. Physical Setting Summary

Physical Setting Information		Information Source
Location		
Main Street Debris Basins (Site 1) – north terminus of Main Street in Washington City, Utah		N/A
Seegmiller Marsh (Site 2) – Virgin River at S. Mall Drive in St. George, Utah.		
Y-Drain (Site 3) – S 3000 E and Mall Drive in St. George and Washington City, Utah		
Warner Valley Disposal System (Site 4) – between Washington Fields Road and Fort Pearce Wash along 2760 S in St. George, Utah		
Hurricane Water Efficiency (Site 5) – Hurricane, Utah		
Topography		
Project Area Elevation	Site 1 – 2,900 to 3,020 feet	Google Earth Pro 2018
	Site 2 – 2,560 to 2,580 feet	
	Site 3 – 2,595 to 2,600 feet	
	Site 4 – 2,600 to 2,700 feet	
	Site 5 – 3,150 to 3,400 feet	
General Topographic Gradient	Site 1 – southwest	United States Geological Survey (USGS) 2017
	Site 2 – varies, general sloping toward Virgin River channel	
	Site 3 – southwest	
	Site 4 – west	
	Site 5 – northwest	

<table>
<tr><th colspan="6">Physical Setting Information</th><th>Information Source</th></tr>
<tr><td colspan="7">Geology</td></tr>
<tr><td rowspan="5">Project Area Geologic Units</td><td colspan="5">Site 1 – Eolian sand and alluvium (Qea), Alluvium and eolian sand (Qae),Kayenta Formation (Jk), Navajo Sandstone (Jn)</td><td rowspan="5">Utah Geological Survey Geologic Map (Biek et al. 2010)</td></tr>
<tr><td colspan="5">Site 2 – River and stream alluvium (Qa), Old river and stream alluvium (Qat), Petrified Forest Member of the Chinle Formation (TRcp), Moenave Formation (JTRm)</td></tr>
<tr><td colspan="5">Site 3 – Qat</td></tr>
<tr><td colspan="5">Site 4 – Qat, Alluvium and colluvium (Qac), Colluvium and alluvium (Qca), Alluvium and eolian sand (Qaeo & Qae), Virgin Limestone Member of the Moenkopi Formation (TRmv), Lower Red Member of the Moenkopi Formation (TRml), Shnabkaib Member of the Moenkopi Formation (TRms)</td></tr>
<tr><td colspan="5">Site 5 – Qac, Qae, Younger fan alluvium (Qafy), Qa, Level-1 fan alluvium (Qaf_1), Landslides (Qms), Ivans Knoll lava flow and cinder cone (Qbi), Qbv, Cinder Pits lava flow and cinder cones (Qbcp), Radio Tower lava flow (Qbrt)</td></tr>
<tr><td colspan="7">Soil Characteristics</td></tr>
<tr><td>Project Area Soil Type</td><td colspan="5">The Project area contains 30 soils types, which are listed and described in Table 4-2 of Section 4.1.</td><td>Web Soil Survey (NRCS 2018)</td></tr>
<tr><td colspan="7">Land Information</td></tr>
<tr><td rowspan="5">Land Ownership</td><td colspan="5">Site 1 – 43% Private, 57% State</td><td rowspan="5">Utah School and Institutional Trust Lands Administration (SITLA) and BLM 2017</td></tr>
<tr><td colspan="5">Site 2 – 100% Private</td></tr>
<tr><td colspan="5">Site 3 – 100% Private</td></tr>
<tr><td colspan="5">Site 4 – 100% Private</td></tr>
<tr><td colspan="5">Site 5 – 99% Private, 1% State</td></tr>
<tr><td rowspan="6">Land Use</td><td>Site #</td><td>Dev.</td><td>Undev.</td><td>Ag</td><td>Water</td><td rowspan="6">Multi-Resolution Land Characteristics (MRLC) Consortium Land Cover (Homer et al. 2015) & Google Earth Pro aerial imagery (Google Earth Pro 2017)</td></tr>
<tr><td>Site 1</td><td>33%</td><td>67%</td><td>-</td><td>-</td></tr>
<tr><td>Site 2</td><td>5%</td><td>80%</td><td>14%</td><td>1%</td></tr>
<tr><td>Site 3</td><td>99%</td><td>-</td><td>1%</td><td>-</td></tr>
<tr><td>Site 4</td><td>36%</td><td>46%</td><td>18%</td><td>-</td></tr>
<tr><td>Site 5</td><td>37%</td><td>45%</td><td>18%</td><td>-</td></tr>
</table>

4.1 Soil Resources

Soil information presented in this section has been summarized from NRCS Web Soil Survey data (NRCS 2018). Soils found within the Project area are depicted in Appendix C – Maps C2.1 through C2.4 and listed in Table 4-2. Note that areas within the Project extents consist of disturbed lands, engineered fill, and concrete/asphalt surfaces and may not be consistent with the soil descriptions listed below or depicted in the Appendix C maps.

Table 4-2. Soil Summary

Soil Unit Name	Landform	Ecological Site[1]	Slope	Description	Erosion Hazard Rating[2]	Farmland Classification	% of Project Area
Borrow Pits (BP)	N/A	N/A	N/A	Borrow pits	NR	Not prime farmland	0.3%
Eroded Land Shalet Complex, warm (EB)	Erosion remnants & swales	Desert Shallow Loam (Creosotebush)	2%-20%	Eroded land and residuum weathered from shale	NR	Not prime farmland	3.6%
Fluvaquents & Torrifluvents, sandy (FA)	Swales & floodplains	Loamy Bottom (Basin Big Sagebrush)	0%-3%	Alluvium and sandy alluvium derived from limestone, sandstone, and shale	Slight	Not prime farmland	17.9%
Hantz Silty Clay Loam (Ha)	Alluvial fans	NR	0%-2%	Mixed alluvium derived from limestone, sandstone, and shale	Slight	Prime farmland if irrigated	0.2%
Harrisburg Fine Sandy Loam (HbC)	Mesas	Desert Loam (Creosotebush)	1%-5%	Eolian deposits derived from tuff and/or eolian deposits derived from sandstone and siltstone over residuum weathered from sandstone	Slight	Prime farmland if irrigated	16.8%
Isom Cobbly Sandy Loam (IAF)	Alluvial fans	Desert Shallow Loam (Creosotebush)	3%-30%	Cobbly alluvium derived from limestone, sandstone, and shale	Moderate	Not prime farmland	1.4%
Junction Fine Sandy Loam (JaB)	Alluvial fans	Desert Loam (Creosotebush)	1%-2%	Fine sandy loam	Slight	Prime farmland if irrigated	1.4%
Junction Fine Sandy Loam (JaC)	Hills, alluvial fans	Desert Loam (Creosotebush)	2%-5%	Fine sandy loam	Slight	Prime farmland if irrigated	1.8%
Leeds Silty Clay Loam (LeA)	Alluvial flats	Desert Loam (Creosotebush)	0%-1%	Alluvium derived from limestone, sandstone, and shale	Slight	Prime farmland if irrigated	0.004%
Leeds Silty Clay Loam (LeB)	Floodplains	Desert Loam (Creosotebush)	1%-2%	Alluvium derived from limestone, sandstone, and shale	Slight	Prime farmland if irrigated	4.6%
Leedst Silty Clay Loam (LeD)	Alluvial flats	Desert Loam (Creosotebush)	5%-10%	Alluvium derived from limestone, sandstone, and shale	Slight	Prime farmland if irrigated	2.2%
Nikey Sandy Loam (NkC)	Alluvial fans	Desert Loam (Creosotebush)	1%-3%	Gravelly alluvium derived from limestone, sandstone, and shale	Slight	Prime farmland if irrigated	2.0%
Nikey Isome Complex (NNE)	Alluvial fans	Desert Shallow & Desert Loam (Creosotebush)	3%-30%	Gravelly and cobbly alluvium derived from limestone, sandstone, and shale	Slight	Not prime farmland	0.6%
Pintura Loamy Fine Sand (PnC)	Mountain slopes	Desert Sand (Indian ricegrass)	1%-5%	Eolian sands derived from sandstone	Slight	Farmland of statewide importance	0.2%
St. George Silty Clay Loam (Sc)	Floodplains	NR	0%-2%	Alluvium derived from sandstone, siltstone, and shale	Slight	Prime farmland if irrigated	20.5%
St. George Silty Clay Loam moderately saline (Sd)	Valley floors, floodplains	NR	0%-2%	Alluvium derived from sandstone, siltstone, and shale	Slight	Not prime farmland	1.4%

Soil Unit Name	Landform	Ecological Site[1]	Slope	Description	Erosion Hazard Rating[2]	Farmland Classification	% of Project Area
St. George Silty Clay Loam, shallow water table (Se)	Floodplains	NR	0%-1%	Alluvium derived from sandstone, siltstone, and shale	Slight	Not prime farmland	2.4%
Stony Colluvial Land (SY)	N/A	NR	N/A	stony colluvial land	NR	Not prime farmland	4.4%
Tobbler Silty Clay Loam (Tc)	Hills, alluvial fans	Desert Loam (Creosotebush)	1%-5%	Alluvium derived from sandstone and shale	Slight	Prime farmland if irrigated	5.5%
Tobbler Silty Clay Loam (Td)	Floodplains, valleys	Desert Loam (Creosotebush)	1%-2%	Alluvium derived from sandstone and shale	Slight	Prime farmland if irrigated	8.5%
Winkel Gravelly Fine Sandy Loam (WBD)	Mesas	Desert Shallow Loam (Creosotebush)	1%-8%	Calcareous material weathered from basalt, limestone, and wind-deposited sand	Slight	Not prime farmland	1.4%
Winkel-Rock Outcrop Complex (WCF)	Mesas	Desert Shallow Loam (Creosotebush)	8%-30%	Calcareous material weathered from basalt, limestone, and wind-deposited sand	Moderate	Not prime farmland	0.8%
Water (W)	N/A	N/A	N/A	water	NR	Not prime farmland	2.1%

[1] Ecological sites comprise a land classification system that describes ecological potential and ecosystem dynamics of land areas. They are used to stratify the landscape and organize ecological information for purposes of monitoring, assessment, and management.

[2] Ratings indicate the hazard of soil loss from off-road and off-trail areas after disturbance activities that expose the soil surface.

4.1.1 Upland Erosion

Soils within the Project area vary from site to site. Erosivity of soils depends on soil characteristics and the erosional forces acting on them. Erosion of surface materials occurs from wind and water interaction. Chemical processes can also help break down surface materials and contribute to erosion. Water is the most powerful erosive force and does the most damage when flowing down steeper slopes. The steeper the terrain, the greater potential for erosion from water interaction due to increased water velocities.

Most soils in the Project area were classified as having a slight erosion hazard from off-road and off-trail areas after disturbance to the soil surface has occurred (Table 4-2). According to NRCS Web Soil Survey erosion data (NRCS 2018), a slight erosion hazard rating indicates that erosion is unlikely under ordinary climatic conditions. Even though the NRCS soil classification for most of the soils is slight, it does not mean that the soils are not easily eroded. There are highly erosive soils present within the Warner Draw Watershed in stream/fan alluvium, eolian, and landslide deposits, as well as poorly consolidated bedrock. Soils susceptible to piping and erosion in these deposits are generally fine-grained, noncohesive, loose to poorly consolidated sand and silt deposits, and some poorly consolidated siltstone and claystone (Lund et al. 2008a). Soils classified as susceptible to piping and erosion have been identified within the Project area at all Project sites except for the Y-Drain site. Most erosion of these soils occurs from sheetwash and eventual channelization runoff during cloudburst storm events (Lund et al. 2008a). Erosion is further escalated when these types of soils are disturbed and/or vegetation is removed.

4.1.2 Sedimentation

As indicated Section 4.1.1, grade plays an important role in erosion, and steeper topography is more susceptible to erosive forces. In the Warner Draw Watershed, large amounts of sediment are eroded from steeper areas and transported during storm events to deposit in the low-lying shallow gradient areas. Sedimentation and/or sediment damages are a concern for Sites 1 and 2.

During flood events at Site 1, sediment-laden water flows over streets and residential areas, depositing large amounts of sediment. A sedimentation analysis was conducted for the area (Bowen & Collins 2019a) and an estimated sedimentation rate of 0.44 ac-ft/sq-mi/year was calculated. Sediment deposition rates for two drainage areas (Main Street and Buena Vista) were estimated. The Main Street contributing drainage area is approximately 399 acres with 376 acres (0.59 sq-mi) of undeveloped exposed land. The Buena Vista drainage area is approximately 175.6 acres (0.27 sq-mi) (Appendix A Map B3.1B). With a sedimentation rate of 0.44 ac-ft/sq-mi/year, approximately 0.26 ac-ft (419 cubic yards) of sediment from the Main Street drainage and approximately 0.12 ac-ft (194 cubic yards) of sediment from the Buena Vista Drainage (total combined 0.38 ac-ft or 613 cubic yards) flows downstream, depositing sediment in streets, residential properties, and stormwater systems.

Seegmiller Marsh at Site 2 has experienced sedimentation from return flows of the Seegmiller Drain, Middle Drain, and Washington Fields Drain/Y-Drain. Large amounts of sediment have also been deposited along the Virgin River floodplain (including in the marsh) from sediment-laden water carried by the river. This has decreased the flood capacity of the river along this stretch and reduced the marsh area.

4.1.3 Prime and Unique Farmland

NRCS, in cooperation with other interested federal, state, and local governments, has inventoried land that can be used to produce the Nation’s food supply. The extent and location of important soils that are best suited for food, feed, fiber, forage, and oilseed crops have been identified and classified as prime farmland, unique farmland, and farmland of statewide or local importance. Approximately 36.3 percent of the Project area is not prime farmland. Soils classified as “prime farmland if irrigated” make up approximately 63.5 percent of the Project area, and soils classified as farmland of statewide importance make up approximately 0.2 percent. A summary of farmland for each Project site is included in Table 4-3. Note that a location classified as prime and unique farmland does not mean the location is suitable for farming or fits the existing condition to be classified as such. Additional descriptions of existing conditions at each site and further qualifications for meeting each classification are provided below the table.

Table 4-3. Prime and Unique Farmland Summary

Site No.	Site Name	Not Prime Farmland		Prime Farmland if Irrigated		Farmland of Statewide Importance		Total
		Acres	%	Acres	%	Acres	%	Acres
1	Main Street Debris Basins	17	73%	5[A]	22%	1[A]	5%	23
2	Seegmiller Marsh	114	86%	18[B]	14%	-	-	132
3	Y-Drain	3	56%	2[B]	44%	-	-	5
4	Warner Valley Disposal System	8	10%	74[B]	90%	-	-	82
5	Hurricane Water Efficiency	47	17%	231[B]	83%	-	-	278
Total		**189**	**36.3%**	**331**	**63.5%**	**1**	**0.2%**	**521**

A = All lands are developed, disturbed, or not irrigated and would not be considered prime farmland or farmland of statewide importance.
B = A portion of these lands are developed, disturbed, or not irrigated and would not be considered prime farmland.

- Main Street Debris Basins (Site 1): Soils identified as "prime farmland if irrigated" within Site 1 are not irrigated or are located in areas that have already been developed. Farmland of statewide importance within Site 1 is currently developed. Because these soils are not or will not be irrigated, and/or have been disturbed through grading/filling and then developed over, these soils would not be considered prime or unique farmland.
- Seegmiller Marsh (Site 2): Approximately 6.4 acres of the 18 acres classified as "prime farmland if irrigated" in Site 2 are currently irrigated farmlands and fit the classification of "prime farmland if irrigated." The remaining 11.6 acres are on lands that have been disturbed and developed or are not currently irrigated. Because these soils are not or will not be irrigated, and/or have been disturbed through grading/filling and development, these soils would not be considered prime or unique farmland.
- Y-Drain (Site 3): Approximately 2,600 square feet (0.06 acres) of the 2 acres classified as "prime farmland if irrigated" in Site 3 are currently irrigated farmlands and fit the classification of "prime farmland if irrigated." The remaining 1.94 acres are on lands that have been disturbed with grading/fill activities and/or developed and are not currently irrigated.
- Warner Valley Disposal System (Site 4): Approximately 6.7 acres of the 74 acres classified as "prime farmland if irrigated" in Site 4 are currently irrigated farmlands and fit the classification of "prime farmland if irrigated." The remaining lands have been disturbed with grading/fill activities and developed with residential subdivisions or are not currently irrigated.
- Hurricane Water Efficiency (Site 5) – Approximately 20 acres of the 231 acres classified as "prime farmland if irrigated" in Site 5 are currently irrigated farmlands and fit the classification of "prime farmland if irrigated." The remaining 211 acres are on lands that have been disturbed with grading/fill activities and developed with residences, city infrastructure, etc. or are not currently irrigated.

4.2 Water Resources

4.2.1 Surface Water Quality

The Project area contains several stream/drainage channels, and water conveyance/drain channels and systems. The only water quality data available for any of these channels/drainages/systems are for the Virgin River and Fort Pearce Wash. The Virgin River is the only perennial stream within the Project area, and the remaining natural drainages are ephemeral, only flowing during precipitation events/seasonal runoff. Excavated water conveyance features are also located within the Project area and have varying flows dependent primarily on irrigation runoff and stormwater runoff. There is only one non-channel feature within the Project area that contains a permanent pool of water, a pond located within the Seegmiller Marsh Site (Site 2). No water quality data are available for this pond.

The Virgin River is currently on the state's list of impaired and threatened waters (Section 303(d) list) for toxic inorganics (boron), temperature, and TDS including salinity, chlorides, sulfates, and other TDS (EPA 2016). These impairments are listed for the Virgin River from the Utah/Arizona border upstream to the Quail Creek Diversion. Sources of impairment for this stretch of water were identified in the 2004 Total Maximum Daily Load (TMDL) Water Quality Study for the Virgin River Watershed and are listed below (Utah Department of Environmental Quality [UDEQ] 2004).

- Streambank and land erosion
- Fort Pearce Wash
- St. George Wastewater Treatment Plant
- Santa Clara River
- Urban stormwater and dry weather flows from lawn and golf course irrigation runoff
- Irrigation return flows
- Geothermal sources / Pah Tempe Hot Springs
- Geology

The Virgin River was monitored for TDS, and average concentrations were between 1,848 milligrams per liter (mg/L) and 2,197 mg/L at two measurement points between the Utah/Arizona border and the confluence with the Santa Clara River. Concentrations of TDS averaged between 1,388 and 1,955 mg/L measured from three points between the Santa Clara River confluence and Quail Creek Diversion (UDEQ 2004). These values exceeded the water quality standard at the time for TDS of 1,200 mg/L. Utah has not yet established TMDLs for the toxic inorganics, temperature, and TDS impairments. The UDEQ TMDL Water Quality Study for the Virgin River concluded that the TDS concentrations for the Virgin River from Pah Tempe Springs to the Utah/Arizona border should be 2,360 mg/L, based on a calculation of existing conditions and contribution of 9,650 mg/L of TDS by the Pah Tempe Hot Springs (UDEQ 2004).

Fort Pearce Wash is currently on the state's list of impaired and threatened waters (Section 303(d) list) for TDS (EPA 2016). This impairment is listed for Fort Pearce Wash from the Virgin River confluence to headwaters, excluding Short Creek. It is estimated that Fort Pearce Wash carries approximately 1,582 mg/L of TDS at an average flow of 9 cfs into the Virgin River. Sources of pollutant loading in Fort Pearce Wash are listed below (UDEQ 2004).

- Saline irrigation return flows
- Nutrient runoff
- Urban stormwater runoff
- Major disturbance from sand and gravel mining
- Stream bank erosion
- Stream channel alterations
- Construction disturbances
- Lack of stormwater detention basins

Utah's antidegradation policy (Rule R317-2-3; Utah Office of Administrative Rules 2018) does not prohibit degradation of water quality unless the Water Quality Board has previously considered the water to be of exceptional recreational or ecological significance (Category 1 or Category 2 waters). Category 1 or Category 2 waters do not exist within or near the Project area; therefore, the antidegradation policy does not apply.

4.2.2 Waters of the U.S.

Section 404 of the Clean Water Act regulates the discharge of dredged or fill material into waters of the U.S. and requires a permit for these activities unless the activities are exempt from Section 404 regulation. A delineation was performed for the Project area to identify aquatic resources that could be potential waters of the U.S. (Appendix E). Maps depicting delineated aquatic features are presented in Appendix C – Maps C3.1-C3.5. Table 4-4 provides information on the aquatic features identified as potential waters of the U.S. that were delineated within the Project area.

Table 4-4. Potential Waters of the U.S.

Aquatic Resource Feature	Feature ID	Cowardin Classification				Area / Length[2]
		System	Subsystem	Class	*Modifier*/ Subclass[1]	
Main Street Debris Basins (Site 1)						
Unnamed Ephemeral Wash	W16	Riverine (R)	Intermittent (4)	Stream Bed (SB)	*Seasonally Flooded (C)*	376 LF
Unnamed Ephemeral Wash	W16B	Riverine (R)	Intermittent (4)	Stream Bed (SB)	*Seasonally Flooded (C)*	420 LF
Seegmiller Marsh (Site 2)						
Virgin River	W1	R	4	Unconsolidated Bottom (UB)	*Permanently Flooded (H)*	4,600 LF
Unnamed Ephemeral Stream	W2	R	Unknown Perennial (5)	SB	*C*	700 LF
Washington Fields Drain	W3	R	5	UB	*Semi-permanently Flooded (F), excavated (x)*	1,530 LF
Pond	W5	Palustrine (P)	-	UB	*F*	2.5 acres
Irrigation Pond	IP1	Lacustrine (L)	Littoral (2)	UB	Mud (3), *Cx*	0.37 acres
Irrigation Pond	IP2	L	2	UB	3, *Cx*	0.27 acres
Y-Drain (Site 3)						
Y-Drain	W11	R	5	UB	*Fx*	1,125 LF
Warner Valley Disposal System (Site 4)						
Warner Valley Disposal System Open Channel	W12	R	5	UB	*Fx*	1,225 LF
Fort Pearce Wash	W13	R	4	SB	Sand (4)	125 LF
Freshwater Pond	W14	P	-	UB	*C*	0.18 acres
Freshwater Pond	W15	P	-	UB	*C*	0.05 acres
Hurricane Water Efficiency (Site 5)						
Gould Wash	W17A	R	4	SB	4	995 LF
Irrigation Pond	IP3	Lacustrine (L)	Littoral (2)	UB	Mud (3), *Cx*	0.05 acres
Total Area/Length of Delineated Potential Waters of the U.S.						**11,975 LF 3.42 acres**

[1] – Italic text is a modifier and non-italic text is a Subclass.

[2] – Lengths in linear feet (LF) are provided for channel features and areas (in acres) are provided for pond features.

Irrigation pond features (IP1, IP2, and IP3) and freshwater ponds (W14 and W15) were noted in the delineation report as not having connectivity to any waters of the U.S. Therefore, these aquatic features may not be jurisdictional waters of the U.S., however, it is the responsibility of the U.S. Army Corps of Engineers (USACE) to make the final determination of jurisdictional waters of the U.S.

4.2.3 Wetlands

A delineation was performed by Bowen Collins for the Project area to identify aquatic resources that could be classified as wetlands (Appendix E). Wetlands were present within Site 2 at Seegmiller Marsh; the remaining Project sites do not contain wetlands. Maps depicting delineated aquatic features for Seegmiller Marsh are presented in Appendix C – Maps C3.2A and C3.2B. Approximately 13.56 acres of emergent wetlands were delineated within the Project area (Table 4-5). These features are assumed to be jurisdictional, but it is the responsibility of the USACE to make the final determination of jurisdiction.

Table 4-5. Delineated Wetlands

Wetland	Cowardin Classification				Size (Acres)
	System	Class	Subclass	Modifier	
Seegmiller Marsh (Site 2)					
W4	Palustrine (P)	Emergent (EM)	Persistent (1)	Semi-permanently Flooded (F)	10.63
W6	P	EM	1	F	1.58
W7	P	EM	Phragmites australis (5)	Seasonally Flooded (C)	0.84
W8	P	EM	5	C	0.51
W9	P	EM	1	C	2.08
Total					**13.56**

4.2.4 Floodplain Management

Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRMs) for the Project area (FEMA 2009) were reviewed to determine existing flood hazard areas. The flood hazard areas for each site are summarized in Table 4-6. Additional information regarding flood hazards and flood management for each site are discussed below the table. Flood zones within the Project area extents include the following (FEMA 2009):

- Zone X: Areas determined to be outside of the 0.2 percent annual chance (500-year) flood
- Zone X (Shaded): Areas determined to be within the 0.2 percent annual chance (500-year) flood.
- Zone A: Areas determined to be located within the 0.1 percent annual chance (100-year) flood and base flood elevations have not been determined.
- Zone AE: Areas determined to be located within the 0.1 percent annual chance (100-year) flood and base flood elevations have been determined.

- Floodway: Floodway areas of Zone AE that include the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1 percent annual chance flood can be carried without substantial increases in flood heights.

Table 4-6. FEMA Flood Zone Summary

Site Number	Site Name	Flood Hazard Ratings	Description
1	Main Street Debris Basins	Zone X	The Project area and downstream areas along Main Street are shown as outside of the 500-year floodplain.
2	Seegmiller Marsh	Floodway, Zone AE, Zone X (Shaded), Zone X	The Project area is located within the Virgin River Floodway and 100- and 500-year flood zones.
3	Y-Drain	Zone X	The Project area is shown outside of the 500-year floodplain.
4	Warner Valley Disposal System	Floodway, Zone AE, Zone X (Shaded), Zone X	The Project area is shown outside of the 500-year floodplain, except at the western edge along Fort Pearce Wash.
5	Hurricane Water Efficiency	Floodway, Zone AE, Zone X (Shaded), Zone X	Portions of Hurricane in the Project area are in the Floodway and 100- and 500-year flood zones of Gould Wash.

- Main Street Debris Basins (Site 1): The FIRMs show the Site 1 Project area, and downstream areas as being outside of the 500-year floodplain (Appendix C – Map C4.1). Ephemeral washes run through the Project area and convey flows from two drainage areas (Main Street Drainage and Buena Vista Drainage) downstream to the Main Street underpass at I-15. Flood events have occurred from these drainages and the existing FIRMs do not depict the actual flood conditions. Modeling was performed for Site 1 (see Appendix D) and show flooding during routing the 100- and 500-year storm events that inundate residentially developed areas of Washington City along Main Street (Appendix C – Map C1.1A and C1.1B).
- Seegmiller Marsh (Site 2): This site is located within the channel and floodplains of the Virgin River. FIRMs show the floodway, and 100- and 500-year floodplains of the river (Appendix C – Map C4.2).
- Y-Drain (Site 3): This site is shown in Zone X outside of the 500-year floodplain (Appendix C – Map C4.2). The Y-Drain is a drainage channel and based on recent modeling performed (Appendix D), shows flooding at events at or greater than a 100-year storm (Appendix C – Map C1.2). The existing FIRMs do not depict the actual flood conditions of the Y-Drain.
- Warner Valley Disposal System (Site 4). This site consists of pipe and open channel that convey surface water flows from three upstream debris basins and stormwater from adjoining residential developments. The FIRMs show the system alignment within Zone X outside of the 500-year floodplain (Appendix C – Map C4.3), however, recent modeling (see Appendix D) shows that the system does not have capacity to handle conveyance of the 100-year flow. Flooding along the alignment would occur in areas for storms greater than or equal to the 100-year storm, inundating residentially developed areas (Appendix C – Map C1.3).

- Hurricane Water Efficiency (Site 5): The FIRMs for Hurricane show the floodway and 100- and 500-year flood zones along the Gould Wash alignment within the site extents (Appendix C – Map C4.4). The remaining portions of Site 5 are depicted as Zone X outside of the 500-year floodplain.

The existing FEMA flood maps do not currently depict the actual flooding conditions associated with certain drainage features within Sites 1, 3, and 4. The local community has the right to request a map revision from FEMA to change the FEMA flood zone designations. A flood analysis was performed for Sites 1, 3, and 4, and a summary of the area and features inundated for 100- and 500-year flood events are provided in Table 4-7.

Table 4-7. Existing Condition Flooding Summary

Storm Event	Number of Features Inundated						Land Inundated (Acres)
	Residential Structures	Commercial Businesses/ Offices	Schools	Other	Road/Minor Highways	Major Interstate Highways	
Site 1: Main Street Debris Basins							
100-Year	188	16	-	1	30	1	118
500-Year	241	22	-	1	30	1	143
Site 3: Y-Drain[1]							
100-Year	9	-	-	-	1	-	3
Site 4: Warner Valley Disposal System[1]							
100-Year	3	-	-	-	5	-	41

[1] – 500-year flooding analysis was not performed

4.2.5 Groundwater

Groundwater levels fluctuate across the Project area. Shallow groundwater susceptibility was mapped for areas of Washington County (Lund et al. 2008b) and the mapped groundwater zones at each site are provided in Table 4-8. Additional discussion is provided below the tables.

The mapped groundwater zones are the location of known and possible areas of shallow groundwater where special studies may be required prior to development. The groundwater zone descriptions are provided below.

- SGW_1: Naturally wet soils mapped by NRCS (depth to groundwater ≤60 inches), and soils mapped by NRCS as poorly drained or frequently irrigated where water-well or geotechnical information indicates a significant area of permanent shallow groundwater (≤10 feet). Construction in these areas will likely encounter shallow groundwater at depths of ≤10 feet, and basements and other water-sensitive underground facilities are not recommended without adequate drainage or other protection. Following development, lawn watering and other sources of urban runoff may cause groundwater levels to rise even higher in these areas.

- SGW_2: Poorly drained, generally fine-grained soils mapped by NRCS that may develop shallow groundwater locally when rates of water application exceed the soil's drainage capacity. Subsurface drains are frequently required to prevent these soils from becoming saturated. Because these soils naturally drain slowly, they may remain wet for most of the year, even though water is applied only during the growing season. Permanent shallow groundwater is possible following urbanization.
- SGW_3: Moderately to freely draining soils mapped by NRCS that are commonly irrigated for agricultural purposes. Where high rates of water application occur, these soils may develop seasonally shallow groundwater, but typically drain quickly once water application stops or is reduced below the soil's drainage capacity. Seasonal or transient shallow groundwater is possible following urbanization.
- None: Areas that have not been mapped as a shallow groundwater zone.

Table 4-8. Shallow Groundwater Zones

Site No.	Site Name	Groundwater Zone
1	Main Street Debris Basins	SGW_1, SGW_3, and None
2	Seegmiller Marsh	SGW_1
3	Y-Drain	SGW_1
4	Warner Valley Disposal System	SGW_1, SGW_2, SGW_3, and None
5	Hurricane Water Efficiency	SGW_1, SGW_2, SGW_3, and None

- Main Street Debris Basins (Site 1): A small area of zone SGW_1 is in the southern portion of Site 1 around the intersection of North Main Street and Buena Vista Boulevard. A small area of zone SGW_3 is also located in the Project area at the north terminus of North Main Street.
- Seegmiller Marsh and Y-Drain (Sites 2 and 3): These sites are located within zone SGW_1 where shallow groundwater is anticipated within 10 feet of ground surface.
- Warner Valley Disposal System (Site 4): A small area of zone SGW_1 is at the western edge of the Warner Valley Disposal System where the system enters Fort Pearce Wash. The remaining portion of this site alternates between zones SGW_2, SGW_3, and areas outside of shallow floodwater zones.
- Hurricane Water Efficiency (Site 5): Most of this site boundary is within zone SGW_3. Gould Wash through town is mapped as Zone SGW_1. Areas outside of floodwater zones exist at the southwestern corner of the site. A few areas within the northeast corner of the site and adjoining the Hurricane Cliffs are located within zone SGW_3.

4.3 Air Resources

4.3.1 Air Quality

The U.S. Environmental Protection Agency (EPA) has established health-based National Ambient Air Quality Standards (NAAQS) for six pollutants considered harmful to public health and the environment, known as criteria pollutants. NAAQS pollutants include carbon monoxide (CO), nitrogen dioxide (NO_2), ozone (O_3), particulate matter (PM), sulfur dioxide (SO_2), and lead (Pb). Monitoring of NAAQS pollutants in Utah is delegated to the Utah Division of Air Quality (UDAQ). UDAQ had 23 fixed air quality monitoring stations throughout the state of Utah that monitored the NAAQS pollutants in 2018 (UDEQ 2018). The closest station is in Hurricane and was monitored for NO_2, O_3, and PM 2.5 in 2018. Results for the Hurricane station show all pollutants monitored in compliance with the EPA air quality standards. Washington County is not listed as a NAAQS nonattainment or maintenance area (UDEQ 2017).

Under Title R307 of the Utah Administrative Code, emission inventories must be undertaken to further characterize air quality throughout Utah. Emission inventories are conducted every 3 years, during which UDAQ collects information about the types and quantities of compounds released by all emission sources in the state. Sources can be categorized as point (large stationary industrial or commercial facilities), area (smaller stationary sources that are assessed as a group), or mobile (personal or commercial vehicles). The 2014 triennial inventory is the most recent state-wide inventory available. It covers more than 360 point sources, 194 area categories, and 12 on- and off-road source categories (UDEQ 2018). The data collected are used by UDAQ to review trends over time and manage the air quality program. Results in tons of compound emitted per year for Washington County are shown in Table 4-9.

Table 4-9. 2014 UDAQ Emissions Inventory (tons/year)

County	CO	NO_2	PM10	PM2.5	SO_2	VOC
Washington	30,365.34	5,532.63	10,894.25	1,600.16	37.16	43,902.15

UDEQ 2018; VOC = volatile organic compound

No specific air quality issues were identified for Washington County based on a review of available air quality information.

4.4 Plant Resources

4.4.1 Noxious Weeds and Invasive Plants

Executive Order 13122 states that, “a federal agency shall not authorize, fund, or carry out actions that it believes are likely to cause or promote the introduction and spread of invasive species in the U.S. or elsewhere.” Noxious weeds and invasive plants are non-native plant species designated by state law or county ordinance because they cause, or have the potential to cause, extraordinary negative economic and ecological impacts.

Utah has 55 plant species listed as noxious and invasive (N&I) weeds in the state of Utah (Utah Department of Agriculture and Food [UDAF] 2019). The state noxious weeds are separated into four classes, Class 1 to Class 4. Class 1 is further separated into Class 1A and 1B. The descriptions of each class are listed below (UDAF 2019).

- Class 1A (Early Detection Rapid Response): Declared N&I weeds not native to Utah and not known to exist in the state but pose a serious threat to the state and should be considered as a very high priority.
- Class 1 B (Early Detection Rapid Response): Declared N&I weeds not native to Utah and known to exist in the state in very limited populations but pose a serious threat to the state and should be considered as a very high priority.
- Class 2 (Control): Declared N&I weeds not native to Utah and known to exist in varying population throughout the state that pose a threat to the state and should be considered a high priority for control. The concentration of these N&I weeds is at a level at which control, or eradication may be possible.
- Class 3 (Containment): Declared N&I weeds not native to Utah that are widely spread and known to exist in various populations throughout the state. These N&I weeds pose a threat to the agricultural industry and agricultural products. Weed control efforts may be directed at reducing or elimination new or expanding populations through the state.
- Class 4 (Prohibited): Declared N&I weeds not native to Utah that pose a threat to the state through the retail sale or propagation in the nursery and greenhouse industry. The weeds are annual, biennial, or perennial plants that the commissioner designates as having the potential or are known to be detrimental the human or animal health, the environment, public roads, crops, or other property.

Noxious weeds and invasive plants occur within the Project area at all Project sites. The Project area is located primarily on private lands, with some minor areas of state lands. General public recreation activities occur on state lands. Private lands are highly disturbed from development and agricultural practices. Soil disturbance and seed dispersal from vehicles, foot traffic, livestock, wildlife, and other on-site activities increase risk for invasion of noxious weeds and invasive plants.

Each of the Project sites were documented to contain non-native plants during the wetland delineation (Appendix E). Plants identified as non-native and their occurrence at each Project site are provided in Table 4-10. The bolded species from Table 4-10 (common reed, Russian olive, and tamarisk) are included in the Utah N&I weed list.

Table 4-10. Non-Native Plant Species

Name	Scientific Name	Site 1	Site 2	Site 3	Site 4	Site 5	N&I Weed Class[1]
Bulbous blue grass	*Poa bulbosa*			X	X		-
Cheatgrass	*Bromus tectorum*			X	X		-
Common reed	***Phragmites australis***		**X**	**X**		**X**	**3**
Dyer's Madder	*Rubia tinctorial*					X	-
Kochia	*Kochia scoparia*			X	X		-
Prickly lettuce	*Lactuca serriola*			X			-
Prickly Russian thistle	*Salsola iberica*			X	X		-
Russian olive	***Elaeagnus angustifolia***		**X**	**X**			**4**
Russian thistle	*Salsola tragus*	X	X				-
Saltlover	*Halogeton glomeratus*			X			-
Siberian elm	*Ulmus pumila*					X	-
Tamarisk	***Tamarix ramosissima***	**X**	**X**	**X**	**X**		**3**
Tumble mustard	*Sisymbrium altissimum*					X	-
Yellow sweet clover	*Melilotus officinalis*			X	X	X	-

X = Occurrence documented within the Project site

[1] Source: UDAF 2019

4.4.2 Riparian Areas

Riparian areas generally consist of long strips of vegetation adjacent to streams, rivers, lakes, reservoirs, and other inland aquatic systems that affect or are affected by the presence of water (Fischer et al. 2000). The riparian area exists in the transitional area between the aquatic and terrestrial ecosystems. Riparian areas feature different vegetative species than the adjoining ecosystems and exhibit more vigorous growth due to shallow groundwater interaction. These areas typically harbor a large number of wildlife species and perform numerous ecological functions. Riparian areas are the major providers of habitat for endangered and threatened species in western desert areas, and a large diversity of animals rely on them for food, cover, and water.

The Project area contains riparian areas at all sites except the Y-Drain (Site 3). The riparian vegetation conditions at each site (outside of delineated wetland areas) are described below.

- Main Street Debris Basin (Site 1): Site 1 has minor amounts of riparian vegetation along the unnamed ephemeral wash that flows through the site (Appendix C-Map C5.1). The riparian vegetation consists primarily of tamarisk that is sparsely spaced (Figure 4-1).

Figure 4-1. General View of Riparian Vegetation at Site 1

- Seegmiller Marsh (Site 2): Site 2 has a wide riparian corridor along the Virgin River that is supported by water supplied by the Virgin River and other water sources into marsh areas and ponds adjoining the river (Appendix C-Map C5.2). It contains dense growths of tamarisk, with scattered cottonwood, velvet ash, and willow (Figure 4-2). The habitat conditions have degraded at this site due to invasion of tamarisk or other non-native species (see Section 4.4.2), ground disturbance, encroaching development, and other factors that have decreased the diversity needed to maintain a healthy riparian corridor.

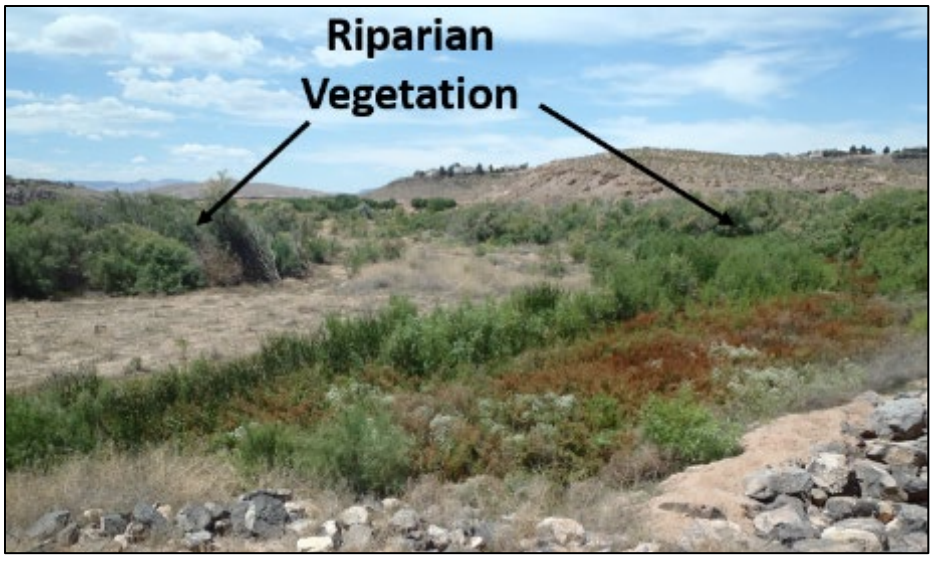

Figure 4-2. General View of Riparian Vegetation at Site 2

- Warner Valley Disposal System (Site 4): Riparian vegetation at Site 4 exists along Fort Pearce Wash at the fallout of the disposal system (Appendix C-Map C5.3). This vegetation consists primarily of phragmites, cattail, and willow (Figure 4-3).

Figure 4-3. General view of Riparian Vegetation at Site 4

- Hurricane Water Efficiency (Site 5): Riparian vegetation within Site 5 exists where the Project site intersects Gould Wash (Appendix C-Map C5.4). Vegetation consists primarily of narrowleaf willow (Figure 4-4).

Figure 4-4. Gould Wash General View of Riparian Vegetation

4.5 Animal Resources

4.5.1 Wildlife and Wildlife Habitat

The Project area may include a range of native and non-native migratory birds, resident birds, mammals, amphibians, reptiles, and aquatic species. Wildlife populations that are the most documented and understood include those that are listed for protection under the ESA, are a state species of concern, or are desired game or furbearers.

There are no designated wilderness areas (Wilderness Connect 2018) or wildlife refuges (USFWS 2018a) in or near the Project area. Wildlife habitat within the Project area for Sites 1, 3, 4, and 5 is of low quality and/or does not exist due to human disturbance, proximity to and within developed areas, and lack of vegetative or other forms of cover. Site 2 is within a riparian corridor that contains more abundant suitable habitat for wildlife species. Habitat conditions within each site are described below.

- Main Street Debris Basins (Site 1): This site adjoins residential development to the south, east, and west, with mostly undeveloped State of Utah-managed lands to the north. Most of the Project area is located on developed lands that do not provide wildlife habitat. Areas of open lands outside of existing surface roads and residential development have been disturbed recently through excavation/fill and are void of vegetation or cover, except for a 100-foot-wide corridor along the northern Project boundary that borders state undeveloped lands. Low-quality habitat in this corridor may offer food and cover for some wildlife species, including native and non-native migratory birds, resident birds, mammals, reptiles, and amphibians. Habitat on this site consists primarily of non-native mixed grasses and native shrubs.
- Seegmiller Marsh (Site 2): Seegmiller Marsh is situated within the Virgin River corridor and contains important riparian and aquatic habitat for a variety of species. The Virgin River is home to many aquatic species, but declining water and habitat conditions combined with human disturbance along the river has led to a drop in the native fish species population. This section of the Virgin River provides important aquatic habitat for ESA-listed species (Virgin River chub and woundfin), state species of concern (Virgin spinedace and desert sucker). The riparian corridor provides cover and habitat for many native and non-native migratory birds and resident birds, several of which are ESA-listed species and state species of concern. The site also offers habitat for mammals, reptile, and amphibian species.
- Y-Drain (Site 3): Residential development, surface roads, and churches adjoin the Y-Drain. The drain ditch has steep slopes with little vegetative cover. No natural wildlife habitat is present at this site, and the area is surrounded by urban development where wildlife species are not prevalent. The site may be used by birds, small mammals, and amphibians. Habitat on this site includes herbaceous species consisting primarily of non-native grasses and forbs, and shrub species consisting of tamarisk and arrow weed.
- Warner Valley Disposal System (Site 4). Most of this site is developed, and areas that are not developed are highly disturbed, with no natural wildlife areas remaining. Wildlife habitat is not available within most of the disposal system alignment, and wildlife species are not prevalent within the urban developed areas. Some undeveloped lands are located within the eastern portion of the site, but habitat and wildlife species are limited due to arid conditions, lack of surface water, limited diversity of vegetation, regular disturbance, and proximity to urban developed areas. Native and non-native migratory birds, resident birds, mammals, reptiles, and amphibians may use portions of

this site. Habitat in the undeveloped portions of the site consists primarily of non-native grasses intermixed with native shrubs.

- Hurricane Water Efficiency (Site 5): This site is located within the developed area of the City of Hurricane. These lands are developed with residential neighborhoods, commercial/office properties, and city infrastructure. Habitat within these areas consists of landscaping, cultivated agricultural fields, and pastures. Habitat quality is low or non-existent because it is located within the developed city limits, it experiences disturbance from city operations and agriculture, and there is limited cover. The southwestern-most site boundary is located on undeveloped lands adjoining rural residential development and farmland. Habitat in this area consists of primarily non-native mixed grasses and native shrubs. Native and non-native migratory birds, resident birds, mammals, reptiles, and amphibians may use portions of this site.

4.5.2 Special Status Animal Species

The ESA was established to protect endangered and threatened species and their habitats. Section 7 of the Act requires federal agencies ensure that federal actions do not jeopardize the existence of any listed species. This is accomplished through Section 7 consultation with USFWS. There are eight ESA animal species listed in Washington County, Utah, of which five have potential habitat and/or known occurrence within 2 miles of the Project sites (Table 4-11). Section 7 consultation was completed for the Project, and the results of the consultation are discussed in Section 6.5.2 of the Environmental Consequences section.

The State of Utah maintains a list of wildlife species of concern that includes those species for which there is credible scientific evidence to substantiate a threat to continued population viability (UDNR 2017). There are 25 species listed for Washington County, of which 19 have potential habitat and/or have a known occurrence within 2 miles of the Project sites (Table 4-11). Special status bird species that are also protected under the Migratory Bird Treaty Act (MBTA) are discussed in Section 4.5.3 Migratory Birds/Bald and Golden Eagles and are not included in the discussion below Table 4-11.

Table 4-11. Special Status Animal Species

Common Name	Scientific Name	ESA Status	State Status	Project Sites[1]
American White Pelican[2]	*Pelecanus erythrorhynchos*	-	SPC	2
Arizona Toad	*Bufo microscaphus*	-	SPC	1-5
Burrowing Owl[2]	*Athene cunicularia*	-	SPC	1-5
Common Chuckwalla	*Sauromalus ater*	-	SPC	1-5
Desert Sucker	*Catostomus clarkii*	-	SPC	2
Desert Tortoise	*Gopherus agassizii*	T	-	1, 4, 5
Ferruginous Hawk[2]	*Buteo regalis*	-	SPC	1-5
Flannelmouth Sucker	*Catostomus latipinnis*	-	CS	2
Fringed Myotis	*Myotis thysanodes*	-	SPC	5
Gila Monster	*Heloderma suspectum*	-	SPC	1, 4, 5

Common Name	Scientific Name	ESA Status	State Status	Project Sites[1]
Kit Fox	*Vulpes macrotis*	-	SPC	1, 4, 5
Long-Billed Curlew[2]	*Numenius americanus*	-	SPC	2, 5
Sidewinder	*Crotalus cerastes*	-	SPC	1, 4, 5
Southwestern Willow Flycatcher[2]	*Empidonax traillii extimus*	E	-	2, 3
Spotted Bat	*Euderma maculatum*	-	SPC	1
Virgin River Chub	*Gila seminuda*	E	-	2
Virgin Spinedace	*Lepidomeda mollispinis*	-	CS	2
Western Banded Gecko	*Coleonyx variegatus*	-	SPC	1, 2, 4, 5
Western Red Bat	*Lasiurus blossevillii*	-	SPC	5
Western Threadsnake	*Plagopterus argentissimus*	-	SPC	1, 2, 5
Woundfin	*Plagopterus argentissimus*	E	-	2
Yellow-billed Cuckoo[2]	*Coccyzus americanus occidentalis*	T	-	2, 3
Zebra-tailed Lizard	*Callisaurus draconoides*	-	SPC	1, 4

[1] Project sites with potential suitable habitat and/or documented occurrence (UDNR 2018b) within 2 miles of the Project site.
[2] Migratory bird protected under the MBTA
T = Threatened, E = Endangered, SPC = Wildlife Species of Concern, CS = Species receiving special management under a Conservation Agreement in order to preclude the need for federal listing

4.5.2.1 Arizona Toad

The Arizona toad is a state Wildlife Species of Concern (SPC). In Utah, the toad is found only in the southwestern portion of the state. They inhabit streams, washes, irrigated crop lands, reservoirs, and uplands adjacent to water. In winter, the species are inactive in cold weather. Breeding occurs in shallow, slow-moving streams where the eggs are laid (UDNR 2019). There are 24 observations of the Arizona toad within a 2-mile radius of Sites 1 through 5 (UDNR 2018b). Suitable habitat is present at these sites, and there is potential for occurrence of the species in or near water or irrigated croplands within the sites.

4.5.2.2 Common Chuckwalla

The common chuckwalla is lizard that is a state SPC. They occur only in the southern portion of the state and can be found predominantly near cliffs, boulders, or rocky slopes. The lizard uses rocks for basking and for shelter (UDNR 2019). There are 10 observations of the common chuckwalla within a 2-mile radius of Sites 1 through 5 (UDNR 2018b) and suitable habitat is present. Therefore, there is potential for occurrence of the species in or near rocky areas within Sites 1 through 5.

4.5.2.3 Desert Sucker

The desert sucker is a state SPC. In Utah, the benthic fish occurs only in the Virgin River system in the southwestern corner of the state (UDNR 2019). Spawning takes place from January through May. Suitable

habitat for this fish is only present within the Seegmiller Marsh Project site (Site 2). There are 26 documented occurrences of desert sucker within a 2-mile radius of this site (UDNR 2018b), and the species is likely to be present in the Virgin River within the Site 2 extents.

4.5.2.4 Desert Tortoise

The desert tortoise is an ESA threatened species. They can be found in the Mojave and Sonoran Deserts of southern California, Nevada, and Utah. The Project area is located within the USFWS-designated Upper Virgin River Recovery Unit for the desert tortoise. They spend most of their time in shelters such as soil burrows, caves, rock shelters, and pallets to help regulate body temperature and reduce water loss (UDNR 2019). The species can be found where suitable soils for den construction occur. Soils must be easily crumbled for ease of digging but also firm enough to not cause collapse. There are 234 documented occurrences of desert tortoise within a 2-mile radius of Sites 1 through 5 (UDNR 2018b). Sites 2 and 3 were determined to not contain suitable habitat for the species based on surveys conducted and consultation with USFWS (Hamilton 2019). According to the NRCS Desert Tortoise Survey Report, no live/dead tortoises, shelter sites, or other evidence of occurrence were discovered during the survey. Therefore, there is potential for occurrence of the species within Sites 1, 4, and 5, though occurrence would not be likely based on recent surveys conducted.

4.5.2.5 Flannelmouth Sucker

The flannelmouth sucker is a state CS (i.e., a species receiving special management under a Conservation Agreement in order to preclude the need for federal listing). In Utah, the benthic fish occurs in the main-stem Colorado River, as well as in many of the Colorado River's large tributaries. Spawning takes place during the spring and early summer. They prefer large rivers, where they are often found in deep pools of slow-flowing, low-gradient reaches (UDNR 2019). Suitable habitat for this fish is only present within the Seegmiller Marsh Project site (Site 2). There are 16 documented occurrences of flannelmouth sucker within a 2-mile radius of this site (UDNR 2018b), and the species is likely to be present in the Virgin River within the Site 2 extents.

4.5.2.6 Fringed Myotis

The fringed myotis is small bat that is a state SPC. The bat is widely distributed throughout Utah but is not very common in the state. The bat inhabits caves, mines, and buildings, most often in desert and woodland areas. The species is nocturnal, and individuals hibernate during the cold summer months (UDNR 2019). There is one documented occurrence of the species within a 2-mile radius of the Seegmiller Marsh Project site (Site 2) (UDNR 2018b). The observation was from 1985, and no other documented observations of the species in the area have occurred in the past 33 years. Based on observations, Site 2 only contains foraging habitat. Even though there is no documented occurrence of the species within 2 miles of the other sites, there is potential suitable habitat present at Site 5. Therefore, there is potential for occurrence of the species in buildings within Project Site 5, though it is unlikely due to lack of documented occurrence. The potential occurrence of the species in other sites would be only for foraging at night and would also be unlikely, due to lack of documented occurrence.

4.5.2.7 Gila Monster

The Gila monster is a venomous lizard that is a state SPC. In Utah, the lizard occurs only in the extreme southwestern corner of the state. Habitat for the species consist of large rocky shelves, sandy areas, and creosote-sagebrush areas. The lizards are most active during the spring and summer months but spend

about 95 percent of the active season in burrows or under rocks (UDNR 2019). There are five observations of the Gila monster within a 2-mile radius of Sites 1 and 5 (UDNR 2018b). Even though there is no documented occurrence of the species within 2 miles of other sites, Site 4 contains potential suitable habitat. Therefore, there is potential for occurrence of the species in large rocky shelves, sandy areas, and creosote-sagebrush areas within Project Sites 1, 4, and 5.

4.5.2.8 Kit Fox

The kit fox is a state SPC in Utah and occurs in the western, east-central, and southeastern portions of the state. The species occurs primarily in open prairie, plains, and desert habitats (UDNR 2019). Even though there is no documented occurrence of the species within 2 miles of the Project sites, there is potential suitable habitat present at Sites 1, 4, and 5. However, habitat is limited at these sites, so while there is potential for occurrence of the species, it is not likely due to proximity to urban development and associated disturbance.

4.5.2.9 Sidewinder

The sidewinder is a state SPC in Utah and only occurs in the extreme southwestern corner of the state. The species prefers sandy open terrain and takes refuge in the burrows of tortoises or small mammals. They are primarily nocturnal, avoiding the extreme heat of the day, and are inactive during cold weather (UDNR 2019). There are five observations of the species within a 2-mile radius of Sites 1 and 5 (UDNR 2018b). Even though there is no documented occurrence of the species within 2 miles of other sites, Site 4 contains suitable habitat. Therefore, there is potential for occurrence of the species within Sites 1, 4, and 5.

4.5.2.10 Spotted Bat

The spotted bat is a state SPC and occurs statewide in Utah but probably has never been abundant in any location. The species can occur in a range of habitats from deserts to forested mountains. Spotted bats are nocturnal, and they roost and hibernate in caves and rock crevices (UDNR 2019). There is one documented occurrence of the species within a 2-mile radius of the Main Street Debris Basin (Site 1) Project site (UDNR 2018b). There is no roosting or hibernating habitat at Site 1, but the area could be potentially used for foraging at night.

4.5.2.11 Virgin River Chub

The Virgin River chub is an ESA endangered species. The fish occurs only in the Virgin River system, and in Utah is restricted to limited areas of the mainstem Virgin River. Spawning takes place during late spring and early summer over gravel or rock substrate (UDNR 2019). Designated Critical Habitat (DCH) for this fish is present within the Seegmiller Marsh site (Site 2) (Appendix C – Map 6.1A) and consists of the 100-year floodplain as identified in the FEMA FIRM map (50 CFR Part 17). There are 21 documented occurrences of Virgin River chub within a 2-mile radius of this site (UDNR 2018b), and the species is likely to be present in the Virgin River within the Site 2 extents.

4.5.2.12 Virgin Spinedace

The Virgin spinedace is a state CS. In Utah, the minnow historically was found throughout the Virgin River system of Utah, Nevada, and Arizona, but is now found only in portions of its historic range. They prefer slow-moving water of creeks and small streams and are usually found in areas with abundant cover.

Spawning takes place during the spring and late summer (UDNR 2019). Suitable habitat for this fish is only present within the Seegmiller Marsh site (Site 2). There are three documented occurrences of Virgin spinedace within a 2-mile radius of this site (UDNR 2018b), and the species have the potential to be present in the Virgin River within the Site 2 extents.

4.5.2.13 Western Banded Gecko

The western banded gecko is a state SPC and in Utah occurs in the Mohave Desert in the extreme southwestern portion of the state. The species can be found in many types of habitat and are excellent climbers (UDNR 2019). There are 13 observations of the species within a 2-mile radius of Sites 1, 2, 4, and 5 (UDNR 2018b). These Project sites contain suitable habitat, and there is potential for occurrence of the species within these sites.

4.5.2.14 Western Red Bat

The western red bat is a state SPC and occurs in the western United States and part of Mexico but is extremely rare in Utah. The bats are typically found near water, often in wooded areas. The species is nocturnal and roosts in trees (UDNR 2019). There is one documented occurrence of the species within a 2-mile radius of Site 5 in Hurricane (UDNR 2018b). The occurrence was documented in 1935, and no other observations of the species in the area have occurred since the original 1935 sighting. The Project sites do not offer much suitable habitat, and due to lack of documented occurrence within the last 83 years, the bat is not likely to be present within any of the Project sites.

4.5.2.15 Western Threadsnake

The western threadsnake is a state SPC. In Utah, they only occur in the southwestern corner of the state. The snakes are burrowers and prefer moist, loose soil. They are nocturnal, and individuals are only active on the surface at night (UDNR 2019). There is one observation of the species within a 2-mile radius of Site 2 (UDNR 2018b). The observation was from 1934 at approximately 1.9 miles from the site, and no other documented observations of the species in the area have occurred in the past 84 years. Even though there is no documented occurrence of the species within 2 miles of other sites, Sites 1 and 5 contain potential suitable habitat. Therefore, there is potential for occurrence of the species within Project Sites 1, 2, and 5; However, presence of the species is unlikely due to lack of documented occurrence at Sites 1 and 5, and lack of documented occurrence within 84 years at Site 2.

4.5.2.16 Woundfin

The woundfin is an ESA endangered species. This minnow occurs only in the Virgin River system, but historically was found in the lower Colorado and Gila River drainages of Utah, Arizona, and Nevada. The species is typically found in the main channel of swift, turbid, warm streams over sand substrate. Spawning takes place during spring in swift, shallow water over gravel substrate (UDNR 2019). DCH for this fish is present within the Seegmiller Marsh site (Site 2) (Appendix C – Map 6.1A) and consists of the 100-year floodplain as identified in the FEMA FIRM map (50 CFR Part 17). There are 22 documented occurrences of woundfin within a 2-mile radius of this site (UDNR 2018b), and the species is likely to be present in the Virgin River within the Site 2 extents.

4.5.2.17 Zebra-Tailed Lizard

The zebra-tailed lizard is a state SPC, and in Utah, they occur only in the southwestern corner of the state. The lizard prefers sparsely vegetated desert areas with hard-packed soils (UDNR 2019). There are nine observations of the lizard within a 2-mile radius of Sites 1, 2, and 3 (UDNR 2018b). Based on site observations, the Seegmiller Marsh (Site 2) and Y-Drain (Site 3) do not contain suitable habitat. Even though there is no documented occurrence of the species within 2 miles of Sites 4 and 5, these sites contain potential suitable habitat. Therefore, there is potential for occurrence of the species within Project Sites 1, 4, and 5.

4.5.3 Migratory Birds / Bald and Golden Eagles

4.5.3.1 Migratory Birds

Eagles are protected under the Eagle Protection Act (16 U.S.C 668), which provides specific protection for bald and golden eagles. The act makes it illegal to take, possess, sell, purchase, barter, or transport any bald or golden eagle, alive or dead, or any part, nest, or egg thereof. The term *take* includes any attempt or success at pursuing, shooting, shooting at, poisoning, wounding, killing, capturing, trapping, collecting, molesting, or disturbing. Bald eagles have the potential to be present, but golden eagles are not anticipated to be present within the Project area.

Migratory birds are afforded protection under authority of the MBTA (16 U.S.C 703-712). Under the MBTA, it is unlawful to take, kill, or possess migratory birds, their parts, nests, or eggs. Migratory Bird Permits must be obtained through the USFWS Migratory Bird Permit Office for any requested waiver or exception to the MBTA. Migratory birds have the potential to occur within the Project area.

USFWS maintains a list of Migratory Birds of Conservation Concern (MBCC), which are migratory nongame birds that without additional conservation actions, are likely to become candidates for listing under the ESA. According to the USFWS Information for Planning and Consultation (IPaC) Resource List (USFWS 2018b) for the Project area, there are 12 MBCCs that may warrant special attention in the Project vicinity (Table 4-12). There are also seven migratory birds protected under the MBTA that are listed as species of concern by the State of Utah or are ESA-listed and were found to have habitat or documented occurrence within 2 miles of the Project area (Table 4-11 and Table 4-12). Additional discussion for each species is provided below the table. Note that there are other migratory birds protected under the MBTA that are not MBCCs or listed as a special status species that could be present within the Project area.

Table 4-12. Migratory Birds

Common Name	Scientific Name	ESA Status	State Status	MBCC[1]	Project Sites[2]
American White Pelican	*Pelecanus erythrorhynchos*	-	SPC	-	2
Bald Eagle	*Haliaeetus leucocephalus*	-	SPC	MBCC	2, 5
Brewers Sparrow	*Toxostoma bendirei*	-	-	MCBB	1-5
Burrowing Owl	*Athene cunicularia*	-	SPC	MBCC	1-5

Common Name	Scientific Name	ESA Status	State Status	MBCC[1]	Project Sites[2]
Clark's Grebe	*Aechmophorus clarkii*	-	-	MBCC	2
Ferruginous Hawk	*Buteo regalis*	-	SPC	-	1-5
Lewis's Woodpecker	*Melanerpes lewis*	-	SPC	MBCC	1, 2, 5
Long-Billed Curlew	*Numenius americanus*	-	SPC	-	2, 5
Long-Eared Owl	*Asio otus*	-	-	MBCC	1-5
Olive-Sided Flycatcher	*Contopus cooperi*	-	-	MBCC	2
Rufous Hummingbird	*Seasphorus rufus*	-	-	MBCC	1-5
Southwestern Willow Flycatcher	*Empidonax traillii extimus*	E	-	-	2, 3
Virginia's Warbler	*Vermivora virginiae*	-	-	MBCC	2
Willet	*Tringa semipalmata*	-	-	MBCC	2
Willow Flycatcher	*Empidonax traillii*	-	-	MBCC	2, 3
Yellow-billed Cuckoo	Coccyzus americanus occidentalis	T	-	-	2

[1] MBCC identified in IPaC Resource List (USFWS 2018b)

[2] Project sites with potential suitable habitat and/or documented occurrence (UDNR 2018b) within 2 miles of the Project site.

T = Threatened, E = Endangered, SPC = Wildlife Species of Concern

4.5.3.2 American White Pelican

The American white pelican is a migratory bird and a state SPC. It migrates to Utah in early March, and the only known breeding colonies are in the northern portions of the state. Preferred breeding habitats are islands, especially those associated with freshwater lakes. Foraging habitat consists of shallow lakes, marshlands, and rivers, and the species feeds primarily on fish. Birds depart from breeding grounds from October through December (UDNR 2019). There is one documented occurrence of the species within a 2-mile radius of Site 5 in Hurricane (UDNR 2018b). Pelicans were spotted at reservoir and sewer pond areas outside of the Project site. Site 5 does not contain suitable nesting or foraging habitat for the species, and they are not anticipated to be present. Sites 1, 3, and 4 do not contain suitable or known nesting habitat. Seegmiller Marsh (Site 2) contains some suitable foraging habitat, and there are two documented observations of the pelican at Seegmiller Marsh (eBird 2019). Based on this information, the species is only likely to be present at Site 2 for foraging.

4.5.3.3 Bald Eagle

The bald eagle is an MBCC and a state SPC. Breeding range for the species spans Alaska, Canada, the coastal United States, and portions of the northern United States. Nesting occurs in tall trees near water

bodies where fish and waterfowl prey are available. During non-breeding periods, especially during winter, bald eagles roost communally in sheltered stands of trees (UDNR 2019). Neither nesting nor roosting habitat is available within the Project sites. Sites 2 and 5 contain potential foraging habitat for the species, but the remaining sites do not. There are seven documented observations of bald eagles at the Seegmiller Marsh Complex and Springs Park at Site 2, and four documented observations near Site 5 (eBird 2019). Therefore, bald eagles could be present at Sites 2 and 5 for foraging but are not anticipated to be encountered at any of the other Project sites.

4.5.3.4 Brewer's Sparrow

The Brewer's sparrow is an MBCC that occurs in shrub-steppe habitats in all Western states to breed. The birds arrive in Utah in mid-April and begin the southern migration in mid-October. Nests are constructed in the top half of shrubs (usually sagebrush) between 8 to 20 inches high. Wintering birds occur rarely in Utah in the southwestern corner of the state (UDNR 2019). There is no known occurrence of the species within 2 miles of the Project sites (UDNR 2018b). Even though there is no documented occurrence of the species, a predicted habitat map shows critical-value and high-value habitat located within the Project area, and the sparrow is noted to be a common to very common summer resident of Utah (UDNR 2019). Shrub-steppe habitats are located within and adjacent to the Project sites. Therefore, Brewer's sparrow has the potential to be present in the Project area for breeding or foraging.

4.5.3.5 Burrowing Owl

The burrowing owl is an MBCC and a state SPC. The owl migrates to Utah in April to breed and heads back to wintering grounds by November. The species uses open grassland and prairie habitats, but it also can be found in other open areas such as golf courses, cemeteries, and airports. Nests are in mammal burrows, usually that of a prairie dog, ground squirrel, badger, or armadillo. If a mammal burrow is not available, the owls will sometimes excavate their own nest burrow (UDNR 2019). There are 22 documented occurrences of the species within 2 miles of the Project area (UDNR 2018b). Project Sites 2 and 4 contain potential nesting habitat for the species, and all Project sites contain foraging habitat. Burrowing owls have the potential to be present within Sites 2 and 4 for nesting and all Project sites for foraging.

4.5.3.6 Clarks Grebe

The Clark's grebe is an MBCC that winters along the west coast of North America and breeds in the northwestern and north-central United States, as well as Canada and areas of Mexico. Preferred habitats include lakes, marshes, and coasts. Nesting occurs on large lakes in vegetation in or near the water (UDNR 2019). Suitable breeding habitat is not present at any of the Project sites. The Seegmiller Marsh Project site (Site 2) provides potential foraging habitat for species migrating to and from breeding grounds, and there is one documented observation of the species at the Seegmiller Marsh Complex and Springs Park Pond. Therefore, there is potential for the species to be present at Site 2 for foraging during migration.

4.5.3.7 Ferruginous Hawk

The ferruginous hawk is a migratory bird and state SPC. It breeds in western North America, from south-central Canada to northern Utah and New Mexico, and winters in the western and central United States and Mexico. During winter, the species uses habitat on open farmlands, grasslands, deserts, and other arid regions where lagomorphs, prairie dogs, or other major prey items are present. Breeding habitat requirements include rolling terrain in grassland or shrub steppe (UDNR 2019). Breeding habitat for the species is present at Site 1, 4, and 5. All sites have potential foraging habitat for the hawk. There are

documented observations of the hawk at Springs Park, adjoining Site 2, within 1 mile of Site 3 and 4, and within Site 5 (eBird 2019). Therefore, there is potential for the species to be present year-round at all sites for foraging and potential for nesting during breeding season at Sites 1, 4, and 5.

4.5.3.8 Lewis's Woodpecker

The Lewis's woodpecker is an MBCC and a state SPC. It is a summer and winter resident in Utah. The bird is a cavity-nester and excavates holes in tall trees, utility poles, or stumps, and prefers ponderosa pine, cottonwood, or sycamore. Breeding habitat requirements primarily consist of open park-like ponderosa pine forests. They are attracted to burned-over Douglas-fir, mixed conifer, piñon-juniper, riparian, and oak woodlands and deciduous forests, especially riparian cottonwoods. Wintering grounds cover a wide range of habitats, but oak woodlands are preferred (UDNR 2019). The Project area does not contain suitable nesting habitat but does contain foraging habitat at Sites 1, 2, and 5. Two observations of the species have been documented within 2 miles of Site 1, one at Site 2, and three within Site 5 (eBird 2019). All observations were during the non-breeding season with one in mid-October and the remaining in February. Therefore, there is potential for occurrence of Lewis's woodpecker at Sites 1, 2, and 5 during the non-breeding season.

4.5.3.9 Long-Billed Curlew

The long-billed curlew is a migratory bird and state SPC. It is a common summer resident and migrant in Utah, especially through the central and more northern valleys, and is less common in the Colorado River drainage. The species lives and breeds in higher and drier meadowlands. The species has four essential nesting habitat requirements in the northwestern United States that includes short grass (less than 30 centimeters tall), bare ground components, shade, and abundant vertebrate prey. They seem to be most successful nesting in mixed fields with adequate, but not tall, grass cover and fields with elevated points. Uncultivated rangelands and pastures support most of the continental long-billed curlew breeding population (UDNR 2019). Most of the Project area does not appear to be suitable habitat for nesting, except for limited lands within Site 5. Potential foraging habitat for the species is present in Site 2 and Site 5. There are eight documented observations of the species within 2 miles of Site 2, all occurring in April, and no documented observations within 2 miles of Site 5 (eBird 2019). Based on this information, there is potential for long-billed curlew to be present in Site 2 for foraging during the spring. The species is not likely to be present in Site 5, but there is potential breeding and foraging habitat at that site.

4.5.3.10 Long-Eared Owl

The long-eared owl is a MBCC and is found throughout Utah, especially where woodlands are bordered by fields or other open habitats. The owl breeds throughout much of Canada and the northeastern and western United States. The winter ranges are not well understood, and commonly, the populations will remain within the breeding range. Some birds have appeared in southern Mexico during winter, revealing evidence of seasonal migration. The owls will use old stick nests built in trees by other birds to lay eggs (UDNR 2019). Potential foraging habitat is available within Sites 1 through 5, and potential nesting habitat is present at Sites 2 and 5. There are two documented observations of the species near the Project area, with an occurrence within 2 miles of Site 2 and an occurrence within 2 miles of Site 5 (eBird 2019). Therefore, there is potential for the species to be present in the Project area for foraging in Sites 1 through 5, and nesting/breeding in Sites 2 and 5.

4.5.3.11 Olive-Sided Flycatcher

The olive-sided flycatcher is an MBCC and in Utah is moderately common during the summer breeding season. It prefers woodland and forest areas, especially areas where standing dead trees are present, and it nests in trees (UDNR 2019). Sites 1 and 2 contain potential breeding/foraging habitat for the species. There are no documented observations of the species within 2 miles of the Project sites, except for Site 2. There are eight documented observations of the species at Site 2 (eBird 2019). Based on this information, there is potential for occurrence of the species for breeding/foraging at Site 2, but the species is not likely to be encountered within the other Project sites.

4.5.3.12 Rufous Hummingbird

The rufous hummingbird is an MBCC that migrates north to coniferous forests and meadows in the northwestern United States from areas in the southern United States and Mexico to breed. The species migrates north during the spring to breeding grounds, traveling along the Pacific Coast. The migration back to wintering grounds occurs during the fall and the species returns inland, either along the side of the Great Basin Desert, or along the Rocky Mountain Cordillera. The birds pass through Utah during their fall migration to forage along their migration route (UDNR 2019). Breeding habitat is not present within the Project area. The Project sites contain potential foraging habitat for the species, and there are documented observations of the species within 2 miles of Project Sites 1 through 5 (eBird 2019). Therefore, there is potential for occurrence of the hummingbird for foraging during fall migration at all Project sites.

4.5.3.13 Southwestern Willow Flycatcher

The southwestern willow flycatcher is an ESA endangered species. It typically inhabits riparian habitats in areas of dense willow (UDNR 2019). The birds only breed in dense riparian vegetation near surface water or saturated soil and build nests primarily in tamarisk and native willow (NPS 2013). The species arrives at breeding grounds in the southwestern United States in May and migrates back to Central America and Mexico between August and September. Nests are constructed in a vertical fork of a willow or other riparian tree (UDNR 2019). Suitable breeding habitat for the species is located at Seegmiller Marsh (Site 2), but it is not present in any of the other Project sites. Site 2 also contains approximately 95 acres of DCH for the species (Appendix C – Map C6.1B). There are several documented observations of the species in and around Site 2 (eBird 2019). The Y-Drain Project site (Site 3) does not contain suitable breeding habitat, but due to proximity to Site 2, it could be used for foraging. Therefore, the flycatcher has the potential to be present at Site 2 for foraging/breeding, and Site 3 for foraging.

4.5.3.14 Virginia's Warbler

The Virginia's warbler is an MBCC and has a breeding range almost entirely within the southwestern United States. It migrates from Mexico, arriving on breeding grounds as soon as late April and returns to Mexico as late as mid-October. Preferred breeding habitat includes chaparral; open stands of pinyon-juniper, yellow pine, and scrub oak; mountain mahogany thickets and other low brush habitats on dry mountainsides; open ravines and canyons; and flat mountain valley bottoms from approximately 6,560 to 9,850 feet in elevation. Nesting elevation in Utah ranges from 4,000 to 10,000 feet (UDNR 2019). The Project area is either outside of the nesting elevations or does not contain suitable nesting habitat. The species uses semi-open habitats during migrations, especially riparian areas. Foraging habitat for the warbler is present at Site 2, but the remaining sites do not appear to have suitable foraging conditions. Therefore, the species has the potential to be present at Site 2 for foraging while migrating to and from breeding grounds.

4.5.3.15 Willet

The willet is an MBCC and occurs in southern Utah during migration to and from more northern breeding grounds in spring and fall. The species prefers to inhabit shorelines of marshes, mudflats, coastal beaches, and lakes (UDNR 2019). The species forages by walking on shore, in marshes, or in water, probing with its bill for food or picking the food from the water (Seattle Audubon Society 2019). Site 2 has the only suitable foraging habitat for the species within the Project area. There are several documented observations of the species within 2 miles of Site 2 along the Virgin River corridor (eBird 2019), and the species has the potential to be present at Site 2 for foraging during migration.

4.5.3.16 Willow Flycatcher

The willow flycatcher is an MBCC that breeds throughout the northern and central United States and winters in Mexico and Central America. Breeding sites are often near water in low scrub, thickets, or groves of small trees. Nests are usually constructed on a vertical fork in willow, rose, or other small riparian tree (UDNR 2019). Breeding habitat for the species is present at Site 2 but not in any of the other Project sites. There are several documented observations of the species in and around Site 2. The Y-Drain Project site (Site 3) does not contain suitable breeding habitat, but due to the proximity to Site 2, it could be used for foraging. Therefore, the flycatcher has the potential to be present at Site 2 for foraging/breeding, and Site 3 for foraging.

4.5.3.17 Yellow-Billed Cuckoo

The yellow-billed cuckoo is an ESA threatened species that migrates from South America and arrives in Utah in late May and early June to breed. The birds return to South America in late August to early September. The species' nesting habitat consists of lowland, large space, riparian areas (about 100+ acres) with dense cottonwood trees, willows, and other riparian shrubs (UDNR 2019). The species is only found in riparian habitats, and the only suitable breeding/foraging habitat within the Project area occurs at Site 2. There have been two documented occurrences of the species within 2 miles of Site 2, with one occurring in 1996 and one in 1981 (UDNR 2018b) (eBird 2019). A presence survey was conducted by Utah Division of Wildlife Resources (UDWR) in 2013 that documented bird return calls at Seegmiller Marsh, but nesting was not confirmed (Defreese 2018 as cited in Bowen Collins 2019e). Based on this information, there is potential for the cuckoo to be present at Site 2, but additional surveys would need to be performed to confirm or deny presence and nesting. There is no DCH for the species in or near the Project area.

4.6 Human Resources

4.6.1 Socioeconomics

The socioeconomic area of consideration surrounding the Project area can be assessed on state, county, and local scales. For the purposes of this study, socioeconomic condition is presented for the State of Utah, Washington County, and pertinent cities (St. George, Washington City, and Hurricane) for comparison. The following sections and tables describe the current demographic, employment, income, and economic conditions that could be affected by Project actions.

4.6.1.1 Population and Demographics

Table 4-13 shows the 2016 population and demographic estimates for St. George, Washington City, Hurricane, Washington County, and the State of Utah. The cities, county, and state are all demographically

similar – all cities are predominantly white, with a population ranging from 89.4 to 92.5 percent white. This falls within the range for Washington County, but is slightly higher than the state percentage at 87.3 percent. Population percentages of all other single races in the cities mentioned above were similar to those in Washington County, with the African American population at 0.2 to 0.9 percent, American Indian or Alaska Native population at 1.2 to 2.5 percent, Asian population at 0.6 to 1.2 percent, and Native Hawaiian or other Pacific Islander population at 0.3 to 1 percent. The percentages for the state were highest for African Americans at 1.1 percent and Asians at 2.2 percent, and lowest for American Indians or Alaska Natives at 1.1 percent. Native Hawaiian and other Pacific Islander populations for the state were similar to the city and county population percentages. Two or more races made up the highest percentages of any other single non-white race at 2.3 to 3.9 percent, and races classified as "other" were at 0.6 to 4.8 percent.

Ethnicity of all races were reported as approximately 8.8 to 13.1 percent Hispanic or Latino, with 86.9 to 91.2 percent reported to not be Hispanic or Latino.

Table 4-13. Demographic Profile Summary

Socioeconomic Criteria		St. George		Washington City		Hurricane		Washington County		Utah	
		Estimate	%	Estimate	%	Estimate	%	Estimate	%	Estimate	%
Total Population		78,573	100	23,141	100	15,106	100	151,959	100	2,948,427	100
Gender	Male	37,829	48.1	11,650	50.3	7,665	50.7	74,981	49.3	1,483,055	50.3
	Female	40,744	51.9	11,491	49.7	7,441	49.3	76,978	50.7	1,465,372	49.7
Age	Under 18	21,000	26.5	6,925	29.9	4,460	29.5	42,891	28.2	905,196	30.7
	18 & over	57,753	73.5	16,216	70.1	10,646	70.5	109,068	71.8	2,043,231	69.3
Race	White	70,228	89.4	20,717	89.5	13,967	92.5	138,580	91.2	2,572,595	87.3
	African American	716	0.9	79	0.3	34	0.2	968	0.6	32,512	1.1
	American Indian or Alaska Native	919	1.2	581	2.5	298	2.0	2,136	1.4	31,686	1.1
	Asian	490	0.6	171	0.7	185	1.2	1,047	0.7	66,039	2.2
	Native Hawaiian and other Pacific Islander	821	1.0	72	0.3	146	1.0	1,240	0.8	26,411	0.9
	Two or More Races	2,026	2.6	901	3.9	384	2.5	3,542	2.3	77,810	2.6
	Other	3,373	4.3	620	2.7	92	0.6	4,446	2.9	141,374	4.8

Source: United States Census Bureau (Census Bureau 2016)

4.6.1.2 Employment and Income

Table 4-14 shows 2016 employment status estimates for St. George, Washington City, Hurricane, Washington County, the State of Utah, and the United States. Unemployment rates in those cities ranged from 3 to 3.1 percent, which is below the county at 3.5 percent, the state at 3.4 percent, and United States at 4.7 percent. The median household income for the cities of $51,228 to $54,463 was within the range of Washington County, but lower than the state at $62,518 and United States at $55,322. The mean household

income for the cities of $66,375 to $67,402 was just less than Washington County at $68,071, and much less than Utah at $79,414 and the United States at $77,866.

Table 4-14. Employment and Income Summary

Characteristic	St. George	Washington City	Hurricane	Washington County	Utah	United States
Population 16 years and older	59,946	16,955	16,955	113,933	2,136,930	253,323,709
Civilian labor force	33,889	9,921	9,921	64,208	1,447,260	159,807,099
Employed	32,075	9,388	9,388	60,181	1,374,146	148,001,326
Unemployed	1,814	533	533	4,027	73,114	11,805,773
Percent unemployed	3.0%	3.1%	3.1%	3.5%	3.4%	4.7%
Median Household Income	$ 51,228	$ 54,463	$ 54,463	$52,865	$62,518	$55,322
Mean Household Income	$ 67,402	$ 66,375	$ 66,375	$68,071	$79,414	$77,866
Percent of Families with Income Below Poverty Level	10.6%	10.8%	10.8%	10.2%	8.4%	11.0%

Source: Census Bureau 2016

4.6.2 Historic Properties / Cultural Resources

Section 106 of the National Historic Preservation Act of 1966 (NHPA) requires federal agencies to take into account the effects of their undertakings on cultural resources and historic properties and afford the Advisory Council on Historic Preservation a reasonable opportunity to comment. An archaeological survey for the Project area was conducted in accordance with NRCS standards. A literature review of known and recorded cultural resources was conducted.

A Cultural Resource Assessment for historic and prehistoric sites was conducted for the Project (Certus Environmental Solutions, LLC 2019). The Area of Potential Effect was surveyed and includes the Project area extents as seen in Appendix B – Maps B3.1 through B3.4. The assessment documented multiple historic sites within the Project area. No prehistoric sites were documented within the Project area. The documented historic sites are described below.

- Sites 1 through Site 3: No sites listed or eligible for listing in the NRHP.
- Site 4: Contains two historic sites eligible for listing in the NRHP including St. George and Washington Canal, and a silo.
- Site 5: Contains sites that are listed in the NRHP, including Hurricane Canal and lateral ditches.

4.6.3 Public Health and Safety

Public health and safety are a concern where flooding has the potential to impact developed and occupied areas. This is currently the case for Main Street Debris Basins (Site 1), Y-Drain (Site 2), and Warner Valley Disposal System (Site 4). Modeling of several storm events was performed at Sites 1, 3, and 4 for existing conditions to determine features and lands inundated. The number and type of structures and roads

inundated, and acres of land inundated during key storm events for these sites, is provided in Table 4-6 of Section 4.2.4. Site-specific public health and safety conditions are described below.

4.6.3.1 Main Street Debris Basins

Three drainage areas (Brio Drainage, Main Street Drainage, and Buena Vista Drainage), totaling 1.32 square miles, occur upstream of I-15 and Main Street in Washington City. During precipitation events, surface water runoff from the three drainages converge near the intersection of Buena Vista and Main Street where existing stormwater systems do not have enough capacity to handle flows from larger local and 24-hour storm events. Excess flows during these events continue down Main Street under I-15 and have regularly flooded residential neighborhoods downstream of I-15 (see Section 2.1.2). Many of the houses along Main Street, south of I-15, were constructed below street grade and are at risk of flooding from minor amounts of surface runoff passing under I-15. The stormwater system upstream of I-15 becomes ineffective between a 2- and 5-year storm event and stormwater begins to run south down Main Street under I-15, causing flooding. Occupants of residences and community buildings, and those using surface roads are exposed to a public health and safety risk during these events and larger storm events.

4.6.3.2 Y-Drain

The Y-Drain is an open channel that conveys surface water runoff from irrigation and rainfall. A 100-year storm is anticipated to generate a flow of 137 cfs, and the existing channel configuration and capacity deficiencies downstream would cause water to back up in the channel and flood. Flooding would extend north into the residential subdivision and west across Sandia Road, affecting residences and surface roads. Occupants of residences and surface roads would be exposed to a public health and safety risk during this and larger storm events.

In addition to flooding hazards, Y-Drain also poses a public health and safety hazard. The drain has steep slopes, is not fenced, and is located between a residential neighborhood and elementary school, where it is easily accessed by students and the public. Students walk along the drain corridor to access residential neighborhoods to the east and west, and some cross over the drain, using unpermitted crossing structures.

4.6.3.3 Warner Valley Disposal System

Warner Valley Disposal System consists of open channel and piped conveyance system for the surrounding residentially developed area and for three debris basins upstream. Due to development pressure, the existing Warner Valley Disposal System does not have capacity to convey the anticipated flows from the upstream debris basins and the existing and proposed stormwater runoff from the surrounding developed areas. At a 100-year storm event, two segments of open channel would overtop, and water would also flow out of two manholes along the pipeline, flooding the surrounding areas. Occupants of residences and surface roads would be exposed to a public health and safety risk during this and larger storm events.

4.6.4 Recreation

Several recreation activities occur within the Project area with varying recreation availability and activities within each Project site. Recreation at each site is described below.

- Main Street Debris Basins (Site 1): Site 1 is located on lands managed by the State of Utah that are open to the public for recreation activities. There are no dedicated trails or recreation areas within the site boundary, but recreation use within the area may include hiking, biking, and off-highway vehicle use, among others.
- Seegmiller Marsh (Site 2): Most of the lands within Site 2 are privately owned without public recreation access, except for the Virgin River North shared-use trail, which is paved. The trail exists along the west side of the Virgin River, and approximately 4,375 linear feet of trail is located within the site boundary. The trail is open to the public and is used primarily for walking, running, and bicycling (Appendix C – Map C7.1).
- Y-Drain (Site 3): Site 3 is located on land owned by the St. George and Washington Canal Company and is not open for public recreation.
- Warner Valley Disposal System (Site 4). This site is located on private land and areas within the road ROW. There are no dedicated trails or recreation areas within the site boundary, except for an approximately 620 linear feet pedestrian and equestrian trail extending between 2350 E and Little Valley Road (Appendix C – Map C7.2). Some minor recreation activities like walking, running, and bicycling likely occur in areas along the road ROWs and existing trail.
- Hurricane Water Efficiency (Site 5): This site is located within the developed area of the City of Hurricane on privately owned lands and in road ROWs. There are no dedicated trails or recreation areas within the site boundary. Some minor recreation activities like walking, running, and bicycling likely occur in areas along the road ROWs within the site extents.

4.6.5 Land Use

A description of land cover was used to help identify land uses within the Project area extents and was obtained from the National Land Cover Database (Homer et al. 2015). Land cover types found within the Project area are defined below (Homer et al. 2015). Maps C8.1 through C8.4 in Appendix C shows the land cover types for the Project area and Table 4-15 identifies the cover types and percentages for each site.

- Developed, Low Intensity – Areas with a mixture of constructed materials and vegetation. Impervious surfaces account for 20 to 49 percent of the total cover. These areas most commonly include single-family housing units.
- Developed, Medium Intensity – Includes areas with a mixture of constructed materials and vegetation. Impervious surfaces account for 50 to 79 percent of the total cover. These areas most commonly include single-family housing units.
- Developed, High Intensity – Highly developed areas where people reside or work in high numbers. Examples include apartment complexes, row houses, and commercial/industrial. Impervious surfaces account for 80 to 100 percent of the total cover.
- Developed, Open Space – Includes areas with a mixture of some constructed materials, but mostly vegetation in the form of lawn grasses. Impervious surfaces account for less than 20 percent of total cover. These areas most commonly include large-lot single-family housing units, parks, golf courses, and vegetation planted in developed settings for recreation, erosion control, or aesthetic purposes.

- Pasture/Hay – Areas of grasses, legumes, or grass-legume mixtures planted for livestock grazing or the production of seed or hay crops, typically on a perennial cycle. Pasture/hay vegetation accounts for more than 20 percent of total vegetation.
- Cultivated Crops – Areas used for the production of annual crops, such as corn, soybeans, vegetables, tobacco, and cotton, and also perennial woody crops such as orchards and vineyards. Crop vegetation accounts for more than 20 percent of total vegetation. This class also includes all land being actively tilled.
- Open Water – All areas of open water, generally with less than 25 percent cover of vegetation or soil.
- Barren Land – Barren areas of bedrock, desert pavement, scarps, talus, slides, volcanic material, glacial debris, sand dunes, strip mines, gravel pits, and other accumulations of earthen material. Generally, vegetation accounts for less than 15 percent of total cover.
- Herbaceous – Areas dominated by graminoid or herbaceous vegetation, generally more than 80 percent of total vegetation. These areas are not subject to intensive management such as tilling but can be used for grazing.
- Scrub/Shrub – Areas dominated by shrubs; less than 5 meters tall, with shrub canopy typically more than 20 percent of total vegetation. This class includes true shrubs, young trees in an early successional stage, or trees stunted from environmental conditions.
- Woody Wetlands – Areas where forest or shrub land vegetation accounts for more than 20 percent of vegetative cover and the soil or substrate is periodically saturated with or covered with water.
- Evergreen Forest – Areas dominated by trees generally more than 5 meters tall, and more than 20 percent of total vegetation. More than 75 percent of the tree species maintain their leaves all year. Canopy is never without green foliage.
- Deciduous Forest – Areas dominated by trees generally more than 5 meters tall and more than 20 percent of total vegetation cover. More than 25 percent of the tree species shed foliage simultaneously in response to seasonal change.

Table 4-15. Land Use

Site	Land Use Type								
	Developed		Agricultural		Undeveloped				
	Low/ Med/ High %	OS %	Past/ Hay %	Cult Crops %	Open Water/ Barren Land %	Herb %	Scrub/ Shrub %	Woody Wet %	Ever/ Dec Forest %
Site 1 Main Street Debris Basins	13.5	19.8	-	-	-	6.7	60.0	-	-
Site 2 Seegmiller Marsh	1.9	3.3	13.1	1.1	0.3	5.7	36.2	38.4	-
Site 3 Y-Drain	76.8	22.5	0.7	-	-	-	-	-	-
Site 4 Warner Valley Disposal System	11.9	23.7	1.6	16.7	-	2.8	43.3	-	-
Site 5 Hurricane Water Efficiency	28.0	8.7	2.6	15.8		7.7	36.5	-	0.7
Total	18.7	10.3	5.0	11.3	<0.1	6.3	38.2	9.8	0.4
	29.0		**16.3**		**54.7**				

Low = Low Intensity, High = High Intensity, OS = Developed Open Space, Past/Hay = Pasture/Hay, Cult Crops = Cultivated Crops, Heb = Herbaceous, Woody Wet = Woody Wetlands, Ever Forest = Evergreen Forest, Dec Forest = Deciduous Forest

Developed lands (low, medium, and high intensity, and open space) make up approximately 29 percent of the Project area and are improved with city infrastructure, residential structures, and community facilities. Agricultural lands make up approximately 16.3 percent of the Project area and are either pastures or cultivated crops. Undeveloped lands make up approximately 54.7 percent of the total Project area and consist of vegetative land cover (herbaceous, scrub/shrub, woody wetlands, evergreen forest, and deciduous forest). The vegetative land cover at Sites 1 and 3-5 is mostly located in areas that have previously been disturbed or have since been improved or disturbed from recent development. These areas operate primarily as private residential areas and road/utility ROWs. Undeveloped lands at Site 2 consists of the Virgin River riparian corridor.

4.6.6 Visual Resources and Scenic Beauty

Project Sites 1, 3, 4, and 5 are located within or adjoining developed areas, are disturbed lands, and do not offer scenic views. The Seegmiller Marsh (Site 2) is located along the Virgin River and offers views of the river corridor that include wetland and riparian habitats (Figure 4-5 and Figure 4-6). In this arid region, wetland and riparian habitats are rare. Additionally, these types of habitats are considered among the most biologically diverse ecosystems, perform numerous ecological functions, and typically harbor many wildlife species. The Virgin River North Trail extends along the west side of the Virgin River, where recreationists can view these rare and important habitats.

Figure 4-5. View of Virgin River and Riparian Corridor

Figure 4-6. View of Virgin River and Riparian Corridor, including the Virgin River North Trail

4.6.7 Transportation Infrastructure

Site 2 does not contain transportation infrastructure. Sites 1, 3, 4, and 5 are located within developed areas and contain multiple roadways or highways. Additionally, transportation infrastructure downstream and surrounding Sites 1, 3, and 4 are at risk of flooding. A description of transportation infrastructure conditions for Sites 1 and 3-5 is provided below.

- Main Street Debris Basins (Site 1) – The site boundary encompasses three improved roads that are used to access residential development. Flooding of roadways downstream of the site boundary occurs from runoff originating in the upstream drainages. During a 100-year storm, much of the developed area downstream of the site is flooded, inundating approximately 30 roads and I-15 (Appendix C – Map C1.1A).
- Y-Drain (Site 3) – The site boundary extends over Sandia Road. Flooding of roadways downstream of the Y-Drain occurs, and Sandia Road and South Mall Drive experience flooding during a 100-year storm (Appendix C – Map C1.2).
- Warner Valley Disposal System (Site 4) – The majority of the Project alignment is along 2760 S and associated cross-streets. The portions of the Project area that do not follow the road ROW are intersected by five road crossings. Along the disposal system alignment open channels would overtop in two areas and water would flow out of two manholes, flooding the surrounding areas during a 100-year flood event. Flooding would occur to five roads during this event (Appendix C – Map C1.3).
- Hurricane Water Efficiency (Site 5) – The site boundary for Site 5 primarily follows road ROWs through Hurricane. There are only a few segments within this site that are outside of existing paved roads or gravel driveways.

4.6.8 Noise

Applicable noise laws for the Project area are provided in the Noise Control Act of 1972 (42 U.S.C. 4901 et seq.), amended by the Quiet Communities Act of 1978 (42 U.S.C. 4913), which promotes the development of state and local noise control programs. Washington County Code also includes regulations regarding noise.

Ambient noise in the Project area has not been measured, and therefore no baseline is available. Generally, there is an abundance of noise sources in the Project area produced from vehicle traffic, agricultural operations, airports, air traffic, and other general town operational noises.

Noise-sensitive receptors are those facilities, land areas, or wildlife populations that require lower noise levels for health and function. Examples include residential neighborhoods, medical facilities, schools, churches, research facilities, parks, and open space. Many of the Project sites are in developed areas near residential neighborhoods, churches, and schools.

5.0 Alternatives

5.1 Project Scoping

Early in the scoping process, comments were requested from the public, organizations, and government agencies. Comments were accepted both orally at a public meeting and via written submittal. The primary purpose of the scoping process was to gather input and feedback on the project's purpose and need, potential alternatives for consideration, environmental issues to be addressed in the Plan-EA, methodologies to be used to evaluate impacts, and the overall public participation process. Four written comments were received during the open scoping comment period. A description of the public scoping process is included in Section 3.0, and Appendix E contains a copy of the Scoping Report.

5.2 Formulation Process

The process of formulating alternatives for the project followed procedures outlined in the NRCS NWPM (NRCS 2015) Parts 500 through 506; NRCS NWPH (NRCS 2014a), Parts 600 through 606; Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies (U.S. Water Resources Council [USWRC] 1983); and other NRCS watershed planning policy. Numerous alternatives were developed by the Project team with consideration for issues and concerns discovered during the scoping process and based on their ability to address the purpose and need of the Project. Alternatives were formulated in consideration of four criteria: completeness, effectiveness, efficiency, and acceptability. In accordance with NEPA (40 CFR 1502.14), some initial alternatives were eliminated from further analysis due to high cost, logistics, environmental reasons, or other critical factors. The Project team analyzed an Action Alternative for each of the five Project sites and one No Action Alternative in detailed study. Multiple additional alternatives and options were formulated but were eliminated from further study due to critical factors.

5.3 Alternatives and Options Considered but Eliminated from Detailed Study

The alternatives and options described in this section were considered during the planning process but were eliminated from detailed study due to environmental impacts, if they were considered infeasible, had exorbitant costs, did not meet the purpose and need of the Project, or other critical factors.

Project costs described for alternatives eliminated from detailed study, if noted, include construction costs. Construction costs incorporate expenses incurred during the installation period for labor, material, equipment, and services; contractor's overhead and profit; and other direct costs associated with items such as earthwork removal or replacement, purchase and installation of materials and appurtenances, plus a realistic contingency allowance (NRCS 2015).

5.3.1 Site 1: Main Street Debris Basins

Several alternatives and options were formulated during the planning process to address the flooding issues caused from the drainage areas upstream of Main Street in Washington City. Alternatives and options formulated but eliminated from further study are listed below.

- Relocation: For this alternative, structures exposed to flooding during a 100-year event would be relocated or purchased and demolished. Approximately 188 homes and 16 office/commercial buildings would need to be relocated or purchased and demolished. This would result in significant

disturbance to families and persons occupying the structures. Additionally, the cost to purchase 188 homes at a median home price of $326,000 (Zillow 2019) would be exorbitant at more than $61 million. This alternative was eliminated from further study based on the environmental impact to people occupying structures, uncertainties with acquisition, and exorbitant cost, making it infeasible.

- Floodproofing: This alternative consisted of installation of flood walls, raising grade in areas, and other measures to protect occupied structures. This alternative would require extensive and invasive modifications at a very high cost. The required measures would also cut off access to residential homes and other structures. This alternative was eliminated from detailed study due to impacts from disturbance, access restrictions from proposed measures, and logistical issues, making it infeasible.
- Main Street Roadway Improvements: To safely convey the 100-year storm event and larger localized storms, curb and gutter would be installed and reconstruction and flattening of Main Street would be completed. A curb wall would be installed at the back of the Main Street sidewalks. Catch basins would be installed to capture runoff from the road and convey it into the existing storm drain system. With these improvements, it was determined that protection was only feasible up to a 10- to 15-year storm event, and additional upstream measures would be necessary to protect for the 100-year storm. This alternative was eliminated from further study because the design couldn't meet the purpose and need to provide protection for the 100-year storm.
- Mill Creek Flood Channel: This alternative would construct a new 1,900-foot-long flood channel from the Main Street/Buena Vista Boulevard intersection to Mill Creek. This channel would be constructed to convey flows from a 100-year storm event. The Main Street/Buena Vista Boulevard intersection would be graded and lowered to direct runoff west before it flows under I-15. Installation of a flood-activated deflector or other deflecting measures to redirect flows from Main Street into the new channel would also be required. Utilities at this intersection would need to be moved or reconstructed to accommodate the regrading. Since water would still be flowing over the roadway during storm events, public health and safety is a concern. Additionally, the deflector may add to these public safety issues. This alternative would not reduce the amount of sediment flowing downstream, and flooding would still occur along surface roads north of I-15. Based on the public health and safety concern, impacts to utilities, and inability to meet the purpose and need, this alternative was eliminated from further study.
- Upsize Stormwater System: The existing stormwater drainage system through Washington City would be upsized to safely convey the flows for the 100-year event. This would consist of installing a significantly larger stormwater system throughout this area of town. Due to the amount of disturbance to existing infrastructure, utility conflicts, and cost, this alternative was determined to be unreasonable and eliminated from further study.

5.3.2 Site 2: Seegmiller Marsh

Several alternatives and options were considered during the planning process to improve the Virgin River water quality, quantity, and riparian health at this site. All of the alternatives considered were developed in accordance with both the Virgin River Master Plan (Natural Channel Design, Inc. 2007) and Seegmiller Marsh Concept Plan (Natural Channel Design, Inc. and Applied Ecological Services 2006). Alternatives and options formulated but eliminated from further study are listed below.

- A second alternative similar to the preferred alternative for Seegmiller Marsh was formulated, but the erosion protection measures would be slightly different. Erosion protection would be installed on the west side of the river adjoining the existing asphalt trail instead of locating it farther upland within the cultivated lands. This would require additional sediment excavation along the river and relocation of the existing erosion protection on the east side of the river farther upland. Modifications and disturbance to known nesting habitat for ESA southwestern willow flycatcher and DCH for ESA fish species would be required for these modifications. These measures would cost approximately $1.25 million more than the preferred alternative. This alternative was eliminated from further study due to adverse environmental impacts to ESA species/DCH and cost.

5.3.3 Site 3: Y-Drain

Alternatives and options were considered during the planning process to provide flood prevention, reduce the public health and safety hazard, and reduce sediment introduction at this site. Alternatives and options formulated but eliminated from further study are listed below.

- An option was formulated to construct a concrete-lined channel that would replace the existing earthen channel at the Y-Drain. The threat to public health and safety would still be present and the channel would need to be fenced. A new asphalt trail would be constructed north of the channel and a pedestrian crossing would be required for safe access from the elementary school to the trail. This alternative was determined to cost more than the preferred alternative for the Project without providing any added benefit and does not meet the goals of the Project to eliminate the public health and safety risk; therefore, it was eliminated from further study.

5.3.4 Site 4: Warner Valley Disposal System

Several alternatives and options were considered during the planning process to correct the Warner Valley Disposal System design deficiencies and increase the system capacity to convey a 100-year storm flow. Alternatives and options formulated but eliminated from further study are listed below.

- Upsize Existing Pipe: Two segments of pipe along the alignment that do not currently have capacity to convey the flow would be replaced with a larger-diameter pipe. There is limited room in the utility corridor for upsizing the disposal system and existing utility conflicts. Additionally, the cost of this alternative is more than the parallel pipe alternative described below. Based on the limited space from utility conflicts, logistics, and cost, this alternative was eliminated from further study.
- Installing a Parallel Pipe: Two segments of pipe along the alignment currently do not have capacity to convey the flow. Parallel piping would be installed along these two segments to increase the capacity of the system. In addition, the open-channel segments of the system would be piped, and the adverse grade piping replaced. There is limited room in the utility corridor for placement of a new pipe, and relocation of an existing irrigation ditch, streetlights, traffic lights, underground power conduits, and other utility conduits/piping would be required. Costs for this alternative were determined to be more than the preferred alternative with no added benefit. This alternative was eliminated from further study due to impacts to utilities, logistical issues with utility relocations, and increased costs with no added benefit to the Project.

5.3.5 Site 5: Hurricane Water Efficiency

Several alternatives and options were considered during the planning process to manage and convey irrigation water flows for the City of Hurricane. Alternatives and options formulated but eliminated from further study are listed below.

- Expanding Existing Irrigation Facilities: An alternative was developed to construct ponds to store 6 million gallons of water adjoining the existing City of Hurricane water department facility at the north edge of the city. The facility abuts BLM-operated lands that are located within the Red Cliffs Desert Reserve. Additionally, this alternative cost approximately $1.36 million more than the preferred alternative, with no additional benefit to the Project, and has more operational issues with higher operation cost. Based on the disturbance to lands within the reserve that include sensitive habitat for the ESA-listed desert tortoise, operational issues/costs, and higher construction cost with no added benefit to the Project, this option was eliminated from further study.
- Higher Reservoir and New Pump Station: An alternative was developed to construct ponds to store 6 million gallons of water at the southwestern extent of the service area. The ponds would be constructed at a higher elevation to provide the required system pressure; however, a booster pump station would be required to pump the water into the ponds. This alternative would cost approximately $200,000 more than other alternatives developed. More pipeline is required, and a larger area of disturbance is anticipated then the preferred alternative. Additionally, water would be pumped prior to de-silting, resulting in operation and maintenance (O&M) issues for the pump. This alternative was eliminated from further study based on the additional unnecessary disturbance, pump O&M issues, and higher cost with no added benefit to the Project.

5.4 Alternatives Considered for Detailed Study

Alternative analysis is required to determine feasible methods that can meet the purpose and need of the Project. The No Action Alternative must also be considered. The alternatives studied in detail include the No Action Alternative, and an Action Alternative for five sites (Main Street Debris Basins, Seegmiller Marsh, Y-Drain, Warner Valley Disposal System, and Hurricane Water Efficiency). A detailed description of alternative measures and cost is provided in Sections 5.4.1 and 5.4.2.

Alternative cost estimates provide a level of detail judged appropriate for the purpose of identifying the NED Alternative among the alternatives considered. Project costs provided for alternatives selected for detailed study include installation and O&M costs. Installation costs include costs for installing the works of improvement to be incurred after the Project is authorized for installation. Installation costs incorporate, as applicable, construction, engineering, real property rights, natural resource rights, permitting, replacement-in-kind relocation payments, and Project administration costs (NRCS 2015). O&M costs include materials, equipment, services, and facilities needed to operate the Project and make repairs and replacements necessary to maintain structural measures in sound operating condition during the 50-year project life (NRCS 2015). A summary and comparison of Project costs for alternatives included in detailed study is provided in Section 5.6, Table 5-5.

5.4.1 No Action Alternative

The No Action Alternative considers the actions that would take place if no federal action or federal funding were provided for the Project. The SLOs' most likely course of action at each of the five sites without federal involvement is described in Sections 5.4.1.1 through 5.4.1.5 below.

To evaluate this alternative for the same duration as the action alternatives, SLOs' O&M costs at each site were estimated over the 50-year project life. In total, installation costs were estimated at $3,530,000 and O&M costs over 50 years were estimated at $7,997,000. Installation measures and costs are described for each site in Sections 5.4.1.1 through 5.4.1.5 below. Refer to Appendix D for construction and O&M cost estimate details and assumptions.

5.4.1.1 No Action Site 1: Main Street Debris Basins

The SLOs would leave the existing stormwater drainage systems in place along Main Street and no improvements would be made for the No Action Alternative. In summer of 2019, Washington City graded two debris basin structures to capture floodwater as part of an emergency action. The new basins can attenuate an approximate 10-year flood event and do not provide additional sediment storage capacity. Total O&M costs to maintain the existing stormwater system over 50 years would be approximately $1,000,000.

5.4.1.2 No Action Site 2: Seegmiller Marsh

The SLOs would construct a new public trail, as described for the Action Alternative, and would work to secure approximately 80 acres of land to conserve and protect the Virgin River floodplain and Seegmiller Marsh area. This action would take place regardless of whether the SLOs receive federal funding for the Project. Total installation costs for this alternative would be approximately $1,561,000. Total O&M costs to maintain the trail over 50 years would be approximately $702,000.

5.4.1.3 No Action Site 3: Y-Drain

The SLOs would leave the existing open channel drain as-is and install a fence around the channel for the No Action Alternative. This action would take place regardless of whether the SLOs receive federal funding for the Project. The total installation cost for fencing is estimated at $26,500. Total O&M costs to remove sediment from the ditch and maintain the fence were estimated at $625,000 over 50 years.

5.4.1.4 No Action Site 4: Warner Valley Disposal System

For the No Action Alternative, the SLOs would construct asphalt pedestrian and unpaved equestrian trails, as described for the Action Alternative. This action would take place regardless of whether the SLOs receive federal funding for the Project. Installation costs for the trail is estimated at $3,530,000. O&M of the trail and existing disposal system were estimated at $4,370,000 over 50 years.

5.4.1.5 No Action Site 5: Hurricane Water Efficiency

The SLOs would leave the existing flood irrigation system in place, and no improvements would be made for the No Action Alternative. Annual O&M of the flood irrigation system is estimated at $1,300,000 over 50 years.

5.4.2 Action Alternative

This alternative would consist of measures at five sites across the Warner Draw Watershed to reduce flood damages, improve Virgin River water quality/quantity and habitat, decrease public safety hazards, and to conserve water resources. Measures proposed for each site are described in Sections 5.4.2.1 through 5.4.2.5 below.

The installation cost for the Action Alternative is estimated at $36,778,000, as detailed in Table 5-5 below. O&M costs over the 50-year project life are estimated at $7,853,000. Installation measures and costs are described for each site in Sections 5.4.2.1 through 5.4.2.5 below. Refer to Appendix D for cost estimate details and assumptions.

5.4.2.1 Action Alternative Site 1: Main Street Debris Basins

To provide flood prevention for the downstream community, two debris basins would be constructed, and additional catch basins and piping installed. The debris basin would be constructed with volume for approximately 50 years of sediment accumulation and enough flood attenuation for all storm events up to and including a 24-hour, 100-year storm. The proposed measures are described in detail below and can be seen in Appendix B – Map B4.1.

Main Street Debris Basin

The Main Street Debris Basin would be excavated upstream of North Main Street and provide approximately 46.5 ac-ft of storage volume (12.3 ac-ft for sediment storage and 34.2 ac-ft for floodwater storage). A small embankment with an effective height of approximately 5.2 feet would be required, and the rest of the basin would be excavated below natural grade. Based on the dam breach analysis, the breach inundation area for the Main Street Debris Basin is predominantly limited to the surface streets and estimated breach depths are less than 6-inches. Therefore, the structure would be classified by NRCS as a low-hazard potential dam meeting the pond standard. Utah Dam Safety defines a dam as a structure which impounds more than 20 ac-ft of water above the natural grade. Most of the storage for this basin is provided below the natural grade with approximately 19.3 ac-ft impounded between the natural grade and auxiliary spillway crest. Based on this information, the basin would not be classified as a dam by Utah Dam Safety.

A 30-foot-wide open channel auxiliary spillway with riprap erosion protection would be constructed on the southwest side of the basin to discharge into North Main Street. The principal spillway would consist of a concrete riser and a 48-inch reinforced concrete pipe (RCP) conduit extending southwest and connecting to an existing storm drain system. The debris basin would attenuate a peak flood flow of 576 cfs (during a 100-year flood) down to an outflow of 160 cfs through the principal spillway and into an existing 54-inch and 60-inch storm drain. The downstream 60-inch storm drain has a minimum capacity of 314 cfs. With the attenuated discharge from the debris basin and other exiting inflows, the peak discharge in the 60-inch storm drain would be 230 cfs. The storm drain would convey this flow to its confluence with Mill Creek.

The existing catch basin in North Main Street would be replaced. A new double-inlet catch basin would be installed along Caddington Circle to intercept and redirect residential runoff into the basin through 24-inch plastic pipe. Additionally, a vacant parcel adjoining the double inlet catch basin would be graded to direct overflow runoff into the basin. Table 5-1 below provides additional design details for the debris basin and appurtenances.

Buena Vista Debris Basin

The Buena Vista Debris Basin would be excavated upstream of the intersection of East Buena Vista Boulevard and Tortoise Rock Drive and provide approximately 14 ac-ft of storage volume (5.4 ac-ft for sediment storage and 8.6 ac-ft for floodwater storage). This basin would be excavated entirely below the existing ground surface, and no embankment would be needed. The structure would be classified by NRCS as a low-hazard potential dam meeting the pond standard. All of the storage in the basin is provided below the natural grade and the structure would not be considered a dam by Utah Dam Safety. Washington City's standard design storm for detention basin sizing is the 100-year; 24-hour storm event. The proposed basin design provides approximately 3-ft of freeboard, assuming 100-years of sediment, and 5-ft of freeboard assuming a clean basin.

The auxiliary spillway and principal spillway would be constructed the same as described for the Main Street Debris Basin, with the auxiliary spillway discharging into Tortoise Rock Drive. The principal spillway conduit would be 36-inch RCP extending south into the existing stormwater system along Buena Vista Boulevard. The existing 42-inch and 36-inch storm-drain pipe of the existing stormwater system would be replaced along a 120-foot length with 36-inch RCP. Along the replaced pipe alignment, an existing manhole would be replaced with a new manhole at a lower grade and a connection made to an existing manhole. Table 5-1 below provides additional design details for the debris basin and appurtenances.

Table 5-1. Debris Basin Structure Summary

Item	Description	
	Main Street Debris Basin	**Buena Vista Debris Basin**
Embankment		
Elevation of Crest or adjacent existing ground (ft)	2,910.0	2994.0[1]
Effective Height (ft)	5.2	N/A[1]
Crest Width (ft)	≥12.0	N/A[1]
Downstream Slope (Horizontal ft: Vertical ft)	15H:1V	N/A[1]
Upstream Slope (Horizontal ft: Vertical ft)	3H:1V	3H:1V
Auxiliary Spillway		
Elevation of Crest (ft)	2,907.0	2,994.0
Bottom Width (ft)	30	30
Slope (%)	6.7	4.8
Capacity (cfs)	488	488
Type	Open Channel with Riprap Armoring	Open Channel with Riprap Armoring
Principal Spillway		
High-Stage Crest Elevation (ft)	2,897.1	2,989.15
Low-Stage Crest Elevation (ft)	2,891.0	2,984.0
Type	Concrete multi-port riser with 48-inch RCP conduit	Concrete multi-port riser with 36-inch RCP conduit
Design Discharge (cfs)[2]	42	12
Basin		
Contributing Drainage Area (acres)	393	134
Inflow 24-hour/100-year (cfs)	576	233
Outflow 24-hour/100-year (cfs)	42	12
Sediment Pool Elevation (ft)	2,897.10	2,989.15
Sediment Storage (ac-ft)	12.3	5.4
Floodwater Storage (ac-ft)	34.2	8.6
Total Storage Capacity (ac-ft)	46.5	14.0

[1] – Buena Vista Debris Basin would be excavated below existing grade and would not have an embankment.

[2] – Capacity with a water surface elevation at the auxiliary spillway crest.

Main Street Inlets

Two new catch-basin inlets would be installed just north of I-15 along North Main Street to intercept overflow that the current stormwater system cannot handle during a 100-year storm event.

Construction Staging and Access

Construction staging would take place within the proposed disturbed basin footprints. The Project area is accessed directly from the adjoining paved roadways.

Material Disposal

Any soils or construction debris would be taken to an offsite permitted disposal location. All waste generated during construction would be properly disposed of in accordance with local, state, and federal regulations.

Schedule

Construction would take place over an approximate 6-month period, recommended to be completed in late fall to early spring to avoid runoff and the summer monsoon season.

Costs

The installation cost for the Main Street Debris Basins Alternative measures is estimated at $3,098,000. O&M costs are estimated to be $700,000 over the 50-year project life and consist of routine pipeline cleaning and weed control.

5.4.2.2 Action Alternative Site 2: Seegmiller Marsh

To improve riparian habitat and water quality at the Seegmiller Marsh site, measures would be taken to better treat, convey, and manage water into and through the marsh, and to restore native vegetation. Access to the area to conserve and develop recreation and scenic resources would also be provided. The proposed measures are described in detail below and can be seen in Appendix B – Maps B4.2A and B4.2B.

Sediment Removal and Recontouring

Approximately 2.9 acres of upland adjoining the Virgin River would be excavated up to 5 feet deep to improve flood capacity and reduce lateral erosion risk. The area would be recontoured and planted with native cottonwood and willow species. Approximately 24.54 acres of upland along the Virgin River riparian corridor would be recontoured to expand wetland/marsh habitat and open water areas and provide better water management and conveyance through the marsh. Approximately 14.23 acres of this area would be converted to wetland, 4.3 acres converted to water channels, and 6.01 acres would remain as upland areas. Areas graded for shallow standing-water conditions would be revegetated with native emergent plants consisting of sedges, rushes, and cattail. Other areas at or above standing water within wetlands would be revegetated with native tree and shrubs, including willow and cottonwood. Uplands would be revegetated with native cottonwood, willow, and upland shrubs.

Conveyance through the existing and new marsh areas would be improved by hydraulically connecting the marsh areas through a series of excavated flow channels and addition of piping controlled through outlet boxes. Braided channels would extend throughout the newly excavated marsh areas. Piping would be installed to connect the existing pond and wetlands to the new marsh areas. Proposed channels, flow patterns and piping can be seen in Figure 5-1. Pipe details are summarized in Table 5-2.

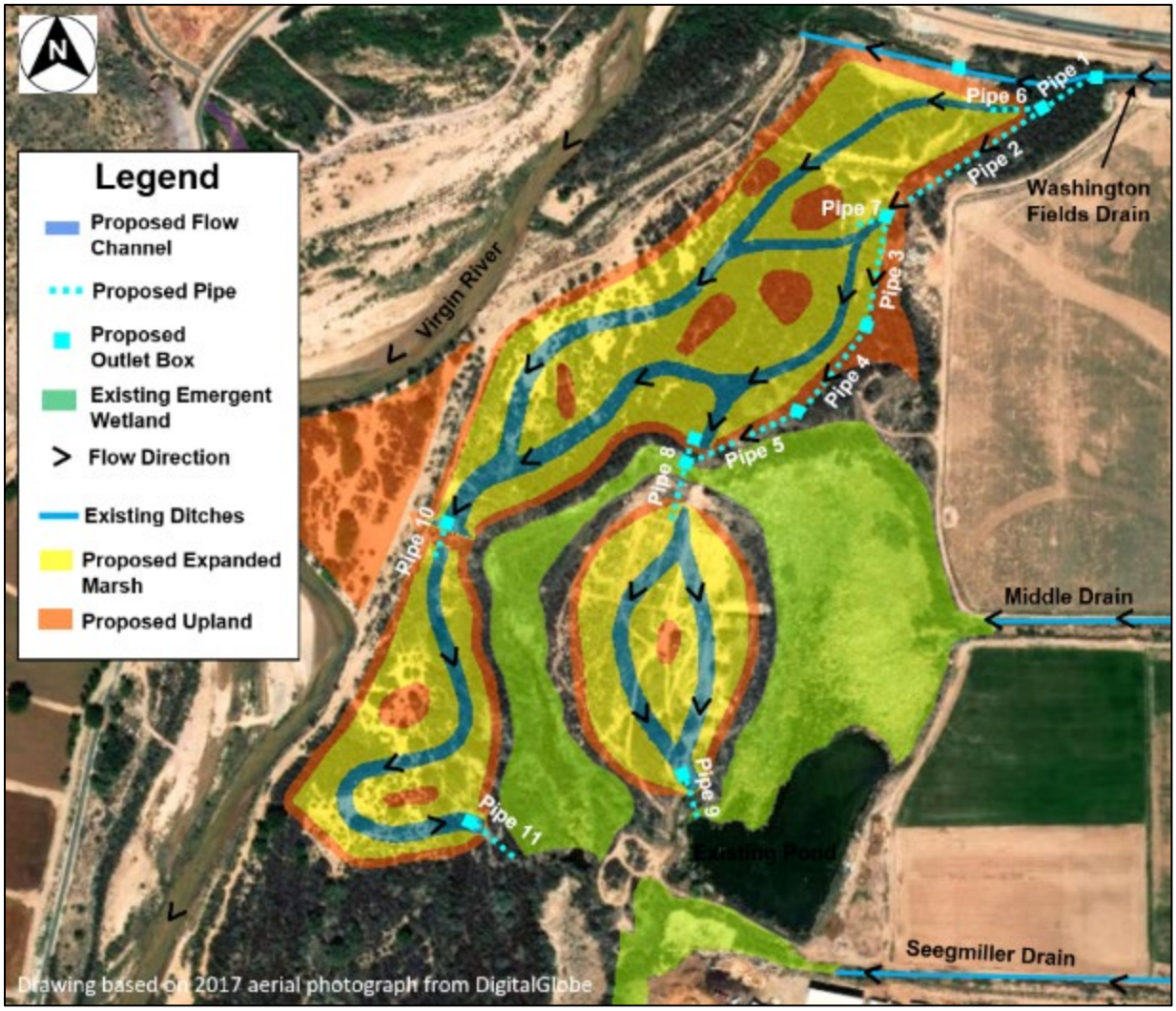

Figure 5-1. Seegmiller Proposed Flow Channels

Table 5-2. Pipe Details

Pipe ID	Location	Diameter (Inches)	Length (ft)	Material
1	From Washington Fields Drain to first diversion box.	18	105	Polyethylene
2-5	From first diversion box to diversion box upstream of southeast marsh area.	18	1,224	Polyethylene
6	From first diversion box to upstream limits of west marsh area.	18	127	Polyethylene
7	From second diversion box to west marsh area.	18	57	Polyethylene
8	Connection from west marsh area to southeast marsh area.	18	192	Polyethylene
9	Outfall from southeast marsh to existing pond.	18	94	Polyethylene
10	Connection from west marsh area to southwest marsh area.	18	77	Polyethylene
11	Outfall from southwest marsh to existing southwest willow flycatcher habitat	18	132	Polyethylene

Debris Removal

Two areas within the existing riparian corridor (formerly marsh lands) have been disturbed through grading activities, placement of fill material, and dumping of trash and construction debris. One approximately 0.85-acre area is present in the southern portion of the site and is partially surrounded by emergent wetland. Another 0.32-acre area is present in the northern portion of the site. These areas would be cleared of miscellaneous debris and fill, regraded to match surrounding elevations, and revegetated with native upland willow or native upland brush.

Stormwater Runoff Pretreatment

To reduce excess sediment and trash from stormwater runoff from entering the marsh, a concrete sediment trap and trashrack would be constructed along the Washington Fields Drain at the outfall into the marsh.

Erosion Protection

Rock riprap erosion protection would be installed to decrease erosion to the right (west) bank of the Virgin River, protect adjoining lands, and reduce sediment entering the river. Riprap erosion protection would extend along an approximate 2,600-foot length of the bank. The riprap would extend from the river flow line up 14 feet to the existing ground surface and have a thickness of 4 to 7 feet (Figure 5-2).

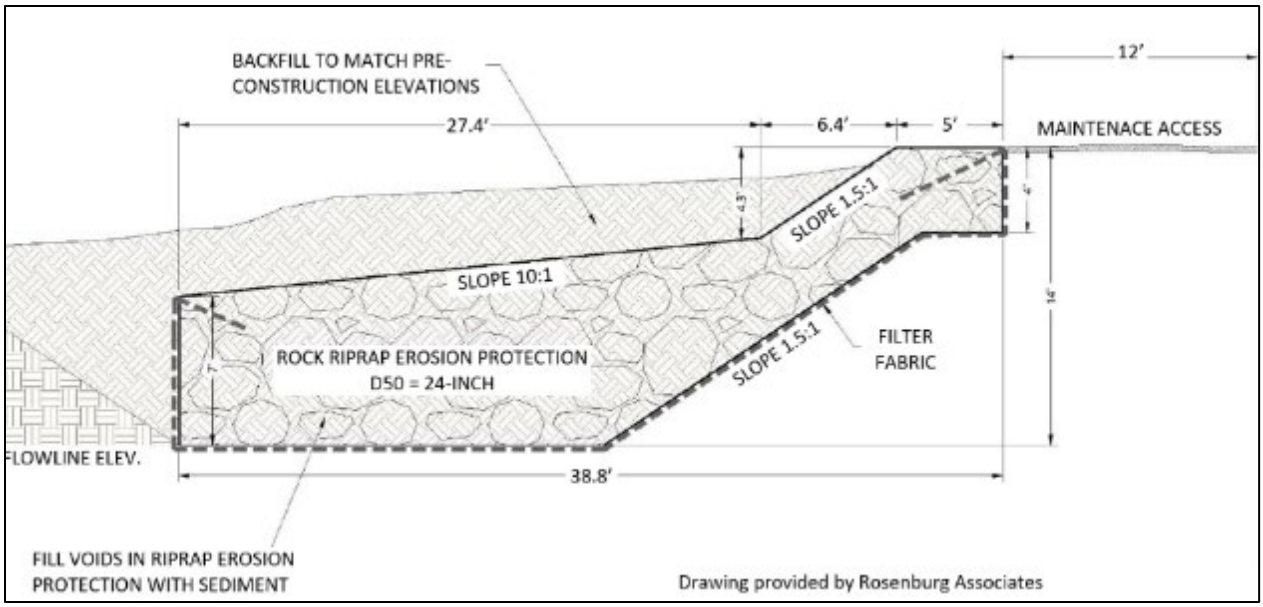

Figure 5-2. West Bank Virgin River Erosion Protection

Public Education and Recreation

To conserve and develop recreation and scenic resources, a multi-use paved trail would be extended to from Springs Park to the Mall Drive, and a pedestrian trail with educational signage installed (Figure 5-3). The multi-use paved trail would be part of the Virgin River South trail system and consist of a 4,000-foot-long and 10-foot-wide paved trail. The paved trail would be constructed outside of the existing and proposed marsh areas on developed, disturbed, and agricultural lands adjoining the Virgin River riparian corridor. Culvert crossings would be installed over the Seegmiller and Middle Drains and a bridge would be constructed over the Washington Fields Drain for construction of the trail.

An approximately 2,000-foot-long pedestrian gravel loop trail and three bird viewing stations would be constructed around the exterior of one of the existing emergent wetland areas. Access to the gravel loop trail would be from the proposed paved multi-use trail. To maintain hydraulic connection to the wetlands and avoid wetland impacts, a steel truss pedestrian bridge would span a narrow section of emergent wetlands for completion of the gravel loop trail. Educational signage for riparian habitat/species health would be placed along the new gravel loop trail. Access gates would be installed at the entrances to the gravel loop trail to allow trail closures due to maintenance, weather, sensitive bird nesting periods, or other critical factors.

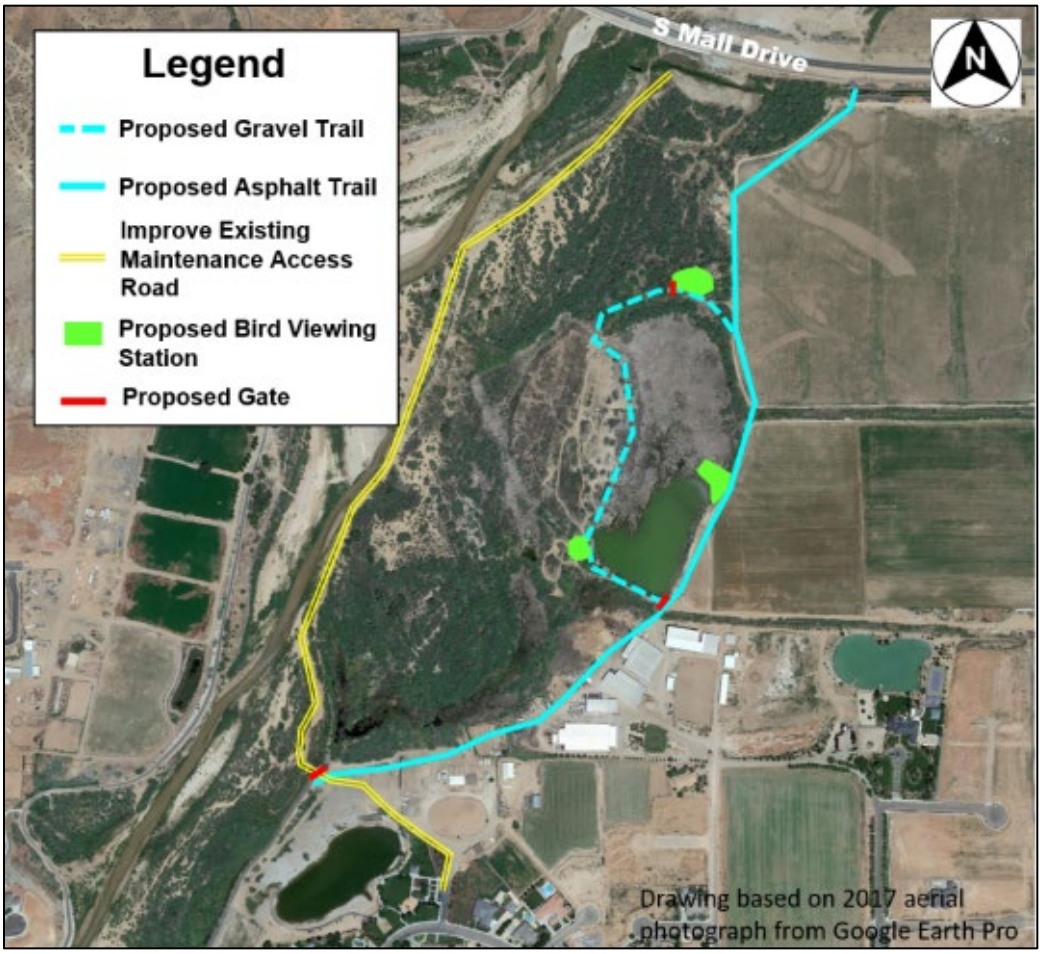

Figure 5-3. Pedestrian Trail and Maintenance Access

Maintenance Access Road

An existing maintenance access road is present along the left (east) bank of the Virgin River, between the marsh and the river. The road follows an existing erosion protection rock wall previously installed by NRCS funding and provides O&M access for the wall. This maintenance access road would be improved by grading where necessary for a 15-foot-wide access and placing a 6-inch layer of road base. This access road would provide construction access for the sediment removal measures described above, continued O&M access for the existing NRCS rock wall, O&M access for marsh improvements as needed, and UDWR access for bird and habitat monitoring activities. A gate would be installed to block public access to this road. The maintenance access alignment can be seen in Figure 5-3 above.

Construction Staging and Access

Workers would access the east side of the river via South Mall Drive. A new 15-foot-wide access road would be constructed extending approximately 1,025 feet south from South Mall Drive, then 840 feet west to the proposed construction staging area. The staging area would be approximately 1.9 acres and is located on disturbed agricultural lands outside of the existing Virgin River riparian corridor.

Workers would access the west side of the river via a paved road off Riverside Drive. A new 15-foot-wide access road would be constructed extending from the paved drive east approximately 400 feet, then south-southeast approximately 200 feet, then east-southeast approximately 165 feet to the proposed new erosion protection area. The last 165 feet of the new access road would adjoin the construction staging area. The staging area consists of disturbed vacant lands covering approximately 1 acre.

Material Disposal

Any soils or construction debris would be taken to an offsite permitted disposal location. All waste generated during construction would be properly disposed of in accordance with local, state, and federal regulations.

Schedule

Construction would take place over an approximate 6-month period with a work window between September 1 and April 1 to avoid disturbance to habitat during sensitive bird nesting and fish spawning seasons. Planting after construction would occur during the same work window and is anticipated to take place during the first year and extend into a second year, depending on the results of the restoration efforts.

Costs

The installation cost for the Seegmiller Marsh Alternative measures is estimated at $6,509,000. O&M costs are estimated to be $1,952,000 over the 50-year project life and include routine pipeline cleaning, weed control, trail maintenance, and sediment removal from the sediment trap.

5.4.2.3 Action Alternative Site 3 : Y-Drain

Measures for the Y-Drain site are proposed to improve water conveyance and water quality, provide flood prevention, and reduce public health and safety hazards. Project measures would consist of piping an open ditch and installing a trail along the new piped alignment. The proposed measures are described in detail below and can be seen in Appendix B – Map B4.3.

Pipe Existing Ditch

An approximate 1,125-foot-long section of open ditch along the Y-Drain would be piped with 54-inch RCP, and approximately 80 linear feet of pipe under S. Sandia Road would be removed and replaced with the new 54-inch RCP. Three new manholes would be installed along the alignment, an existing manhole replaced, and an existing storm drain inlet replaced with a new storm drain and manhole.

The new culvert proposed to enclose the Y-drain crosses Sandia Road and connects to an existing 54-inch storm drain and then further downstream to a 60-inch storm drain. The 60-inch storm drain discharges into the Washington Fields Drain with the top matching the calculated high-water elevation in the Drain. Due to the slope of the proposed upstream Y-Drain enclosure pipe, high tail water conditions do not affect the hydraulics of the Y-Drain system.

Pedestrian Trail

A new 10-foot-wide asphalt pedestrian trail would be installed adjoining the new pipe alignment. The trail would extend from the S. Sandia Road sidewalk northeast 1,150 feet to connect into the existing paved trail. A 2.5-foot-wide gravel shoulder would be installed on each side of the trail. The trail would decrease student traffic on the main roadway (S. Mall Drive) by providing safe pedestrian/bicycle passage for the students at the adjoining elementary school into the residential neighborhoods. The trail would be open to the general public and would also be used as maintenance access for the new pipe.

Construction Staging and Access

Workers would access the site from S. Sandia Road or Mall Drive. The staging area would be approximately 0.5 acres and is located on disturbed vacant graded area adjoining the Y-Drain alignment to the south.

Material Disposal

Any soils or construction debris would be taken to an offsite permitted disposal location. All waste generated during construction would be properly disposed of in accordance with local, state, and federal regulations.

Schedule

Construction would take place over an approximate 3-month period during winter to accommodate dewatering of the Project site and relocation of a culinary water line.

Costs

The installation cost for the Y-Drain Alternative measures is estimated at $1,323,000. O&M costs are estimated to be $525,000 over the 50-year project life and include routine pipeline cleaning and trail maintenance.

5.4.2.4 Action Alternative Site 4: Warner Valley Disposal System

Measures for the Warner Valley Disposal System are proposed for flood prevention and to extend public recreation opportunities. Measures are proposed along an approximate 13,650-foot stretch of the existing Warner Valley Disposal System alignment (Table 5-3). The proposed measures are described in detail below and can be seen in Appendix B – Map B4.4A-B4.4C.

Table 5-3. Warner Valley Disposal System Improvements

Station	Description
1+00	Install outfall headwall at Fort Pearce Wash and add flap gate valve to existing 66-inch RCP
9+00 to 36+25	Construct new asphalt pedestrian and unpaved equestrian trails
5+00	Install flap gate valve on catch basin
9+00 to 21+20	Replace open channel with 72-inch RCP
21+93 to 23+17	Replace open channel with 72-inch RCP
23+17.2 to 36+25	Regrade ground surface and raise manholes (six manholes) to match new grade
44+00 to 78+75	Construct new asphalt pedestrian and unpaved equestrian trails
78+00	Connect existing 66-inch RCP to proposed 4.7-ac-ft detention basin by installing a new manhole and 18-inch pipe to connect to detention basin outlet
79+50 to 95+00	Convert existing asphalt road into asphalt pedestrian and unpaved equestrian trails
95+00 to 135+50	Construct new asphalt pedestrian and unpaved equestrian trails
96+00	Connect existing 66-inch RCP to proposed 7.3-ac-ft detention basin by installing a new manhole and 24-inch pipe to connect to detention basin outlet
126+50 to 137+50	Replace existing adverse sloped 66-inch RCP with new 66-inch RCP at a positive slope

Fort Pearce Wash Outfall

Backwatering during storm events has caused sediment-laden water to enter the piped stormwater system, depositing large amounts of sediment in the pipe. To decrease sediment-laden water from backwatering into the system, a new headwall and flap gate would be installed. The headwall would be a 12-inch-thick concrete wall with a maximum height of 9.6 feet. A new flap gate valve would be installed on the existing 66-inch RCP. Riprap erosion protection would be installed downstream of the headwall (Figure 5-4).

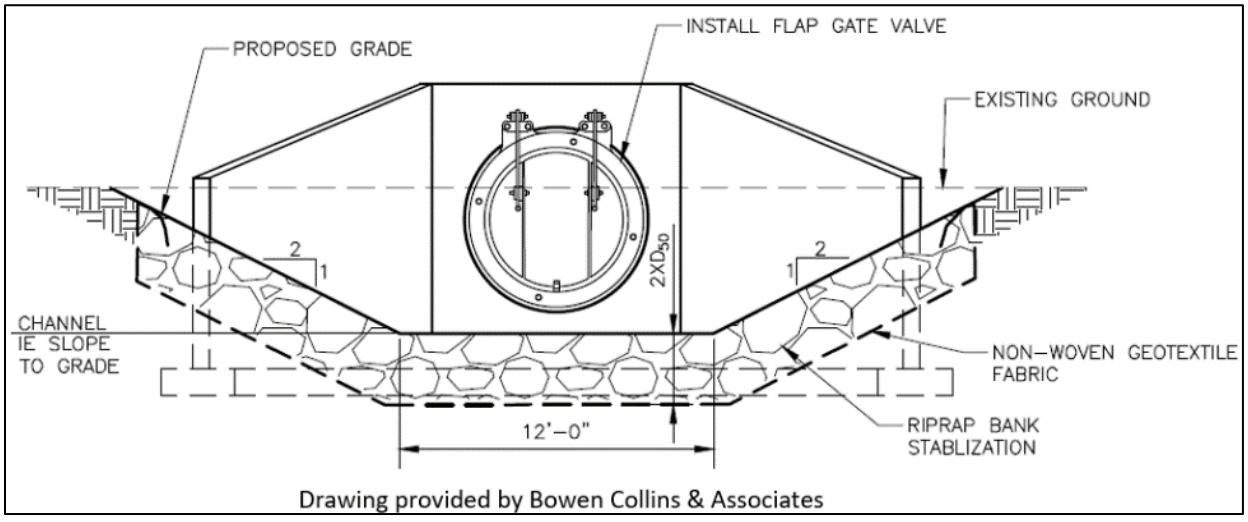

Figure 5-4. Fort Pearce Wash Headwall and Flap Gate

Detention Basins

Two detention basins would be excavated to provide additional capacity for the system. The basins would increase the capacity of the Warner Valley Disposal System to convey the 100-year storm event. One 4.7-ac-ft basin would be excavated at the southwest corner of 2630 S and 3000 E. Two new double-inlet catch basins would be installed in 3000 E adjoining the basin, and a new 24-inch storm-drain pipe would be connected from an existing catch basin in 3000 E to the basin outlet structure. Another 7.3-ac-ft detention basin would be constructed southeast of the intersection of 2760 S and 3210 E. Two new double-inlet catch basins would be installed in 3210 E adjoining the basin. Two new manholes and a storm-drain pipe would be installed and connect into the basin at the southwest corner. Two new manholes and storm-drain pipe would also be installed and connect into the basin at the outlet structure.

Asphalt and Equestrian Trails

The equestrian trail would consist of a 6-foot-wide path of sand or rock chat material. The asphalt pedestrian trail would be approximately 10 feet wide and spacing between the pedestrian and equestrian trails would vary between 0 and 6 feet. A total of 11,800 linear feet of trail would be constructed. The total trail length combined with the existing trail sections would extend approximately 12,500 feet over 2 1/3 miles.

Construction Staging and Access

The site is located primarily along existing roadways that are easily accessed. Construction staging would take place along the disposal system and proposed trail alignment and would stay within these disturbed areas. The proposed detention basin areas would also be used for construction staging.

Material Disposal

Any soils or construction debris would be taken to an offsite permitted disposal location. All waste generated during construction would be properly disposed of in accordance with local, state, and federal regulations.

Schedule

Construction would take place over an approximate 8-month period anytime during the year of construction.

Costs

The installation cost for the Warner Valley Disposal System Alternative measures is estimated at $7,411,000. O&M costs are estimated to be $3,376,000 over the 50-year project life and include routine pipeline cleaning, landscape maintenance, and trail maintenance.

5.4.2.5 Action Alternative Site 5: Hurricane Water Efficiency

To improve water supply, conservation, and delivery, portions of Hurricane City would be converted from a flood irrigation system to a pressurized irrigation system. Irrigation piping would be installed throughout the town and a new pump station constructed. The proposed Project would convert approximately 715 acres of agriculture land from flood irrigation to sprinkler irrigation. This change would result in an annual water usage savings of approximately 1,000 ac-ft, which would help to ensure that irrigation demands can be met, even in dryer years. The proposed measures are described in detail below and can be seen in Appendix B – Map B4.5A through B4.5F.

Pumping Station

The pumping station would consist of two water storage ponds, a sludge pond, and pump booster station. Two 1.8-acre area storage ponds capable of holding 3 million gallons of water each would be constructed on the south side of W 1500 S. A 1.3-million-gallon sludge pond covering approximately 1.1 acres would be excavated adjoining the ponds to accommodate the removal of deposited sediment in the ponds. A pump booster station would be installed to boost water from the proposed storage ponds into the irrigation system to create a pressurized system. Approximately 56,150 linear feet of piping would be installed, as summarized in Table 5-4 and seen in Appendix B – Maps B4.5A through B4.5F.

Table 5-4. Pipe Details

Location	Pipe		Description
	Diameter (inches)	Length (feet)	
W 1500 S	30	4,007	New PVC Pipe from storage ponds down road ROW – Gravel
W 1500 S	30	3,121	New PVC Pipe for 684 ft and replace existing 15-inch pipe with new PVC pipe for 2,437 ft in Road ROW - Gravel
S 920 W and open space on private land	24	1,380	Replace existing 15-inch pipe with new PVC pipe
S 920 W	12	1,385	Replace existing 10-inch pipe with new PVC pipe in road ROW - Asphalt
S 540 W	6	1,216	New PVC pipe in road ROW - Asphalt
S 325 W	6	590	New PVC pipe in road ROW - Asphalt
S 325 W	8	885	Replace existing 6-inch pipe with new PVC pipe in ROW - Asphalt
W 1440 S	6	443	New PVC pipe in road ROW - Asphalt
W180 S	6	540	New PVC pipe in road ROW - Asphalt
Angel Heights Dr.	6	1,685	New PVC pipe in road ROW - Asphalt
S 280 W	6	416	New PVC pipe in road ROW - Asphalt
1200 S	6	591	New PVC pipe in road ROW - Asphalt
Private drive	6	341	New PVC pipe in road ROW – Asphalt
Private drive	6	355	New PVC pipe in road ROW – Asphalt
Private drive	6	655	New PVC pipe in road ROW – Asphalt
810 S	6	1,088	New PVC pipe in road ROW – Asphalt
Gould Wash	12	232	New PVC pipe under Gould Wash
W 960 S	6	542	New PVC pipe in road ROW – Asphalt
977 S	6	508	New PVC pipe in road ROW – Asphalt
W 1070 S	6	1,002	New PVC pipe in road ROW – Asphalt
W 1080 S	6	636	New PVC pipe in road ROW – Asphalt
Open space on private land	6	383	Replace Existing 4-inch pipe with new 6-inch PVC pipe through private land.
S 990 W	6	637	New PVC pipe in road ROW – Asphalt

Location	Pipe		Description
	Diameter (inches)	Length (feet)	
S 1100 W & W 650 S	6	4,383	New PVC pipe in road ROW – Asphalt
Open space on private land	15	4,628	New PCC through private land
S 1480 W	6	1,765	New PVC pipe in road ROW – Asphalt
S 180 W (Gould Wash Crossing)	12	243	New PVC through Gould Wash
S 400 W	12	774	New PVC pipe in road ROW – Asphalt
S 400 W (Gould Wash Crossing)	12	212	New PVC through Gould Wash
W 500 S & S 600 W	6	916	New PVC pipe in road ROW – Asphalt
S 650 W	6	353	New PVC pipe in road ROW – Asphalt
W 600 S. S 650 W, S 600 W	6	1,360	New PVC pipe in road ROW – Asphalt
Airport Rd	6	1,190	New PVC pipe in road ROW – Asphalt
Airport Rd (Gould Wash Crossing)	12	103	New PVC through Gould Wash
Private drive	6	399	New PCV pipe in private drive – Gravel
S 840 W	6	611	New PCV pipe in gravel drive
Private drive	6	503	New PVC pipe in ROW – Gravel
S 1040 W	6	833	New PVC pipe in road ROW – Asphalt
W 400 S	12	60	New PVC pipe in road ROW – Asphalt
S 1230 W	6	1,211	New PVC pipe in road ROW – Asphalt
S 1430 W & W 300 S	6	794	New PVC pipe in road ROW – Asphalt
S 1515 W	6	1,103	New PVC pipe in road ROW – Asphalt
Private drive	6	221	New PCV pipe in private drive – Gravel
S 1410 W	12	723	Replace existing 6-inch with new PVC pipe through gravel drive
open space	15	1,970	New PCC through private land open space
W 400 S	6	492	New PVC pipe in road ROW – Asphalt
S 1760 W	6	2,575	New PVC pipe in road ROW – Asphalt
S 1700 W	6	696	New PCV pipe in gravel drive
N 200 W	8	12	Replace existing 6-Inch with new PCV pipe in ROW – Asphalt
N 200 E	8	212	Replace existing 6-inch with new PCV pipe in ROW – Asphalt
N 870 W	8	843	Replace existing 6-inch pipe with new PCV pipe in ROW – Asphalt
W 100 N & N 1150 W	12	86	New PVC pipe in road ROW – Asphalt
Open space on private land	6	567	New PCV pipe along property boundary

Location	Pipe		Description
	Diameter (inches)	Length (feet)	
N 1580 W	6	1,741	New PVC pipe in road ROW – Asphalt
W 250 N	6	914	New PCV pipe in gravel drive
N 1690 W	6	635	New PCV pipe in gravel drive
N 200 W	16	69	Replace existing 10-inch pipe with new PVC pipe in road ROW – Asphalt
State Street	6	315	New PVC pipe in road ROW – Asphalt
Total Pipe Length		**56,150**	

Construction Staging and Access

The site is located primarily along existing roadways that are easily accessed. Construction staging would take place along the alignments within the road ROWs and open-space areas. Construction staging at the proposed pump station would remain within the areas disturbed for construction of the ponds and booster station.

Material Disposal

Any soils or construction debris would be taken to an offsite permitted disposal location. All waste generated during construction would be properly disposed of in accordance with local, state, and federal regulations.

Land Rights and Water Rights

To construct the pumping station, approximately 10 acres of private land would need to be acquired. No costs for easements are anticipated for the new pipe alignments because they are located along existing ROWs or existing utility corridors. Hurricane City would purchase water shares from Hurricane Canal Company the serve the community and to convert the existing flood irrigation systems to pressurized irrigation. Approximately 500 water right shares were estimated for purchase for this alternative.

Schedule

Construction activities for irrigation pipe installation would take place over a 5-month period, primarily outside of the irrigation season (October through February) over 2 years (10 months total). Construction of the pumping station could be completed outside of the irrigation season. All construction activities are anticipated to be completed within a 2-year time frame.

Costs

The installation cost for the Hurricane Water Efficiency Alternative measures is estimated at $18,437,000. O&M costs are estimated to be $1,300,000 over the 50-year project life and include routine repairs and maintenance to the pressurized irrigation system.

5.5 National Economic Development Alternative

The NED Alternative is the alternative or combination of alternatives that reasonably maximizes the net economic benefit of the Project consistent with protecting the nation's environment. The net economic benefit is the benefit minus the cost. The NED Alternative for the Project was determined to be the Action Alternative because it is the federally assisted alternative with the greatest economic benefit, as detailed in Table 5-5.

5.6 Summary and Comparison of Alternative Plans

The alternatives proposed for consideration and analyzed in detail in this Plan-EA have been compared against each other to discern the merits and disadvantages of each alternative. This comparison of environmental, social, and economic effects is summarized in Table 5-5. The detailed analysis of environmental consequences for each alternative is provided in Section 6.0.

Table 5-5. Summary and Comparison of Alternative Plans

Resource Concern	No Action Alternative	Action Alternative
Environmental Quality Account		
Soils		
Upland Erosion	Proper construction Best Management Practices (BMPs) would be installed during and after construction to prevent and control soil erosion.	
Sedimentation	No change from existing condition.	Project measures would capture approximately 0.92 ac-ft (0.36 at the Main Street Debris Basins and 0.56 ac-ft at Seegmiller Marsh) of sediment annually, reducing sedimentation to Seegmiller Marsh, the Virgin River, and developed areas.
Prime and Unique Farmland	Approximately 1.96 acres would be temporarily disturbed, and 0.53 acres would be permanently disturbed on irrigated lands with soils designated as "prime farmland if irrigated."	Approximately 2.82 acres would be temporarily disturbed, and 0.58 acres would be permanently disturbed on irrigated lands with soils designated as "prime farmland if irrigated."

Resource Concern	No Action Alternative	Action Alternative
Environmental Quality Account		
Water		
Surface Water Quality	Surface water quality would not change under this alternative. Construction activities may temporarily impact surface water quality, but construction BMPs would be used during construction and impacts would be minor.	Effects would be similar to the No Action Alternative, with long-term benefits to surface water quality from decreased sediment loads to surface water and increased water quantities into the Virgin River.
Waters of the U.S.	There would be no change from existing conditions.	Approximately 4,106 linear feet (LF) of channels/ditches and 0.23 acres of pond that are potential jurisdictional waters of the U.S would be affected. The alternative would add 5,640 LF of new channel at Seegmiller Marsh.
Wetlands	Removes 0.09 acres of emergent wetland.	Removes 0.13 acres of emergent wetland and adds 14.23 acres of new wetland. Long-term beneficial impacts are anticipated with a net increase to wetlands of 14.1 acres.
Floodplain Management	No change from exiting conditions	Removes flooding to 162 acres of land containing 200 residences, 16 commercial/office buildings, 36 roads, and one major interstate for up to and including a 100-year flood, which provides a long-term benefit that decreases the risk to life and property.
Groundwater	No change from exiting conditions	Minor fluctuations would occur to local shallow groundwater conditions influenced by piping drainage/ irrigation ditches and new detention basins.
Air Quality		
Air Quality	Construction activities are not expected to violate air quality standards, due to the implementation of BMPs and the short duration of construction.	

Resource Concern	No Action Alternative	Action Alternative
Environmental Quality Account		
Plants		
Noxious Weeds and Invasive Plants	This alternative would put the Project area at risk for future invasion of noxious weeds and invasive plants. BMPs would be implemented to minimize the short-term impacts associated with construction activities.	Similar to the No Action Alternative but a Post Construction Rehabilitation Plan (PCRP) would also be developed. Impacts would be minor with implementation of BMPs and development of a PCRP. Non-native and N&I plant species would be removed and replaced with native species in sensitive riparian habitat at Seegmiller Marsh.
Riparian Areas	Removal of 0.93 acres of riparian vegetation would have minor long-term impacts.	Removal of 1.04 acres of riparian vegetation and adding 5.53 acres of new riparian vegetation would take place. Also, 10.35 acres of riparian habitat would be converted to new water and wetland habitat areas. There would be short-term adverse impacts to riparian areas during construction and long-term beneficial impacts from the reestablishment of native riparian vegetation and habitat diversity in the riparian corridor.
Animals		
Wildlife and Wildlife Habitat	Minor short-term impacts would take place during construction that could temporarily displace wildlife to adjacent habitats. Minor long-term impacts could result from removal of 2.64 acres of habitat.	Moderate temporary disturbance to 36.21 acres of habitat would take place during construction that could displace wildlife to adjacent habitats. Permanent disturbance to 13.15 acres of urban/agricultural landscape that could provide limited low-quality habitat for various species would also occur. Minor long-term benefits are anticipated due to habitat enhancements at Seegmiller Marsh and water quality/quantity improvements to the Virgin River.

Resource Concern	No Action Alternative	Action Alternative
Environmental Quality Account		
Special Status Animal Species	There is an increased risk of harm to or take of ESA-listed species (desert tortoise, southwestern willow flycatcher, and yellow-billed cuckoo) and sensitive species without preconstruction surveys being performed or adherence to avoidance/minimization measures. Moderate impacts to these species could occur if the species are present or nesting habitat is encountered during construction.	There would be short-term impacts from temporary and permanent disturbance to Endangered Species Act (ESA) southwestern willow flycatcher, woundfin, and Virgin River chub DCH, and to ESA yellow-billed cuckoo suitable habitat. Modifications would enhance habitat, which is anticipated to have short-term adverse impacts to species and DCH/suitable habitat from disturbance but would have long-term beneficial impacts to the species and DCH/suitable habitat. Temporary disturbance to ESA desert tortoise suitable habitat is anticipated, but disturbance is within unoccupied habitat based on surveys performed. A BA was submitted to the USFWS to comply with Section 7 of the ESA (Appendix E), and the USFWS issued a Biological Opinion dated June 16, 2021 (Appendix A). Short-term minor impacts to state sensitive species could occur. Avoidance and minimization measures would be in place for all ESA- and state-listed species (see Section 8.3).
Migratory Birds/Bald and Golden Eagles	Impacts to migratory birds would be minor to moderate (if present), since construction activities have the potential to destroy nests and harm or kill species, if present. Impacts to suitable habitat for migratory birds would be short-term and minor based on duration of construction, restoration of disturbed areas, and abundant suitable habitat in the surrounding area.	Migratory birds and bald eagles could be present in the Project area. Preconstruction surveys would be performed, and spatial buffers would be established as necessary in coordination with USFWS and NRCS. Impacts to migratory birds/bald eagles and associated habitat would be short-term and minor based on the duration of construction, restoration of disturbed areas, abundant suitable habitat in the surrounding area, and avoidance/minimization measures in place.

Resource Concern	No Action Alternative	Action Alternative
Environmental Quality Account		
Human		
Socioeconomics	There would be no change from existing conditions.	Socioeconomic benefits would be incurred from additional employment requirements that may be necessary during construction. There would be indirect long-term benefits from reduced risk to life and property from flood prevention measures at Sites 1, 3, and 4.
Historic Properties / Cultural Resources	No impacts to historic properties or cultural resources.	Two historic canals would be modified due to alternative actions. Approximately 1,425 feet of the St. George and Washington Canal and 680 feet of the Hurricane Canal would be piped, but these segments were determined to be non-contributing to the overall eligibility for the National Register of Historic Places due to modern alterations. The alternative was determined to have No Adverse Effect to historic properties, and the determination was submitted to SHPO to comply with Section 106 of the NHPA. SHPO concurred with the determination in a letter dated March 3, 2021 (Appendix A).
Public Health and Safety	The risk of harm or injury would be reduced by measures at Site 3 but flooding and health and safety risks to inhabitants within the 100-year floodplain for Sites 1, 3, and 5 would remain.	This alternative removes flooding to 162 acres of land containing 200 residences, 16 commercial/office buildings, 36 roads, and one major interstate up to and including a 100-year flood, which provides a long-term benefit that decreases the risk to life and property. It also removes risk of harm or injury related to the open ditch at Site 3.
Recreation	Improves recreation opportunities over the long term through construction of new public trails.	
Land Use	Agricultural and disturbed urban lands would be converted to public trail systems.	Agricultural and disturbed urban lands would be converted to public trail systems and areas of open state lands converted for use as flood detention basins.
Visual Resources and Scenic Beauty	Short-term impacts would occur during construction from disturbance and construction equipment. Construction of a new trail system would offer a long-term benefit from increased opportunity to view scenic areas of the Virgin River corridor.	

Resource Concern	No Action Alternative	Action Alternative
Environmental Quality Account		
Transportation Infrastructure	Short-term road closures/detours may occur during construction, resulting in minor temporary commuting delays.	This would have the same impacts as the No Action Alternative, in addition to reduced flood damage to transportation infrastructure for approximately 36 roads and for I-15.
Noise	Short-term minor impacts are anticipated, due to the duration of construction and implementation of BMPs.	
Installation Costs		
Item	**No Action Alternative**	**Action Alternative**
Construction Cost	$2,618,500	$25,567,000
Other Costs[1]	$2,499,000	$11,211,000
Total Project Cost (Installation Cost	$5,117,500	$36,778,000
Cost Sharing (NRCS)	$0	$23,638,500
Cost Sharing (SLOs)	$7,997,000	$13,139,500
NED Account		
Item	**No Action Alternative**	**Action Alternative**
Annual Installation Cost[2]	$170,100	$1,308,200
Annual O&M Cost[2]	$132,200	$146,900
Total Annual Cost[2]	$302,300	$1,455,100
Annual Benefit[2]	$0	$2,999,100
Annual Net Economic Benefit	-$302,300	$1,544,000
Benefit Cost Ratio	-	2.1

[1] Other costs include engineering, real property rights, water rights, permits, and Project administration.

[2] Calculated using FY 2020 Water Resources Discount Rate (2.75%) and annualized over 50 years with a 52-year period of analysis.

BMP = Best Management Practices

PCRP = Post-Construction Rehabilitation Plan

6.0 Environmental Consequences

NRCS has the responsibility under the National Environmental Policy Act (NEPA) to identify and address effects on the environment that may result from the alternative plans. These alternatives include the No Action and Action Alternatives (Sites 1 through 5), and NED Alternative. The Action Alternatives for each site were determined to be the NED Alternative for the Project. This section describes the potential effects of the alternatives within each resource category, as defined in Section 4.0.

The following lists the specific terminology used to describe impacts associated with alternative measures:

Type

- Direct Effect: Impacts caused by a proposed action and occurring at the same time and place.
- Indirect Effect: Impacts caused by an action that are later in time or farther removed in distance but are still reasonably foreseeable.
- Cumulative Effect: The impact on the environment that results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency (federal or non-federal) or person is undertaking such other action.

Type

- Temporary and Permanent Impacts: Temporary impacts are impacts that are not lasting and the affected resource will return or be restored to its previous (pre-project) state. Permanent impacts are those in which the affected resource will not return to its previous state within one's lifetime.
- Short- and Long-Term Impacts: Short-term impacts are those that last during the duration of construction and shortly after (duration of impact is approximately 2 years). Long-term impacts are those that last for an extended duration of time. For this evaluation, long-term impacts extend beyond year 2 up to the evaluated life of the Project (52 years).

Intensity

- No Impact – Resource conditions would not change.
- Negligible – Resource condition changes would be so slight there would be no measurable or perceptible consequence to the resource.
- Minor – A small measurable effect to the resource, but localized, small, and of little consequence to the resource. Mitigation measures, if needed to offset adverse effects, would be easily implemented and successful based on knowledge and experience.
- Moderate – A measurable effect to the resource from the alternative actions. Mitigation measures would likely be needed to offset adverse effects and could be extensive, moderately complicated to implement, and probably successful based on knowledge and experience.
- Substantial – A large, measurable effect to the resource from the alternative actions. Mitigation measures would be needed to offset adverse effects and could be extensive and complicated to implement.

6.1 Soil Resources

6.1.1 Upland Erosion

Please refer to Section 4.1.1 for existing upland erosion conditions for the Project area.

6.1.1.1 No Action Alternative

For this alternative, upland erosion conditions would not change from existing conditions, except for within grounds temporarily disturbed during construction. Areas disturbed during construction would have increased potential for erosion. Proper Best Management Practices (BMPs) would be installed during and after construction to prevent and control soil erosion. Areas disturbed during construction activities would be restored and stabilized through establishment of ground cover.

6.1.1.2 Action Alternative (NED Alternative)

Similar to the No Action Alternative, grounds disturbed during construction would temporarily have an increased potential for erosion, but proper BMPs would be installed as described above. Measures proposed for Seegmiller Marsh include erosion protection to reduce the lateral migration of the Virgin River and erosion of the adjoining upland soils along the right (west) side of the river.

6.1.2 Sedimentation

Please refer to Section 4.1.2 for existing sedimentation conditions for the Project area. Sedimentation resource concerns do not apply to Sites 3 through 5.

6.1.2.1 No Action Alternative

For this alternative, there would be no change to the sedimentation issues for Main Street (Site 1) or Seegmiller Marsh (Site 2). Areas along Main Street in Washington City would continue to flood and incur sediment damages during flood events. Sedimentation in Seegmiller Marsh and in the Virgin River adjoining the marsh would continue, decreasing the flood capacity of the river and marsh area.

6.1.2.2 Action Alternative (NED Alternative)

For this alternative, two debris basins (Main Street Debris Basin and Buena Vista Debris Basin) would be constructed upstream of Main Street in Washington City (Site 1) and would provide enough volume to accommodate 50 years of sediment accumulation. Main Street Debris Basin is anticipated to capture approximately 96 percent of the sediments transported from the upstream drainage area, and Buena Vista Debris Basin is anticipated to capture approximately 93 percent. This would reduce the sediment transported downstream from approximately 613 cubic yards to 30 cubic yards annually. This equates to a reduction of 583 cubic yards (0.36 ac-ft) of sediment annually. Additionally, the water from the drainages would be routed through the stormwater system and eliminate flooding and associated sediment damages for all events up to and including a 100-year storm.

Seegmiller Marsh measures include recontouring and excavating sediment in the upland areas to restore open water and wetland areas of the marsh that have been filled in with sediment. In addition, a sediment basin would be installed along the Washington Fields drain to reduce sediment entering the marsh and causing sedimentation issues. The proposed measures would reduce sediment entering the marsh by approximately 900 cubic yards (0.56 ac-ft) per year.

Project measures would have long-term benefits to marsh habitat at Seegmiller Marsh, the Virgin River, and communities downstream of the Main Street and Buena Vista drainages by reducing sediment deposition in the river, into sensitive marsh habitat, and to developed areas.

6.1.3 Prime and Unique Farmland

Prime and unique farmlands are present within the Project area. Please refer to Section 4.1.3 for a description of existing prime and unique farmland within the Project area.

6.1.3.1 No Action Alternative

This alternative would disturb approximately 2.49 acres of irrigated lands that are classified as "prime farmland if irrigated" for construction measures at Seegmiller Marsh. Approximately 1.96 acres would experience temporary disturbance during construction from equipment/vehicle traffic. Approximately 0.53 acres would experience permanent disturbance from construction of an asphalt path at Seegmiller Marsh.

6.1.3.2 Action Alternative (NED Alternative)

This alternative would disturb approximately 3.4 acres of irrigated lands that are classified as "prime farmland if irrigated." Approximately 2.82 acres would experience temporary disturbance during construction from construction access and staging, but these areas would be restored to preconstruction conditions or better after construction completion. Approximately 0.58 acres would experience permanent disturbance from construction of an asphalt path at Seegmiller Marsh (Site 2) and placement of new irrigation pipeline in Hurricane (Site 5). A summary of impacts to irrigated prime farmlands is included in Table 6-1 and can be seen in Appendix C-Maps C2.1-C2.4.

Table 6-1. Prime Farmland Impacts

Site No.	Site Name	Feature	Prime Farmland Impacts (Acres)		
			Temporary	Permanent	Total
1	Main Street Debris Basins	-	0	0	0
2	Seegmiller Marsh	Asphalt Trail	0.21	0.53	0.74
		Staging Area	1.3	0	1.3
		Construction Access	0.45	0	0.45
3	Y-Drain	-	0	0	0
4	Warner Valley Disposal System	-	0	0	0
6	Hurricane Water Efficiency	New Pipeline	0.86	0.05	0.91
Total			**2.82**	**0.58**	**3.40**

6.2 Water Resources

6.2.1 Surface Water Quality

Please refer to Section 4.2.1 for existing surface water quality conditions for the Project area.

6.2.1.1 No Action Alternative

Project design elements, including required BMPs, would be implemented to reduce the quantity of sediment (1) entering drainages, and (2) flowing downstream and violating any federal or state water quality rules and regulations. This alternative would also meet Utah antidegradation requirements. Construction BMPs would include, but are not limited to, the following:

- A Storm Water Pollution Prevention Plan would be required and implemented that contains erosion and sediment control and pollution prevention BMPs, such as, but not limited to, silt fences, fiber wattles, and/or earthen berms.
- Water bodies adjacent to construction and staging areas would be identified, and such measures as straw bales, silt fences, and other appropriate sediment control BMPs would be implemented to prevent the entry of sediment and other contaminants into waters.
- To ensure that accidental spills do not enter waters, the storage of petroleum-based fuels and the refueling of construction machinery would not occur outside of approved designated staging/batch plant areas. Furthermore, the alternative would comply with state and federal water quality standards and toxic effluent standards to minimize any potential adverse impacts from discharges to waters of the U.S.
- No construction materials would be stockpiled or deposited in or near any water bodies.

With the implementation of the BMPs listed above, there may be impacts on water quality that could include short-term increases in sediment load in surface water. Impacts would be minor with implementation of BMPs.

6.2.1.2 Action Alternative (NED Alternative)

BMPs would be in place as described for the No Action Alternative. The debris basins at Site 1 would reduce sediment loads to downstream lands and drainages from approximately 613 cubic yards to approximately 30 cubic yards annually. Modifications at Site 2 would capture sediment in Washington Fields Drain before water discharges into Seegmiller Marsh and the Virgin River. Site 2 would also add approximately 14.1 acres of new wetland providing natural treatment of water before discharging it into the Virgin River. Piping of the Y-Drain at Site 3 and piping of open channel at Site 4 are anticipated to reduce sediment loads to downstream surface waters. Improvements at Seegmiller Marsh and piping of the Y-Drain are anticipated to decrease sediment loads to surface waters within the marsh and Virgin River by 0.56 ac-ft annually. All alternative measures combined would reduce sediment loads to downstream drainages by approximately 0.92 ac-ft (1,483) cubic yards annually.

In addition to reduced sediment loads in surface waters, piping of the Y-Drain and open channels of the Warner Valley Disposal System would provide better water conveyance and reduce water loss from infiltrations and evapotranspiration. Water savings of approximately 800 to 1,200 ac-ft per year, or 1,050 to 1,600 ac-ft per year in a wet year, are also anticipated from installation of a pressurized irrigation system

at Hurricane (Site 5). This water would be returned or left in the Virgin River for improved water quality and quantity. The returned water quantities would be determined in future design/construction phases of the Project.

Based on implementation of BMPs, construction activities would have minor impacts on surface water quality. Impacts may include short-term increases in sediment load in surface water. Long-term beneficial impacts are anticipated that would help improve water quality and quantity in the Virgin River.

6.2.2 Waters of the U.S.

Waters of the U.S. were identified and delineated within the Project area (Appendix E). Refer to Section 4.2.2 for a list of all waters of the U.S. within the Project area.

6.2.2.1 No Action Alternative

This alternative would have no impact to features determined to be potential jurisdictional waters of the U.S.

6.2.2.2 Action Alternative (NED Alternative)

Approximately 4,106 linear feet (LF) of impacts to channels and 0.23 acres of pond that are potential jurisdictional waters of the U.S. would occur from alternative actions. Approximately 5,640 LF of new channels would be added for alternative actions. It is the responsibility of the USACE to make the final determination of jurisdictional waters of the U.S. Table 6-2 below summarizes the impacts to potential waters of the U.S. for each Project site, and additional discussion is provided below the table. Maps showing existing waters and alternative impacts are included in Appendix C – Maps C3.1 through C3.5.

Table 6-2. Impacts to Waters of the U.S. Impacts

Site No.	Site Name	Potential Water of the U.S.	Feature ID	Length/Area Disturbed[1]	Impact	Description
Site 1	Main Street Debris Basins	Unnamed Ephemeral Wash	W16	420 LF	Removes Channel	Excavation for Main Street Debris Basin
		Unnamed Ephemeral Wash	W16B	376 LF	Removes Channel	Excavation for Main Street Debris Basin
Site 2	Seegmiller Marsh	Virgin River	W1	160 LF	Disturbance in Channel	Erosion Protection
		Washington Fields Canal	W3	680 LF	Removes Channel	Regrading for Marsh
		Washington Fields Canal	W3	30 LF	Disturbance in Channel	Concrete Sediment Trap
		New Channels	N/A	+5,640 LF	Adds New Channels	Add New Conveyance Channels
Site 3	Y-Drain	Y-Drain	W11	1,125 LF	Pipes Channel	Pipe Open Channel
Site 4	Warner Valley Disposal System	Warner Valley Disposal System Open Channel	W12	1,225 LF	Pipes Channel	Pipe Open Channel
		Fort Pearce Wash	W13	50 LF	Disturbance in Channel	Construct Outfall
		Freshwater Pond	W14	0.18 acres	Removes Pond	Excavation for detention basin
		Freshwater Pond	W15	0.05 acres	Removes Pond	Excavation for detention basin
Site 5	Hurricane Water Efficiency	Gould Wash	W17A	40 LF	Disturbance in Channel	New irrigation pipe crossing
Total				**4,106 LF / 0.23 acres** **+ 5,640 LF of New Channel**		**Project Modifications**

[1] Lengths in linear feet (LF) are provided for channel features and areas (in acres) are provided for pond features.

- Site 1: Approximately 796 LF of unnamed ephemeral washes would be excavated and graded to convert the area into a debris basin (Appendix C – Map C3.1). Recent changes at this Project site have diverted surface water runoff from these channels into underground stormwater systems and they may no longer be jurisdictional, but it is up to the USACE to make the final jurisdictional determination.
- Site 2: Approximately 680 LF of the Washington Fields Canal would be removed from regrading activities for a new wetland complex, which would add 5,640 LF (4.3 acres) of new channel. The Washington Fields Canal would also be disturbed along approximately 30 LF for construction of a sediment trap. Approximately 160 LF of the Virgin River would be disturbed from excavation/fill for installation of erosion protection. Refer to Appendix C – Map C3.2B for Site 2 water impacts.

- Site 3: Approximately 1,125 LF of an existing excavated drainage ditch (Y-Drain) would be piped (Appendix C – Map C3.3).
- Site 4: Approximately 1,225 LF of an open channel along the Warner Valley Disposal System would be piped. Two freshwater ponds, which lack connectivity to waters of the U.S., would be excavated and graded to convert the area into a detention basin. Approximately 50 LF (0.02 acres) of Fort Pearce Wash would be disturbed through excavation/fill for construction of the disposal system outfall. Refer to Appendix C – Maps C3.4A and C3.4B for Site 4 water impacts.
- Site 5: Approximately 40 LF of Gould Wash would be disturbed for installation of irrigation piping across the channel at four separate crossings (Appendix C – Map C3.5A).

6.2.3 Wetlands

Wetlands were identified and delineated within the Project area (Appendix E). Refer to Section 4.2.3 for a list of all waters of the U.S. within the Project area.

6.2.3.1 No Action Alternative

This alternative would have no impact to features determined to be potential jurisdictional waters of the U.S. except for within Site 2. Impacts would be similar to those described for construction of the trail for the Action Alternative, with 0.09 acres of disturbance to wetlands for construction of two culverts and a bridge along the proposed trail alignment.

6.2.3.2 Action Alternative (NED Alternative)

Table 6-3 below summarizes the impacts to wetlands and additional discussion is provided below the table. The only Project site containing wetlands is Site 2 Seegmiller Marsh. Existing wetlands can be seen in Appendix C-Map C3.2A and alternative impacts can be seen in Appendix C-Map C3.2B.

Table 6-3. Wetland Impacts

Site No.	Site Name	Wetland Type	Feature ID	Impact (Acres)	Description
Site 2	Seegmiller Marsh	Emergent	W4	0.06	Removes wetland for installation of a culvert and bridge.
		Emergent	W6	0.03	Removes wetland for installation of a culvert.
		Emergent	W8	0.04	Placement of riprap erosion protection
		N/A	N/A	+14.23	Convert upland areas to wetlands
Total Impacts		**0.13 acres of existing wetland would be removed and 14.23 acres of new wetland would be created (14.1 acres net increase in wetlands)**			

Approximately 0.09 acres of emergent wetland would be removed for construction of two culverts and a bridge along the proposed new trail alignment. Approximately 0.04 acres of an emergent wetland dominated by common reed (*Phragmites australis*) on the right (west) side of the Virgin River would be removed from excavation/fill for installation of erosion protection. Based on the amount of wetland disturbed of less than 1% of the total wetland within Site 2, impacts to the overall wetland quality and function from this removal

are anticipated to be negligible. Approximately 14.23 acres of new wetland would be created to expand the marsh habitat. New wetland areas located in standing water would be planted with native sedges, rushes, and cattail, and areas outside of standing water would be planted with native willow and cottonwood. This alternative is anticipated to have a long-term beneficial impact, with a net increase to wetlands of approximately 14.1 acres. There would be a moderate benefit to the overall quality and function of this wetland system: enhancement to biodiversity, biogeochemical cycling, and fish and wildlife habitat; improved water quality from reduction of suspended sediments, removing/retaining inorganic nutrients, and processing organic wastes; and flood benefits through spreading and slowing down of flood flows.

6.2.4 Floodplain Management

The existing FEMA flood maps do not currently depict flooding associated with the ephemeral washes upstream of Main Street in Washington City, the Y-Drain, or Warner Valley Disposal System. An analysis was performed for each alternative to determine flood extents for the 100-year flood event for these sites and for the 500-year flood event for Main Street. Table 6-4 provides a summary of the inundation for each event for comparison. Please refer to Section 4.2.4 for additional information on the existing floodplain management conditions. Refer to Appendix C – Maps C1.1 through C1.3 for flood inundation extents.

Table 6-4. Inundation Summary

Storm Event	Number of Features Inundated						Land Inundated (Acres)
	Residential Structures	Commercial Businesses/ Offices	Schools	Other	Road/Minor Highways	Major Interstate Highways	
Site 1: Main Street Debris Basins							
100-Year No Action	188	16	0	1	30	1	118
100-Year Action Alternative	0	0	0	0	0	0	0
500-Year No Action	241	22	0	1	30	1	143
500-Year Action Alternative	141	11	0	1	26	1	102
Site 3: Y-Drain							
100-Year No Action	9	0	0	0	1	0	3
100-Year Action Alternative	0	0	0	0	0	0	0
Site 4: Warner Valley Disposal System							
100-Year No Action[1]	3	0	0	0	5	0	41
100-Year Action Alternative		0	0	0	0	0	0

[1] Note future development of the area could increase residential structures inundated to approximately 120 residences.

6.2.4.1 No Action Alternative

This alternative would not provide any flood prevention measures, and flooding conditions would not change from the current conditions.

FEMA flood maps currently do not depict the flooding conditions at the sites listed in Table 6-4. The local community has the right to request a map revision from FEMA to change the FEMA flood zone designations.

6.2.4.2 Action Alternative (NED Alternative)

This alternative provides flood prevention measures up to and including a 100-year event for developed areas at Sites 1, 3, and 4. The modifications at these sites would eliminate flooding from the associated drainages/channels to community structures and roads for up to and including the 100-year event. A long-term beneficial impact is anticipated from the decreased risk to life and property from these flood events.

FEMA flood maps may require revision after modifications have been performed. The local community has the right to request a map revision from FEMA to change the FEMA flood zone designations.

6.2.5 Groundwater

Shallow groundwater conditions were identified within the Project area. Refer to Section 4.2.5 for mapped shallow groundwater zones.

6.2.5.1 No Action Alternative

This alternative would not impact groundwater conditions with the Project sites.

6.2.5.2 Action Alternative (NED Alternative)

Project modifications would influence shallow groundwater conditions within the Project sites as described below.

- Site 1: Two basins would be constructed at this site that would temporarily store water to attenuate flood flows during extreme precipitation events. These basins would hold water for less than a 48-hour duration, which may influence shallow groundwater conditions. Shallow groundwater levels in the immediate vicinity of the basins may temporarily rise while water remains in the basins.
- Site 2: Project measures include excavation in upland areas to use the Seegmiller Marsh shallow groundwater conditions and create more open water and wetlands within the marsh. Minor local fluctuations in shallow groundwater levels could occur from alternative actions but would only impact shallow groundwater within the Project area.
- Site 3: For this site, an open ditch would be piped, removing interaction of water in the ditch with the shallow groundwater table. Any water loss from ditch water percolation into the subsurface would be removed and may lead to lower shallow groundwater levels in and adjoining the ditch.

- Site 4: Similar to Site 3, a section of open ditch would be piped, resulting in lower shallow groundwater levels in and adjoining the ditch. Two detention basins would be excavated to attenuate peak discharges during precipitation events. These basins would hold water for approximately 26 hours, which may influence shallow groundwater conditions. Shallow groundwater levels in the immediate vicinity of the basins may temporarily rise while water remains in the basins.
- Site 5: Project measures include converting an existing flood irrigation system into a pressurized irrigation system. Groundwater conditions in Hurricane are affected by flood irrigation operations. Water percolation through existing ditch systems and from flood irrigation would be decreased by conveyance through piping and more efficient watering practices. This would likely result in a lowered shallow groundwater level in the areas converted to pressurized irrigation.

6.3 Air Resources

6.3.1 Air Quality

Please refer to Section 4.3.1 for existing air quality conditions for the Project area.

6.3.1.1 No Action Alternative

Construction activities would temporarily emit several air pollutants. PM10 emissions are associated with the dust created from demolition, land clearing, ground excavation, cut-and-fill operations, and road construction. All other pollutants (PM2.5, CO, sulfur oxides [SOx], nitrous oxides [NOx], mobile source air toxics [MSATs], and greenhouse gases [GHGs]) are generated from heavy-duty diesel engines used by the construction equipment. Construction emissions are greatest during the earthwork phases because of the dust associated with this activity. Fugitive dust can also be produced by winds blowing through the construction site and by trucks carrying uncovered loads. Additionally, mud tracked onto paved roads leading to and from the construction site creates a source of fugitive dust (i.e., road dust) after it dries.

Emissions from trucks and construction equipment powered by heavy-duty diesel engines would be short-term and concentrated around the construction site. Delays associated with travel through construction zones would increase emissions from on-road vehicles. However, these delays would likely result in only a small amount of additional pollutant emissions when compared with the usual traffic experienced around the construction site.

Fugitive dust, MSAT, and GHG emissions increases associated with construction would be minimized by implementing applicable BMPs. These include the following:

- Spraying the soil on-site with water or other similar approved dust suppressant/soil binder.
- Wetting materials hauled in trucks, providing adequate freeboard (space from the top of the material to the top of the truck), or covering loads to reduce emissions during material transportation/handling.
- Providing a stabilized construction entrance (track-out pad), wheel washers, and/or other similar BMPs at construction site access areas to reduce track-out of site materials onto the adjacent roadway network.
- Removing tracked-out materials deposited onto adjacent roadways.

- Wetting material stockpiles to prevent wind-blown emissions.
- Establishing vegetative cover on bare ground as soon as possible after grading to reduce wind-blown dust.
- Requiring appropriate emission-control devices on all construction equipment.
- Requiring the use of cleaner burning fuels.
- Using only properly operating, well-maintained construction equipment.

Construction activities are not expected to violate air quality standards, based on the implementation of BMPs and the short duration of construction.

6.3.1.2 Action Alternative (NED Alternative)

The impacts would be the same as those of the No Action Alternative.

6.4 Plant Resources

6.4.1 Noxious Weeds and Invasive Plants

N&I plants and non-native plant species have been documented at all of the Project sites within the Project area. Please refer to Section 4.4.1 for existing information on N&I plants.

6.4.1.1 No Action Alternative

This alternative would have minor impacts that would put the Project area at risk for future invasion of noxious weeds. BMPs would be implemented during construction to prevent the spread of noxious weeds/invasive plant species and comply with Executive Order 13112. During construction and until restoration areas are fully established, they would be maintained on a regular basis to prevent the establishment of noxious weeds and invasive plant species. Non-desirable plant species would be controlled by cleaning equipment prior to delivery to the Project site and eradicating these species before the start and during construction as discovered.

6.4.1.2 Action Alternative (NED Alternative)

This alternative would have impacts like those described for the No Action Alternative, but routine monitoring after construction completion would also be performed. In addition, a Post Construction Rehabilitation Plan (PCRP) would be developed and would include mechanisms for addressing weed establishment and treatment. Measures at Seegmiller Marsh include removal of N&I and non-native plant species and replanting with native vegetation. Project measures are anticipated to reduce non-native and N&I plant species in these sensitive habitat areas.

6.4.2 Riparian Areas

Project Sites 1, 2, and 4, contain riparian areas (Appendix C – Maps C5.1 through C5.4). Please refer to Section 4.4.2 for existing information on riparian areas.

6.4.2.1 No Action Alternative

This alternative would have minor long-term impacts from removal of approximately 0.93 acres of riparian vegetation at Seegmiller Marsh for construction of a trail and bird-viewing stations.

6.4.2.2 Action Alternative (NED Alternative)

Table 6-5 below summarizes the impacts to riparian areas (outside of existing identified wetlands) for each Project site, and additional discussion is provided below the table.

Table 6-5. Riparian Impacts

Site	Riparian Converted to Different Habitat (Acres)	New and Replaced Riparian Habitat (Acres)		Removal of Riparian Habitat (Acres)
		Disturbed Riparian Areas Replanted	Add New Riparian Habitat	
1	-	-	-	0.09
2	7.99[1]	-	-	-
	2.36[2]	-	-	-
	-	4.55	-	-
	-		-	0.93
	-	-	5.53	-
4	-	-	-	0.01
5	-	-	-	0.01
Total	**10.35**	**4.55**	**5.53**	**1.04**
		10.08		

[1] Riparian converted to wetlands

[2] Riparian converted to water channels

- Main Street Debris Basins (Site 1): Approximately 0.09 acres of sparsely spaced, tamarisk (*tamarix*)-dominant riparian areas would be removed during excavation activities for construction of the Main Street Debris Basin (Appendix C-Map C5.1).
- Seegmiller Marsh (Site 2): Approximately 7.99 acres of riparian habitat would be converted to wetland habitat and approximately 2.36 acres of riparian habitat would be converted to water habitat. Other areas of existing riparian habitat disturbed by regrading activities (4.55 acres) would be replanted with native riparian vegetation. Approximately 0.93 acres of riparian habitat would be removed from construction of a trail and bird-viewing stations, and approximately 5.53 acres of new riparian habitat would be created within existing bare and disturbed areas. New and modified riparian areas would be replanted with native cottonwood, willow, and upland shrubs. Refer to Appendix C-Map C5.5 for riparian area impacts.

- Warner Valley Disposal System (Site 4): Approximately 0.01 acres riparian habitat would be removed from construction of a new outfall at Fort Pearce Wash (Appendix C-Map C5.3).
- Hurricane Water Efficiency (Site 5): Approximately 0.01 acres riparian habitat would be removed from installation of a new irrigation line crossing at Gould Wash (Appendix C-Map C5.4).

Removal of riparian habitat for alternative measures is estimated at 1.04 acres, with an addition of 5.53 acres of new riparian habitat. Conversion of 10.35 acres of riparian habitat to water and wetland areas is being performed to improve the health of the riparian corridor, add habitat diversity, and reestablish native vegetation within the corridor. Short-term adverse impacts to riparian areas are anticipated during construction and until riparian vegetation becomes reestablished. Long-term benefits to riparian corridor health are anticipated from the Seegmiller Marsh habitat enhancements.

6.5 Animal Resources

6.5.1 Wildlife and Wildlife Habitat

Please refer to Section 4.5.1 for information regarding the presence of wildlife and wildlife habitat within the Project area.

6.5.1.1 No Action Alternative

Impacts to wildlife and associated habitat would not change from existing conditions for Site 3 and 5. Annual sediment removal would be performed within the exiting basins covering approximately 6 acres at Site 1. Approximately 0.93 acres of habitat would be removed at Site 2 from construction of a trail and bird-viewing stations and approximately 1.71 acres of habitat would be removed from Site 4 for construction of new asphalt pedestrian and unpaved equestrian trails, as described for the Action Alternative. Minor short-term impacts are anticipated from temporary disturbance to habitat. Wildlife species, if present, might be temporarily disturbed and displaced to adjacent habitats during construction. Once construction is completed, temporarily disturbed areas would be restored and wildlife could return to the area. Minor long-term impacts are also anticipated from permanent removal of habitat at Sites 2 and 4 and annual disturbance to wildlife species at Site 1.

6.5.1.2 Action Alternative (NED Alternative)

Table 6-6 below summarizes the impacts to wildlife habitat for each Project site and additional discussion is provided below the table.

Table 6-6. Wildlife Habitat Impacts

Site No.	Site Name	Description	Impact (Acres)	
			Temporary	Permanent
Site 1	Main Street Debris Basins	Excavation of Main Street Basin	1.8	0
Site 2	Seegmiller Marsh	Excavation/Contouring	24.54	0
		Gravel Trail/Bird-Viewing Stations	0.81	1.16
		Erosion Protection	0.02	0
Site 3	Y-Drain	Piping of Y-Drain and New Trail	0	0.78
Site 4	Warner Valley Disposal System	Construct new outfall	0.02	0
		New Asphalt/Equestrian Trail	0.6	1.71
		Detention Basin (East)	2.72	0
		Detention Basin (West)	2.69	0
Site 5	Hurricane Water Efficiency	Irrigation Piping	1.74	0
		Pumping Station and Ponds	1.27	9.5
Total			**36.21**	**13.15**

- Site 1: Approximately 1.8 acres of low-quality wildlife habitat on undeveloped land would be temporarily disturbed from construction of the Main Street Debris Basin. Habitat here consists primarily of non-native mixed grasses and native desert shrubs adjoining the developed city landscape. The Buena Vista Debris Basin and remaining alternative modifications are within disturbed and developed areas lacking wildlife habitat.
- Site 2: Approximately 1.16 acres of wildlife habitat would be removed from construction of a gravel trail and bird-viewing stations; however, alternative measures would add approximately 1.17 acres of new habitat by restoring disturbed areas used for dumping debris, resulting in a net increase of wildlife habitat at this site. Approximately 24.56 acres of habitat would be temporarily disturbed through installation of erosion protection and regrading activities. Areas disturbed from regrading would be enhanced by adding habitat complexity through new water conveyance channels and wetland areas with interspersed uplands. Project measures would remove non-native plant species and revegetate with native species. The remaining measures at Site 2 are in developed or disturbed areas that do not provide adequate habitat for wildlife.
- Site 3: Approximately 0.78 acres of low-quality wildlife habitat along the Y-Drain would be permanently removed from piping of the drain and construction of a trail. This habitat consists primarily of non-native and N&I grasses with areas of tamarisk, surrounded by a developed city landscape. Areas outside of the Y-Drain within the site boundary are developed and/or graded disturbed lands that do not provide adequate habitat for wildlife.

- Site 4: Approximately 5.41 acres of low-quality wildlife habitat would be temporarily disturbed from construction of two detention basins and modifications to the Fort Pearce Wash outfall. These areas are mostly disturbed from agricultural practices, and habitat, where available, consists primarily non-native grasses with intermixed native desert shrubs. Piping an open channel section of the disposal system and construction of asphalt pedestrian and unpaved equestrian trails would permanently remove 1.71 acres of low-quality habitat. These habitat areas exist at the eastern edge of the disposal system alignment and along the open channel in the western edge of the disposal system alignment. Habitat in the eastern extents is previously disturbed lands from agricultural practices consisting of non-native grasses intermixed with native desert shrubs. Habitat along the open channel segment is an excavated channel surrounded by residential development, with non-native grasses and scattered non-native and N&I shrubs/trees. The remaining measures for Site 4 are on developed and/or graded disturbed lands that do not provide adequate habitat for wildlife.
- Site 5: Approximately 3.01 acres of wildlife habitat on undeveloped land would be temporarily disturbed from installation of irrigation pipelines and the pump station. These areas would be restored after construction completion. The pumping station and associated ponds would remove approximately 9.5 acres of low-quality habitat consisting of non-native grasses and native desert shrubs adjoining a rural residential/cultivated agricultural lands. The remaining site measures are within existing road ROWs or graded disturbed lands that do not provide habitat for wildlife.

  Conversion of the existing flood irrigation system to pressurized irrigation at this site results in water savings that would be used to keep water in or return water to the Virgin River to benefit aquatic ecosystems and species.

A total of approximately 13.15 acres of wildlife habitat would be permanently removed from alternative actions. These impacts would be minor based on limited disturbance, proximity to city and/or agricultural development, previous disturbance, and low quality of habitat present. A total of approximately 36.21 acres of temporary disturbance to wildlife habitat would also occur from alternative actions. Approximately 24.54 acres of this would be modifications for wildlife habitat enhancement at Seegmiller Marsh and the remaining 11.67 acres are within and adjoining disturbed and developed lands. Moderate short-term impacts are anticipated from temporary disturbance to habitat. Wildlife species, if present, might be temporarily disturbed and displaced to adjacent habitats during construction. Once construction is completed, temporarily disturbed areas would be restored and wildlife could return to the area. At Seegmiller Marsh, the temporarily disturbed areas would be replanted with native species that provide habitat complexity and diversity, which would have a moderate long-term benefit to wildlife and habitat. A long-term benefit is also anticipated for aquatic ecosystems and species in the Virgin River from increased river flows.

6.5.2 Special Status Animal Species

ESA species with potential to be present or with habitat present within the Project area include desert tortoise, southwestern willow flycatcher, Virgin River chub, woundfin, and yellow-billed cuckoo. There are also 17 state sensitive species that have potential to be located within the Project area, four of which are migratory birds. State sensitive species with potential to be present, or with habitat within the Project area, are listed below. Impacts to state sensitive species that are also migratory birds are discussed in Section 6.5.3.

Arizona toad
Common chuckwalla
Desert sucker
Flannelmouth sucker
Fringed myotis
Gila monster
Kit fox
Sidewinder
Virgin spinedace
Western banded gecko
Western red bat
Western threadsnake
Zebra-tailed lizard

6.5.2.1 No Action Alternative

This alternative has the potential to affect ESA-listed species (desert tortoise, southwestern willow flycatcher, or yellow-billed cuckoo) on Site 1, Site 2, and Site 4, as listed in Table 6-7. State sensitive species (see Section 4.5.2) have the potential to be present within these sites as well. Section 7 consultation and avoidance/minimization measures are not required for Sponsor-funded activities. There is an increased risk of harm to or take of ESA-listed and sensitive species without preconstruction surveys being performed and avoidance/minimization measures in place. Moderate impacts to these species could occur if the species are present or nesting habitat is encountered during construction.

6.5.2.2 Action Alternative (NED Alternative)

A Biological Assessment (BA) was completed for the alternative and submitted to the USFWS to complete Section 7 consultation. The USFWS submittal letter is provided in Appendix A and the BA is provided in Appendix E. The USFWS issued a BO on June 16, 2021 (Appendix A). The summary of the ESA species effect determinations for each site are provided in Table 6-7. No Effect species determinations from alternative actions are not included in the table. The overall effect determination for the alternative is included in Table 6-8. The USFWS BO concluded that the alternative is not likely to jeopardize the continued existence or result in destruction or adverse modification of DCH for the southwestern willow flycatcher, Virgin River chub, and woundfin.

Table 6-7. ESA Species Effect Determinations by Site

Species	Effect Determination				
	Site 1	Site 2	Site 3	Site 4	Site 5
Desert tortoise	MA-NLAA	NE	NE	MA-NLAA	MA-NLAA
Desert tortoise DCH	NE	NE	NE	NE	NE
Southwestern willow flycatcher	MA-NLAA	MA-LAA	MA-NLAA	NE	NE
Southwestern willow flycatcher DCH	NE	MA-LAA	NE	NE	NE
Virgin River chub	NE	MA-NLAA	MA-NLAA	NE	NE
Virgin River chub DCH	NE	MA-LAA	NE	NE	NE
Woundfin	NE	MA-NLAA	MA-NLAA	NE	NE
Woundfin DCH	NE	MA-LAA	NE	NE	NE
Yellow-billed cuckoo	NE	MA-NLAA	MA-NLAA	NE	NE
Yellow-billed cuckoo DCH	NE	NE	NE	NE	NE

DCH = Designated Critical Habitat, NE = No Effect, MA-NLAA = May Affect, Not Likely to Adversely Affect, MA-LAA = May Affect, Likely to Adversely Affect

Table 6-8. ESA Project Effect Determinations

Species	Item	Effect Determination
Desert tortoise	Species	May Affect, Not Likely to Adversely Affect
	DCH	No Effect
Southwestern willow flycatcher	Species	May Affect, Likely to Adversely Affect
	DCH	May Affect, Likely to Adversely Affect
Virgin River chub	Species	May Affect, Not Likely to Adversely Affect
	DCH	May Affect, Likely to Adversely Affect
Woundfin	Species	May Affect, Not Likely to Adversely Affect
	DCH	May Affect, Likely to Adversely Affect
Yellow-billed cuckoo	Species	May Affect, Not Likely to Adversely Affect
	DCH	No Effect

Impacts to each ESA species and DCH as applicable for each site are described below. A list of avoidance and minimization measures is provided in Section 8.3.6, Table 8-1.

- Site 1: No ESA species DCH is located within Site 1. Desert tortoise and southwestern willow flycatcher have the potential to occur at this site. No desert tortoise or signs (i.e.: carcasses, shelter sites, scats, tracks, or mating rings) were observed during surveys (Hamilton 2019) and the species is not likely to be encountered. However, suitable habitat was identified within the site boundary. Southwestern willow flycatcher has the potential to be at Site 1 for foraging, though unlikely due to lack of nesting habitat and no known occurrence at the site. Impacts to the desert tortoise and southwestern willow flycatcher would be minor and short-term based on no documented occurrence and avoidance and minimization measures outlined in Section 8.3.6, Table 8-1 and in Section 6.5.3.2 for migratory birds.
- Site 2: Site 2 contains DCH for southwest willow flycatcher, Virgin River chub, and woundfin. Site measures are intended to protect from residential and commercial development/encroachment through purchase of a conservation easement and would enhance the riparian corridor through reestablishment of native wetland and riparian vegetation. Table 6-9 shows the temporary and permanent disturbance impacts within DCH for this alternative. Impacts to DCH for these species can be seen in Appendix A – Maps C6.1A and C6.1B.

Woundfin and Virgin River chub DCH would be permanently modified from construction of a gravel trail, bird viewing stations, and installation of erosion protection. The activities would take place in the floodplain and not in the river itself. Approximately 1.96 acres of the 3.53-acre permanently disturbed areas are previously disturbed through grading/fill/excavation and void of vegetation and/or are developed, which are not likely to contribute to the Primary Constituent Elements (PCE) needed to support the DCH. Additionally, approximately 0.88 acres of land currently being used as dump sites would be restored to a natural condition within DCH that could provide PCE. Therefore, it is anticipated that a net of 0.69 acres of DCH (0.6 percent of the total DCH within the site) contributing PCE would be removed. This is not anticipated to have measurable long-term adverse effects to these fish or their recovery. Short-term moderate adverse impacts to DCH are anticipated, but these areas would be restored and/or enhanced after construction completion. Long-term beneficial impacts to fish habitat are anticipated from addition of approximately 14.1 acres of new wetland providing natural treatment of water before discharging it into the Virgin River. Short-term impacts to the species during construction would be minor based on no activities occurring in the river, construction timing, and the avoidance and minimization measures included in Section 8.3.6, Table 8-1.

Southwestern willow flycatcher DCH would be permanently modified from construction of a gravel trail, bird viewing stations, and installation of erosion protection. However, approximately 0.18 acres of the 1.68-acre permanently disturbed areas are previously disturbed through grading/fill/excavation and non-vegetated and/or developed which are not likely to contribute to the needed to support the DCH. Additionally, approximately 0.75 acres of land currently being used as dump sites would be restored to a natural condition within DCH that could provide PCE. Therefore, it is anticipated that a net of 0.75 acres of DCH (0.79 percent of the total DCH within the site) contributing PCE would be removed. However, approximately 24.54 acres of habitat would be enhanced to provide habitat complexity and diversity, which would provide a long-term benefit for the species. Short-term moderate adverse impacts to DCH are anticipated, but these areas would be restored and/or enhanced after construction completion. Construction activities would be performed outside of the southwest willow flycatcher breading season. Short-term impacts to the species during construction would be minor based on construction timing and the avoidance and minimization measures included in Section 8.3.6, Table 8-1. Addition of a recreation trail would result in increased human presence at the site, but the main recreation trail is on the outside perimeter of the marsh adjoining developed and or frequently disturbed lands. The unimproved loop trail and bird viewing stations would be constructed in unoccupied habitat providing distance and protection from human disturbance in occupied areas of the marsh. The loop trail would be closed during bird breeding season. Signage, gates, and fencing would be used to keep recreationist from entering areas of the marsh outside of the proposed trails. Therefore, long-term impacts from human disturbance would be minor.

Yellow-billed cuckoo suitable habitat would be permanently modified from construction of a gravel trail, bird viewing stations, and installation of erosion protection. However, approximately 0.18 acres of the 1.53-acre permanently disturbed areas are previously disturbed through grading/fill/excavation and void of vegetation and/or are developed. Additionally, approximately 1.17 acres of land currently being used as dump sites would be restored to a natural condition and provide suitable habitat. Therefore, it is anticipated that a net of 0.18 acres of suitable habitat would be removed. However, approximately 24.54 acres of suitable habitat would be enhanced to provide

habitat complexity and diversity, which would provide a long-term benefit for the species. The impacts to the species and suitable habitat are the same as those described for southwest willow flycatcher above.

Table 6-9. DCH and Suitable Habitat Impacts

Species	Habitat	DCH/Suitable Habitat within Project Area (acres)	Permanent Impact	Temporary Impact	Total Impact
Woundfin / Virgin River chub	DCH	112	3.53	34.49	38.02
Yellow-billed cuckoo	Suitable Habitat	99	1.53	26.92	28.45
Southwestern willow flycatcher	DCH	95	1.68	27.43	29.11

- Site 3: No ESA species DCH is located within Site 3. The site is located 4,000 feet west-northwest of Site 2, therefore, there is potential for occurrence of southwest willow flycatcher and yellow-billed cuckoo. Nesting habitat is not located at this site, but the birds may be present while foraging. Impacts would be minor and short-term based on lack of nesting habitat, short construction duration, and the avoidance and minimization measures outlined in Section 8.3.6, Table 8-1.
- Site 4: No ESA species DCH is located within Site 4. Desert tortoises have the potential to occur at this site. No desert tortoise or signs (i.e.: carcasses, shelter sites, scats, tracks, or mating rings) were observed during surveys (Hamilton 2019) and the species is not likely to be encountered. However, suitable habitat was identified within the site boundary. Impacts to the desert tortoise would be minor and short-term based on no observed species or sign, short construction duration, and avoidance and minimization measures outlined in Section 8.3.6, Table 8-1.
- Site 5: No ESA species DCH is located within Site 5. Desert tortoises have the potential to occur at this site. No desert tortoise or signs (i.e.: carcasses, shelter sites, scats, tracks, or mating rings) were observed during surveys (Hamilton 2019) and the species is not likely to be encountered. However, suitable habitat was identified within the site boundary. Impacts to the desert tortoise would be minor and short-term based on no observed species or sign, short construction duration, and avoidance and minimization measures outlined in Section 8.3.6, Table 8-1.

  Conversion of the existing flood irrigation system to pressurized irrigation at Site 5 is anticipated to have a beneficial impact to ESA-listed and state sensitive fish species and habitat. This benefit would be from water savings partially used to keep water in or return water to the Virgin River, increasing river flow.

State sensitive species (see Section 4.5.2) could be present within the Project area during construction. Areas of disturbance would be surveyed by a qualified biologist prior to the commencement of work. If the species were found during surveys, relocation of the species would be performed. Based on adherence to avoidance and minimization measures, state sensitive species impacts would be short-term and minor during construction.

6.5.3 Migratory Birds / Bald and Golden Eagles

Please refer to Section 4.5.3 for a description of migratory birds and bald and golden eagles and potential occurrence within the Project area. Migratory birds protected under the MBTA that are not MBCC or listed as a special status species also have the potential to be present within the Project area.

6.5.3.1 No Action Alternative

This alternative could have direct impacts to migratory birds, including those also listed as MBCC, ESA, and state species of concern. If present, migratory birds may be temporarily disturbed and displaced to adjacent habitats. Construction activities would occur during nesting season for various migratory bird species and have the potential to destroy nests and harm or kill species, if present. Species displaced by construction activities could return to the area upon construction completion. Impacts to migratory birds during construction would be moderate (if present). Impacts to habitat for migratory birds would be minor based on the duration of construction, minor area of disturbance, and abundant suitable habitat in the surrounding area.

Bald eagles have potential foraging habitat in the Project area, and short-term minor impacts to the species could occur from temporary construction activities, deterring bald eagle foraging in and near the Project area. No impacts to golden eagles are anticipated.

6.5.3.2 Action Alternative (NED Alternative)

This alternative would have direct impacts to migratory birds, bald eagles, and associated habitat, but avoidance and minimization measures would be implemented. If construction activities occurred during migratory bird breeding/nesting periods, the Project area (and surrounding habitats) would be surveyed by a qualified biologist for active nests no more than 5 days prior to the commencement of work. If active nests were found during surveys, spatial buffers would be established around such in coordination with USFWS and NRCS. Construction activities within the buffer areas would be prohibited until a qualified biologist confirmed that all nests are no longer active. Impacts of this alternative to migratory birds/bald eagles and associated habitat would be minor based on implementation of avoidance/minimization measures (see Section 6.5.2), preconstruction surveys, restoration of disturbed areas, and abundant suitable habitat in the surrounding area. Impacts to migratory birds (southwestern willow flycatcher and yellow-billed cuckoo) slightly vary from the impacts to other migratory birds based on their ESA status and disturbance to DCH for the species. Refer to Section 6.5.2.2 for a description of impacts to these specific migratory bird/ESA species. No impacts to golden eagles are anticipated.

6.6 Human Resources

6.6.1 Socioeconomics

Please refer to Section 4.6.1 for existing socioeconomic conditions.

6.6.1.1 No Action Alternative

Short-term direct socioeconomic benefits would be incurred from additional employment requirements that may be necessary during construction. There would be no long-term change to socioeconomic conditions for this alternative.

6.6.1.2 Action Alternative (NED Alternative)

Measures for the alternative include flood damage prevention that would reduce flooding to communities downstream of the flood basins proposed at Site 2, adjoining the Y-drain at Site 3, and adjoining the Warner Valley Disposal System at Site 4. This would decrease flood damages for up to and including a 100-year event and the associated costs to the community. Short-term direct socioeconomic benefits would be incurred from additional employment requirements that may be necessary during construction. Indirect long-term benefit from reduced risk to life and property from flood prevention measures at Sites 1, 3, and 4 are anticipated, and a direct short-term benefit from additional employment requirements for construction at all sites is anticipated.

6.6.2 Historic Properties / Cultural Resources

Please refer to Section 4.6.2 for existing historic properties and cultural resources within the Project area.

6.6.2.1 No Action Alternative

There would be no impacts to historical properties or cultural resources from this alternative.

6.6.2.2 Action Alternative (NED Alternative)

This alternative would have no impact to cultural or historical resources, except for at the St. George and Washington Canal and the Hurricane Canal. This alternative would pipe approximately 1,425 feet of St. George and Washington Canal and 680 feet of an open, concrete-lined section of the Hurricane Canal. These segments of the canals were determined to be non-contributing to the overall eligibility for the NRHP due to modern alterations. It was determined that the alternative would have No Adverse Effect to these historic properties, and the determination was submitted to SHPO on September 9, 2020, to comply with Section 106 of the NHPA. SHPO concurred with the determination in a letter dated March 3, 2021 (Appendix A). Tribal consultation has been completed for the Project to comply with EO 13175 and the NHPA (Appendix A).

6.6.3 Public Health and Safety

Please refer to Section 4.6.4 for public health and safety conditions for the existing structure.

6.6.3.1 No Action Alternative

There would be no change to public health and safety for this alternative from the current conditions, except for at Site 3. The existing open drainage ditch at Y-Drain would be fenced, reducing the risk of harm or injury to the public and elementary school students that traverse the ditch corridor.

6.6.3.2 Action Alternative (NED Alternative)

This alternative would remove the public health and safety hazards to inhabitants in approximately 200 residences, 16 office/commercial businesses, 36 roads, one interstate highway, and 162 acres of land that would be flooded during a 100-year storm event along Main Street in Washington City, and adjoining the Y-Drain and Warner Valley Disposal System in St. George. It would also eliminate the public health and safety hazard caused by the open Y-Drain adjoining the elementary school.

6.6.4 Recreation

Please refer to Section 4.6.4 for recreation within the Project area.

6.6.4.1 No Action Alternative

Recreation conditions would remain unchanged at Sites 1, 3, and 5. Site 2 measures include construction of an asphalt trail outside of the riparian corridor and a gravel pedestrian trail through portions of Seegmiller Marsh. Site 4 includes construction of asphalt pedestrian and unpaved equestrian trails. These improvements are anticipated to improve recreational opportunities in the area over the long term.

6.6.4.2 Action Alternative (NED Alternative)

Recreation conditions would remain unchanged at Site 1 and Site 5. Improvements to recreation are anticipated from measures proposed at Site 2, Site 3, and Site 4. Site 2 measures include construction of an asphalt trail outside of the riparian corridor and a gravel pedestrian trail for educational opportunities through portions of Seegmiller Marsh (Appendix C – Map C7.1). An asphalt path would be added in Site 3 that would connect to an existing neighborhood trail (Appendix C – Map C7.1), and Site 4 includes construction of asphalt pedestrian and unpaved equestrian trails (Appendix C – Map C7.2). These improvements are anticipated to improve recreational opportunities in the area over the long term.

6.6.5 Land Use

Please refer to Section 4.6.5 for land uses within the Project area.

6.6.5.1 No Action Alternative

There would be no change to land uses for Site 1, 3, and 5. Site 2 and 4 would have the same change to land uses as described for the Action Alternative.

6.6.5.2 Action Alternative (NED Alternative)

There would be no change to land use for Site 5. Changes to land use for Sites 1 through 4 are described below.

- Site 1: Undeveloped open areas on state lands would be used as flood management basins for construction of the Main Street and Buena Vista Debris Basins.
- Site 2: Seegmiller Marsh would be improved and remain as important wildlife habitat, but easement or purchase of private lands would take place to conserve and protect these sensitive areas from disturbance and development. A public trail system would also be provided, changing privately owned cultivated/disturbed lands into a public multi-use trail system.
- Site 3: The open Y-Drain would be piped, and the land use converted to public trail.
- Site 4: Areas along the existing Warner Valley Disposal System alignment would be converted from open areas along road ROWs and utility corridors to a public multi-use trails system.

6.6.6 Visual Resources and Scenic Beauty

Please refer to Section 4.6.6 for existing visual resources and scenic beauty conditions within the Project area.

6.6.6.1 No Action Alternative

There would be no change to visual resources and scenic beauty for this alternative. Short-term direct impacts to visual quality are anticipated at Sites 2 and 4 from construction equipment parked or operating in the Project area. Impacts would be minor, as disturbance would be temporary and disturbed areas would be restored after construction completion. Enhancements at Seegmiller Marsh and the addition of a multi-use trail are anticipated to increase the opportunity to view the scenic areas of the river corridor along the Virgin River.

6.6.6.2 Action Alternative (NED Alternative)

Short-term direct impacts to visual quality are anticipated at all sites due to construction equipment parked or operating in the Project area. Impacts would be minor, as disturbance would be temporary and disturbed areas would be restored after construction completion. Enhancements at Seegmiller Marsh and the addition of a multi-use trail are anticipated to increase the opportunity to view the scenic areas of the river corridor and improve the riparian habitat along the Virgin River.

6.6.7 Transportation Infrastructure

Please refer to Section 4.6.7 for a description of existing transportation infrastructure with the potential to be impacted.

6.6.7.1 No Action Alternative

Short-term road closures/detours may occur during construction to facilitate proposed modifications at Sites 2 and 4. Access to residences and businesses/offices would be maintained, but small delays in commuting could occur, resulting in minor traffic impacts during construction.

6.6.7.2 Action Alternative (NED Alternative)

Approximately 36 roads and one interstate highway (I-15) would be protected from flood damages for storm events up to and including a 100-year event along Main Street in Washington City, and adjoining the Y-Drain and Warner Valley Disposal System in St. George. This would result in reduced damages to transportation infrastructure during these flood events.

Short-term road closures/detours may occur during construction to facilitate proposed modifications at Sites 2 through 5. Access to residences and businesses/offices would be maintained, but short delays in commuting could occur, resulting in minor traffic impacts during construction.

6.6.8 Noise

Please refer to Section 4.6.8 for existing noise conditions within the Project area.

6.6.8.1 No Action Alternative

During construction activities, noise could be generated that would constitute a nuisance to nearby residential and other community properties. This effect would be short-term in nature, and Washington County Code noise regulations would be followed. Short-term noise impacts would be minor, based on the duration of construction and adherence to code regulations.

6.6.8.2 Action Alternative (NED Alternative)

During construction activities, noise could be generated that would constitute a nuisance to nearby residential and other community properties. This effect would be short-term in nature, and noise minimization efforts would be used. In addition, noise control programs (42 U.S.C. 4913) and Washington County Code noise regulations would be followed. Short-term noise impacts would be minor based on the duration of construction, implementation of BMPs, and adherence to noise programs/regulations.

6.7 Cumulative Effects

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

- Residential Development: Washington County has drastically increased in population, and development of city infrastructure and buildings is anticipated to continue.
- Frog Hollow Debris Basin Rehabilitation: Rehabilitation of an existing debris basin upstream of the City of Hurricane is proposed to take place in 2022. Rehabilitation measures would include modifications to the existing dam embankment.
- Stucki Debris, Warner Draw, and Gypsum Wash Debris Basin Rehabilitations: Three debris basins located upstream of St. George are proposed for rehabilitation to reduce the risk of dam failure and extend the lives of the structures. These structures provide flood protection to St. George and Washington City by attenuating flood flows and trapping sediment. The principal spillways at these basins discharge into the Warner Valley Disposal System (Site 4). Pipeline improvements and upsizing of the disposal system between Site 4 and the three basins would also be part of the rehabilitation activities and are proposed for fall of 2021. Gypsum Wash Debris Basin completed partial rehabilitation in 2020 and is scheduled for the remaining measures in spring of 2022. Stucki and Warner Draw Debris Basins are scheduled for construction in 2022.
- Seegmiller Marsh Park: The City of St. George is proposing to construct a park within cultivated agricultural lands near Seegmiller Marsh. This park would consist of playground equipment and a trail and is planned for construction in late 2021 or early 2022.
- Fort Pearce Park Management Activities: Sediment management and habitat restoration was completed along Fort Pearce Wash in 2020, approximately 2,000 feet southwest of the Little Valley Pickleball Complex in St. George.
- Industrial Park Debris Basins: Debris basins are being constructed by the City of St. George upstream of the industrial park located north of I-15 at the base of the Red Hills. The basins are planned for construction in late 2021 or early 2022.

6.7.1 No Action Alternative

Impacts to resources from the No Action Alternative would be minor, with the majority being short-term impacts during construction. Based on adherence to BMPs, most impacts consisting of temporary disturbances during construction, and activities occurring primarily in previously disturbed and developed areas, measurable cumulative impacts to most resources are not anticipated. Resources anticipated to have measurable cumulative impacts include those associated with habitat/wildlife and recreation.

Alternative impacts, when added to impacts associated with other known actions occurring in the past, present, or reasonably foreseeable future, are described below.

6.7.1.1 Wildlife, Special Status Animal Species, and Migratory Birds

Impacts to wildlife, special status species, and migratory birds for this alternative would be primarily short-term during construction. Permanent impacts include removal of low-quality and high-quality habitat located in or adjoining highly developed or disturbed areas. These measures could have minor long-term adverse impacts when combined with other past, present, or reasonably foreseeable actions. Cumulative impacts could occur to these resources during construction and may contribute a minor short-term cumulative disturbance to species if other actions occur at the same time and in the same area as the proposed action.

6.7.1.2 Recreation

The No Action Alternative combined with the Seegmiller Marsh Park project would cumulatively increase recreation facilities improving recreational opportunities in the area over the long term.

6.7.2 Action Alternative (NED Alternative)

Impacts to resources from the Action Alternative would be minor, with the majority being short-term impacts during construction. Based on adherence to BMPs, most impacts consisting of temporary disturbances during construction, and activities occurring primarily in previously disturbed and developed areas, measurable cumulative impacts to most resources are not anticipated. Resources anticipated to have measurable cumulative impacts include those associated with habitat and wildlife resources (including special status species and migratory birds), resources associated with flood prevention measures (sedimentation, floodplain management, socioeconomics, public health and safety, and transportation infrastructure), and recreation. Alternative impacts, when added to impacts associated with other known actions occurring in the past, present, or reasonably foreseeable future, are described below.

6.7.2.1 Sedimentation

Flood prevention measures proposed for the Main Street Debris Basins include capturing sediment to decrease sedimentation to downstream properties during flood events. When combined with the other debris basin rehabilitation projects, there would be a cumulative long-term beneficial impact that would decrease sediment deposition damages within developed areas of the Warner Draw Watershed.

6.7.2.2 Wildlife, Special Status Animal Species, and Migratory Birds

Impacts to wildlife, special status species, and migratory birds for this alternative would be primarily short-term during construction, and avoidance and minimization measures would be in place. Permanent impacts include removal of low-quality habitat located in or adjoining highly developed or disturbed areas. Modifications in high-quality habitat areas at Seegmiller Marsh would result in a net increase to available habitat and enhancement of the habitat over the long term. Therefore, the alternative actions are not anticipated to have measurable long-term adverse impacts to wildlife, special status animal species, migratory birds, or associated habitat, and would not contribute to cumulative long-term adverse impacts when combined with other past, present, or reasonably foreseeable actions. Cumulative impacts could occur to these resources during construction and may contribute a minor short-term cumulative disturbance to species if other actions occur at the same time and in the same area as the proposed action.

6.7.2.3 Floodplain Management

Reduced flooding to developed areas would occur downstream of Site 1, and adjoining Site 3 and 4. When combined with the measures proposed for the debris basin rehabilitation and new debris basin projects, a long-term cumulative benefit would occur that would decrease flooding to developed areas of the Warner Draw Watershed.

Coordination with the downstream community floodplain administrators and emergency preparedness managers should be performed regarding changes to FEMA and National Flood Insurance Program floodplain designations.

6.7.2.4 Socioeconomics

Short-term direct socioeconomic benefits would be incurred from additional employment requirements that may be necessary during construction if the other projects occur at the same time as the proposed action. Flood damage and associated costs to the community would decrease over the long term from reduced flood risk to property at Site 1, Site 3, and Site 4, combined with the measures for the other debris basin projects.

6.7.2.5 Public Health and Safety and Transportation Infrastructure

The proposed action combined with the other debris basin projects would reduce flooding and associated hazards and damages to areas within the Warner Draw Watershed. This would result in a cumulative benefit increasing public health and safety for inhabitants within the flooded areas and decreasing the risk of damage to transportation infrastructure over the long term.

6.7.2.6 Recreation

The preferred alternative combined with the Seegmiller Marsh Park project would cumulatively increase recreation facilities improving recreational opportunities in the area over the long term.

6.8 Risk and Uncertainty

A 50-year project life was assumed for alternative costs and economic evaluations. Estimating alternative costs and benefits involves a certain degree of risk and uncertainty. During the rehabilitation planning process, decisions are made with information that is uncertain, including errors in measurements and climatic changes that could alter rainfall storm events. Assumptions made during the planning process are based on the best available science, technology, and information. Extended delays between the planning process and construction increase the degree of risk and uncertainty. Estimated alternative costs are based on computed work quantities multiplied by the appropriate unit cost for that type of work. Unit costs are based on current market prices from similar projects. Costs can be influenced by economic factors that cannot be predicted between the planning process and construction that could increase the actual cost and decrease the availability of materials.

Economic benefits from projects are based values of floodplain property, infrastructure, agricultural land, water rights, dredging, equipment, and services. Such items are expected to become more valuable in the future, but it can be difficult to predict future economic conditions. There is also uncertainty in estimating the social and environmental costs associated with each alternative because interested party values, judgments, and opinions may shift over time.

Additional risk and uncertainties associated with the project include the following:

- Development trends: There is always a risk and uncertainty associated with estimating development trends. Estimates were based on projections from the Census Bureau (Census Bureau 2016 and Census Bureau 2017).
- Upland Erosion and Sedimentation: Erosion and sedimentation are dependent upon several unpredictable factors. The actual sedimentation rate could vary based on conditions in drainage area, including construction activity, wildfires, storm events, and off-highway vehicle/pedestrian traffic, among others.

6.9 Irreversible and Irretrievable Resource Commitments

NEPA requires that environmental analysis include identification of "… any irreversible and irretrievable commitments of resource which would be involved in the Proposed Action should it be implemented." Irreversible and irretrievable resource commitments are related to the use of nonrenewable resources and the effects this use could have on future generations. Irreversible effects primarily result from the use or destruction of a specific resource (e.g., energy and minerals) that cannot be replaced within a reasonable time frame. Irretrievable resource commitments involve the loss in value of an affected resource that cannot be restored as a result of the action (e.g., extinction of a threatened or endangered species or the disturbance of a cultural resource).

Implementing the No Action Alternative or Action Alternative would involve a commitment of a range of natural, physical, human, and fiscal resources. Considerable amounts of fossil fuels, labor, and construction materials would be expended. Additionally, large amounts of labor and natural resources would be used in the fabrication and preparation of construction materials. These materials are generally not retrievable. They are not, however, in short supply, and their use would not have an adverse effect upon continued availability of these resources. Any construction would also require a substantial one-time expenditure of federal and cost-share funds that would not be retrievable.

The commitment of these resources would be based on the premise that residents in the immediate area, the state, and the region would benefit by the improved quality of post-construction conditions. These benefits generally are anticipated to outweigh the permanent commitment of resources.

7.0 Consultation, Coordination, and Public Participation

This section describes the coordination efforts with the public, agencies, tribes, and SLOs for the Project.

7.1 Consultation

7.1.1 U.S. Fish and Wildlife Service

USFWS was invited to comment on the Project during the scoping period, but no comment was received. A formal request to be a cooperating agency on the Project was submitted to USFWS on February 12, 2018 (Appendix A), but no response was received. Consultation with USFWS will continue during the Draft Plan-EA review period, and the results will be documented in the Final Plan-EA.

A BA was completed for the Project to comply with Section 7 of the ESA. The BA was submitted to the USFWS on June 9, 2020, to comply with Section 7 of the ESA. The USFWS concurred with the determination for the Project and issued a BO June 16, 2021. Refer to Appendix A for the consultation letters and BO Appendix E for the BA.

7.1.2 Utah Division of Wildlife Resources

A formal request to be a cooperating agency on the Project was submitted to UDWR on February 12, 2018 (Appendix A), but no response was received. UDWR was invited to comment on the Project during the scoping period, but no comment was received. The UDWR is a partner working with SLOs for measures at Seegmiller Marsh (Site 2) and Hurricane Water Efficiency (Site 5). Before issuing the Draft Plan-EA to the public, UDWR was provided copies of the preliminary report for review. Agency report comments or concerns were addressed and/or corrected prior to issuance of the Draft Plan-EA to the public. Consultation with UDWR will continue during the Draft Plan-EA review period, and the results will be documented in the Final Plan-EA.

7.1.3 Utah State Historic Preservation Office

Utah State Historic Preservation Office (SHPO) was invited to comment on the Project during the scoping period, but no comment was received. A Cultural Resources Inventory Report was completed and NRCS determined that there would be No Adverse Effect to historic properties from Project actions. The Cultural Resources Inventory Report was submitted to Utah SHPO for concurrence with the determination, and SHPO concurrence was received on March 3, 2021 (Appendix A). In the event that cultural/archaeological resources are found during construction activities, construction would stop, and the appropriate agencies would be notified, according to NRCS protocol. Consultation with SHPO will continue during the Draft Plan-EA review period, and the results will be documented in the Final Plan-EA.

7.1.4 Tribal Consultation

Tribal consultation was completed for the Project to comply with EO 13175 and the NHPA. Tribes were invited to comment on the Project during the scoping comment period, and consultation letters were also sent to the tribes on September 9, 2020 (Appendix A). The following tribal entities were consulted for the Project, and responses received from tribes are summarized in Table 7-1 and included in Appendix A. Consultation with the tribes will continue during the Draft Plan-EA review period, and the results will be documented in the Final Plan-EA.

- Moapa Band of Paiute Indians of the Moapa River Indian Reservation
- Las Vegas Tribe of Paiute Indians of the Las Vegas Indian Colony
- Paiute Indian Tribe of Utah
- The Hopi Tribe
- Kaibab Band of Paiute Indians of the Kaibab Indian Reservation
- Ute Indian Tribe of the Uintah and Ouray Reservation
- Navajo Nation
- Ute Mountain Ute Tribe

Table 7-1. Tribal Consultation Summary

Project Phase	Tribe	Response
Scoping	Hopi Tribe	Tribe requested copies for review of the Draft Plan-EA and Cultural Report when they become available. If any cultural resources are discovered during construction, work should discontinue and consultation with SHPO performed. If Native American human remains or funerary objects are discovered, they should be immediately reported as required by law.
EO 13175 and NHPA Consultation	Navaho Nation	The tribe determined that there are no Navajo traditional cultural properties within the Project area and the Project may proceed without any further consultation.
	Paiute Indian Tribe of Utah	The tribe does not have any objections and concurs with the determination of eligibility.
Draft Plan-EA	To be documented in Final Plan-EA	

7.1.5 U.S. Army Corps of Engineers

USACE has jurisdiction over work in waters of the U.S. under Section 404 of the Clean Water Act. A formal request to be a cooperating agency on the Project was submitted to USACE on February 12, 2018 and the determination of effect to waters of the U.S. and wetlands for the Project was sent to the USACE on September 9, 2020 (Appendix A). USACE was also invited to comment on the Project during the scoping period. At the issuance of this report, a response has not been received from the USACE. Consultation with USACE will continue during the Draft Plan-EA review period, and the results will be documented in the Final Plan-EA.

7.1.6 Bureau of Reclamation

A formal request to be a cooperating agency on the Project was submitted to BOR on August 27, 2019. BOR responded, declining cooperating agency status in a letter dated September 17, 2019 (Appendix A). BOR was invited to comment on the Project during the scoping period, but no comment was received. Consultation with BOR will continue during the Draft Plan-EA review period, and the results will be documented in the Final Plan-EA.

7.1.7 Utah School and Institutional Trust Lands Administrations

A formal request to be a cooperating agency on the Project was submitted to SITLA on August 25, 2020, and the determination of effect to cultural and historic resources for the Project was sent to SITLA on September 9, 2020 (Appendix A). SITLA was also invited to comment on the Project during the scoping period. At the issuance of this report, a response has not been received from SITLA. Consultation with SITLA will continue during the Draft Plan-EA review period, and the results will be documented in the Final Plan-EA.

7.1.8 Federal Emergency Management Agency

A formal request to be a cooperating agency on the Project was submitted to FEMA on August 25, 2020 (Appendix A), but no response was received. FEMA was invited to comment on the Project during the scoping period, but no comment was received. Consultation with FEMA will continue during the Draft Plan-EA review period, and the results will be documented in the Final Plan-EA.

7.2 Coordination

7.2.1 Sponsoring Local Organizations

Washington County, City of Hurricane, Washington City, City of St. George, Washington County Water Conservancy District, and The Nature Conservancy are the SLOs for the Project. Financial assistance for the Project was requested from NRCS through Standard Form 424-Application for Federal Assistance on January 9, 2018. Initial coordination was conducted with the Sponsors regarding the Project and the proposed measures. Meetings were conducted throughout the planning and engineering process to discuss the Project measures and identify potential concerns. The SLOs were provided copies of the preliminary Plan-EA for review prior to issuance of the Draft Plan-EA to the public. SLO report comments or concerns were addressed and/or corrected prior to issuance of the Draft Plan-EA to the public.

7.2.2 Utah Division of Water Rights Dam Safety

Utah Dam Safety has jurisdiction over dams in the state, and new dams must meet Utah Division of Administrative Rules (UDAR) regulations (UDAR 2018). The proposed Main Street Debris Basins would be constructed almost entirely below grade, with a 5.2-foot embankment. Concept design drawings for the dam were submitted to Dam Safety for review on October 26, 2020. Dam Safety replied on November 9, 2020 indicating that if more than 20 ac-ft of water could be stored above the natural grade, then the basin would be considered a dam, but if less than 20 ac-ft, the construction approval would be approved through an application process (Appendix A).

7.2.3 Stakeholders

7.2.3.1 Landowners

Coordination was conducted with private landowners from whom additional easements may need to be obtained to facilitate alternative measures. Consultation with stakeholders will continue throughout the planning process.

7.2.3.2 Virgin River Program

The Virgin River Program is a partner working with SLOs for measures at Seegmiller Marsh (Site 2) and Hurricane Water Efficiency (Site 5). The Virgin River Program is in strong support of the measures at Site 2 and Site 5 that benefit Virgin River habitat and stream health. Coordination with the Virgin River Program will continue during the Draft Plan-EA review period, and the results will be documented in the Final Plan-EA.

7.2.3.3 USDA-Animal and Plant Health Inspection Service

USDA-Animal and Plant Health Inspection Service (APHIS) is interested in partnering with the SLOs for measures at Seegmiller Marsh (Site 2). Coordination with APHIS will continue during the Draft Plan-EA review period, and the results will be documented in the Final Plan-EA.

7.3 Public Participation

7.3.1 Public Participation Plan

The Public Participation Plan dated May 2018 (McMillen Jacobs Associates 2018) was prepared to provide effective procedures that define outreach to the general public, recreationists, local businesses, associations, stakeholders, affected landowners, and affected government agencies. The main goal of public participation is to involve a diverse group of public and government agency participants to solicit input and provide timely information throughout the NEPA review process. As part of the public participation process, the plan seeks to meaningfully engage minority, low-income, and traditionally under-represented populations during the NEPA review process.

7.3.2 Project Scoping

The participation of the public is a vital component of the Project so that those who are interested in or potentially affected by proposed alternatives have an opportunity to share their concerns and provide input regarding the Plan-EA during the initial stages of the process. The Project Scoping Report (Appendix E) outlines the scoping efforts and comments received from the agencies and public during the scoping process.

Project scoping questions, comments, and concerns were requested from the public and government agencies during the preliminary scoping period, both orally at public meetings and via written submittal of comments.

7.3.3 Public Outreach

Table 7-2 lists the Project's public outreach activities. The public, agencies, and/or organizations were notified of activities as described below and provided with opportunities to comment on the Project.

Table 7-2. Public Outreach Activities

Date	Purpose	Type
March 22, 2018	Project Kickoff Meeting	Meeting with NRCS and the SLOs to Identify Watershed Problems
May 2018	Scoping Announcement	Scoping Meeting and Request for Comment Announcement in the City of Hurricane Utility Bill
May 2018	Scoping Announcement	Scoping Meeting and Request for Comment Announcement in the Ivins City News and Washington County News Community Newsletters
May 2018	Scoping Announcement	Scoping Meeting and Request for Comment Announcement on the Washington County Website
May 11, 2018	Scoping Announcement	Scoping Letters Sent to Tribes
May 14, 2018	Scoping Announcement	Scoping Notice Mailed to Public, Organizations, and Agencies
May 15, 2018	Scoping – Public Comment Period Open	
May 15, 2018	Scoping Announcement	Scoping Notice Posted to NRCS Website, in The Spectrum Daily News, and Flyers Posted
May 15, 2018	Scoping Announcement	Scoping Notice Posted in The Spectrum Daily News
May 25, 2018	UDWR and Virgin River Program Meeting	Meeting to Discuss Water/Land Resource Conservation Plans
May 29, 2018	Scoping Public Meeting	Scoping Meeting Held at the Washington County Office in St. George, Utah
May 30, 2018	Scoping Public Meeting	Scoping Meeting Held at the Hurricane City Office in Hurricane, Utah
June 14, 2018	Scoping – Public Comment Period Closed	
January 13, 2022	Notice of Draft Plan-EA Public Comment Period	Notice of Availability (NOA) of the Draft Plan-EA, comment period, and meeting announcements
January 13, 2022	Draft Plan-EA Comment Period Open	
January 27, 2022	Draft Plan-EA Public Meeting	Virtual Draft Plan-EA Meeting
February 14, 2022	Draft Plan-EA Comment Period Closed	
March 2022	Final Plan-EA	Estimated Completion

7.3.4 Agency and Organization Involvement

During the development of the Plan-EA, agencies were contacted to request input and participation in the Project. Agencies were provided letters of the scoping announcement, which notified them of the Project, public meeting time and locations, and open comment period, and also requested their input. The agencies accepting participation and/or providing input in the Project to date, in addition to NRCS and the SLOs, are listed below. See Section 11.0 for a list of all agencies that were included in the distribution list for Project information announcements. Consultation with agencies and organizations will continue during the Draft Plan-EA review period, and the results will be documented in the Final Plan-EA.

- APHIS (Stakeholder)
- SITLA (Stakeholder)
- Tribes (Tribal Consultation)
- USFWS (Section 7 Consultation)
- Utah Dam Safety (Main Street Debris Basin Concept Design Review)
- Utah SHPO (Section 106 Consultation)
- Virgin River Program (Stakeholder)

7.3.5 Tribal Involvement

During the development of the Plan-EA, tribes were contacted to request input and participation in the Project. Tribes were provided letters of the scoping announcement, which notified them of the Project, public meeting time and locations, and open comment period, and also requested their input (Appendix A). Tribal consultation was completed to comply with EO 13175 and the NHPA. Tribal consultation letters, including a copy of the Cultural Resources Inventory Report, were sent out on September 9, 2020 (Appendix A). See Section 7.1.4 for a summary of tribes consulted and tribal responses to date. Consultation with tribes will continue during the Draft Plan-EA review period, and the results will be documented in the Final Plan-EA.

7.3.6 Agency Plan-EA Reviews

Before issuing the Draft Plan-EA to the public, NRCS's National Water Management Center was provided copies of the preliminary report for review. Agency report comments or concerns were addressed and/or corrected prior to issuance of the Draft Plan-EA to the public.

7.3.7 Draft Plan-EA Public Comment

This portion will be completed in the Final Plan-EA to document the Draft Plan-EA public comment process. Comments and responses on the Draft Plan-EA will be included in Appendix A of the Final Plan-EA.

7.3.8 Final Plan-EA and FONSI Public Comment

When the Final Plan-EA and FONSI are issued, a Notice of Availability will be published locally to notify the public of the finding and copies made available on the Project website.

8.0 Preferred Alternative

8.1 Rationale for Preferred Alternative Selection

Alternatives were formulated following procedures outlined in the NWPM (NRCS 2015), NWPH (NRCS 2014a), Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies (USWRC 1983), and other NRCS watershed planning policies. The preferred alternative was selected based on the ability to meet the purpose and need, compliance with the previously mentioned documents, the economic benefits it provides, and the ability to meet the Project goals and objectives.

The Action Alternative was selected as the preferred alternative for the Project and was also determined to be the NED Alternative. It improves water conveyance, conserves water resources, enhances, and protects important riparian habitat used by ESA species, provides flood damage reduction to developed areas, decreases public health and safety hazards, provides educational and recreational opportunities, and improves water quality and quantity for the Virgin River. No long-term adverse impacts are anticipated from proposed measures and the alternative successfully meets the goals for the flood prevention, watershed protection and agricultural water management authorized Project purposes.

8.2 Measures to be Installed

A summary of the Action Alternative measures is included below. Refer to Section 5.4.2 for a detailed description of the alternative. A map of alternative measures is provided in Appendix B – Maps B4.1 through B4.5, and conceptual design drawings are provided in Appendix D.

8.2.1 Site 1: Main Street Debris Basins

The following measures proposed for Site 1 would provide flood prevention for all storms up to and including a 24-hour/100-year storm event and would provide a 50-year project life.

- Construct a debris basin (Main Street Debris Basin) upstream of North Main Street with approximately 46.5 ac-ft of storage volume (12.3 ac-ft for sediment storage and 34.2 ac-ft for floodwater storage). The structure would have a principal spillway consisting of a concrete riser with 48-inch RCP conduit that discharges into the existing stormwater system. A riprap-armored auxiliary spillway would be constructed with a crest height equal to the 100-year storm water surface elevation.
- Construct a debris basin (Buena Vista Debris Basin) upstream of the intersection of East Buena Vista Boulevard and Tortoise Rock Drive with approximately 14 ac-ft of storage volume (5.4 ac-ft for sediment storage and 8.6 ac-ft for floodwater storage). The structure would have a principal spillway consisting of a concrete riser with 36-inch RCP conduit that discharges into the existing stormwater system. A riprap-armored auxiliary spillway would be constructed with a crest height equal to the 100-year storm water surface elevation.
- Replace an existing catch basin at the connection of the proposed Main Street Debris Basin principal spillway conduit and existing stormwater system.
- Install a new double inlet catch basin along Caddington Circle to intercept and redirect residential runoff into the Main Street Debris Basin. A vacant parcel adjoining the new catch basin would also be graded to direct overflow runoff into the basin.

- Replace 120 linear feet of the existing 42-inch and 36-inch storm-drain pipe along Buena Vista Boulevard with 36-inch RCP and replace one manhole.
- Install two catch basin inlets just north of I-15 along North Main Street to intercept overflow that the current stormwater system cannot handle during a 100-year storm event.

8.2.2 Site 2: Seegmiller Marsh

The following measures are proposed for Site 2 to provide trail systems for recreation and education, and to improve Virgin River ecosystems.

- Excavate approximately 2.9 acres of upland adjoining the Virgin River 5 feet deep to improve flood capacity and reduce lateral erosion risk. The area would be restored by planting native cottonwood and willow.
- Recontour approximately 24.54 acres within the upland along the Virgin River riparian corridor to expand wetland/marsh habitat and open-water areas, and to provide better water management and conveyance through the marsh. Areas graded for shallow standing water conditions would be revegetated with native emergent plants consisting of sedges, rushes, and cattail. Other areas at or above standing water would be revegetated with native tree and shrubs.
- Install piping and outlet boxes to control and convey water flows through the marsh.
- Remove dumped fill, trash, and construction debris from approximately 1.17 acres and restore areas by planting with native upland vegetation.
- Install a sediment trap on Washington Fields Drain.
- Install rock riprap erosion protection along a 2,600-foot length of the right (west) bank of the Virgin River.
- Construct a multi-use paved trail and gravel pedestrian trail with three bird-viewing stations that provide educational opportunities and educational signage for riparian habitat/species health.
- Improve the existing maintenance access road along the left (east) bank of the Virgin River to improve access for marsh maintenance and for UDWR bird-habitat monitoring activities.

8.2.3 Site 3: Y-Drain

The following measures proposed for Site 3 would improve water conveyance and water quality, provide flood prevention, and reduce public health and safety hazards.

- Pipe approximately 1,125 feet of open ditch with 54-inch RCP and tie into existing piped sections at the upstream and downstream extent.
- Install three new manholes along the new pipe alignment, replace an existing manhole, and replace an existing storm drain inlet with a new drain and manhole.
- Construct an asphalt trail adjoining the new pipe alignment to connect into an existing paved trail.

8.2.4 Site 4: Warner Valley Disposal System

The following measures proposed for Site 4 would improve water conveyance, provide flood prevention, and improve public recreation.

- Install a new outfall with concrete headwall and riprap armoring at Fort Pearce Wash and new flap gate valve.
- Install a flap gate valve on 66-inch RCP at outfall and at the upstream catch basin.
- Pipe approximately 1,225 feet of open ditch with 72-inch RCP.
- Regrade the ground surface along an approximately 1,308 LF length of the existing pipeline and raise six manholes to match the new grade.
- Construct 4.7-ac-ft-volume and 7.3-ac-ft-volume detention basins to connect into the disposal system pipeline and provide additional capacity for the system.
- Replace approximately 1,100 LF of adverse sloped 66-inch RCP with new 66-inch RCP at a positive slope.
- Construct new asphalt pedestrian and unpaved equestrian trails along the disposal pipeline alignment for approximately 11,800 feet to connect into an existing asphalt and equestrian trail segment.

8.2.5 Site 5: Hurricane Water Efficiency

The following measures proposed for Site 5 would improve water conveyance, conserve water resources, and use water savings to keep more water in the Virgin River.

- Install approximately 56,150 LF of piping throughout portions of Hurricane to convert flood irrigation systems to pressurized irrigation systems.
- Construct a new pumping station consisting of two 3-million-gallon water storage ponds, a sludge pond, and pump booster station.

8.3 Avoidance, Minimization, and Mitigation

Compensatory mitigation would not be required for the Action Alternative. The alternative measures would impact waters and wetlands (see Section 6.2.2 and 6.2.3) but result in a net increase of 14.1 acres of wetland and net increase in stream channel of 1,534 linear feet. This would provide an overall benefit to waters, wetlands, and associated habitat that includes DCH for ESA animal species. Therefore, the alternative measures are anticipated to be self-mitigating. The general avoidance and minimization measures proposed for all sites are described in Sections 8.3.1 through 8.3.9 below. Additional site-specific mitigation measures for Site 2 are included in Section 8.3.10.

8.3.1 Erosion

Erosion may occur on disturbed and cleared areas within the Project boundary during precipitation events. Proper BMPs would be installed during and after construction to prevent and control soil erosion. Areas disturbed during construction activities would be restored and stabilized through establishment of ground cover.

8.3.2 Surface Water Quality

Construction activities may temporarily affect surface water quality, but Project design elements, including BMPs, would be implemented to reduce the quantity of sediment (1) entering drainages, and (2) flowing downstream and violating any federal or state water quality rules and regulations. Construction BMPs would include, but are not limited to, the following:

- A Storm Water Pollution Prevention Plan (SWPPP) would be required and implemented that contains erosion and sediment control and pollution prevention BMPs, such as, but not limited to, silt fences, fiber wattles, and/or earth berms.
- Construction and staging areas would be assessed for the feasibility of such measures as straw bales, silt fences, and other appropriate sediment control BMPs, which would be implemented to prevent the entry of sediment and other contaminants into downstream drainages.
- To ensure that accidental spills do not enter waters, the storage of petroleum-based fuels and other hazardous materials and the refueling of construction machinery would not occur outside of approved designated staging/batch plant areas. Furthermore, the Project would comply with federal and state water quality standards and toxic effluent standards to minimize any potential adverse impacts from discharges to waters of the U.S. or wetlands.

8.3.3 Air Quality

Construction activities would temporarily emit air pollutants. Fugitive dust, MSAT, and GHG emission increases associated with construction would be minimized through implementation of the following applicable BMPs:

- Spraying the soil on-site with water or other similar approved dust suppressant/soil binder.
- Wetting materials hauled in trucks, providing adequate freeboard (space from the top of the material to the top of the truck), or covering loads to reduce emissions during material transportation/handling.
- Providing a stabilized construction entrance (track-out pad), wheel washers, and/or other similar BMPs at construction site accesses to reduce track-out of site materials onto the adjacent roadway network.
- Removing tracked-out materials deposited onto adjacent roadways.
- Wetting material stockpiles to prevent wind-blown emissions.
- Establishing vegetative cover on bare ground as soon as possible after grading to reduce wind-blown dust.
- Requiring appropriate emission-control devices on all construction equipment.
- Requiring the use of cleaner-burning fuels.
- Using only properly operating, well-maintained construction equipment.

8.3.4 Noxious Weeds and Invasive Plants

Construction activities would put the Project area at risk for future invasion of noxious weeds and invasive plant species (N&I). BMPs would be implemented during construction to prevent the spread of N&I species. During construction and until restoration areas are fully established, BMPs would be maintained on a regular basis to prevent the establishment of N&I species. Non-desirable plant species would be controlled by cleaning equipment prior to delivery to the Project site, eradicating these species before the start and during construction as discovered, and routinely monitoring after construction completion. A PCRP would be developed that would include mechanisms for addressing weed establishment and treatment. Long-term negative impacts would be managed with replanting and various methods of weed control.

8.3.5 Wildlife and Wildlife Habitat

Construction activities would be limited to the smallest extent practicable within the Project area. Disturbed areas would be restored after construction completion.

8.3.6 Special Status Animal Species

Refer to Section 8.3.7 Migratory Birds/Bald Eagles for avoidance and minimization measures for special status species that are also protected under the MBTA.

State Sensitive Species

Areas of disturbance would be surveyed by a qualified biologist prior to the commencement of work. If the species were found during surveys, relocation of the species or other avoidance/minimization measures would be performed

ESA species

Conservation measures were developed for ESA species as part of the BA prepared for the Project and are included in Appendix E (Bowen Collins & Associates 2020). Applicant-committed conservation measures were also listed in the USFWS BO. Conservations measures from the BA and BO are listed in Table 8-1 below.

Table 8-1. ESA-Species Conservation Measures

Conservation Measure	Site 1	Site 2	Site 3	Site 4	Site 5
Desert Tortoise					
Timing of construction and maintenance is expected to take place outside the active tortoise season (March through June and September through October) in suitable habitat areas.	X			X	X
All construction employees would be required to read a desert tortoise educational brochure prior to site entry. The brochure would describe the biology of desert tortoises, the characteristics of suitable habitat, and the appropriate measures to take upon potential discovery of an individual. All construction employees would sign an affidavit that they have read and understand the material presented in the brochure.	X			X	X
Suitable desert tortoise habitat in the Project areas would be surveyed by a USFWS-approved desert tortoise survey biologist for the presence of individuals during the active season, and no more than 30 days prior to construction. If desert tortoise or their signs are discovered during presence surveys, USFWS would be contacted, and formal Section 7 ESA consultation would be initiated.	X			X	X
If desert tortoises are encountered during construction, the Project would be halted and USFWS would be contacted, and formal Section 7 ESA consultation would be initiated.	X			X	X
Trenches, pits, and other excavation sites would be checked for desert tortoises prior to backfilling.	X			X	X
Trash would be contained to reduce the potential for attracting desert tortoise predators.	X			X	X
Construction equipment (including pick-up trucks) speeds would not exceed 10 miles per hour to minimize collisions with desert tortoises and reduce fugitive dust.	X			X	X
Southwestern Willow Flycatcher, Yellow-Billed Cuckoo, Migratory Birds, and Raptors					
Surveys and monitoring will initiate 5 days prior to construction, continue through the duration of construction, and will continue seasonally for the next five years with USFWS an UDWR coordination to determine any long-term negative effects that may lead to potential adjustments to the Project plans.		X			
Construction would be scheduled between September 1 and March 31 to avoid the breeding season. If the Project is not complete during this time, construction must be halted until after the breeding season is over, unless approved by USFWS.		X			
If any trees are to be removed during migratory bird breeding and nesting season (February through September), pre-construction surveys should take place (no more than 5 days prior). If active nests are found, construction activities would be postponed until after the nesting season or until nestlings have fledged and/or the nest fails, or breeding behaviors are no longer observed, as determined by a USFWS-approved southwestern willow flycatcher survey biologist.	X		X	X	X
The Project area (and surrounding habitats within 1 mile) would be surveyed by a qualified biologist for active raptor nests no more than 5 days prior to the commencement of work. If active nests are found during surveys, spatial buffers would be established around each nest site in coordination with USFWS and NRCS. Construction activities within the buffer areas would be prohibited until a qualified biologist confirms that all nests are no longer active.	X	X			X

Conservation Measure	Site 1	Site 2	Site 3	Site 4	Site 5
Virgin River Chub and Woundfin					
Construction would be scheduled between September 1 and March 31 to avoid spawning season for fish. If the Project is not complete during this time, construction must be halted until after spawning season is over, unless approved by USFWS		X			
All construction activities would adhere to the Virgin River Program Floodplain Protection Construction Conditions (attachment to the BA included in Appendix E), which include provisions for working near the Virgin River and guidance regarding construction timing, stream disturbances, and other construction BMPs.		X			
Vegetation					
Temporarily disturbed areas would be revegetated using a USFWS-approved seed-mix.	X			X	X
Excavated soils would be sorted into mineral soil and topsoil. When backfilling a disturbed site, topsoil would be placed on top to provide a seed bed for native plants.		X			
When construction is complete, revegetation in the form of seeding and pole-planting of riparian vegetation would be coordinated with USFWS UDWR, and would include planting plans, techniques, and sources of vegetation material. General details, including approved species, can be found in the Common Virgin River Applicant Committed Measures/Best Management Practices, included as Appendix G to the BA. Revegetation efforts would be monitored for 3 years, with replanting and reseeding required if not successful over that time.		X			
Vegetation removal and replacement would be phased according to instructions from UDWR.		X			
Water Quality					
As removal of some existing invasive plant species is expected, a SWPP would be prepared by the contractor to include silt fencing to prevent runoff during construction, which has potential to be greater than usual during storm events with the removal of existing vegetation.		X			
If construction materials are displaced by high flows, the applicant would contact the UDWR or the Virgin River Program (Steve Meismer) as soon as possible to coordinate the least-intrusive retrieval methods.		X			
Care would be taken to minimize sedimentation resulting from bank or streambed disturbance.		X			
No work shall take place in flowing water. The contractor shall reroute any flows during construction.		X	X	X	
General					
Equipment would be cleaned to remove noxious weeds/seeds and petroleum products prior to moving on-site. Additionally, any chemical pollutants produced during the construction activities shall be disposed of according to the Common Virgin River Applicant Committed Measures/Best Management Practices.		X			
Fueling machinery would occur off-site or in a confined, designated area to prevent spillage into waterways and wetlands.		X			
Materials would not be stockpiled in the riparian areas or other sensitive areas (i.e., wetlands or occupied TES habitat).		X			
Fill materials would be free of fines, waste, pollutants, and noxious weeds/seeds.		X			

Conservation Measure	Site 1	Site 2	Site 3	Site 4	Site 5
Equipment would work from the top of the bank or from the channel to minimize disturbance to the riparian area and to protect the banks. Heavy equipment would avoid crossing and/or disturbing wetlands.		X			
The number of ingress and egress routes to/from all Project sites would be kept to a minimum.	X	X	X	X	X
Excavated material and construction debris may not be wasted in any stream channel or placed in flowing waters or adjacent wetlands; this would include material such as grease, oil, joint coating, or any other possible pollutants. Excess material must be wasted at an upland site away from any channel or habitat of a federally listed or sensitive species. All construction materials must be removed from the active channel and from the 100-year floodplain at the end of the Project.		X			
The applicant would complete the Project in as short of a timeframe as possible (taking into account the terms and conditions above) to minimize the potential for damage to the altered channel during high flows caused by storm events and to reduce the potential for birds to abandon use of the area.		X			

8.3.7 Migratory Birds/Bald Eagles

Construction activities would be limited to the smallest extent practicable within the Project area. Disturbed areas would be restored after construction completion. If construction activities occur during migratory bird breeding/nesting periods, the Project area (and surrounding habitats) would be surveyed by a qualified biologist for active nests no more than 5 days prior to the commencement of work. If active nests are found during surveys, spatial buffers would be established around them in coordination with USFWS and NRCS. Construction activities within the buffer areas would be prohibited until a qualified biologist confirms that all nests are no longer active.

8.3.8 Hazardous Materials

NRCS requires that contractors comply with all federal, state, and local laws and regulations pertaining to pollution and contamination of the environment to prevent pollution of surface water, groundwater, soil, and air with any hazardous materials.

8.3.9 Visual Resources

Areas disturbed during construction activities would be restored after construction completion by grading to match natural contours and stabilizing through establishment of ground cover. These areas would be reestablished by seeding with an herbaceous plant seed mixture and revegetation with NRCS-approved plant species to match the surrounding plant community.

8.3.10 Site 2 Mitigation Commitments

Project measures would have temporary and permanent disturbance to Virgin River chub, woundfin, and southwestern willow flycatcher DCH. Temporary disturbances include removal of invasive plant species and reestablishment of native plant species that would enhance habitat by adding complexity and diversity. Permanent impacts to DCH overlap and would impact up to 3.53 acres of DCH; however, approximately 4.3 acres of open water and 14.23 acres of marsh would be created that would provide important PCEs including, but not limited to, the following (Bowen Collins & Associates 2020):

- More riparian habitat in a riverine environment to provide nesting, foraging and shelter for southwestern willow flycatcher.
- More riparian woodlands in a dynamic riverine environment for yellow-billed cuckoo.
- Additional water to increase the hydrology of the existing marsh for fish.
- Cleaner water that is filtered through the newly established marsh for fish.
- Potential new habitat for fish as the dynamic river re-establishes in areas previously dominated by invasive species.

Despite potential DCH loss, it is expected that the proposed actions would create a net increase in habitat quality, and therefore, the Project would be self-mitigating, as outlined in the BA (Appendix E) and concurred with by the USFWS (Appendix A).

8.4 Permits and Compliance

The federal, state, and local permits and compliance actions described in this section would be required for construction of the Action Alternative. A Watershed Agreement and a Memorandum of Understanding shall be completed and signed by the NRCS and SLOs prior to the obligation of construction funds for the Project.

8.4.1 Federal

USACE: A USACE jurisdictional determination should be made for potential waters of the U.S. within the Project area. Section 404 permitting would be required if waters are determined to be jurisdictional.

USFWS: A BA was submitted to the USFWS on June 9, 2020 (Appendix E), with a determination of effect for ESA species, and USFWS concurred with the determination for the Project and issued a BO on June 16, 2021 (Appendix A).

FEMA: It is recommended that the SLOs consult with the local floodplain zoning authority and appropriate FEMA region staff to keep floodplain maps up to date.

8.4.2 State

Utah SHPO: A Cultural Resources Inventory Report was submitted to the Utah SHPO for concurrence with a determination that the Project would have No Adverse Effect to historic properties. A SHPO concurrence letter, dated March 3, 2021, was received and has been included in Appendix A. In the event that cultural/archaeological resources are found during construction activities, construction would stop, and the appropriate agencies would be notified according to NRCS protocol.

Utah Division of Oil, Gas and Mining: If riprap will be obtained from a source that does not have an existing mining permit, a mining operations permit would be required to mine the riprap.

Utah Department of Environmental Quality: A Utah Pollutant Discharge Elimination System Construction General Permit is required for construction activities that disturb more than 1 acre and discharge pollutants to surface waters. A SWPPP would be developed, including submitting a Notice of Intent (NOI) to the Utah DEQ. A 401 Water Quality Certification Application may also need to be completed for Project measures.

Utah Dam Safety: Approval through an application process is required prior to construction of debris/detention basins.

Utah Division of Water Rights: Written authorization from the State Engineer would need to be obtained to comply with the state Stream Alteration Program before any stream bed or banks could be altered for alternative measures.

8.4.3 Local

City of Hurricane, Washington City, City of St. George, or Washington County Permits: Any additional required city or county permits will be obtained prior to construction.

8.5 Installation and Financing

8.5.1 Planned Sequence of Installation

SLOs would complete all approvals and permits for the Project prior to the start of construction; these may take up to 1 year to obtain. The major construction elements for the Action Alternative would be sequenced to complete the critical path items first. Proposed sequence for construction completions is summarized below.

- Site 1: The construction work for Site 1 would take place over an approximate a 6-month period. It is recommended that the work be completed in later fall to early spring to avoid winter runoff and summer monsoons.
- Site 2: The construction work for Site 2 would take place over an approximate 6-month period between September 1st and April 1st to avoid disturbance to habitat during sensitive bird nesting and fish spawning seasons. Additional planting may be required during the first growing season after construction, depending on the results of the restoration efforts.
- Site 3: The construction work for Site 3 would take place over an approximate 3-month period during winter to accommodate dewatering of the Project site and relocation of a culinary waterline.
- Site 4: The construction work for the Warner Valley Disposal System would take place over an approximate 8-month period. There are no other schedule constraints associated with this site.
- Site 5: Construction activities for the new irrigation pipe installation would take place over a 5-month period primarily outside of the irrigations season (October through February) over two years (10 months total). Construction of the pumping station could be completed outside of the irrigation season. All construction activities are anticipated to be completed within a 2-year time frame.

8.5.2 Responsibilities

The original 1963 Watershed Work Plan set forth the responsibilities of NRCS (formerly Soil Conservation Service [SCS]) and original sponsors. The roles and responsibilities for NRCS and the SLOs would continue in accordance with this Plan-EA, the Watershed Agreement, and the Memorandum of Understanding. NRCS is responsible for leading the planning efforts and providing engineering support, SLOs are responsible for environmental permits and construction implementation, and NRCS or SLOs are responsible for the Project design. NRCS would assist SLOs during construction by providing oversight and certifying completion of the Project.

8.5.3 Contracting

Rehabilitation improvements installed from NRCS funding mechanisms would be procured using contracts awarded. SLOs would oversee and administer construction of the Project in coordination with NRCS.

8.5.4 Real Property and Relocations

Property within the Project area is on private and state lands (Appendix C-Maps C9.1 through C9.4). Easements for proposed improvements (including egress/ingress), easements for future O&M activities, or property acquisition, would need to be obtained.

8.5.5 Financing

The watershed plan must be authorized before funding may be made available for Project operations. NRCS would provide funding from the Watershed Protection and Flood Prevention Act (PL 83-566, as amended by PL 106-472), at the percentages detailed in Table 8-2. Federal assistance varies by project authorized purpose and alternative measures includes purposes of flood prevention, watershed protection, public recreation, and agricultural water management. SLOs are responsible for providing the remaining non-federally funded portions of the Project.

Table 8-2. Cost Share by Authorized Project Purpose

Authorized Purpose	Construction		Engineering		Real Property Rights	
	NRCS	Sponsor	NRCS	Sponsor	NRCS	Sponsor
Flood Prevention	100%	0%	100%	0%	0%	100%
Watershed Protection	Variable	Variable	100%	0%	0%	100%
Public Recreation	Up to 50%	≥50%	100%	0%	Up to 50%	≥50%
Agricultural Water Management	Up to 75%	≥25%	≤ 100%	≥0%	0%	100%

Funding for O&M of facilities after construction would be derived from normal revenues of the SLOs. This O&M cost would be budgeted annually so that the facilities are kept in good condition.

8.6 Operation and Maintenance

Operation of facilities includes the administration, management, and performance of non-maintenance actions needed to keep the facilities safe and functioning as designed. Maintenance includes performance of work, measuring the recording instrumentation data, preventing deterioration of facility components, and repairing damage or replacing the facility components as needed. Repairing damages to completed facilities caused by normal deterioration, droughts, flooding, or vandalism is considered maintenance. Maintenance includes both routine and as-needed measures.

The SLOs would be responsible for the operation, maintenance, and future modifications to facilities, and the estimated annual O&M cost for each Project site are included in Section 8.7. A specific O&M Plan would be prepared by NRCS and the SLOs in accordance with the NRCS National Operation and Maintenance Manual (NRCS 2003). This plan and agreement would be entered into prior to the start of construction activities and would be in place for the extended life of the Project. The agreement would provide for inspections, reports, and procedures for performing the maintenance items. The agreement would include

specific provisions for retention, use, and property improved with PL 83-566 (as amended by PL 106-472) assistance.

8.7 Costs

The installation cost estimate for the Action Alternative (Preferred and NED Alternative) is $36,778,000, as identified in Table 8-3. Economic tables have been included to present information relevant to the costs and benefits of the preferred alternative and NED Alternative. Structural tables have been included to present the relevant structural information pertinent to the design of the preferred alternative. The costs for the preferred alternative are conceptual-level cost estimates only, with an estimated range of accuracy at ±30 percent. Detailed structural designs and construction cost estimates would be prepared for the Project during the final design phase and prior to the start of the competitive bidding process. The final cost of the Project would be the price received from the winning construction bid plus or minus the amount of contract modifications. Assessments, considerations, and calculations are based on a 52-year evaluation period and a discount rate of 2.75 percent (Federal Water Resources FY 2020 discount rate).

The estimated installation cost in Table 8-3 documents land status upon which the Project structures reside, as well as federal and non-federal funding sources, respectively.

Table 8-3. Economic Table 1 - Estimated Installation Cost
Warner Draw Watershed, Utah
(Dollars) [1]

Works of Improvement	PL 83-566 Funds[2]	Other Funds[2]	Total
Site 1: Main Street Debris Basins	$2,991,500	$106,500	$3,098,000
Site 2: Seegmiller Marsh	$4,211,500	$2,297,500	$6,509,000
Site 3: Y-Drain	$1,255,500	$67,500	$1,323,000
Site 4: Warner Valley Disposal System	$5,089,500	$2,321,500	$7,411,000
Site 5: Hurricane Water Efficiency	$10,090,500	$8,346,500	$18,437,000
Total	**$23,638,500**	**$13,139,500**	**$36,778,000**

[1] Price base: 2019 Prepared November 2019
[2] All works of improvement will be on non-federal land.

The estimated cost distribution in Table 8-4 shows the estimated installation costs works of improvement between PL 83-566 funds and the costs borne by the SLOs (other). Table 8-5 shows the installation costs allocated to the various purposes for the Project, as well as the sharing of costs allocated to each purpose.

Table 8-4. Economic Table 2 - Estimated Cost Distribution - Water Resource Project Measures
Warner Draw Watershed, Utah
(Dollars)[1]

Works of Improvement	Installation Cost - Public Law 83-566					Installation Cost - Other Funds						Total
	Construction	Engineering	Project Admin	Real Property Rights	Total Public Law 83-566	Construction	Real Property Rights	Water Rights	Permits	Project Admin	Total Other	Installation Costs
Site 1: Main Street Debris Basins	$2,659,000	$266,000	$66,500	-	$2,991,500	$0	-	-	$40,000	$66,500	$106,500	**$3,098,000**
Site 2: Seegmiller Marsh	$3,184,000	$490,000	$122,500	$415,000	$4,211,500	$1,715,000	$415,000	$20,000	$25,000	$122,500	$2,297,500	**$6,509,000**
Site 3: Y-Drain	$1,113,000	$114,000	$28,500	-	$1,255,500	$24,000	-	-	$15,000	$28,500	$67,500	**$1,323,000**
Site 4: Warner Valley Disposal System	$4,420,500	$535,000	$134,000	-	$5,089,500	$920,500	$1,242,000	-	$25,000	$134,000	$2,321,500	**$7,411,000**
Site 5: Hurricane Water Efficiency	$8,648,000	$1,154,000	$288,500	-	$10,090,500	$2,883,000	$140,000	$5,000,000	$35,000	$288,500	$8,346,500	**$18,437,000**
Total	**$20,024,500**	**$2,559,000**	**$640,000**	**$415,000**	**$23,638,500**	**$5,542,500**	**$1,797,000**	**$5,020,000**	**$140,000**	**$640,000**	**$13,139,500**	**$36,778,000**

[1] Price base: 2019

Prepared November 2019

Table 8-5. Economic Table 2a - Cost Allocation and Cost Sharing Summary Water Resource Project Measures
Warner Draw Watershed, Utah
(Dollars)[1]

Site	Item	Cost Allocation					Cost Sharing									
		Purpose					Public Law 83-566					Other				
		Flood Prevention	Watershed Protection	Public Recreation	Agricultural Water Management	Total	Flood Prevention	Watershed Protection	Public Recreation	Agricultural Water Management	Total	Flood Prevention	Watershed Protection	Public Recreation	Agricultural Water Management	Total
Site 1: Main Street Debris Basins	Construction	$2,659,000	-	-	-	$2,659,000	$2,659,000	-	-	-	$2,659,000	$0	-	-	-	$0
	Engineering	$266,000	-	-	-	$266,000	$266,000	-	-	-	$266,000	$0	-	-	-	$0
	Permitting	$40,000	-	-	-	$40,000	$0	-	-	-	$0	$40,000	-	-	-	$40,000
	Admin	$133,000	-	-	-	$133,000	$66,500	-	-	-	$66,500	$66,500	-	-	-	$66,500
	Subtotal	$3,098,000	-	-	-	**$3,098,000**	$2,991,500	-	-	-	**$2,991,500**	$106,500	-	-	-	**$106,500**
Site 2: Seegmiller Marsh	Construction	-	$4,899,000	-	-	$4,899,000	-	$3,184,000	-	-	$3,184,000	-	$1,715,000	-	-	$1,715,000
	Engineering	-	$490,000	-	-	$490,000	-	$490,000	-	-	$490,000	-	$0	-	-	$0
	Permitting	-	$25,000	-	-	$25,000	-	$0	-	-	$0	-	$25,000	-	-	$25,000
	Admin	-	$245,000	-	-	$245,000	-	$122,500	-	-	$122,500	-	$122,500	-	-	$122,500
	Real Property Rights	-	$830,000	-	-	$830,000	-	$415,000	-	-	$415,000	-	$415,000	-	-	$415,000
	Water Rights	-	$20,000	-	-	$20,000	-	$0	-	-	$0	-	$20,000	-	-	$20,000
	Subtotal	-	$6,509,000	-	-	**$6,509,000**	**-**	$4,211,500	**-**	**-**	**$4,211,500**	-	$2,297,500	-	-	**$2,297,500**
Site 3: Y-Drain	Construction	$1,089,000	-	$48,000	-	$1,137,000	$1,089,000	-	$24,000	-	$1,113,000	$0	-	$24,000	-	$24,000
	Engineering	$114,000	-	-	-	$114,000	$114,000	-	-	-	$114,000	$0	-	-	-	$0
	Permitting	$15,000	-	-	-	$15,000	$0	-	-	-	$0	$15,000	-	-	-	$15,000
	Admin	$57,000	-	-	-	$57,000	$28,500	-	-	-	$28,500	$28,500	-	-	-	$28,500
	Subtotal	$1,275,000	$0	$48,000	$0	**$1,323,000**	$1,231,500	-	$24,000	-	**$1,255,500**	$43,500	-	$24,000	-	**$67,500**

Site	Item	Cost Allocation					Cost Sharing									
		Purpose					Public Law 83-566					Other				
		Flood Prevention	Watershed Protection	Public Recreation	Agricultural Water Management	Total	Flood Prevention	Watershed Protection	Public Recreation	Agricultural Water Management	Total	Flood Prevention	Watershed Protection	Public Recreation	Agricultural Water Management	Total
Site 4: Warner Valley Disposal System	Construction	$3,500,000	-	$1,841,000	-	$5,341,000	$3,500,000	-	$920,500	-	$4,420,500	$0	-	$920,500	-	$920,500
	Engineering	$535,000	-	-	-	$535,000	$535,000	-	-	-	$535,000	$0	-	-	-	$0
	Permitting	$25,000	-	-	-	$25,000	$0	-	-	-	$0	$25,000	-	-	-	$25,000
	Admin	$268,000	-	-	-	$268,000	$134,000	-	-	-	$134,000	$134,000	-	-	-	$134,000
	Real Property Rights	$1,242,000				$1,242,000	$0	-	-	-	$0	$1,242,000	-	-	-	$1,242,000
	Subtotal	$5,570,000	$0	$1,841,000	$0	**$7,411,000**	$4,169,000	$0	$920,500	$0	**$5,089,500**	$1,401,000	$0	$920,500	$0	**$2,321,500**
Site 5: Hurricane Water Efficiency	Construction	-	-	-	$11,531,000	$11,531,000	-	-	-	$8,648,000	$8,648,000	-	-	-	$2,883,000	$2,883,000
	Engineering	-	-	-	$1,154,000	$1,154,000	-	-	-	$1,154,000	$1,154,000	-	-	-	$0	$0
	Permitting	-	-	-	$35,000	$35,000	-	-	-	$0	$0	-	-	-	$35,000	$35,000
	Admin	-	-	-	$577,000	$577,000	-	-	-	$288,500	$288,500	-	-	-	$288,500	$288,500
	Real Property Rights	-	-	-	$140,000	$140,000	-	-	-	$0	$0	-	-	-	$140,000	$140,000
	Water Rights	-	-	-	$5,000,000	$5,000,000	-	-	-	$0	$0	-	-	-	$5,000,000	$5,000,000
	Subtotal	**-**	**-**	**-**	$18,437,000	**$18,437,000**	**-**	**-**	**-**	**$10,090,500**	**$10,090,500**	**-**	**-**	**-**	**$8,346,500**	**$8,346,500**
Total		$9,943,000	$6,509,000	$1,889,000	$18,437,000	**$36,778,000**	$8,392,000	$4,211,500	$944,500	$10,090,500	**$23.638,500**	$1,551,000	$2,297,500	$944,500	$8,346,500	**$13,139,500**

[1] Price base: 2019

Prepared November 2019

Table 8-6 shows the number, estimated unit construction cost, and total cost for recreational facilities proposed.

Table 8-6. Economic Table 2b – Recreational Facilities – Estimated Construction Cost
Warner Draw Watershed, Utah
(Dollars)[1]

Item		Quantity 2/	Units	Estimated Unit Cost 3/	Total Construction Cost 4/
Site 2	Public Trail with Bird Viewing Stations/Educational Signage	1	LS	$449,000	$449,000
Site 3	Public Path	12,200	SF	$3.93	$48,000
Site 4	Public Path and Equestrian Trail	11,800	LF	$156.01	$1,841,000
Total					**$2,338,000**

[1] Price base: 2019 Prepared November 2019
[2] Estimated quantity subject to minor variation at time of detailed planning
[3] Estimated unit cost includes 30% contingency
[4] Rounded to the nearest thousand

Table 8-7 shows the Project cost amortized over the period of analysis (52 years).

Table 8-7. Economic Table 4 - Estimated Average Annual NED Costs
Warner Draw Watershed, Utah
(Dollars)[1]

Improvements	Project Outlays Amortization of Installation Cost	Project Outlays O&M and Replacement Cost	Total
Site 1	$110,200	$12,900	$123,100
Site 2	$231,500	$36,500	$268,000
Site 3	$47,100	$9,700	$56,800
Site 4	$263,600	$63,200	$326,800
Site 5	$655,800	$24,600	$680,400
Total	**$1,308,200**	**$146,900**	**$1,455,100**

[1] Price base: 2019. Calculated using FY 2020 Water Resources Discount Rate (2.75%), annualized over 50 years, and 52-year period of analysis.
Prepared January 2020

Table 8-8 summarizes the results of the flood damage reduction analysis conducted for this Project. The preferred alternative is projected to eliminate existing flood damages (up to and including a 100-year storm event) for Sites 1, 3, and 4.

Table 8-8. Economic Table 5 - Estimated Average Annual Flood Damage Reduction Benefits
Warner Draw Watershed, Utah
(Dollars)[1]

Item	Estimated Average Annual Damage[2]		Damage Reduction Benefit
	Without Project (No Action Alternative)	With Project (Preferred Alternative)	
Residential	$185,000	$37,300	$147,700
Commercial	$47,400	$5,300	$42,100
Other	$600	$100	$500
Total	**$233,000**	**$42,700**	**$190,300**

[1] Price base: 2019. Calculated using FY 2020 Water Resources Discount Rate (2.75%), annualized over 50 years, and 52-year period of analysis.
[2] All flood damage is agriculture. Agriculture-related damages include damages to rural communities.
[3] Other includes churches, schools, roads, and income/productivity lost due to cleanup activities.
Prepared May 2020

Table 8-9 shows the estimated average annual watershed protection damage reduction benefits. Benefits are considered offsite/public.

Table 8-9. Economic Table 5a - Estimated Average Annual Watershed Protection Damage Reduction Benefits
Warner Draw Watershed, Utah
(Dollars)[1]

Item	Damage Reduction Benefit, Average Annual[2]
Sediment Damages	$8,500
Water Conservation	$1,894,400
Total	**$1,902,900**

[1] Price base: 2019. Calculated using FY 2020 Water Resources Discount Rate (2.75%), annualized over 50 years, and 52-year period of analysis.
[2] All damage reduction is agriculture. Agriculture-related damages include damages to rural communities.
Prepared June 2021

Table 8-10 summarizes the benefits and costs of the Project and documents the overall benefit to cost ratio of the proposed improvements.

Table 8-10. Economic Table 6 - Comparison of Annual NED Benefits and Costs
Warner Draw Watershed, Utah
(Dollars)[1]

Item	Average Annual Costs[2]	Flood Damage Reduction[3]	Water Efficiency	Recreation	Total Benefits	Benefit Cost Ratio	Net Economic Benefits
Site 1	$123,100	$181,000	-		$181,000	1.5	$57,900
Site 2	$268,000	-	-	$378,200*	$378,200	1.4	$110,200
Site 3	$56,800	$6,900	-	$89,000	$95,900	1.7	$39,100
Site 4	$326,800	$2,300	-	447,300	$449,600	1.4	$122,800
Site 5	$680,400	-	$1,894,400	-	$1,894,400	2.8	$1,214,000
Total	**$1,455,100**	**$190,200**	**$1,894,400**	**$914,500**	**$2,999,100**	**2.1**	**$1,544,000**

[1] Price base: 2019 Prepared June 2021

[2] From Table 8-6

[3] Total of this column does not match the total from Table 8-7 due to rounding.

*Annual watershed damage reduction benefit of $8,500 for sediment reduction is included with the amount displayed.

9.0 References

50 CFR Part 17. Endangered and Threatened Wildlife and Plants; Designation of Critical Habitat for the Woundfin and Virgin River Chub. Col. 65, No. 17. Published January 26, 2000.

Bowen Collins & Associates. 2019a. Technical Memorandum 01 for Main Street Debris Basin. Dated February 11, 2019.

_____. 2019b. Technical Memorandum 04 for Warner Valley Disposal System. Dated April 5, 2019.

_____. 2019c. Technical Memorandum 05 for Y-Drain. Dated April 19, 2019.

_____. 2019d. Technical Memorandum for Hurricane Irrigation Efficiency. Dated February 15, 2019.

_____. 2019e. Biological Assessment of the Warner Draw Watershed Plan, Washington County, Utah. Dated September 2019.

_____. 2020. Biological Assessment of the Warner Draw Watershed Plan Washington County, Utah. Dated June 2020.

Biek, R. F., Rowley, P. D., Hayden, J. M., Hacker, D.B, Willis, G. C., Hintze, L. F., Anderson, R. E., Brown, K. D. 2010. Geologic Map of the St. George and East Part of the Clover Mountains 30' X 60' Quadrangles, Washington and Iron Counties, Utah. Map 242DM Utah Geological Survey.

Certus Environmental Solutions, LLC. 2019. Cultural Resource Assessment for the Warner Draw Watershed Plan-EA, Washington County, Utah.

Dixie Soil Conservation District, St. George City, Ivins Town, Washington County, St. George and Washington Canal Company, Bloomington Canal Company, St. George-Clara Field Canal Company, Hurricane Canal Company, and Bench Lake Irrigation Company. 1968. Watershed Work Plan, Warner Draw Watershed, Washington County, Utah. October 1968.

eBird. 2019. Interactive Map of documented occurrence of bird species. Accessed January 14, 2019 online at https://ebird.org/map/.

EPA (U.S. Environmental Protection Agency). 2016. Waterbody Quality Assessment Report for the Virgin River from the state line to the Santa Clara River, from the Santa Clara River to the Quail Creek Diversion, and from Quail Creek Diversion to North Creek Confluence. Water Quality Assessment Report for Fort Pearce Wash from the Virgin River confluence to headwaters. Accessed online at https://ofmpub.epa.gov/waters10/attains_index.home.

_____. 2018. Sole Source Aquifers Interactive Map. Accessed online October 2018 at https://www.epa.gov/dwssa.

FEMA (Federal Emergency Management Agency). 2009. Flood Insurance Rate Map Washington County, Utah and Incorporated Areas. Map Numbers 49053C1031G, 49053C1032G, 49053C1033G 49053C1034G, 49053C1041G, 49053C1042G, 49053C1055G, 49053C7094G, 49053C0845G, 49053C1125G. Effective April 2, 2009.

Fischer, Richard A., Martin, Chester O., Fischenich, J. Craig. 2000. Improving Riparian Buffer Strips and Corridors for Water Quality and Wildlife.

Glisson, B. 2018. Threatened and Endangered Plant Species Survey Reports for Main Street Debris Basin, Y-Drain, Seegmiller Marsh, Warner Valley Disposal System, Gould Wash Borrow Site 1, Gould Wash Borrow Site 2, Gould Wash Debris Basin Sites 3-5, and Hurricane Irrigation System Study, Washington County Utah. Dated June and July 2018.

Google Earth Pro. 2017. June 14, 2017 Aerial imagery.

_____. 2018. Terrain layer on Google Earth Pro. Accessed December 12, 2018.

Hamilton, D. 2019. Desert Tortoise Survey Report for the Warner Draw Watershed Plan, Supplement. Dated January 17, 2019.

Homer, C.G., Dewitz, J.A., Yang, L., Jin, S., Danielson, P., Xian, G., Coulston, J., Herold, N.D., Wickham, J.D., and Megown, K., 2015. Completion of the 2011 NLCD for the conterminous United States-Representing a decade of land cover change information. Photogrammetric Engineering and Remote Sensing, v.81, no.5, p.345-354. Published October 27, 2015.

Lund, W. R., Knudsen, T. R., Vice, G. S., Shaw, L. M. 2008a. Piping- and Soil-Erosion-Susceptibility Map for the St. George-Hurricane Metropolitan Area.

_____. 2008b. Shallow-Ground-Water-Susceptibility Map for the St. George-Hurricane Metropolitan Area.

Natural Channel Design, Inc. 2007. Virgin River Master Plan. A road map for reconstruction, management, and long-term maintenance. Final report dated October 2007.

Natural Channel Design, Inc. and Applied Ecological Services. 2006. A Concept Plan for the Future of Seegmiller Marsh and its Watershed. Dated February 2006, revised October 2006.

NPS (National Park Service). 2013. National Parks Service Southwestern Willow Flycatcher Profile. Prepared by Sonya Daw, Southern Colorado Plateau Network I&M Program in 2013. Accessed online at https://www.nps.gov/articles/southwestern-willow-flycatcher.htm.

_____. 2018a. Interactive National Parks Mapper. Accessed at https://www.nps.gov/state/ut/index.htm.

_____.2018b. Natural National Landmarks Map. Accessed online at: https://www.nps.gov/subjects/nnlandmarks/nation.htm.

NRCS (United States Department of Agriculture Natural Resources Conservation Service). 2003. National Operation and Maintenance Manual for Conservation Practices Installed with NRCS Assistance. Second Edition dated May 2003.

_____. 2010. NRCS General Manual, Title 190 – Ecological Sciences, Part 410 – Compliance with NEPA. GM_190_410_A. Amend. 17, March 2010.

_____. 2011. NRCS Handbooks, Title 190 – Ecological Sciences, Part 610 – National Environmental Compliance Handbook. H_190_NECH, Second Edition, March 2010.

_____. 2014a. National Watershed Program Handbook, 2nd Edition, April 2014 Parts 600 through 606.

_____. 2014b. Warner Draw Watershed Supplemental Watershed Work Plan Agreement No. 3. Dated April 29, 2014.

_____. 2015. National Watershed Program Manual, 4th Edition, April 2014, as amended January 2015, Parts 500 through 506.

_____. 2016. Warner Draw Watershed Supplemental Watershed Work Plan Agreement No. 4 for the Gypsum Wash Debris Basin Rehabilitation. Dated February 24, 2016.

_____. 2017a. Warner Draw Watershed Supplemental Watershed Work Plan Agreement No. 5 for Ivins Debris Basins 1-6 Rehabilitation. Dated January 23, 2017.

_____. 2017b. Warner Draw Watershed Supplemental Watershed Work Plan Agreement No. 6 for the Warner Draw Debris Basin Rehabilitation. Dated May 2017.

_____. 2017c. Warner Draw Watershed Supplemental Watershed Work Plan Agreement No. 7 for the Stucki Debris Basin Rehabilitation. Dated July 2017.

_____. 2018. Web Soil Survey. Washington County Area, Utah. Accessed online at https://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx.

_____. 2019. Warner Draw Watershed Supplemental Watershed Work Plan Agreement No. 8 for the Frog Hollow Debris Basin Rehabilitation. Dated January 2019.

NWSRS (National Wild and Scenic River System). 2018. Map of Wild and Scenic Rivers in Utah. Accessed online at http://www.rivers.gov/map.php.

SCS (United States Department of Agriculture Soil Conservation Service). 1971. Warner Draw Watershed Supplemental Watershed Work Plan Agreement No. 1.

_____. 1975. Warner Draw Watershed Supplemental Watershed Work Plan Agreement No. 2.

Seattle Audubon Society. 2019. Willet life history description. Accessed online at http://www.birdweb.org/birdweb/bird/willet.

SITLA and BLM. 2017. Shapefile for Land Ownership Status and Areas of Responsibility for the State of Utah.

Todea, N. 2017. Washington County Water Loss Study. NRCS Study dated November 13, 2017.

UDAF (Utah Department of Agriculture and Food). 2019. State of Utah Noxious Weed List. Published June 6, 2019. Available at https://ag.utah.gov/farmers/plants-industry/noxious-weed-control-resources/state-of-utah-noxious-weed-list/.

UDAR (Utah Division of Administrative Rules). 2018. Utah Administrative Code, R655-11. Requirements for the Design, Construction, and Abandonment of Dams. As in effect on September 1, 2018.

UDEQ (Utah Department of Environmental Quality). 2004. TMDL Water Quality Study of the Virgin River Watershed. EPA Approval Date September 20, 2004.

_____. 2018. Utah Division of Air Quality 2018 Annual Report.

UDNR. 2017. Utah Sensitive Species List. Updated November 1, 2017.

_____. 2018a. State Park interactive mapper accessed at https://stateparks.utah.gov/parks/?view=map.

_____. 2018b. UDNR Division of Wildlife Resources shapefiles for species known occurrence information within a 2-mile buffer of each project site. Provided on November 21, 2018.

_____. 2019. Utah Conservation Data Center under the Division of Wildlife Resources. Accessed online at https://dwrcdc.nr.utah.gov/ucdc/.

Census Bureau (United States Census Bureau). 1996. Population of States and Counties of the United States: 1790 to 1990.

_____. 2016. 2016 ACS Demographic and Housing Estimates 2012-2016 American Community Survey 5-Year Estimates for Hurricane, St. George, Washington City, Washington County, and the State of Utah. Originally accessed online at https://factfinder.census.gov/faces/nav/jsf/pages/index.xhtml?#; however, reports are now found at: https://data.census.gov/cedsci/

_____. 2017. Annual Estimates of the Resident Population: April 1, 2010 to July 1, 2010 Population Estimates for St. George, Ivins, Santa Clara, Washington City, Hurricane and Apple Valley. Originally accessed online at https://factfinder.census.gov/faces/nav/jsf/pages/index.xhtml?#; however, reports are now found at: https://data.census.gov/cedsci/

USDA (United States Department of Agriculture). 2017. 2017 Census of Agriculture. County Profile. Washington County, Utah.

USFWS (United States Fish and Wildlife Service). 2018a. National Wildlife Refuge Locator Map. Accessed online at: https://www.fws.gov/refuges/find-a-wildlife-refuge/

_____. 2018b. IPaC Resource list for the Project Area. Accessed online at https://ecos.fws.gov/ipac/.

USGS (United States Geological Survey). 2014. Discharge, Water Quality, and Native Fish Abundance in the Virgin River, Utah, Nevada, and Arizona, in Support of Pah Tempe Springs Discharge Remediation Efforts.

_____. 2017. Hurricane, Little Creek Mountain, Saint George, The Divide, and Washington, Utah Quadrangles 7.5-Minute Series.

USWRC (United States Water Resources Council). 1983. Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies.

Utah Office of Administrative Rules. 2018. Standards of Quality for Waters of the State R317-2-12 Category 1 and Category 2 Waters. As in effect September 1, 2018.

Wilderness Connect. 2018. Interactive map of legislative designated wilderness boundaries. Accessed online at https://www.wilderness.net/nwps/maps.

Zillow. 2019. Zillow home value index median home value for Washington City, Utah. Accessed online in June 2019 at https://www.zillow.com/washington-ut/home-values/.

10.0 List of Preparers

Table 10-1 lists the people who participated in the preparation of this document.

Table 10-1. List of Preparers

Name	Title (Years of Experience)	Education	Other
NRCS – Utah (Review and Coordination)			
Norm Evenstad	Water Resources Coordinator (25+)	B.S. – Geology	Utah P.G.
Bronson Smart	State Engineer (15+)	B.S. – Civil and Environmental Engineering M.S. – Civil Engineering	Utah P.E.
Derek Hamilton	Wildlife Biologist (15+)	M.S. - Biology	
Lance Smith	Engineer (15+)	B.S. – Civil Engineering	Utah P.E.
Tara Hoffmann	State Cultural Resources Specialist (10+)	B.S. – Interdisciplinary Studies M.A. – Anthropology	
Adaptive Environmental Planning, LLC (Plan-EA Preparation)			
Bobbi Preite	Senior Natural Resources Consultant (15+)	B.S. – Geology	
Greg Allington	Senior Biologist (15+)	B.S. – Wildlife Ecology	
McMillen Jacobs Associates (Map Production)			
Laura Johnson	Licensing and Regulatory Consultant (17+)	B.S. – Biology M.S. – Aquatic and Fishery Sciences	
Long Watershed Planning Economics, LLC (Economic Analysis)			
John Long	Economist (20+)	B.S. – Agricultural Economics	
Bowen Collins Associates (Engineering, Concept Design, Wetland Delineation, Biological Assessment)			
Jamie Tsandes	Landscape Architect (20+)	B.L.A. – Landscape Architecture and Environmental Planning	Utah P.L.A. Idaho P.L.A.
Todd Olsen	Engineer (15+)	B.S. – Civil and Environmental Engineering	Utah P.E. Arizona P.E. Nevada P.E.
Craig Bagley	Engineer (30+)	B.S. – Civil and Environmental Engineering M.S. – Civil Engineering	Utah P.E. Idaho P.E.
Merissa Davis	Biologist (17+)	B.S. – Conservation Biology, Wildlife Emphasis	
Clinton Merrell	Engineer (12+)	B.S. – Civil and Environmental Engineering M.S. – Civil Engineering	Utah P.E. California P.E. Colorado P.E.

Name	Title (Years of Experience)	Education	Other
Cody Moultrie	Engineer (11+)	B.S. – Civil and Environmental Engineering M.S. – Civil Engineering	Utah P.E.
Tyler Seamons	Engineer (5+)	B.S. – Civil and Environmental Engineering M.S. – Civil Engineering	Utah P.E.
Derek Schriner	Engineer (2+)	B.S. – Civil Engineering M.S. – Civil and Environmental Engineering	
Rosenberg Associates (Geotechnical Studies)			
Dave Black	Geotechnical Engineer (25+)	B.S. – Geology M.S. – Geological Engineering	Utah P.E.
Certus Environmental Solutions (Cultural Resource Surveys and Reporting)			
Sheri Ellis	Archaeologist (20+)	B.S. – Psychology & Anthropology American Studies	
Bruce Glisson Consulting (Vegetation Surveys and Reporting)			
Bruce Glisson	Botanist/Ecologist (26+)	B.S. – Biology Public Health Ph. D. – Botany	

11.0 Distribution List

This section lists the government agencies and organizations that are included on the Project distribution list for scoping notice and notice of availability for the Draft Plan-EA.

11.1 Federal Government

APHIS
BLM
BOR
EPA
FEMA
USACE
USFWS

11.2 State Government

SITLA
State Representative
State Senator
U.S. Representatives
U.S. Senators
Utah Department of Agriculture
Utah Department of Environmental Quality
Utah Department of Heritage and Arts
Utah Department of Public Safety
Utah Department of Transportation
Utah Division of Forestry, Fire & State Lands
Utah Division of Water Rights
Utah Division of Wildlife Resources
Utah Natural Heritage Program
Utah Public Land & Policy Coordination Office
Utah Reclamation Mitigation & Conservation

11.2.1 Local Government

City of Hurricane
City of La Verkin
City of St. George
Ivins City
Santa Clara City
Toquerville City
Town of Leeds
Washington City
Washington County

11.2.2 Business and Organizations

Dixie Power
Sierra Club Utah Chapter
The Nature Conservancy
Virgin River Program
Western Land Exchange Project
Wild Earth Guardians
Wild Utah Project

11.3 Tribes

Hopi Tribe

Kaibab Band of Paiute Indians

Las Vegas Tribe of Paiute Indians

Moapa Band of Paiute Indians

Navajo Nation

Paiute Indian Tribe of Utah

Ute Indian Tribe of the Uintah & Ouray Reservation

Ute Mountain Ute Tribe

11.4 Private Parties

The names and addresses of private parties who will receive notice of the Draft Plan-EA are not listed in this section for privacy.

12.0 Acronyms, Abbreviations, and Short Forms

ac	acre
ac-ft	acre-feet
APHIS	Animal and Plant Health Inspection Service
BA	Biological Assessment
BMPs	Best Management Practices
BOR	Bureau of Reclamation
Census Bureau	U.S. Census Bureau
CFR	Code of Federal Regulations
cfs	cubic feet per second
CWA	Clean Water Act
DCH	Designated Critical Habitat
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
FR	Federal Register
ft	feet
GHG	greenhouse gas
IPaC	Information for Planning and Consultation
MBCC	Migratory Birds of Conservation Concern
MBTA	Migratory Bird Treaty Act
MOU	Memorandum of Understanding
MRLC	Multi-Resolution Land Characteristics
MSAT	Mobile Source Air Toxics
N&I	Noxious and invasive weeds
NAAQS	National Ambient Air Quality Standards
NED	National Economic Development
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NOI	Notice of Intent
NPS	National Park Service
NRCS	U.S. Department of Agriculture Natural Resources Conservation Service
NRHP	National Register of Historic Places
NWSRS	National Wild and Scenic River System
O&M	Operations and Maintenance
PCRP	Post Construction Rehabilitation Plan
PL	Public law
Plan-EA	Supplemental Watershed Plan and Environmental Assessment
PM	particulate matter

RCP	Reinforced concrete pipe
SCS	Soil Conservation Service
SHPO	State Historic Preservation Office
SITLA	Utah School and Institutional Trust Lands Administration
SPC	Wildlife Species of Concern
SWPPP	Storm Water Pollution Prevention Plan
TDS	Total dissolved solids
TMDL	total maximum daily load
UDAF	Utah Department of Agriculture and Food
UDAQ	Utah Division of Air Quality
UDAR	Utah Division of Administrative Rules
UDNR	Utah Department of Natural Resources
UDWR	Utah Division of Wildlife Resources
USACE	U.S. Army Corps of Engineers
U.S.C	United States Code
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
USGS	United States Geological Survey
VOC	volatile organic compound
WFPO	Watershed and Flood Prevention Operations