Appendix E. Supporting Information

Aquatic Resource Delineation

Aquatic Resource Delineation for the

Spring City Watershed Flood and Irrigation Project

Spring City, Utah

Prepared for:

Spring City and Horseshoe Irrigation Company

Prepared by:

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Chapter 1. Introduction

1.1 Introduction

J-U-B Engineers, Inc. (J-U-B) conducted an aquatic resource delineation (ARD) on July 12 and 13, 2021 for the proposed Spring City Watershed Flood & Irrigation Project (Proposed Project) located in Spring City, Utah. The Proposed Project is located within portions of Sections 18, 19, 20, 29, 31, 32, 33, 34, 35, and 36, Township 15 South, Range 4 East,; portions of Sections 24, 25, and 26, Township 15 South, Range 3 East; and portions of Sections 1 and 2, Township 16 South, Range 4 East, Salt Lake Base and Meridian. The Proposed Project would occur within agricultural fields surrounding the city and through the middle of the city along both Oak Creek and Canal Creek (See attached Topo Map). The objective of this assessment was to document the Waters of the U.S. (WOTUS), including wetlands located within the Proposed Project Survey Area (Survey Area).

The Proposed Project components include the following:

- Debris Basin and Water Storage Reservoir (Debris Basin): Construct a 1,034 acre-feet (ac-ft) multi-purpose reservoir (52-foot high embankment, 2,382 feet in length) which would provide for critical flood control and damage protection, irrigation water storage, and day use recreational facilities.
- Oak Creek Diversion Structure: Construct a new concrete water diversion structure on Oak Creek to divert flood flows into the Debris Basin.
- Flood Channel to Debris Basin: Install a new open concrete, 5,850 linear feet, trapezoidal channel within an existing ditch and upgrade existing diversion structure to divert flood water and debris from Oak Creek into the Debris Basin. The concrete channel would be designed to convey a peak flow rate of 382 cubic feet per second (cfs) (500-year storm flow plus debris and sediment).
- Debris Basin Outlet Piping: Install 7,830 linear feet of new outfall piping to deliver flood water from the Debris Basin back to Oak Creek and the irrigation system at the existing, downstream Last Chance Diversion Structure. Pipeline will convey 11.6 cfs of flood water and 16.8 cfs of irrigation water from the reservoir to the distribution system.
- Mill Race Flood Ditch Piping: Construct 11,570 linear feet of new pipeline to deliver floodwater through the City during periods of high runoff. This pipeline would increase flood flows through City by 20 cfs and reduce erosion and maintenance issues for City.
- North Fields Piping: Install approximately 21,070 linear feet of piping in the existing irrigation ditches within the North Field Ditch and deliver 5 cfs of irrigation water to water users. The pipeline will replace an existing open earth ditch system that is highly susceptible to water loss and is expected to save up to 648 ac-ft of irrigation water annually.
- Point Ditch Piping and Work Area: Install approximately 6,890 linear feet of pipe in the Point Ditch and deliver 10 cfs of irrigation water to water users. The pipeline would replace an existing open earth ditch system that is highly susceptible to water loss and is expected to save up to 1,773 ac-ft of irrigation water annually.
- City Regulating Pond: Construct a new 20 ac-ft regulating pond with a 20-foot high embankment, 1,060 feet in length, adjacent to the existing agricultural regulating pond to provide separate water storage for Spring City residential water users.

- Penstock Pipeline Replacement: Replace the existing penstock pipeline with 8,450 linear feet of new pipeline that will convey 8 cfs of water from Oak Creek to Spring City's hydroelectrical plant and provide continuity and long-term power generation of 266 kW.
- Chester Ponds Capacity Restoration: Dredge the Chester irrigation ponds and install new, 5,330 linear feet of pipeline and a new diversion from Oak Creek. Dredging would remove an estimated 161,333 cubic yards of sediment and debris and increase water storage capacity of ponds by 1,000 ac-ft for late season irrigation.
- Install new secondary water meters for approximately 502 residential water users within Spring City's boundary. Water meters would be located at the juncture of pipeline connection and residential property line on private property. This would provide an estimated water saving of 142 ac-ft annually.
- Replace existing, deteriorated diversion structures throughout the system and upsize 15 culvert road crossings to reduce water losses.
- Construct day use recreational facilities at the Debris Basin including picnic facilities, trails, and a boat ramp.1.2 Landscape Setting.

1.2 Landscape Setting

Spring City is situated in Sanpete County between the San Pitch Mountains and the Manti-La Sal National Forest. The Survey Area is hilly with elevation ranging from 7,150 to 5,640 above mean sea level (AMSL). Land uses in the surrounding area consist of residential, industrial, commercial, and agricultural uses; the multi-purpose reservoir, Oak Creek Flood Channel Diversion, Penstock Diversion, and Last Chance pipeline are located to the east of Spring City; the secondary reservoir, Point Ditch and Upper Mill race Ditch are located just south of Spring City; the Chester ponds and new irrigation pipeline are located west of Spring City; the Mill Race Ditch runs through Spring City and connects to the North Ditch pipelines, which run north and west of the city. Oak Creek and Canal Creek run from the base of the Manti-La Sal National Forest west through Spring City and connect to the project area in multiple places. For representative photos of the Survey Area, refer to the attached Photo Inventory.

1.2.1 Climate

The region is considered a warm summer continental climate. Climate Data was pulled from the Western Regional Climate Center's records for the Moroni, Utah location. The Moroni climate station is located in Moroni, Utah, approximately 4 miles northwest of Spring City. Moroni has an average annual high temperature of 62.9° Fahrenheit (F) and an average annual low temperature of 30.9° F (WRCC, 2022a). Extreme temperatures are not uncommon, the highest recorded temperature was 107° F in July and the coldest temperature was -30° F in January and February (WRCC, 2022b). The average annual precipitation is 10.2 inches of rain and 42.2 inches of snowfall (WRCC, 2022a). The nearest Agricultural Applied Climate Information System (AgACIS) Climate Analysis for Wetlands Tables (also known as WETS) station is located in Moroni as well. Information obtained from this WETS station indicates that 2021 had a lower than average amount of total precipitation at 9.74 inches; the last time total precipitation was at or above the average was in 2017 (NOAA, 2022).

1.2.2 Vegetation

Vegetation within the Survey Area was typical for landscapes in this region, consisting primarily of upland species with wetland species occurring in swales, low-lying areas, and from seeps at toe slopes. Dominant species are identified in Table 1.1 below.

Table 1.1 –Dominant Vegetation Within the Survey Area

Stratum	Common Name	Scientific Name	Indicator Status
Tree	Bigtooth maple	*Acer grandidentatum*	FACU
	Boxelder maple	*Acer negundo*	FACW
	Narrowleaf cottonwood	*Populus angustifolia*	FACW
Shrubs	Big sagebrush	*Artemisia tridentata*	UPL
	Booth's willow	*Salix boothii*	FACW
	Coyote willow	*Salix exigua*	FACW
	Redtwig dogwood	*Cornus sericea*	FAC
	Rubber rabbitbrush	*Ericameria nauseosa*	UPL
	Wood's rose	*Rosa woodsii*	FACU
Herbs	Alsike Clover	*Trifolium hybridum*	FAC
	Baltic rush	*Juncus balticus*	FACW
	Blue wildrye	*Elymus glaucus*	FACU
	Bulrush	*Schoenoplectus acutus*	OBL
	Canada thistle	*Cirsium Arvense*	FACU
	Common bentgrass	*Agrostis capillaris*	FAC
	Common spike-rush	*Eleocharis palustris*	OBL
	Common teasel	*Dipsacus fullonum*	FAC
	Creeping wild rye	*Leymus triticoides*	FAC
	Dandelion	*Taraxacum officinale*	FACU
	Rose evening primrose	*Oenothera rosea*	FACW
	Inland saltgrass	*Distichlis spicata*	FAC
	Intermediate wheatgrass	*Thinopyrum intermedium*	UPL
	Meadow foxtail	*Alopecurus pratensis*	FACW
	Narrowleaf plantain	*Plantago lanceolata*	FAC
	Nebraska sedge	*Carex nebrascensis*	OBL
	Olney's three-square	*Schoenoplectus americanus*	OBL
	Prickly lettuce	*Lactuca serriola*	FACU
	Reed canary grass	*Phalaris arundinacea*	FACW
	Showy milkweed	*Asclepias speciosa*	FAC
	Smooth brome	*Bromus inermis*	FACU
	Smooth horsetail	*Equisetum laevigatum*	FACW
	Strawberry clover	*Trifolium fragiferum*	FAC
	Water sedge	*Carex aquatilis*	OBL
	Whitetop	*Lepidium draba*	UPL
	Yarrow	*Achillea millefolium*	FACU

Obligate (OBL) *– Almost always occurs in wetlands.*
Facultative Wetland (FACW) *– Usually occurs in wetlands but may occur in non-wetlands.*
Facultative (FAC) *– Occurs in wetlands and non-wetlands equally.*
Facultative Upland (FACU) *) – Usually occurs in non-wetlands but may occur in wetlands.*
Upland (UPL) *– Almost never occurs in wetlands.*

1.2.3 Soils

A review of Natural Resources Conservation Service's (NRCS) Web Soil Survey revealed that the Survey Area is comprised of twenty-three soil map units. The largest five soil map units are described in the following paragraphs. All of the soil map units are described in greater detail in the attached Soil Reports. Five of the twenty-three soils are classified as hydric (see table 1.2 NRCS Soil Types Mapped within the Survey Area).

Atepic Very Cobbly Silty Clay Loam

The Atepic very cobbly silty clay loam component makes up 16.9 percent of the map unit complex. This component can be found on hills with slopes generally ranging from 8 to 40 percent. The parent material consists of colluvium and residuum deposits derived from shale. The natural drainage class is well drained. Water movement in the most restrictive layer is low. Available water to a depth of 60 inches (or restricted depth) is very low. Shrink-swell potential is moderate. This soil is not flooded or ponded. This soil has no seasonal zone of water saturation within 72 inches. Organic matter content in the surface horizon is about 2 percent. The calcium carbonate equivalent within 40 inches, typically, does not exceed 60 percent. The soil has no saline horizon within 30 inches of the soil surface. The soil has a maximum sodium adsorption ratio of 3 within 30 inches of the soil surface.

Fluvaquents

The Fluvaquents component makes up 13.7 percent of the map unit. This component can be found on flood plains with slopes generally ranging from 0 to 1 percent. The parent material consists of alluvium derived from sandstone and shale. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is poorly drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches (or restricted depth) is moderate. Shrink-swell potential is low. This soil is frequently flooded and is not ponded. This soil has a seasonal zone of water saturation at 15 inches throughout the year. Organic matter content in the surface horizon is about 3 percent. The calcium carbonate equivalent within 40 inches, typically, does not exceed 25 percent. There are no saline horizons within 30 inches of the soil surface. The soil has a maximum sodium adsorption ratio of 1 within 30 inches of the soil surface.

Pavant-Doyce Complex

The Pavant-Doyce complex is made of 40% Pavant and 30% Doyce components. The Pavant-Doyce complex component makes up 11.2 percent of the map unit. The Pavant component can be found on alluvial fans with slopes generally ranging from 4 to 8 percent; the Doyce component can be found of swales with slopes generally ranging from 2 to 4 percent. The parent material consists of alluvium derived from limestone, sandstone and shale. The natural drainage class is well drained. Water movement in the most restrictive layer of the Pavant component is low; water movement in the most restrictive layer of the Doyce component is moderately high. Available water to a depth of 60 inches (or restricted depth) is very low for the Pavant component and moderate for the Doyce component. Shrink-swell potential is moderate in the Pavant component and low in the Doyce component. This soil is not flooded or ponded. This soil has no seasonal zone of water saturation within 72 inches. Organic matter content in the surface horizon is about 2-3 percent. The calcium carbonate equivalent within 40 inches, typically, does not exceed 38 percent within the Pavant component and 20 percent within the Doyce component. There are no saline horizons within 30 inches of the soil surface.

Genola Loam

The Genola loam component makes up 9.2 percent of the map unit. This component can be found on alluvial flats and alluvium fans with slopes generally ranging from 0 to 2 percent. The parent material consists of alluvium derived from limestone, sandstone and shale. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches (or restricted depth) is high. Shrink-swell potential is low. This soil is rarely flooded and is not ponded. This soil has no seasonal zone of water saturation within 72 inches. Organic matter content in the surface horizon is about 1 percent. The calcium carbonate equivalent within 40 inches, typically, does not exceed 28 percent. There are no saline horizons within 30 inches of the soil surface. The soil has a maximum sodium adsorption ratio of 3 within 30 inches of the soil surface.

Clegg Loam

The Clegg loam component makes up 8.4 percent of the map unit. This component can be found on flats and alluvial fans with slopes generally ranging from 3 to 10 percent. The parent material consists of alluvium derived from limestone, sandstone and shale. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches (or restricted depth) is high. Shrink-swell potential is moderate. This soil is not flooded or ponded. This soil has no seasonal zone of water saturation within 72 inches. Organic matter content in the surface horizon is about 3 percent. The calcium carbonate equivalent within 40 inches, typically, does not exceed 15 percent. There are no saline horizons within 30 inches of the soil surface.

Table 1.2 – NRCS Soil Types Mapped within the Survey Area

Soil Series Name	Hydric	% of Project Area
Birdow-Shurpert families complex, 2 to 8 percent slopes	No - 0% hydric	0.6%
No digital data available	No - 0% hydric	1.4%
Anco silty clay loam	Yes - 10% hydric	4.4%
Arapien fine sandy loam, 1 to 2 percent slopes	No - 0% hydric	4.8%
Arapient fine sandy loam, 2 to 5 percent slopes	No - 0% hydric	1.5%
Arapien fine sandy loam, wet, 1 to 2 percent slopes	No - 0% hydric	1.0%
Atepic very cobbly silty clay loam, 8 to 40 percent slopes	No - 0% hydric	16.9%
Borvant-Doyce complex, 2 to 10 percent slopes	No - 0% hydric	6.4%
Chipman silty clay loam	Yes - 90% hydric	0.7%
Clegg loam, 3 to 10 percent slopes	No - 0% hydric	8.4%
Deer Creek stony silt loam, 6 to 30 percent slopes	No - 0% hydric	3.3%
Deer Creek-Mower complex, 25 to 50 percent slopes	No - 0% hydric	3.8%
Denmark gravelly loam, 2 to 5 percent slopes	No - 0% hydric	0.2%
Donnardo very stony loam, 4 to 16 percent slopes	No - 0% hydric	2.3%
Dyreng silty clay	Yes - 5% hydric	1.2%
Fluvaquents	Yes - 100% hydric	13.7%
Genola loam, 0 to 2 percent slopes	No - 0% hydric	9.2%
Lisade loam, 1 to 2 percent slopes	No - 0% hydric	2.3%
Mountainville-Doyce complex, 2 to 8 percent slopes	No - 0% hydric	0.1%

Pavant-Doyce complex, 2 to 8 percent slopes	No - 0% hydric	11.2%
Shumway silty clay loam	Yes - 100% hydric	0.3%
Water	No - 0% hydric	4.6%
Woodrow silty clay loam, 0 to 2 percent slopes	No - 0% hydric	1.7%
Total		**100%**

1.2.4 National Wetland Inventory (NWI)

The U.S. Fish and Wildlife Service (USFWS) National Wetland Inventory (NWI) suggests that 43.37 acres of freshwater emergent wetlands, 33.87 acres of freshwater ponds, 19.39 acres of riverine, and 0.38 acres of freshwater forested/shrub wetland features may be found throughout the Survey Area (See Attached NWI Maps).

Chapter 2. Methods

2.1 Delineation Methodology for Waters of the U.S.

An ARD was completed on July 12 and 13, 2021, in accordance with the U.S. Army Corps of Engineers (USACE) 1987 *Wetland Delineation Manual* (USACE, 1987) and the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West (Version 2.0)* (USACE, 2008). All portions of the Survey Area were evaluated for water resources, however due to limitations on access, some areas were not surveyed using soil pits, but rather were evaluated based on aerial imagery and vegetation signatures. Those areas, including wetlands, that were accessible were investigated for indicators in accordance with the USACE manuals. In areas where access was not available, wetland status was determined based on the presence of hydrophytic vegetations as determined through photo interpretation of similar field verified wetlands in the Survey Area, landscape position and/or adjacency to verified wetlands. Many of the unsampled wetlands identified in this report consist of thick willow dominated thickets or along eroding stream banks where safe access was not feasible. For those sites where soil pit analysis was completed, the following procedures were implemented at each of the selected sample points to determine the presence of wetland indicators. These data were recorded on Arid West Wetland Determination Data Forms. Photographs were also taken to document each sample point and are provided in the attached Photo Inventory.

2.1.1 Hydrophytic Vegetation

All plant species within a 5-foot radius were recorded for each sample point. The relative percent cover for each species was determined by estimating aerial cover. The indicator status of each species was determined using the *2018 National Wetland Plant List* (USACE, 2018). Vegetation species comprising at least 20 percent of the total aerial cover in its stratum were considered dominant, following the guidelines of the USACE 50/20 rule. If more than 50 percent of the dominant plant species had an indicator status of obligate wetland species (OBL), facultative wetland species (FACW), or facultative species (FAC), or if the prevalence index was less than three, then the sample point met the hydrophytic vegetation parameter.

2.1.2 Hydric Soils

At each sample point, a soil pit was dug to a minimum depth of 18 inches to assess soil characteristics and water conditions. A profile of the soil pit was used to determine soil color, texture, and moisture at different depths within the soil profile. Colors of the soil profile and any redox features were identified by comparing a moistened sample to the Munsell® Soil Color Charts (Munsell®, 2009). Soil textures were determined by rubbing the wetted soil samples between the thumb and forefinger. If the soil characteristics met one of the primary hydric soil indicators, or two or more secondary hydric soil indicators, identified in the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West (Version 2.0)* (USACE, 2008) and *the Field Indicators of Hydric Soils in the U.S.* Version 7 manual (USDA, 2018), the sample point met the hydric soils parameter.

2.1.3 Wetland Hydrology

Each soil pit was also examined for the presence or absence of hydrologic indicators. These hydrologic indicators are described in the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West* (Version 2.0) (USACE, 2008). If it was determined that at least one primary hydrologic indicator, or two or more secondary hydrologic indicators, were present, the sample point met the hydrologic parameter.

2.1.4 Wetland Boundary Delineation Procedure

Sample points that met all three parameters (hydrophytic vegetation, hydric soils, and wetland hydrology) were classified as occurring in a wetland. A second sample point, located in the adjacent upland, was then tested for the presence of the three indicators. If the point did not meet all three parameters, the point was classified as occurring in an upland. The next step was to define the wetland boundary occurring between a wetland sample point and the upland sample point. The boundary was based on information gathered from the two sample points and observable changes in elevation and plant communities. Survey data was downloaded into ArcMap to produce a map that shows delineated wetland boundaries and sample point locations. The acreages for each wetland polygon were calculated in ArcMap and included on the map. The Cowardin Classification (Cowardin, 1979) was used to designate the wetland type.

Chapter 3. Delineation Results

A total of four emergent marsh wetlands (2.503 acres), 26 freshwater emergent wetlands (33.060 acres), 15 scrub-shrub wetlands (16.615 acres), five reservoirs (12.917 acres), and one lake bed (2.046 acres) were delineated within the Survey Area. Additionally, 5,484 Linear Feet (LF) (0.562 acres) of lower perennial stream, 3,099 LF (0.279 acres) of R4SB3 intermittent stream, 487 LF (0.051 acres) of upper perennial stream, 5,273 LF of ephemeral stream (0.287 acres), and 41,323 LF (2.619 acres) of canal were delineated within the Survey Area. Isolated aquatic features included six isolated freshwater emergent wetlands (14.157 acres) and one R4SB7 intermittent stream (531 LF or 0.015 acres). No other wetlands or WOTUS were identified within the Survey Area (see Table 3.1 – Aquatic Resources).

Table 3.1 – Aquatic Resources Delineated in the Survey Area

Aquatic Resource Name	Aquatic Resources Classification		Aquatic Resource Size (AC)	Aquatic Resource Length (linear feet)
	Cowardin	Sample Point		
Wetland Features				
Emergent Marsh	PEM1B	-	2.503	-

Aquatic Resource Name	Aquatic Resources Classification		Aquatic Resource Size (AC)	Aquatic Resource Length (linear feet)
	Cowardin	Sample Point		
Freshwater Emergent	PEM1E	SP01, SP04, SP-W1, SP-W2, SP-W3, SP-W4, SP-W6, RW01, RW04, RW08, and RW10	33.060	-
Scrub-Shrub	PSS1E	RW05 and SC40	16.615	-
Sub Total			**52.178**	**-**
Linear Features				
Upper Perennial Stream	R3UB1	-	0.051	487
Lower Perennial Stream	R2UB1	-	0.035	368
Lower Perennial Stream	R2UB3	RW-P75, SC-P79, SP-W1, SP-W4, RW09	0.527	5,200
Intermittent Stream	R4SB3	SC01, SC02, SC03, SC-P27, and SC-P35	0.279	3,099
Ephemeral Stream	NA	SC-P1, SC-P2, SC-P4, SC-P5, SC-P6, SC-P7, SC-P8, SC-P9, SC-P10, SC-P11, SC-P12, and SC-P13	0.287	5,273
Canal	NA	SC03, SC04, SC06, SC07, SC08, SC11, SC12, SC13, SC14, SC15, SC16, SC17, SC18, SC19, SC21, SC29, SC-P37, SC-P38, SC-P39, SC-P40, SC-P41, SC-P42, SC-P43, SC-P44, SC-P45, SC-P46, SC-P47, SC-P48, SC-P51, SC-P52, SC-P55, SC-P59	2.619	41,323
Sub Total			**3.798**	**55,750**
Pond Features				
Lake Bed	NA	RU16	2.046	-
Reservoir	-	RU09, RU21, RU22, and RU23	12.917	-
Sub Total			**25.152**	**-**
Isolated Features				
Potential Isolated freshwater emergent Wetlands	PEM1E*	SP01 and SP03	14.157	-
Intermittent Stream	R4SB7	RW02 and RW03	0.015	531
Sub Total			**14.963**	**531**
Grand Total			**85.902**	**56,281**

3.1 Aquatic Resources

Vegetation

Overall, Obligate (OBL), Facultative Wetland (FACW), and Facultative Neutral (FAC) classes represented the dominant vegetation in the wetlands. These species included: Baltic rush, reed canary grass, Nebraska sedge, bulrush, inland saltgrass, and coyote willow. Uplands were dominated by smooth brome, Kentucky bluegrass, whitetop, prickly lettuce, big sagebrush, rubber rabbitbrush, Great Basin wildrye, and intermediate wheatgrass.

Soils

Wetland test pits contained evidence of one or more of the following hydric soil indicators: histosol (A1), loamy mucky mineral (F1), depleted matrix (F3), redox dark surface (F6), or depleted dark surface (F7). The upland soil pits did not exhibit any indicators of hydric soils.

Hydrology

Each of the wetland test pits contained evidence of one or more of the following primary hydrology indicators: saturation (A3), water-stained leaves (B9), or oxidized rhizospheres along living root channels (C3). Secondary hydrology indicators were also present at the wetland test pits and included: saturation visible on aerial imagery (C9) or passing the FAC-neutral test (D5). No evidence of hydrology was recorded within the uplands.

3.1.1 Emergent Marsh – PEM1B *(Palustrine, Emergent, Persistent, Saturated)*

A total of four emergent marsh wetlands (2.503 acres) were delineated within the Survey Area. In an average year, these wetlands experience persistently wet conditions and are typically saturated. Dominant vegetation included Nebraska sedge, water sedge, Baltic rush, cattails, Olney's three-square, and bulrush. No soil pits were dug in these wetlands; however, it is assumed they would meet both hydric soil and hydrology indicators as they were positioned lower in the landscape than surrounding wetlands. Each of the emergent marsh wetlands have a connection to Oak Creek (a WOTUS). Therefore, the emergent marsh wetlands identified in this report would be considered jurisdictional.

3.1.2 Freshwater Emergent Wetlands – PEM1E *(Palustrine, Emergent, Persistent, Seasonally Flooded/ Saturated)*

A total of 26 freshwater emergent wetlands (33.060 acres) were delineated within the Survey Area. In an average year, these wetlands experience persistently wet conditions and are seasonally flooded/saturated. Dominant vegetation included Nebraska sedge, Baltic rush, inland saltgrass, and reed canary grass. Soils in these wetlands exhibited one or more of the following hydric soil indicators: histosol, loamy mucky mineral, depleted matrix, redox dark surface, or depleted dark surface. Hydrology for these wetlands was met through one or more of the following indicators: saturation, water-stained leaves, or oxidized rhizospheres along living root channels. All of the freshwater emergent wetlands have a connection to Oak Creek (a WOTUS). Therefore, these freshwater emergent wetlands identified in this report would be considered jurisdictional.

3.1.3 Scrub-Shrub Wetland – PSS1E *(Palustrine, Scrub-Shrub, Broad-Leaved Deciduous, Seasonally Flooded/Saturated)*

A total of 15 scrub-shrub wetlands (16.615 acres) were identified within the Survey Area. In an average year, these wetlands experience persistently wet conditions and are seasonally flooded/saturated.

Dominant vegetation included coyote willow, Booth's willow, Nebraska sedge, Baltic rush, and reed canary grass. No soil pits were dug in these wetlands due to the presence of dense woody vegetation; however, it is assumed they would meet both hydric soil and hydrology indicators as they were positioned at the same elevation or lower in the landscape than surrounding wetlands. The scrub-shrub wetlands have a connection to Oak Creek (a WOTUS). Therefore, the scrub-shrub wetlands identified in this report would be considered jurisdictional.

3.1.4 Upper Perennial Stream – R3UB1 *(Riverine, Upper Perennial, Unconsolidated Bottom, Cobble-Gravel)*

A total of 487 LF (0.051 acres) of Oak Creek, which is a cobble-bottomed upper perennial stream were delineated within the Survey Area. The location of the Ordinary High Water Mark (OHWM) was assessed based on the following indicators: change in average sediment texture, change in vegetation species, change in vegetation cover, and break in bank slope. Oak Creek is a WOTUS and is therefore considered jurisdictional.

3.1.5 Lower Perennial Stream – R2UB1 *(Riverine, Lower Perennial, Unconsolidated Bottom, Cobble-Gravel)*

Two cobble-bottomed, lower perennial stream segments of Oak Creek totaling 368 LF (0.035 acres) were delineated within the Survey Area. The location of the OHWM was assessed based on the following indicators: change in average sediment texture, change in vegetation species, change in vegetation cover, and break in bank slope. Oak Creek is a WOTUS and is therefore considered jurisdictional.

3.1.6 Lower Perennial Stream – R2UB3 *(Riverine, Lower Perennial, Unconsolidated Bottom, Mud)*

Eight mud-bottomed, lower perennial stream segments of Oak Creek totaling 5,200 LF (0.527 acres) were delineated within the Survey Area. The location of the OHWM was assessed based on the following indicators: change in average sediment texture, change in vegetation species, change in vegetation cover, and break in bank slope (except as described below). Oak Creek is a WOTUS and is therefore considered jurisdictional.

3.1.7 Intermittent Stream – R4SB3 (Riverine, Intermittent, Stream Bed, *Cobble-Gravel)*

Nine cobble-bottomed intermittent stream segments totaling 3,099 LF (0.279 acres) were identified in the Survey Area including portions of Oak Creek and an unnamed intermittent stream. The location of the OHWM was assessed based on the following indicators: change in average sediment texture, change in vegetation species, change in vegetation cover, and break in bank slope. Oak Creek is a WOTUS and is therefore considered jurisdictional. The unnamed intermittent stream does not appear to have a connection to a WOTUS and would not be considered jurisdictional.

3.1.8 Ephemeral Stream

A total of 5,273 LF (0.287 acres) of ephemeral stream were identified in the Survey Area. These streams contain water only in direct response to stormwater runoff or snowmelt and do not connect to the groundwater table. No features of an OHWM were observed at any of the ephemeral streams. None of the ephemeral streams identified in this report contain an OHWM. Therefore, these ephemeral streams would not be considered jurisdictional.

3.1.9 Canal
A total of 41,323 LF (2.619 acres) of canal were identified within the Survey Area. The canals identified in this report carry water throughout the growing season, and exhibit indicators of an OHWM. The indicators of an OHWM observed include break in bank slope, change in vegetation cover, and high-water marks on canal liners. Each of these canals empty into either Oak Creek, Canal Creek, or Cedar Creek which all have a connection to the San Pitch River (a WOTUS). Therefore, the canals identified in this report would be considered jurisdictional.

3.1.10 Lake Bed
One lakebed totaling 2.046 acres was delineated within the Survey Area. This lakebed is contained within a manmade depression that has historically been used as a reservoir but appears to have remained mostly dry in the last five years. At the time of delineation, the lakebed was mostly bare ground with less than 5% vegetative cover. This lakebed drains into Oak Creek (a WOTUS) and could be considered jurisdictional if hydrophytic vegetative cover increases above 5%, which is likely to occur if the lakebed continues to be intermittently exposed.

3.1.11 Reservoir
Five reservoirs totaling 12.917 acres were delineated within the Survey Area. Three of the five reservoirs have a connection to Oak Creek (see maps 1, 3, and 4) and one reservoir has a connection to Cedar Creek (see map 12). As each of these four reservoirs have a connection to a WOTUS, they would be considered jurisdictional. The reservoir depicted on Map 23 does not appear to connect to any of the nearby streams. Therefore, the reservoir depicted on Map 23 would not be considered jurisdictional.

3.1.12 Isolated Freshwater Emergent Wetlands – PEM1E* *(Palustrine, Emergent, Persistent, Seasonally Flooded/ Saturated)*
A total of six isolated freshwater emergent wetlands (14.157 acres) were delineated within the Survey Area. In an average year, these wetlands experience persistently wet conditions and are seasonally flooded/saturated. Dominant vegetation included Nebraska sedge, Baltic rush, inland saltgrass, and reed canary grass. Soils in these wetlands exhibited one or more of the following hydric soil indicators: histosol, loamy mucky mineral, depleted matrix, redox dark surface, or depleted dark surface. Hydrology for these wetlands was met through one or more of the following indicators: saturation, water-stained leaves, or oxidized rhizospheres along living root channels. These six isolated freshwater emergent wetlands are potentially non-jurisdictional wetlands as they do not appear to have a connection to a WOTUS. These wetlands drain into an intermittent stream that intersects Last Chance Canal and appear to terminate just north of 900 North and 700 East in Spring City.

3.1.13 Intermittent Stream – R4SB7 (Riverine, Intermittent, Stream Bed, *Vegetated)*
A total of 531 LF (0.015 acres) of an unnamed vegetated intermittent stream was identified in the Survey Area. This is an intermittent stream that is inundated for much of the year and likely has a connection to the water table. The stream bed consists of hydrophytic plant species. The location of the OHWM was assessed based on the following indicators: change in average sediment texture, change in vegetation species, and a change in vegetation cover. This intermittent stream does not appear to connect to a WOTUS and would therefore, not be considered jurisdictional.

Chapter 4. Conclusions

A total of four emergent marsh wetlands (2.503 acres), 26 freshwater emergent wetlands (33.060 acres), 15 scrub-shrub wetlands (16.615 acres), five reservoirs (12.917 acres), and one lake bed (2.046 acres) were delineated within the Survey Area. Additionally, 5,484 Linear Feet (LF) (0.562 acres) of lower perennial stream, 3,099 LF (0.279 acres) of R4SB3 intermittent stream, 487 LF (0.051 acres) of upper perennial stream, 5,273 LF of ephemeral stream (0.287 acres), and 41,323 LF (2.619 acres) of canal were delineated within the Survey Area. Except for the features specifically identified in Chapter 3 of this report (Table 3.1: six freshwater emergent wetlands and one intermittent stream), all other aquatic features identified would be considered jurisdictional and fall under the regulatory authority of the USACE. Accordingly, 70.652 acres of aquatic features are likely jurisdictional, and 15.250 acres of aquatic features (including 0.287 acres of ephemeral streams) are likely non-jurisdictional. It should be noted that final authority with regards to aquatic resource delineation and jurisdiction rests with the appropriate regulatory agency.

If you have any questions regarding this report, please contact me. I may be reached at tschade@jub.com, or on my office phone at 208-509-2715.

Respectfully submitted by:

______________________________ Date: November 7, 2023

Tyler Schade, Wetland Scientist
J-U-B ENGINEERS, Inc.

Attachments

1. References
2. Water Resource Delineation Maps
3. Datasheets and Photo Inventory
4. NRCS Soils Map
5. NWI Map

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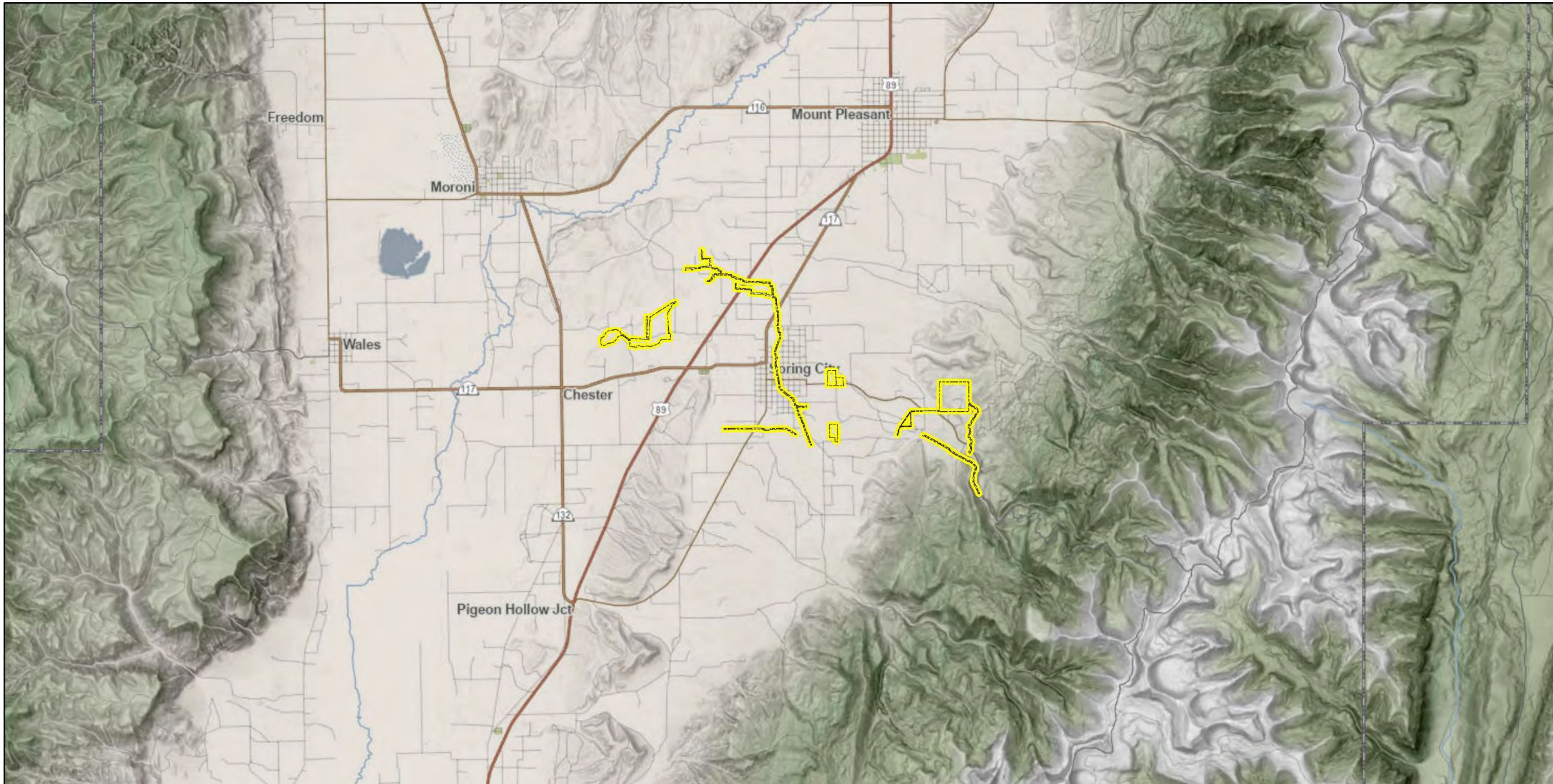

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Vicinity Map

Delineation of Wetlands and Other Waters of the U.S. - for the Spring City Watershed Flood and Irrigation Project

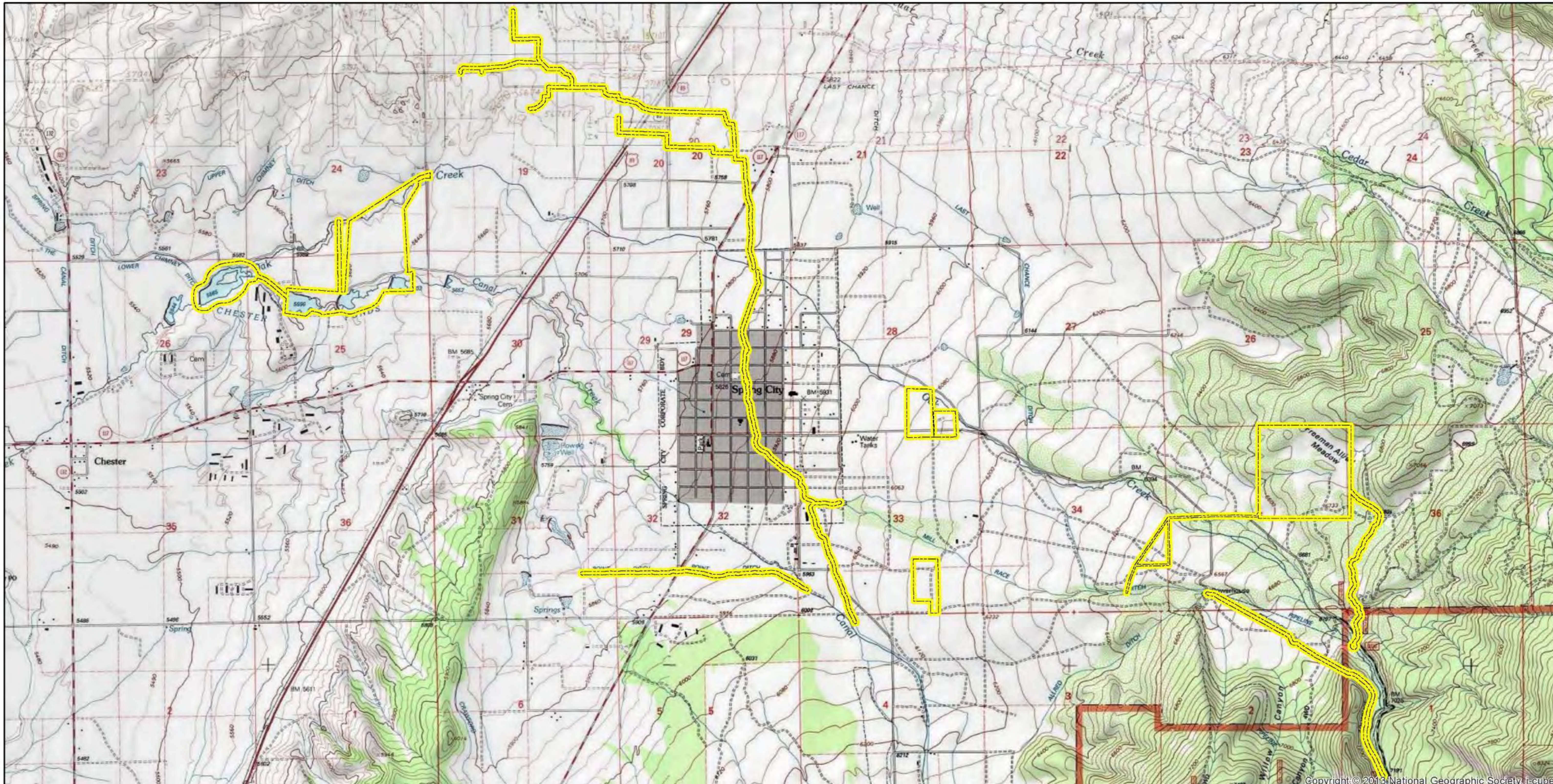
Created on March 12, 2022

Coord. System: NAD 1983 UTM 12N
Projection: Transverse Mercator
Datum: North American 1983

Legend

Survey Area (560 AC)

Miles
0 1 2 4



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Topographic Map

Delineation of Wetlands and Other Waters of the U.S. - for the Spring City Watershed Flood and Irrigation Project

Created on March 12, 2022

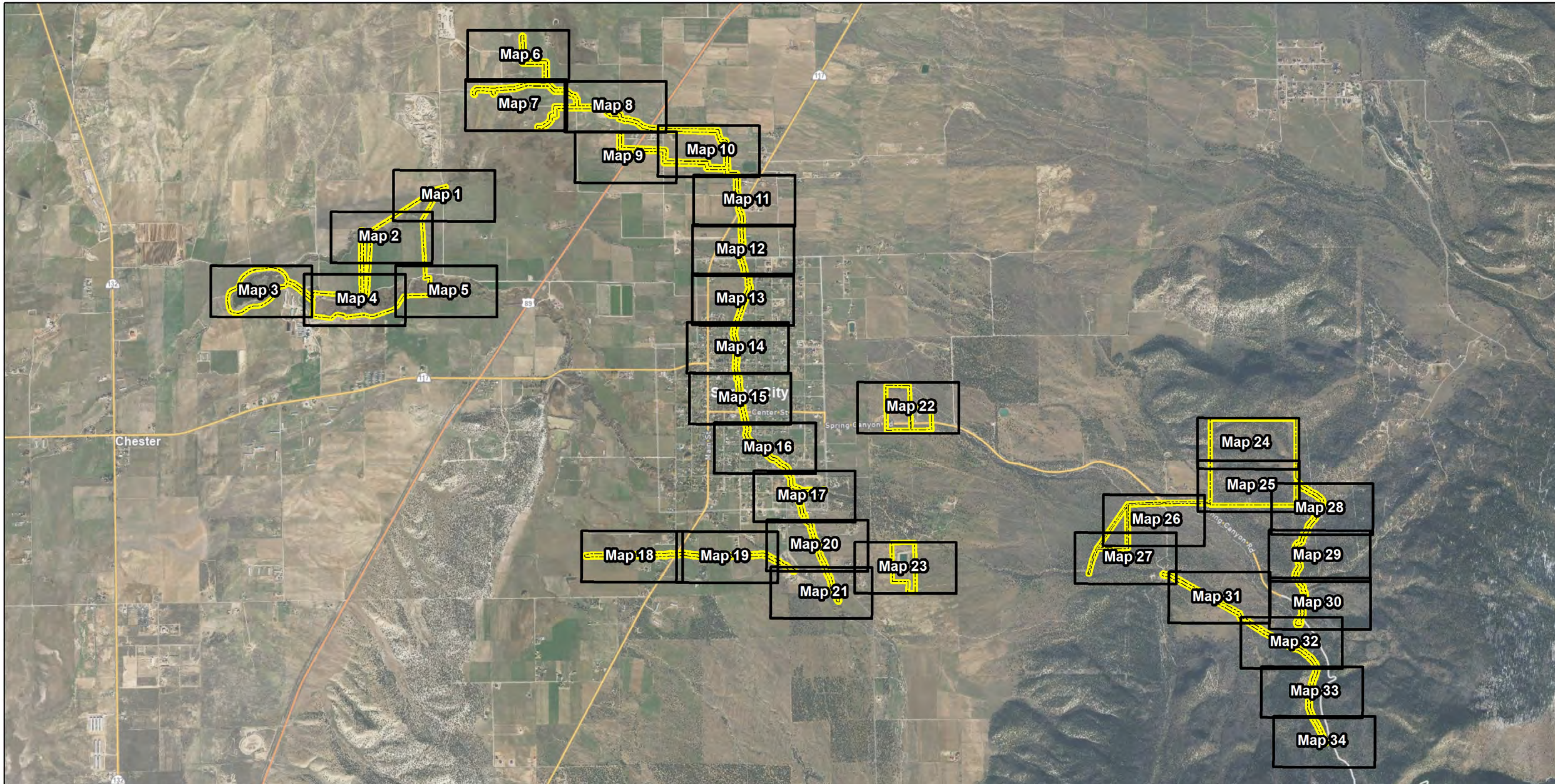
Coord. System: NAD 1983 UTM 12N
Projection: Transverse Mercator
Datum: North American 1983

N

Miles
0 0.25 0.5 1

Legend

Survey Area (560 AC)



Index Map

Delineation of Wetlands and Other Waters of the U.S. - for the Spring City Watershed Flood and Irrigation Project

Created on March 12, 2022

J-U-B ENGINEERS, INC.

Coord. System: NAD 1983 UTM 12N
Projection: Transverse Mercator
Datum: North American 1983

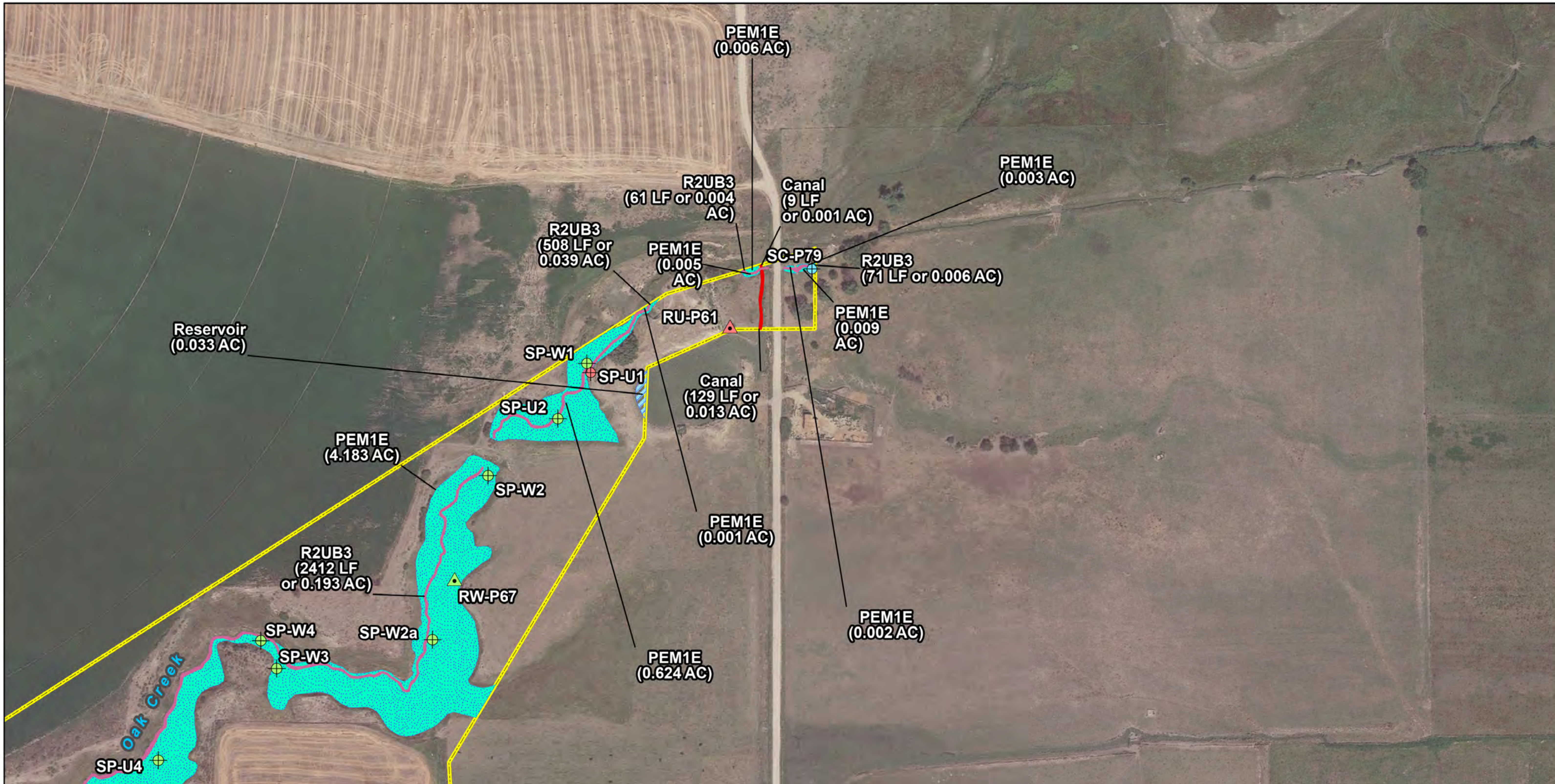
Legend

Survey Area (560 AC)

Map Indices

Miles

0 0.25 0.5 1



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Water Resources Assessment

Map 1

Delineation of Wetlands and Other Waters of the U.S. - for the Spring City Watershed Flood and Irrigation Project

Revised 11/7/2023

Coord. System: NAD 1983 UTM 12N
Projection: Transverse Mercator
Datum: North American 1983
Imagery: Utah AGRC - Google Earth 2018

1 inch = 250 feet on 11X17

N

0 125 250 500 Feet

Legend

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- Wetland Soil Pit
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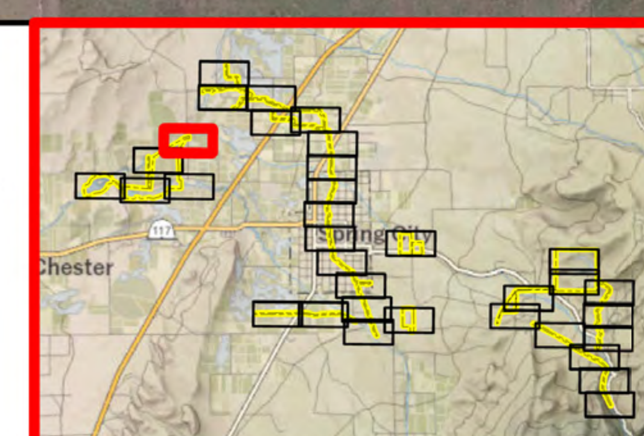

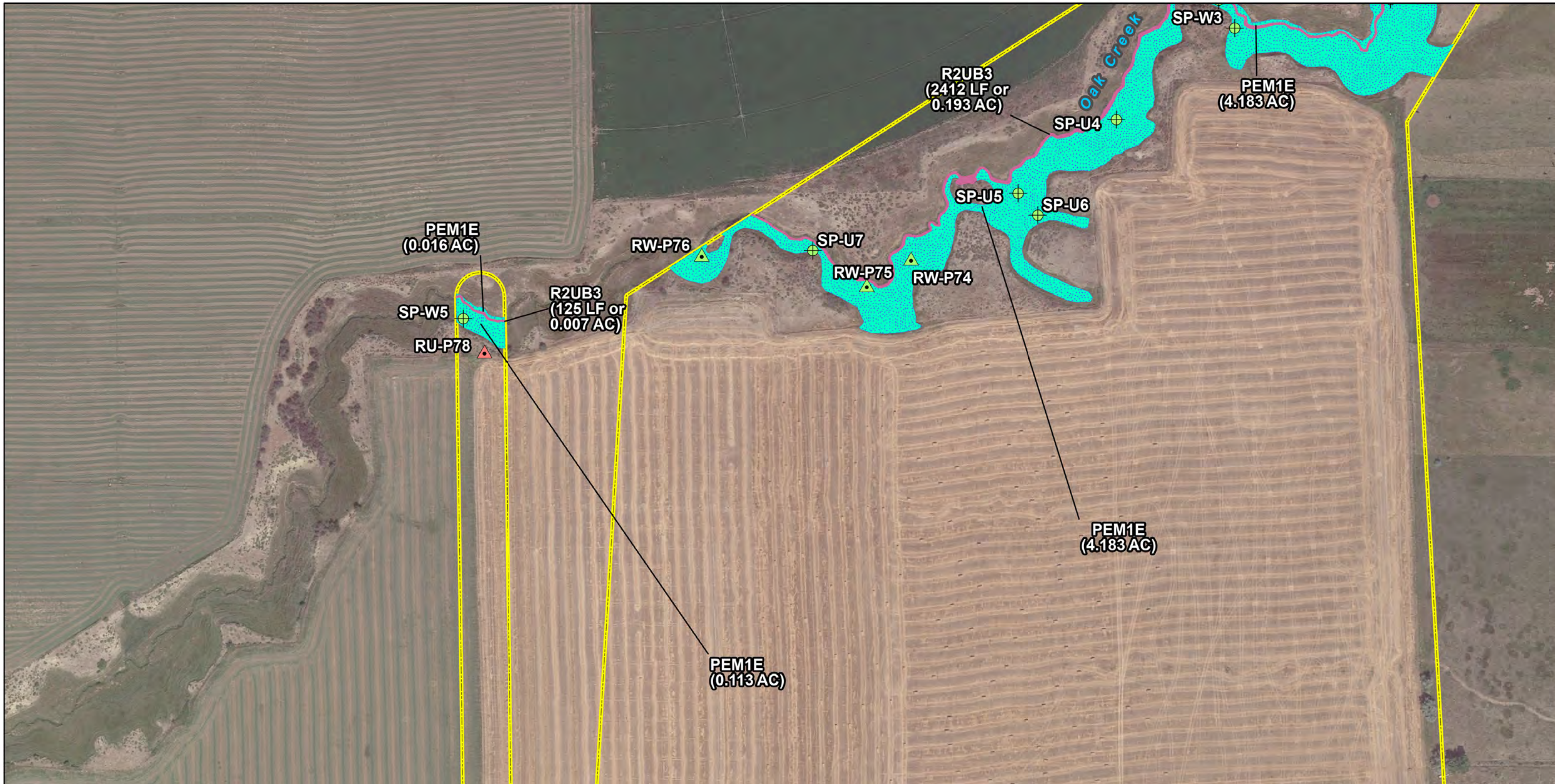

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Water Resources Assessment

Map 2

Delineation of Wetlands and Other Waters of the U.S. - for the Spring City Watershed Flood and Irrigation Project

Revised 11/7/2023

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Projection: Transverse Mercator
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Imagery: Utah AGRC - Google Earth 2018

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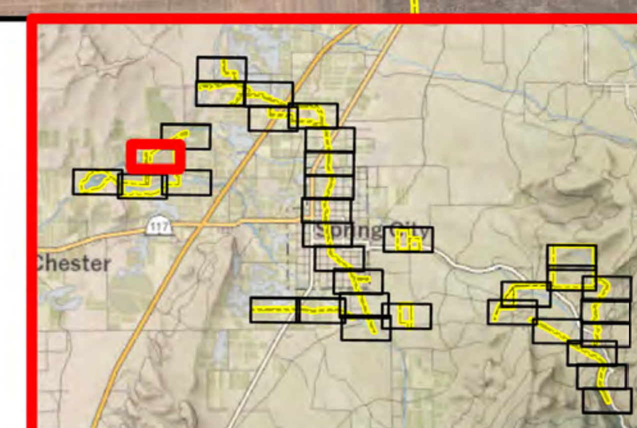

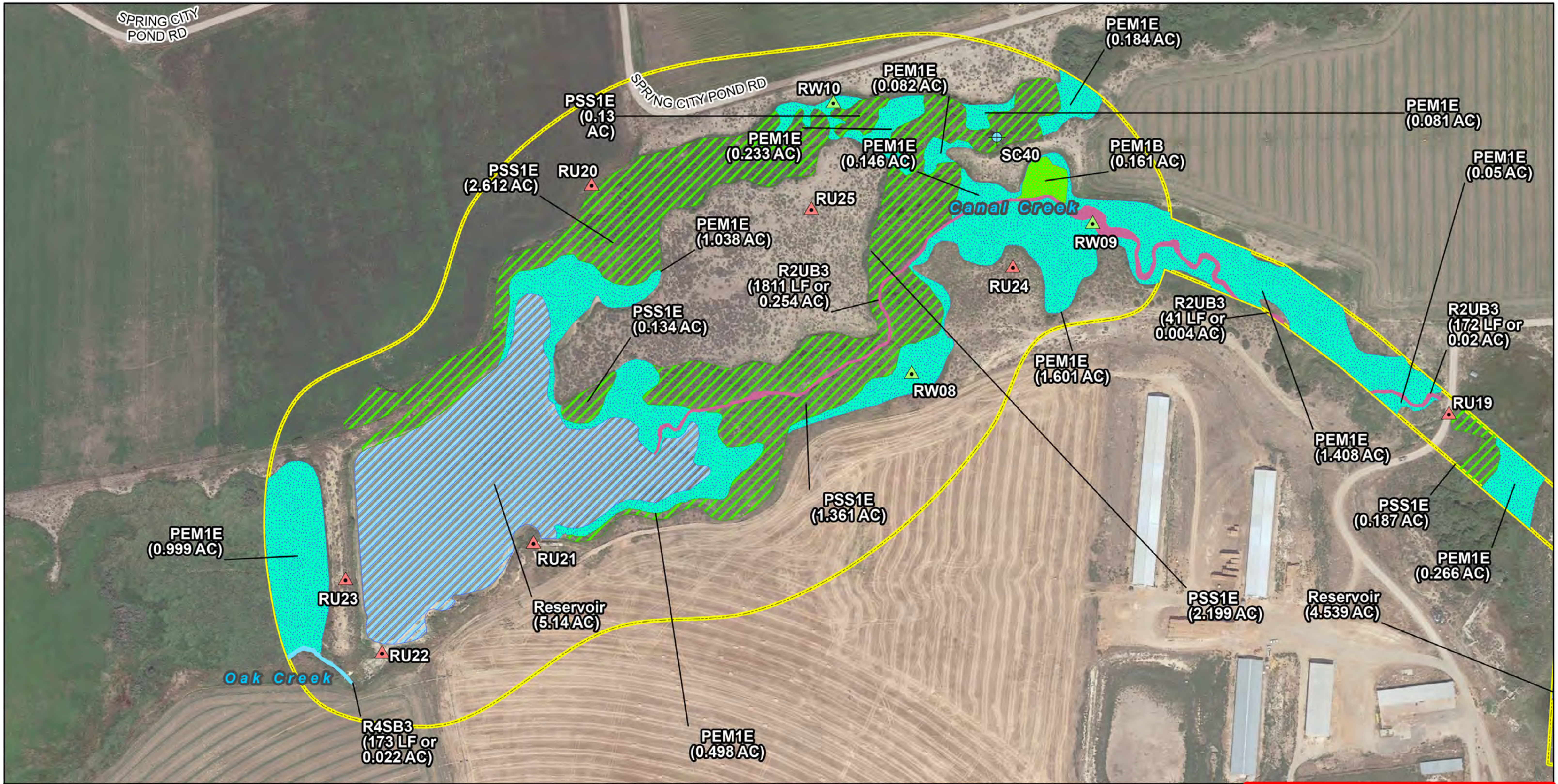

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Map 3

Delineation of Wetlands and Other Waters of the U.S. - for the Spring City Watershed Flood and Irrigation Project

Revised 11/7/2023

Coord. System: NAD 1983 UTM 12N
Projection: Transverse Mercator
Datum: North American 1983
Imagery: Utah AGRC - Google Earth 2018

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0 125 250 500 Feet

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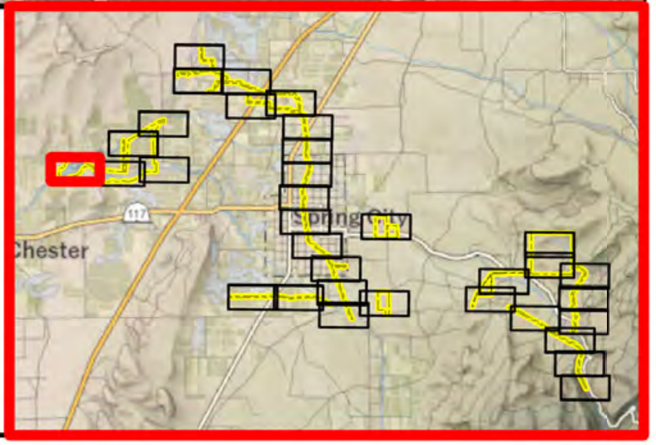

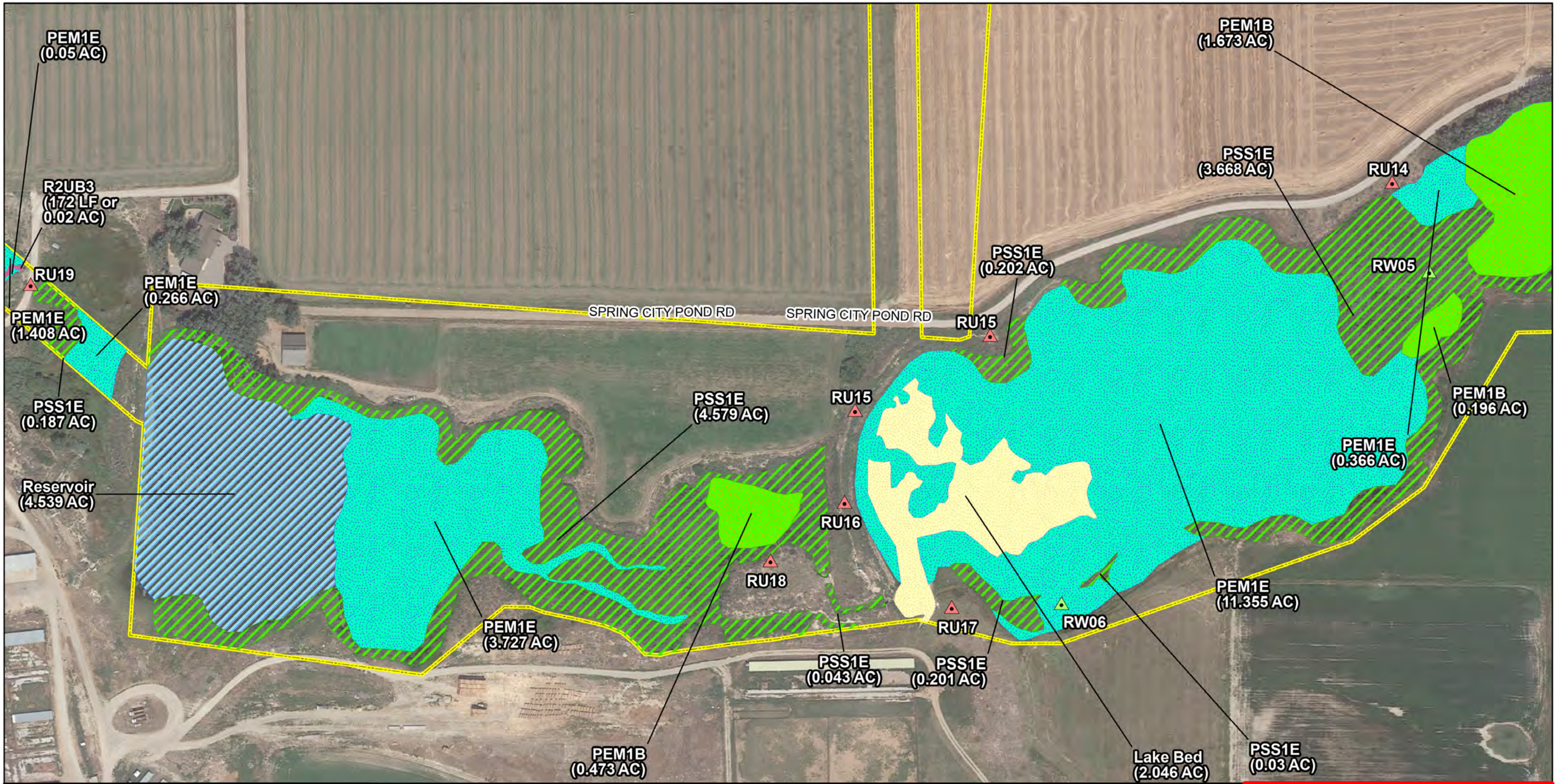

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Map 4

Delineation of Wetlands and Other Waters of the U.S. - for the Spring City Watershed Flood and Irrigation Project

Revised 11/7/2023

Coord. System: NAD 1983 UTM 12N
Projection: Transverse Mercator
Datum: North American 1983
Imagery: Utah AGRC - Google Earth 2018

1 inch = 250 feet on 11X17

N

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Legend

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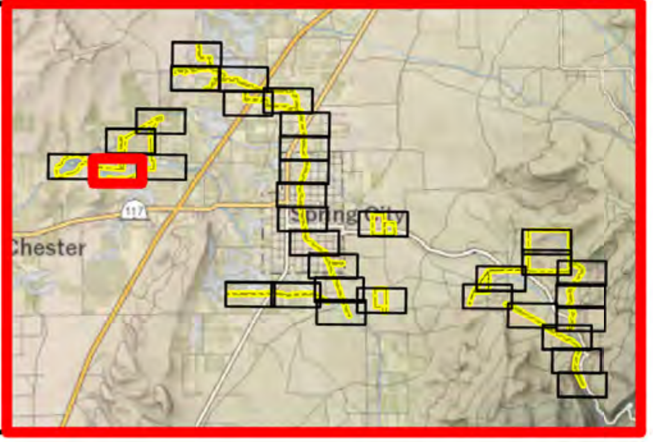

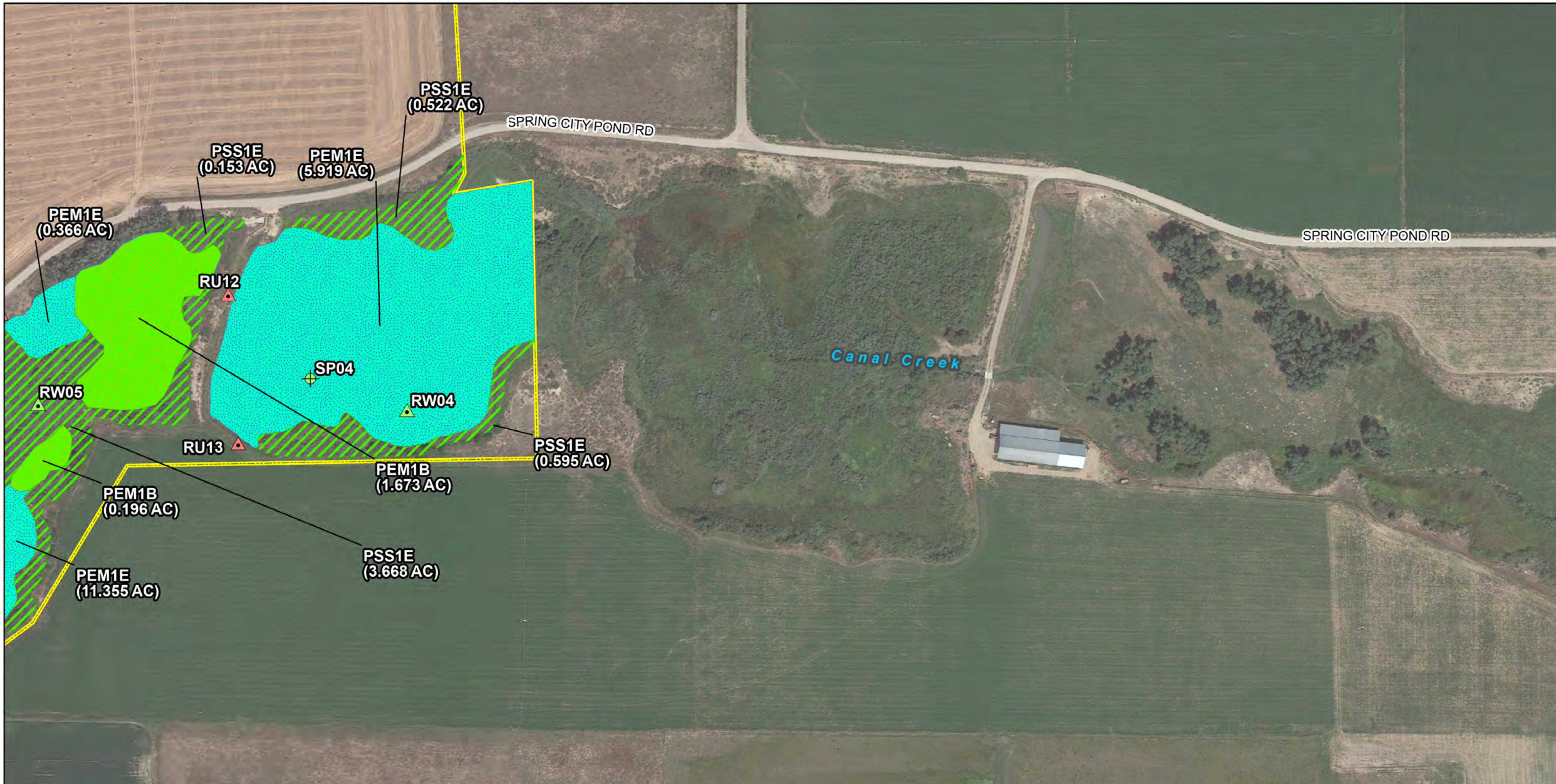

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Map 5

Delineation of Wetlands and Other Waters of the U.S. - for the Spring City Watershed Flood and Irrigation Project

Revised 11/7/2023

Coord. System: NAD 1983 UTM 12N
Projection: Transverse Mercator
Datum: North American 1983
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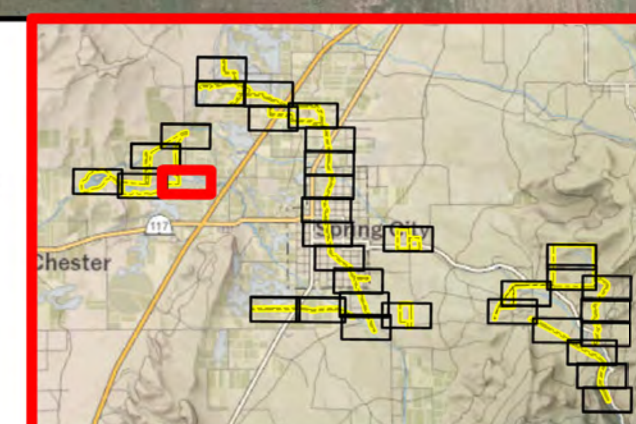

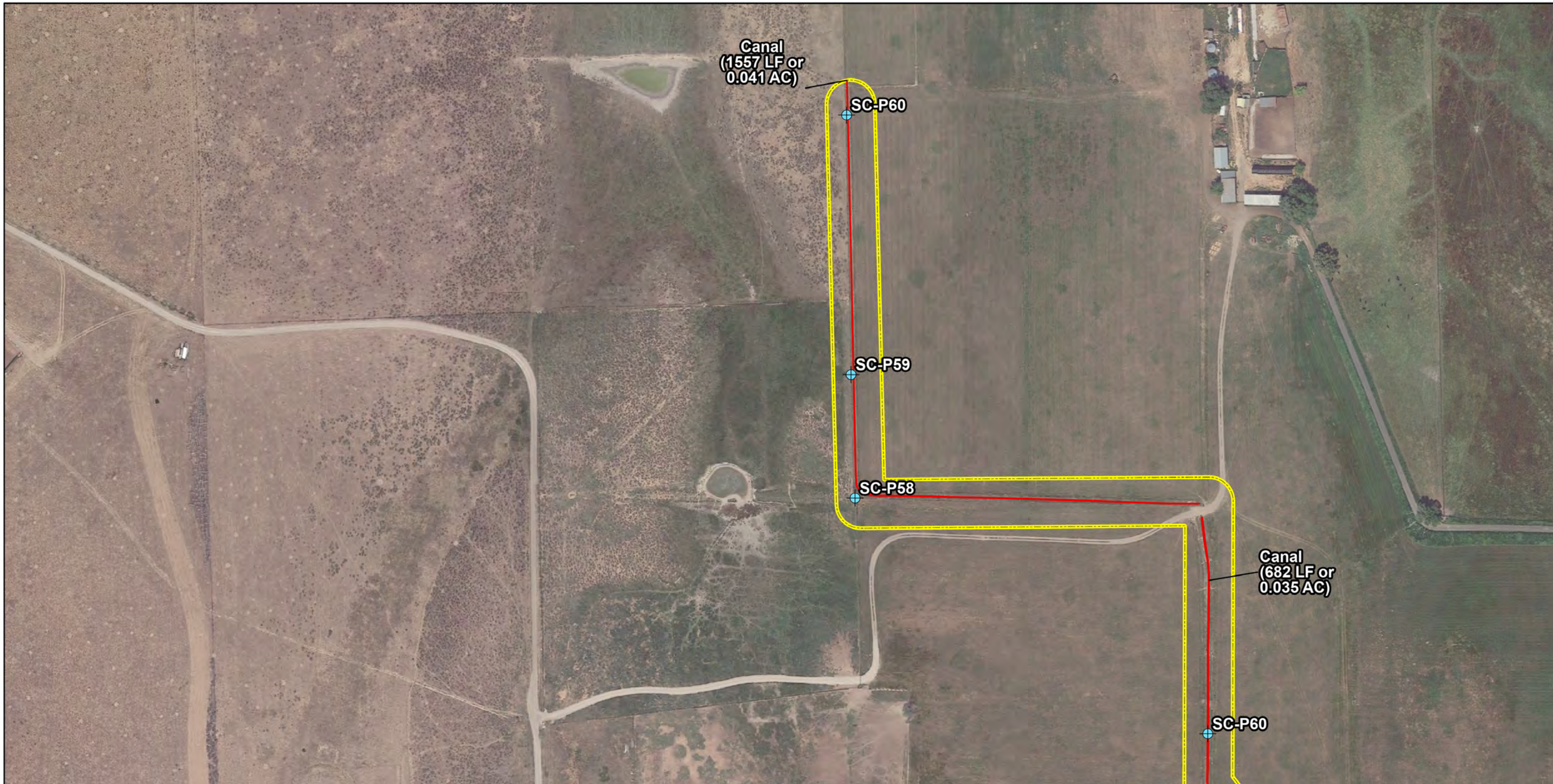

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Map 6

Delineation of Wetlands and Other Waters of the U.S. - for the Spring City Watershed Flood and Irrigation Project

Revised 11/7/2023

Coord. System: NAD 1983 UTM 12N
Projection: Transverse Mercator
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Imagery: Utah AGRC - Google Earth 2018

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N

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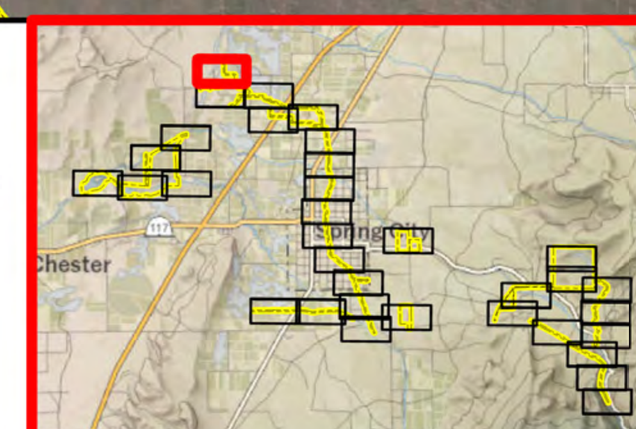

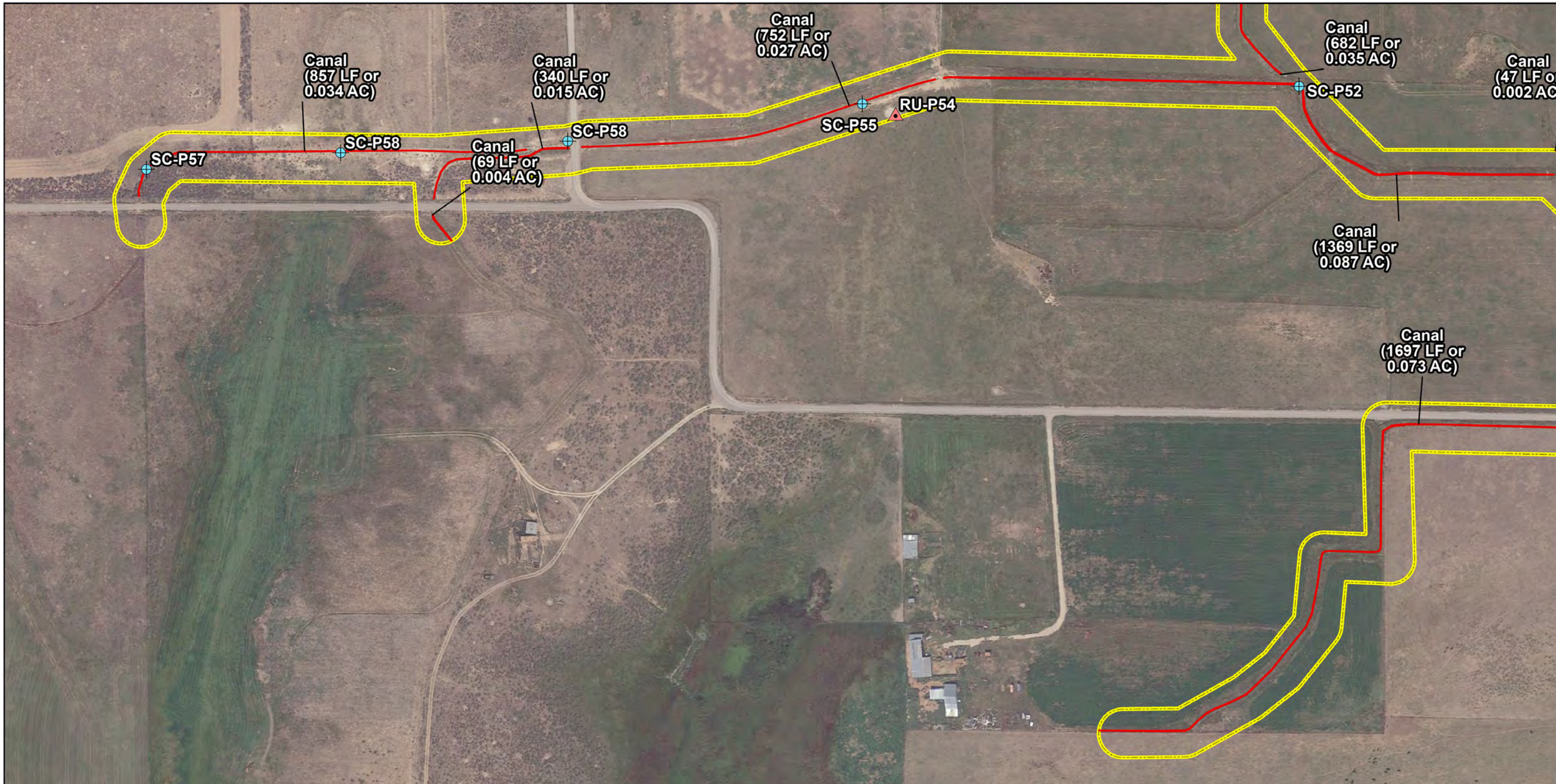

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Map 7

Delineation of Wetlands and Other Waters of the U.S. - for the Spring City Watershed Flood and Irrigation Project

Revised 11/7/2023

Coord. System: NAD 1983 UTM 12N
Projection: Transverse Mercator
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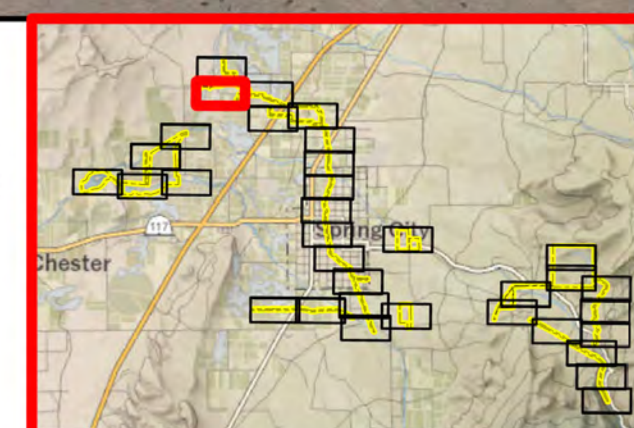

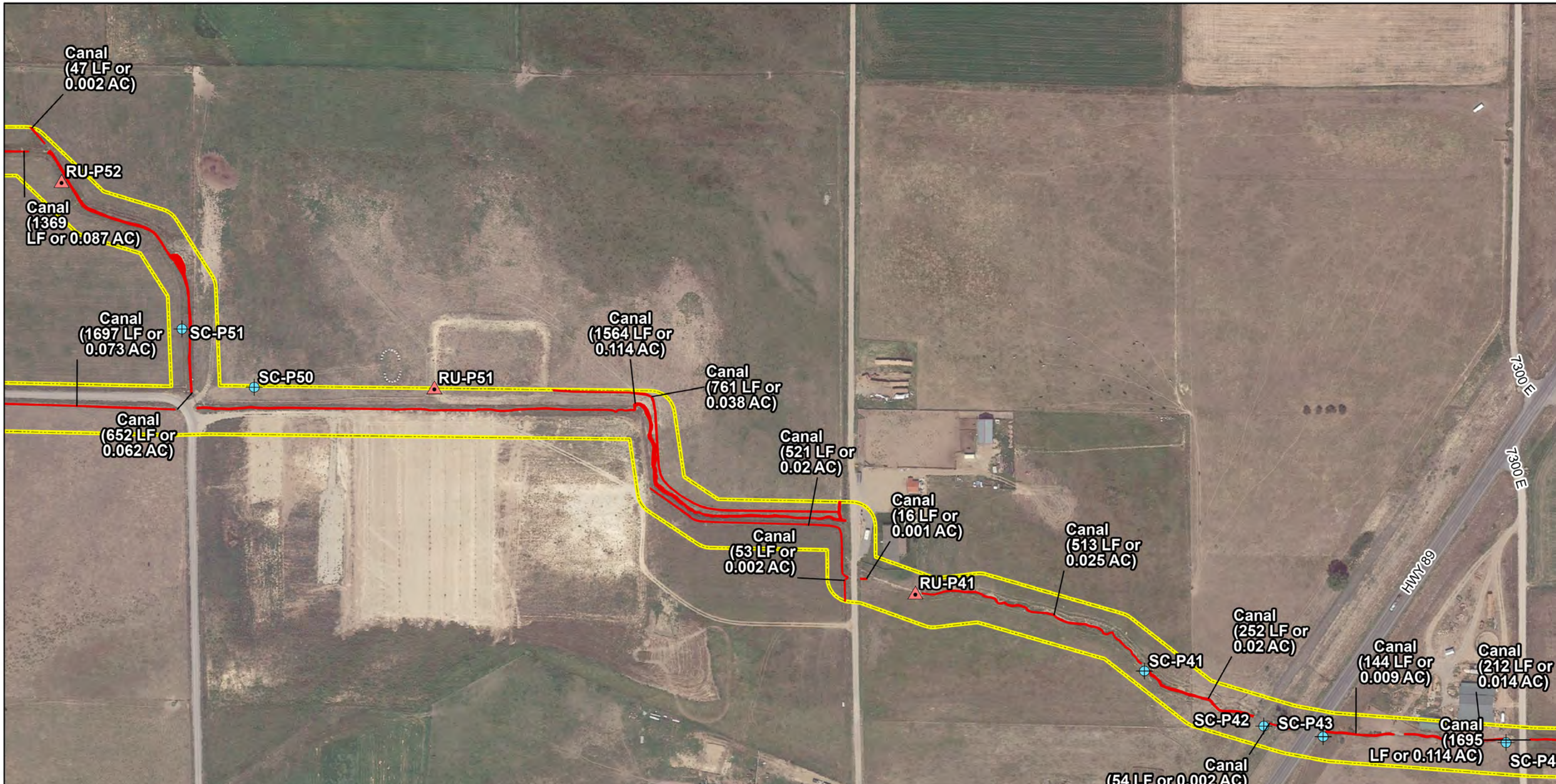

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Map 8

Delineation of Wetlands and Other Waters of the U.S. - for the Spring City Watershed Flood and Irrigation Project

Revised 11/7/2023

Coord. System: NAD 1983 UTM 12N
Projection: Transverse Mercator
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Imagery: Utah AGRC - Google Earth 2018

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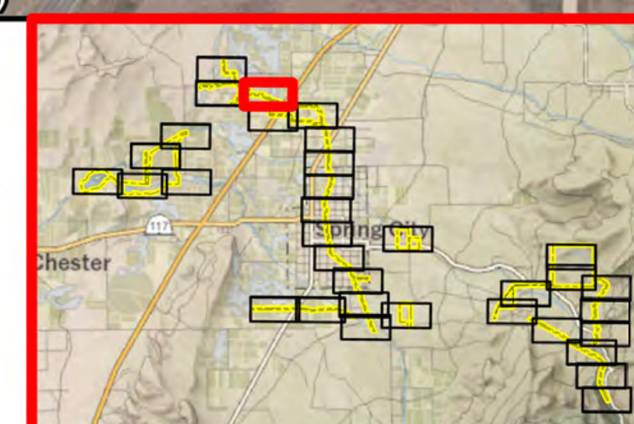

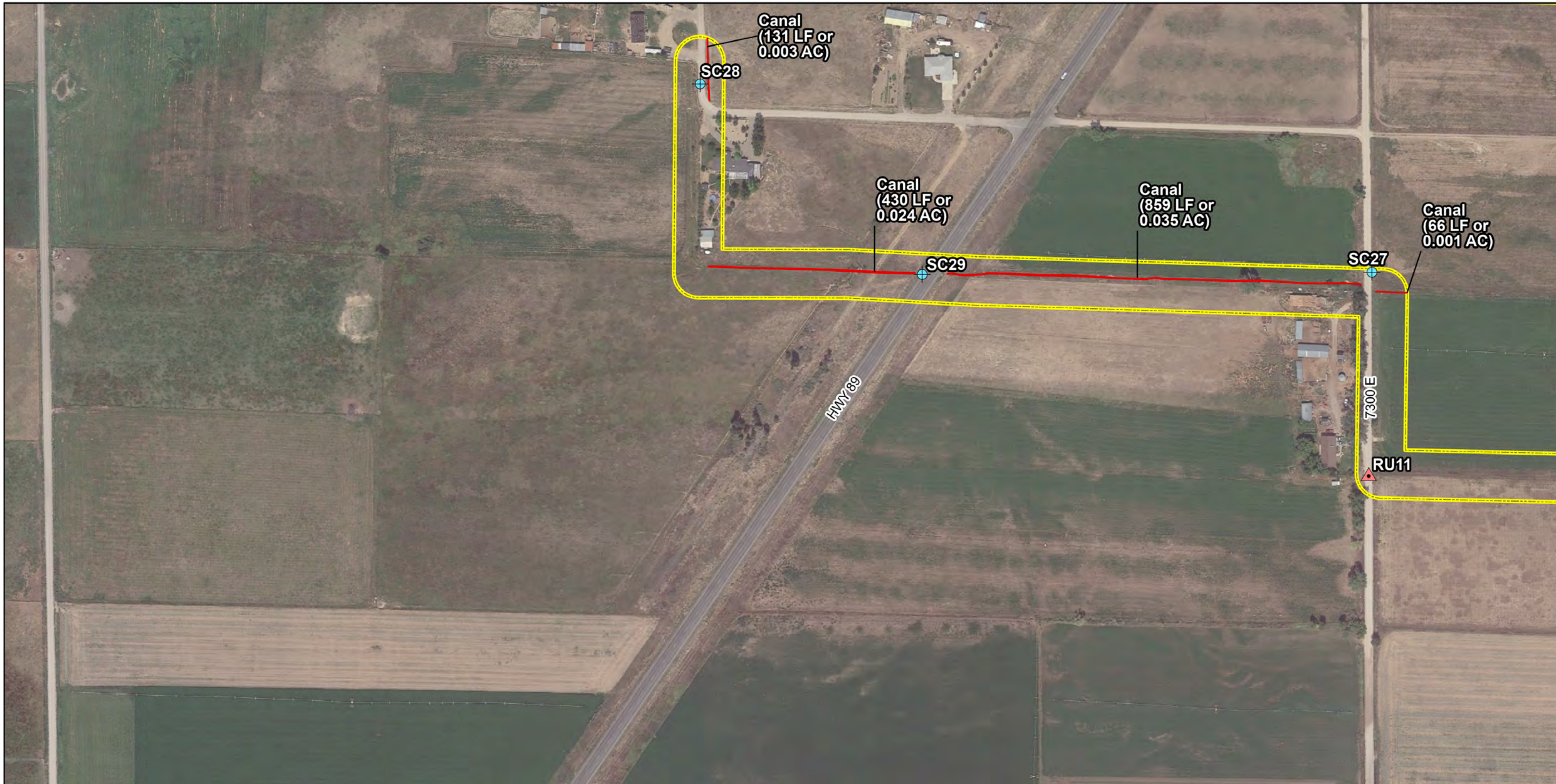

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Map 9

Delineation of Wetlands and Other Waters of the U.S. - for the Spring City Watershed Flood and Irrigation Project

Revised 11/7/2023

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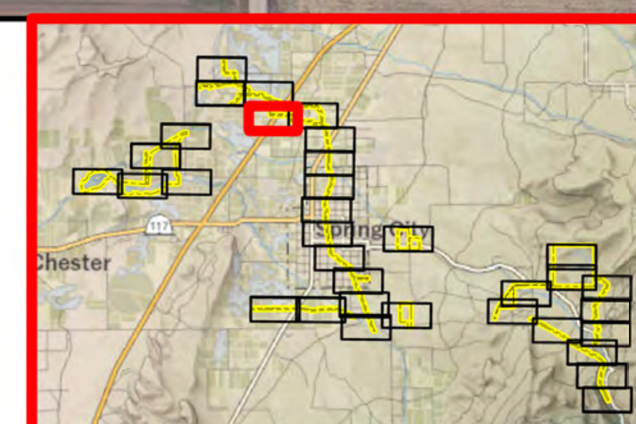

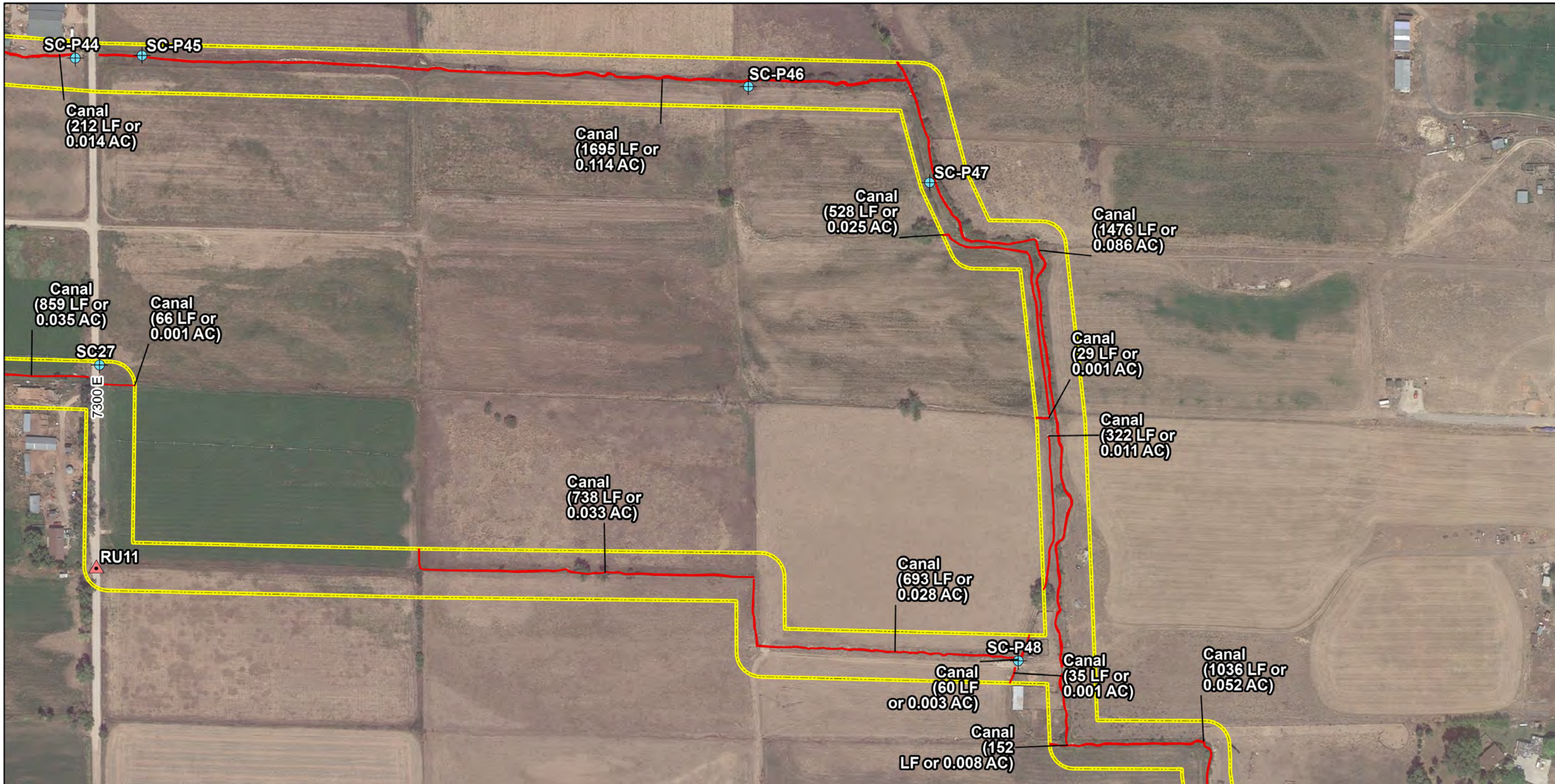

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Water Resources Assessment

Map 10

Delineation of Wetlands and Other Waters of the U.S. - for the Spring City Watershed Flood and Irrigation Project

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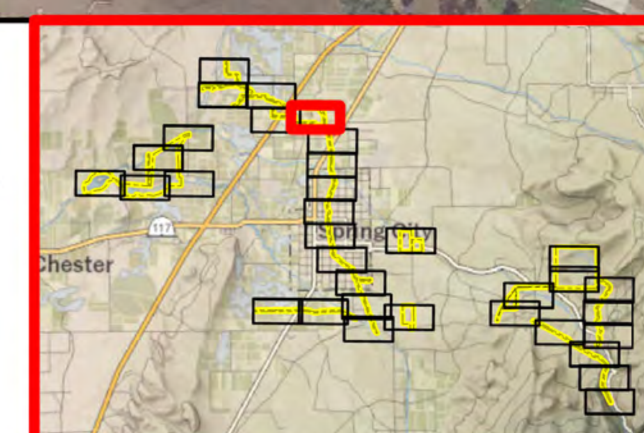
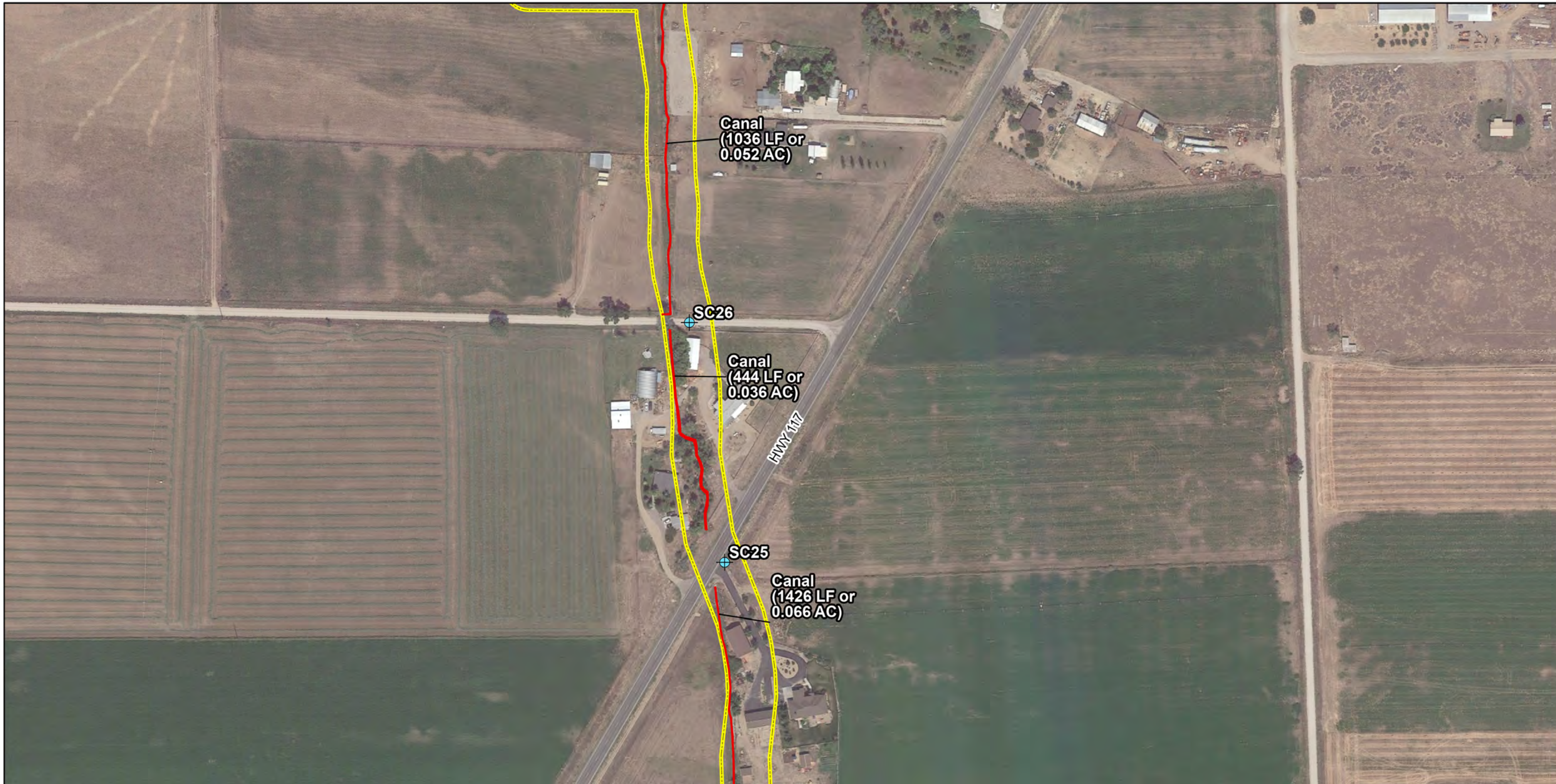
- Freshwater Emergent - PEM1E (33.060 AC)
- Scrub-Shrub - PSS1E (16.615 AC)
- Isolated Freshwater Emergent Wetlands - PEM1E* (14.157 AC)
- Canal (41,323 LF or 2.619 AC)
- Ephemeral Stream (5,273 LF or 0.287 AC))
- Intermittent Stream - R4SB3 (2,568 L or 0.264 AC)
- Intermittent Stream - R4SB7 (531 LF or 0.015 AC)
- Upper Perennial Stream - R3UB1 (487 LF or 0.051 AC)
- Lower Perennial Stream - R2UB1 (284 LF or 0.035 AC)
- Lower Perennial Stream - R2UB3 (5,200 LF or 0.527 AC)





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Water Resources Assessment

Map 11

Delineation of Wetlands and Other Waters of the U.S. - for the Spring City Watershed Flood and Irrigation Project

Revised 11/7/2023

Coord. System: NAD 1983 UTM 12N
Projection: Transverse Mercator
Datum: North American 1983
Imagery: Utah AGRC - Google Earth 2018

1 inch = 250 feet on 11X17

N

0 125 250 500 Feet

Legend

- Survey Area (565 AC)
- Representative Upland
- Representative Wetland
- Stream Crossing
- Upland Soil Pit
- Wetland Soil Pit
- Reservoir (12.917 AC)
- Lake Bed (2.046 AC)
- Emergent Marsh - PEM1B (2.503 AC)
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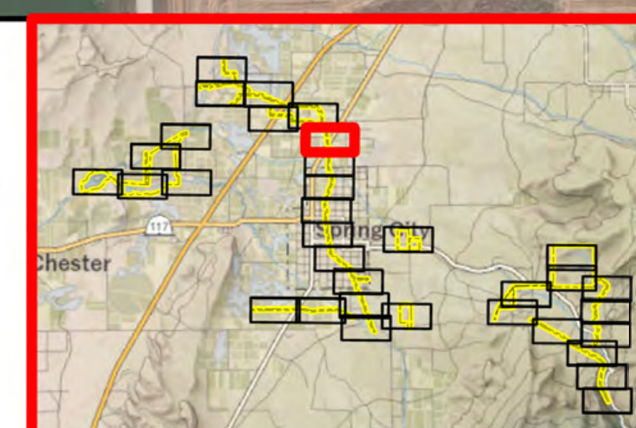
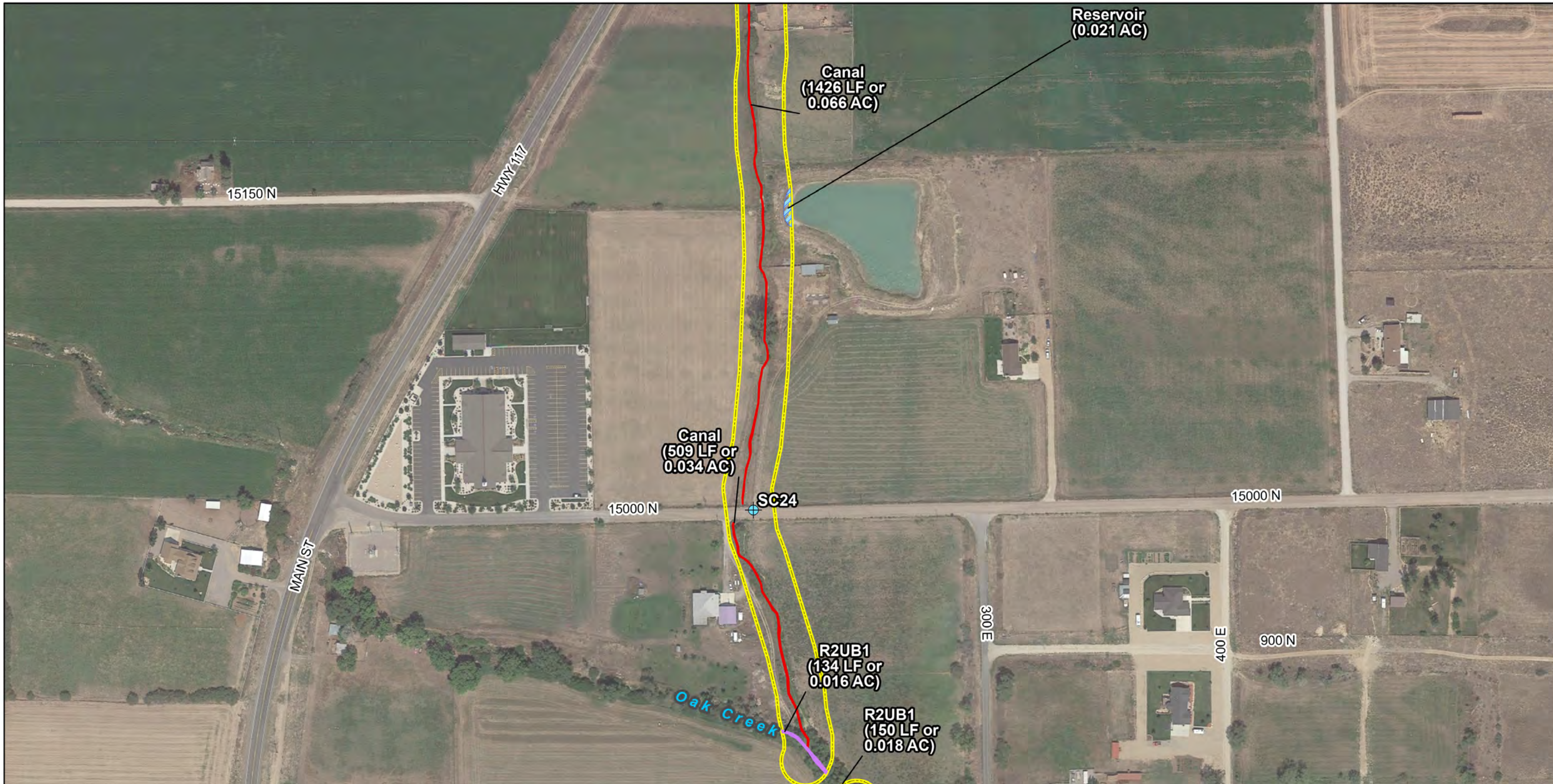
- Lower Perennial Stream - R2UB3 (5,200 LF or 0.527 AC)





Water Resources Assessment

Map 12

Delineation of Wetlands and Other Waters of the U.S. - for the Spring City Watershed Flood and Irrigation Project

Revised 11/7/2023

J-U-B ENGINEERS, INC.

Coord. System: NAD 1983 UTM 12N
Projection: Transverse Mercator
Datum: North American 1983
Imagery: Utah AGRC - Google Earth 2018

1 inch = 250 feet on 11X17

N

0 125 250 500 Feet

Legend

- Survey Area (565 AC)
- Representative Upland
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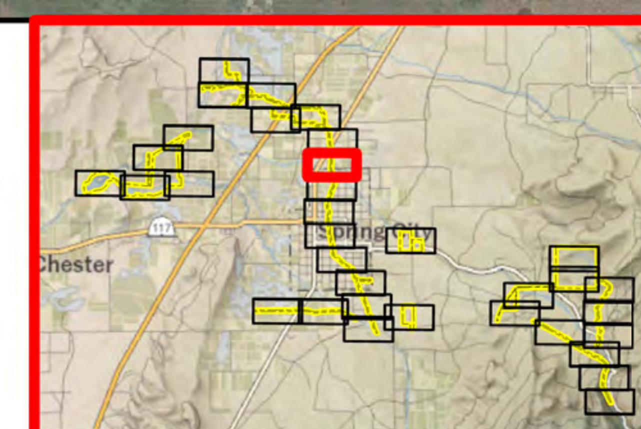

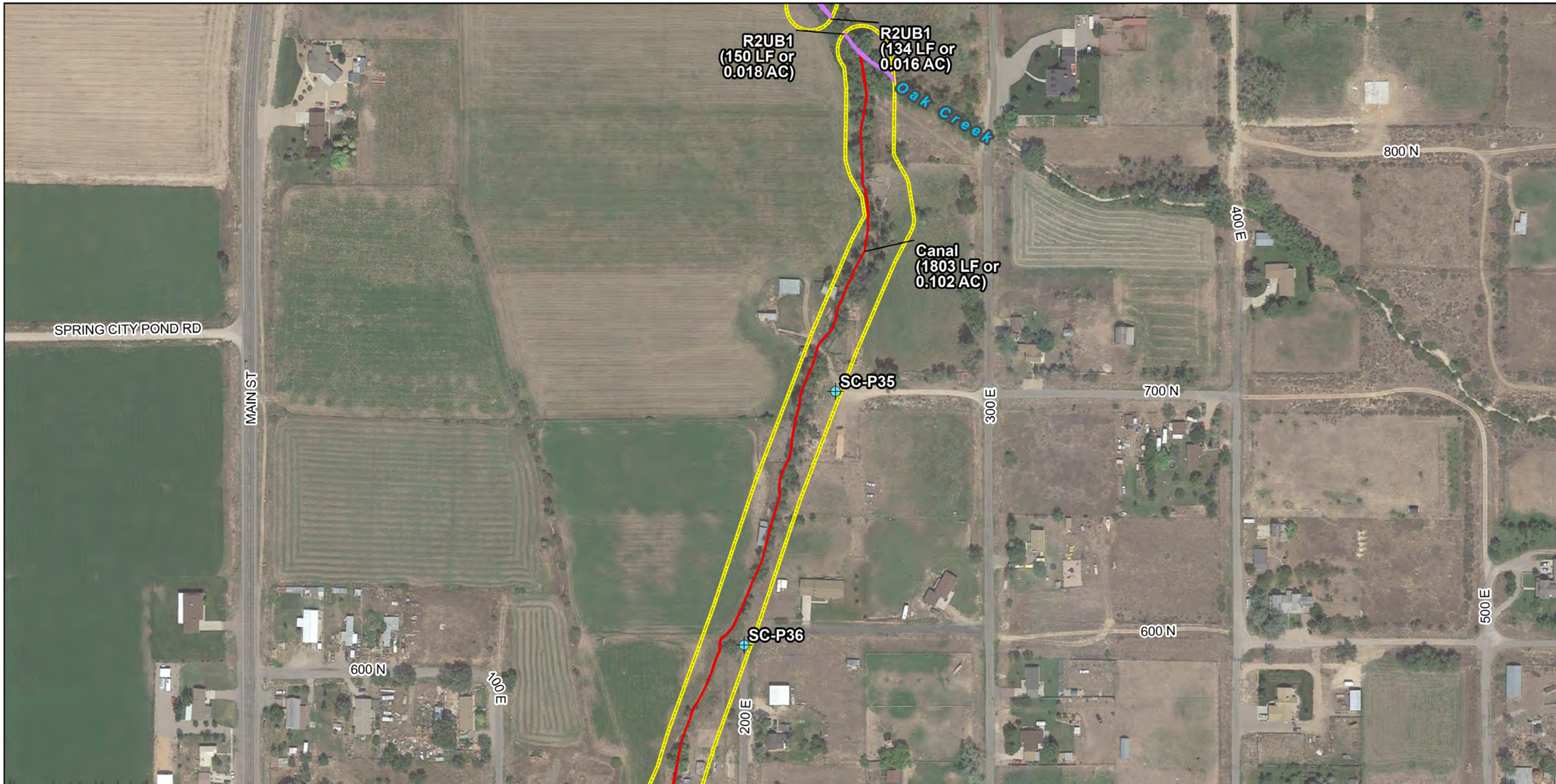

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Map 13

Delineation of Wetlands and Other Waters of the U.S. - for the Spring City Watershed Flood and Irrigation Project

Revised 11/7/2023

Coord. System: NAD 1983 UTM 12N
Projection: Transverse Mercator
Datum: North American 1983
Imagery: Utah AGRC - Google Earth 2018

1 inch = 250 feet on 11X17

N

0 125 250 500 Feet

Legend

- Survey Area (565 AC)
- Representative Upland
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- Stream Crossing
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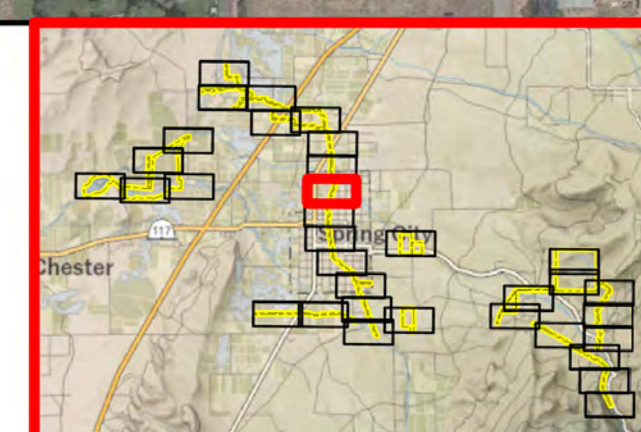

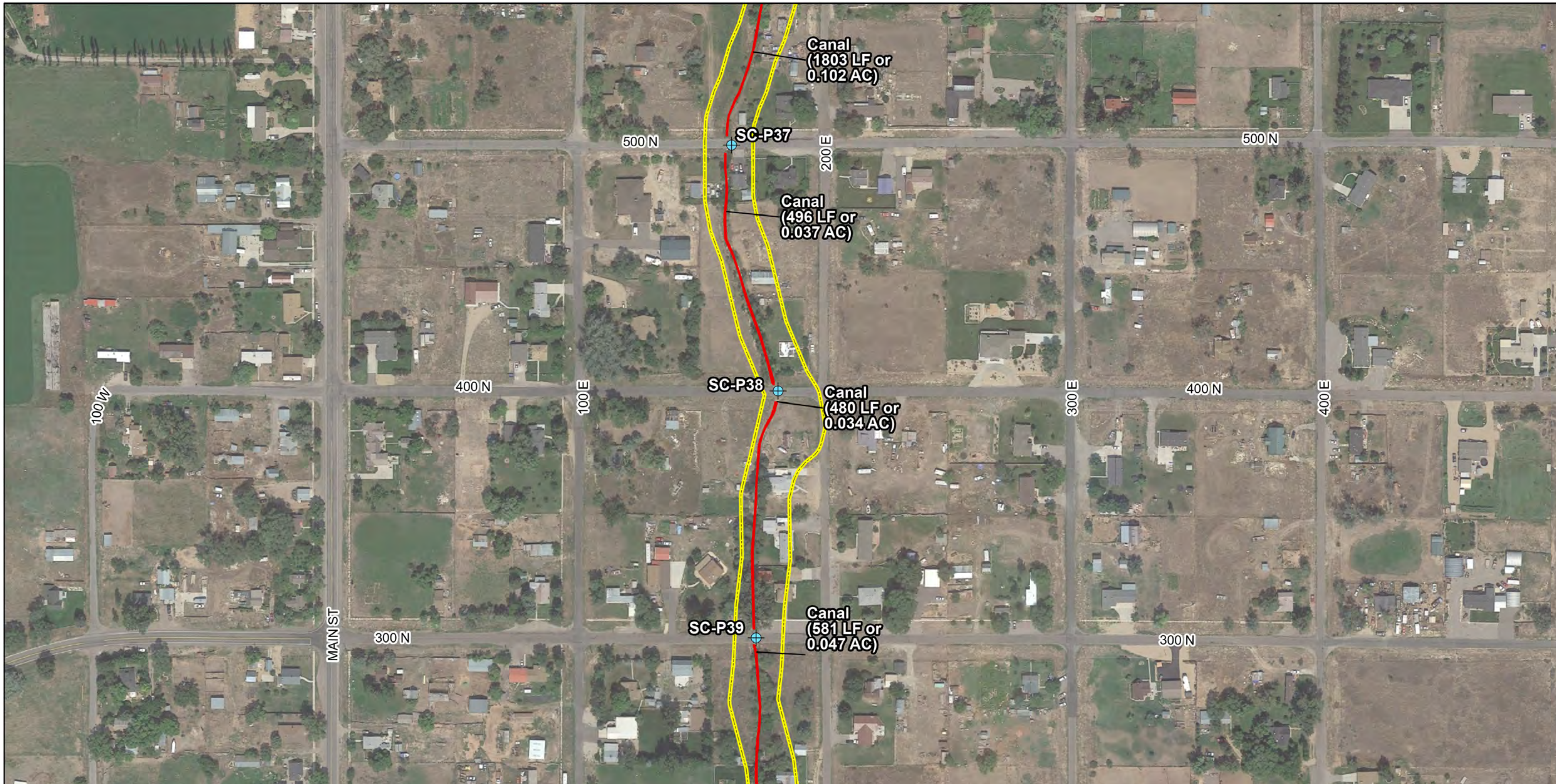

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Water Resources Assessment

Map 14

Delineation of Wetlands and Other Waters of the U.S. - for the Spring City Watershed Flood and Irrigation Project

Revised 11/7/2023

Coord. System: NAD 1983 UTM 12N
Projection: Transverse Mercator
Datum: North American 1983
Imagery: Utah AGRC - Google Earth 2018

1 inch = 250 feet on 11X17

N

0 125 250 500 Feet

Legend

- Survey Area (565 AC)
- Representative Upland
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- Stream Crossing
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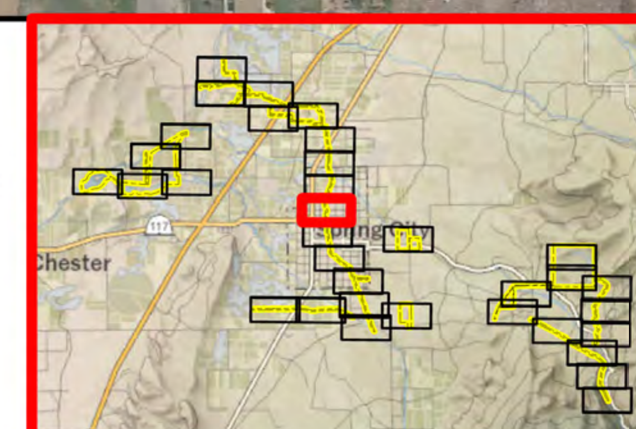

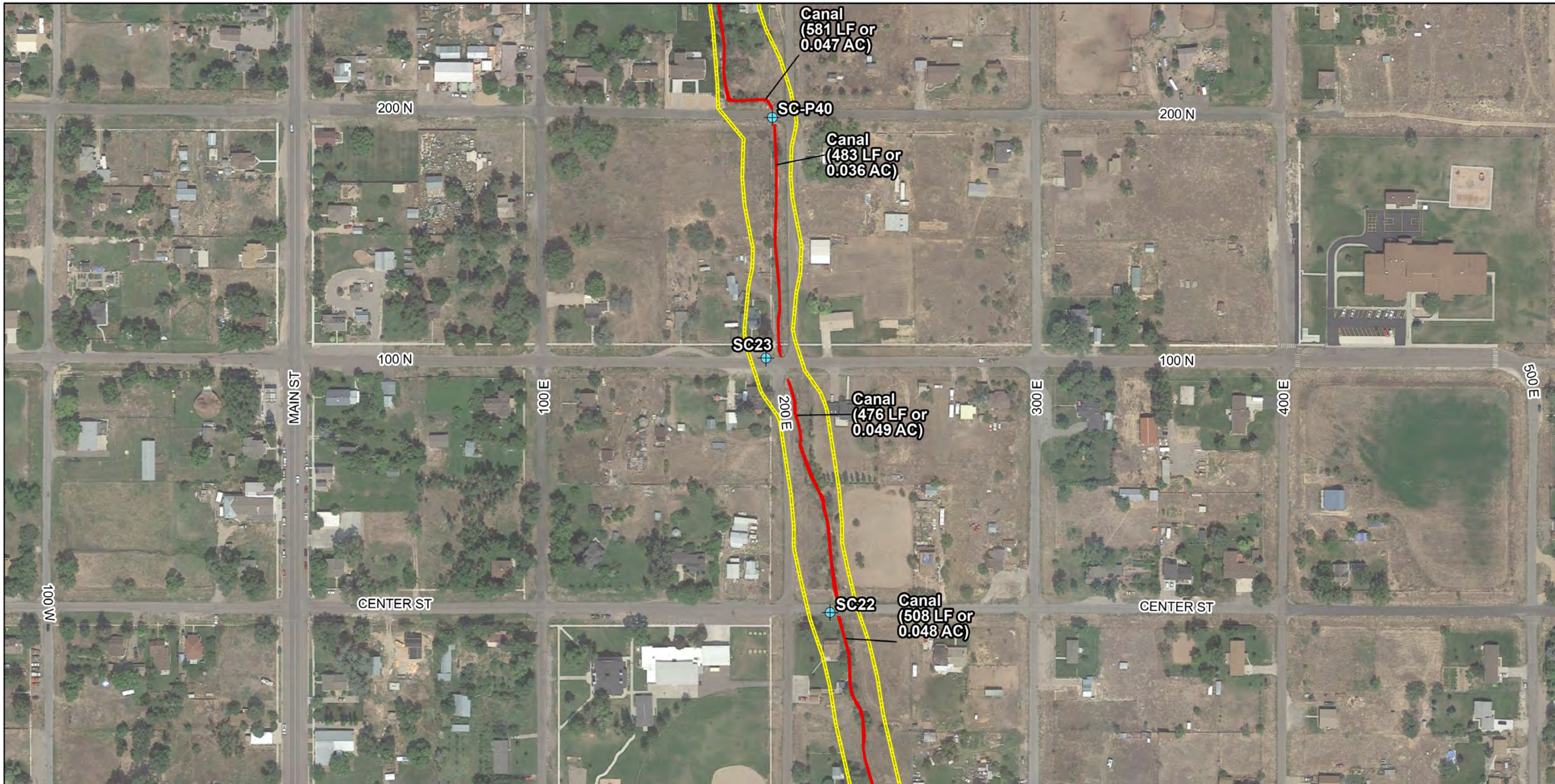

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Map 15

Delineation of Wetlands and Other Waters of the U.S. - for the Spring City Watershed Flood and Irrigation Project

Revised 11/7/2023

Coord. System: NAD 1983 UTM 12N
Projection: Transverse Mercator
Datum: North American 1983
Imagery: Utah AGRC - Google Earth 2018

1 inch = 250 feet on 11X17

N

0 125 250 500 Feet

Legend

- Survey Area (565 AC)
- Representative Upland
- Representative Wetland
- Stream Crossing
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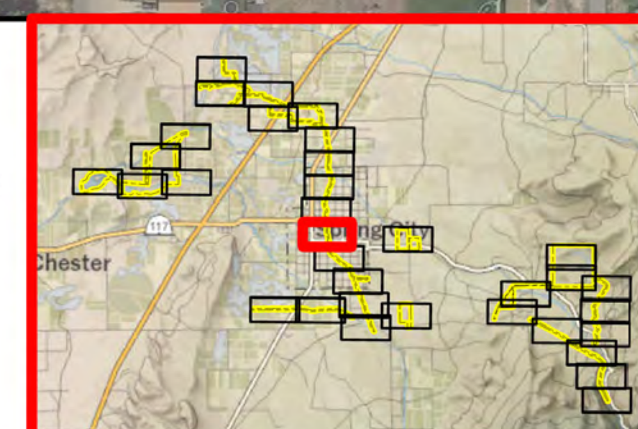
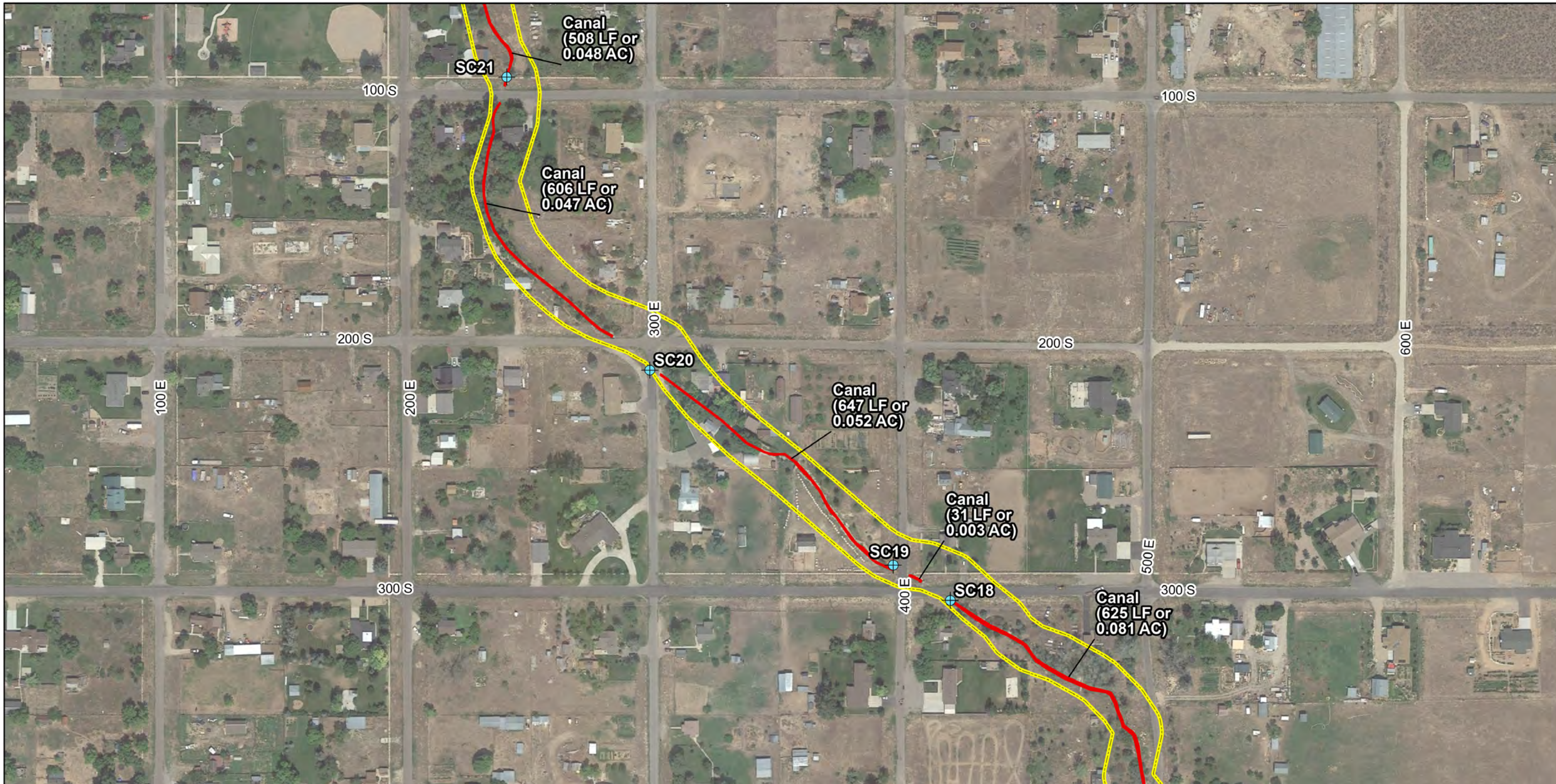
- Lower Perennial Stream - R2UB3 (5,200 LF or 0.527 AC)





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Map 16

Delineation of Wetlands and Other Waters of the U.S. - for the Spring City Watershed Flood and Irrigation Project

Revised 11/7/2023

Coord. System: NAD 1983 UTM 12N
Projection: Transverse Mercator
Datum: North American 1983
Imagery: Utah AGRC - Google Earth 2018

1 inch = 250 feet on 11X17

N

0 125 250 500 Feet

Legend

- Survey Area (565 AC)
- Representative Upland
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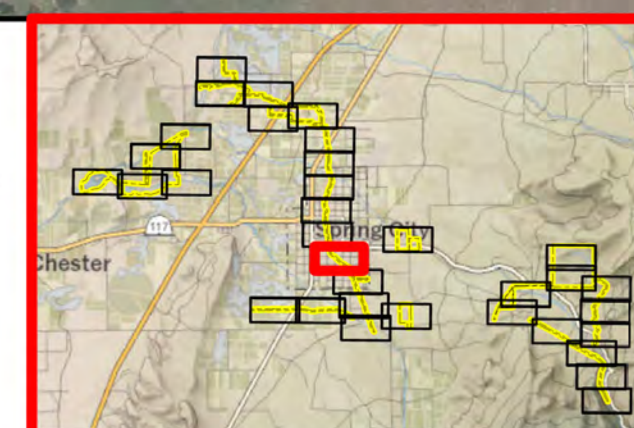

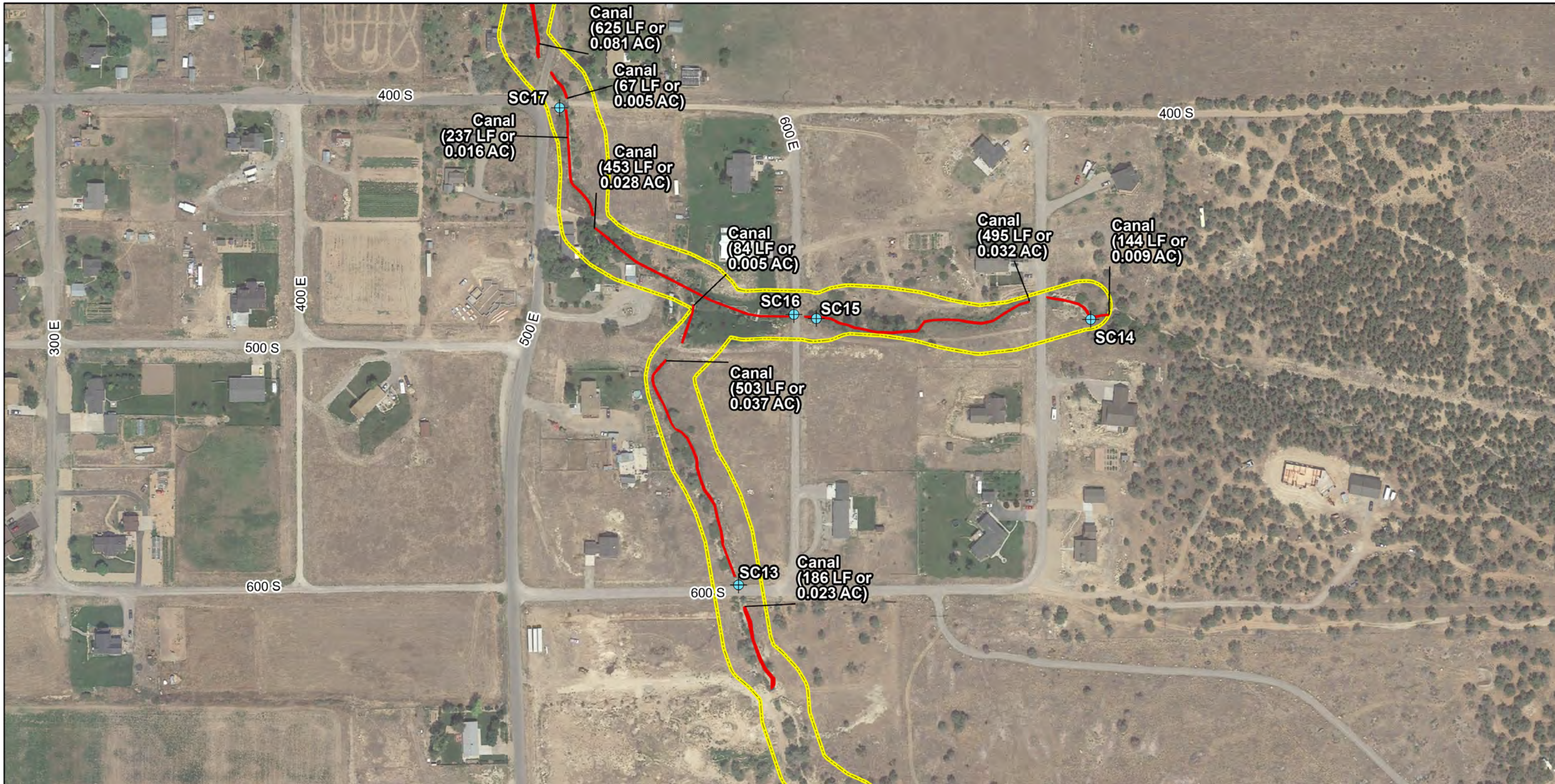

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Map 17

Delineation of Wetlands and Other Waters of the U.S. - for the Spring City Watershed Flood and Irrigation Project

Revised 11/7/2023

Coord. System: NAD 1983 UTM 12N
Projection: Transverse Mercator
Datum: North American 1983
Imagery: Utah AGRC - Google Earth 2018

1 inch = 250 feet on 11X17

N

0 125 250 500 Feet

Legend

- Survey Area (565 AC)
- Representative Upland
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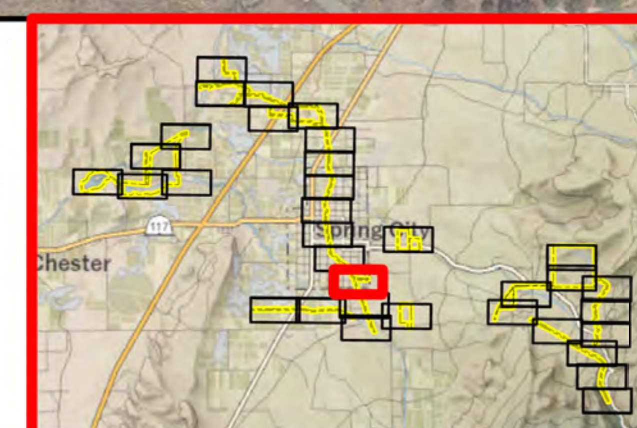

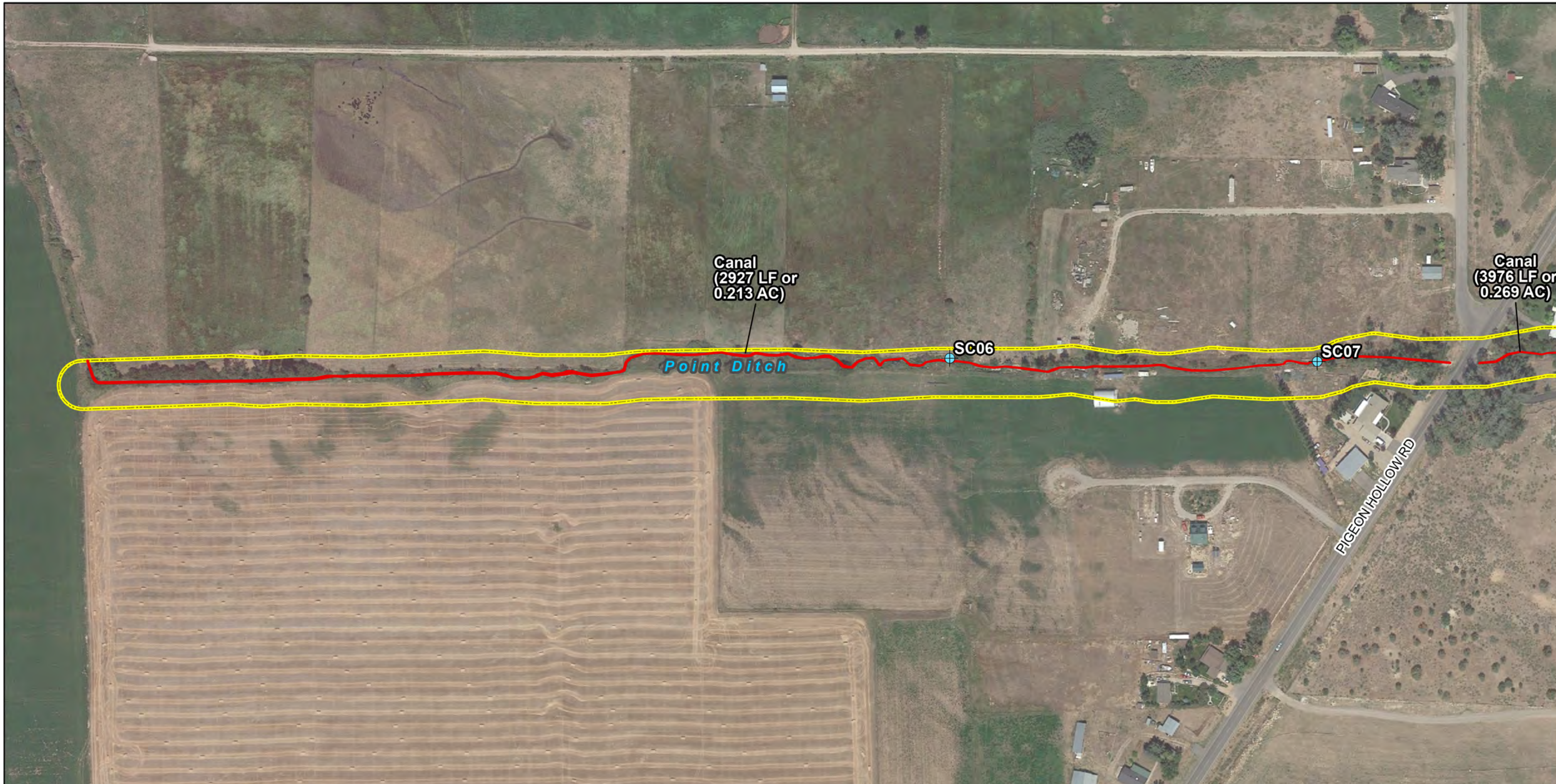

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Map 18

Delineation of Wetlands and Other Waters of the U.S. - for the Spring City Watershed Flood and Irrigation Project

Revised 11/7/2023

Coord. System: NAD 1983 UTM 12N
Projection: Transverse Mercator
Datum: North American 1983
Imagery: Utah AGRC - Google Earth 2018

1 inch = 250 feet on 11X17

N

0 125 250 500 Feet

Legend

- Survey Area (565 AC)
- Representative Upland
- Representative Wetland
- Stream Crossing
- Upland Soil Pit
- Wetland Soil Pit
- Reservoir (12.917 AC)
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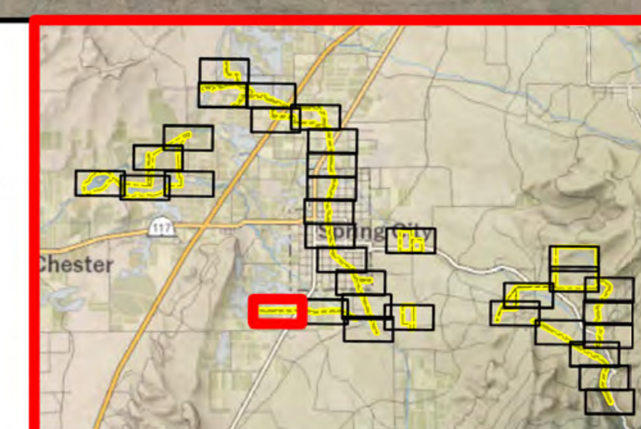

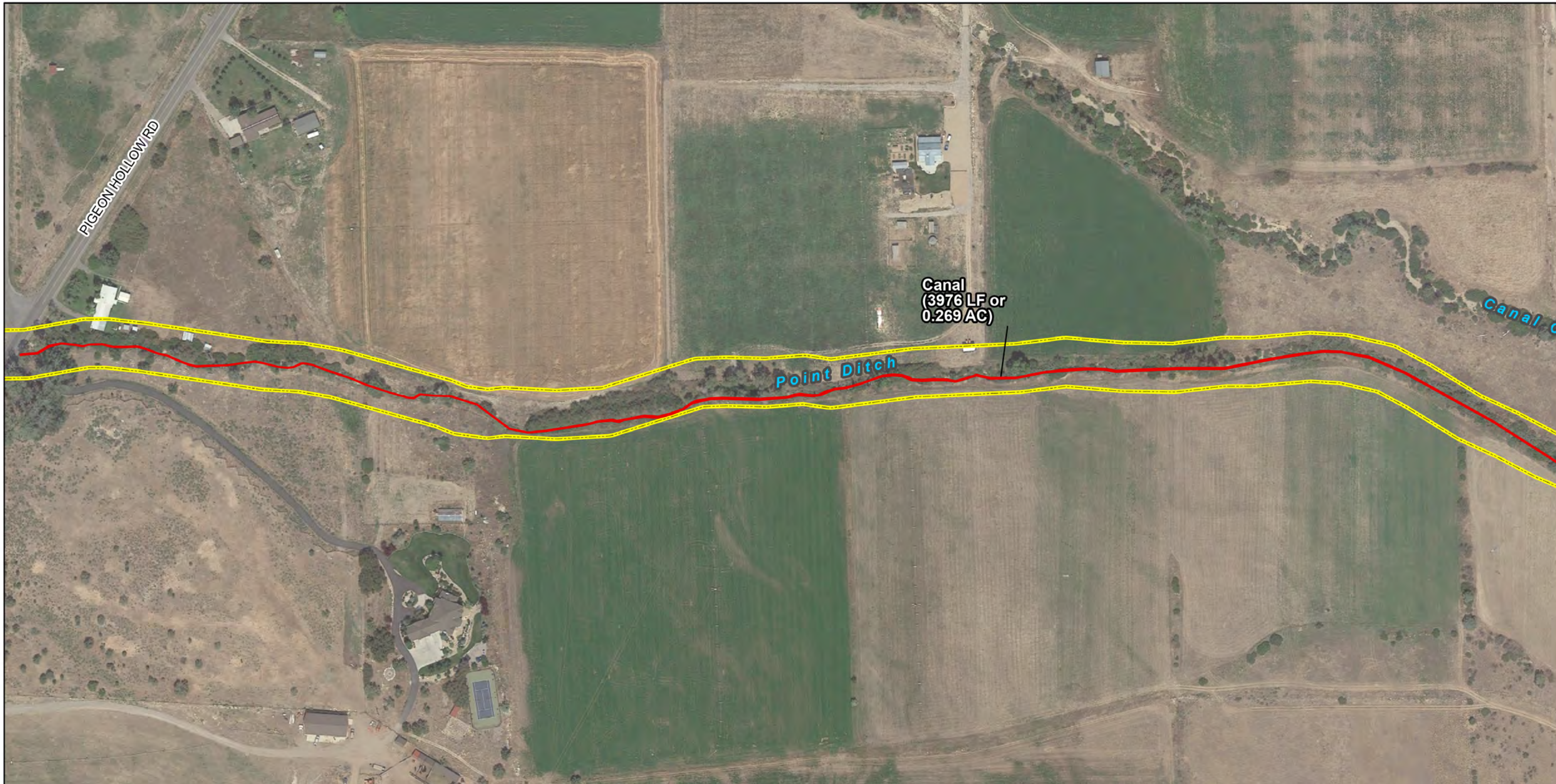

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Water Resources Assessment

Map 19

Delineation of Wetlands and Other Waters of the U.S. - for the Spring City Watershed Flood and Irrigation Project

Revised 11/7/2023

Coord. System: NAD 1983 UTM 12N
Projection: Transverse Mercator
Datum: North American 1983
Imagery: Utah AGRC - Google Earth 2018

1 inch = 250 feet on 11X17

Feet
0 125 250 500

Legend

- Survey Area (565 AC)
- Representative Upland
- Representative Wetland
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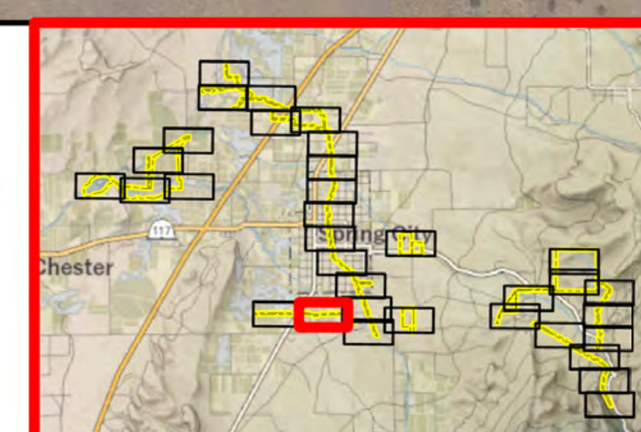

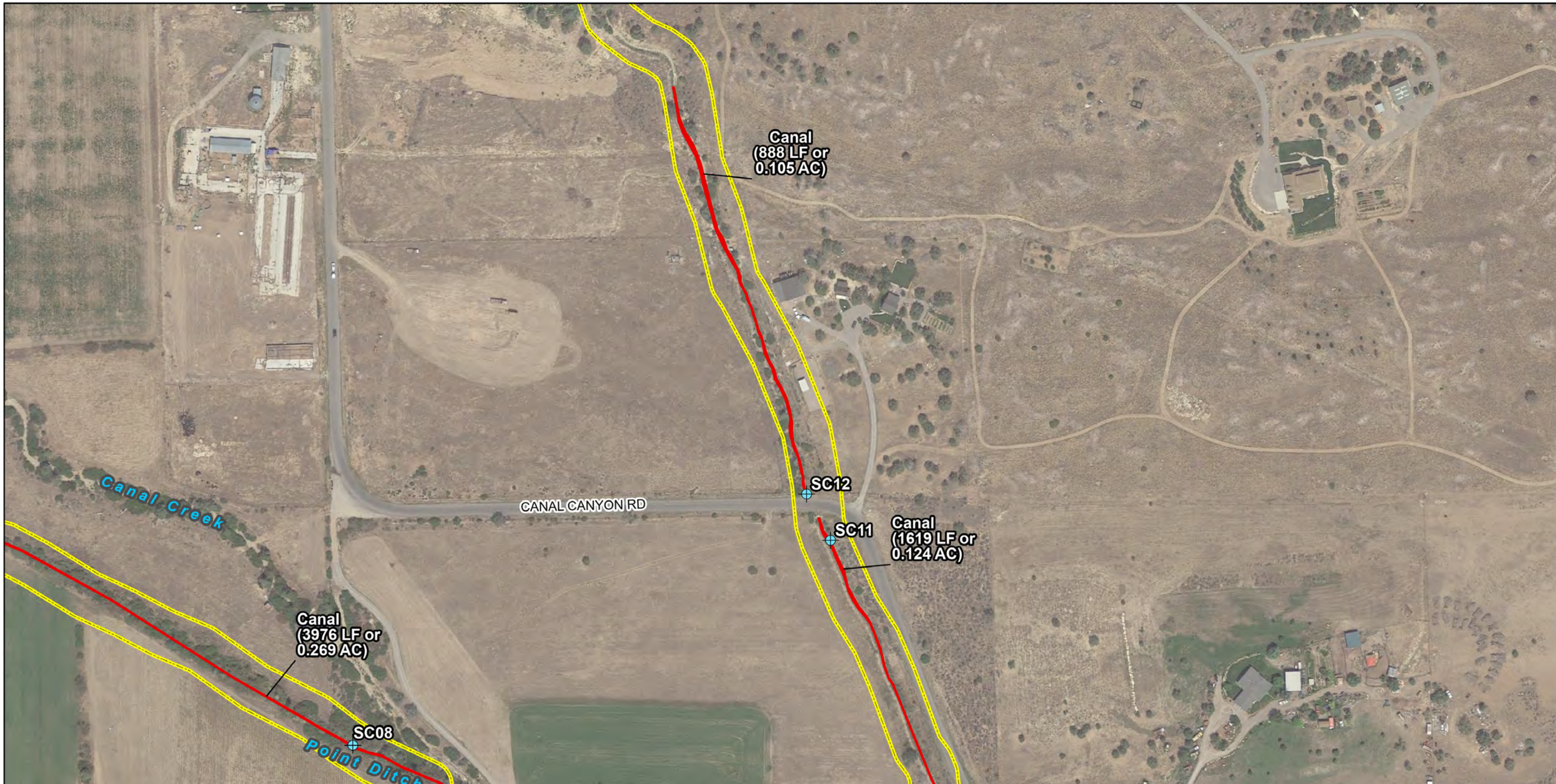

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Water Resources Assessment

Map 20

Delineation of Wetlands and Other Waters of the U.S. - for the Spring City Watershed Flood and Irrigation Project

Revised 11/7/2023

Coord. System: NAD 1983 UTM 12N
Projection: Transverse Mercator
Datum: North American 1983
Imagery: Utah AGRC - Google Earth 2018

1 inch = 250 feet on 11X17

N

0 125 250 500 Feet

Legend

- Survey Area (565 AC)
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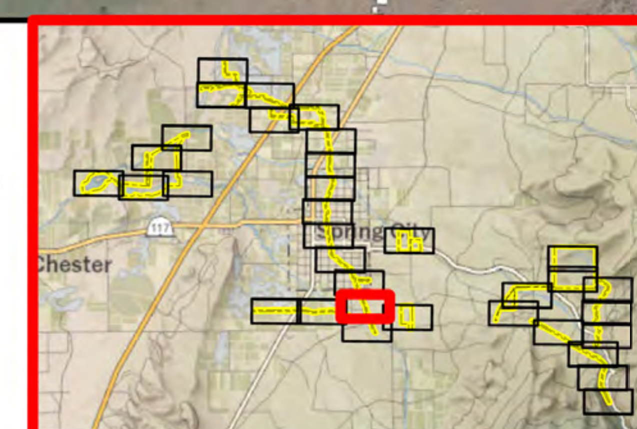

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Map 21

Delineation of Wetlands and Other Waters of the U.S. - for the Spring City Watershed Flood and Irrigation Project

Revised 11/7/2023

Coord. System: NAD 1983 UTM 12N
Projection: Transverse Mercator
Datum: North American 1983
Imagery: Utah AGRC - Google Earth 2018

1 inch = 250 feet on 11X17

N

0 125 250 500 Feet

Legend

- Survey Area (565 AC)
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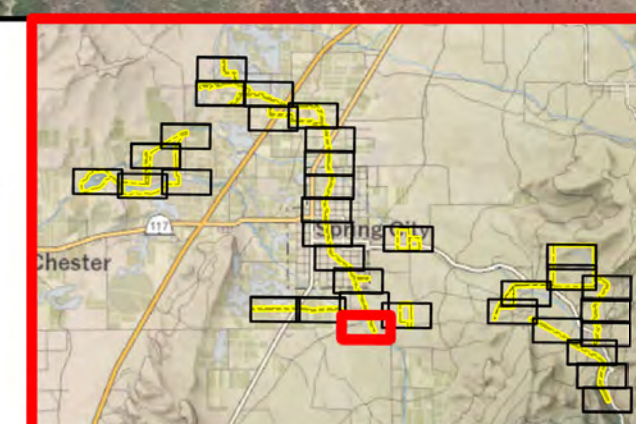

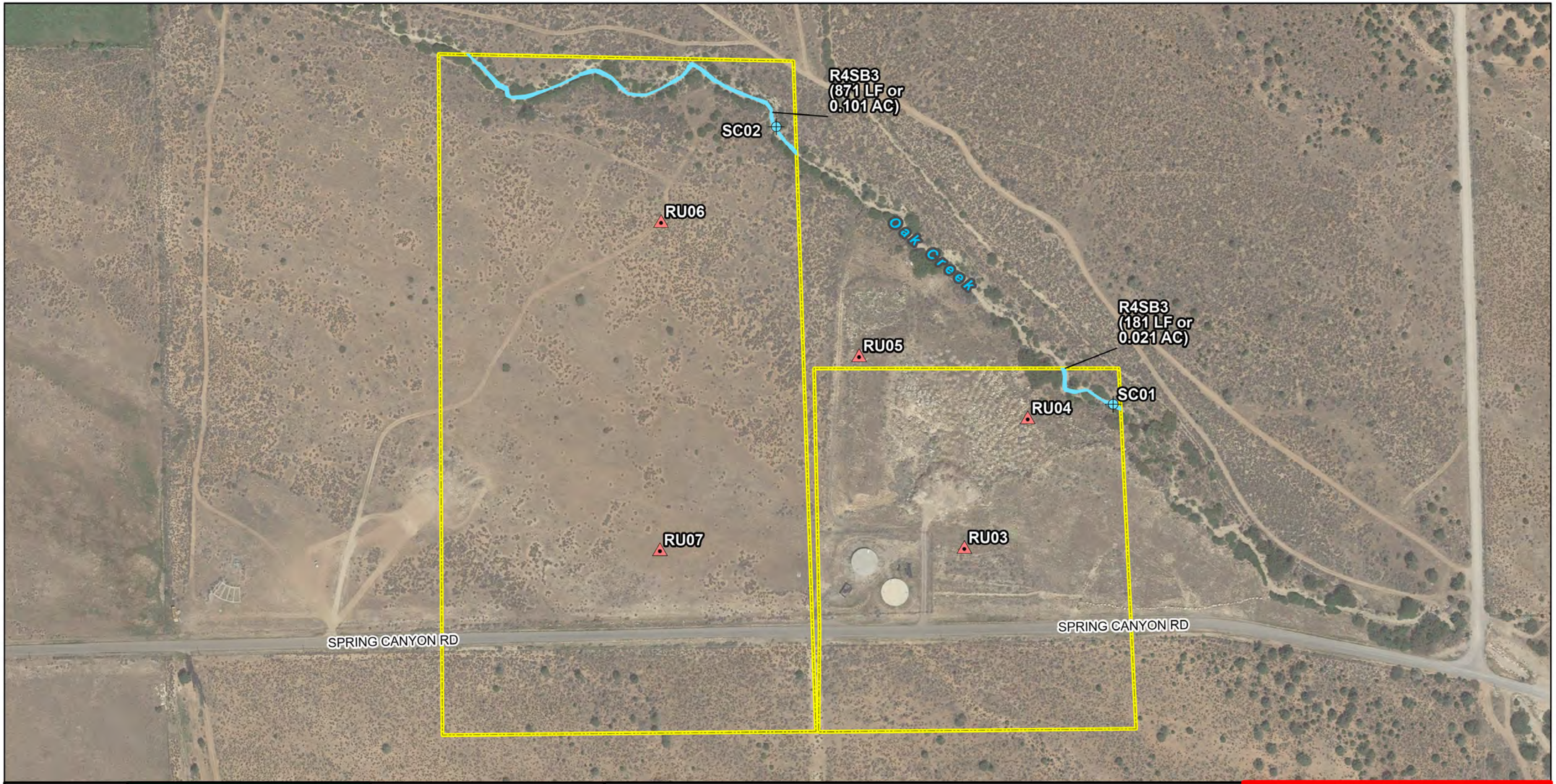

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Water Resources Assessment

Map 22

Delineation of Wetlands and Other Waters of the U.S. - for the Spring City Watershed Flood and Irrigation Project

Revised 11/7/2023

Coord. System: NAD 1983 UTM 12N
Projection: Transverse Mercator
Datum: North American 1983
Imagery: Utah AGRC - Google Earth 2018

1 inch = 250 feet on 11X17

0 125 250 500 Feet

Legend

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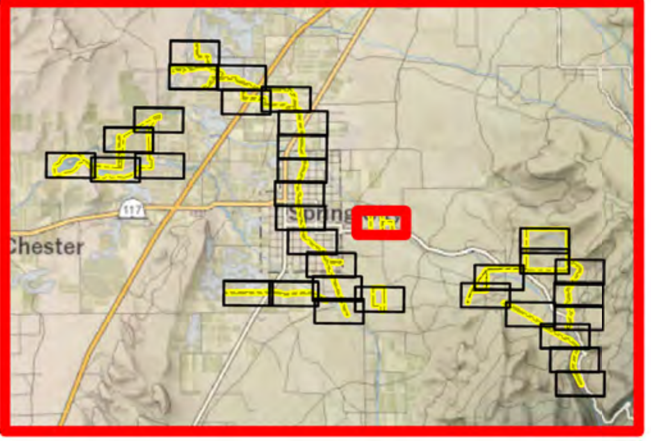

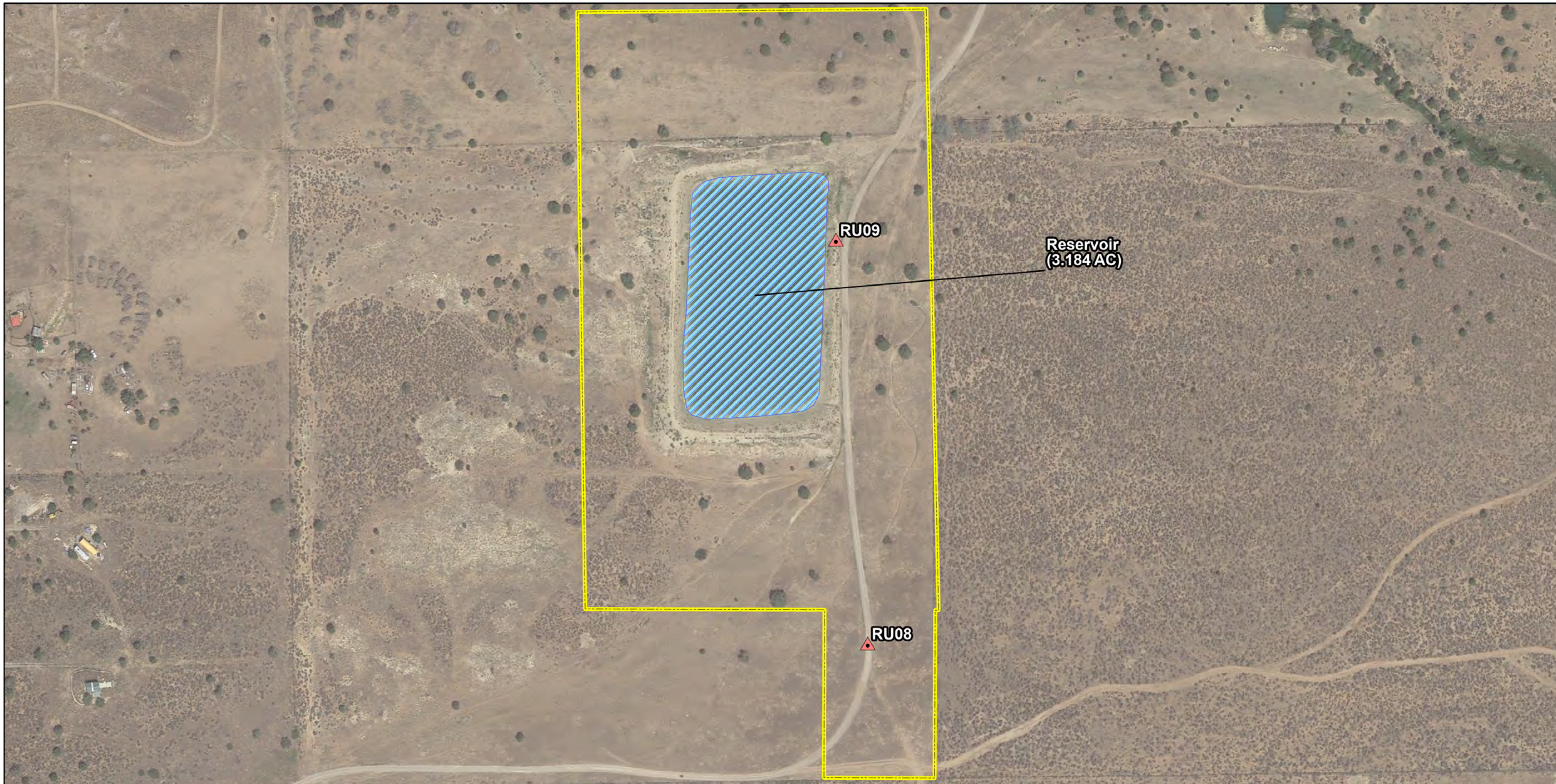

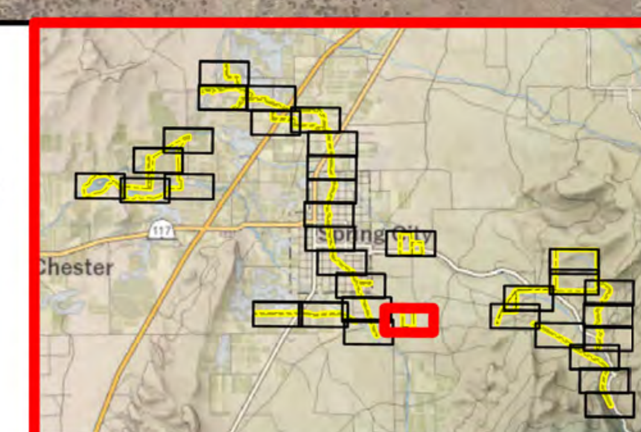

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Map 23

Delineation of Wetlands and Other Waters of the U.S. - for the Spring City Watershed Flood and Irrigation Project

Revised 11/7/2023

Coord. System: NAD 1983 UTM 12N
Projection: Transverse Mercator
Datum: North American 1983
Imagery: Utah AGRC - Google Earth 2018

1 inch = 250 feet on 11X17

N

0 125 250 500 Feet

Legend

- Survey Area (565 AC)
- Representative Upland
- Representative Wetland
- Stream Crossing
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- Reservoir (12.917 AC)
- Lake Bed (2.046 AC)
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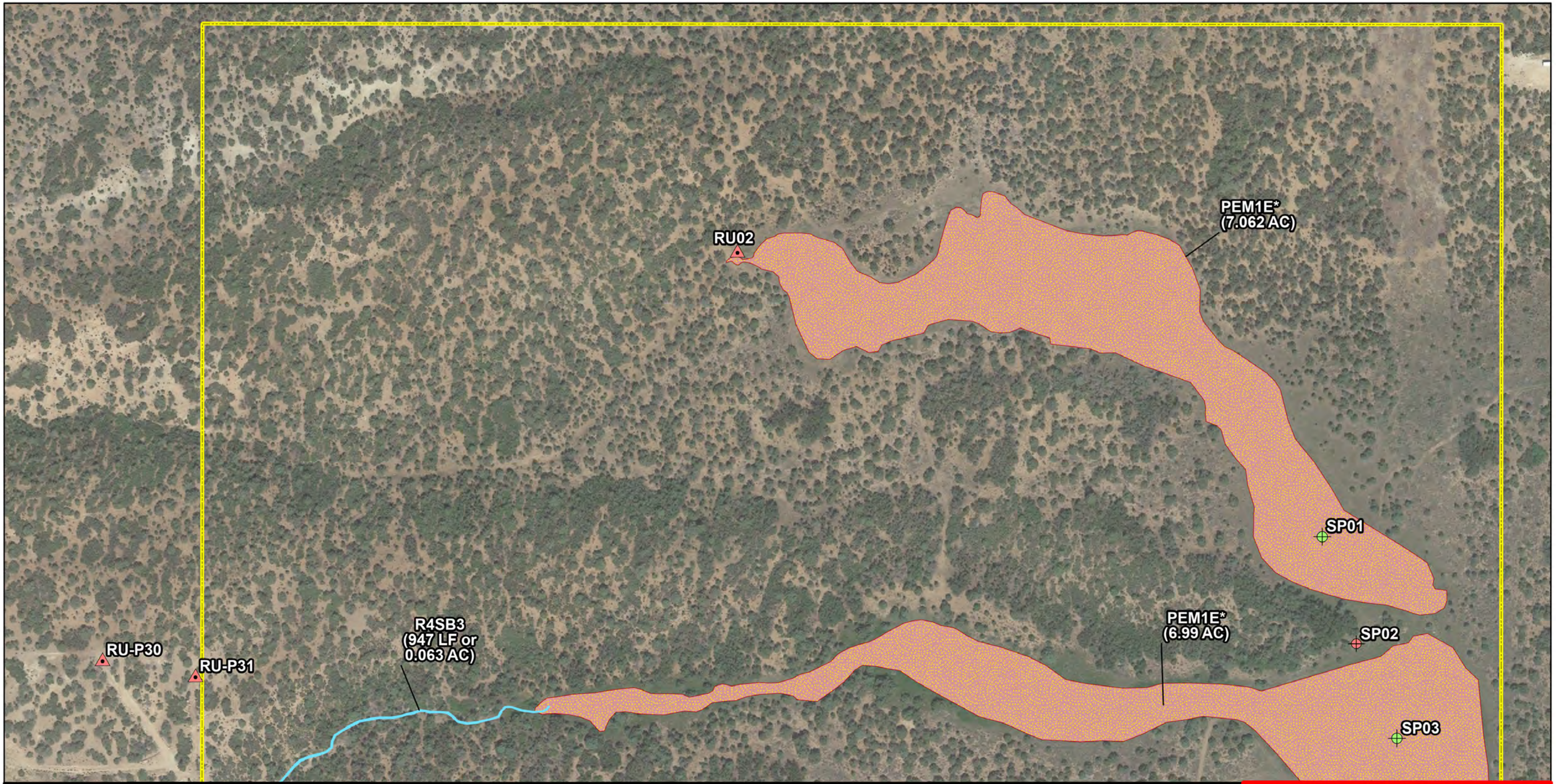

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Water Resources Assessment

Map 24

Delineation of Wetlands and Other Waters of the U.S. - for the Spring City Watershed Flood and Irrigation Project

Revised 11/7/2023

Coord. System: NAD 1983 UTM 12N
Projection: Transverse Mercator
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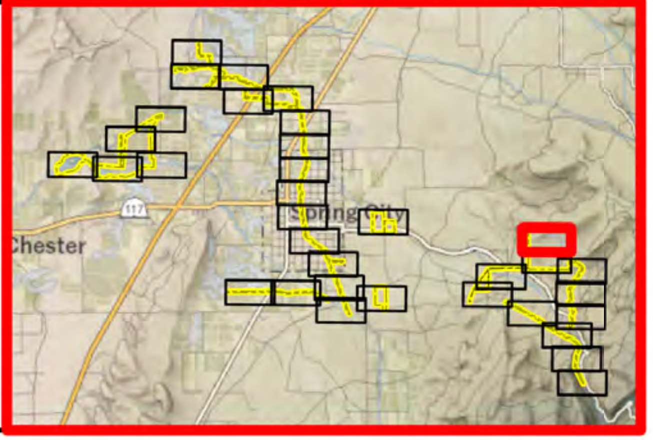

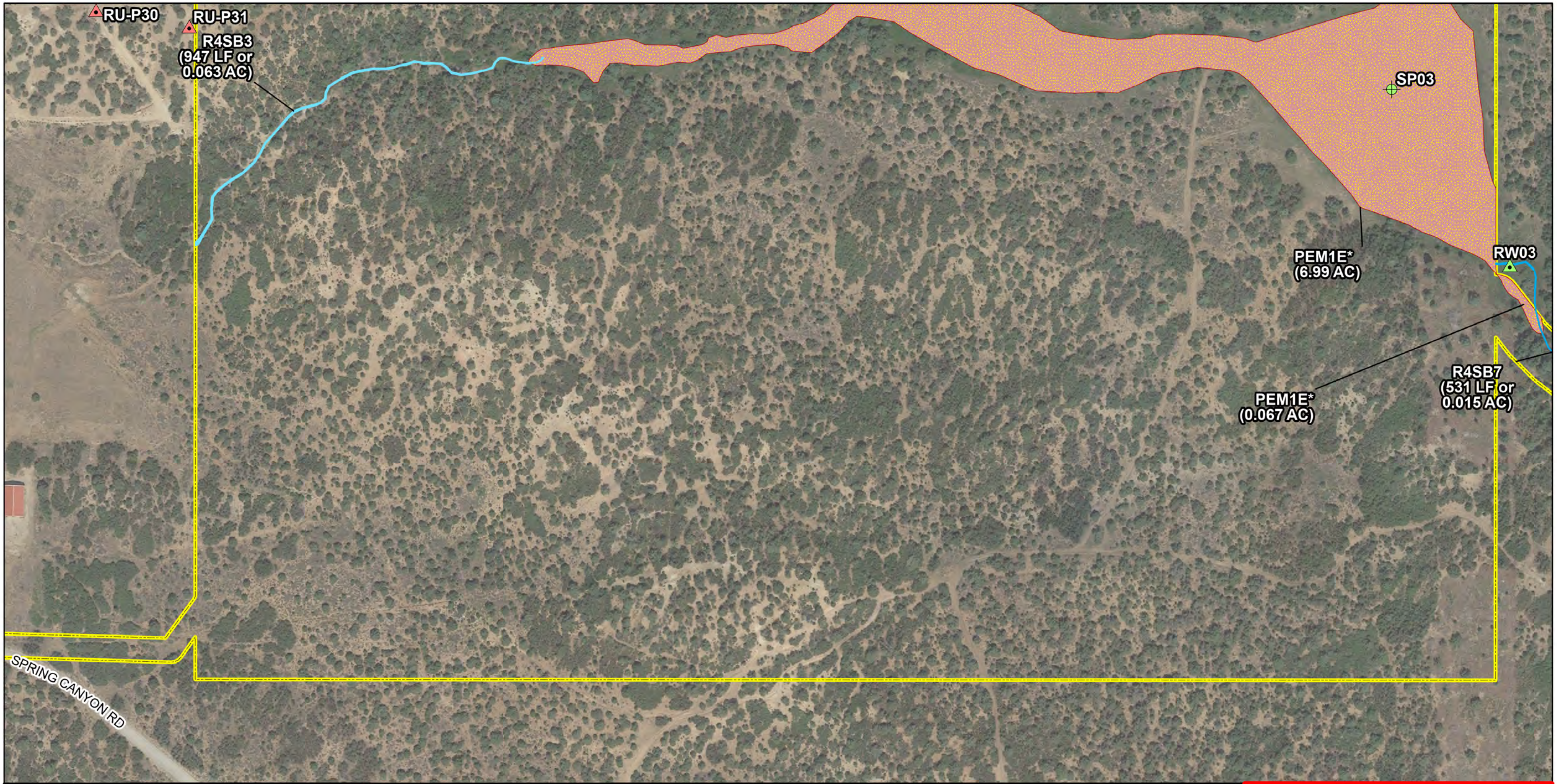

J·U·B ENGINEERS, INC.

Water Resources Assessment

Map 25

Delineation of Wetlands and Other Waters of the U.S. - for the Spring City Watershed Flood and Irrigation Project

Revised 11/7/2023

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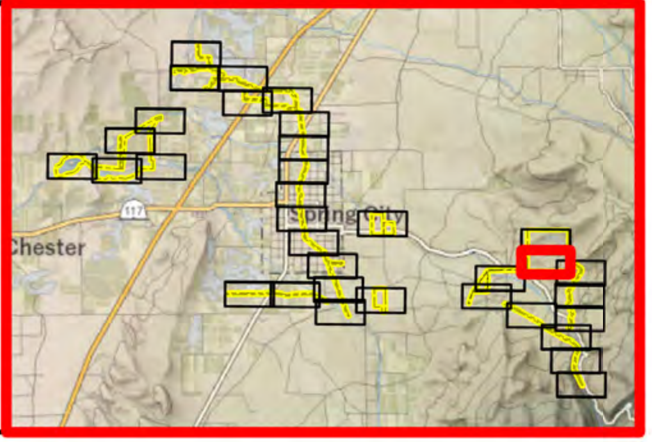

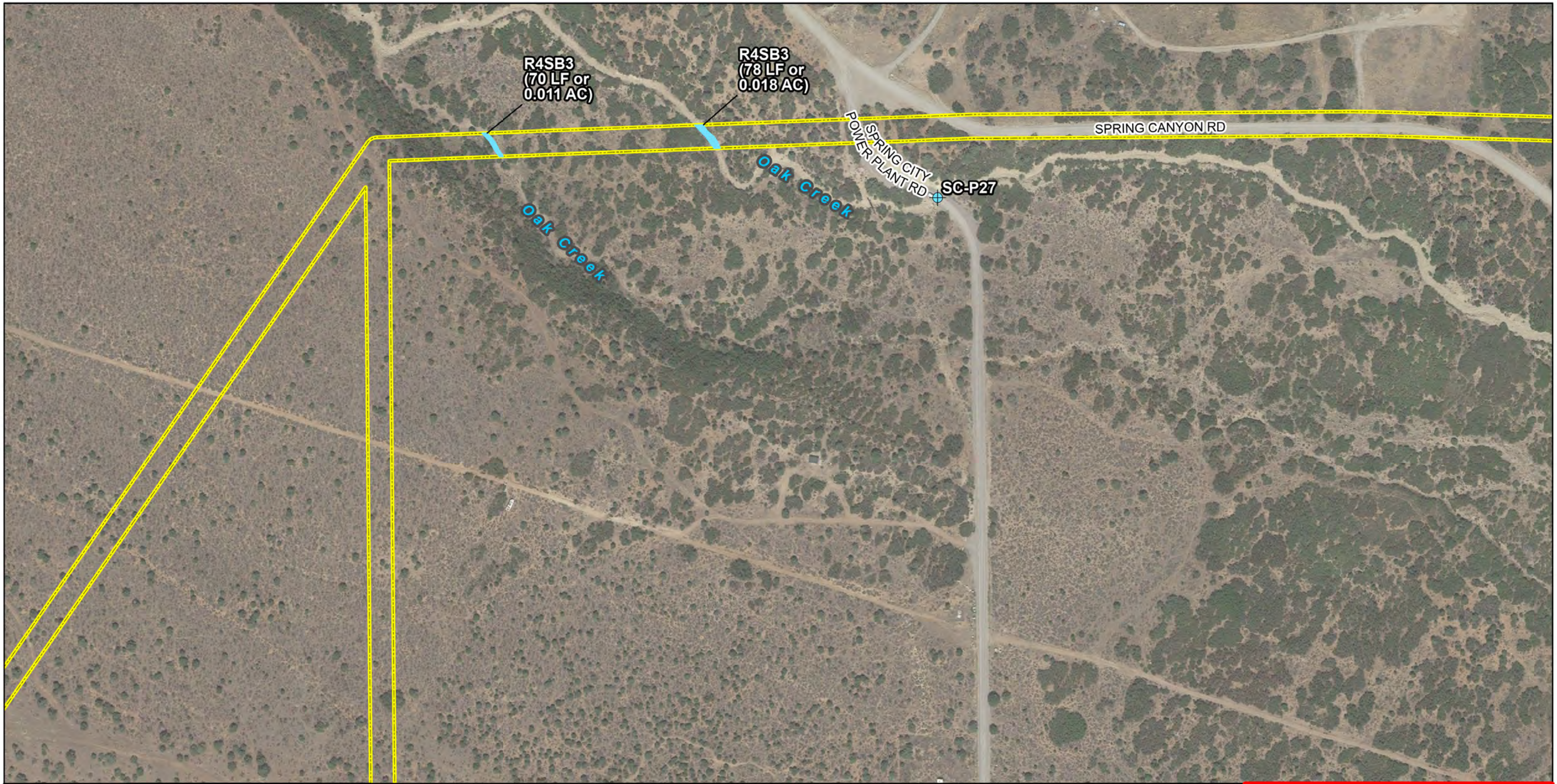

J·U·B ENGINEERS, INC.

Water Resources Assessment

Map 26

Delineation of Wetlands and Other Waters of the U.S. - for the Spring City Watershed Flood and Irrigation Project

Revised 11/7/2023

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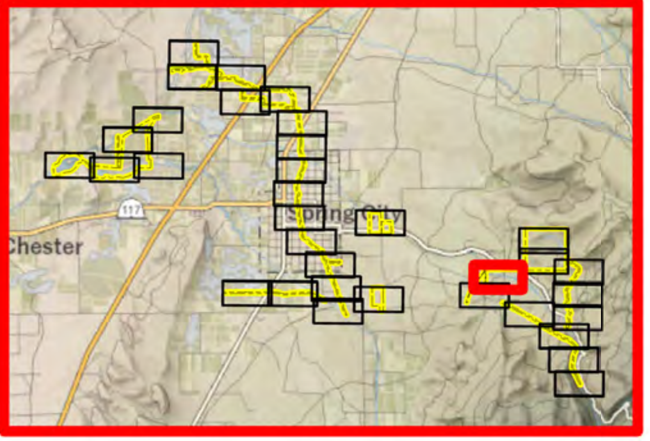

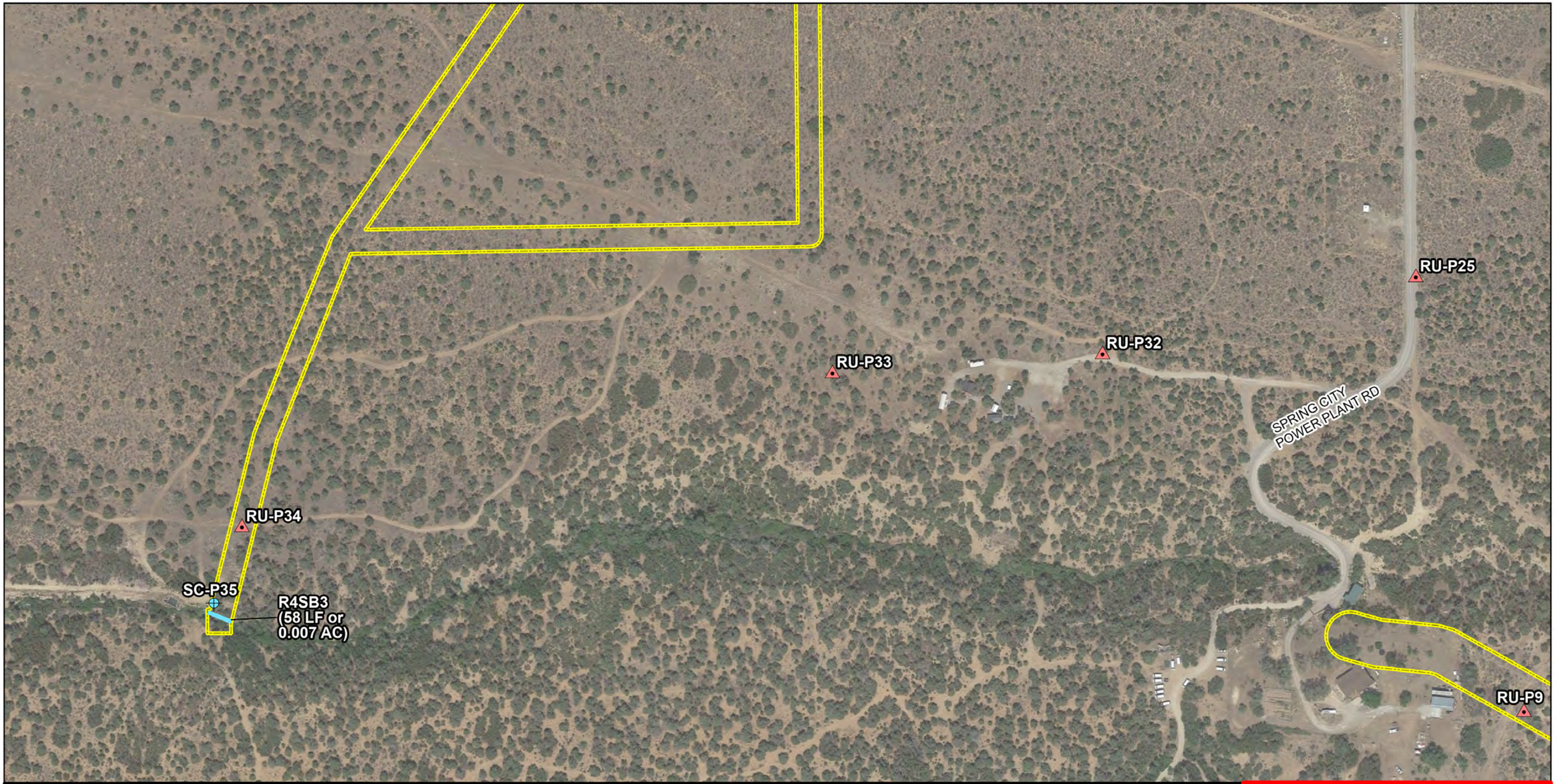

J·U·B ENGINEERS, INC.

Water Resources Assessment

Map 27

Delineation of Wetlands and Other Waters of the U.S. - for the Spring City Watershed Flood and Irrigation Project

Revised 11/7/2023

Coord. System: NAD 1983 UTM 12N
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N

Feet
0 125 250 500

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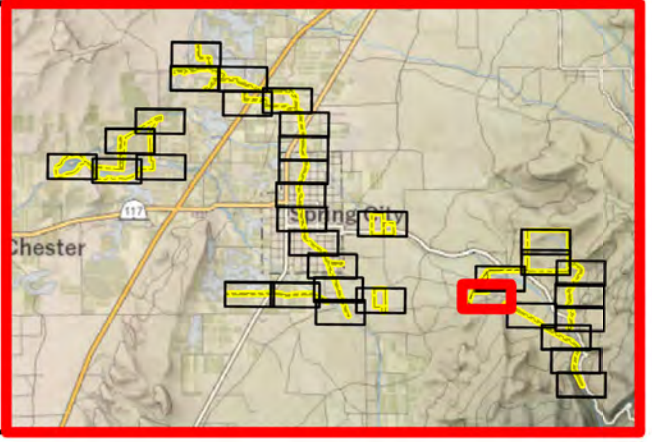

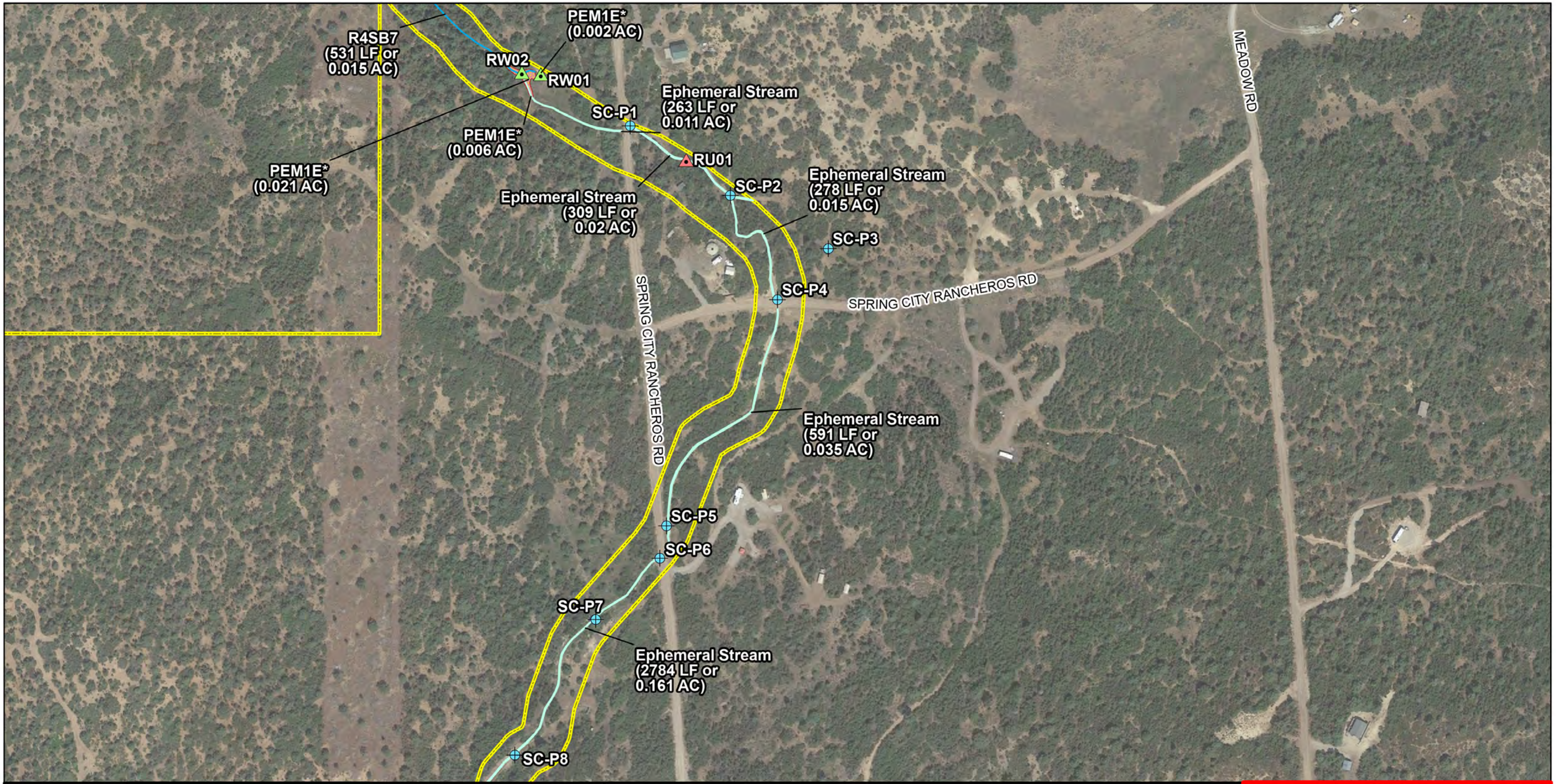

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Water Resources Assessment

Map 28

Delineation of Wetlands and Other Waters of the U.S. - for the Spring City Watershed Flood and Irrigation Project

Revised 11/7/2023

Coord. System: NAD 1983 UTM 12N
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Datum: North American 1983
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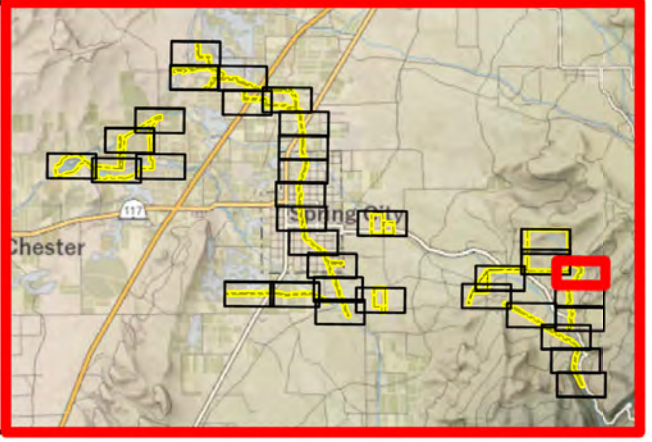

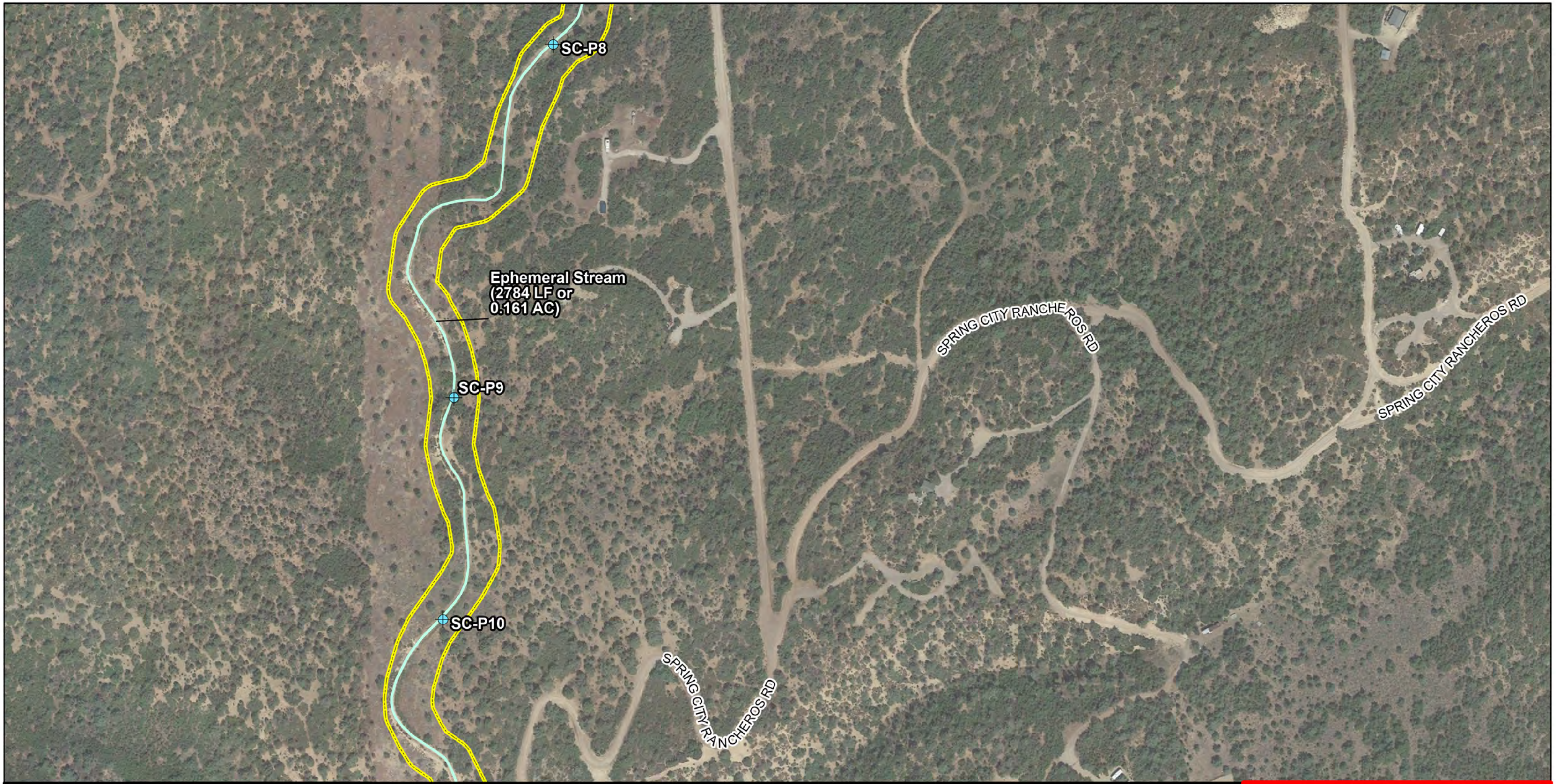

Water Resources Assessment

Map 29

Delineation of Wetlands and Other Waters of the U.S. - for the Spring City Watershed Flood and Irrigation Project

Revised 11/7/2023

J-U-B ENGINEERS, INC.

Coord. System: NAD 1983 UTM 12N
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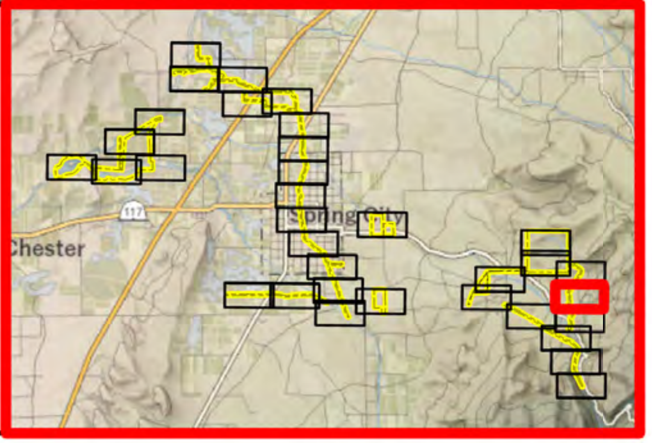

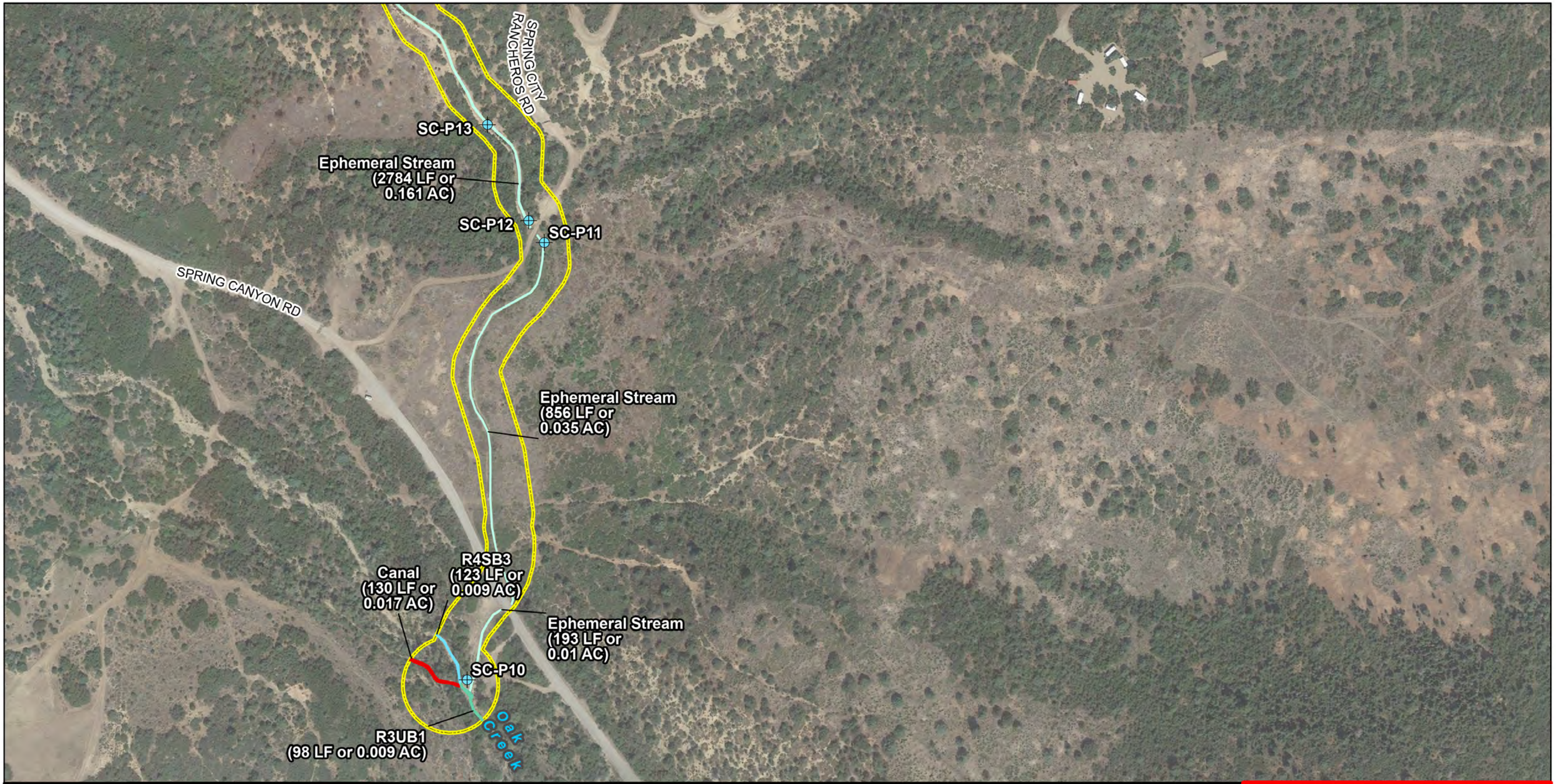

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Water Resources Assessment

Map 30

Delineation of Wetlands and Other Waters of the U.S. - for the Spring City Watershed Flood and Irrigation Project

Revised 11/7/2023

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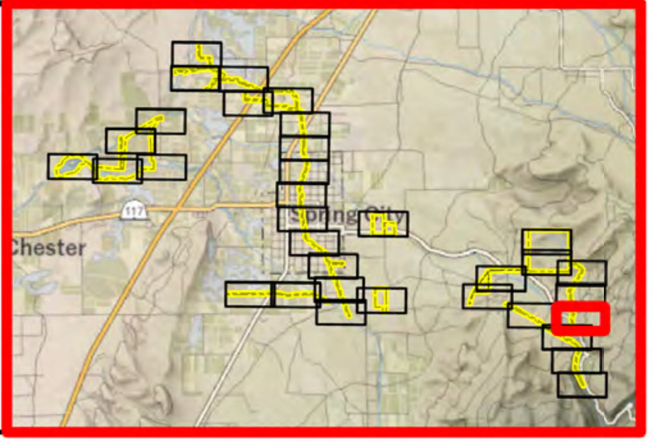

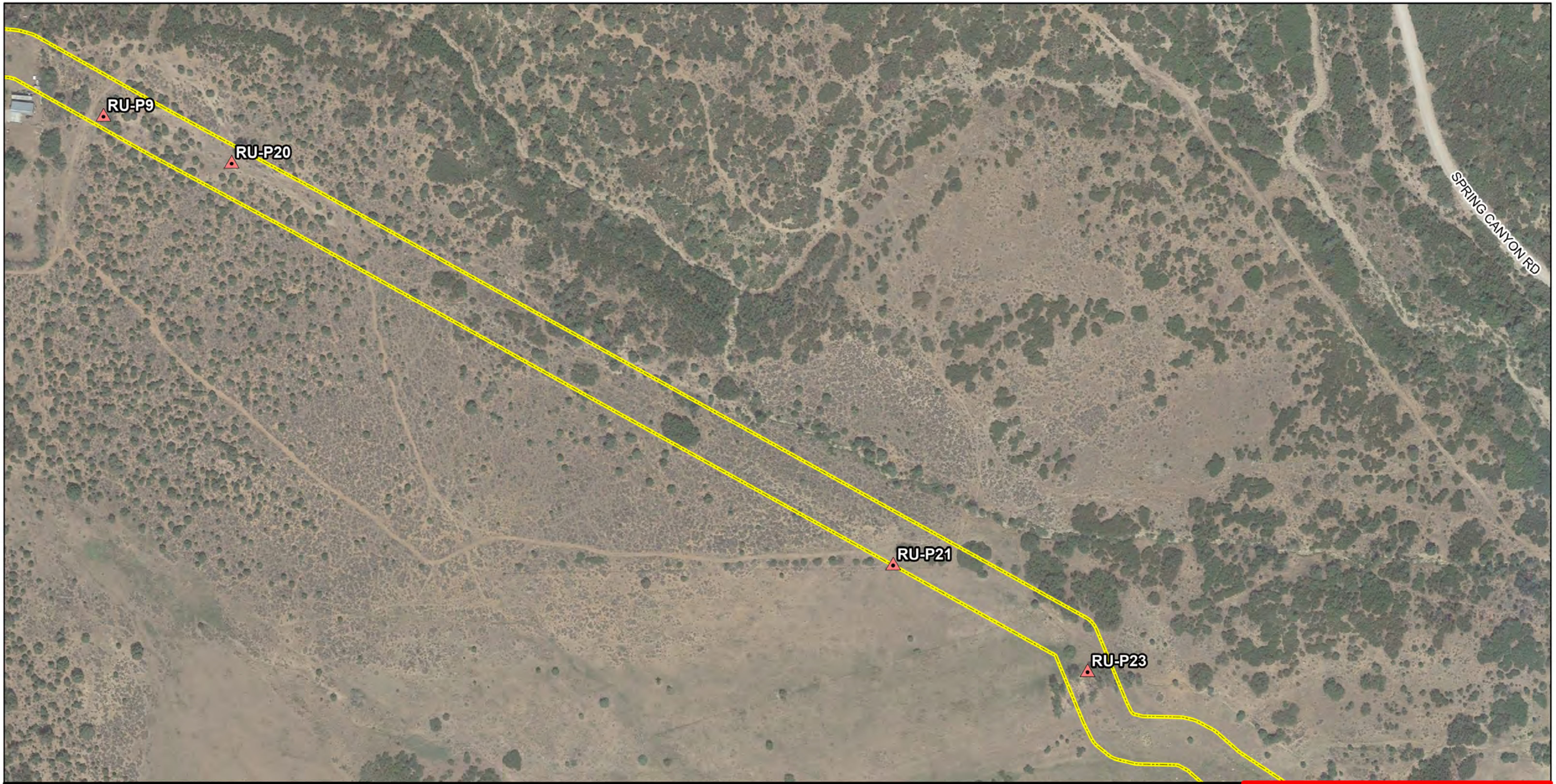

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Water Resources Assessment

Map 31

Delineation of Wetlands and Other Waters of the U.S. - for the Spring City Watershed Flood and Irrigation Project

Revised 11/7/2023

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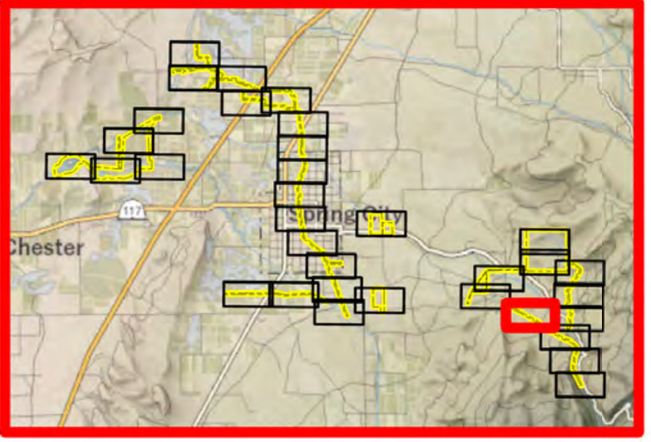

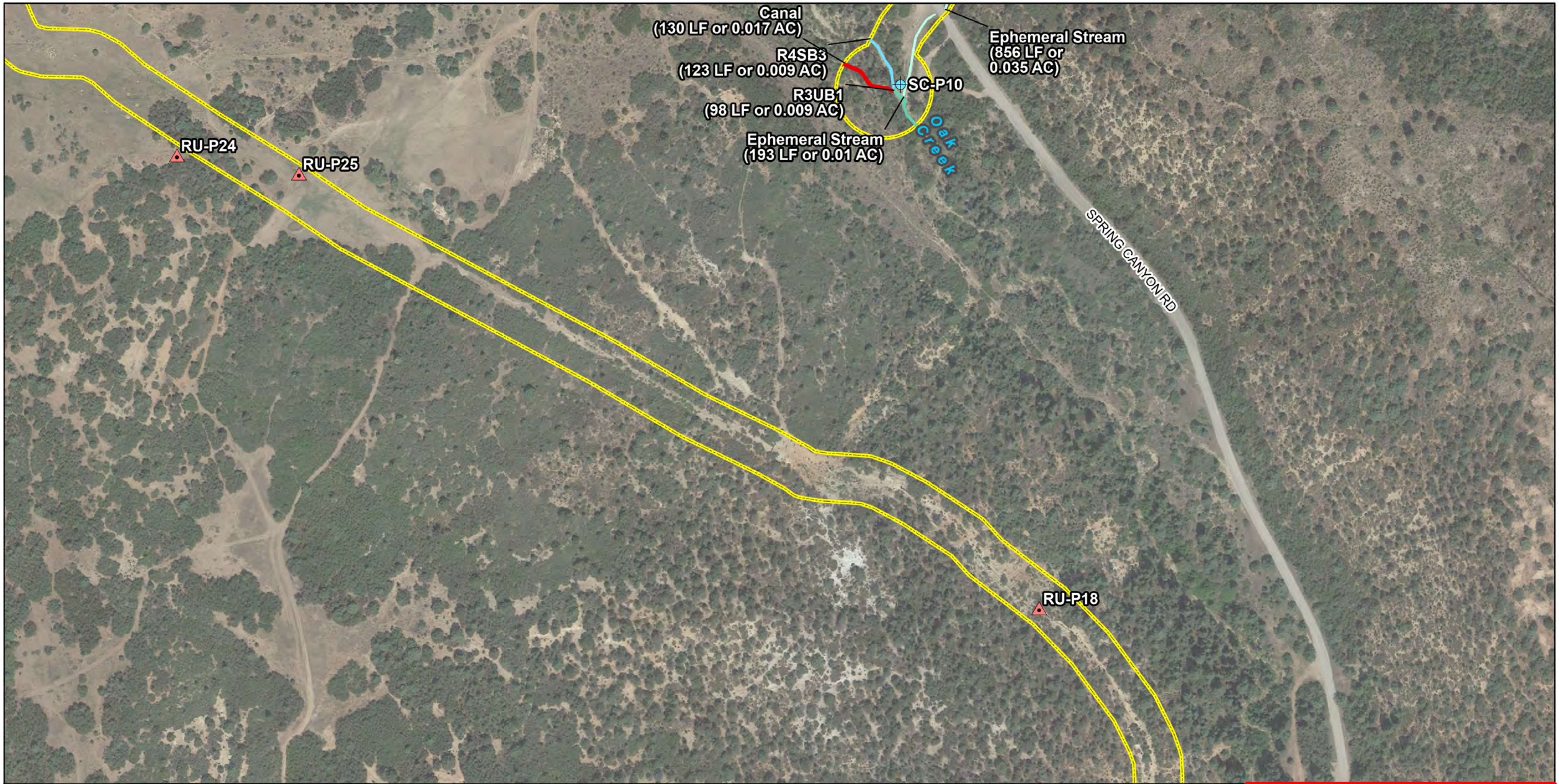

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Water Resources Assessment

Map 32

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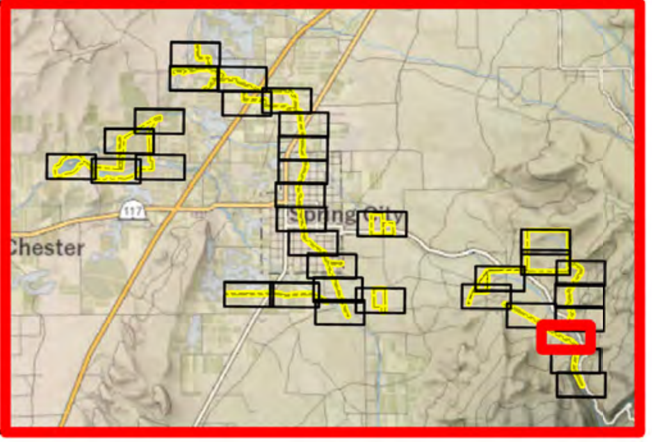

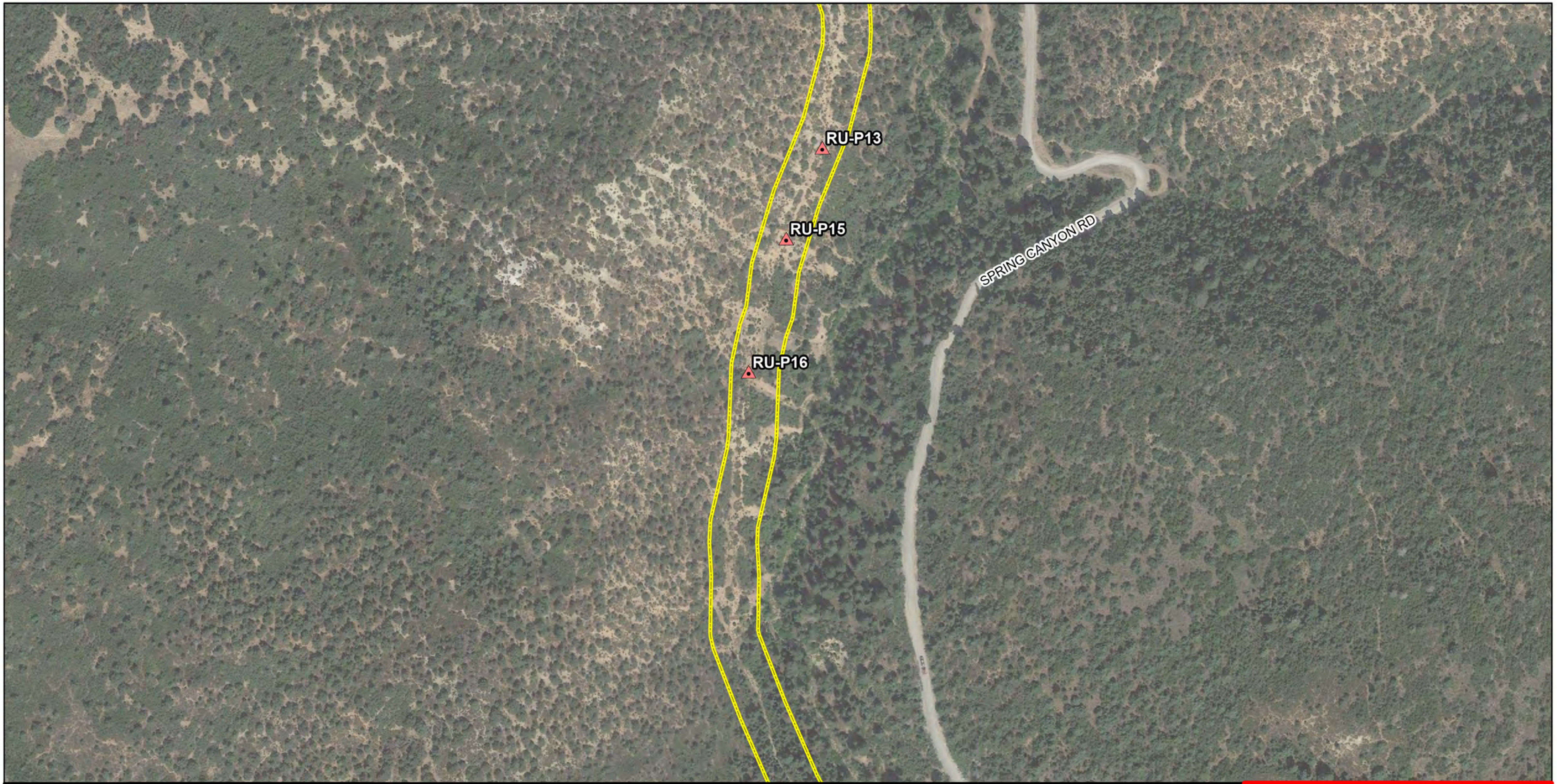

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Water Resources Assessment

Map 33

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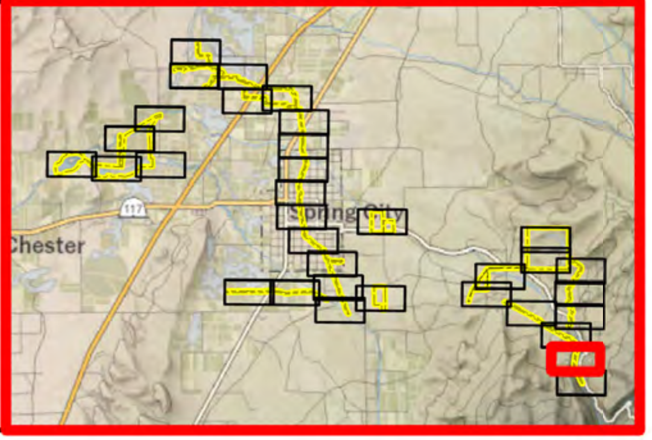

J·U·B ENGINEERS, INC.

Water Resources Assessment

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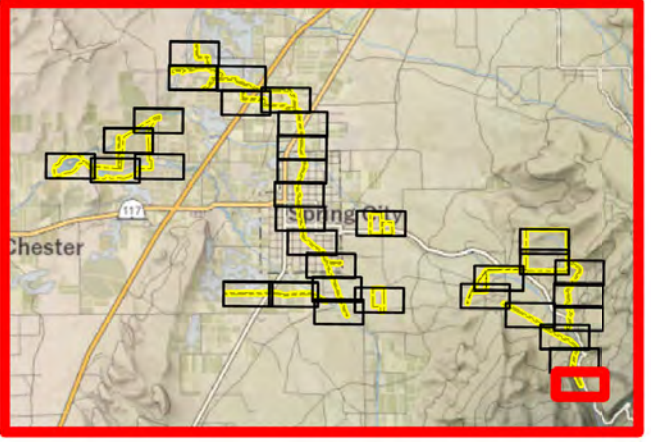


WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Spring City City/County: Spring City Sampling Date: 7/12/2021

Applicant/Owner: ______ State: UT Sampling Point: SP01

Investigator(s): D. White, Section, Township, Range: S35 T15S R4E

Landform (hillslope, terrace, etc.): Hillslope Local relief (concave, convex, none): Concave Slope (%): 2

Subregion (LRR): Greater Salt Lake Area Lat: 39.474568° Long: -111.431342° Datum: WGS 84

Soil Map Unit Name: Clegg loam, 3 to 10 percent slopes NWI classification: PEM1E

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No ✓ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ____ No ✓

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓ No ____	**Is the Sampled Area within a Wetland?** Yes ✓ No ____
Hydric Soil Present?	Yes ✓ No ____	
Wetland Hydrology Present?	Yes ✓ No ____	

Remarks:

Precipitation is below normal for the year.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	____ = Total Cover		
Sapling/Shrub Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
	____ = Total Cover		
Herb Stratum (Plot size: ____)			
1. Phalaris arundinacea	70	Y	FACW
2. Juncus balticus	10		FACW
3.			
4.			
5.			
6.			
7.			
8.			
	____ = Total Cover		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
	80 = Total Cover		

% Bare Ground in Herb Stratum ____ % Cover of Biotic Crust ____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC:	1	(A)
Total Number of Dominant Species Across All Strata:	1	(B)
Percent of Dominant Species That Are OBL, FACW, or FAC:	100	(A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	____	x 1 = ____
FACW species	____	x 2 = ____
FAC species	____	x 3 = ____
FACU species	____	x 4 = ____
UPL species	____	x 5 = ____
Column Totals:	____ (A)	____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

✓ Dominance Test is >50%

__ Prevalence Index is ≤3.0[1]

__ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

__ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No ____

Remarks:

SOIL

Sampling Point: SP01

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-18	10 YR 2/1						Organic	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ✓ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes ✓ No ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ✓ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ✓ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ✓ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No ✓ Depth (inches): ______

Water Table Present? Yes ___ No ✓ Depth (inches): ______

Saturation Present? (includes capillary fringe) Yes ___ No ✓ Depth (inches): ______

Wetland Hydrology Present? Yes ✓ No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

SP01 Typical Site Conditions | East

SP01 Typical Site Conditions | West

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Spring City City/County: Spring City Sampling Date: 7/12/2021

Applicant/Owner: ______ State: UT Sampling Point: SP02

Investigator(s): D. White, Section, Township, Range: S35 T15S R4E

Landform (hillslope, terrace, etc.): Hillslope Local relief (concave, convex, none): Convex Slope (%): 4

Subregion (LRR): Greater Salt Lake Area Lat: 39.474018° Long: -111.430929° Datum: WGS 84

Soil Map Unit Name: Clegg loam, 3 to 10 percent slopes NWI classification: NA

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No ✓ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ____ No ✓

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?		✓
Hydric Soil Present?		✓
Wetland Hydrology Present?		✓

Is the Sampled Area within a Wetland? Yes ____ No ✓

Remarks:

Precipitation is below normal for the year.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
= Total Cover			
Sapling/Shrub Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
= Total Cover			
Herb Stratum (Plot size: ____)			
1. Cardaria draba	20	Y	UPL
2. Bromus inermis	25	Y	FACU
3. Achillea millefolium	10		FACU
4.			
5.			
6.			
7.			
8.			
= Total Cover	55		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
= Total Cover			

% Bare Ground in Herb Stratum ____ % Cover of Biotic Crust ____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 0 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	0	x 1 = 0
FACW species	0	x 2 = 0
FAC species	0	x 3 = 0
FACU species	35	x 4 = 140
UPL species	20	x 5 = 100
Column Totals:	55 (A)	240 (B)

Prevalence Index = B/A = 4.4

Hydrophytic Vegetation Indicators:

- ___ Dominance Test is >50%
- ___ Prevalence Index is ≤3.0[1]
- ___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ____ No ✓

Remarks:

SOIL

Sampling Point: SP02

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
1-16	10 YR 3/2	100					Silt Loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

__ Histosol (A1)
__ Histic Epipedon (A2)
__ Black Histic (A3)
__ Hydrogen Sulfide (A4)
__ Stratified Layers (A5) (**LRR C**)
__ 1 cm Muck (A9) (**LRR D**)
__ Depleted Below Dark Surface (A11)
__ Thick Dark Surface (A12)
__ Sandy Mucky Mineral (S1)
__ Sandy Gleyed Matrix (S4)
__ Sandy Redox (S5)
__ Stripped Matrix (S6)
__ Loamy Mucky Mineral (F1)
__ Loamy Gleyed Matrix (F2)
__ Depleted Matrix (F3)
__ Redox Dark Surface (F6)
__ Depleted Dark Surface (F7)
__ Redox Depressions (F8)
__ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

__ 1 cm Muck (A9) (**LRR C**)
__ 2 cm Muck (A10) (**LRR B**)
__ Reduced Vertic (F18)
__ Red Parent Material (TF2)
__ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes ___ No ✓

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

__ Surface Water (A1)
__ High Water Table (A2)
__ Saturation (A3)
__ Water Marks (B1) (**Nonriverine**)
__ Sediment Deposits (B2) (**Nonriverine**)
__ Drift Deposits (B3) (**Nonriverine**)
__ Surface Soil Cracks (B6)
__ Inundation Visible on Aerial Imagery (B7)
__ Water-Stained Leaves (B9)
__ Salt Crust (B11)
__ Biotic Crust (B12)
__ Aquatic Invertebrates (B13)
__ Hydrogen Sulfide Odor (C1)
__ Oxidized Rhizospheres along Living Roots (C3)
__ Presence of Reduced Iron (C4)
__ Recent Iron Reduction in Tilled Soils (C6)
__ Thin Muck Surface (C7)
__ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

__ Water Marks (B1) (**Riverine**)
__ Sediment Deposits (B2) (**Riverine**)
__ Drift Deposits (B3) (**Riverine**)
__ Drainage Patterns (B10)
__ Dry-Season Water Table (C2)
__ Crayfish Burrows (C8)
__ Saturation Visible on Aerial Imagery (C9)
__ Shallow Aquitard (D3)
__ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No ✓ Depth (inches): ______

Water Table Present? Yes ___ No ✓ Depth (inches): ______

Saturation Present? (includes capillary fringe) Yes ___ No ✓ Depth (inches): ______

Wetland Hydrology Present? Yes ___ No ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

SP02 Typical Site Conditions | Solis

SP02 Typical Site Conditions | West

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Spring City City/County: Spring City Sampling Date: 7/12/2021

Applicant/Owner: ______ State: UT Sampling Point: SP03

Investigator(s): D. White, Section, Township, Range: S35 T15S R4E

Landform (hillslope, terrace, etc.): Hillslope Local relief (concave, convex, none): Concave Slope (%): 2

Subregion (LRR): Greater Salt Lake Area Lat: 39.474568° Long: -111.431342° Datum: WGS 84

Soil Map Unit Name: Clegg loam, 3 to 10 percent slopes NWI classification: PEM1E

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No ✓ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ____ No ✓

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓ No ____	**Is the Sampled Area within a Wetland?**	**Yes** ✓ **No** ____
Hydric Soil Present?	Yes ✓ No ____		
Wetland Hydrology Present?	Yes ✓ No ____		

Remarks:

Precipitation is below normal for the year.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
= Total Cover			
Sapling/Shrub Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
= Total Cover			
Herb Stratum (Plot size: ____)			
1. Juncus balticus	90	Y	FACW
2. Alopecurus pratensis	10		FACW
3.			
4.			
5.			
6.			
7.			
8.			
= Total Cover			
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
= Total Cover	80		

% Bare Ground in Herb Stratum ____ % Cover of Biotic Crust ____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	____	x 1 = ____
FACW species	____	x 2 = ____
FAC species	____	x 3 = ____
FACU species	____	x 4 = ____
UPL species	____	x 5 = ____
Column Totals:	____ (A)	____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

- ✓ Dominance Test is >50%
- ___ Prevalence Index is ≤3.0[1]
- ___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** ✓ **No** ____

Remarks:

SOIL

Sampling Point: SP03

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-16	10 YR 2/1	70	10 YR 5/8	5	C	PL	Silt Loam	
	10 YR 7/2	25						

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ✓ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ______________

Depth (inches): ______________

Hydric Soil Present? Yes ✓ No ______

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ✓ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ✓ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ✓ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ______ No ✓ Depth (inches): ______________

Water Table Present? Yes ______ No ✓ Depth (inches): ______________

Saturation Present? (includes capillary fringe) Yes ______ No ✓ Depth (inches): ______________

Wetland Hydrology Present? Yes ✓ No ______

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

SP03 Typical Site Conditions | East

SP03 Typical Site Conditions | West

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Spring City City/County: Spring City Sampling Date: 7/12/2021

Applicant/Owner: ______ State: UT Sampling Point: SP04

Investigator(s): D. White, Z. Scott Section, Township, Range: S25 T15S R3E

Landform (hillslope, terrace, etc.): Flood Plain Local relief (concave, convex, none): Concave Slope (%): 2

Subregion (LRR): Greater Salt Lake Area Lat: 39.488736° Long: -111.528887° Datum: WGS 84

Soil Map Unit Name: Fluvaquents NWI classification: PEM1E

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ___ No ✓ (If no, explain in Remarks.)

Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes ___ No ✓

Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓ No ___	**Is the Sampled Area within a Wetland?**	**Yes** ✓ **No** ___
Hydric Soil Present?	Yes ✓ No ___		
Wetland Hydrology Present?	Yes ✓ No ___		

Remarks:

Precipitation is below normal for the year.

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: ___)			
1.			
2.			
3.			
4.			
		= Total Cover	
Sapling/Shrub Stratum (Plot size: ___)			
1.			
2.			
3.			
4.			
5.			
		= Total Cover	
Herb Stratum (Plot size: ___)			
1. Oenothera rosea	85	Y	FACW
2. Schoenoplectus acutus	10		OBL
3.			
4.			
5.			
6.			
7.			
8.			
	95	= Total Cover	
Woody Vine Stratum (Plot size: ___)			
1.			
2.			
		= Total Cover	

% Bare Ground in Herb Stratum ___ % Cover of Biotic Crust ___

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	___	x 1 = ___
FACW species	___	x 2 = ___
FAC species	___	x 3 = ___
FACU species	___	x 4 = ___
UPL species	___	x 5 = ___
Column Totals:	___ (A)	___ (B)

Prevalence Index = B/A = ___

Hydrophytic Vegetation Indicators:

✓ Dominance Test is >50%
___ Prevalence Index is ≤3.0[1]
___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** ✓ **No** ___

Remarks:

SOIL

Sampling Point: SP04

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-10	10 YR 4/2	96	7.5 YR 4/6	4	C	PL	Silty Clay	
10-18	10 YR 5/2	94	7.5 YR 4/6	6	C	PL	Clay	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ✓ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: Aquitard

Depth (inches): 10

Hydric Soil Present? Yes ✓ No ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ✓ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ✓ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ✓ Shallow Aquitard (D3)
- ✓ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No ✓ Depth (inches): ___

Water Table Present? Yes ___ No ✓ Depth (inches): ___

Saturation Present? (includes capillary fringe) Yes ___ No ✓ Depth (inches): ___

Wetland Hydrology Present? Yes ✓ No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

SP04 Typical Site Conditions | Solis

SP04 Typical Site Conditions | East

WETLAND DETERMINATION DATA FORM - Arid West Region

Project/Site: Spring City Watershed Flood and Irrigation City/County: Sanpete County Sampling Date: 7/13/21

Applicant/Owner: Spring City and Horseshoe Irrigation Company State: UT Sampling Point: SP-U1

Investigator(s): Tyler Schade, Danny White Section, Township, Range: S24, T15S, R03E

Landform (hillslope, terrace, etc.): hillslope Local relief (concave, convex, none): none Slope (%): 3

Subregion (LRR): D - Interior Deserts Lat: 39.49709594 Long: -111.52722059 Datum: NAD 1983

Soil Map Unit Name: Shumway loam NWI classification: NA

Are climatic / hydrologic conditions on the site typical for this time of year? Yes (•) No ( ) (If no, explain in Remarks.)

Are Vegetation ☐ Soil ☐ or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes (•) No ( )

Are Vegetation ☐ Soil ☐ or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes (•)	No ( )
Hydric Soil Present?	Yes ( )	No (•)
Wetland Hydrology Present?	Yes ( )	No (•)

Is the Sampled Area within a Wetland? Yes ( ) No (•)

Remarks:

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	%		
Sapling/Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
Total Cover:	%		
Herb Stratum			
1. *Carex sp.*	10		OBL
2. *Poa pratensis*	60	Yes	FAC
3. *Lactuca serriola*	10		FACU
4. *Juncus sp.*	20	Yes	FACW
5.			
6.			
7.			
8.			
Total Cover:	100%		
Woody Vine Stratum			
1.			
2.			
Total Cover:	%		

% Bare Ground in Herb Stratum % % Cover of Biotic Crust %

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC:	2	(A)
Total Number of Dominant Species Across All Strata:	2	(B)
Percent of Dominant Species That Are OBL, FACW, or FAC:	100.0%	(A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	10	x 1 =	10
FACW species	20	x 2 =	40
FAC species	60	x 3 =	180
FACU species	10	x 4 =	40
UPL species		x 5 =	0
Column Totals:	100 (A)		270 (B)

Prevalence Index = B/A = 2.70

Hydrophytic Vegetation Indicators:

- [x] Dominance Test is >50%
- [x] Prevalence Index is ≤3.0[1]
- [ ] Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- [ ] Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes (•) No ( )

Remarks: heavy grazing in area restricted identifying plant to species

SOIL

Sampling Point: SP-U1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture[3]	Remarks
0-13	10YR 4/3						silt loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.
[3]Soil Textures: Clay, Silty Clay, Sandy Clay, Loam, Sandy Clay Loam, Sandy Loam, Clay Loam, Silty Clay Loam, Silt Loam, Silt, Loamy Sand, Sand.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (**LRR C**)
- ☐ 1 cm Muck (A9) (**LRR D**)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[4]:

- ☐ 1 cm Muck (A9) (**LRR C**)
- ☐ 2 cm Muck (A10) (**LRR B**)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☐ Other (Explain in Remarks)

[4]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type:

Depth (inches):

Hydric Soil Present? Yes ○ No ◉

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1) (**Nonriverine**)
- ☐ Sediment Deposits (B2) (**Nonriverine**)
- ☐ Drift Deposits (B3) (**Nonriverine**)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☐ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Plowed Soils (C6)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Marks (B1) (**Riverine**)
- ☐ Sediment Deposits (B2) (**Riverine**)
- ☐ Drift Deposits (B3) (**Riverine**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Thin Muck Surface (C7)
- ☐ Crayfish Burrows (C8)
- ☒ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ○ No ◉ Depth (inches):

Water Table Present? Yes ○ No ◉ Depth (inches):

Saturation Present? (includes capillary fringe) Yes ○ No ◉ Depth (inches):

Wetland Hydrology Present? Yes ○ No ◉

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: saturation present on aerial imagery on: 8/7/2015, 5/31/2013, 9/14/2011, 6/22/2009, 7/12/2006, 12/31/2005, and 8/4/2004

WETLAND DETERMINATION DATA FORM - Arid West Region

Project/Site: Spring City Watershed Flood and Irrigation   City/County: Sanpete County   Sampling Date: 7/13/21

Applicant/Owner: Spring City and Horseshoe Irrigation Company   State: UT   Sampling Point: SP-W1

Investigator(s): Tyler Schade, Danny White   Section, Township, Range: S24, T15S, R03E

Landform (hillslope, terrace, etc.): hillslope   Local relief (concave, convex, none): none   Slope (%): 3

Subregion (LRR): D - Interior Deserts   Lat: 39.49714163   Long: -111.52723773   Datum: NAD 1983

Soil Map Unit Name: Shumway silty loam   NWI classification: NA

Are climatic / hydrologic conditions on the site typical for this time of year? Yes (●) No ( ) (If no, explain in Remarks.)

Are Vegetation ☐ Soil ☐ or Hydrology ☐ significantly disturbed?   Are "Normal Circumstances" present? Yes (●) No ( )

Are Vegetation ☐ Soil ☐ or Hydrology ☐ naturally problematic?   (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes (●)	No ( )
Hydric Soil Present?	Yes (●)	No ( )
Wetland Hydrology Present?	Yes (●)	No ( )

Is the Sampled Area within a Wetland? Yes (●) No ( )

Remarks:

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	%		
Sapling/Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
Total Cover:	%		
Herb Stratum			
1. *Carex sp.*	70	Yes	OBL
2. *Juncus sp.*	30	Yes	FACW
3.			
4.			
5.			
6.			
7.			
8.			
Total Cover:	100%		
Woody Vine Stratum			
1.			
2.			
Total Cover:	%		

% Bare Ground in Herb Stratum ___ %   % Cover of Biotic Crust ___ %

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC:	2	(A)
Total Number of Dominant Species Across All Strata:	2	(B)
Percent of Dominant Species That Are OBL, FACW, or FAC:	100.0%	(A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	70	x 1 =	70
FACW species	30	x 2 =	60
FAC species		x 3 =	0
FACU species		x 4 =	0
UPL species		x 5 =	0
Column Totals:	100 (A)		130 (B)

Prevalence Index = B/A = 1.30

Hydrophytic Vegetation Indicators:

- ☒ Dominance Test is >50%
- ☒ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes (●) No ( )

Remarks: heavy grazing in area restricted identifying plant to species

SOIL

Sampling Point: SP-W1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture[3]	Remarks
0-4	10YR 3/3	97	7.5YR 4/6	3	C	M	loam	
4-15	10YR 3/3	97	7.5YR 5/6	3	C	M	mucky loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.
[3]Soil Textures: Clay, Silty Clay, Sandy Clay, Loam, Sandy Clay Loam, Sandy Loam, Clay Loam, Silty Clay Loam, Silt Loam, Silt, Loamy Sand, Sand.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (**LRR C**)
- ☐ 1 cm Muck (A9) (**LRR D**)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☒ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[4]:

- ☐ 1 cm Muck (A9) (**LRR C**)
- ☐ 2 cm Muck (A10) (**LRR B**)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☐ Other (Explain in Remarks)

[4]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):
Type:
Depth (inches):

Hydric Soil Present? Yes ◉ No ○

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☒ Saturation (A3)
- ☐ Water Marks (B1) (**Nonriverine**)
- ☐ Sediment Deposits (B2) (**Nonriverine**)
- ☐ Drift Deposits (B3) (**Nonriverine**)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☐ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Plowed Soils (C6)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Marks (B1) (**Riverine**)
- ☐ Sediment Deposits (B2) (**Riverine**)
- ☐ Drift Deposits (B3) (**Riverine**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Thin Muck Surface (C7)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ○ No ◉ Depth (inches):
Water Table Present? Yes ○ No ◉ Depth (inches):
Saturation Present? (includes capillary fringe) Yes ◉ No ○ Depth (inches): 4

Wetland Hydrology Present? Yes ◉ No ○

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM - Arid West Region

Project/Site: Spring City Watershed Flood and Irrigation City/County: Sanpete County Sampling Date: 7/13/21

Applicant/Owner: Spring City and Horseshoe Irrigation Company State: UT Sampling Point: SP-U2

Investigator(s): Tyler Schade, Danny White Section, Township, Range: S24, T15S, R03E

Landform (hillslope, terrace, etc.): hillslope Local relief (concave, convex, none): none Slope (%): 3

Subregion (LRR): D - Interior Deserts Lat: 39.49682801 Long: -111.52745114 Datum: NAD 1983

Soil Map Unit Name: Fluvaquent NWI classification: PEM1A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes (●) No ( ) (If no, explain in Remarks.)

Are Vegetation ☐ Soil ☐ or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes (●) No ( )

Are Vegetation ☐ Soil ☐ or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes (●)	No ( )
Hydric Soil Present?	Yes (●)	No ( )
Wetland Hydrology Present?	Yes (●)	No ( )

Is the Sampled Area within a Wetland? Yes (●) No ( )

Remarks:

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	%		
Sapling/Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
Total Cover:	%		
Herb Stratum			
1. *Carex sp.*	30	Yes	OBL
2. *Poa pratensis*	50	Yes	FAC
3. *Cirsium arvense*	20	Yes	FACU
4.			
5.			
6.			
7.			
8.			
Total Cover:	100%		
Woody Vine Stratum			
1.			
2.			
Total Cover:	%		

% Bare Ground in Herb Stratum % % Cover of Biotic Crust %

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC:	2	(A)
Total Number of Dominant Species Across All Strata:	3	(B)
Percent of Dominant Species That Are OBL, FACW, or FAC:	66.7 %	(A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	30	x 1 =	30
FACW species		x 2 =	0
FAC species	50	x 3 =	150
FACU species	20	x 4 =	80
UPL species		x 5 =	0
Column Totals:	100 (A)		260 (B)

Prevalence Index = B/A = 2.60

Hydrophytic Vegetation Indicators:

- ☒ Dominance Test is >50%
- ☒ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes (●) No ( )

Remarks: heavy grazing in area restricted identifying plant to species

SOIL

Sampling Point: SP-U2

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture[3]	Remarks
0-12	10YR 4/2						silt loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.
[3]Soil Textures: Clay, Silty Clay, Sandy Clay, Loam, Sandy Clay Loam, Sandy Loam, Clay Loam, Silty Clay Loam, Silt Loam, Silt, Loamy Sand, Sand.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (**LRR C**)
- ☐ 1 cm Muck (A9) (**LRR D**)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☒ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[4]:

- ☐ 1 cm Muck (A9) (**LRR C**)
- ☐ 2 cm Muck (A10) (**LRR B**)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☐ Other (Explain in Remarks)

[4]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type:

Depth (inches):

Hydric Soil Present? Yes ◉ No ○

Remarks: Soils in this region have a high pH ranging from 7.5-9. It is assumed that redox features would be presence if lower pH was present.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1) (**Nonriverine**)
- ☐ Sediment Deposits (B2) (**Nonriverine**)
- ☐ Drift Deposits (B3) (**Nonriverine**)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☐ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Plowed Soils (C6)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Marks (B1) (**Riverine**)
- ☐ Sediment Deposits (B2) (**Riverine**)
- ☐ Drift Deposits (B3) (**Riverine**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Thin Muck Surface (C7)
- ☐ Crayfish Burrows (C8)
- ☒ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☒ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ○ No ◉ Depth (inches):

Water Table Present? Yes ○ No ◉ Depth (inches):

Saturation Present? (includes capillary fringe) Yes ○ No ◉ Depth (inches):

Wetland Hydrology Present? Yes ◉ No ○

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: saturation present on aerial imagery on: 8/7/2015, 5/31/2013, 9/14/2011, 6/22/2009, 7/12/2006, 12/31/2005, and 8/4/2004

WETLAND DETERMINATION DATA FORM - Arid West Region

Project/Site: Spring City Watershed Flood and Irrigation | City/County: Sanpete County | Sampling Date: 7/13/21

Applicant/Owner: Spring City and Horseshoe Irrigation Company | State: UT | Sampling Point: SP-U3

Investigator(s): Tyler Schade, Danny White | Section, Township, Range: S24, T15S, R03E

Landform (hillslope, terrace, etc.): hillslope | Local relief (concave, convex, none): none | Slope (%): 4

Subregion (LRR): D - Interior Deserts | Lat: 39.49489171 | Long: -111.53038630 | Datum: NAD 1983

Soil Map Unit Name: Fluvaquent | NWI classification: PEM1A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ◉ No ○ (If no, explain in Remarks.)

Are Vegetation ☐ Soil ☐ or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ◉ No ○

Are Vegetation ☐ Soil ☐ or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ◉	No ○	
Hydric Soil Present?	Yes ◉	No ○	**Is the Sampled Area**
Wetland Hydrology Present?	Yes ◉	No ○	**within a Wetland?** Yes ◉ No ○

Remarks:

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	%		
Sapling/Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
Total Cover:	%		
Herb Stratum			
1. *Carex sp.*	20	Yes	OBL
2. *Poa pratensis*	60	Yes	FAC
3. *Juncus sp.*	10		FACW
4.			
5.			
6.			
7.			
8.			
Total Cover:	90 %		
Woody Vine Stratum			
1.			
2.			
Total Cover:	%		

% Bare Ground in Herb Stratum 10 % | % Cover of Biotic Crust %

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC:	2	(A)
Total Number of Dominant Species Across All Strata:	2	(B)
Percent of Dominant Species That Are OBL, FACW, or FAC:	100.0 %	(A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:		
OBL species	20	x 1 =	20	
FACW species	10	x 2 =	20	
FAC species	60	x 3 =	180	
FACU species		x 4 =	0	
UPL species		x 5 =	0	
Column Totals:	90	(A)	220	(B)

Prevalence Index = B/A = 2.44

Hydrophytic Vegetation Indicators:

- ☒ Dominance Test is >50%
- ☒ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes ◉ No ○

Remarks: heavy grazing in area restricted identifying plant to species

SOIL

Sampling Point: SP-U3

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Color (moist)	Redox %	Type[1]	Loc[2]	Texture[3]	Remarks
0-12	10YR 3/3						silt loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.
[3]Soil Textures: Clay, Silty Clay, Sandy Clay, Loam, Sandy Clay Loam, Sandy Loam, Clay Loam, Silty Clay Loam, Silt Loam, Silt, Loamy Sand, Sand.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- [ ] Histosol (A1)
- [ ] Histic Epipedon (A2)
- [ ] Black Histic (A3)
- [ ] Hydrogen Sulfide (A4)
- [ ] Stratified Layers (A5) (**LRR C**)
- [ ] 1 cm Muck (A9) (**LRR D**)
- [ ] Depleted Below Dark Surface (A11)
- [ ] Thick Dark Surface (A12)
- [ ] Sandy Mucky Mineral (S1)
- [ ] Sandy Gleyed Matrix (S4)
- [ ] Sandy Redox (S5)
- [ ] Stripped Matrix (S6)
- [ ] Loamy Mucky Mineral (F1)
- [ ] Loamy Gleyed Matrix (F2)
- [ ] Depleted Matrix (F3)
- [x] Redox Dark Surface (F6)
- [ ] Depleted Dark Surface (F7)
- [ ] Redox Depressions (F8)
- [ ] Vernal Pools (F9)

Indicators for Problematic Hydric Soils[4]:

- [ ] 1 cm Muck (A9) (**LRR C**)
- [ ] 2 cm Muck (A10) (**LRR B**)
- [ ] Reduced Vertic (F18)
- [ ] Red Parent Material (TF2)
- [ ] Other (Explain in Remarks)

[4]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type:

Depth (inches):

Hydric Soil Present? Yes (●) No ( )

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- [ ] Surface Water (A1)
- [ ] High Water Table (A2)
- [ ] Saturation (A3)
- [ ] Water Marks (B1) (**Nonriverine**)
- [ ] Sediment Deposits (B2) (**Nonriverine**)
- [ ] Drift Deposits (B3) (**Nonriverine**)
- [ ] Surface Soil Cracks (B6)
- [ ] Inundation Visible on Aerial Imagery (B7)
- [ ] Water-Stained Leaves (B9)
- [ ] Salt Crust (B11)
- [ ] Biotic Crust (B12)
- [ ] Aquatic Invertebrates (B13)
- [ ] Hydrogen Sulfide Odor (C1)
- [ ] Oxidized Rhizospheres along Living Roots (C3)
- [ ] Presence of Reduced Iron (C4)
- [ ] Recent Iron Reduction in Plowed Soils (C6)
- [ ] Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- [ ] Water Marks (B1) (**Riverine**)
- [ ] Sediment Deposits (B2) (**Riverine**)
- [ ] Drift Deposits (B3) (**Riverine**)
- [ ] Drainage Patterns (B10)
- [ ] Dry-Season Water Table (C2)
- [ ] Thin Muck Surface (C7)
- [ ] Crayfish Burrows (C8)
- [x] Saturation Visible on Aerial Imagery (C9)
- [ ] Shallow Aquitard (D3)
- [x] FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ( ) No (●) Depth (inches):

Water Table Present? Yes ( ) No (●) Depth (inches):

Saturation Present? (includes capillary fringe) Yes ( ) No (●) Depth (inches):

Wetland Hydrology Present? Yes (●) No ( )

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: saturation present on aerial imagery on: 8/7/2015, 5/31/2013, 9/14/2011, 6/22/2009, 7/12/2006, 12/31/2005, and 8/4/2004

SP-U3 Typical Site Conditions | North

WETLAND DETERMINATION DATA FORM - Arid West Region

Project/Site: Spring City Watershed Flood and Irrigation City/County: Sanpete County Sampling Date: 7/13/21

Applicant/Owner: Spring City and Horseshoe Irrigation Company State: UT Sampling Point: SP-W2

Investigator(s): Tyler Schade, Danny White Section, Township, Range: S24, T15S, R03E

Landform (hillslope, terrace, etc.): hillslope Local relief (concave, convex, none): none Slope (%): 3

Subregion (LRR): D - Interior Deserts Lat: 39.496505138 Long: -111.52796556 Datum: NAD 1983

Soil Map Unit Name: Fluvquents NWI classification: NA

Are climatic / hydrologic conditions on the site typical for this time of year? Yes (●) No ( ) (If no, explain in Remarks.)

Are Vegetation ☐ Soil ☐ or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes (●) No ( )

Are Vegetation ☐ Soil ☐ or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes (●)	No ( )	
Hydric Soil Present?	Yes (●)	No ( )	Is the Sampled Area
Wetland Hydrology Present?	Yes (●)	No ( )	within a Wetland? Yes (●) No ( )

Remarks:

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	%		
Sapling/Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
Total Cover:	%		
Herb Stratum			
1. *Carex sp.*	40	Yes	OBL
2. *Juncus sp.*	60	Yes	FACW
3. *Cirsium arvense*	1		FACU
4.			
5.			
6.			
7.			
8.			
Total Cover:	101 %		
Woody Vine Stratum			
1.			
2.			
Total Cover:	%		

% Bare Ground in Herb Stratum ____ % % Cover of Biotic Crust ____ %

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0 % (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	40	x 1 =	40
FACW species	60	x 2 =	120
FAC species		x 3 =	0
FACU species	1	x 4 =	4
UPL species		x 5 =	0
Column Totals:	101 (A)		164 (B)

Prevalence Index = B/A = 1.62

Hydrophytic Vegetation Indicators:

- ☒ Dominance Test is >50%
- ☒ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes (●) No ( )

Remarks: heavy grazing in area restricted identifying plant to species

SOIL

Sampling Point: SP-W2

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture[3]	Remarks
0-14	10YR 3/2	80	7.5YR 4/6	20	C	M	loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.
[3]Soil Textures: Clay, Silty Clay, Sandy Clay, Loam, Sandy Clay Loam, Sandy Loam, Clay Loam, Silty Clay Loam, Silt Loam, Silt, Loamy Sand, Sand.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- [ ] Histosol (A1)
- [ ] Histic Epipedon (A2)
- [ ] Black Histic (A3)
- [ ] Hydrogen Sulfide (A4)
- [ ] Stratified Layers (A5) (**LRR C**)
- [ ] 1 cm Muck (A9) (**LRR D**)
- [ ] Depleted Below Dark Surface (A11)
- [ ] Thick Dark Surface (A12)
- [ ] Sandy Mucky Mineral (S1)
- [ ] Sandy Gleyed Matrix (S4)
- [ ] Sandy Redox (S5)
- [ ] Stripped Matrix (S6)
- [ ] Loamy Mucky Mineral (F1)
- [ ] Loamy Gleyed Matrix (F2)
- [ ] Depleted Matrix (F3)
- [x] Redox Dark Surface (F6)
- [ ] Depleted Dark Surface (F7)
- [ ] Redox Depressions (F8)
- [ ] Vernal Pools (F9)

Indicators for Problematic Hydric Soils[4]:

- [ ] 1 cm Muck (A9) (**LRR C**)
- [ ] 2 cm Muck (A10) (**LRR B**)
- [ ] Reduced Vertic (F18)
- [ ] Red Parent Material (TF2)
- [ ] Other (Explain in Remarks)

[4]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type:

Depth (inches):

Hydric Soil Present? Yes (●) No ( )

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- [ ] Surface Water (A1)
- [ ] High Water Table (A2)
- [ ] Saturation (A3)
- [ ] Water Marks (B1) (**Nonriverine**)
- [ ] Sediment Deposits (B2) (**Nonriverine**)
- [ ] Drift Deposits (B3) (**Nonriverine**)
- [ ] Surface Soil Cracks (B6)
- [ ] Inundation Visible on Aerial Imagery (B7)
- [ ] Water-Stained Leaves (B9)
- [ ] Salt Crust (B11)
- [ ] Biotic Crust (B12)
- [ ] Aquatic Invertebrates (B13)
- [ ] Hydrogen Sulfide Odor (C1)
- [ ] Oxidized Rhizospheres along Living Roots (C3)
- [ ] Presence of Reduced Iron (C4)
- [ ] Recent Iron Reduction in Plowed Soils (C6)
- [ ] Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- [ ] Water Marks (B1) (**Riverine**)
- [ ] Sediment Deposits (B2) (**Riverine**)
- [ ] Drift Deposits (B3) (**Riverine**)
- [ ] Drainage Patterns (B10)
- [ ] Dry-Season Water Table (C2)
- [ ] Thin Muck Surface (C7)
- [ ] Crayfish Burrows (C8)
- [x] Saturation Visible on Aerial Imagery (C9)
- [ ] Shallow Aquitard (D3)
- [x] FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ( )	No (●)	Depth (inches):
Water Table Present?	Yes ( )	No (●)	Depth (inches):
Saturation Present? (includes capillary fringe)	Yes ( )	No (●)	Depth (inches):

Wetland Hydrology Present? Yes (●) No ( )

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: saturation present on aerial imagery on: 8/7/2015, 5/31/2013, 9/14/2011, 6/22/2009, 7/12/2006, 12/31/2005, and 8/4/2004

SP-W2 Typical Site Conditions

WETLAND DETERMINATION DATA FORM - Arid West Region

Project/Site: Spring City Watershed Flood and Irrigation City/County: Sanpete County Sampling Date: 7/13/21

Applicant/Owner: Spring City and Horseshoe Irrigation Company State: UT Sampling Point: SP-W3

Investigator(s): Tyler Schade, Danny White Section, Township, Range: S24, T15S, R03E

Landform (hillslope, terrace, etc.): hillslope Local relief (concave, convex, none): none Slope (%): 3

Subregion (LRR): D - Interior Deserts Lat: 39.49541179 Long: -111.528951755 Datum: NAD 1983

Soil Map Unit Name: Fluvquents NWI classification: NA

Are climatic / hydrologic conditions on the site typical for this time of year? Yes (●) No ( ) (If no, explain in Remarks.)

Are Vegetation ☐ Soil ☐ or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes (●) No ( )

Are Vegetation ☐ Soil ☐ or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes (●)	No ( )	
Hydric Soil Present?	Yes (●)	No ( )	**Is the Sampled Area**
Wetland Hydrology Present?	Yes (●)	No ( )	**within a Wetland?** Yes (●) No ( )

Remarks:

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	%		
Sapling/Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
Total Cover:	%		
Herb Stratum			
1. *Carex sp.*	55	Yes	OBL
2. *Juncus sp.*	35	Yes	FACW
3.			
4. *Poa sp.*	10		
5.			
6.			
7.			
8.			
Total Cover:	100%		
Woody Vine Stratum			
1.			
2.			
Total Cover:	%		
% Bare Ground in Herb Stratum %	% Cover of Biotic Crust %		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC:	2	(A)
Total Number of Dominant Species Across All Strata:	2	(B)
Percent of Dominant Species That Are OBL, FACW, or FAC:	100.0%	(A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	55	x 1 =	55
FACW species	35	x 2 =	70
FAC species		x 3 =	0
FACU species		x 4 =	0
UPL species		x 5 =	0
Column Totals:	90 (A)		125 (B)

Prevalence Index = B/A = 1.39

Hydrophytic Vegetation Indicators:

- ☒ Dominance Test is >50%
- ☒ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes (●) No ( )

Remarks: heavy grazing in area restricted identifying plant to species

SOIL

Sampling Point: SP-W3

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture[3]	Remarks
0-3	10YR 3/3	100						
3-14	10YR 3/3	100					muck	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.
[3]Soil Textures: Clay, Silty Clay, Sandy Clay, Loam, Sandy Clay Loam, Sandy Loam, Clay Loam, Silty Clay Loam, Silt Loam, Silt, Loamy Sand, Sand.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- [ ] Histosol (A1)
- [ ] Histic Epipedon (A2)
- [ ] Black Histic (A3)
- [ ] Hydrogen Sulfide (A4)
- [ ] Stratified Layers (A5) (**LRR C**)
- [ ] 1 cm Muck (A9) (**LRR D**)
- [ ] Depleted Below Dark Surface (A11)
- [ ] Thick Dark Surface (A12)
- [ ] Sandy Mucky Mineral (S1)
- [ ] Sandy Gleyed Matrix (S4)
- [ ] Sandy Redox (S5)
- [ ] Stripped Matrix (S6)
- [x] Loamy Mucky Mineral (F1)
- [ ] Loamy Gleyed Matrix (F2)
- [ ] Depleted Matrix (F3)
- [ ] Redox Dark Surface (F6)
- [ ] Depleted Dark Surface (F7)
- [ ] Redox Depressions (F8)
- [ ] Vernal Pools (F9)

Indicators for Problematic Hydric Soils[4]:

- [ ] 1 cm Muck (A9) (**LRR C**)
- [ ] 2 cm Muck (A10) (**LRR B**)
- [ ] Reduced Vertic (F18)
- [ ] Red Parent Material (TF2)
- [ ] Other (Explain in Remarks)

[4]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type:

Depth (inches):

Hydric Soil Present? Yes (●) No ( )

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- [ ] Surface Water (A1)
- [ ] High Water Table (A2)
- [ ] Saturation (A3)
- [ ] Water Marks (B1) (**Nonriverine**)
- [ ] Sediment Deposits (B2) (**Nonriverine**)
- [ ] Drift Deposits (B3) (**Nonriverine**)
- [ ] Surface Soil Cracks (B6)
- [ ] Inundation Visible on Aerial Imagery (B7)
- [ ] Water-Stained Leaves (B9)
- [ ] Salt Crust (B11)
- [ ] Biotic Crust (B12)
- [ ] Aquatic Invertebrates (B13)
- [ ] Hydrogen Sulfide Odor (C1)
- [ ] Oxidized Rhizospheres along Living Roots (C3)
- [ ] Presence of Reduced Iron (C4)
- [ ] Recent Iron Reduction in Plowed Soils (C6)
- [ ] Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- [ ] Water Marks (B1) (**Riverine**)
- [ ] Sediment Deposits (B2) (**Riverine**)
- [ ] Drift Deposits (B3) (**Riverine**)
- [ ] Drainage Patterns (B10)
- [ ] Dry-Season Water Table (C2)
- [ ] Thin Muck Surface (C7)
- [ ] Crayfish Burrows (C8)
- [x] Saturation Visible on Aerial Imagery (C9)
- [ ] Shallow Aquitard (D3)
- [x] FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ( )	No (●)	Depth (inches):
Water Table Present?	Yes ( )	No (●)	Depth (inches):
Saturation Present? (includes capillary fringe)	Yes ( )	No (●)	Depth (inches):

Wetland Hydrology Present? Yes (●) No ( )

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: saturation present on aerial imagery on: 8/7/2015, 5/31/2013, 9/14/2011, 6/22/2009, 7/12/2006, 12/31/2005, and 8/4/2004

SP-W3 Typical Site Conditions | West

WETLAND DETERMINATION DATA FORM - Arid West Region

Project/Site: Spring City Watershed Flood and Irrigation City/County: Sanpete County Sampling Date: 7/13/21

Applicant/Owner: Spring City and Horseshoe Irrigation Company State: UT Sampling Point: SP-W4

Investigator(s): Tyler Schade, Danny White Section, Township, Range: S24, T15S, R03E

Landform (hillslope, terrace, etc.): hillslope Local relief (concave, convex, none): none Slope (%): 3

Subregion (LRR): D - Interior Deserts Lat: 39.4955697 Long: -111.52963423 Datum: NAD 1983

Soil Map Unit Name: Fluvquents NWI classification: R4SBC

Are climatic / hydrologic conditions on the site typical for this time of year? Yes (●) No ( ) (If no, explain in Remarks.)

Are Vegetation ☐ Soil ☐ or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes (●) No ( )

Are Vegetation ☐ Soil ☐ or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes (●)	No ( )
Hydric Soil Present?	Yes (●)	No ( )
Wetland Hydrology Present?	Yes (●)	No ( )

Is the Sampled Area within a Wetland? Yes (●) No ( )

Remarks:

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	%		
Sapling/Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
Total Cover:	%		
Herb Stratum			
1. *Carex sp.*	60	Yes	OBL
2. *Juncus sp.*	35	Yes	FACW
3.			
4. *Poa sp.*	5		
5.			
6.			
7.			
8.			
Total Cover:	100%		
Woody Vine Stratum			
1.			
2.			
Total Cover:	%		

% Bare Ground in Herb Stratum % % Cover of Biotic Crust %

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	60	x 1 =	60
FACW species	35	x 2 =	70
FAC species		x 3 =	0
FACU species		x 4 =	0
UPL species		x 5 =	0
Column Totals:	95 (A)		130 (B)

Prevalence Index = B/A = 1.37

Hydrophytic Vegetation Indicators:

- ☒ Dominance Test is >50%
- ☒ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes (●) No ( )

Remarks: heavy grazing in area restricted identifying plant to species

SOIL

Sampling Point: SP-W4

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture[3]	Remarks
0-3	10YR 3/3	100						
3-13	10YR 3/3	100					muck	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.
[3]Soil Textures: Clay, Silty Clay, Sandy Clay, Loam, Sandy Clay Loam, Sandy Loam, Clay Loam, Silty Clay Loam, Silt Loam, Silt, Loamy Sand, Sand.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- [ ] Histosol (A1)
- [ ] Histic Epipedon (A2)
- [ ] Black Histic (A3)
- [ ] Hydrogen Sulfide (A4)
- [ ] Stratified Layers (A5) (**LRR C**)
- [ ] 1 cm Muck (A9) (**LRR D**)
- [ ] Depleted Below Dark Surface (A11)
- [ ] Thick Dark Surface (A12)
- [ ] Sandy Mucky Mineral (S1)
- [ ] Sandy Gleyed Matrix (S4)
- [ ] Sandy Redox (S5)
- [ ] Stripped Matrix (S6)
- [x] Loamy Mucky Mineral (F1)
- [ ] Loamy Gleyed Matrix (F2)
- [ ] Depleted Matrix (F3)
- [ ] Redox Dark Surface (F6)
- [ ] Depleted Dark Surface (F7)
- [ ] Redox Depressions (F8)
- [ ] Vernal Pools (F9)

Indicators for Problematic Hydric Soils[4]:

- [ ] 1 cm Muck (A9) (**LRR C**)
- [ ] 2 cm Muck (A10) (**LRR B**)
- [ ] Reduced Vertic (F18)
- [ ] Red Parent Material (TF2)
- [ ] Other (Explain in Remarks)

[4]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type:

Depth (inches):

Hydric Soil Present? Yes (●) No ( )

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- [ ] Surface Water (A1)
- [ ] High Water Table (A2)
- [ ] Saturation (A3)
- [ ] Water Marks (B1) (**Nonriverine**)
- [ ] Sediment Deposits (B2) (**Nonriverine**)
- [ ] Drift Deposits (B3) (**Nonriverine**)
- [ ] Surface Soil Cracks (B6)
- [ ] Inundation Visible on Aerial Imagery (B7)
- [ ] Water-Stained Leaves (B9)
- [ ] Salt Crust (B11)
- [ ] Biotic Crust (B12)
- [ ] Aquatic Invertebrates (B13)
- [ ] Hydrogen Sulfide Odor (C1)
- [ ] Oxidized Rhizospheres along Living Roots (C3)
- [ ] Presence of Reduced Iron (C4)
- [ ] Recent Iron Reduction in Plowed Soils (C6)
- [ ] Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- [ ] Water Marks (B1) (**Riverine**)
- [ ] Sediment Deposits (B2) (**Riverine**)
- [ ] Drift Deposits (B3) (**Riverine**)
- [ ] Drainage Patterns (B10)
- [ ] Dry-Season Water Table (C2)
- [ ] Thin Muck Surface (C7)
- [ ] Crayfish Burrows (C8)
- [x] Saturation Visible on Aerial Imagery (C9)
- [ ] Shallow Aquitard (D3)
- [x] FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ( )	No (●)	Depth (inches):
Water Table Present?	Yes ( )	No (●)	Depth (inches):
Saturation Present? (includes capillary fringe)	Yes ( )	No (●)	Depth (inches):

Wetland Hydrology Present? Yes (●) No ( )

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: saturation present on aerial imagery on: 8/7/2015, 5/31/2013, 9/14/2011, 6/22/2009, 7/12/2006, 12/31/2005, and 8/4/2004; spring coming from side of hill upslope

SP-W4 Typical Site Conditions | Northwest

WETLAND DETERMINATION DATA FORM - Arid West Region

Project/Site: Spring City Watershed Flood and Irrigation City/County: Sanpete County Sampling Date: 7/13/21

Applicant/Owner: Spring City and Horseshoe Irrigation Company State: UT Sampling Point: SP-U4

Investigator(s): Tyler Schade, Danny White Section, Township, Range: S24, T15S, R03E

Landform (hillslope, terrace, etc.): hillslope Local relief (concave, convex, none): none Slope (%): 4

Subregion (LRR): D - Interior Deserts Lat: 39.49447483 Long: -111.53110871 Datum: NAD 1983

Soil Map Unit Name: Fluvaquent NWI classification: PEM1A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes (•) No ( ) (If no, explain in Remarks.)

Are Vegetation ☐ Soil ☐ or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes (•) No ( )

Are Vegetation ☐ Soil ☐ or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes (•)	No ( )
Hydric Soil Present?	Yes (•)	No ( )
Wetland Hydrology Present?	Yes (•)	No ( )

Is the Sampled Area within a Wetland? Yes (•) No ( )

Remarks:

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	%		
Sapling/Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
Total Cover:	%		
Herb Stratum			
1. *Carex sp.*	40	Yes	OBL
2. *Poa sp.*	5		FAC
3. *Juncus sp.*	50	Yes	FACU
4. *Cirsium Arvense*	5		FACU
5.			
6.			
7.			
8.			
Total Cover:	100%		
Woody Vine Stratum			
1.			
2.			
Total Cover:	%		

% Bare Ground in Herb Stratum % % Cover of Biotic Crust %

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC:	1	(A)
Total Number of Dominant Species Across All Strata:	2	(B)
Percent of Dominant Species That Are OBL, FACW, or FAC:	50.0 %	(A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	40	x 1 =	40
FACW species		x 2 =	0
FAC species	5	x 3 =	15
FACU species	55	x 4 =	220
UPL species		x 5 =	0
Column Totals:	100 (A)		275 (B)

Prevalence Index = B/A = 2.75

Hydrophytic Vegetation Indicators:

- ☐ Dominance Test is >50%
- ☒ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes (•) No ( )

Remarks: heavy grazing in area restricted identifying plant to species

SOIL

Sampling Point: SP-U4

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture[3]	Remarks
0-12	10YR 4/2						silt loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.
[3]Soil Textures: Clay, Silty Clay, Sandy Clay, Loam, Sandy Clay Loam, Sandy Loam, Clay Loam, Silty Clay Loam, Silt Loam, Silt, Loamy Sand, Sand.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- [ ] Histosol (A1)
- [ ] Histic Epipedon (A2)
- [ ] Black Histic (A3)
- [ ] Hydrogen Sulfide (A4)
- [ ] Stratified Layers (A5) (**LRR C**)
- [ ] 1 cm Muck (A9) (**LRR D**)
- [ ] Depleted Below Dark Surface (A11)
- [ ] Thick Dark Surface (A12)
- [ ] Sandy Mucky Mineral (S1)
- [ ] Sandy Gleyed Matrix (S4)
- [ ] Sandy Redox (S5)
- [ ] Stripped Matrix (S6)
- [ ] Loamy Mucky Mineral (F1)
- [ ] Loamy Gleyed Matrix (F2)
- [x] Depleted Matrix (F3)
- [ ] Redox Dark Surface (F6)
- [ ] Depleted Dark Surface (F7)
- [ ] Redox Depressions (F8)
- [ ] Vernal Pools (F9)

Indicators for Problematic Hydric Soils[4]:

- [ ] 1 cm Muck (A9) (**LRR C**)
- [ ] 2 cm Muck (A10) (**LRR B**)
- [ ] Reduced Vertic (F18)
- [ ] Red Parent Material (TF2)
- [ ] Other (Explain in Remarks)

[4]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type:

Depth (inches):

Hydric Soil Present? Yes (●) No ( )

Remarks: Soils in this region have a high pH ranging from 7.5-9. It is assumed that redox features would be presence if lower pH was present.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- [ ] Surface Water (A1)
- [ ] High Water Table (A2)
- [ ] Saturation (A3)
- [ ] Water Marks (B1) (**Nonriverine**)
- [ ] Sediment Deposits (B2) (**Nonriverine**)
- [ ] Drift Deposits (B3) (**Nonriverine**)
- [ ] Surface Soil Cracks (B6)
- [ ] Inundation Visible on Aerial Imagery (B7)
- [ ] Water-Stained Leaves (B9)
- [ ] Salt Crust (B11)
- [ ] Biotic Crust (B12)
- [ ] Aquatic Invertebrates (B13)
- [ ] Hydrogen Sulfide Odor (C1)
- [ ] Oxidized Rhizospheres along Living Roots (C3)
- [ ] Presence of Reduced Iron (C4)
- [ ] Recent Iron Reduction in Plowed Soils (C6)
- [ ] Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- [ ] Water Marks (B1) (**Riverine**)
- [ ] Sediment Deposits (B2) (**Riverine**)
- [ ] Drift Deposits (B3) (**Riverine**)
- [ ] Drainage Patterns (B10)
- [ ] Dry-Season Water Table (C2)
- [ ] Thin Muck Surface (C7)
- [ ] Crayfish Burrows (C8)
- [x] Saturation Visible on Aerial Imagery (C9)
- [ ] Shallow Aquitard (D3)
- [x] FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ( )	No (●)	Depth (inches):
Water Table Present?	Yes ( )	No (●)	Depth (inches):
Saturation Present? (includes capillary fringe)	Yes ( )	No (●)	Depth (inches):

Wetland Hydrology Present? Yes (●) No ( )

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: saturation present on aerial imagery on: 8/7/2015, 5/31/2013, 9/14/2011, 6/22/2009, 7/12/2006, 12/31/2005, and 8/4/2004

SP-U4 Typical Site Conditions | West

WETLAND DETERMINATION DATA FORM - Arid West Region

Project/Site: Spring City Watershed Flood and Irrigation | City/County: Sanpete County | Sampling Date: 7/13/21

Applicant/Owner: Spring City and Horseshoe Irrigation Company | State: UT | Sampling Point: SP-U5

Investigator(s): Tyler Schade, Danny White | Section, Township, Range: S24, T15S, R03E

Landform (hillslope, terrace, etc.): hillslope | Local relief (concave, convex, none): none | Slope (%): 4

Subregion (LRR): D - Interior Deserts | Lat: 39.494305866 | Long: -111.53092760 | Datum: NAD 1983

Soil Map Unit Name: Fluvaquent | NWI classification: NA

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ◉ No ○ (If no, explain in Remarks.)

Are Vegetation ☐ Soil ☐ or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ◉ No ○

Are Vegetation ☐ Soil ☐ or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ◉	No ○
Hydric Soil Present?	Yes ◉	No ○
Wetland Hydrology Present?	Yes ◉	No ○

Is the Sampled Area within a Wetland? Yes ◉ No ○

Remarks:

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	%		
Sapling/Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
Total Cover:	%		
Herb Stratum			
1. *Asclepias speciosa*	20	Yes	FAC
2. *Poa sp.*	10		FAC
3. *Juncus sp.*	40	Yes	FACW
4. *Cirsium Arvense*	20	Yes	FACU
5.			
6.			
7.			
8.			
Total Cover:	90 %		
Woody Vine Stratum			
1.			
2.			
Total Cover:	%		

% Bare Ground in Herb Stratum 10 % | % Cover of Biotic Crust %

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 66.7 % (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	0
FACW species	40	x 2 =	80
FAC species	30	x 3 =	90
FACU species	20	x 4 =	80
UPL species		x 5 =	0
Column Totals:	90 (A)		250 (B)

Prevalence Index = B/A = 2.78

Hydrophytic Vegetation Indicators:

- ☒ Dominance Test is >50%
- ☒ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes ◉ No ○

Remarks: heavy grazing in area restricted identifying plant to species

SOIL

Sampling Point: SP-U5

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture[3]	Remarks
0-12	10YR 4/2						silt loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.
[3]Soil Textures: Clay, Silty Clay, Sandy Clay, Loam, Sandy Clay Loam, Sandy Loam, Clay Loam, Silty Clay Loam, Silt Loam, Silt, Loamy Sand, Sand.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- [ ] Histosol (A1)
- [ ] Histic Epipedon (A2)
- [ ] Black Histic (A3)
- [ ] Hydrogen Sulfide (A4)
- [ ] Stratified Layers (A5) (**LRR C**)
- [ ] 1 cm Muck (A9) (**LRR D**)
- [ ] Depleted Below Dark Surface (A11)
- [ ] Thick Dark Surface (A12)
- [ ] Sandy Mucky Mineral (S1)
- [ ] Sandy Gleyed Matrix (S4)
- [ ] Sandy Redox (S5)
- [ ] Stripped Matrix (S6)
- [ ] Loamy Mucky Mineral (F1)
- [ ] Loamy Gleyed Matrix (F2)
- [x] Depleted Matrix (F3)
- [ ] Redox Dark Surface (F6)
- [ ] Depleted Dark Surface (F7)
- [ ] Redox Depressions (F8)
- [ ] Vernal Pools (F9)

Indicators for Problematic Hydric Soils[4]:

- [ ] 1 cm Muck (A9) (**LRR C**)
- [ ] 2 cm Muck (A10) (**LRR B**)
- [ ] Reduced Vertic (F18)
- [ ] Red Parent Material (TF2)
- [ ] Other (Explain in Remarks)

[4]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):
Type:
Depth (inches):

Hydric Soil Present? Yes (●) No ( )

Remarks: Soils in this region have a high pH ranging from 7.5-9. It is assumed that redox features would be presence if lower pH was present.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- [ ] Surface Water (A1)
- [ ] High Water Table (A2)
- [ ] Saturation (A3)
- [ ] Water Marks (B1) (**Nonriverine**)
- [ ] Sediment Deposits (B2) (**Nonriverine**)
- [ ] Drift Deposits (B3) (**Nonriverine**)
- [ ] Surface Soil Cracks (B6)
- [ ] Inundation Visible on Aerial Imagery (B7)
- [ ] Water-Stained Leaves (B9)
- [ ] Salt Crust (B11)
- [ ] Biotic Crust (B12)
- [ ] Aquatic Invertebrates (B13)
- [ ] Hydrogen Sulfide Odor (C1)
- [ ] Oxidized Rhizospheres along Living Roots (C3)
- [ ] Presence of Reduced Iron (C4)
- [ ] Recent Iron Reduction in Plowed Soils (C6)
- [ ] Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- [ ] Water Marks (B1) (**Riverine**)
- [ ] Sediment Deposits (B2) (**Riverine**)
- [ ] Drift Deposits (B3) (**Riverine**)
- [ ] Drainage Patterns (B10)
- [ ] Dry-Season Water Table (C2)
- [ ] Thin Muck Surface (C7)
- [ ] Crayfish Burrows (C8)
- [x] Saturation Visible on Aerial Imagery (C9)
- [ ] Shallow Aquitard (D3)
- [x] FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ( )	No (●)	Depth (inches):
Water Table Present?	Yes ( )	No (●)	Depth (inches):
Saturation Present? (includes capillary fringe)	Yes ( )	No (●)	Depth (inches):

Wetland Hydrology Present? Yes (●) No ( )

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: saturation present on aerial imagery on: 8/7/2015, 5/31/2013, 9/14/2011, 6/22/2009, 7/12/2006, 12/31/2005, and 8/4/2004

WETLAND DETERMINATION DATA FORM - Arid West Region

Project/Site: Spring City Watershed Flood and Irrigation City/County: Sanpete County Sampling Date: 7/13/21

Applicant/Owner: Spring City and Horseshoe Irrigation Company State: UT Sampling Point: SP-U6

Investigator(s): Tyler Schade, Danny White Section, Township, Range: S24, T15S, R03E

Landform (hillslope, terrace, etc.): hillslope Local relief (concave, convex, none): none Slope (%): 4

Subregion (LRR): D - Interior Deserts Lat: 39.49415022 Long: -111.53261601 Datum: NAD 1983

Soil Map Unit Name: Fluvaquent NWI classification: NA

Are climatic / hydrologic conditions on the site typical for this time of year? Yes (●) No ( ) (If no, explain in Remarks.)

Are Vegetation ☐ Soil ☐ or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes (●) No ( )

Are Vegetation ☐ Soil ☐ or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes (●)	No ( )	
Hydric Soil Present?	Yes (●)	No ( )	Is the Sampled Area
Wetland Hydrology Present?	Yes (●)	No ( )	within a Wetland? Yes (●) No ( )

Remarks:

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	%		
Sapling/Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
Total Cover:	%		
Herb Stratum			
1. *Carex sp*	40	Yes	OBL
2. *Poa sp.*	5		FAC
3. *Juncus sp.*	50	Yes	FACW
4. *Cirsium Arvense*	5	Yes	FACU
5.			
6.			
7.			
8.			
Total Cover:	100%		
Woody Vine Stratum			
1.			
2.			
Total Cover:	%		

% Bare Ground in Herb Stratum ____ % % Cover of Biotic Crust ____ %

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC:	2	(A)
Total Number of Dominant Species Across All Strata:	3	(B)
Percent of Dominant Species That Are OBL, FACW, or FAC:	66.7 %	(A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:		
OBL species	40	x 1 =	40	
FACW species	50	x 2 =	100	
FAC species	5	x 3 =	15	
FACU species	5	x 4 =	20	
UPL species		x 5 =	0	
Column Totals:	100	(A)	175	(B)

Prevalence Index = B/A = 1.75

Hydrophytic Vegetation Indicators:

- ☒ Dominance Test is >50%
- ☒ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes (●) No ( )

Remarks: heavy grazing in area restricted identifying plant to species

SOIL

Sampling Point: SP-U6

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture[3]	Remarks
0-12	10YR 3/3						silt loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.
[3]Soil Textures: Clay, Silty Clay, Sandy Clay, Loam, Sandy Clay Loam, Sandy Loam, Clay Loam, Silty Clay Loam, Silt Loam, Silt, Loamy Sand, Sand.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- [ ] Histosol (A1)
- [ ] Histic Epipedon (A2)
- [ ] Black Histic (A3)
- [ ] Hydrogen Sulfide (A4)
- [ ] Stratified Layers (A5) (**LRR C**)
- [ ] 1 cm Muck (A9) (**LRR D**)
- [ ] Depleted Below Dark Surface (A11)
- [ ] Thick Dark Surface (A12)
- [ ] Sandy Mucky Mineral (S1)
- [ ] Sandy Gleyed Matrix (S4)
- [ ] Sandy Redox (S5)
- [ ] Stripped Matrix (S6)
- [ ] Loamy Mucky Mineral (F1)
- [ ] Loamy Gleyed Matrix (F2)
- [ ] Depleted Matrix (F3)
- [x] Redox Dark Surface (F6)
- [ ] Depleted Dark Surface (F7)
- [ ] Redox Depressions (F8)
- [ ] Vernal Pools (F9)

Indicators for Problematic Hydric Soils[4]:

- [ ] 1 cm Muck (A9) (**LRR C**)
- [ ] 2 cm Muck (A10) (**LRR B**)
- [ ] Reduced Vertic (F18)
- [ ] Red Parent Material (TF2)
- [ ] Other (Explain in Remarks)

[4]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type:

Depth (inches):

Hydric Soil Present? Yes (●) No ( )

Remarks: Soils in this region have a high pH ranging from 7.5-9. It is assumed that redox features would be presence if lower pH was present.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- [ ] Surface Water (A1)
- [ ] High Water Table (A2)
- [ ] Saturation (A3)
- [ ] Water Marks (B1) (**Nonriverine**)
- [ ] Sediment Deposits (B2) (**Nonriverine**)
- [ ] Drift Deposits (B3) (**Nonriverine**)
- [ ] Surface Soil Cracks (B6)
- [ ] Inundation Visible on Aerial Imagery (B7)
- [ ] Water-Stained Leaves (B9)
- [ ] Salt Crust (B11)
- [ ] Biotic Crust (B12)
- [ ] Aquatic Invertebrates (B13)
- [ ] Hydrogen Sulfide Odor (C1)
- [ ] Oxidized Rhizospheres along Living Roots (C3)
- [ ] Presence of Reduced Iron (C4)
- [ ] Recent Iron Reduction in Plowed Soils (C6)
- [ ] Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- [ ] Water Marks (B1) (**Riverine**)
- [ ] Sediment Deposits (B2) (**Riverine**)
- [ ] Drift Deposits (B3) (**Riverine**)
- [ ] Drainage Patterns (B10)
- [ ] Dry-Season Water Table (C2)
- [ ] Thin Muck Surface (C7)
- [ ] Crayfish Burrows (C8)
- [x] Saturation Visible on Aerial Imagery (C9)
- [ ] Shallow Aquitard (D3)
- [x] FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ( )	No (●)	Depth (inches):
Water Table Present?	Yes ( )	No (●)	Depth (inches):
Saturation Present? (includes capillary fringe)	Yes ( )	No (●)	Depth (inches):

Wetland Hydrology Present? Yes (●) No ( )

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: saturation present on aerial imagery on: 8/7/2015, 5/31/2013, 9/14/2011, 6/22/2009, 7/12/2006, 12/31/2005, and 8/4/2004

WETLAND DETERMINATION DATA FORM - Arid West Region

Project/Site: Spring City Watershed Flood and Irrigation City/County: Sanpete County Sampling Date: 7/13/21

Applicant/Owner: Spring City and Horseshoe Irrigation Company State: UT Sampling Point: SP-U7

Investigator(s): Tyler Schade, Danny White Section, Township, Range: S24, T15S, R03E

Landform (hillslope, terrace, etc.): hillslope Local relief (concave, convex, none): none Slope (%): 3

Subregion (LRR): D - Interior Deserts Lat: 39.49376407 Long: -111.53518230 Datum: NAD 1983

Soil Map Unit Name: Fluvaquent NWI classification: PEM1A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes (●) No ( ) (If no, explain in Remarks.)

Are Vegetation ☐ Soil ☐ or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes (●) No ( )

Are Vegetation ☐ Soil ☐ or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes (●)	No ( )
Hydric Soil Present?	Yes (●)	No ( )
Wetland Hydrology Present?	Yes (●)	No ( )

Is the Sampled Area within a Wetland? Yes (●) No ( )

Remarks:

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	%		
Sapling/Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
Total Cover:	%		
Herb Stratum			
1. *Carex sp*	20	Yes	OBL
2. *Poa sp.*	5		FAC
3. *Juncus sp.*	75	Yes	FACW
4.			
5.			
6.			
7.			
8.			
Total Cover:	100%		
Woody Vine Stratum			
1.			
2.			
Total Cover:	%		

% Bare Ground in Herb Stratum ____ % % Cover of Biotic Crust ____ %

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	20	x 1 =	20
FACW species	75	x 2 =	150
FAC species	5	x 3 =	15
FACU species		x 4 =	0
UPL species		x 5 =	0
Column Totals:	100 (A)		185 (B)

Prevalence Index = B/A = 1.85

Hydrophytic Vegetation Indicators:

- ☒ Dominance Test is >50%
- ☒ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes (●) No ( )

Remarks: heavy grazing in area restricted identifying plant to species

SOIL

Sampling Point: SP-U7

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture[3]	Remarks
0-12	10YR 3/3						silt loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.
[3]Soil Textures: Clay, Silty Clay, Sandy Clay, Loam, Sandy Clay Loam, Sandy Loam, Clay Loam, Silty Clay Loam, Silt Loam, Silt, Loamy Sand, Sand.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (**LRR C**)
- ☐ 1 cm Muck (A9) (**LRR D**)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☒ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[4]:

- ☐ 1 cm Muck (A9) (**LRR C**)
- ☐ 2 cm Muck (A10) (**LRR B**)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☐ Other (Explain in Remarks)

[4]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):
Type:
Depth (inches):

Hydric Soil Present? Yes ◉ No ○

Remarks: Soils in this region have a high pH ranging from 7.5-9. It is assumed that redox features would be presence if lower pH was present.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1) (**Nonriverine**)
- ☐ Sediment Deposits (B2) (**Nonriverine**)
- ☐ Drift Deposits (B3) (**Nonriverine**)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☐ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Plowed Soils (C6)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Marks (B1) (**Riverine**)
- ☐ Sediment Deposits (B2) (**Riverine**)
- ☐ Drift Deposits (B3) (**Riverine**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Thin Muck Surface (C7)
- ☐ Crayfish Burrows (C8)
- ☒ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☒ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ○	No ◉	Depth (inches):
Water Table Present?	Yes ○	No ◉	Depth (inches):
Saturation Present? (includes capillary fringe)	Yes ○	No ◉	Depth (inches):

Wetland Hydrology Present? Yes ◉ No ○

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: saturation present on aerial imagery on: 8/7/2015, 5/31/2013, 9/14/2011, 6/22/2009, 7/12/2006, 12/31/2005, and 8/4/2004

WETLAND DETERMINATION DATA FORM - Arid West Region

Project/Site: Spring City Watershed Flood and Irrigation City/County: Sanpete County Sampling Date: 7/13/21

Applicant/Owner: Spring City and Horseshoe Irrigation Company State: UT Sampling Point: SP-W5

Investigator(s): Tyler Schade, Danny White Section, Township, Range: S24, T15S, R03E

Landform (hillslope, terrace, etc.): hillslope Local relief (concave, convex, none): none Slope (%): 3

Subregion (LRR): D - Interior Deserts Lat: 39.494350525 Long: -111.53096273 Datum: NAD 1983

Soil Map Unit Name: Fluvquents NWI classification: PEM1A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes (●) No ( ) (If no, explain in Remarks.)

Are Vegetation ☐ Soil ☐ or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes (●) No ( )

Are Vegetation ☐ Soil ☐ or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes (●)	No ( )
Hydric Soil Present?	Yes (●)	No ( )
Wetland Hydrology Present?	Yes (●)	No ( )

Is the Sampled Area within a Wetland? Yes (●) No ( )

Remarks:

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	%		
Sapling/Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
Total Cover:	%		
Herb Stratum			
1. *Carex sp.*	20	Yes	OBL
2. *Juncus sp.*	75	Yes	FACW
3.			
4. *Poa sp.*	5		
5.			
6.			
7.			
8.			
Total Cover:	100%		
Woody Vine Stratum			
1.			
2.			
Total Cover:	%		

% Bare Ground in Herb Stratum % % Cover of Biotic Crust %

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	20	x 1 =	20
FACW species	75	x 2 =	150
FAC species		x 3 =	0
FACU species		x 4 =	0
UPL species		x 5 =	0
Column Totals:	95 (A)		170 (B)

Prevalence Index = B/A = 1.79

Hydrophytic Vegetation Indicators:

- ☒ Dominance Test is >50%
- ☒ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes (●) No ( )

Remarks: heavy grazing in area restricted identifying plant to species

SOIL

Sampling Point: SP-W5

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture[3]	Remarks
0-3	10YR 3/2	97	7.5YR 4/6	3	C	M	silt loam	
3-13	10YR 3/2	95	7.5YR 4/6	5	C	M	silt loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.
[3]Soil Textures: Clay, Silty Clay, Sandy Clay, Loam, Sandy Clay Loam, Sandy Loam, Clay Loam, Silty Clay Loam, Silt Loam, Silt, Loamy Sand, Sand.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- [ ] Histosol (A1)
- [ ] Histic Epipedon (A2)
- [ ] Black Histic (A3)
- [ ] Hydrogen Sulfide (A4)
- [ ] Stratified Layers (A5) (**LRR C**)
- [ ] 1 cm Muck (A9) (**LRR D**)
- [ ] Depleted Below Dark Surface (A11)
- [ ] Thick Dark Surface (A12)
- [ ] Sandy Mucky Mineral (S1)
- [ ] Sandy Gleyed Matrix (S4)
- [ ] Sandy Redox (S5)
- [ ] Stripped Matrix (S6)
- [ ] Loamy Mucky Mineral (F1)
- [ ] Loamy Gleyed Matrix (F2)
- [ ] Depleted Matrix (F3)
- [x] Redox Dark Surface (F6)
- [ ] Depleted Dark Surface (F7)
- [ ] Redox Depressions (F8)
- [ ] Vernal Pools (F9)

Indicators for Problematic Hydric Soils[4]:

- [ ] 1 cm Muck (A9) (**LRR C**)
- [ ] 2 cm Muck (A10) (**LRR B**)
- [ ] Reduced Vertic (F18)
- [ ] Red Parent Material (TF2)
- [ ] Other (Explain in Remarks)

[4]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type:

Depth (inches):

Hydric Soil Present? Yes (●) No ( )

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- [ ] Surface Water (A1)
- [ ] High Water Table (A2)
- [ ] Saturation (A3)
- [ ] Water Marks (B1) (**Nonriverine**)
- [ ] Sediment Deposits (B2) (**Nonriverine**)
- [ ] Drift Deposits (B3) (**Nonriverine**)
- [ ] Surface Soil Cracks (B6)
- [ ] Inundation Visible on Aerial Imagery (B7)
- [ ] Water-Stained Leaves (B9)
- [ ] Salt Crust (B11)
- [ ] Biotic Crust (B12)
- [ ] Aquatic Invertebrates (B13)
- [ ] Hydrogen Sulfide Odor (C1)
- [ ] Oxidized Rhizospheres along Living Roots (C3)
- [ ] Presence of Reduced Iron (C4)
- [ ] Recent Iron Reduction in Plowed Soils (C6)
- [ ] Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- [ ] Water Marks (B1) (**Riverine**)
- [ ] Sediment Deposits (B2) (**Riverine**)
- [ ] Drift Deposits (B3) (**Riverine**)
- [ ] Drainage Patterns (B10)
- [ ] Dry-Season Water Table (C2)
- [ ] Thin Muck Surface (C7)
- [ ] Crayfish Burrows (C8)
- [x] Saturation Visible on Aerial Imagery (C9)
- [ ] Shallow Aquitard (D3)
- [x] FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ( ) No (●) Depth (inches):

Water Table Present? Yes ( ) No (●) Depth (inches):

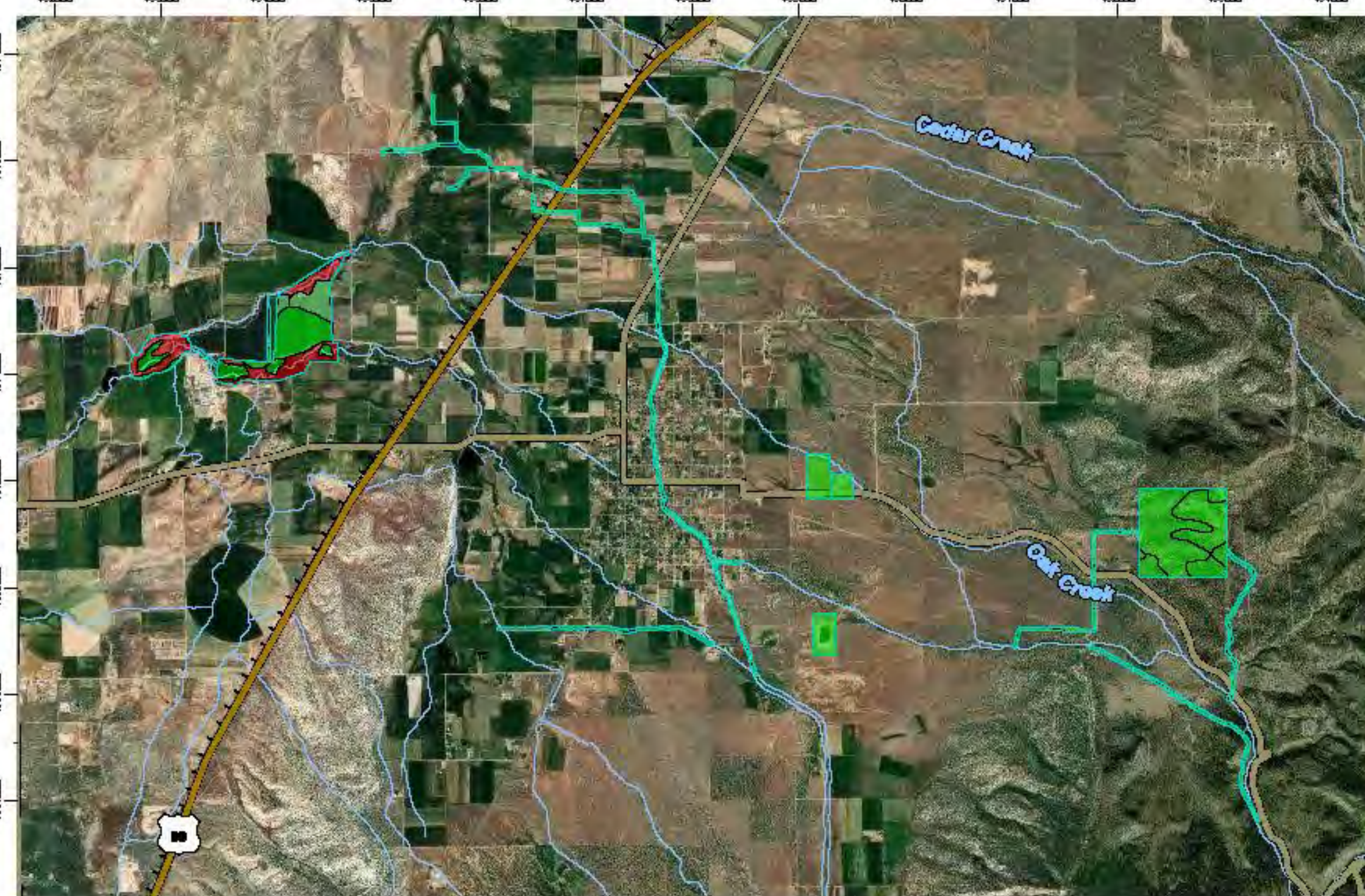
Saturation Present? (includes capillary fringe) Yes ( ) No (●) Depth (inches):

Wetland Hydrology Present? Yes (●) No ( )

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: saturation present on aerial imagery on: 8/7/2015, 5/31/2013, 9/14/2011, 6/22/2009, 7/12/2006, 12/31/2005, and 8/4/2004

Hydric Rating by Map Unit—Manti-Lasal National Forest, Manti Division - Parts of Sanpete and Emery Counties; and Sanpete Valley Area, Utah, Parts of ...
(Survey Area)



Map Scale: 1:58,400 if printed on A landscape (11" x 8.5") sheet.

Meters: 0 500 1000 2000 3000

Feet: 0 2500 5000 10000 15000

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 12N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils

Soil Rating Polygons
- Hydric (100%)
- Hydric (66 to 99%)
- Hydric (33 to 65%)
- Hydric (1 to 32%)
- Not Hydric (0%)
- Not rated or not available

Soil Rating Lines
- Hydric (100%)
- Hydric (66 to 99%)
- Hydric (33 to 65%)
- Hydric (1 to 32%)
- Not Hydric (0%)
- Not rated or not available

Soil Rating Points
- Hydric (100%)
- Hydric (66 to 99%)
- Hydric (33 to 65%)
- Hydric (1 to 32%)
- Not Hydric (0%)
- Not rated or not available

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Manti-Lasal National Forest, Manti Division - Parts of Sanpete and Emery Counties
Survey Area Data: Version 3, Sep 7, 2021

Soil Survey Area: Sanpete Valley Area, Utah, Parts of Utah and Sanpete Counties
Survey Area Data: Version 15, Sep 10, 2021

Your area of interest (AOI) includes more than one soil survey area. These survey areas may have been mapped at different scales, with a different land use in mind, at different times, or at different levels of detail. This may result in map unit symbols, soil properties, and interpretations that do not completely agree across soil survey area boundaries.

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Sep 10, 2009—Nov 8, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydric Rating by Map Unit

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
12	Birdow-Shupert families complex, 2 to 8 percent slopes	0	3.1	0.6%
NOTCOM	No Digital Data Available	0	7.9	1.4%
Subtotals for Soil Survey Area			**11.0**	**1.9%**
Totals for Area of Interest			**565.3**	**100.0%**

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
Ag	Anco silty clay loam	10	25.0	4.4%
AmB	Arapien fine sandy loam, 1 to 2 percent slopes	0	27.3	4.8%
AmC2	Arapien fine sandy loam, 2 to 5 percent slopes, eroded	0	8.7	1.5%
AoB	Arapien fine sandy loam, wet, 1 to 2 percent slopes	0	5.7	1.0%
ATF	Atepic very cobbly silty clay loam, 8 to 40 percent slopes	0	95.7	16.9%
BTC	Borvant-Doyce complex, 2 to 10 percent slopes	0	35.9	6.4%
Ch	Chipman silty clay loam	90	4.1	0.7%
CNC	Clegg loam, 3 to 10 percent slopes	0	47.3	8.4%
DCD	Deer Creek stony silt loam, 6 to 30 percent slopes	0	18.4	3.3%
DFF	Deer Creek-Mower complex, 25 to 50 percent slopes	0	21.3	3.8%
DgC	Denmark gravelly loam, 2 to 5 percent slopes	0	0.9	0.2%
DKD	Donnardo very stony loam, 4 to 16 percent slopes	0	13.1	2.3%
Ds	Dyreng silty clay	5	6.9	1.2%
FN	Fluvaquents	100	77.4	13.7%
GeB	Genola loam, 0 to 2 percent slopes	0	51.9	9.2%

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
LeB	Lisade loam, 1 to 2 percent slopes	0	13.2	2.3%
MoC	Mountainville-Doyce complex, 2 to 8 percent slopes	0	0.4	0.1%
PDC	Pavant-Doyce complex, 2 to 8 percent slopes	0	63.4	11.2%
Sm	Shumway silty clay loam	100	1.9	0.3%
W	Water	0	25.9	4.6%
WoA	Woodrow silty clay loam, 0 to 2 percent slopes	0	9.9	1.7%
Subtotals for Soil Survey Area			**554.3**	**98.1%**
Totals for Area of Interest			**565.3**	**100.0%**

Description

This rating indicates the percentage of map units that meets the criteria for hydric soils. Map units are composed of one or more map unit components or soil types, each of which is rated as hydric soil or not hydric. Map units that are made up dominantly of hydric soils may have small areas of minor nonhydric components in the higher positions on the landform, and map units that are made up dominantly of nonhydric soils may have small areas of minor hydric components in the lower positions on the landform. Each map unit is rated based on its respective components and the percentage of each component within the map unit.

The thematic map is color coded based on the composition of hydric components. The five color classes are separated as 100 percent hydric components, 66 to 99 percent hydric components, 33 to 65 percent hydric components, 1 to 32 percent hydric components, and less than one percent hydric components.

In Web Soil Survey, the Summary by Map Unit table that is displayed below the map pane contains a column named 'Rating'. In this column the percentage of each map unit that is classified as hydric is displayed.

Hydric soils are defined by the National Technical Committee for Hydric Soils (NTCHS) as soils that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part (Federal Register, 1994). Under natural conditions, these soils are either saturated or inundated long enough during the growing season to support the growth and reproduction of hydrophytic vegetation.

The NTCHS definition identifies general soil properties that are associated with wetness. In order to determine whether a specific soil is a hydric soil or nonhydric soil, however, more specific information, such as information about the depth and duration of the water table, is needed. Thus, criteria that identify those estimated soil properties unique to hydric soils have been established (Federal Register, 2002). These criteria are used to identify map unit components that normally are associated with wetlands. The criteria used are selected estimated soil properties that are described in "Soil Taxonomy" (Soil Survey Staff, 1999) and "Keys to Soil Taxonomy" (Soil Survey Staff, 2006) and in the "Soil Survey Manual" (Soil Survey Division Staff, 1993).

If soils are wet enough for a long enough period of time to be considered hydric, they should exhibit certain properties that can be easily observed in the field. These visible properties are indicators of hydric soils. The indicators used to make onsite determinations of hydric soils are specified in "Field Indicators of Hydric Soils in the United States" (Hurt and Vasilas, 2006).

References:

Federal Register. July 13, 1994. Changes in hydric soils of the United States.

Federal Register. September 18, 2002. Hydric soils of the United States.

Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.

Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18.

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service. U.S. Department of Agriculture Handbook 436.

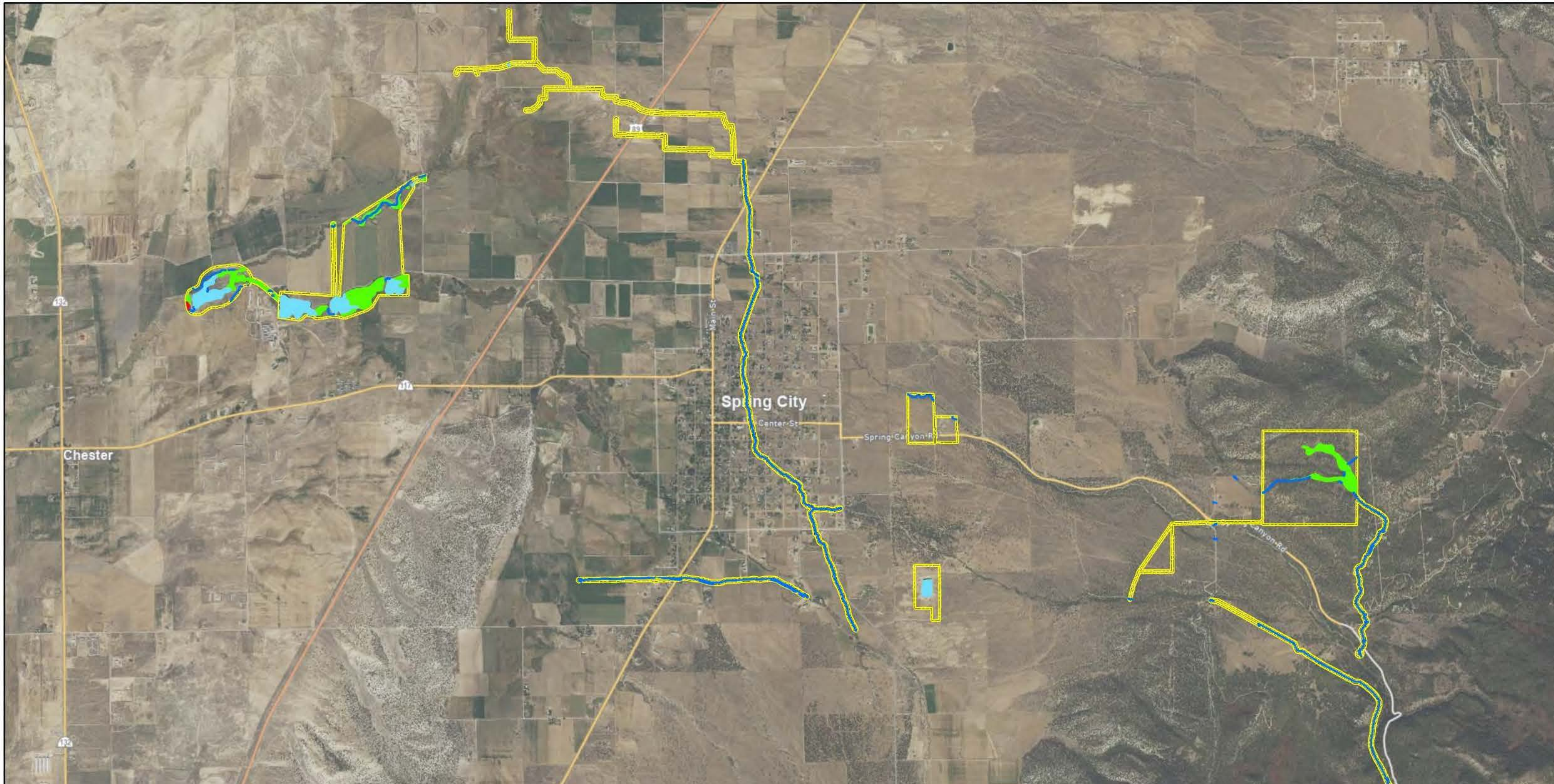
Soil Survey Staff. 2006. Keys to soil taxonomy. 10th edition. U.S. Department of Agriculture, Natural Resources Conservation Service.

Rating Options

Aggregation Method: Percent Present

Component Percent Cutoff: None Specified

Tie-break Rule: Lower



J-U-B
J-U-B ENGINEERS, INC.

NWI Map

Delineation of Wetlands and Other Waters of the U.S. - for the Spring City Watershed Flood and Irrigation Project

Created on March 12, 2022

Coord. System: NAD 1983 UTM 12N
Projection: Transverse Mercator
Datum: North American 1983

Legend

- Survey Area (560 Acres)
- Freshwater Emergent Wetland (43.47 Acres, QTY = 22)
- Freshwater Forested/Shrub Wetland (0.38 Acres, QTY = 1)
- Freshwater Pond (33.87 Acres, QTY = 9)
- Riverine (19.39 Acres, QTY = 29)

N

Miles
0 0.25 0.5 1

Biological Evaluation

Biological Evaluation for the Spring City Watershed Flood and Irrigation Project

Sanpete County, Utah

Prepared for

Natural Resources Conservation Service
125 South State Street, Room 4010
Salt Lake City, UT 84138

Prepared by

J-U-B ENGINEERS, Inc.
392 E Winchester St Suite 300
Salt Lake City, UT 84107

July 2024

Contents

Figures

Tables

Appendices

Introduction

J-U-B ENGINEERS, Inc. (J-U-B) prepared this biological evaluation (BE) for the Spring City Watershed Flood & Irrigation Project (Proposed Project). The Proposed Project is in and adjacent to Spring City in Sanpete County, Utah (Figure 1). The Action Area is contained within Section 18, 19, 20, 29, 31, 32, 33, 34, 35, and 36, Township 15 South, Range 4 East; Sections 24, 25, and 26, Township 15 South, Range 3 East; and Sections 1 and 2 Township 16 South Range 4 East Salt Lake Base and Meridian.

The purpose of this BE is to provide technical information and review the Proposed Project's Action Area (Action Area) in sufficient detail to determine to what extent the Proposed Project may affect: federally threatened or endangered species or species proposed for listing; designated and proposed critical habitat; State Sensitive Species under Conservation Agreements; and essential fish habitat (EFH) as required by the Magnuson-Stevens Fishery Conservation and Management Act (16 USC 1801 et seq.). This BA is prepared in accordance with 50 CFR 402 and legal requirements found in Section 7 (a)(2) of the Endangered Species Act (ESA) (16 U.S.C. 1536(c)). This BE serves as supporting documentation for the Watershed Plan-Environmental Assessment for the Proposed Project, and as supporting rationale for effect determinations for ESA consultation purposes.

Project Action

The Proposed Project would construct a large multi-purpose reservoir with associated pipelines and channels, rebuild existing diversion structures, pipe the existing open ditch irrigation delivery system, build a small reservoir, clean and improve existing channels, replace undersized culverts, and provide recreational opportunities at the multi-purpose reservoir. The Proposed Project would address flood control, water conservation, water delivery efficiency, and recreational use.

The Action Area analyzed for this BE encompasses 586 acres and occurs within Spring City limits, and to the east and west of Spring City. The Action Area crosses U.S. Route 89 and State Route 117. The Action Area encompasses the Proposed Project footprint and staging areas (Figure 2).

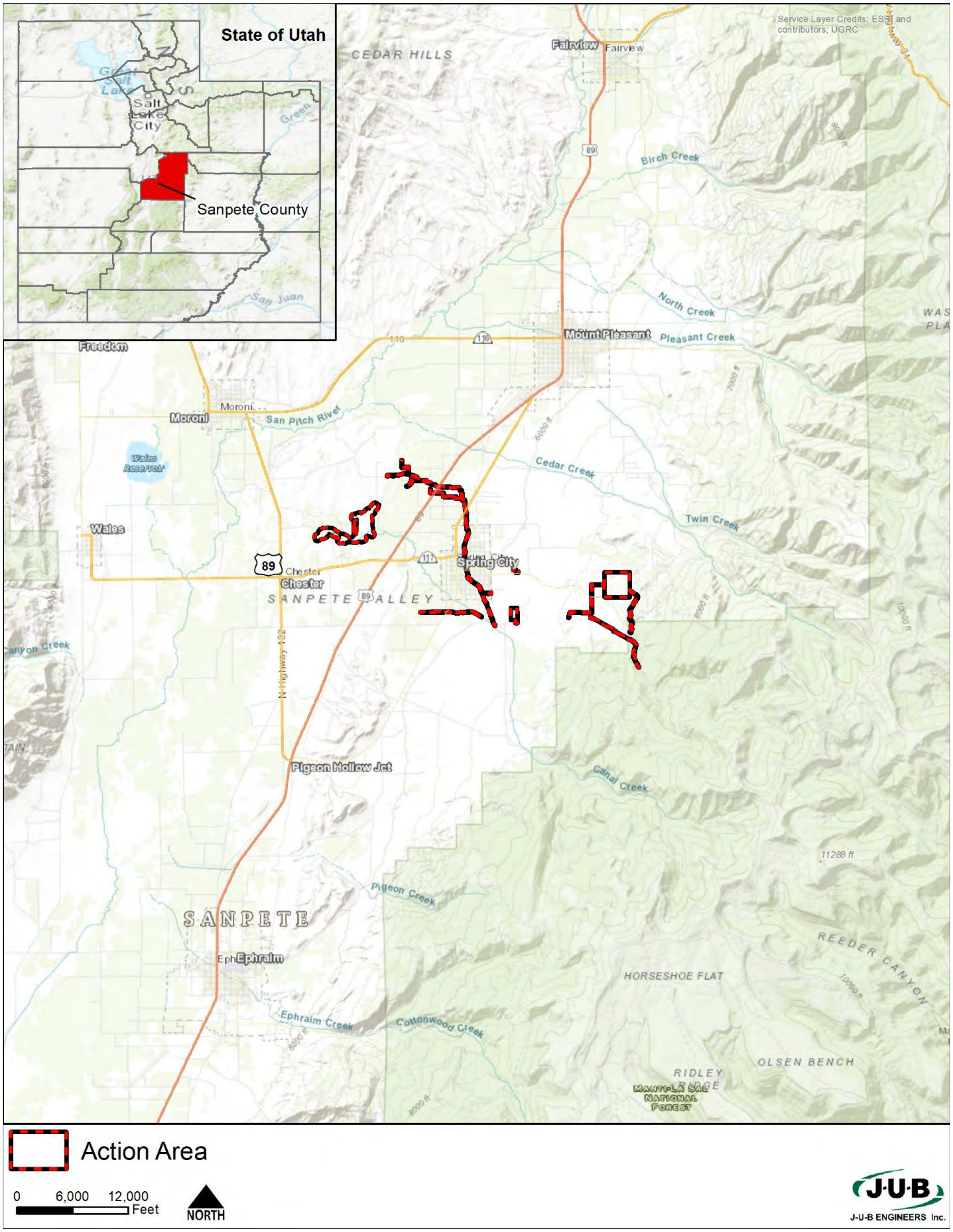


Figure 1: Vicinity Map

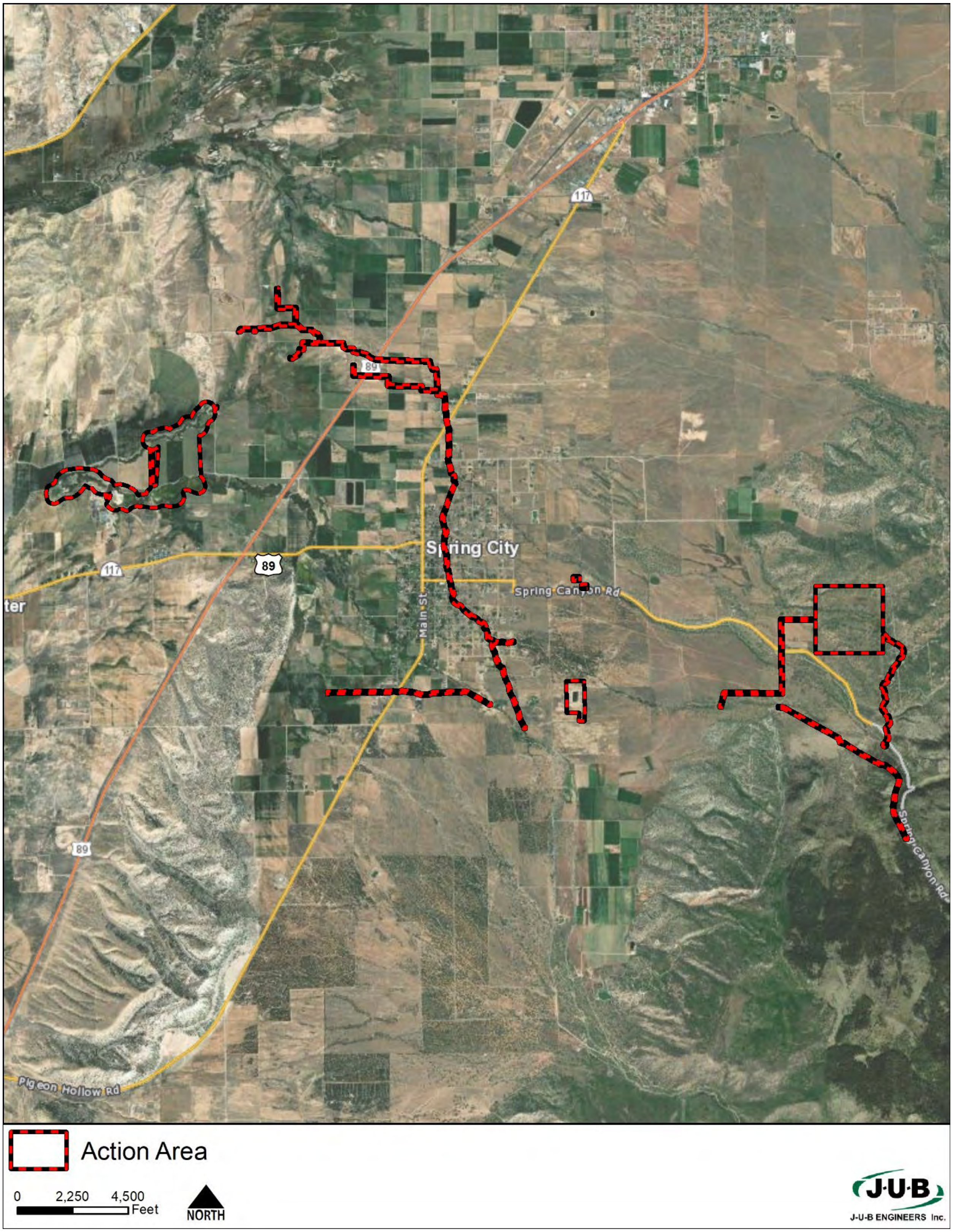


Figure 2: Action Area

Best Management Practices and Conservation Measures

Construction Best Management Practices (BMPs) are standard requirements and would be required during the implementation of the Proposed Project. BMPs would include, but are not limited to, soil and erosion control devices, noxious weed prevention and control, and construction timing to minimize or avoid breeding and nesting season for migratory birds. The following BMPs and conservation measures are intended to minimize effects on listed species and their habitats, as well as to protect water quality and minimize disturbance to soil and vegetation.

1. Complete all work within the designated Action Area during established working hours.
2. Contain all work activities, including those within staging areas, to upland areas to minimize potential impacts to surface water quality, whenever feasible.
3. Ensure all applicable local or state water quality permits are in place, and where applicable, obtain an EPA Construction General Permit for the Proposed Project. Meet associated permit conditions during construction operations.
4. Ensure the contractor develops and follows an approved Stormwater Pollution Prevention Plan (SWPPP) and a Spill Prevention, Control and Countermeasure (SPCC) plan or other similar plan.
5. Comply with all measures in the associated SWPPP and SPCC plan when fueling, performing cleaning and maintenance, and storing or disposing of hazardous materials.
6. Comply with all measures in the associated SWPPP or similar document for implementing temporary erosion and sediment controls (TESCs), covering and storing materials, and other erosion prevention measures. Do not perform construction activities during extreme wet weather conditions, whenever practicable. If heavy precipitation is predicted to occur within 24 hours, take appropriate measures to cover up any stockpiles and check that TESCs are functioning.
7. Perform pre-construction surveys for migratory birds and raptors in all areas where vegetation removal will occur. These surveys should occur no more than 7 days before vegetation removal and disturbance., when construction activities or vegetation removal would occur during the breeding and nesting season of migratory birds (March–September) or eagles (December–August). Repeat surveys if construction and vegetation removal are paused and resumed. If an active nest is discovered within the Action Area, halt construction and/or vegetation removal and contact the appropriate regulatory agency for guidance.
8. Rehabilitate all areas of ground disturbance. Spread or grade stockpiled materials and use a native seed mix (99.9% noxious weed-free seed) approved by **NRCS** to reseed all areas where ground disturbance has occurred. Ensure the seed mix and plants are appropriate to the region and include milkweed species (Asclepias sp.) when appropriate to the site.

9. If appropriate for the area, apply seed by hydroseeding, using a temporary erosion control mulch tackifier to provide stabilization, eliminate erosion concerns, and create vegetation recruitment opportunities.
10. Clean equipment of mud and other debris to avoid noxious weed or seed dispersal within or near the Action Area. Use pressure washing where appropriate to remove soil, plant parts, or other materials that may carry invasive and noxious weed seeds before arriving at the Action Area. Ensure this cleaning occurs each time equipment is brought into the Action Area from a different location.
11. Ensure the contractor provides the site inspector with the opportunity to inspect the equipment before unloading at the construction site. If upon inspection, dirt, debris, and seeds are visible, ensure the contractor immediately removes the equipment from the Action Area and rewashes it. Ensure the equipment is clean by having the site inspector re-inspect the equipment.
12. Protect native site vegetation and plant communities, including wetland vegetation and milkweed, when practicable. Clearly mark, flag, or fence areas where vegetation is to be protected.

Environmental Setting

Spring City is situated in Sanpete County between the San Pitch Mountains and the Manti-La Sal National Forest. The Action Area includes foothills and mountainous areas on the eastern side and flat agricultural areas on the western side; elevation in the Action Area ranges from 5,640 feet to 7,150 feet above mean sea level (AMSL). Undisturbed forest, shrubland, and grassland occur on the eastern portion of the Action Area. Residential, industrial, commercial, and agricultural areas occur in the central portion of the Action Area. And agricultural, stream, and pond areas occur on the western portion of the Action Area.

The Action Area occurs in three separate ecoregions within the Wasatch and Uinta Mountains. These include the Wasatch Mountain Zone, Semiarid Foothills, and Mountain Valleys. Descriptions below come from the Ecoregions of Utah poster (Wood, et al. 2001). Only a very small portion of the southeastern Action Area occurs in the Wasatch Mountain Zone; this ecoregion includes middle elevation forested mountain slopes, mountain tops, mountain ridges, and plateaus in the Wasatch Range. Moraines and lakes occur here with good quality perennial streams. Vegetation is mostly Douglas-fir forest. Land uses include logging, seasonal range, recreation, wildlife habitat, and water supply. Most of the eastern portion of the Action Area occurs in the Semiarid Foothills Ecoregion. This ecoregion includes semiarid lower mountain slopes, foothills, ridgetops, and alluvial fans. Some perennial streams, which originate in higher elevation, occur in this area. Vegetation is mostly mountain mahogany-oak scrub with some juniper-pinyon woodland. Land uses include wildlife habitat, livestock grazing, recreation, and water supply. Some intensively used rangeland areas also occur.

The western portion of the Action Area occurs in the Mountain Valleys Ecoregion. This ecoregion includes largely unforested valleys that separate the high plateaus. Alluvial fans, low terraces, flood plains, and a few hills occur. Vegetation is mostly Great basin sagebrush with some juniper-pinyon woodland. Land uses include irrigated cropland and pastureland with some rangeland.

Methodology

An Official Species List was initially obtained November 9, 2021, and updated June 25, 2024 from the U.S. Fish and Wildlife Service (USFWS) Information for Planning and Consultation (IPaC) system to identify species of concern that could potentially occur in or near the Action Area (USFWS 2024a; Appendix A). A list of Utah species' records occurring within 0.5 miles and within two miles of the Action Area was obtained on November 15, 2021, and updated June 25, 2024 from the Utah Natural Heritage Program (UNHP; Appendix B; UDWR 2024).

A desktop analysis of the Action Area was conducted using maps and data in ArcGIS (AGOL 2021). This analysis evaluated aerial imagery with habitat information, elevation data, species range, landscape topography, the National Wetlands Inventory (NWI; USFWS 2021a), and the National Hydrography Dataset (NHD; USGS 2021). Various sources (e.g., species recovery plans, research papers) from agencies and field experts were also used to analyze species and their habitats in respect to the Action Area.

On July 12 and 13, 2021, J-U-B biologist Tyler Schade conducted a biological survey to identify special-status species, if present (i.e., federally-listed species and state species of concern), and to identify and characterize potential habitat for special-status species, if present.

Existing Environmental Conditions

The Action Area is widespread and occurs in multiple different landscapes, including on or adjacent to Oak Creek, within wetlands, ponds, and grassland areas, within the Manti-La Sal National Forest, shrub-scrub land, developed residential areas, and agricultural land (pastureland and cropland). Refer to the Photo Inventory in Appendix C for representative photos of the Action Area.

Oak Creek, Canal Creek, and numerous ditches (including Upper and Lower Chimney Ditch) occur in the Action Area. Several wetlands also occur throughout the Action Area, predominantly in the west area.

Vegetation Communities

Six vegetation communities occur in the Study Area: sagebrush shrub, woodlands, wetland, riparian, grasslands, and forest.

- Sagebrush scrub primarily consisted of Great Basin sagebrush (*Artemisia tridentata*) with cheatgrass (*Bromus tectorum*) and smooth brome (*Bromus inermis*) occurring in the understory.
- Woodlands primarily consisted of Gambel oak (*Quercus gambelii*), pinyon pine (*Pinus edulis*), Utah juniper (*Juniperus osteosperma*), Utah serviceberry (*Amelanchier utahensis*), and black hawthorn (*Crataegus douglasii*).
- Wetland plants primarily consisted of hardstem bulrush (*Schoenoplectus acutus*), evening primrose (*Oenothera rosea*), Baltic rush (*Juncus balticus*), sedge (*Carex* sp.), Nebraska sedge (*Carex nebrascensis*), saltgrass (*Distichlis spicata*), reed canarygrass (*Phalaris arundinacea*), and narrowleaf willow (*Salix exigua*).
- Riparian vegetation primarily consisted of white willow (*Salix alba*), narrowleaf willow, and balsam poplar (*Populus balsamifera*) with some reed canarygrass along the banks of water courses.
- Grasslands primarily consisted of Kentucky bluegrass (*Poa pratensis*), cheatgrass, smooth brome, and orchard grass (*Dactylis glomerata*).
- Forested areas primarily consisted of white fir (*Abies concolor*), Douglas-fir (*Pseudotsuga menziesii*), and ponderosa pine (*Pinus ponderosa*).

Dominant plant species observed in the Action Area during surveys are identified in Table 1 below.

Table 1: Dominant Vegetation Within the Action Area

Stratum	Common Name	Scientific Name
Tree	Bigtooth maple	*Acer grandidentatum*
	Boxelder maple	*Acer negundo*
	Narrowleaf cottonwood	*Populus angustifolia*
Shrubs	Big sagebrush	*Artemisia tridentata*
	Booth's willow	*Salix boothii*
	Coyote willow	*Salix exigua*
	Redtwig dogwood	*Cornus sericea*
	Rubber rabbitbrush	*Ericameria nauseosa*
	Wood's rose	*Rosa woodsii*
Herbs	Alsike Clover	*Trifolium hybridum*
	Baltic rush	*Juncus balticus*
	Blue wildrye	*Elymus glaucus*
	Bulrush	*Schoenoplectus acutus*
	Canada thistle	*Cirsium Arvense*
	Common bentgrass	*Agrostis capillaris*
	Common spike-rush	*Eleocharis palustris*
	Common teasel	*Dipsacus fullonum*
	Creeping wild rye	*Leymus triticoides*
	Dandelion	*Taraxacum officinale*
	Rose evening primrose	*Oenothera rosea*
	Inland saltgrass	*Distichlis spicata*

	Intermediate wheatgrass	*Thinopyrum intermedium*
	Meadow foxtail	*Alopecurus pratensis*
	Narrowleaf plantain	*Plantago lanceolata*
	Nebraska sedge	*Carex nebrascensis*
	Olney's three-square	*Schoenoplectus americanus*
	Prickly lettuce	*Lactuca serriola*
	Reed canary grass	*Phalaris arundinacea*
	Showy milkweed	*Asclepias speciosa*
	Smooth brome	*Bromus inermis*
	Smooth horsetail	*Equisetum laevigatum*
	Strawberry clover	*Trifolium fragiferum*
	Water sedge	*Carex aquatilis*
	Whitetop	*Lepidium draba*
	Yarrow	*Achillea millefolium*

Agency Coordination and Species of Concern

The IPaC report identified two ESA species as potentially occurring within the Action Area: the federally threatened Ute ladies'-tresses (ULT) (*Spiranthes diluvialis*) and the candidate species monarch butterfly (*Danaus plexippus*). No critical habitat occurs in the Action Area (Table 2; USFWS 2024a).

Table 2. ESA-listed species that may occur in the Action Area.

Common Name	Scientific Name	Critical Habitat present?	ESA Designation
Ute ladies'-tresses	*Spiranthes diluvialis*	No	Threatened
monarch butterfly	*Danaus plexippus*	No	Candidate

The UNHP Online Species Search Report identified records of bald eagle (*Haliaeetus leucocephalus*) and northern leopard frog (*Lithobates pipiens*) occurring within 0.5 miles of the Action Area and records of golden eagle (*Aquila chrysaetos*) and southern leatherside chub (*Lepidomeda aliciae*) occurring within two miles of the Action Area. No ESA-listed species were identified by the UNHP as occurring in or near the Action Area. The southern leatherside chub is listed as a Utah species of concern and a state-wide Conservation Agreement was prepared in 2010 by the Utah Department of Wildlife Resources (UDWR; 2010). Refer to Table 3 for a list of UNHP protected species that may occur within the Action Area.

Table 3. UNHP protected species that may occur within 0.5 miles or 2 miles of the Action Area.

Common Name	Scientific Name	Occurs within 0.5 miles or 2 miles of the Action Area?
bald eagle	*Haliaeetus leucocephalus*	0.5 miles
northern leopard frog	*Lithobates pipiens*	0.5 miles
golden eagle	*Aquila chrysaetos*	2 miles
southern leatherside chub	*Lepidomeda aliciae*	2miles

Due to the geographic extent of the Action Area and proximity to sage-grouse management areas (SGMAs), the greater sage-grouse (*Centrocercus urophasianus*) will also be analyzed in this document. The greater sage-grouse is considered a Utah state sensitive species but is not federally listed.

Species Descriptions and Effects Analysis

The following species descriptions include ULT, monarch butterfly, southern leatherside chub, and greater sage-grouse. The effects analysis excludes the monarch butterfly. Because the monarch butterfly is a candidate species, formal consultation is not necessary under the National Environmental Policy Act (NEPA) and none is requested for the species in this analysis. An effects analysis and determination are not presented for the monarch butterfly in this BE.

Ute Ladies'-tresses

ULT was designated as threatened by the USFWS under the ESA in January 1992 (USFWS 1995). Major threats to the species include habitat disruption, urbanization, and stream channelization for agricultural development (UDWR 2024). On May 10, 1995, the USFWS received a petition to delist the species. In October 2004, the USFWS' 90-day findings on the petition found that there is substantial information to delist the species. The USFWS initiated a 12-month status review concurrently with the 5-year review of a listed species under section 4(c)(2)(A) of the ESA. The 12-month findings have not been issued as of the date of this report. No critical habitat has been proposed or designated for the ULT.

ULT is a member of the orchid family. This perennial herb has small white or ivory flowers that spiral around the 3-15 cm tall spike (USFWS 2021b). Populations of the ULT have been found in Utah, Colorado, Wyoming, Montana, Nevada, Idaho, and Washington (Fertig et al. 2005). It is found in wetlands and riparian areas, including spring habitats, mesic meadows, river meanders and floodplains. They require open habitats, and populations decline if dense trees and shrubs invade the habitat. The elevation ranges in which populations have been found vary from 750 to 7,000 feet AMSL, with most populations existing above 4,000 feet AMSL (USFWS 2021b). They are not tolerant of permanent standing water, and do not compete well with aggressive species, such as reed canary grass.

Due to the general geographic location of the Proposed Project and the potential habitat within the Action Area, a protocol-level ULT survey was conducted to evaluate habitat suitability for the species within the Action Area. The surveyed area included the riparian and wetland area near Bear River and Old City Ditch on the eastern portion of the Action Area. The survey time for the species, as identified by the USFWS, is mid-August through mid-September (USFWS 1995), though recent information indicates the species typically blooms only through August in average water years (USFWS 2021b). A protocol-level ULT survey was conducted by Autumn Foushee, a qualified botanist, on August 6, 2021 to determine if the Proposed Project would affect the species or any suitable habitat. The protocol followed for the survey is detailed in the *USFWS Utah Field Office Guidelines for Conducting and Reporting Botanical Inventories and*

Monitoring of Federally Listed, Proposed and Candidate Plants (2011) and the *USFWS Interim Survey Requirements for Ute Ladies'-tresses Orchid* (1992). No ULT individual plants were identified, and the habitat was determined to be unsuitable due to dense reed canarygrass and aggressive agricultural grasses (i.e., orchardgrass and alfalfa) or due to dense dominant willow species and super saturated areas.

Effects Analysis

The survey and accompanying memorandum indicate that no suitable habitat for ULTs occurs in the Action Area. Additionally, no ULT individuals were observed in the Action Area. The Proposed Project would also remove vegetation along multiple portions of the ditch alignment, however, this vegetation removal would occur in areas that do not currently support suitable habitat for ULT given the presence of dense vegetation dominated by Kentucky bluegrass, bromes, reed canarygrass, and other aggressive grasses and shrubs.

Given the lack of suitable habitat and lack of occurrence records for the species in the vicinity, the Proposed Project is anticipated to have No Effect on the Ute ladies'-tresses.

Southern Leatherside Chub

Leatherside chub are small *cyprinid* fish that occur in desert streams in the Bonneville Basin and parts of the Upper Snake River drainage (UDWR 2010). There are two distinct taxa of leatherside chub—northern and southern. The southern leatherside chub is native to the Utah Lake and Sevier River drainages in Utah and the northern leatherside chub occurs in the Snake River and Bear River drainages. The historical range of the species in the Sevier River Drainage includes the San Pitch River hydrologic unit in which the Action Area occurs. Historical populations occurred in the San Pitch River, Manti Canyon, and Cedar Creek. Extant populations of the species occur in Canal Creek and the San Pitch River (UDWR 2010).

In 2010, the southern leatherisde chub was placed under a Conservation Agreement. The Utah Division of Wildlife Resources (UDWR), USFWS, U.S. Bureau of Land Management, and U.S. Bureau of Reclamation approved the Conservation Agreement and work cooperatively to implement the agreement. The species is a Tier II wildlife species of concern and listed as a species of greatest conservation need in the Utah Wildlife Action Plan (2015).

Leatherside chub requires flowing water and will not persist in lakes or reservoirs. Habitat typically includes a high variability of stream flow, annual precipitation, gradient, elevation, conductivity, and pH. The species typically occurs in elevations ranging from 3,700 feet AMSL to 8,560 feet AMSL. The preferred temperature range is between 15.6-20.0° Celsius (C), though reports indicate it occurs between 10.0-23.3° C. Microhabitat variables in potential habitat include low water velocities, intermediate water depths, and a low percent composition of sand-silt or gravel substrates. Generally, the species uses the main channel of streams, but in the presence of nonnative predators, may use side or off-channel habitats.

Effects Analysis

Potential habitat for southern leatherside chub occurs in Canal Creek, which is in a small part of the Action Area. Although Oak Creek connects to the San Pitch River, which contains habitat and records of southern leatherside chub, no records of the species occur in Oak Creek (UDWR 2024).

The Proposed Project is not anticipated to have any impacts to Canal Creek. The nearby Point Ditch Canal and Mill Race Canal are part of the Proposed Project, which would reduce flooding of Canal Creek, thereby reducing erosion and sedimentation of the creek. Accordingly, the Proposed Project is anticipated is anticipated to have No Effect on the southern leatherside chub.

Monarch Butterfly

The monarch butterfly was designated as a candidate species under the ESA on December 15, 2020. This species migrates approximately 1,200 to 2,800 miles from breeding grounds in Canada and the United States to hibernation grounds in central Mexico, Arizona, or southern California. In many regions, monarchs breed year-round. Milkweed (*Asclepias* spp.) is an obligate plant species in the monarch butterfly's lifecycle. Breeding monarchs lay their eggs on milkweed plants, typically on the uppermost leaves, and larvae emerge between two to five days later. After larvae have emerged, they will feed on milkweed as they develop into a chrysalis. Nectar and milkweed resources for monarch butterflies are often associated with riparian corridors.

Primary threats to the monarch butterfly include climate change, which affects weather conditions in both the wintering and summer breeding grounds. Climate change-influenced patterns of drought and rainfall can increase adult butterfly mortality and reduce food availability for monarch caterpillars (WWF 2024). Habitat loss and fragmentation from development and pesticide use, which impacts milkweed abundance, also contribute to decline in populations of the monarch butterfly (USFWS 2024b).

No milkweed (*Asclepias* spp.) plants were detected within the Action Area. While nectarous plant species were documented, the overall Action Area has an absence of food resource availability for the larval, caterpillar, and adult life stages of the monarch butterfly, rendering the Action Area's habitat suitability as poor for this species. BMPs and conservation measures would reduce construction effects to vegetation, including riparian habitats, where milkweed is often found as disturbed areas within riparian zones would be reseeded with native seed suitable to the landscape position, where applicable.

Although the USFWS has recently decided the monarch butterfly should be protected under the ESA, a formal listing is not expected until sometime in late 2024, therefore the species remains a candidate species. As the species remains a candidate for listing, no formal consultation is necessary under the ESA and none is requested for the species in this analysis. As such, no effects analysis and determination are presented for the monarch butterfly.

Greater Sage-grouse

The greater sage-grouse is the largest North American grouse species and inhabits sagebrush plains, foothills, wetlands, and riparian areas in the western United States (USFWS 2015). The species is considered an obligate user of sagebrush. Adult male greater sage-grouse range in length from 26 to 30 inches and weigh between four and seven pounds. Adult females are smaller and range in length from 19 to 23 inches and weigh between two and four pounds. Historically, greater sage-grouse occurred in 13 states, from Nebraska west to the coast states. In 2015, the USFWS found that the greater sage-grouse did not warrant listing under the ESA (USFWS 2015).

Sagebrush habitats ranging from approximately 4,000 to 9,000 feet elevation with a plentiful understory of forbs, grasses, and water availability are essential for optimum sage-grouse habitat. The species' diet consists of evergreen leaves, plain sagebrush shoots, blossoms, leaves, pods, buds, and insects (Alsop 2001). Male sage-grouse gather on traditional breeding grounds, called leks, during the spring breeding season and perform elaborate courtship performances to attract a mate. Breeding typically begins in March, with females nesting from mid-March to mid-May (Macais 2011). Productive nesting areas typically are characterized by sagebrush with an understory of native grasses and forbs, with horizontal and vertical structural diversity that provides an insect prey base, herbaceous forage for pre-laying and nesting hens, and cover for the hen during incubation (USFWS 2015). Shrub canopy and grass cover provide concealment for sage-grouse nests and young and are critical for reproductive success (USFWS 2015).

According to the Utah Sage-Grouse Management Areas (SGMA), the Action Area is not within a management area. The nearest SGMA is located approximately 7.5 miles east of the Action Area and the nearest greater sage-grouse lek record is approximately 20 miles southeast of the Action Area (UDWR 2021; Figure 4).

Effects Analysis

The Action Area is not located in or near any lek records or any SGMAs. Only a small amount of sagebrush occurs within the Action Area; the sagebrush areas have sparse coverage, low forb density, and lack of nearby wet meadows or a persistent, accessible water source. The sagebrush areas tend to either be very narrow or spread out and mixed with other vegetation (e.g., juniper, Gambel oak). The level of human disturbance and proximity to agricultural development would also likely deter greater sage-grouse occupation at these locations.

Given the marginal quality of sagebrush habitat within the Action Area, the large distance between the Action Area and the nearest active lek and SGMAs, and the lack of recent records of occurrence in the Action Area, it is reasonable to determine that the Proposed Project would have No Effect on the greater sage-grouse, and No Effect to SGMA or core habitat areas for the species.

Migratory Bird Treaty Act & Bald and Golden Eagle Protection Act

The IPaC report identified 12 migratory bird species (Table 1) protected under the Migratory Bird Treaty Act (MBTA) and two species protected under the Bald and Golden Eagle Protection Act (BGEPA). No nests (recently active or historical) were observed in the Action Area during the field survey.

Table 4: Migratory Bird Species in IPaC Report

Common Name	Scientific Name	Breeding Season	Preferred Habitat[1]	Habitat Present Within the Action Area?
American avocet	*Recurvirostra americana*	Apr 21 - Aug 10	Nests in areas with minimal vegetation along dikes and islands. During winter nesting sites include intertidal mudflats, tidal lagoons, brackish impoundments, sewage ponds, rice fields and flooded pastures. Forage in shallow wetlands.	No.
bald eagle	*Haliaeetus leucocephalus*	Dec 1 – Aug 31	Nests in forested areas adjacent to large bodies or water, staying away from heavily developed areas when possible.	Nesting and foraging habitat may occur within the Action Area.
broad-tailed hummingbird	*Selasphorus platycerus*	May 25 – Aug 21	Breeds in meadows and open woodlands preferring 5,000-10,500 feet in elevation. During winter migration they can be found in lowlands.	Breeding habitat may occur within the Action Area.
California gull	*Larus californicus*	Mar 1 – Jul 31	Nests on islands and levees within inland lakes and rivers, where vegetation cover is low. This species may forage up to 40 miles from breeding colonies.	No.
Cassin's finch	*Haemorhous cassinii*	May 15 – Jul 15	Nests in coniferous forests, primarily in mature forests of species including lodgepole pine (*Pinus contorta*) and ponderosa pine (*Pinus ponderosa*). Sometimes will breed in open sagebrush shrubland habitat where	Nesting habitat may occur within the Action Area.

Common Name	Scientific Name	Breeding Season	Preferred Habitat[1]	Habitat Present Within the Action Area?
			western junipers (*Juniperus occidentalis*) are present.	
Clark's nutcracker	*Nucifraga columbiana*	Jan 15 – Jul 15	Nests and forages in open coniferous forests of pines (*Pinus spp.),* larches (*Larix spp*.), junipers (*Juniperus spp.*), and spruces (*Picea spp.*) in the western United States and southwestern Canada, at anywhere from 3,000 to 12,000 feet.	Nesting and foraging habitat may occur within the Action Area.
evening grosbeak	*Coccothraustes vespertinus*	May 15 – Aug 10	Nests in mature and second-growth coniferous forests, and less commonly will nest in woodlands, parks and orchards.	No.
golden eagle	*Aquila chrysaetos*	Jan 1 – Aug 31	Nests in sites high above the ground that are open and accessible, like cliffs and steep escarpments. Typically breeds in grasslands, chaparral, open forests and mountainous areas.	Breeding habitat may occur within the Action Area.
northern harrier	*Circus hudsonius*	Apr 1 – Sep 15	Nests on or near the water, preferring sloughs, wet meadows, prairies, grasslands, and shrublands. Forage in large forest openings.	No.
olive-sided flycatcher	*Contopus cooperi*	May 20 – Aug 31	Breeds in mixed conifer forests in the Rocky Mountains, composed primarily of spruce (*Picea spp.*), fir (*Abies spp.*), Douglas-fir (*Pseudotsuga menziesii*), hemlock (*Tsuga spp.*), and other evergreen conifer species.	Breeding habitat may occur within the Action Area.
rufous hummingbird	*Selasphorus rufus*	Apr 15 – Jul 15	Nests in open shrubby areas, forest openings, and meadows.	Nesting habitat may occur within the Action Area.
sage thrasher	*Oreoscoptes montanus*	Apr 15 – Aug 10	Nests in areas with shrub and tree cover habitat, exclusively within sage-steppe habitat.	No.

[1]Sources: Cornell 2024a-Cornell 2024l.

Field investigations found no active nests for raptors or migratory birds. The Action Area and the surrounding area could provide nesting, roosting or stopover habitat for these species. The Proposed Project may require the removal of trees that could provide habitat for protected avian species. The Action Area should be cleared for any migratory bird or eagle nests prior to the removal of any trees or shrubs in areas of suitable habitat. An incidental nest survey should be completed earlier than one week prior to the removal of trees and shrubs within the Action Area. If a nest were identified within the Action Area, an NRCS Biologist and/or USFWS would be notified immediately to discuss the appropriate course of action.

Conclusion

This analysis summarizes the Proposed Project's potential effects on species listed as endangered or threatened, and designated and proposed critical habitat protected under the ESA. The IPaC report identified two ESA-listed species, the threatened ULT and candidate species monarch butterfly as having the potential to occur in the Action Area. No critical habitat occurs in the Action Area. A protocol-level survey for ULT found no ULT in the Action Area and determined that no suitable habitat occurs in the Action Area. Accordingly, the Proposed Project would have no effect to ULT. Potential habitat for monarch butterfly does occur in the Action Area along two ditches.

Table 5. Effects Determinations for ESA Species Evaluated in this BA

Common Name	Scientific Name	Designation	Determination
Ute ladies'-tresses	Spiranthes diluvialis	ESA Threatened	No Effect
monarch butterfly	*Danaus plexippus*	ESA Candidate	N/A

Based on the current distribution of the species in Utah and the presence of existing marginal sagebrush habitat, effects to the greater sage-grouse from the Proposed Project were studied further. Given the marginal quality of habitat within the Action Area, the large distance between the Action Area and the nearest active lek and SGMAs, the lack of recent records of occurrence in the Action Area, it is reasonable to determine that the Proposed Project would have No Effect on the greater sage-grouse, and No Effect to SGMA or core habitat areas for the species.

Clearance surveys for nests or nesting birds and appropriate avoidance mitigation, if required, would result in no effect or minimized impacts to migratory birds and raptors. Additional conservation measures may be included in permits and certifications issued for the Proposed Project by regulatory agencies. It should be noted that the final authority regarding species effect determinations rests with the appropriate regulatory agencies.

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Appendix A: USFWS IPaC Species List

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Utah Ecological Services Field Office
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West Valley City, UT 84119-7603
Phone: (801) 975-3330 Fax: (801) 975-3331

In Reply Refer To: 06/25/2024 14:30:12 UTC
Project Code: 2024-0101991
Project Name: Spring City Watershed Plan - EA Revised

Subject: List of threatened and endangered species that may occur in your proposed project location or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed, and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

https://www.fws.gov/sites/default/files/documents/endangered-species-consultation-handbook.pdf

Migratory Birds: In addition to responsibilities to protect threatened and endangered species under the Endangered Species Act (ESA), there are additional responsibilities under the Migratory Bird Treaty Act (MBTA) and the Bald and Golden Eagle Protection Act (BGEPA) to protect native birds from project-related impacts. Any activity, intentional or unintentional, resulting in take of migratory birds, including eagles, is prohibited unless otherwise permitted by the U.S. Fish and Wildlife Service (50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)). For more information regarding these Acts, see https://www.fws.gov/program/migratory-bird-permit/what-we-do.

The MBTA has no provision for allowing take of migratory birds that may be unintentionally killed or injured by otherwise lawful activities. It is the responsibility of the project proponent to comply with these Acts by identifying potential impacts to migratory birds and eagles within applicable NEPA documents (when there is a federal nexus) or a Bird/Eagle Conservation Plan (when there is no federal nexus). Proponents should implement conservation measures to avoid or minimize the production of project-related stressors or minimize the exposure of birds and their resources to the project-related stressors. For more information on avian stressors and recommended conservation measures, see https://www.fws.gov/library/collections/threats-birds.

In addition to MBTA and BGEPA, Executive Order 13186: *Responsibilities of Federal Agencies to Protect Migratory Birds*, obligates all Federal agencies that engage in or authorize activities that might affect migratory birds, to minimize those effects and encourage conservation measures that will improve bird populations. Executive Order 13186 provides for the protection of both migratory birds and migratory bird habitat. For information regarding the implementation of Executive Order 13186, please visit https://www.fws.gov/partner/council-conservation-migratory-birds.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Code in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List

OFFICIAL SPECIES LIST

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Utah Ecological Services Field Office
2369 West Orton Circle, Suite 50
West Valley City, UT 84119-7603
(801) 975-3330

PROJECT SUMMARY

Project Code: 2024-0101991
Project Name: Spring City Watershed Plan - EA Revised
Project Type: Flooding
Project Description: Irrigation and Flood Control Structures
Project Location:

The approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@39.488719950000004,-111.54719292345914,14z

Counties: Sanpete County, Utah

ENDANGERED SPECIES ACT SPECIES

There is a total of 2 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

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1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

INSECTS

NAME	STATUS
Monarch Butterfly *Danaus plexippus* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9743	Candidate

FLOWERING PLANTS

NAME	STATUS
Ute Ladies'-tresses *Spiranthes diluvialis* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/2159	Threatened

CRITICAL HABITATS

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

YOU ARE STILL REQUIRED TO DETERMINE IF YOUR PROJECT(S) MAY HAVE EFFECTS ON ALL ABOVE LISTED SPECIES.

IPAC USER CONTACT INFORMATION

Agency:	J-U-B Engineers, Inc.
Name:	Kira Coff
Address:	392 Winchester Street
Address Line 2:	Ste. 300
City:	Salt Lake City
State:	UT
Zip:	84107
Email	kcoff@jub.com
Phone:	8018869052

LEAD AGENCY CONTACT INFORMATION

Lead Agency: Natural Resources Conservation Service

Appendix B: UNHP Species List

Utah Division of Wildlife Resources
Utah Natural Heritage Program
1594 W. North Temple
PO Box 146301
Salt Lake City, UT 84116

Report Number: 15690
June 25, 2024

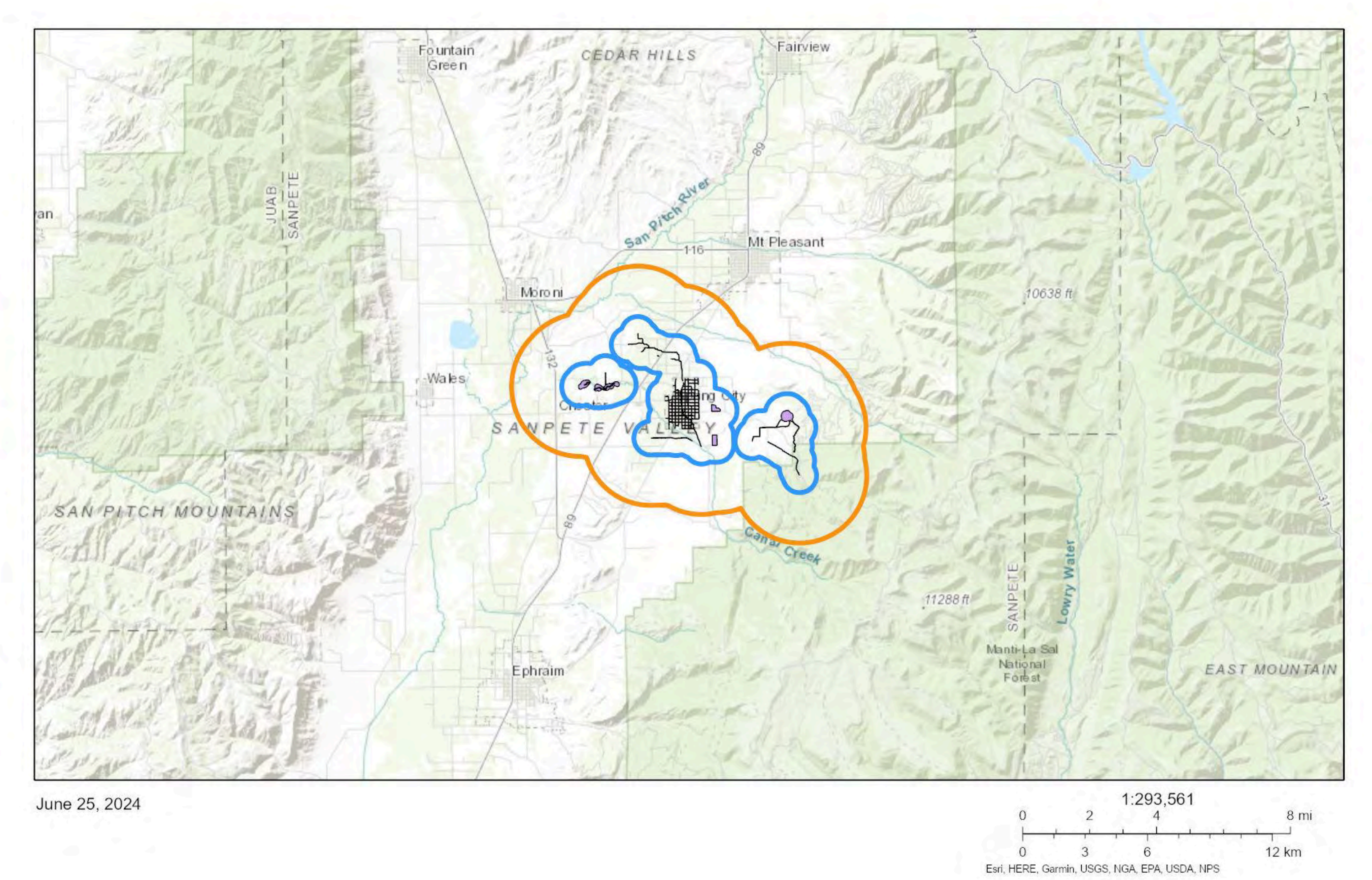
Utah Natural Heritage Program Online Species Search Report

Project Information

Project Name
Spring City Watershed

Project Description
Flood damage reduction

Location Description
(39.482651, -111.496064), (39.474021, -111.434091), (39.488886, -111.534381)



Animals within a ½ mile radius

Common Name	Scientific Name	State Status	U.S. ESA Status	Last Observation Year
Bald Eagle	Haliaeetus leucocephalus	SGCN		2003
Northern Leopard Frog	Lithobates pipiens	SGCN		2002

Plants within a ½ mile radius

Common Name	Scientific Name	State Status	U.S. ESA Status	Last Observation Year
No Species Found				

Animals within a 2 mile radius

Common Name	Scientific Name	State Status	U.S. ESA Status	Last Observation Year
Bald Eagle	Haliaeetus leucocephalus	SGCN		2003
Golden Eagle	Aquila chrysaetos	SGCN		2018
Northern Leopard Frog	Lithobates pipiens	SGCN		2010
Southern Leatherside Chub	Lepidomeda aliciae	SGCN		2010

Plants within a 2 mile radius

Common Name	Scientific Name	State Status	U.S. ESA Status	Last Observation Year
No Species Found				

Definitions

State Status

SGCN	Species of greatest conservation need listed in the Utah Wildlife Action Plan

U.S. Endangered Species Act

LE	A taxon that is listed by the U.S. Fish and Wildlife Service as "endangered" with the probability of worldwide extinction
LT	A taxon that is listed by the U.S. Fish and Wildlife Service as "threatened" with becoming endangered
LE;XN	An "endangered" taxon that is considered by the U.S. Fish and Wildlife Service to be "experimental and nonessential" in its designated use areas in Utah
C	A taxon for which the U.S. Fish and Wildlife Service has on file sufficient information on biological vulnerability and threats to justify it being a "candidate" for listing as endangered or threatened
PT/PE	A taxon "proposed" to be listed as "endangered" or "threatened" by the U.S. Fish and Wildlife Service

Disclaimer

The information provided in this report is based on data existing in the Utah Division of Wildlife Resources' central database at the time of the request. It should not be regarded as a final statement on the occurrence of any species on or near the designated site, nor should it be considered a substitute for on-the-ground biological surveys. Moreover, because the Utah Division of Wildlife Resources' central database is continually updated, any given response is only appropriate for its respective request.

The UDWR provides no warranty, nor accepts any liability, occurring from any incorrect, incomplete, or misleading data, or from any incorrect, incomplete, or misleading use of these data.

The results are a query of species tracked by the Utah Natural Heritage Program, which includes all species listed under the U.S. Endangered Species Act and species on the Utah Wildlife Action Plan. Other significant wildlife values might also be present on the designated site. Please contact UDWR's regional habitat manager if you have any questions.

For additional information about species listed under the Endangered Species Act and their Critical Habitats that may be affected by activities in this area or for information about Section 7 consultation under the Endangered Species Act, please visit https://ecos.fws.gov/ipac/ or contact the U.S. Fish and Wildlife Service Utah Ecological Services Field Office at (801) 975-3330 or utahfieldoffice_esa@fws.gov.

Please contact our office at (801) 538-4759 or habitat@utah.gov if you require further assistance.

Your project is located in the following UDWR region(s): Central region

Report generated for:
Sydney Allen
J-U-B Engineers
392 E Winchester St Suite 300
Salt Lake City, UT 84107
(801) 866-9052
seallen@jub.com

Appendix C: Photograph Inventory

Photograph 1: Southwest view of wetland in meadow area, eastern portion of Action Area

Photograph 2: South view of ditch with juniper and Gambel oak, southeastern area

Photograph 3: Northeast view of Oak Creek on southeastern portion of Action Area, where ditch joins

Photograph 4: Northwest view of pipeline route on southeastern portion of Action Area

Photograph 5: Southeast view of marginal sagebrush habitat with low cover and mixed with juniper

Photograph 6: North view Main Ditch, in Spring City

Photograph 7: East view of ditch and surrounding agricultural area, west of Highway 89

Photograph 8: Southeast view of ditch surrounding agricultural area, northwestern portion of Action Area

Photograph 9: Northeast view of wetland area and Oak Creek, western portion of Action Area

Photograph 10: South view of agricultural area, south of Oak Creek and wetlands

Ute Ladies'-Tresses Survey Findings Memo

MEMORANDUM

DATE: August 12, 2024

TO: Rita Reisor USFWS Botanist (Utah Field Office)

CC: Derek Hamilton, NEPA Biologist (NRCS)

FROM: Autumn Davies, Natural Resources Technical Lead (J-U-B ENGINEERS, Inc.); Tyler Schade, Biologist (J-U-B ENGINEERS, Inc.)

SUBJECT: Sanpete County, UT Spring City Watershed Flood and Irrigation PL566 Project: Ute ladies'-tresses Survey Findings

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The City of Spring City, Horseshoe Irrigation District, and the Natural Resources Conservation Service (NRCS) are proposing the Spring City Watershed Flood and Irrigation Project (Proposed Project) in Sanpete County, Utah, including areas within city limits of Spring City. The Proposed Project Action Area (Action Area) encompasses approximately 536 acres and occurs in multiple different landscapes, including areas on or adjacent to Oak Creek, within wetlands, ponds, and grassland areas, in the Manti-La Sal National Forest, shrub-scrub land, developed residential areas, and agricultural land (pastureland and cropland). The entire Action Area was evaluated for suitable Ute ladies'-tresses (ULT) (*Spiranthes diluvialis*) habitat on July 12 and 13, 2021. Based on areas that were identified as potential suitable habitat, a protocol-level plant survey was completed on five areas (Survey Area) within the Action Area. The Survey Area includes five areas along Oak Creek that spanned approximately 1.0 mile in length and encompassed 9.7 acres. The ULT survey was completed to evaluate suitable habitat conditions within the Action Area and to locate any previously unidentified ULT populations, if present.

Funding for the Proposed Project has been awarded from the NRCS PL566 Program, therefore this ULT survey has been completed to meet the environmental compliance requirements for the Proposed Project, and to provide documentation of survey results in accordance with the *USFWS Utah Field Office Guidelines for Conducting and Reporting Botanical Inventories and Monitoring of Federally Listed, Proposed and Candidate Plants* (2011) and the *USFWS Interim Survey Requirements for Ute Ladies'-tresses Orchid* (1992). The USFWS guidelines were implemented for the survey efforts. Autumn Foushee Davies, Senior Biologist/Natural Resources Technical Lead (J-

U-B Engineers, Inc.) conducted the field investigation on August 6, 2021, during the accepted flowering period.

The following section provides a brief description of ULTs, as well as the typical habitat requirements of the species. This information was used to ensure that the rare plant survey was completed in an efficient and comprehensive manner.

Species Description

The ULT is a member of the orchid family that was first described in 1984. The plant was federally listed as threatened by the U.S. Fish and Wildlife Service (USFWS) under the Endangered Species Act (ESA) in January 1992 (USFWS, 1995). Populations have been found in Utah, Colorado, Wyoming, Montana, Nevada, Idaho, and Washington. The elevation ranges in which populations have been found vary from 750 to 7,000 feet, with most populations located above 4,000 feet. ULTs are found in wetlands and riparian areas, including spring habitats, mesic meadows, river meanders and floodplains. They require open habitats, and populations decline if trees and shrubs invade the habitat. The species is intolerant of permanent standing water and does not compete well with aggressive species, such as reed canarygrass (*Phalaris arundinacea*). The recommended survey time for the species coincides with its flowering period, as identified by the USFWS (1995), and is typically mid-August through mid-September, depending on geographic position and seasonal trends.

Site Evaluation & Survey Results

Potential habitat along a portion of Oak Creek in the Action Area was surveyed for suitable habitat and ULT presence on August 6, 2021. A 600-foot wide corridor (from the centerline of the creek, 300 feet on both sides) was surveyed along Oak Creek near wetland/stream areas on the western portion of the Action Area. The Survey Area included five areas totaling 9.7 acres along approximately 1.0 miles of Oak Creek. No ULTs were identified during the survey. It was also determined that no suitable habitat for ULTs occurs in the Survey Area or Action Area.

Existing conditions along the creek segments were dominated by wetland vegetation, including hardstem bulrush (*Schoenoplectus acutus*), evening primrose (*Oenothera rosea*), Baltic rush (*Juncus balticus*), sedge (*Carex* sp.), Nebraska sedge (*Carex nebrascensis*), saltgrass (*Distichlis spicata*), reed canarygrass, and narrowleaf willow (*Salix exigua*). Aggressive agricultural species, including orchard grass (*Dactylis glomerata*) and alfalfa (*Medicago sativa*) are dominant species outside the wetland areas near the creek. The survey area near the wetland ponds consisted of super saturated conditions or were dominated by willow species, which did not exhibit the appropriate light regime for ULTs

Open, undisturbed riparian habitat was not present along these surveyed portions of the creek. Some riparian habitat is present in other segments of the creek, which are dominated by trees and shrubs and would not be preferred suitable habitat for the species. Given the saturated conditions, dense willow stands, and aggressive agricultural grasses, the current condition of the creek banks likely would not support suitable habitat for ULT. Given the lack of suitable habitat, no further protocol-level surveys for ULTs are warranted.

The attached ULT Survey Exhibit illustrates the locations of the ULT survey areas. The attached Photo Inventory captures the pertinent habitat conditions encountered during the survey.

Conclusion

The Action Area was evaluated for suitable ULT habitat. Five areas totaling 9.7 acres along 1.0 miles of Oak Creek were identified as potential suitable habitat and were surveyed under the accepted protocol for the ULT. The field investigation did not locate any ULT within the Survey Area and no suitable habitat was identified. The banks of the creek (and other canals) throughout most of the Proposed Project alignment would not be suitable habitat for ULT given the saturated conditions, heavy vegetative coverage, and competition from aggressive agricultural species.

If you have any questions regarding the information presented herein, please do not hesitate to contact me at: adavies@jub.com or via phone at 801-886-9052.

Attachments

1. ULT Survey Map
2. Photo Inventory

J·U·B ENGINEERS, INC. THE LANGDON GROUP GATEWAY MAPPING INC. J-U-B FAMILY OF COMPANIES

References

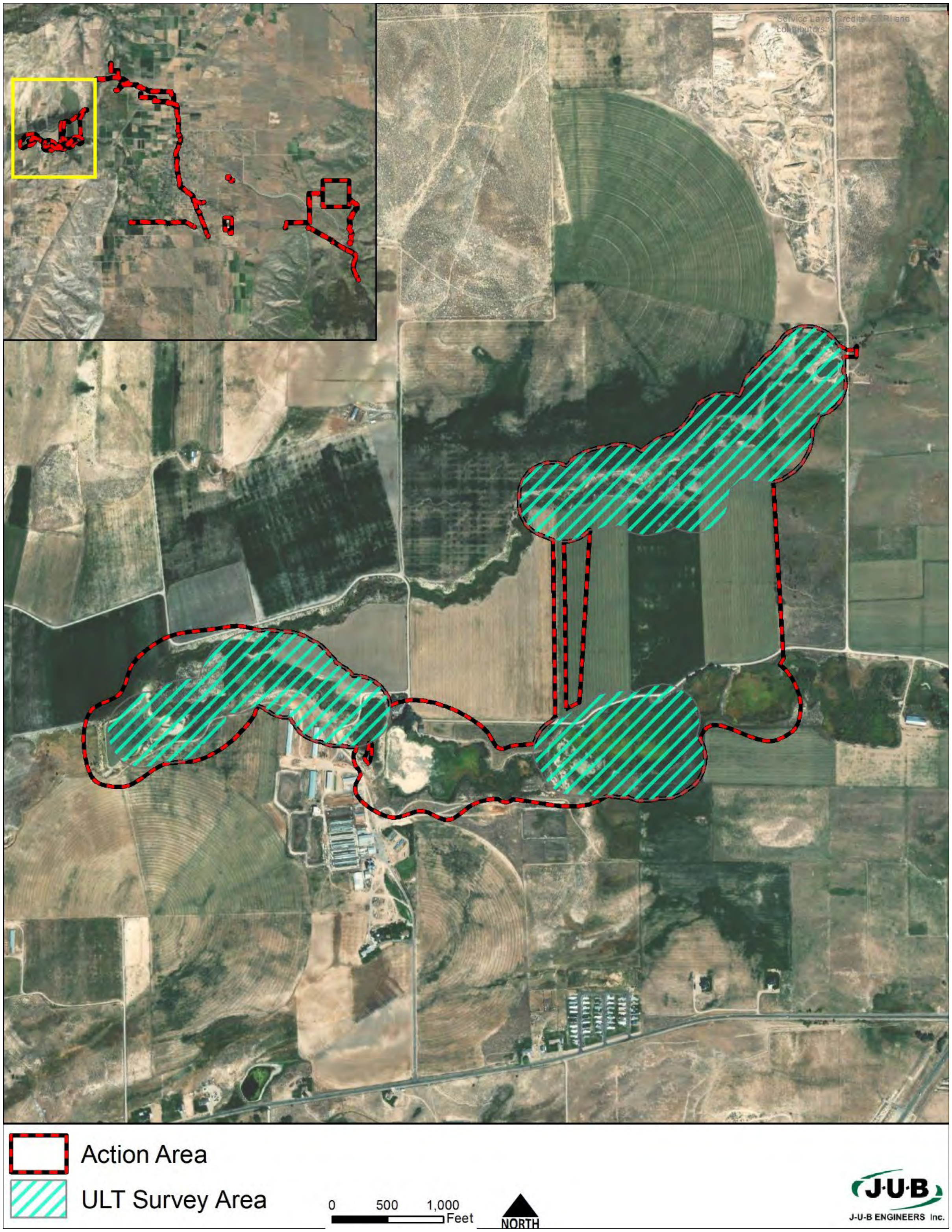
Federal Register. 1992. Final Rule to List the Plant Spiranthes diluvialis, Ute Ladies'-tresses as a Threatened Species. 57 FR 2048 205. (1992)

USFWS. 2011. USFWS Utah Field Office Guidelines for Conducting and Reporting Botanical Inventories and Monitoring of Federally Listed, Proposed, and Candidate Plants.

----. 1995. *Ute ladies'-tresses (Spiranthes diluvialis) Draft Recovery Plan*. USFWS, Denver, Colorado.

----. 1992. *USFWS Interim Survey Requirements for Ute Ladies'-tresses Orchid.*

Attachment 1: ULT Survey Map



Ute ladies'-tresses (ULT) Survey Area Map

J·U·B ENGINEERS, INC.

THE LANGDON GROUP

GATEWAY MAPPING INC.

J-U-B FAMILY OF COMPANIES

Attachment 2: Photo Inventory

Photograph 1: Northwest view of ULT survey area

Photograph 2: South view of ULT survey area along Oak Creek

Photograph 3: Southeast view of ULT survey area

Photograph 4: South view of ULT survey area, Oak Creek

J·U·B ENGINEERS, INC.

THE LANGDON GROUP

GATEWAY MAPPING INC.

J-U-B FAMILY OF COMPANIES

Photograph 5: South view of ULT survey area

Cultural Resources Report, redacted

COVER PAGE

Must Accompany All Project Reports Submitted to the Utah SHPO

UDSH Project Number: U21TW0755

Report Title: Cultural Assessment for the Spring City Watershed Plan and Environmental Assessment Sanpete County, Utah

Report Date: 28 July 2024

Org. Project Number: 21-08

County(ies): Sanpete

Report Author(s): Hannah Russell, Jessica Goodwin, Jacob Nelson, Tara Hoffmann

Principal Investigator: Hannah Russell

Record Search Date(s): 1 October 2021, 19 Feb 2024

Field Supervisor(s): Hannah Russell

Intensive Acres Surveyed (<15m intervals): 1604.08

Recon/Intuitive Acres Surveyed (<15m intervals): 767

USGS 7.5' Series Map Reference(s): USGS 7.5' 7.5 Spring City (2020), Chester, UT (2020), Moroni, UT (2020), Mount Pleasant (2020)

Sites Reported	Count	Smithsonian Trinomials
Revisits (no updated site forms)	1	42SP1098
Updates (updated site forms provided)	4	42SP437, 615, 621, 1105
New recordings (site forms provided)	32	42SP1206-1237
Total Count of Archaeological Sites in APE	36	
Historic Structures (structures forms provided)	1	255 S 300E
Total National Register Eligible Sites	14	42SP437, 42SP1098, 42SP1105, 42SP1206, 42SP1215-1216, 42SP1218, 42SP1222-1224, 42SP1226-1228, 42SP1231, 42SP1237

*Please list all site numbers per category. Number strings are acceptable (e.g. "42TO1-13; 42TO15"). Cells should expand to accommodate extensive lists.

Checklist of Required Items for Submittal to SHPO

- ☒"Born Digital" Report in a PDF/A format
  - ☒SHPO Cover Sheet
  - ☒File Name is the UDSH Project Number with no hyphens or landowner suffixes
- ☒"Born Digital" Site forms in PDF/A format
  - ☒UASF with embedded maps and photos
  - ☒File name is Smithsonian Trinomial without leading zeros (e.g. 42TO13 not 42TO00013)
  - ☒Photo requirements (including size and quality)
- ☒Archaeological Site Tabular Data
  - ☒Single spreadsheet for each project
  - ☒Follows UTSHPO template (info here: https://goo.gl/7SLMqj)
- ☒GIS data
  - ☒Zipped polygon shapefile or geodatabase of survey (if different from APE) or other activity area with required field names and variable intensity denoted
  - ☒Zipped polygon shapefile or geodatabase of site boundaries with a the required field n

Cultural Assessment for the Spring City Watershed Plan and Environmental Assessment Sanpete County, Utah

Lead Agency:
U.S. Department of Agriculture
Natural Resources Conservation Service

Additional Agencies:
U.S. Department of Agriculture
National Forest Service

Utah Department of Transportation

Sponsoring Local Organizations:
Spring City
Horseshoe Irrigation Company

State of Utah Antiquities Permit No. U21TW0755

28 July 2024

Prepared for:
J-U-B Engineers, Inc.
392 E Winchester St. Suite 300
Salt Lake City, Utah 84107

Prepared by:
Hannah Russell, MA, RPA, Jessica Goodwin MA, And Jacob Nelson with contributions from Mark Richter, Hannah Morris, and Tara Hoffmann, MA (NRCS)

Cottonwood Archaeology, LLC
P.O. Box 573
Moab, Utah 84532

Utah State Public Lands Policy Coordinating Office
Permit Number 38

Abstract

An archaeological inventory was conducted by Cottonwood Archaeology, LLC in Sanpete County, Utah between 2 October 2021 and 10 April 2022 for the Spring City Watershed Plan and Environmental Assessment. The inventory was undertaken at the request of Derek Moss and Douglas Davidson of J-U-B Engineers, Inc, on behalf of the USDA Natural Resources Conservation Service (NRCS). The proposed undertaking is located on private land, within the Manti-La Sal National Forest, and within Utah Department of Transportation Right-of-Way. In total, the inventoried area includes 36 sites and site segments. These include the update of four previously recorded sites (42SP437, 42SP615, 42SP621, and 42SP1105) and the recordation of 32 new sites (42SP1206-42SP1237). In total, 16 sites are recommended eligible. These include three precontact temporary camps (42SP1215, 42SP1216, and 42SP1227), three multi-component temporary camps (42SP1218, 42SP1226, and 42SP1228), three historic ponds (42SP1222-1224), two historic irrigation ditches (42SP437 and 42SP1231), two historic roads (42SP1098 and 42SP1237), and two are related to irrigation and historic electricity (42SP105 and 42SP1206). Based on the results of the inventory and the proposed projects measures, the project will result in "Adverse Effects" to historic properties, in accordance with Section 106 of the National Historic Preservation Act, 36 CFR 800 and Utah Code Section 9-8-404.

Table of Contents

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List of Tables

Introduction

Cottonwood Archaeology, LLC was contracted by J-U-B Engineers, Inc., on behalf of the Natural Resources Conservation Service (NRCS), to conduct a cultural heritage inventory of the Spring City Watershed Plan and Environmental Assessment (Plan-EA) in Sanpete County, Utah. The cultural heritage survey is located on private lands, within the Manti-La Sal National Forest, and within Utah Department of Transportation Right-of-Way. The cultural heritage inventory was conducted by Cottonwood Archaeology, LLC between 5 October 2021 and 10 April 2022. Fieldwork was undertaken by Hannah Russell, MA, RPA, who served as Principal Investigator, and was assisted by Jessica Goodwin, Hannah Morris, Jacob Nelson, and Mark Richter. A total of approximately 1610 acres were inventoried for cultural sites and materials. The cultural heritage inventory updated four archaeological sites and site segments, and recorded 32 new archaeological sites, and 14 isolated finds of archaeological materials.

The purpose of the inventory was to locate, document, and evaluate cultural sites and materials within the Area of Potential Effects (APE) to ensure that the proposed undertaking adheres to federal and state laws that mandate that agencies take into account effects on cultural objects, site, and landscapes as mandated by the National Historic Preservation Act of 1966 (amended), the Utah State Antiquities Act of 1973 (amended 1990), and the Utah State Register (R212-6). In total, the inventoried area includes 36 sites and site segments and 14 isolated finds. In total, 14 of the sites are recommended eligible for inclusion on the National Register of Historic Places. Further, the undertaking traverses through the Spring City National Register District. Based on the results of the inventory and the proposed projects measures, a finding of "Adverse Effect" to historic properties is recommended, in accordance with Section 106 of the National Historic Preservation Act, 36 CFR 800 and Utah Code Section 9-8-404.

Project Description

The proposed undertaking is a flood control and agriculture water management project led by the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) (lead agency), funded in part through with Watershed Protection and Flood Prevention Act (Public Law [PL] 83-566) for the purpose of supporting the protection of communities, agricultural water needs, and infrastructure within the project area. The NRCS s serving as the Lead Federal agency for the purposes of Section 106, with the U.S. Forest Service and Utah Department of Transportation as cooperating agencies. Spring City and the Horseshoe Irrigation Company are the Project Sponsors. The stated goals for the project are to develop a flood channel to debris basin in the Freeman Allred meadow and to develop piping to deliver flood and irrigation water below the reservoir. The flood channel and debris basin will divert waters from Oak Creek and the piping will improve the water delivery systems of Point Ditch, the North Fields' ditches, and Mill Race ditch in and around Spring City, Utah. (See Table 1 for specific project measures).

According to the associated draft Watershed Plan-Environmental Assessment, Proposed Alternatives includes construction of a new Freeman Allred Reservoir with new day-use recreational facilities, a new Oak Creek diversion structure with a new flood channel to the Reservoir, piping the Mill Race Flood Ditch, North Fields Ditch, and Point Ditch, a new city regulating pond, an Oak Creek Upper Diversion replacement, Chester Ponds cleaning (through dredging), new secondary water meters in Spring City, and diversion structure replacements throughout the system (NRCS, EPA, USFS 2023:S-9.0). More specifically, the Action Alternative would construct a 1,034 acre-foot reservoir (231 acre-feet of flood water, 703 acre-feet of irrigation water storage, and 100 acre-feet of debris and sediment storage) at Freeman Allred Meadow, located east of Spring City. The construction would also include the installation of an open trapezoidal concrete Flood Channel (5,850 ft) in an existing ditch easement to provide a means of transporting flood water and debris out of Oak Creek

Table 1: Specific Project Measures

Project Measure	Linear Feet, as appropr-iate	Temp. Disturb-ance (ac.)	Permanent Disturb-ance (ac.)	Construction Methodology
Freeman Allred Reservoir	-	82.6	59.0	Clear and Grub the reservoir site. Excavated cut material will help create the fill material needed. Import material will be hauled in to create the reservoir berm. Maximum excavation depth for the reservoir is 42 ft with an average depth of 15 ft.
Oak Creek Diversion	-	0.10	0.07	Existing Diversion will be demolished and proposed diversion rebuilt in same location.
Flood Channel (to reservoir)	5,850	6.71	4.03	New open channel will follow the existing ditch and will be cleared, grubbed, and excavated so the width of proposed channel is wider and deeper than original channel and material is cast in place concrete work.
Outlet Pipeline from Reservoir	7,830	7.19	0.004	The pipeline route would be trenched to a depth of 3 ft and the pipe would be buried; air vents would be installed every 500 ft which release trapped air in pipe and would be maintained inside covers .01 acre. An outfall structure will be built with cast in place concrete.
Mill Race Flood Ditch Piping	11,570	10.62	0.00	The pipeline route would follow the existing ditch. The pipe would be placed in the ditch and buried. Land will be seeded to prevent erosion. No excavation of the existing ditch is anticipated prior to pipe installation.
North Field Ditch Piping	21,070	19.35	0.00	The pipeline route would follow the existing ditch. The pipe would be placed in the ditch and buried. Land will be seeded to prevent erosion. No excavation of the existing ditch is anticipated prior to pipe installation.
Point Ditch Piping	6,890	6.33	0.00	The pipeline route would follow the existing ditch. The pipe would be placed in the ditch and buried. Land will be seeded to prevent erosion. No excavation of the existing ditch is anticipated prior to pipe installation.
City Regulating Pond	-	6.69	4.52	Clear and Grub the reservoir site. Excavated cut material will help create the fill material needed. Import material will be hauled in to create the reservoir berm.
Oak Creek Upper Diversion	8,450	7.76	0.00	The pipeline route would follow the existing pipeline. The pipe would be placed in the ditch (5 ft deep) and buried. Land will be seeded to prevent erosion.
Chester Ponds	-	95	0.00	Dredge the four existing ponds to depths of 2.5 ft to 5 ft (161,333 cubic ft) using excavation methods when ponds are empty. The dredged or excavated material will be hauled away and spread in nearby existing disturbed materials site in Township 15 South, Range 3 East, Section 24.
Oak Creek Bypass Piping	5,330	4.89	0.00	The pipeline route would be trenched and the pipe would be buried (3-5 ft). Land will be seeded to prevent erosion.
Secondary Water Meters	-	1.15	0.00	Install 502 meters at the juncture of the pipeline connection and the residential property line on private property. Excavation will be done using a vacuum truck and ground to be restored to original.
Freeman Allred Day Use Area	6,500	3.73	0.75	Clear and grub existing ground and construction grading equipment will be using to create the trail.

and into the planned reservoir. As part of the multi-purpose use of the Reservoir, the Freeman Allred Day Use Area would be constructed to include picnic facilities and pavilions, a pedestrian trail, and a boat launch area. The Action Alternative would also construct a new 1.5-mile pipeline to transport water away from the Reservoir back to both Oak Creek and the Last Chance diversion. The Action Alternative would pipe approximately 7.5 miles of existing open ditch irrigation systems within the North Fields, Point Ditch, and Mill Race Ditch systems, replace existing deteriorated diversions, and upsize 15 culvert road crossings to improve flood flows throughout Spring City. As part of the Mill Race Ditch improvement design, the proposed action would install 22" piping in half of the existing ditch prism and use the remaining half to continue collecting floodwater and street runoff from Spring City's streets and conveying the water to Oak Creek. Other project components would replace approximately 1.6 miles of the Oak Creek Upper Diversion from Oak Creek to the Spring City hydroelectric power plant. The project is intended to develop a new 20 acre-foot Regulating Pond, located adjacent to an existing regulating pond that will serve residential secondary water users of Spring City. Installation of the residential secondary water meters is estimated to conserve 142 acre-feet of water annually. Lastly, the Action Alternative would dredge the four existing Chester Ponds to depths of 2.5 to 5 feet in order to regain approximately 1,000 acre-feet of water storage (NRCS, EPA, USFS 2023:3.4.2).

The APE was initially established by the NRCS, the U.S. Forest Service, and the Sponsors based on known project conditions. The Direct Effects APE include all proposed project measures, access roads, staging areas, and necessary construction buffers. An existing materials source area will be used to dispose of dredged materials from Chester Ponds. The Direct APE totals 1604.08 acres. All areas of the direct APE were intensively surveyed. The APE was expanded to encompass the Visual Effects APE, which includes a $^{1}/_{8}$-mile buffer around Big Ditch, which is within the Spring City Historic District, and totals 963 acres. The Indirect APE encompasses the 100-year flood inundation zones for the No Action Alternative and the breach inundation zone for the Action Alternative. The Indirect APE totals 767 acres. Irrigation and canal ditches were inventoried to a width of 15 meters (7.5 meters from centerline). Roads were inventoried to a width of 30 meters (15 meters from centerline). An 18.5-acre area was inventoried around the City Regulating Pond in Township 15 South, Range 4 East, Section 33, a 170.4 acre area was inventoried around the Freeman Allred Reservoir in Township 15 South, Range 4 East, Sections 35 and 36, and 108 acres were inventoried around the Chester Ponds in Township 15 South, Range 3 East, Sections 25 and 26 and Township 15 South, Range 4 East, Section 30. The secondary water meters within Spring City were inventoried at reconnaissance level. A Class I literature review was conducted for the flood inundation zone.

The APE is located on private land, lands administered by the Manti- La Sal National Forest, and within Utah Department of Transportation Right-of-Way (ROW), Region 4. The Direct APE on private land totals 1604.08 acres, which includes 12.73 miles of linear corridor. The secondary water meters are all located on private lands in Spring City. The Direct APE within Manti-La Sal Forest lands includes 5.62 acres and includes 0.95 miles of linear corridor. Finally, 0.30 acres of the Direct APE are located within the UDOT ROW, which includes 0.05 miles of linear corridor.

The proposed project is located in the Sanpete-Sevier Valleys Geographic Unit (Stokes 1986:inner back cover) at the interface between the Great Basin and the Colorado Plateau (Stokes 1986:248). More specifically, the project area is located in the Sanpete Valley in Sanpete County, Utah. The legal description is Township 15 South, Range 3 East, Sections 24, 25, and 26, Township 15 South, Range 4 East, Sections 19, 20, 29, 31, 32, 33, 34, 35, and 36, and Township 16 South, Range 4 East, Sections 1, 2, and 4. (Figures 1-4).

[redacted]

USGS Topographic 7.5' Quadrangles Chester, UT (2020) and Moroni, UT (2020)

Cottonwood Archaeology

Legend

U21TW0755APE

100 Year Flood Footprint

Site Boundary

42SP1231

Land Ownership

Private

Date: 2/27/2024

[redacted]

Legend

U21TW0755APE	Site Boundary	100 Year Flood Footprint	
42SP1231	Spring City Historic Structures	**Land Ownership**	
1/8 mi Visual APE	Spring City National Register Historic District	Private	**Date: 3/17/2024**

[redacted]

Legend

U21TW0755APE

42SP1231

1/8 mi Visual APE

Site Boundary

Spring City Historic Structures

Spring City National Register Historic District

100 Year Flood Footprint

Land Ownership

Private

Date: 3/17/2024

[redacted]

Archaeology

Legend

- Isolated Finds
- U21TW0755APE
- Site Boundary
- Spring City Watershed Project Footprint
- 100 Year Flood Footprint

Land Ownership

- National Forest
- Private

Date: 2/27/2024

Environmental Setting

The proposed undertaking is located in the Upper Sonoran life zone in east-central Sanpete County and begins in the Oak Creek drainage of the San Pitch River and traverses westward to the westernmost impoundment of the Chester Ponds, west of Spring City. The eastern extent of the APE begins at an elevation of 7,160 feet above sea level in the semi-arid foothills ecoregion of the west slope of the southern Wasatch Range, west of the Wasatch Plateau. The highest elevations of the project area have tree species characteristic of both the semi-arid foothills zone, and the Wasatch Montane zone (EPA level IV, 19f/19d), and contain ponderosa pine, aspen, juniper, piñon pine, manzanita and Douglas-fir trees. As the APE descends in elevation, the ecoregion transitions to semi-arid foothills with juniper/piñon dominated forest with pockets of Gamble Oak, in a matrix of sagebrush, gramma grass, and intermittent areas of mountain mahogany. Continuing westward, the surveyed area descends into the mountain valley ecoregion (19g) in the vicinity of Spring City, and continues to its terminus at the west end of the Chester Ponds at an elevation of 5540 feet above sea level. This part of the APE habitat is primarily agricultural. The relatively short growing season lends itself to cultivation of hay crops, dairy and feedlot operations, winter sheep pasture, and turkey farming (EPA; epa.gov).

The geophysical region of the project area lies on the eastern extent of the transitional zone between the Basin Range province and the Colorado Plateau, in an area of transitional tectonics and physiography, with normal block faulting and alluvial processes as dominant forces of geomorphology (Milligan 2000). The proposed undertaking is located in the Sanpete-Sevier Valleys Geographic Unit (Stokes 1986:inner back cover) and is defined topographically by the narrow river valleys of the Sanpete and Sevier Rivers (Stokes 1986:248). Upper portions of the APE are underlain by Flagstaff limestone (Eocene and Paleocene), and by the North Horn formation (Paleocene and Upper Cretaceous) of mudstone, claystone, sandstone conglomerates, and sparse limestone "in irregular, alternating units" (Utah; interactive geological map). The mountain valley sections from Spring City to the Chester Ponds, classified as coalesced alluvial fan deposits, were formed by overlapping and interfingering alluvial fans. The fill deposits in the valley go back as far as the Pliocene and Miocene, and may be very deep in some areas. Fluvial sediments in the valley include silt, sand, pebbles, cobbles, and sparse boulders (Utah). Recent drought conditions have caused variability in the water supply, however, annual precipitation in the San Pitch River drainage basin has historically been about 12 inches in the valley areas, but precipitation in the mountains, much of it as snowpack, can reach up to 40 inches per year (Robinson; 1971:1). The Oak Creek drainage comprises a relatively small portion of the San Pitch River overall drainage area and is listed by USGS to have a drainage area of 8.35 square miles before reaching the valley floor (USGS).

Cultural and Historical Overview

Paleoindigenous Period

The timeframe and migration methods of the initial peopling of the Americas is still and increasingly debated within the American archaeological cannon. Pre-Clovis theories cite the growing number of pre-Clovis C14 dates reliably collected at hundreds of sites in North and South America. Further, linguistic models and genetic studies suggest that the earliest Western Hemisphere migrations, of which many were likely to have occurred, would have had to have taken place between 20,000 and 50,000 years before present, and molecular research has suggested early migrations might have occurred between 22,000 and 40,000 years before present (Steeves 2014:1509).

Paleoindigenous peoples were highly mobile forager-hunters who hunted both ice age megafauna and smaller animals (Fagan 2000:85). Projectile points produced from high-quality lithic materials with distinctive flaking patterns, fluting, and a general lanceolate shape (Schroedl 1991) are the most notable and diagnostic artifacts of the Paleoindigenous toolkit. Across the Paleoindigenous archaeological landscape, early human sites in North America are frequently related to large mammoth kill sites buried by thousands of years of soil development. In the immediate region, identified Paleoindigenous sites are predominantly expressed by surficial artifact deposits (Matson 1991:127-128).

In the Intermountain West, identified Paleoindigenous sites and materials have been relatively sparse. In northern Utah and Southeastern Idaho, identified Paleoindigenous sites and materials include lanceolate shaped projectile points that noticeably cluster around permanent waterways (Pitblado 2009). The Wasatch Plateau and San Pitch Mountains were used by people living in the lower elevation valleys, including the Sanpete Valley. Clovis spear points have been found on the Wasatch Plateau (Thompson and Irwin 2016:6).

Archaic Period

The Archaic period began in 7500 BCE and lasted until the advent of the Common Era. Archaic cultures were forager-hunter based and sites are indicated by temporary camps, artifact scatters, and rock markings with diagnostic projectile points, tool technologies, and features located in open areas and rock shelters (Tipps 1995:88-89). Archaic camps were used seasonally, perhaps over centuries, or for single use (Tipps 1995:88-89). It is suggested that there was a great deal of overlap between late Paleo peoples, and early Archaic peoples (Nickens 1982:10). Sub-surface archaeological investigations have indicated that the surficial expression of Archaic sites generally belies the extent and complexity of those sites (Reed 1993:12, Tipps 1995:88-89). An excellent example exists at Sudden Shelter, an Archaic era rock shelter near Salina, Utah. Extensive excavations have uncovered three phases that span over 4000 years of human seasonal occupation (Jennings 1973:92). Rock art and split-twig figurines show up in the archaeological record during the late archaic period (Madsen 1993:185). Rock marking styles indicative of the Archaic period in the Great Basin include Great Basin Representational and Abstract Styles (Sammons-Lohse 1981).

Formative Period

The Formative Period is defined by the spread of horticulture, domestication of animals, the production of pottery and textiles, and permanent to semi-permanent architecture. Within the context of the project area and its surrounds, the Formative Period is represented primarily by western Fremont peoples (700-1200 CE). Generally, Fremont archaeological remains withstand categorization suggesting Fremont cultural fluidity. Fremont sites are indicated by artifact scatters, granaries, subterranean slab-lined cist features, pit houses, multi-room surface architecture, distinctive rock art, and artifact scatters that include Fremont dent maize, Utah metates, Fremont pottery, clay figurines, moccasins, and formative projectile points (Barlow 2002:65-67). Fremont pottery consisted of gray and brown wares with later painted variants (Cordell 2009:213). Fremont rock art, a key diagnostic feature, includes anthropomorphs with trapezoidal body shapes and "bucket heads". Frequently, the anthropomorphs are elaborately decorated or are represented by select, minimal features. Other common Fremont elements that are ubiquitous across time and culture include spirals, shield figures, and quadrupeds (Cole 1990:173-220). Fremont peoples lived in organized villages including at nearby Beaver, Utah and Fremont Indian State Park, and as dispersed mobile groups (Simms 2010). Three miles southwest of Ephraim, which is near the project area, is a Fremont site known as Witch's Knoll, which includes fourteen mounds, varied forms of architecture, and other typical Fremont items (Antrei and Roberts 1999:21).

Late Precontact Period/Protohistory/Early Indigenous Historical Period

Following the abandonment of formative lifeways in the region due in part to environmental stresses and warfare, forager-gatherer lifeways regained cultural prominence in the area. Numic speaking Paiute and Goshute Indigenous peoples, whose homelands the APE fall within, followed regional and seasonal foodstuffs throughout most of the year before settling into winter camps in sunny open areas near perennial waterways (Bennett 2001:18). Archaeological explanations of the Numic presence in the Great Basin and Utah specifically include cultural continuity in the Great Basin as indicated by a lack of evidence suggesting cultural change or the supplanting of one people for another (Jones 2005:144; Defa 2003:77), and the slow, continual incorporation of Numic and Fremont peoples (Simms 1994, McBeth 2010:4). Numic peoples lived in temporary brush shelters (wickiups) and in the 19th century sometimes used teepees (Tom and Holt 2000:124). Both housing styles are more common in ethnographic accounts rather than archaeological contexts because of their ephemeral nature. Common Numic rock art motifs include horses, tipis, guns, and the recycling of older rock art styles (Cole 1990:225-226). Desert-side notched projectile points and Numic pottery have been found at a number of sites in southern Utah which were employed by Numic peoples from the late precontact period through to the period following Euro-American contact (Reed 1993:75).

The Sanpete area was inhabited by several bands of Utes, who were first encountered by Spanish Franciscans in the 1770s (Antrei and Roberts 1999:61). Relations with Mormon settlers in the 19th century began hospitably and included an invitation to Joseph Smith for Mormons to settle in the area. Increased Euro-American settlement of and transportation through southern Utah proved to be a substantial stress to local Indigenous populations, whose populations declined by as much as 90% during the 19th century (Tom and Holt 2000:123). After little more than a year of Mormon occupation of the valley, local Indigenous people felt encroached upon, and perhaps regretted their invitation (Antrei and Roberts 1999:68). Unrest and skirmishes increased, culminating in Walker's War in 1853-1854. In 1855, plans were made to resettle the Ute on a reservation. The Twelve Mile Creek Reservation was only initially successful; it was liquidated in 1864 and remaining Utes were forced to move to the Uintah Reservation (Antrei and Roberts 1999:75). This led to the Black Hawk War, an uprising led by a young Ute warrior, which lasted until 1869 and mainly comprised guerilla warfare and small skirmishes (Antrei and Roberts 1999:75). After this, most remaining Utes removed to the Uintah Reservation.

Undifferentiated Precontact/Post-contact Indigenous

Frequently, the surface expression of Indigenous sites is void of temporal or cultural indicators. The ubiquitousness of lithic refuse and some groundstone makes ascribing cultural or temporal affiliation very difficult to impossible, particularly at the survey level. Additionally, some rock marking elements are ubiquitous and used cross culturally and cross temporally.

Non-Indigenous Historical Period to Present

While the Spanish Dominguez and Escalante expedition came through Utah during their 1776 trek from Santa Fe, New Mexico to California, it is likely that they were not the first Europeans in the area as other Spanish expeditions preceded this one (Wilson et al 1999:31). Others would follow, which involved trade with local Indigenous peoples.

Mormon expansion into Sanpete County began in 1849, when Ute Chiefs Wakara and Sowiette led a band to Salt Lake City to formally invite Mormon people to settle in the Sanpete Valley (Antrei and Roberts 1999:24). Manti became the center of Mormon settlement in the area, with smaller settlements radiating outward from it. The Allred Settlement was established during this early wave of settlement, and later became Spring City. Expansion of Mormon settlements throughout the county continued but waned around the turn of the century.

New settlements were carefully chosen after scouting identified sources of water, timber, grazing land, and fertile soil (Antrei and Roberts 1999:34). These small settlements in the Sanpete Valley subsisted heavily on agriculture, but by at least 1860, cultivation was beginning to surpass water availability. This resulted in a vast system of water irrigation that is still in use today. Agriculture and livestock were and continue to be the dominant industries in the area, including beef and dairy cattle, sheep, poultry, wheat, and sugar beets. Grist and sawmills were also crucial components of each settlement, and coal mining eventually brought the railroad to the county (Antrei and Roberts 1999:125).

The Allred Settlement was settled in 1852 by the James Allred family, and was initially a small settlement of a dozen or so families. Unrest with local Ute Native Americans led to reinforcements in the form of 50 families of Danish converts, leading to the settlement being called "Little Denmark" (Watson 1984:12). This unrest led to open hostilities and caused the town to evacuate twice, once in 1853 during Walker's War, and again in 1866 during the Black Hawk War. Little Denmark came to be known as Springtown, and eventually, Spring City. Due in part to successful missions to Denmark, Mormon settlement in Utah was accompanied by Scandinavian converts as early as 1852. These immigrants settled throughout Utah but were concentrated in Sanpete and Sevier counties. By 1870, 80 percent of Sanpete County was composed of Scandinavians (Antrei and Roberts 1999:47). The large number of Scandinavian settlers of Spring City faced persecution and animosity early on from the American settlers, leading them to congregate in the northern portion of the city which became known as Little Denmark (after the town no longer went by that name). Little Denmark contained a meetinghouse, where prayer, school lessons, annual conferences with surrounding Scandinavian communities, and a choir met (Watson 1984:41).

As the town developed, homes, school buildings, stores, and sawmills were constructed, and skilled tradesmen provided essential services. Oolitic limestone was quarried in the hills west and south of town. Livestock was the primary industry in town, but sheep became the backbone of the local economy (Watson 1984:58). Agriculture was also a crucial industry, and water rights for irrigation were first granted in 1870 for Canal, Oak, and Cedar creeks. The town initially had wooden boardwalks, but they were inadequate and replaced by concrete sidewalks in 1913 (Watson 1984:69). The first concrete sidewalks were in front of the Edgar Allred Drug Store and the Anderson Meat and Grocery store (Watson 1984:69). The town made use of the WPA during the Great Depression to complete local projects, including the construction of a culinary water system, a library, a swimming pool, picnic grounds, sidewalks, and road improvements (Watson 1984:157). Several Civilian Conservation Corps (CCC) camps were located in the surrounding area, and as many as 50 young men from Spring City were involved with them (Watson 1984:157). One notable achievement from the CCC was the construction of Canyon Road, which runs from town into the national forest.

In the early 20th century, the Sanpete area slowly improved its infrastructure, adding improved water lines, putting electric and communication systems in place, and developing roads and highways. All these developments occurred rather later than in urban areas, but helped connect the communities more to the outside world. The Spring City area continues to be small, rural, and self-sufficient, as it has since it was first settled by Mormon settlers in the 1850s. Despite its isolation, the area has continued to diversify over the years with different cultures and religions. Spring City had a population of just over 1,000 in 2019, and Sanpete County had a population of almost 30,000.

Logistics and Methodology

Prior to fieldwork, a file search was conducted through Utah SHPO's SEGO and UDAM online databases and with Charmaine Thompson at the Manti-La Sal National Forest to identify previous archaeological projects and sites that occur within and in the vicinity of the project area. The search identified 24 previously conducted archaeological projects and 7 previously recorded archaeological sites within the APE and within a half-mile of the APE. In addition, Spring City is located in a National Register District and is a Certified Local Government (CLG). Documents pertaining to those historical locations were also reviewed.

Fieldwork was undertaken between 2 October 2021 and 10 April 2022. The APE totals 1610 acres of linear and block survey areas. Irrigation and canal ditches were inventoried to a width of 15 meters (7.5 meters from centerline). Roads were inventoried to a width of 30 meters (15 meters from centerline). An 18.5 acre area was inventoried around the City Regulating Pond in Township 15 South, Range 4 East, Section 33, a 170.4 acre area was inventoried around the Freeman Allred Reservoir in Township 15 South, Range 4 East, Sections 35 and 36, and 108 acres were inventoried around the Chester Ponds in Township 15 South, Range 3 East, Sections 25 and 26 and Township 15 South, Range 4 East, Section 30. The secondary water meters within Spring City were inventoried at reconnaissance level. A Class I literature review was conducted for the flood inundation zone. The inventory was conducted via an intensive pedestrian survey with the archaeologists traversing the project area at intervals of no greater than 15 meters. Archaeological sites are defined as 50 years old or older, two or more temporally associated cultural features without artifacts, a cultural feature with at least one temporally associated artifact, and/or a cluster of ten or more associated cultural materials in a ten meter square area or 15 or more unassociated artifacts within a ten meter square area (Utah State Historic Preservation Office and Antiquities Section 2019:13-14). Linear sites are defined as a modification of the landscape that is substantially longer than it is wide with the physical remains of the historical fabric or the remains of the landscape modification (UPAC 2008).

Sites were documented using the Utah Archaeological Site Form, mapped with a Trimble Juno 3B GPS, and photographed with a digital camera. Trimble collected GIS data were post-processed. No archaeological materials were collected in the course of the inventory. All archaeological sites were evaluated for National Register of Historic Places (NRHP) inclusion. Isolated finds were photographed, documented, and a GPS point was collected at the location of isolates.

File Search Results

A file search for previously conducted archaeological and architectural inventories and previously recorded sites was conducted through Utah SHPO's SEGO and UDAM online databases, the Historic Utah Buildings (HUB) online database, and with Charmaine Thompson at the Manti-La Sal National Forest on 1 October 2021. The file search yielded a total of 13 projects (Table 2) and 20 sites (Table 3) that occur within and within a half-mile radius around the APE. Five previously conducted projects fall within the APE and four previously recorded sites fall within the APE of the undertaking.

In addition to the cultural projects and recorded archaeological sites, the project area traverses through the Spring City National Register Historic District (SCNRHD) and Certified Local Government (CLG). The National Register Nomination was prepared in 1979, accepted in 1980, and amended in

2022. The National Register nomination and associated historic architecture inventories were also reviewed as were historic maps and aerial imagery (SCNRHD addressed in detail below). Further, the HUB online database was consulted to identify documented architecture and non-archaeological built environment (45 years old and older) within a half mile of the project area and outside of the SCNRHD (Table 4). Properties in bold indicate that they fall within the APE. A total of 33 built environment features have been documented within and within half a mile of the APE and outside of SCNRHD.

Table 2: Previous Archaeological Inventories

Report No.	Project Component	Report Title	Author	Date
U87BC0077	½ mile of proj ftprnt.	Archaeological investigations along the mountain fuel supply pipeline in central and Southwestern Utah, Sevier County, Utah	Lorna Beth Billat and Scott E. Billat	1988
U94NP0132	**In proj ftprnt.; ½ mile from 2nd H_2O Meters**	**A cultural resource inventory of the proposed US West Communications fiber optic cable corridor in Juab, Sanpete and Sevier Counties, Utah**	**Asa S. Nielson, Charles E. Hughes, Garth Norman, and Shaner R. Sulz**	**1994**
U01BS0237	**In proj ftprnt.; ½ mile from 2nd H_2O Meters**	**A cultural/paleontological resource inventory of the proposed central telephone of Utah Mount Pleasant to Spring City Buried Cable Corridor, Sanpete County, Utah**	**Asa S. Nielson**	**2001**
U01BC0468	½ mile of proj ftprnt.; ½ mile of 100 yr Fld. Zone	Archaeological inventory of state trust lands parcels in central and southwestern Utah	Jacob J. Sauer; Richard K. Talbot	2002
U03FS0496	½ mile of proj ftprnt.; ½ mile of 100 yr Fld. Zone	Whispering Pines Fuels Treatment	Chris Horting	2003
U04MQ0136	½ mile of proj ftprnt.; ½ mile of 100 yr Fld. Zone; ½ mile from 2nd H_2O Meters	Cultural resource inventory of Central Utah Telephone / Skyline Telecom's proposed Wales to Spring City fiberoptic line in San Pete County, Utah.	Sharyl Kinnear-Ferris	2004
U04BS1381	**In proj ftprnt.**	**A cultural resource inventory for the Cedar Creek Group Irrigation Project in Sanpete County, Utah**	**Quint A. Colman; Todd B. Seacat**	**2004**
U05UQ0895	½ mile of proj ftprnt.; ½ mile of 100 yr Fld. Zone	Spring City Plateau demonstration	Michael O'Hara; Dennis Gilpin; Krislyn Taite	2005
U06MQ0590	**In proj ftprnt.**	**Cultural Resource Inventory for Utah Department of Transportation's Pigeon Hollow Junction; to Spring City Highway Improvement Project, Sanpete County, Utah**	**Meg Thornton and Jacki Montgomery**	**2006**
U18FS0261	½ mile of proj ftprnt.	Spring City Spring Redevelopment	Sarah Herrera	2018
U19HX0830	½ mile of proj ftprnt.; ½ mile of 100 yr Fld. Zone	An Archaeological Inventory of the Spring City Fuel Break: Alternative A	Aaron Woods	2019
U20FN0487	½ mile of 100 yr Fld. Zone; ½ mile of proj ftprnt.	Field Survey of 9,437 Acres for the Sanpete Face Archaeological Survey in the Manti-La Sal National Forest, Sanpete and Utah Counties, Utah	Brian McKee, Will Russell, Lindsay Wygant, Sarah	2020

Report No.	Project Component	Report Title	Author	Date
			Herrera	
U22HO0725	**In proj ftprnt.; ½ mile of 100 yr Fld. Zone; ½ mile from 2nd H2O Meters**	**A Cultural Resource Inventory for the Proposed Spring City Sewer Line Project in Spring City, Sanpete County, Utah**	**Jon Baxter**	**2023**

Table 3: Previously Recorded Archaeological Sites

Site No.	Year Recorded	Site Type/Name	NRHP Eligibility	Project Component
42SP193	2006	Railroad	Eligible	½ mile of 100 yr Fld. Zone; ½ mile of proj ftprnt.
42SP195	1987	Historic Foundation	Recommended Not Eligible	½ mile of 100 yr Fld. Zone; ½ mile of proj ftprnt.
42SP437	**2001**	**Mill Race Ditch (Irrigation Ditch)**	**Eligible**	**In proj ftprnt.;** ½ mile from 2nd H2O Meters
42SP440	2004	Last Chance Ditch (Irrigation Ditch)	Determined Eligible	½ mile of proj ftprnt.
42SP465	2001, 2019	Allred Ditch (Irrigation Ditch)	Not Eligible	½ mile of proj ftprnt.
42SP517	**2004**	**Highway 117 (Historic Road)**	**Recommended Not Eligible**	½ mile from 2nd H2O Meters; **100 yr Fld. Zone;** ½ mile of proj ftprnt.
42SP552	2004	Historic Dump	Not Eligible	½ mile of proj ftprnt.
42SP553	2004	Historic Corral	Not Eligible	½ mile of proj ftprnt.
42SP554	2004	Historic Stock Pond	Not Eligible	½ mile of proj ftprnt.
42SP555	2004	Historic Stock Pond	Not Eligible	½ mile of proj ftprnt.
42SP556	2004	Historic Stock Pond	Not Eligible	½ mile of proj ftprnt.
42SP614	2006	Historic Corral	Not Eligible	½ mile from 2nd H2O Meters; ½ mile of proj ftprnt.
42SP615	**2006**	**Point Ditch (Irrigation Ditch)**	**Not Eligible**	**In proj ftprnt.;** ½ mile from 2nd H2O Meters
42SP616	2006	Historic Trash Scatter	Not Eligible	½ mile of proj ftprnt.
42SP621	**2006**	**Highway 89 (Historic Road)**	**Not Eligible**	**In proj ftprnt.;** ½ mile from 2nd H2O Meters;
42SP622	2006	Historic Farmstead	Eligible	½ mile from 2nd H2O Meters; ½ mile of proj ftprnt.
42SP1098	**2022**	**Historic Road**	**Eligible**	**In proj ftprnt** ½ mile of 100 yr Fld. Zone
42SP1104	2019	Multicomponent Site	Not Eligible	½ mile of proj ftprnt.; ½ mile of 100 yr Fld. Zone;
42SP1105	**2019**	**Historic Penstock Aqueduct**	**Eligible**	**In proj ftprnt.;** ½ mile of 100 yr Fld. Zone;
42SP1379	2023	Historic Corral	Not Eligible	½ mile from 2nd H2O Meters; ½ mile of 100 yr Fld. Zone; ½ mile of proj ftprnt.

Table 4: Documented Historic Built Environment outside of SCNRHD

PR ID	Project Component	Address	Property Name	Const. Year	Original Use/Type	NRHP Eligibility Status
204	**100 yr Fld. Zone**	830 Pigeon Hollow Road		1960	single dwelling/ building	Not Eligible/Non-Contributing
68424	½ mile from proj. ftprint; 100 yr Fld. Zone	932 S Spring City Area		1875	single dwelling/ building	Not Eligible/Non-Contributing
68396	½ mile from 100 yr Fld. Zone	Spring City/ Chester Area		1870	single dwelling/ building	Not Eligible/Non-Contributing
68400	½ mile from 100 yr Fld. Zone	Spring City Area		1870	single dwelling/ building	Eligible/Contributing
69130	½ mile from proj. ftprint	Spring City Area		1885	single dwelling/ building	Eligible/Contributing
69132	½ mile from 100 yr Fld. Zone	Spring City/ Chester Area		1880	single dwelling/ building	Eligible/Contributing
69161	**100 yr Fld. Zone**	Spring City Area		1910	agricultural storage/ building	Eligible/Contributing
69356	½ mile from proj. ftprint; ½ mile from 100 yr Fld. Zone	Spring City/ Chester Area		1885	other residential	Eligible/Contributing
69358	½ mile from proj. ftprint; ½ mile from 100 yr Fld. Zone	Spring City/ Chester Area		1880	single dwelling/ building	Eligible/Contributing
69828	½ mile from 100 yr Fld. Zone	Spring City/ Chester Area		1870	single dwelling/ building	Not Eligible/Non-Contributing
69991	½ mile from proj. ftprint; ½ mile from 100 yr Fld. Zone	Spring City/ Chester Area		1880	single dwelling/ building	Not Eligible/Non-Contributing
73639	½ mile from proj. ftprint; ½ mile from 100 yr Fld. Zone	4715 E 14175 North Fayette	Honeymoon Cabin	1904	single dwelling/ building	Eligible/Contributing
83350	½ mile from proj. ftprint; ½ mile from 100 yr Fld. Zone	Spring City Area		1870	single dwelling/ building	Eligible/Contributing
83351	½ mile from proj. ftprint	Spring City Area		1880	single dwelling/ building	Not Eligible/Non-Contributing
90953	½ mile from 2nd H2O Meters; ½ mile from proj. ftprint	745 E 400 North		1955	single dwelling/ building	Eligible/Contributing
98476	½ mile from 2nd H2O Meters; ½ mile from 100 yr Fld. Zone; ½ mile from proj. ftprint	546 S 200 West	Larsen, Otto, House	1900	single dwelling/ building	Not Eligible
99177	½ mile from 2nd H2O Meters;	395 S 500 East	Sutliff,	1969	single dwelling/	Eligible/Contributing

PR ID	Project Component	Address	Property Name	Const. Year	Original Use/Type	NRHP Eligibility Status
	½ mile from 100 yr Fld. Zone; ½ mile from proj. ftprint		Edward, House		building	
99195	½ mile from 2nd H2O Meters; **100 yr Fld. Zone**; ½ mile from proj. ftprint	600 S 200 West	Behunnin, Martin House	1900	single dwelling/ building	Demolished
99226	½ mile from 2nd H2O Meters; ½ mile from proj. ftprint	225 S 700 East		1890	single dwelling/ building	Demolished
100807	½ mile from 2nd H2O Meters; 100 yr Fld. Zone; ½ mile from proj. ftprint	469 S 500 East		1970	single dwelling/ building	Eligible/Contributing
100818	**100 yr Fld. Zone**	740 S 200 West	Allred House	1900	single dwelling/ building	Demolished
101068	**100-Yr Fld. Zone;** ½ mile from 2nd H2O Meters; ½ mile from proj. ftprint	586 S 200 West	Dahl, Niels House	1915	single dwelling/ building	Not Eligible
101576	**100 yr Fld. Zone**	600 W Highway 117		1869	single dwelling/ building	Eligible/Contributing
101597	**100-Yr Fld. Zone**; 50' of proj. ftprint	200 W Old Hwy 89		1890	single dwelling/ building	Eligible/Contributing
116019	½ mile from 100 yr Fld. Zone	11500 N 8500 East	Johnson, Jacob, Farmhouse	1872	single dwelling/ building	Eligible/Contributing
222792	½ mile from 2nd H2O Meters; ½ mile from proj. ftprint	395 S 500 East		1880	agricultural storage/ building	Eligible/Contributing
257143	**100 yr Fld. Zone**	546 S 200 West	Larsen, Otto, House	1900	single dwelling/ building	Not Eligible
257170	**100 yr Fld. Zone**	487 S 200 East	Allred-Bunnell House	1880	single dwelling/ building	Not Eligible
257229	**100 yr Fld. Zone**	670 S 200 West	Dahl, Rulon House	1900	single dwelling/ building	Eligible/Contributing
257310	**100 yr Fld. Zone**	750 S 200 West	Crawforth, James, House	1895	single dwelling/ building	Not Eligible
257312	**100 yr Fld. Zone**	586 S 200 West	Dahl, Niels House	1915	single dwelling/ building	Not Eligible
257527	½ mile from 2nd H2O Meters; ½ mile from 100 yr Fld. Zone	75 S 700 East	Cattle Corrals	1940	animal facility/ structure	Eligible/Contributing

PR ID	Project Component	Address	Property Name	Const. Year	Original Use/Type	NRHP Eligibility Status
257528	½ mile from 2nd H2O Meters; ½ mile from 100 yr Fld. Zone	81 S 700 East	Sheep Corrals	1915	animal facility/ structure	Eligible/Contributing

Spring City National Register District

The SCNRHD was listed on the NRHP in 1980 following an inventory of the city in 1974 that documented 443 buildings, structures, and/or objects of which, 337 were recommended NRHP eligible and listed. The areas of significance identified in Spring City in 1980 were agriculture, architecture, and exploration/settlement and the dates of significance identified spanned from 1851 to 1915 (Carter 1980:6). More specifically, the author states: "the historic and architectural significance of Spring City lies in two areas: (1.) the town graphically documents the techniques of Mormon town planning in Utah; [and] (2.) architecture in Spring City is remarkably well preserved with an abundance of religious…, homes, and small commercial establishments" (Carter 1980:6). Carter continues saying that Spring City's significance lies in its exemplary quality as a "Mormon village" type settlement consistent with the "Plat for the City of Zion" as described by Joseph Smith (Carter 1980:9).

In 2022, the nomination was updated and amended by Korral Broschinsky in coordination with the Friends of Historic Spring City. Numerous changes to the original nomination were made. The areas of significance were expanded to include community planning and development in addition to exploration/settlement, architecture, and agriculture; and the period of significance was altered to between 1859 and 1972 (Broschinsky 2022:3). Additionally, the district was formally evaluated for NRHP Criteria. The district is eligible under Criterion A for its association with mid-19th century development patterns in rural Utah, and the "Plat for the City of Zion" planning style (Broschinsky 2022:Section 8 Page 3-4). The district is also eligible under Criterion C for the many exemplary architectural styles represented in Spring City that span the period of significance including vernacular, Greek and Gothic Revivals, bungalows, period cottages, and ranch houses. Further, the planning of Spring City's one-home-per-block pattern remained consistent throughout the period of significance (Broschinsky 2022:Section 8 Page 2). The district's significance is supported by the integrity of location, setting, design, and feeling (Broschinsky 2022). As a result of the changes laid out in the 2022 nomination, which was accompanied by an updated inventory, 496 built environment features were documented. Of these, 290 are eligible and 206 are not eligible (Broschinsky 2022) (Table 5). Within the not eligible built environment features, 144 are "out-of-period", 43 are demolished, and 1 is unevaluated (Historic Utah Buildings 2024). (Note: recorded built environment features that are under 45 years old are not represented in Table 5.)

Table 5: Spring City National Register Historic District Built Environment

PR ID	Project Component	Address	Property Name	Const. Year	Original Use/Type	NRHP Eligibility
82616	100-Yr Fld. Zone; 50' of proj. ftprint	69 W 300 South	Spring City Relief Society Granary	1875	agricultural storage/ building	Listed/ Contributing

PR ID	Project Component	Address	Property Name	Const. Year	Original Use/Type	NRHP Eligibility
98369	100-Yr Fld. Zone; ½ mile from 2nd H2O Meters; 50' of proj. ftprint	469 S 300 East	Allred - Johnson House	1890	single dwelling / building	Listed/ Contributing
98371	50' of 2nd H2O Meters; 50' of proj. ftprint; ½ mile of 100 yr Fld. Zone	50 S 500 East		c1970	single dwelling / building	Listed/ Contributing
98373	100-Yr Fld. Zone; ½ mile from 2nd H2O Meters; ½ mile from proj. ftprint	475 E 400 South	Chester School	1895	school/ building	Not Eligible / Non-Contributing
98376	50' of 2nd H2O Meters; 50' of proj. ftprint	184 E 200 South	Rasmussen (Clawson), James, House	1884	agric. outbuilding/ building	Listed/ Contributing
98377	½ mile from 100-Yr Fld. Zone; 50' of 2nd H2O Meters; ½ mile from proj. ftprint	263 S 300 East		1970	single dwelling / building	Not Eligible / Non-Contributing
98378	50' of 2nd H2O Meters	241 S 200 East		c1925	single dwelling / building	Not Eligible / Non-Contributing
98379	50' of 2nd H2O Meters; 50' of proj. ftprint	379 N 200 East	Sterner, Annie, House	c1940	single dwelling/ building	Listed/ Contributing
98381	100-Yr Fld. Zone; ½ mile from 2nd H2O Meters; ½ mile from proj. ftprint	190 W 300 South	Nielsen Jacob Log House	1875	single dwelling / building	Demolished
98382	½ mile from 100-Yr Fld. Zone; 50' of 2nd H2O Meters; 50' of proj. ftprint	388 E 300 South	Hudson, Alder House	1880	single dwelling / building	Listed/ Contributing
98383	100-Yr Fld. Zone; 50' of 2nd H2O Meters; 50' of proj. ftprint	389 E 400 South	Madsen, Francis C., House	1900	single dwelling / building	Listed/ Contributing
98384	100-Yr Fld. Zone; 50' of proj. ftprint	415 S 400 East	Higsby-Christensen House	1875	single dwelling/ building	Listed/ Contributing
98385	50' of 2nd H2O Meters; 50' of proj.	11 E 100 South	Kofford House	c1860	single dwelling/	Listed/ Contributing

	ftprint				building	
98386	50' of 2nd H_2O Meters; 50' of proj. ftprint	393 E 200 South	Olsen, John, House	1902	single dwelling/ building	Listed/ Contributing
98387	½ mile from 100-Yr Fld. Zone; 50' of 2nd H_2O Meters; 50' of proj. ftprint	575 E 100 South		1960	animal facility/ building	Listed/ Contributing
98388	½ mile from 2nd H_2O Meters; ½ mile from proj. ftprint	313 E 100 South	Mickel House	1910	single dwelling / building	Not Eligible / Non-Contributing

PR ID	Project Component	Address	Property Name	Const. Year	Original Use/Type	Listing Status
98389	½ mile from 100-Yr Fld. Zone; 50' of 2nd H_2O Meters; 50' of proj. ftprint	310 E 200 South	Black, Roy House	1919	single dwelling/ building	Listed/ Contributing
98390	50' of 2nd H_2O Meters; ½ mile from proj. ftprint	165 W Center	Sherm's Garage	1950	Commercial (gen)/ building	Not Eligible / Non-Contributing
98475	100-Yr Fld. Zone; 50' of 2nd H_2O Meters; 50' of proj. ftprint	164 N 100 West	Bohleen- Olsen House	1859	single dwelling/ building	Listed/ Contributing
98477	100-Yr Fld. Zone; 50' of 2nd H_2O Meters; 50' of proj. ftprint	523 S 200 West	Major's Pug Mill/Adobe Yard	1880	mill/processing/ site	Listed/ Contributing
98478	100-Yr Fld. Zone 50' of 2nd H_2O Meters; 50' of proj. ftprint	407 N Main	Kelsey's Garage	1940	commercial (gen.)/ building	Listed/ Contributing
98479	100-Yr Fld. Zone; ½ mile from 2nd H_2O Meters; ½ mile from proj. ftprint	422 N Main		1875	agric. outbuilding/ structure	Demolished
98481	50' of 2nd H_2O Meters; 50' of proj. ftprint	125 S Main	Anderson, Soren, House	1904	single dwelling/ building	Listed/ Contributing
98482	100-Yr Fld. Zone; 50' of 2nd H_2O Meters; 50' of proj. ftprint	12 N Main	Justesen, Rasmus House	1875	single dwelling/ building	Listed/ Contributing
98483	100-Yr Fld. Zone; 50' of proj. ftprint; ½ mile from 2nd H_2O Meters	13 N Main	Ford-Baxter House	1880	single dwelling/ building	Listed/ Contributing
98484	100-Yr Fld. Zone; ½ mile from 2nd H_2O Meters; ½ mile from proj. ftprint	34 N Main	New City Garage/Firestation	1970	government (gen)/ building	Demolished
98486	100-Yr Fld. Zone 50' of 2nd H_2O Meters; 50' of proj. ftprint	160 N Main	Justesen, Annie, House	1910	single dwelling/ building	Listed/ Contributing
98487	50' of 2nd H_2O Meters; 50' of proj. ftprint	181 E 300 North	Jorgensen House	1914	single dwelling/ building	Listed/ Contributing
98488	50' of 2nd H_2O Meters; 50' of proj. ftprint	269 E 300 North	Olsen/Jensen House	1869	single dwelling/ building	Listed/ Contributing
98489	50' of 2nd H_2O Meters; 50' of proj. ftprint	389 E 400 North		1890	single dwelling/ building	Listed/ Contributing
98490	50' of 2nd H_2O Meters; 50' of proj. ftprint	361 E 400 North	Sahlberg, Edmund, House	1892	single dwelling/ building	Listed/ Contributing
98491	100-Yr Fld. Zone; 50' of 2nd H_2O Meters; 50' of proj. ftprint	95 W 300 North	Rasmussen/James T. Ellis House	1919	single dwelling/ building	Listed/ Contributing

PR ID	Project Component	Address	Property Name	Const. Year	Original Use/Type	Listing Status
98492	100-Yr Fld. Zone; 50' of 2nd H_2O Meters; 50' of proj. ftprint	139 E 100 North		1916	single dwelling/ building	Listed/ Contributing
98493	100-Yr Fld. Zone; 50' of 2nd H_2O Meters; 50' of proj. ftprint	181 E 100 North	Mortensen House	1903	single dwelling/ building	Listed/ Contributing
98494	100-Yr Fld. Zone; 50' of proj. ftprint	389 S Main	Crawforth-Carlson House	1919	single dwelling/ building	Listed/ Contributing
98495	100-Yr Fld. Zone; 50' of 2nd H_2O Meters; ½ mile from proj. ftprint	87 E 200 North	Sorensen, Peter, House	1890	single dwelling/ building	Not Eligible / Non-Contributing
98500	½ mile from 2nd H_2O Meters; ½ mile from proj. ftprint	260 E Center		c1890	single dwelling/ building	Not Eligible / Non-Contributing
98502	100-Yr Fld. Zone; 50' of proj. ftprint	388 S 100 West	Johnson, Jacob, Law Office & Court	1875	resid. auxiliary/ building	Listed/ Contributing
99174	½ mile from 100-Yr Fld. Zone; 50' of 2nd H_2O Meters; ½ mile from proj. ftprint	21 S 300 East	Petersen, James, House	1925	single dwelling/ building	Not Eligible / Non-Contributing
99176	½ mile from 100-Yr Fld. Zone; 50' of 2nd H_2O Meters; ½ mile from proj. ftprint	636 N 300 East	Allred-Bunnell House	1880	single dwelling/ building	Not Eligible / Non-Contributing
99178	100-Yr Fld. Zone; 50' of 2nd H_2O Meters; ½ mile from proj. ftprint	610 N 400 East	Sandstrom, Emil, House	1880	single dwelling/ building	Not Eligible / Non-Contributing
99181	100-Yr Fld. Zone; ½ mile from 2nd H_2O Meter; ½ mile from proj. ftprint	488 N 100 East	Jensen-Nielsen House	1880	single dwelling/ building	Demolished
99182	50' of 2nd H_2O Meters; 50' of proj. ftprint	255 N 200 East	Petersen/Thompson House	1910	single dwelling/ building	Listed/ Contributing
99183	½ mile from 100-Yr Fld. Zone; 50' of 2nd H_2O Meters; 50' of proj. ftprint	291 S 200 East	Allred, Eugene, House	1894	single dwelling/ building	Listed/ Contributing
99184	50' of 2nd H_2O Meters; 50' of proj. ftprint	151 S 200 East	Hyde, Anne E., House	1905	single dwelling/ building	Listed/ Contributing
99185	100-Yr Fld. Zone; 50' of 2nd H_2O Meters; 50' of proj. ftprint	378 N 100 East	Rasmussen, Peter, House	1878	single dwelling/ building	Listed/ Contributing
99186	50' of 2nd H_2O Meters; ½ mile from proj. ftprint	367 N 200 East	Sterner House	1900	single dwelling/ building	Not Eligible / Non-Contributing

PR ID	Project Component	Address	Property Name	Const. Year	Original Use/Type	Listing Status
99187	100-Yr Fld. Zone; 50' of 2nd H_2O Meters; 50' of proj. ftprint	409 E 300 South	Barney House	1880	single dwelling/ building	Listed/ Contributing
99188	½ mile from 100-Yr Fld. Zone; 50' of 2nd H_2O Meters; 50' of proj. ftprint	480 E 300 South	Peterson House	1881	single dwelling/ building	Listed/ Contributing
99189	100-Yr Fld. Zone; ½ mile from 2nd H_2O Meters; ½ mile from proj. ftprint	317 E 400 South	Madsen, Helen, House	1919	single dwelling/ building	Not Eligible / Non-Contributing
99190	100-Yr Fld. Zone; 50' of 2nd H_2O Meters; 50' of proj. ftprint	94 W 400 South	Dye, Mar, House	1948	single dwelling/ building	Listed/ Contributing
99191	100-Yr Fld. Zone; 50' of 2nd H_2O Meters; 50' of proj. ftprint	43 100 South	Strate Rulon House	1948	single dwelling/ building	Listed/ Contributing
99192	50' of proj. ftprint; ½ mile from 2nd H_2O Meters	90 E 100 South	Johnson , J. Morgan & Anna, House	1904	single dwelling/ building	Listed/ Contributing
99193	½ mile from 2nd H_2O Meters; ½ mile from proj. ftprint	78 W 100 South		1965	single dwelling/ building	Demolished
99197	100-Yr Fld. Zone; 50' of 2nd H_2O Meters; 50' of proj. ftprint	201 N 200 West	Larsen, David, House	c1880	single dwelling/ building	Listed/ Contributing
99198	50' of proj. ftprint; ½ mile from 2nd H_2O Meters	189 E 500 North	Frandsen Anthon, House	1881	single dwelling/ building	Listed/ Contributing
99199	100-Yr Fld. Zone; 50' of 2nd H_2O Meters; 50' of proj. ftprint	527 S 200 West	Major, William, House	1876	single dwelling/ building	Listed/ Contributing
99200	100-Yr Fld. Zone; 50' of proj. ftprint	520 S 200 West	Nunley House	1970	single dwelling/ building	Listed/ Contributing
99201	100-Yr Fld. Zone; 50' of 2nd H_2O Meters; ½ mile from proj. ftprint	398 N Main	Olsen, Martin, House	1885	single dwelling/ building	Not Eligible / Non-Contributing
99202	100-Yr Fld. Zone; 50' of 2nd H_2O Meters; ½ mile from proj. ftprint	443 N Main		1935	single dwelling/ building	Not Eligible / Non-Contributing
99203	100-Yr Fld. Zone; 50' of proj. ftprint; ½ mile from 2nd H_2O Meters	76 S Main	Osborne Merc	1925	grocery/ building	Listed/ Contributing
99204	50' of 2nd H_2O Meters; 50' of proj. ftprint	90 S Main	Allred, Mary Ann, House	1911	single dwelling/ building	Listed/ Contributing

PR ID	Project Component	Address	Property Name	Const. Year	Original Use/Type	Listing Status
99205	100-Yr Fld. Zone; 50' of proj. ftprint; ½ mile from 2nd H_2O Meters	24 N Main	Spring City Post Office	1962	post office/ building	Listed/ Contributing
99206	100-Yr Fld. Zone; 50' of 2nd H_2O Meters; 50' of proj. ftprint	33 N Main	Baxter Confectionary	1915	specialty store/ building	Listed/ Contributing
99207	100-Yr Fld. Zone; 50' of 2nd H_2O Meters; 50' of proj. ftprint	190 N Main	Baxter & Blain Store	1895	commercial (gen.)/ building	Listed/ Contributing
99208	100-Yr Fld. Zone; 50' of 2nd H_2O Meters; 50' of proj. ftprint	113 N Main	Mickelson House	1869	single dwelling/ building	Listed/ Contributing
99209	100-Yr Fld. Zone; 50' of 2nd H_2O Meters; 50' of proj. ftprint	116 E 300 North	Petersen, Soren, House	1890	single dwelling/ building	Listed/ Contributing
99212	100-Yr Fld. Zone; 50' of proj. ftprint; ½ mile from 2nd H_2O Meters	83 E 400 North	Sorensen, Christian, House/Billington, Zeke, House	1916	single dwelling/ building	Listed/ Contributing
99213	100-Yr Fld. Zone; 50' of 2nd H_2O Meters; 50' of proj. ftprint	115 E 100 North	Benson, Niels, House	1889	single dwelling/ building	Listed/ Contributing
99215	100-Yr Fld. Zone; ½ mile from 2nd H_2O Meters; ½ mile from proj. ftprint	590 E 100 North		1960	single dwelling/ building	Demolished
99987	½ mile from 100-Yr Fld. Zone; 50' of 2nd H_2O Meters; 50' of proj. ftprint	186 S 300 East	Tulgreen House	1910	single dwelling/ building	Listed/ Contributing
99989	50' of proj. ftprint; ½ mile from 2nd H_2O Meters	560 N 300 East	Blain, Bert, House	1950	single dwelling/ building	Listed/ Contributing
99993	50' of proj. ftprint; ½ mile from 2nd H_2O Meters	479 N 400 East	Frandsen, Peter, House	1910	single dwelling/ building	Listed/ Contributing
99995	½ mile from 2nd H_2O Meters; ½ mile from proj. ftprint	310 E 400 South	Allred, James T.S., Jr. House	1880	agricultural (gen.)	Demolished
99996	100-Yr Fld. Zone; 50' of 2nd H_2O Meters; 50' of proj. ftprint	310 E 400 South	Allred, James T.S. , Jr., House	1910	single dwelling/ building	Listed/ Contributing
99998	50' of 2nd H_2O Meters; 50' of proj. ftprint	185 S 200 East	Hyde, Sarah Ellen Justesen, House	1900	single dwelling/ building	Listed/ Contributing
99999	50' of 2nd H_2O Meters; 50' of proj. ftprint	109 S 200 East	Downard, George House	1879	single dwelling/ building	Listed/ Contributing

PR ID	Project Component	Address	Property Name	Const. Year	Original Use/Type	Listing Status
100000	100-Yr Fld. Zone; 50' of proj. ftprint	93 E 300 South	Allred, Mary Ann Pollard, House	1881	single dwelling/ building	Listed/ Contributing
100001	½ mile from 2nd H_2O Meters; ½ mile from proj. ftprint	190 E 300 South		1920	single dwelling/ building	Not Eligible / Non-Contributing
100002	50' of 2nd H_2O Meters; 50' of proj. ftprint	190 E 500 North	Thompson, Fred, House	1941	single dwelling/ building	Listed/ Contributing
100003	50' of 2nd H_2O Meters; ½ mile from proj. ftprint	210 E 200 South	Larsen, Louis, House	1880	single dwelling/ building	Not Eligible / Non-Contributing
100005	100-Yr Fld. Zone; mile from 2nd H_2O Meters; 50' of proj. ftprint	317 E 700 North	Christensen, Jens Peter, House	1880	single dwelling/ building	Listed/ Contributing
100007	50' of 2nd H_2O Meters; 50' of proj. ftprint	112 E 200 South	Beck House	1911	single dwelling/ building	Listed/ Contributing
100008	50' of 2nd H_2O Meters; 50' of proj. ftprint	275 E Center	Robinson House	1889	single dwelling/ building	Listed/ Contributing
100009	50' of 2nd H_2O Meters; ½ mile from proj. ftprint	355 E Center		c1945	single dwelling/ building	Not Eligible / Non-Contributing
100012	100-Yr Fld. Zone; 50' of 2nd H_2O Meters; 50' of proj. ftprint	411 S 100 West	Olsen, Martin House	1889	single dwelling/ building	Listed/ Contributing
100014	½ mile from 2nd H_2O Meters; ½ mile from proj. ftprint	450 S 100 West	Beckstrom, Daniel House	1880	single dwelling/ building	Not Eligible / Non-Contributing
100015	100-Yr Fld. Zone; ½ mile from 2nd H_2O Meters; ½ mile from proj. ftprint	385 S 200 West	Jensen-Neilsen House	1860	single dwelling/ building	Demolished
100016	100-Yr Fld. Zone; ½ mile from 2nd H_2O Meters; ½ mile from proj. ftprint	300 N Main	Larsen, Hans, House	1888	single dwelling/ building	Demolished
100017	100-Yr Fld. Zone; 50' of proj. ftprint; ½ mile from 2nd H_2O Meters	79 S Main	Strate's Garage	1927	service station/ building	Listed/ Contributing
100018	100-Yr Fld. Zone; 50' of 2nd H_2O Meters; 50' of proj. ftprint	197 S Main	Borreson House	c1864	single dwelling/ building	Listed/ Contributing
100019	100-Yr Fld. Zone; 50' of proj. ftprint	216 S Main	Osborne, William, House	1894	single dwelling/ building	Listed/ Contributing
100020	100-Yr Fld. Zone; 50' of proj. ftprint; ½ mile from 2nd H_2O Meters	265 N Main	Beck, Allan, House	1922	single dwelling/ building	Listed/ Contributing

PR ID	Project Component	Address	Property Name	Const. Year	Original Use/Type	Listing Status
100021	100-Yr Fld. Zone; 50' of proj. ftprint; ½ mile from 2nd H_2O Meters	46 N Main	Spring City Hall (Old)	1893	city hall/ building	Listed/ Contributing
100022	100-Yr Fld. Zone; 50' of 2nd H_2O Meters; 50' of proj. ftprint	95 N Main	William Blain Spring	1950	monument/ marker/ object	Listed/ Contributing
100023	100-Yr Fld. Zone; 50' of 2nd H_2O Meters; 50' of proj. ftprint	80 N Main	Fullmer, Darrell, House	1918	single dwelling/ building	Listed/ Contributing
100024	100-Yr Fld. Zone; 50' of 2nd H_2O Meters; 50' of proj. ftprint	85 W 400 North	Justensen, Peter, House	1890	single dwelling/ building	Listed/ Contributing
100025	50' of 2nd H_2O Meters; 50' of proj. ftprint	515 E 400 North	Malmgreen, Hogan, House	1880	single dwelling/ building	Listed/ Contributing
100026	½ mile from 2nd H_2O Meters; ½ mile from proj. ftprint	241 E 200 North	Hansen, Henming House	1895	single dwelling/ building	Demolished
100027	½ mile from 2nd H_2O Meters; ½ mile from proj. ftprint	395 E 100 North		1880	single dwelling/ building	Demolished
100028	½ mile from 2nd H_2O Meters; ½ mile from proj. ftprint	395 E 100 North	Clemonsen House	1880	single dwelling/ building	Demolished
100029	100-Yr Fld. Zone; 50' of 2nd H_2O Meters; 50' of proj. ftprint	94 W 100 North	Allred - Hansen House	1898	single dwelling/ building	Listed/ Contributing
100030	mile from 2nd H_2O Meters; 50' of proj. ftprint		Spring City Feeder Canal	1934	irrigation/ canal/ditch	Undetermined
100031	50' of 2nd H_2O Meters; 50' of proj. ftprint	245 E 200 North		1895	agricultural storage/ building	Listed/ Contributing
100032	100-Yr Fld. Zone; ½ mile from 2nd H_2O Meters; ½ mile from proj. ftprint	300 S 100 East	Larsen-Jensen House	1870	single dwelling/ building	Demolished
100034	100-Yr Fld. Zone; 50' of 2nd H_2O Meters; ½ mile from proj. ftprint	140 E 500 North		c1880	agricultural storage/ building	Demolished
100035	100-Yr Fld. Zone; 50' of 2nd H_2O Meters; 50' of proj. ftprint	147 N Main	Strate, Fred, House	c1915	single dwelling/ building	Listed/ Contributing
100666	½ mile from 100-Yr Fld. Zone; 50' of 2nd H_2O Meters; 50' of proj. ftprint	220 S 300 East		1970	single dwelling/ building	Listed/ Contributing

PR ID	Project Component	Address	Property Name	Const. Year	Original Use/Type	Listing Status
100668	50' of 2nd H_2O Meters; 50' of proj. ftprint	110 N 300 East	Blain, John, Thomas, House	1892	single dwelling/ building	Listed/ Contributing
100669	100-Yr Fld. Zone; ½ mile from proj. ftprint 50' of 2nd H_2O Meters;	287 S 100 East	Beck, Joseph, House	1920	single dwelling/ building	Listed/ Contributing
100670	50' of 2nd H_2O Meters; 50' of proj. ftprint	470 N 500 East	Sorensen, F. C., House	1894	single dwelling/ building	Listed/ Contributing
100671	50' of 2nd H_2O Meters; 50' of proj. ftprint	115 S 400 East	Blain, Odell, House	1939	single dwelling/ building	Listed/ Contributing
100673	50' of 2nd H_2O Meters; 50' of proj. ftprint	195 S 100 East	Justesen House	1940	single dwelling/ building	Listed/ Contributing
100799	½ mile from 2nd H_2O Meters; ½ mile from proj. ftprint	80 N 400 East	"Karen's House"	1880	single dwelling/ building	Demolished
100802	50' of proj. ftprint; ½ mile from 2nd H_2O Meters	525 E Center	Omansen, Neils, House	1901	single dwelling/ building	Listed/ Contributing
100803	½ mile from 2nd H_2O Meters; ½ mile from proj. ftprint	41 S 400 East	Blain, Robert, House	1925	single dwelling/ building	Demolished
100805	50' of 2nd H_2O Meters; 100-Yr Fld. Zone; ½ mile from proj. ftprint	10 S 100 East		1973	single dwelling/ building	Undetermined
100806	100-Yr Fld. Zone; 50' of 2nd H_2O Meters; ½ mile from proj. ftprint	250 N 100 East	Spring City Pioneer Cemetery	1857	cemetery/ site	Listed/ Contributing
100808	100-Yr Fld. Zone; 50' of 2nd H_2O Meters; 50' of proj. ftprint	93 S 200 East	Olsen-Justesen House	c1875	single dwelling/ building	Listed/ Contributing
100809	50' of proj. ftprint; ½ mile from 2nd H_2O Meters	419 N 200 East		1948	single dwelling/ building	Listed/ Contributing
100810	50' of 2nd H_2O Meters; 50' of proj. ftprint	288 N 200 East	Hansen, Henming Edward House	1894	single dwelling/ building	Listed/ Contributing
100811	50' of 2nd H_2O Meters; ½ mile from proj. ftprint	320 E 300 South		1890	Single dwelling/ building	Not Eligible / Non-Contributing
100813	100-Yr Fld. Zone; 50' of 2nd H_2O Meters; 50' of proj. ftprint	185 E 400 South	Zabriskie, John H., House	1880	single dwelling/ building	Listed/ Contributing
100814	50' of 2nd H_2O Meters; ½ mile from proj. ftprint	240 E 500 North	Harding, Grace, House	c1948	Single dwelling/ building	Not Eligible / Non-Contributing
100815	50' of 2nd H_2O Meters; 50' of proj. ftprint	725 E 600 North		c1915	single dwelling/ building	Listed/ Contributing
100816	100-Yr Fld. Zone;	297 S 100 West	Allred, James House	1874	single dwelling/ building	Listed/ Contributing

PR ID	Project Component	Address	Property Name	Const. Year	Original Use/Type	Listing Status
	50' of 2nd H_2O Meters; 50' of proj. ftprint					
100817	50' of proj. ftprint; ½ mile from 2nd H_2O Meters	385 E 100 South	Blain, John House	1889	single dwelling/ building	Listed/ Contributing
100819	50' of proj. ftprint; ½ mile from 2nd H_2O Meters	255 E Center	Petersen, Anna, House	1911	single dwelling/ building	Not Eligible / Non-Contributing
100821	100-Yr Fld. Zone; 50' of proj. ftprint; ½ mile from 2nd H_2O Meters	47 W Center	Puzey, Joseph H., House	1910	single dwelling/ building	Listed/ Contributing
100822	100-Yr Fld. Zone; 50' of 2nd H_2O Meters; 50' of proj. ftprint	309 N 100 West	Sorensen, William Henry, House	1894	single dwelling/ building	Listed/ Contributing
100823	100-Yr Fld. Zone; ½ mile from 2nd H_2O Meters	443 S 200 West	Larsen, Soren, House	1865	single dwelling/ building	Demolished
100824	100-Yr Fld. Zone; ½ mile from 2nd H_2O Meters	450 S 200 West	Larsen, Hyrum, House	1913	single dwelling/ building	Demolished
100825	½ mile from 2nd H_2O Meters; 100-Yr Fld. Zone	179 W 400 South	Larsen, Daniel, House	1890	single dwelling/ building	Not Eligible / Non-Contributing
100826	½ mile from 2nd H_2O Meters; 50' of proj. ftprint	488 N Main	Aiken House	1908	single dwelling/ building	Listed/ Contributing
100827	100-Yr Fld. Zone; 50' of proj. ftprint; ½ mile from 2nd H_2O Meters	53 S Main	Frantzen, John, House	1880	single dwelling/ building	Listed/ Contributing
100828	50' of 2nd H_2O Meters; 50' of proj. ftprint	164 S Main	Spring City LDS Meetinghouse	1902	religious facility	Listed/ Contributing
100829	½ mile from 2nd H_2O Meters; ½ mile from proj. ftprint	155 S Main	Schofield Home and Granary	1860	single dwelling/ building	Demolished
100830	100-Yr Fld. Zone; 50' of 2nd H_2O Meters; 50' of proj. ftprint	37 N Main	Sandstrom's Pool & Dance Hall	1911	music/dance facility	Listed/ Contributing
100831	100-Yr Fld. Zone; 50' of 2nd H_2O Meters; 50' of proj. ftprint	297 N Main	Justesen, Ernest, House	1919	single dwelling/ building	Listed/ Contributing
100832	100-Yr Fld. Zone; 50' of proj. ftprint; ½ mile from 2nd H_2O Meters	309 N Main	Petersen, Iver, House	1875	single dwelling/ building	Listed/ Contributing

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100833	½ mile from 2nd H_2O Meters; ½ mile from proj. ftprint	169 W 200 North		1871	single dwelling/ building	Not Eligible / Non-Contributing
100834	50' of proj. ftprint; ½ mile from 2nd H_2O Meters	289 N 300 East	Thompson, Anders "Chris" House	1891	single dwelling/ building	Listed/ Contributing
100835	50' of 2nd H_2O Meters; 50' of proj. ftprint	435 E 300 North	Mott, Harrison, House	1910	single dwelling/ building	Listed/ Contributing
100840	½ mile from 2nd H_2O Meters; 100-Yr Fld. Zone	534 S 200 West		1905	single dwelling/ building	Demolished
100842	½ mile from 100-Yr Fld. Zone; ½ mile from 2nd H_2O Meters; ½ mile from proj. ftprint	255 S 300 East		c1970	single dwelling/ building	Not Eligible / Non-Contributing
100846	½ mile from 100-Yr Fld. Zone; ½ mile from 2nd H_2O Meters; ½ mile from proj. ftprint	515 E 100 South		1930	animal facility/ building	Listed/ Contributing
101044	½ mile from 100-Yr Fld. Zone; ½ mile from 2nd H_2O Meters; ½ mile from proj. ftprint	191 S 300 East	Allred, Samuel, House	1894	single dwelling/ building	Not Eligible / Non-Contributing
101045	100-Yr Fld. Zone; ½ mile from 2nd H_2O Meters; ½ mile from proj. ftprint	488 S 200 East	Allred, David Harden House	1862	single dwelling/ building	Demolished
101046	½ mile from 100-Yr Fld. Zone; 50' of 2nd H_2O Meters; ½ mile from proj. ftprint	211 S 400 East		1904	single dwelling/ building	Not Eligible / Non-Contributing
101047	50' of 2nd H_2O Meters; 50' of proj. ftprint	515 East 500 North	Peterson House	1948	single dwelling/ building	Listed/ Contributing
101048	½ mile from 2nd H_2O Meters; ½ mile from proj. ftprint	84 N 500 East		1910	single dwelling/ building	Not Eligible / Non-Contributing
101049	100-Yr Fld. Zone; ½ mile from 2nd H_2O Meters; ½ mile from proj. ftprint	75 W 200 North	Larsen-Jensen Barn	1870	animal facility/ building	Not Eligible / Non-Contributing
101051	100-Yr Fld. Zone; 50' of 2nd H_2O Meters; 50' of proj. ftprint	291 N 100 East	Sorensen, Lee Ray, House	c1940	single dwelling/ building	Listed/ Contributing

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101054	50' of 2nd H_2O Meters; 50' of proj. ftprint	390 N 200 East	Mortensen, Joe House	1915	single dwelling/ building	Listed/ Contributing
101055	50' of 2nd H_2O Meters; 50' of proj. ftprint	318 N 200 East	Thompson, James, House	1919	single dwelling/ building	Listed/ Contributing
101056	50' of 2nd H_2O Meters; 50' of proj. ftprint	268 N 200 East	Strate House	1973	single dwelling/ building	Unevaluated
101059	50' of 2nd H_2O Meters; 100-Yr Fld. Zone; ½ mile from proj. ftprint	217 E 400 South	Mickel House	1880	single dwelling/ building	Not Eligible / Non-Contributing
101061	½ mile from 100-Yr Fld. Zone; 50' of 2nd H_2O Meters; ½ mile from proj. ftprint	525 E 300 South		1906	single dwelling/ building	Not Eligible / Non-Contributing
101062	½ mile from 2nd H_2O Meters; 100-Yr Fld. Zone; ½ mile from proj. ftprint	281 E 400 South	Allred, Sanford, House	1894	single dwelling/ building	Not Eligible / Non-Contributing
101067	100-Yr Fld. Zone; 50' of proj. ftprint; ½ mile from 2nd H_2O Meters	59 W Center	Puzey, Lydia, House	1909	single dwelling/ building	Listed/ Contributing
101069	100-Yr Fld. Zone; 50' of 2nd H_2O Meters; 50' of proj. ftprint	16 S 100 West	Olsen, Charles A., House	1916	single dwelling/ building	Listed/ Contributing
101070	50' of 2nd H_2O Meters; 50' of proj. ftprint	92 S 100 West	Olsen, Andrew House	1884	single dwelling/ building	Listed/ Contributing
101071	100-Yr Fld. Zone; ½ mile from 2nd H_2O Meters; ½ mile from proj. ftprint	498 S 200 West	Dye, Jean Baxter, Puzey, House	1859	single dwelling/ building	Demolished
101072	100-Yr Fld. Zone; 50' of 2nd H_2O Meters; 50' of proj. ftprint	379 N Main	Irvin, Moroni, House	1892	single dwelling/ building	Listed/ Contributing
101074	100-Yr Fld. Zone; 50' of 2nd H_2O Meters; 50' of proj. ftprint	487 N Main	Nielsen, Mads, House	1875	single dwelling/ building	Listed/ Contributing
101077	100-Yr Fld. Zone; 50' of proj. ftprint; ½ mile from 2nd H_2O Meters	35 N Main	Lyceum Theater/ Victory Theater	1915	Theater/ building	Listed/ Contributing
101078	100-Yr Fld. Zone; 50' of 2nd H_2O Meters; 50' of proj. ftprint	38 N Main	Spring City firehouse (Old)	c1900	fire station/ building	Listed/ Contributing
101079	100-Yr Fld. Zone; 50' of proj. ftprint; ½ mile from 2nd H_2O Meters	119 W 200 North	Erickson-Paulsen House	1888	single dwelling/ building	Listed/ Contributing

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101080	100-Yr Fld. Zone; 50' of 2nd H_2O Meters; 50' of proj. ftprint	190 W 200 North	Griffiths/Beck House	1910	single dwelling/ building	Listed/ Contributing
101081	50' of 2nd H_2O Meters; ½ mile from proj. ftprint	315 E 300 North		1947	single dwelling/ building	Not Eligible / Non-Contributing
101082	½ mile from 2nd H_2O Meters; ½ mile from proj. ftprint	422 E 400 North	Sandstrom, Erick, House	1889	single dwelling/ building	Demolished
101083	100-Yr Fld. Zone; 50' of 2nd H_2O Meters; 50' of proj. ftprint	19 E 100 North	Behunin-Beck House	1879	single dwelling/ building	Listed/ Contributing
101084	100-Yr Fld. Zone; 50' of 2nd H_2O Meters; 50' of proj. ftprint	95 E 100 North		1870	single dwelling/ building	Listed/ Contributing
101085	100-Yr Fld. Zone; 50' of 2nd H_2O Meters; 50' of proj. ftprint	12 W 200 North	Baxter, John , Sr. House	1903	single dwelling/ building	Listed/ Contributing
101086	½ mile from 100-Yr Fld. Zone; 50' of 2nd H_2O Meters; 50' of proj. ftprint	267 E 200 North	Hansen Orlan, House	1880	single dwelling/ building	Listed/ Contributing
101097	100-Yr Fld. Zone; ½ mile from 2nd H_2O Meters	145 E 400 South		c1880	single dwelling/ building	Not Eligible / Non-Contributing
101301	50' of 2nd H_2O Meters; 50' of proj. ftprint	155 S 500 East		c1880	animal facility/ building	Listed/ Contributing
101478	100-Yr Fld. Zone; 50' of 2nd H_2O Meters; 50' of proj. ftprint	389 N 100 East	Mickel-Sorenson House	1901	single dwelling/ building	Listed/ Contributing
101479	½ mile from 2nd H_2O Meters; ½ mile from proj. ftprint	519 N 100 East		1950	single dwelling/ building	Demolished
101480	50' of 2nd H_2O Meters; 50' of proj. ftprint	120 S 200 East		c1960	single dwelling/ building	Listed/ Contributing
101481	100-Yr Fld. Zone; 50' of 2nd H_2O Meters; 50' of proj. ftprint	317 S 200 East		1870	single dwelling/ building	Listed/ Contributing
101564	100-Yr Fld. Zone; 50' of 2nd H_2O Meters; 50' of proj. ftprint	190 N 200 East	Hansen, Neils Peter, House	1874	single dwelling/ building	Listed/ Contributing
101565	100-Yr Fld. Zone; 50' of 2nd H_2O Meters; 50' of proj. ftprint	185 E 300 South	Graham, Robert M., House	1967	single dwelling/ building	Listed/ Contributing
101566	½ mile from 100-Yr Fld. Zone;	489 E 300 South	Bunnell, Stephen House	1892	single dwelling/ building	Demolished

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	½ mile from 2nd H_2O Meters; ½ mile from proj. ftprint					
101567	100-Yr Fld. Zone; 50' of 2nd H_2O Meters; 50' of proj. ftprint	218 E 400 South	Allred, John Frank House	1878	single dwelling/ building	Listed/ Contributing
101568	½ mile from 2nd H_2O Meters; ½ mile from proj. ftprint	295 E 100 South	Allred, Alvin E., House	1910	single dwelling/ building	Not Eligible / Non-Contributing
101569	½ mile from 2nd H_2O Meters; ½ mile from proj. ftprint	225 E 600 North	Christensen, Thomas G. House	1875	single dwelling/ building	Demolished
101571	½ mile from 100-Yr Fld. Zone; ½ mile from 2nd H_2O Meters; ½ mile from proj. ftprint	450 E 100 South		1920	single dwelling/ building	Not Eligible / Non-Contributing
101572	50' of 2nd H_2O Meters; ½ mile from proj. ftprint	325 E Center	Jensen, James House	1899	single dwelling/ building	Listed/ Contributing
101573	50' of 2nd H_2O Meters; 50' of proj. ftprint	325 E Center	Andersen-Madsen House	1882	single dwelling/ building	Listed/ Contributing
101575	100-Yr Fld. Zone; 50' of proj. ftprint; ½ mile from 2nd H_2O Meters	73 W Center	Blain, Robert, House	1888	single dwelling/ building	Listed/ Contributing
101577	50' of 2nd H_2O Meters; ½ mile from proj. ftprint	58 S 100 West	Larsen, Lauritz O., House	1900	single dwelling/ building	Not Eligible / Non-Contributing
101578	50' of 2nd H_2O Meters; 50' of proj. ftprint	428 S 100 West	Justesen-Olsen House	1875	single dwelling/ building	Listed/ Contributing
101579	100-Yr Fld. Zone; ½ mile from 2nd H_2O Meters	530 S 200 West	Ellis, George House	1880	single dwelling/ building	Demolished
101580	100-Yr Fld. Zone; 50' of proj. ftprint	441 S 200 West	Larsen, Soren Jr., House	1899	single dwelling/ building	Listed/ Contributing
101581	½ mile from 2nd H_2O Meters; ½ mile from proj. ftprint	627 N Main		1875	single dwelling/ building	Demolished
101582	100-Yr Fld. Zone; 50' of 2nd H_2O Meters; 50' of proj. ftprint	465 N Main	Aiken, Terrance, House	1944	single dwelling/ building	Listed/ Contributing
101583	100-Yr Fld. Zone; ½ mile from 2nd H_2O Meters; ½ mile from proj. ftprint	625 N Main	Strate, Kenneth, House	1970	single dwelling/ building	Not Eligible / Non-Contributing
101585	100-Yr Fld. Zone;	209 S Main	Hyde, Orson, House	1865	single dwelling/ building	Listed/ Contributing

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	50' of 2nd H_2O Meters; 50' of proj. ftprint					
101587	100-Yr Fld. Zone; 50' of proj. ftprint; ½ mile from 2nd H_2O Meters	48 N Main	Spring City Jail	1900	correctional inst./ building	Listed/ Contributing
101588	100-Yr Fld. Zone; 50' of 2nd H_2O Meters; 50' of proj. ftprint	260 N Main	Andersen, Niels, House	1895	single dwelling/ building	Listed/ Contributing
101589	100-Yr Fld. Zone; 50' of 2nd H_2O Meters; 50' of proj. ftprint	87 N Main	Spring City Service	1949	service station/ building	Listed/ Contributing
101590	100-Yr Fld. Zone; 50' of proj. ftprint; ½ mile from 2nd H_2O Meters	81 E 300 North	Viv Larsen/Don Petersen House	1909	single dwelling/ building	Listed
101591	50' of proj. ftprint; ½ mile from 2nd H_2O Meters	409 E 200 North		1910	single dwelling/ building	Listed/ Contributing
101592	50' of 2nd H_2O Meters ½ mile from proj. ftprint	397 E 300 North		1904	single dwelling/ building	Not Eligible / Non-Contributing
101594	100-Yr Fld. Zone; 50' of proj. ftprint	45 E 100 North	Methodist Church Living Quarters	1889	single dwelling/ building	Listed/ Contributing
101595	100-Yr Fld. Zone; 50' of 2nd H_2O Meters; ½ mile from proj. ftprint	165 W 100 North	Downard, William, House	1895	single dwelling/ building	Listed/ Contributing
101599	100-Yr Fld. Zone; ½ mile from 2nd H_2O Meters; ½ mile from proj. ftprint	405 N 100 West		c1935	animal facility/ building	Listed/ Contributing
101600	½ mile from 2nd H_2O Meters; 50' of proj. ftprint	240 E 600 North		c1905	agric. outbuilding/ building	Listed/ Contributing
101602	½ mile from 100-Yr Fld. Zone; 50' of proj. ftprint; ½ mile from 2nd H_2O Meters	275 S 200 East	Spring City Jail (Old)	1885	agric. storage/ building	Listed/ Contributing
103141	½ mile from 100-Yr Fld. Zone; 50' of 2nd H_2O Meters; 50' of proj. ftprint	285 S 300 East		1890	single dwelling/ building	Listed/ Contributing
103143	50' of 2nd H_2O Meters; 50' of proj. ftprint	276 N 300 East	Jensen, Severine, House	1879	single dwelling/ building	Listed/ Contributing
103144	50' of 2nd H_2O Meters; 50' of proj. ftprint	74 N 300 East	Pedersen, "Jimmy King", House	1910	single dwelling/ building	Listed/ Contributing

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103145	50' of 2nd H_2O Meters; 50' of proj. ftprint	323 S 400 East		1940	single dwelling/ building	Listed/ Contributing
103147	100-Yr Fld. Zone; 50' of 2nd H_2O Meters; 50' of proj. ftprint	323 S 100 East	Christensen, James, House	1890	single dwelling/ building	Listed/ Contributing
103149	100-Yr Fld. Zone; 50' of 2nd H_2O Meters; 50' of proj. ftprint	383 S 100 East	Brough, Moroni, House	1909	single dwelling/ building	Listed/ Contributing
103150	100-Yr Fld. Zone; 50' of 2nd H_2O Meters; 50' of proj. ftprint	147 N 100 East	Petersen, Jens, House & Log Barn	1874	single dwelling/ building	Listed/ Contributing
103151	100-Yr Fld. Zone; 50' of 2nd H_2O Meters; 50' of proj. ftprint	80 N 100 East	Jensen House	c1937	single dwelling/ building	Listed/ Contributing
103152	½ mile from 2nd H_2O Meters; 100-Yr Fld. Zone; ½ mile from proj. ftprint	15 S 200 East	Jonsson House	1910	single dwelling/ building	Not Eligible /Non-Contributing
103153	100-Yr Fld. Zone; 50' of 2nd H_2O Meters; 50' of proj. ftprint	93 N 200 East	Hansen, Hans Jorgan, House	1874	single dwelling/ building	Listed/ Contributing
103154	½ mile from 2nd H_2O Meters; ½ mile from proj. ftprint	48 W 300 South		1950	single dwelling/ building	Not Eligible /Non-Contributing
103155	100-Yr Fld. Zone; 50' of proj. ftprint	12 E 300 South	Larsen, Lauritz, House	1884	single dwelling/ building	Listed/ Contributing
103157	100-Yr Fld. Zone; 50' of 2nd H_2O Meters; 50' of proj. ftprint	96 E 400 South	Allred, James T.S., House	1864	single dwelling/ building	Listed/ Contributing
103158	50' of 2nd H_2O Meters; 50' of proj. ftprint	285 E 500 North	Peterson, Marinus, House	1878	single dwelling/ building	Listed/ Contributing
103159	50' of 2nd H_2O Meters; 50' of proj. ftprint	383 E 500 North	Jensen, Hyrum, House	1890	single dwelling/ building	Listed/ Contributing
103160	50' of 2nd H_2O Meters; 50' of proj. ftprint	91 E 100 South	Anderson, Jens C. House	1884	single dwelling/ building	Listed/ Contributing
103161	½ mile from 2nd H_2O Meters 100-Yr Fld. Zone	248 E 100 South		1906	single dwelling/ building	Not Eligible /Non-Contributing
103162	100-Yr Fld. Zone; ½ mile from 2nd H_2O Meters; 50' of proj. ftprint	150 E Center	Spring City Jr. High School	1916	school/ building	Listed/ Contributing
103163	100-Yr Fld. Zone; ½ mile from 2nd H_2O Meters; 50' of proj. ftprint	121 E Center	Allred, Freeman, House	1912	single dwelling/ building	Listed/ Contributing

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103164	100-Yr Fld. Zone; 50' of 2nd H_2O Meters; 50' of proj. ftprint	195 E Center	Zabriskie-Justesen House	1885	single dwelling/ building	Listed/ Contributing
103165	100-Yr Fld. Zone; ½ mile from 2nd H_2O Meters; ½ mile from proj. ftprint	187 W Center	Acord House	1924	single dwelling/ building	Not Eligible /Non-Contributing
103167	100-Yr Fld. Zone; 50' of 2nd H_2O Meters; 50' of proj. ftprint	116 S 100 West	Jensen, Rasmus, House	1905	single dwelling/ building	Listed/ Contributing
103168	100-Yr Fld. Zone; 50' of 2nd H_2O Meters; 50' of proj. ftprint	355 S 100 West	Carlson, Jens Peter, House	1896	single dwelling/ building	Listed/ Contributing
103170	100-Yr Fld. Zone; ½ mile from 2nd H_2O Meters	310 S 200 West	Mickelsen, Christian, House	1875	single dwelling/ building	Demolished
103171	½ mile from 2nd H_2O Meters; ½ mile from proj. ftprint	509 N Main	Schofield, John House	1890	single dwelling/ building	Demolished
103173	100-Yr Fld. Zone; 50' of 2nd H_2O Meters; 50' of proj. ftprint	296 S Main	Alder, Niels, House	1874	single dwelling/ building	Listed/ Contributing
103174	100-Yr Fld. Zone; 50' of 2nd H_2O Meters; 50' of proj. ftprint	59 N Main	Crisp-Allred House	1881	single dwelling/ building	Listed/ Contributing
103175	100-Yr Fld. Zone; 50' of proj. ftprint; ½ mile from proj. ftprint	187 N Main	Justesen, Alex, House	1898	single dwelling/ building	Listed/ Contributing
103176	100-Yr Fld. Zone; ½ mile from 2nd H_2O Meters; 50' of proj. ftprint	298 N Main	Olsen, Frederick, House	1875	single dwelling/ building	Listed/ Contributing
103177	100-Yr Fld. Zone; 50' of proj. ftprint; ½ mile from proj. ftprint	245 N Main	Baxter, John, House	1877	single dwelling/ building	Listed/ Contributing
103178	100-Yr Fld. Zone; 50' of proj. ftprint	310 S Main	Allred, Albert M., House	1904	single dwelling/ building	Listed/ Contributing
103179	100-Yr Fld. Zone; 50' of 2nd H_2O Meters; 50' of proj. ftprint	112 W 200 North	Larsen, Ephraim, House	1884	single dwelling/ building	Listed/ Contributing
103180	100-Yr Fld. Zone; 50' of 2nd H_2O Meters; 50' of proj. ftprint	115 E 500 North	Christiansen, Andres C., House	1875	single dwelling/ building	Listed/ Contributing
103182	100-Yr Fld. Zone; 50' of 2nd H_2O Meters; 50' of proj. ftprint	415 S Main	Allred, Reuben Warren Sr., House	1864	single dwelling/ building	Listed/ Contributing

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103184	100-Yr Fld. Zone; 50' of 2nd H_2O Meters; ½ mile from proj. ftprint	141 E 200 North	Syndergaard Home	1935	single dwelling/ building	Demolished
103185	50' of 2nd H_2O Meters; ½ mile from proj. ftprint	296 E 100 North	Robinson, John, House	1944	single dwelling/ building	Not Eligible / Non-Contributing
103186	50' of proj. ftprint	280 E 300 South	Hansen, Carl House	c1890	single dwelling/ building	Listed/ Contributing
103187	100-Yr Fld. Zone; ½ mile from 2nd H_2O Meters; 50' of proj. ftprint	650 N 100 East	Andersen Slaughter House / Beef Gallows	c1930	animal facility/ site	Listed/ Contributing
103188	100-Yr Fld. Zone; 50' of 2nd H_2O Meters; 50' of proj. ftprint	225 S 200 West		c1900	agricultural (gen.)/ building	Listed/ Contributing
103191	50' of 2nd H_2O Meters; 50' of proj. ftprint	155 N 400 East		c1900	animal facility/ building	Listed/ Contributing
103193	100-Yr Fld. Zone; ½ mile from of 2nd H_2O Meters; 50' of proj. ftprint	55 E 300 North		c1910	agricultural storage/ building	Listed/ Contributing
111026	½ mile from 100-Yr Fld. Zone; ½ mile from 2nd H_2O Meters; 50' of proj. ftprint	227 S 300 East	Ellis House	1865	single dwelling/ building	Demolished
111027	½ mile from 100-Yr Fld. Zone; ½ mile from 2nd H_2O Meters; ½ mile from proj. ftprint	353 S 300 East		1950	single dwelling/ building	Not Eligible / Non-Contributing
111029	½ mile from 2nd H_2O Meters; 50' of proj. ftprint	191 N 300 East	Christopherson House	1881	single dwelling/ building	Listed/ Contributing
111030	½ mile from 2nd H_2O Meters; ½ mile from proj. ftprint	55 S 500 East	Monson, Dave, House	1874	single dwelling/ building	Not Eligible / Non-Contributing
111031	50' of 2nd H_2O Meters; 50' of proj. ftprint	253 N 400 East	Omansen, August House	1908	single dwelling/ building	Listed/ Contributing
111032	100-Yr Fld. Zone; 50' of proj. ftprint	450 S 100 East	Allred, Edward F., House	1890	single dwelling/ building	Listed/ Contributing
111033	100-Yr Fld. Zone; 50' of 2nd H_2O Meters; 50' of proj. ftprint	415 S 100 East	Allred-Watson House	1878	single dwelling/ building	Listed/ Contributing
111034	100-Yr Fld. Zone; 50' of 2nd H_2O Meters; 50' of proj. ftprint	85 N 100 East	Monson-Larsen House	1883	single dwelling/ building	Listed/ Contributing

PR ID	Project Component	Address	Property Name	Const. Year	Original Use/Type	Listing Status
111036	50' of 2nd H_2O Meters; 50' of proj. ftprint	560 N 200 East	Anderson, John T., House	1880	single dwelling/ building	Listed/ Contributing
111037	50' of 2nd H_2O Meters; 50' of proj. ftprint	488 N 200 East	Thomson, Andrew "Fishman", House	1880	single dwelling/ building	Listed/ Contributing
111038	100-Yr Fld. Zone; 50' of 2nd H_2O Meters; 50' of proj. ftprint	89 W 200 South	Justensen, John F., House	1896	single dwelling/ building	Listed/ Contributing
111039	100-Yr Fld. Zone; ½ mile from 2nd H_2O Meters; ½ mile from proj. ftprint	40 E 300 South	Allred, Osral, House	1901	single dwelling/ building	Not Eligible / Non-Contributing
111040	100-Yr Fld. Zone; 50' of proj. ftprint	63 W 300 South	Endowment House/ Rock School House	1876	school/ building	Listed/ Contributing
111041	100-Yr Fld. Zone; 50' of 2nd H_2O Meters; 50' of proj. ftprint	95 E 400 South	Robinson, John & Emma House	1875	single dwelling/ building	Listed/ Contributing
111042	½ mile from 2nd H_2O Meters; 50' of proj. ftprint	325 E 500 North	Sandstrom, Annie, House	c1890	single dwelling/ building	Listed/ Contributing
111043	½ mile from 2nd H_2O Meters; 50' of proj. ftprint	323 E 500 North	Christensen, Iver & Maria, House	1908	single dwelling/ building	Listed/ Contributing
111044	100-Yr Fld. Zone; ½ mile from 2nd H_2O Meters; 50' of proj. ftprint	186 W 100 South	Nielsen, Jacob, House	1905	single dwelling/ building	Listed/ Contributing
111045	50' of 2nd H_2O Meters; 50' of proj. ftprint	52 W 100 South	Erickson, Emil, Second Home	1910	single dwelling/ building	Listed/ Contributing
111046	100-Yr Fld. Zone; 50' of 2nd H_2O Meters; 50' of proj. ftprint	95 E Center	Spring City Bishop's Store House	1905	religious (general)/ building	Listed/ Contributing
111047	100-Yr Fld. Zone; 50' of 2nd H_2O Meters; 50' of proj. ftprint	163 E Center	Zabriskie, Charles, House	1894	single dwelling/ building	Listed/ Contributing
111048	50' of 2nd H_2O Meters; 50' of proj. ftprint	427 E Center	Jensen, Miels Peter, House	1880	single dwelling/ building	Listed/ Contributing
111049	100-Yr Fld. Zone; ½ mile from 2nd H_2O Meters; 50' of proj. ftprint	120 W Center	Osborne, Osman House	1908	single dwelling/ building	Listed/ Contributing
111050	100-Yr Fld. Zone; 50' of 2nd H_2O Meters; ½ mile from proj. ftprint	316 S 100 West	Allred, Maria, House	1929	single dwelling/ building	Not Eligible / Non-Contributing
111051	100-Yr Fld. Zone; 50' of proj. ftprint	390 S 100 West	Johnson, Jacob, House	1875	single dwelling/ building	Listed/ Contributing
111052	100-Yr Fld. Zone; 50' of 2nd H_2O Meters	400 S 200 West	Jensen, Laurtz House	1854	single dwelling/ building	Demolished

PR ID	Project Component	Address	Property Name	Const. Year	Original Use/Type	Listing Status
111053	100-Yr Fld. Zone; 50' of 2nd H_2O Meters; 50' of proj. ftprint	275 N 200 West	Larsen-Jensen House	1890	single dwelling/ building	Listed/ Contributing
111054	½ mile from 2nd H_2O Meters; 50' of proj. ftprint	498 N Main	Aiken Service	1924	service station/ building	Listed/ Contributing
111055	50' of 2nd H_2O Meters; 50' of proj. ftprint	551 N Main		1950	single dwelling/ building	Listed/ Contributing
111056	100-Yr Fld. Zone; 50' of proj. ftprint	278 S Main	Arthur Johnson Meat Market	1905	specialty store/ building	Listed/ Contributing
111058	100-Yr Fld. Zone; 50' of proj. ftprint	345 N Main	Hansen, Willard, House	1915	single dwelling/ building	Listed/ Contributing
111059	100-Yr Fld. Zone; 50' of 2nd H_2O Meters; 50' of proj. ftprint	390 S Main	Schroder, Thomas, House	1876	single dwelling/ building	Listed/ Contributing
111060	100-Yr Fld. Zone; ½ mile from 2nd H_2O Meters; 50' of proj. ftprint	80 W 300 North	Mortensen-Petersen House	1880	single dwelling/ building	Listed/ Contributing
111061	100-Yr Fld. Zone; 50' of 2nd H_2O Meters; 50' of proj. ftprint	87 W 200 North	Puzey, Albert, House	1906	single dwelling/ building	Listed/ Contributing
111062	½ mile from 2nd H_2O Meters; 50' of proj. ftprint	25 E 500 North	Sorensen, Jens, "Rock", House	1894	single dwelling/ building	Listed/ Contributing
111064	100-Yr Fld. Zone; 50' of 2nd H_2O Meters; 50' of proj. ftprint	420 S Main	Black, Lewis, House	1880	single dwelling/ building	Listed/ Contributing
111065	100-Yr Fld. Zone; 50' of 2nd H_2O Meters; 50' of proj. ftprint	475 S Main	Allred, Reuben W. Jr., House	1870	single dwelling/ building	Listed/ Contributing
111067	100-Yr Fld. Zone; ½ mile from 2nd H2O Meters; 50' of proj. ftprint	15 E 200 North	Ole Petersen-Nielsen House	1872	single dwelling/ building	Listed/ Contributing
111068	50' of 2nd H_2O Meters; 50' of proj. ftprint	115 S 100 East	Allred, Redick Newton, House	1875	single dwelling/ building	Listed/ Contributing
111069	100-Yr Fld. Zone; 50' of 2nd H_2O Meters; 50' of proj. ftprint	275 S 200 West	Nielsen, Jacob, Log House	c1885	single dwelling/ building	Listed/ Contributing
111076	100-Yr Fld. Zone; ½ mile from 2nd H2O Meters; ½ mile from proj. ftprint	55 W 400 South		c1890	animal facility/ building	Demolished
114251	100-Yr Fld. Zone; 50' of proj. ftprint;	45 S 100 East	Spring City School	1899	school/ building	Listed/ Contributing

PR ID	Project Component	Address	Property Name	Const. Year	Original Use/Type	Listing Status
	½ mile from 2nd H_2O Meters					
168584	½ mile from 2nd H2O Meters; ½ mile from proj. ftprint	30 W 300 North		1890	single dwelling/ building	Not Eligible / Non-Contributing
168598	½ mile from 2nd H2O Meters	225 N Main		1890	other residential/ building	Not Eligible /Non-Contributing
168636	100-Yr Fld. Zone; 50' of 2nd H_2O Meters; 50' of proj. ftprint	205 E 200 North	Borreson Log House	1880	single dwelling/ building	Listed/ Contributing
168676	50' of 2nd H_2O Meters; 50' of proj. ftprint;	250 E 100 North	Grain Cleaning Shed	1930	agric. processing/ building	Listed/ Contributing
175421	50' of 2nd H_2O Meters; ½ mile from proj. ftprint	165 N 200 West		1885	single dwelling/ building	Not Eligible / Non-Contributing
198653	50' of proj. ftprint; ½ mile from 2nd H2O Meters	194 N 300 East	Peter Mo(u)lter Granary	1870	agricultural storage/ building	Listed/ Contributing
201476	100-Yr Fld. Zone; 50' of proj. ftprint	386 S 100 West	Johnson, Jacob, Carriage House/ Horse Barn	1875	agric. outbuilding/ building	Listed/ Contributing
222749	½ mile from 2nd H_2O Meters; ½ mile from proj. ftprint	16 S 100 West		c1900	agricultural storage/ building	Listed/ Contributing
222750	50' of 2nd H_2O Meters; 50' of proj. ftprint	58 S 100 West		1900	resid. auxiliary/ building	Listed/ Contributing
222751	50' of 2nd H_2O Meters; 50' of proj. ftprint	313 E 100 South		1900	resid. auxiliary/ building	Listed/ Contributing
222752	50' of proj. ftprint; ½ mile from 2nd H2O Meters	385 E 100 South		c1880	resid. auxiliary/ building	Listed/ Contributing
222753	50' of 2nd H_2O Meters; 50' of proj. ftprint	52 W 100 South		c1910	agricultural storage/ building	Listed/ Contributing
222754	100-Yr Fld. Zone; 50' of 2nd H_2O Meters; 50' of proj. ftprint	309 N 100 West		c1900	animal facility/ building	Listed/ Contributing
222755	100-Yr Fld. Zone; 50' of 2nd H_2O Meters; 50' of proj. ftprint	309 N 100 West		c1900	animal facility/ building	Listed/ Contributing
222756	100-Yr Fld. Zone; 50' of 2nd H_2O Meters; 50' of proj. ftprint	297 S 100 West		c1890	agricultural storage/ building	Listed/ Contributing

PR ID	Project Component	Address	Property Name	Const. Year	Original Use/Type	Listing Status
222757	100-Yr Fld. Zone; 50' of 2nd H_2O Meters; 50' of proj. ftprint	297 S 100 West		c1890	agricultural storage/ building	Listed/ Contributing
222758	100-Yr Fld. Zone; 50' of proj. ftprint; ½ mile from 2nd H2O Meters	93 N 200 East		c1880	agricultural storage/ building	Listed/ Contributing
222759	100-Yr Fld. Zone; 50' of 2nd H_2O Meters; 50' of proj. ftprint	100 N 200 East	Big Ditch	c1875	Irrigation/ canal/ditch	Listed/ Contributing
222760	50' of proj. ftprint; ½ mile from 2nd H2O Meters	419 N 200 East		c1950	animal facility/ building	Listed/ Contributing
222761	50' of proj. ftprint; ½ mile from 2nd H2O Meters	560 N 200 East		c1900	resid. auxiliary/ building	Not Eligible / Non-Contributing
222762	100-Yr Fld. Zone; 50' of 2nd H_2O Meters; 50' of proj. ftprint	93 S 200 East		c1890	agricultural storage/ building	Listed/ Contributing
222763	100-Yr Fld. Zone; 50' of 2nd H_2O Meters; 50' of proj. ftprint	89 W 200 South		c1900	agric. outbuilding/ building	Listed/ Contributing
222764	100-Yr Fld. Zone; 50' of 2nd H_2O Meters; 50' of proj. ftprint	89 W 200 South		c1900	animal facility/ building	Listed/ Contributing
222765	100-Yr Fld. Zone; 50' of proj. ftprint; ½ mile from 2nd H2O Meters	15 E 200 North		c1880	agricultural storage/ building	Listed/ Contributing
222766	100-Yr Fld. Zone; 50' of proj. ftprint; ½ mile from 2nd H2O Meters	15 E 200 North		c1875	animal facility/ building	Listed/ Contributing
222767	100-Yr Fld. Zone; 50' of proj. ftprint; ½ mile from 2nd H2O Meters	87 E 200 North		c1880	agricultural storage/ building	Listed/ Contributing
222768	100-Yr Fld. Zone; 50' of proj. ftprint; ½ mile from 2nd H2O Meters	87 E 200 North		c1880	animal facility/ building	Listed/ Contributing
222769	100-Yr Fld. Zone; 50' of 2nd H_2O Meters; 50' of proj. ftprint	112 W 200 North		c1890	resid. auxiliary/ building	Listed/ Contributing
222770	100-Yr Fld. Zone; 50' of proj. ftprint;	119 W 200 North		c1890	agricultural storage/ building	Listed/ Contributing

PR ID	Project Component	Address	Property Name	Const. Year	Original Use/Type	Listing Status
	½ mile from 2nd H2O Meters					
222771	100-Yr Fld. Zone; 50' of 2nd H_2O Meters; 50' of proj. ftprint	190 W 200 North		c1910	agricultural storage/ building	Listed/ Contributing
222772	100-Yr Fld. Zone; 50' of 2nd H_2O Meters; ½ mile from proj. ftprint	190 W 200 North		c1880	agricultural storage/ building	Listed/ Contributing
222773	50' of 2nd H_2O Meters; 50' of proj. ftprint	112 E 200 South	Beck Granary/Coop	c1890	agricultural storage/ building	Listed/ Contributing
222774	50' of 2nd H_2O Meters; 50' of proj. ftprint	184 E 200 South		c880	animal facility/ building	Listed/ Contributing
222775	50' of 2nd H_2O Meters; 50' of proj. ftprint	184 E 200 South		c1890	agricultural storage/ building	Listed/ Contributing
222776	½ mile from 100-Yr Fld. Zone; 50' of proj. ftprint; ½ mile from of 2nd H_2O Meters	310 E 200 East		c1930	animal facility/ building	Listed/ Contributing
222777	50' of 2nd H_2O Meters; 50' of proj. ftprint	393 E 200 South		c1880	agricultural storage/ building	Listed/ Contributing
222778	100-Yr Fld. Zone; 50' of proj. ftprint	275 S 200 West		c1885	agricultural storage/ building	Listed/ Contributing
222779	50' of 2nd H_2O Meters; 50' of proj. ftprint	110 N 300 East		c1870	agricultural storage/ building	Listed/ Contributing
222780	50' of 2nd H_2O Meters; 50' of proj. ftprint	289 N 300 East		c1890	resid. auxiliary	Listed/ Contributing
222781	100-Yr Fld. Zone; 50' of proj. ftprint	469 S 300 East		c1880	agricultural storage/ building	Listed/ Contributing
222782	100-Yr Fld. Zone; 50' of 2nd H_2O Meters; 50' of proj. ftprint	116 E 300 North		c1900	resid. auxiliary/ building	Listed/ Contributing
222783	50' of 2nd H_2O Meters; 50' of proj. ftprint	315 E 300 North		c1900	agricultural storage/ building	Listed/ Contributing
222784	½ mile from 2nd H_2O Meters; 50' of proj. ftprint	280 E 300 East		c1890	agricultural storage/ building	Listed/ Contributing
222785	50' of proj. ftprint; ½ mile from of 2nd H_2O Meters	479 N 400 East		c1900	animal facility/ building	Listed/ Contributing

PR ID	Project Component	Address	Property Name	Const. Year	Original Use/Type	Listing Status
222786	100-Yr Fld. Zone; ½ mile from 2nd H_2O Meters; 50' of proj. ftprint	610 N 400 East		c1910	animal facility/ building	Listed/ Contributing
222787	100-Yr Fld. Zone; ½ mile from 2nd H_2O Meters; ½ mile from proj. ftprint	610 N 400 East		c1900	animal facility/ building	Listed/ Contributing
222788	50' of 2nd H_2O Meters; 50' of proj. ftprint	515 E 400 North		c1880	animal facility/ building	Listed/ Contributing
222789	100-Yr Fld. Zone; 50' of 2nd H_2O Meters; 50' of proj. ftprint	95 E 400 South		c1900	animal facility/ building	Listed/ Contributing
222790	100-Yr Fld. Zone; 50' of 2nd H_2O Meters; 50' of proj. ftprint	95 E 400 South		c1890	agricultural storage/ building	Listed/ Contributing
222791	100-Yr Fld. Zone; 50' of 2nd H_2O Meters; 50' of proj. ftprint	281 E 400 South		c1875	single dwelling/ building	Listed/ Contributing
222793	100-Yr Fld. Zone; 50' of 2nd H_2O Meters; 50' of proj. ftprint	115 E 500 North		c1880	agricultural storage/ building	Listed/ Contributing
222794	100-Yr Fld. Zone; 50' of 2nd H_2O Meters; 50' of proj. ftprint	115 E 500 North		c1880	animal facility/ building	Listed/ Contributing
222795	50' of proj. ftprint; ½ mile from 2nd H_2O Meters	189 E 500 North		c1880	animal facility/ building	Listed/ Contributing
222796	50' of 2nd H_2O Meters; 50' of proj. ftprint	323 E 500 North		c1890	animal facility/ building	Listed/ Contributing
222797	50' of 2nd H_2O Meters; 50' of proj. ftprint	323 E 500 North		c1990	resid. auxiliary/ building	Listed/ Contributing
222798	100-Yr Fld. Zone; 50' of 2nd H_2O Meters; 50' of proj. ftprint	515 E 500 North		c1880	single dwelling/ building	Listed/ Contributing
222799	50' of 2nd H_2O Meters; 50' of proj. ftprint	515 E 500 North		1950	agricultural storage/ building	Listed/ Contributing
222800	50' of 2nd H_2O Meters; 50' of proj. ftprint	515 E 500 North		1880	agricultural storage/ building	Listed/ Contributing
222801	100-Yr Fld. Zone; ½ mile from 2nd H_2O Meters 50' of proj. ftprint	317 E 700 North		c1890	agricultural storage/ building	Listed/ Contributing
222802	100-Yr Fld. Zone; 50' of proj. ftprint	317 E 700 North		c1900	animal facility/ building	Listed/ Contributing

PR ID	Project Component	Address	Property Name	Const. Year	Original Use/Type	Listing Status
222803	100-Yr Fld. Zone; 50' of 2nd H_2O Meters; 50' of proj. ftprint	245 E 700 North		c1930	agricultural (gen.)	Listed/ Contributing
222804	100-Yr Fld. Zone; 50' of 2nd H_2O Meters; 50' of proj. ftprint	260 N Main		c1880	agricultural storage/ building	Listed/ Contributing
222805	100-Yr Fld. Zone; ½ mile from of 2nd H_2O Meters; ½ mile from proj. ftprint	309 N Main	Petersen Granary	c1875	agricultural storage/ building	Listed/ Contributing
222806	100-Yr Fld. Zone; 50' of 2nd H_2O Meters; 50' of proj. ftprint	113 N Main		c1875	single dwelling/ building	Listed/ Contributing
222807	100-Yr Fld. Zone; 50' of proj. ftprint; ½ mile from 2nd H_2O Meters	187 N Main		c1900	agricultural storage/ building	Listed/ Contributing
222808	100-Yr Fld. Zone; 50' of 2nd H_2O Meters; 50' of proj. ftprint	260 N Main		c1890	resid. auxiliary/ building	Listed/ Contributing
222810	100-Yr Fld. Zone; 50' of proj. ftprint; ½ mile from 2nd H_2O Meters	187 N Main		c1880	single dwelling/ building	Listed/ Contributing
222811	100-Yr Fld. Zone; 50' of 2nd H_2O Meters; 50' of proj. ftprint	379 N Main		c1890	animal facility/ building	Listed/ Contributing
222812	100-Yr Fld. Zone; 50' of 2nd H_2O Meters; 50' of proj. ftprint	379 N Main		c1940	animal facility/ building	Listed/ Contributing
222813	100-Yr Fld. Zone; ½ mile from proj. ftprint; ½ mile from 2nd H_2O Meters	187 N Main		1920	animal facility/ building	Listed/ Contributing
222815	100-Yr Fld. Zone; 50' of 2nd H_2O Meters; ½ mile from proj. ftprint	209 S Main		c1880	animal facility/ building	Listed/ Contributing
222816	100-Yr Fld. Zone; 50' of 2nd H_2O Meters; ½ mile from proj. ftprint	209 S Main		c1880	agricultural storage/ building	Listed/ Contributing
222817	100-Yr Fld. Zone; ½ mile from proj. ftprint	216 S Main		c1890	agricultural storage/ building	Listed/ Contributing
222818	100-Yr Fld. Zone; ½ mile from proj. ftprint	389 S Main		c1890	agricultural storage/ building	Listed/ Contributing

PR ID	Project Component	Address	Property Name	Const. Year	Original Use/Type	Listing Status
222819	100-Yr Fld. Zone; ½ mile from proj. ftprint	389 S Main		c1890	animal facility/ building	Listed/ Contributing
222820	100-Yr Fld. Zone; 50' of 2nd H_2O Meters; ½ mile from proj. ftprint	415 S Main		c1890	resid. auxiliary/ building	Listed/ Contributing
222821	100-Yr Fld. Zone; 50' of 2nd H_2O Meters; ½ mile from proj. ftprint	415 S Main		c1880	agricultural storage/ building	Listed/ Contributing
222822	100-Yr Fld. Zone; 50' of 2nd H_2O Meters; ½ mile from proj. ftprint	415 S Main		1870	animal facility/ building	Listed/ Contributing
222823	100-Yr Fld. Zone; 50' of 2nd H_2O Meters	383 S 100 East		c1880	Single dwelling/ building	Not Eligible / Non-Contributing
222824	100-Yr Fld. Zone; 50' of 2nd H_2O Meters; ½ mile from proj. ftprint	69 W 300 South		c1880	single dwelling/ building	Not Eligible / Non-Contributing
222825	50' of 2nd H_2O Meters; ½ mile from proj. ftprint	285 E 500 North		c1885	animal facility/ building	Listed/ Contributing
257120	100-Yr Fld. Zone; ½ mile from2nd H_2O Meters; ½ mile from proj. ftprint	469 S 200 East	Allred-Johnson House	1890	single dwelling/ building	Listed/ Contributing
257179	100-Yr Fld. Zone; ½ mile from2nd H_2O Meters; ½ mile from proj. ftprint	43 E 100 South	Strate, Rulon, House	1948	single dwelling/ building	Listed/ Contributing
257289	100-Yr Fld. Zone; ½ mile from2nd H_2O Meters; ½ mile from proj. ftprint	166 W 400 South	Jensen, James House	1899	single dwelling/ building	Not Eligible / Non-Contributing
257417	100-Yr Fld. Zone; ½ mile from2nd H_2O Meters; ½ mile from proj. ftprint	89 W 200 South	Justensen, John F., House	1896	single dwelling/ building	Listed/ Contributing
259406	100-Yr Fld. Zone; ½ mile from2nd H_2O Meters; ½ mile from proj. ftprint	60 W 400 North	Strate, Geneva, House	c1974	single dwelling/ building	Out-of-period
259249	½ mile from2nd H_2O Meters; ½ mile from proj. ftprint	110 S 300 East		1978	single dwelling/ building	Out-Of-Period
259251	½ mile from2nd H_2O Meters; ½ mile from proj. ftprint	24 S 500 East		c1975	single dwelling/ building	Out-Of-Period
259259	½ mile from2nd H_2O Meters;	342 N 200 East		1977	single dwelling/ building	Out-Of-Period

PR ID	Project Component	Address	Property Name	Const. Year	Original Use/Type	Listing Status
	½ mile from proj. ftprint					
259297	100-Yr Fld. Zone; ½ mile from2nd H_2O Meters; ½ mile from proj. ftprint	636 N 300 East		1977	single dwelling/ building	Out-Of-Period
259300	100-Yr Fld. Zone; ½ mile from2nd H_2O Meters; ½ mile from proj. ftprint	679 N 400 East		1978	single dwelling/ building	Out-Of-Period
259309	½ mile from2nd H_2O Meters; ½ mile from proj. ftprint	583 E Center		1978	single dwelling/ building	Out-Of-Period
259317	½ mile from2nd H_2O Meters; ½ mile from proj. ftprint	20 S 400 East		c1978	single dwelling/ building	Out-Of-Period
259318	½ mile from2nd H_2O Meters; ½ mile from proj. ftprint	185 E 200 South		1978	single dwelling/ building	Out-Of-Period
259319	100-Yr Fld. Zone; ½ mile from2nd H_2O Meters; ½ mile from proj. ftprint	490 S 300 East	Allred, John, House	1978	single dwelling/ building	Out-Of-Period
259332	½ mile from2nd H_2O Meters; ½ mile from proj. ftprint	192 N 300 East		c1975	single dwelling/ building	Out-Of-Period
259335	½ mile from2nd H_2O Meters; ½ mile from proj. ftprint	675 E Center		c1977	single dwelling/ building	Out-Of-Period
259342	100-Yr Fld. Zone; ½ mile from2nd H_2O Meters; ½ mile from proj. ftprint	343 S 400 East		1978	single dwelling/ building	Out-Of-Period
259377	100-Yr Fld. Zone; ½ mile from2nd H_2O Meters; ½ mile from proj. ftprint	435 N 100 East	Blain , Boyd, House	1977	single dwelling/ building	Out-Of-Period
259381	½ mile from2nd H_2O Meters; ½ mile from proj. ftprint	283 N 400 East		c1975	single dwelling/ building	Out-Of-Period
259388	½ mile from2nd H_2O Meters; ½ mile from proj. ftprint	530 E 300 South		1977	single dwelling/ building	Out-Of-Period
259407	½ mile from2nd H_2O Meters; ½ mile from proj. ftprint	490 S Main	Hansen, Lorell, House	1978	single dwelling/ building	Out-Of-Period

PR ID	Project Component	Address	Property Name	Const. Year	Original Use/Type	Listing Status
259409	100-Yr Fld. Zone; ½ mile from2nd H_2O Meters; ½ mile from proj. ftprint	116 W 100 North		1978	single dwelling/ building	Out-Of-Period
259416	½ mile from2nd H_2O Meters; ½ mile from proj. ftprint	153 E 200 South		1978	single dwelling/ building	Out-Of-Period
259423	½ mile from2nd H_2O Meters; ½ mile from proj. ftprint	121 S 100 East		1978	single dwelling/ building	Out-Of-Period
259425	½ mile from2nd H_2O Meters; ½ mile from proj. ftprint	458 N 200 East		1976	single dwelling/ building	Out-Of-Period
259432	100-Yr Fld. Zone; ½ mile from2nd H_2O Meters; ½ mile from proj. ftprint	296 E 400 South		1976	single dwelling/ building	Out-Of-Period
259435	½ mile from2nd H_2O Meters; ½ mile from proj. ftprint	485 E 100 South	Winona, Danny, House	c1975	single dwelling/ building	Out-Of-Period
259484	½ mile from2nd H_2O Meters; ½ mile from proj. ftprint	615 E 100 North		1975	single dwelling/ building	Out-Of-Period
259492	100-Yr Fld. Zone; ½ mile from2nd H_2O Meters; ½ mile from proj. ftprint	454 S 300 East		1978	single dwelling/ building	Out-Of-Period
259495	½ mile from2nd H_2O Meters; ½ mile from proj. ftprint	118 S 400 East		1978	single dwelling/ building	Out-Of-Period
259499	100-Yr Fld. Zone; ½ mile from2nd H_2O Meters; ½ mile from proj. ftprint	420 S 100 East	Crisp, Floyd, House	c1975	single dwelling/ building	Out-Of-Period
259522	100-Yr Fld. Zone; ½ mile from2nd H_2O Meters; ½ mile from proj. ftprint	402 S 200 West	Everitt/Owen House	c1975	single dwelling/ building	Out-Of-Period
259523	½ mile from2nd H_2O Meters; ½ mile from proj. ftprint	219 E 500 North		1975	single dwelling/ building	Out-Of-Period
259532	100-Yr Fld. Zone; ½ mile from2nd H_2O Meters; ½ mile from proj. ftprint	424 S Main	Syme, Courtney D., House	1978	single dwelling/ building	Out-Of-Period
259570	100-Yr Fld. Zone;	117 E 200 North	Sorensen, Mark, House	1976	single dwelling/ building	Out-Of-Period

PR ID	Project Component	Address	Property Name	Const. Year	Original Use/Type	Listing Status
	½ mile from2nd H2O Meters; ½ mile from proj. ftprint					
259629	100-Yr Fld. Zone; ½ mile from2nd H2O Meters; ½ mile from proj. ftprint	56 N Main		1975	single dwelling/ building	Out-Of-Period
259632	100-Yr Fld. Zone; ½ mile from2nd H2O Meters; ½ mile from proj. ftprint	768 N 400 East		1976	single dwelling/ building	Out-Of-Period

Archaeological Results

The cultural heritage inventory resulted in the documentation of 14 isolated finds, the update of four previously recorded sites (42SP437, 42SP615, 42SP621, and 42SP1105), and the recordation of 32 new sites (42SP1206-1237) (Table 6). Of the total 36 sites, 14 are recommended eligible and 22 are recommended not eligible. The eligible sites include three are precontact temporary camps (42SP1215, 42SP1216, and 42SP1227), three are multi-component temporary camps (42SP1218, 42SP1226, and 42SP1228), three are historic ponds (42SP1222-1224), two are historic irrigation ditches (42SP437 and 42SP1231), one is a historic road (42SP1237), and two are related to irrigation and historic electricity (42SP1105 and 42SP1206). Of the 22 recommended not eligible sites, three are precontact temporary camps (42SP1219, 42SP1220, and 42SP1225), one is a multi-component temporary camp (42SP1217), six are historic sidewalks (42SP1210, and 2SP1232-1236), four are historic artifact scatters/dumps (42SP1209, and 42SP1211-1214), four are historic architectural sites (42SP1207, 42SP1208, 42SP1221, and 42SP1229), one is a historic arborglyph site (42SP1230), one is a historic irrigation ditch (42SP615), and one is a historic road (42SP621).

Table 6: Recorded Sites

Site No.	Site Type	Name/Description	Eligibility	Land Ownership
42SP437	Historic Irrigation Canal	Mill Race Ditch	Recommended Eligible, Criterion A	Private
42SP615	Historic Irrigation Canal	Point Ditch	Recommended Not Eligible	Private
42SP621	Historic Road	U.S. Hwy 89	Determined/Recommended Not Eligible	UDOT
42SP1105 (ML-5727)	Historic Hydroelectric System	Penstock Aqueduct	Determined/Recommended Eligible	USFS, Private
42SP1206	Historic Multi-Component Site	Historic artifact scatter and irrigation features	Recommended Eligible, Criterion A	Private
42SP1207	Historic Structure	Historic deteriorated foundation	Recommended Not Eligible	Private
42SP1208	Historic Structure	Historic log granary	Recommended Not Eligible	Private

Site No.	Site Type	Name/Description	Eligibility	Land Ownership
42SP1209	Historic Artifact Scatter	Historic roadside dump	Recommended Not Eligible	Private
42SP1210	Historic Sidewalk	Historic sidewalk	Recommended Not Eligible	Private
42SP1211	Historic Artifact Scatter	Historic artifact scatter	Recommended Not Eligible	Private
42SP1212	Historic Artifact Scatter	Historic expedient dump	Recommended Not Eligible	Private
42SP1213	Historic Artifact Scatter	Historic expedient dump	Recommended Not Eligible	Private
42SP1214	Historic Multi-Component Site	Historic structures and artifact scatter	Recommended Not Eligible	Private
42SP1215	Precontact Artifact scatter	Precontact lithic scatter	Recommended Eligible, Criterion D	Private
42SP1216	Precontact Temporary Camp	Precontact temporary camp	Recommended Eligible, Criterion D	Private
42SP1217	Multi-Component Site	Precontact lithic scatter and historic artifact scatter	Recommended Not Eligible	Private
42SP1218	Multi-Component Site	Fremont temporary camp and historic artifact scatter	Recommended Eligible, Criterion D	Private
42SP1219	Precontact Artifact scatter	Fremont artifact scatter	Recommended Not Eligible	Private
42SP1220	Precontact Artifact scatter	Precontact lithic scatter	Recommended Not Eligible	Private
42SP1221	Historic Architecture	Historic lean-to animal shelter	Recommended Not Eligible	Private
42SP1222	Historic Reservoir	Chester Ponds	Recommended Eligible, Criterion A	Private
42SP1223	Historic Reservoir	Chester Ponds	Recommended Eligible, Criterion A	Private
42SP1224	Historic Reservoir	Chester Ponds	Recommended Eligible, Criterion A	Private
42SP1225	Precontact Temporary Camp	Precontact temporary camp	Recommended Not Eligible	Private
42SP1226	Multi-Component Site	Multi-component precontact temporary camp and historic artifact scatter	Recommended Eligible, Criterion D	Private
42SP1227	Precontact Artifact Scatter	Precontact lithic scatter	Recommended Eligible, Criterion D	Private
42SP1228	Multi-Component Site	Precontact temporary camp and historic artifact scatter	Recommended Eligible, Criterion D	Private

Site No.	Site Type	Name/Description	Eligibility	Land Ownership
42SP1229	Historic Agricultural Complex	Historic Agricultural Complex	Recommended Not Eligible	Private
42SP1230 (ML-5728)	Historic Culturally Modified Trees	Two historic aspen arborglyphs	Recommended Not Eligible	USFS
42SP1231 (PR ID 222759)	Historic Irrigation Canal	Big Ditch	Listed in SCNRHD Recommended Eligible, Criterion A outside of district	Private
42SP1232	Historic sidewalk	Historic sidewalk	Recommended Not Eligible	Private
42SP1233	Historic sidewalk	Historic sidewalk	Recommended Not Eligible	Private
42SP1234	Historic sidewalk	Historic sidewalk	Recommended Not Eligible	Private
42SP1235	Historic sidewalk	Historic sidewalk	Recommended Not Eligible	Private
42SP1236	Historic sidewalk	Historic sidewalk	Recommended Not Eligible	Private
42SP1237	Historic Road	Spring City Power Plant Road	Recommended Eligible, Criterion A	Private

Updated Sites

Site No./Name: 42SP437/ Mill Race Ditch

Location: [redacted]

Land Designation: Private

NRHP Eligibility: Eligible, Criteria A and B

Description: Site 42SP437 is Mill Race Ditch, an earthen and partially rock-lined irrigation ditch that originates [redacted] The ditch was likely constructed between 1870 and 1880 and is owned by Horseshoe Irrigation Company. A concrete diversion structure along the ditch includes an inscription that reads "ERECTED / 5/28/37 / SCS ECW U5" and "Br21DY 4/26/37". The inscription indicates that the feature was constructed by the CCC (known into 1937 as the Emergency Conservation Works [ECW]) (Speakman 2006) in conjunction with the Soil Conservation Service (SCS). The November 1939 "CCC News" ("Midget Tribune") mentions SCS-5, which appears to correlate to the Mt. Pleasant Camp (Civilian Conservation Corps, Company 585:9; CCC Legacy). Finally, "Br21DY, may be Darrell Brady, who served at several Utah camps, including Mt. Pleasant (Brady 1933-1939). The ditch is still in use, but the concrete diversion was recently replaced by an electronically controlled diversion. When originally recorded, a portion of Big Ditch was included as part of the Mill Race Ditch. Big Ditch was recorded as a separate ditch and site during this project (see 42SP1231). A wooden foot bridge was also initially recorded as a feature of Mill Race Ditch, but it is associated with Big Ditch. Aside from the updates mentioned above, the site condition was similar to its original recording.

Eligibility: In 2001, the site was recommended eligible for listing on the NRHP under Criterion A due to its association with the intricate irrigation system that is directly connected to early Mormon settlement of Spring City. The updates to this site do not warrant a change in determination of eligibility under Criterion A. The historic inscription on Feature Two suggests that the site is also associated with the CCC and is therefore also recommended eligible under Criterion B. The irrigation ditch does not possess unique or artistic value or represent the work of a master and will not add significant information important to history and so does not meet the standards of Criteria C or D. Qualities of integrity of location, setting, and feeling are conveyed through the in-situ value of the ditch and the relatively unaltered nature of the setting of the site. The ditch segment invokes the feeling of the historic landscape, especially in historic Spring City. The site further retains the integrity of association because the link between the historical development and success of Spring City is evident and because the historic inscription conveys the association with the CCC. Because the ditch has been maintained and updated throughout its use, and the ubiquity and simplicity of earthen irrigation ditches, the integrity elements of design, materials, and workmanship, do not apply to the site.

Site No./Name: 42SP615/Point Ditch
Location: [redacted]
Land Designation: Private
NRHP Eligibility: Not Eligible

Description: Site 42SP615 is Point Ditch, an earthen irrigation ditch that diverts water [redacted] The ditch was constructed by the Horseshoe Irrigation Company and water rights were assigned in 1853. It is approximately 3 feet deep, averages 6 to 8 feet wide, and has a U-shape profile. A concrete confluence box is associated with the ditch but is outside the project area and was not visited for this project. The ditch is still in use and its condition appears consistent with that of its original recording in 2006. Impacts to the site include dense vegetation growth, cattle grazing adjacent to it, and ongoing maintenance.

Eligibility: In 2006, the site was recommended not eligible for listing on the NRHP. During the site update, no changes were observed that would warrant a deviation from the 2006 determination. The ditch, while old, has had a limited distribution of water to only a few properties and so does not meet the standards of Criteria A. The irrigation ditch is not associated with known historically significant persons, does not possess unique or artistic value or represent the work of a master and will not add significant information important to history. Qualities of integrity of location, setting, and feeling are conveyed through the in-situ value of the ditch and the relatively unaltered nature of the setting of the site. The ditch segment invokes the feeling of the historic agricultural landscape. Because the ditch has been Maintained and updated throughout its use, and the ubiquity and simplicity of earthen irrigation ditches, the integrity elements of design, materials, and workmanship, do not apply to the site and because the site fails to meet Criteria A and B, the integrity of association is lacking.

Site No./Name: 42SP621/U.S. 89
Location: [redacted]
Land Designation: UDOT
NRHP Eligibility: Not Eligible

Description: The inventory documented two segments of U.S. 89. The southern segment, [redacted] was an update of a 2006 recording and is located on [redacted]. The second segment was a new recording of a segment [redacted]. The updated segment included "Culvert 7", a "poured-in-place concrete box culvert… [that] is partially lined with dry-laid sandstone slabs" (Thornton 2006) and spans [redacted]. Since that time, the culvert has been replaced with a new concrete box culvert. Clearly, extensive roadwork has occurred through the previously recorded section. A comparison between the 2006 photos and now does suggest that the roadbed has been relaid since that time. The northern section of road appears to have undergone some roadbed maintenance, however, two older style galvanized riveted culverts were observed across the recorded section. Both culverts were partially obscured by ice at the time of recording but erosion around the culverts is evident. One of the culverts spans Big Ditch.

Eligibility: The site has been determined not eligible to the National Register. The highway is not associated with known historically significant events or persons, does not possess unique or artistic value, represent the work of a master, embody a disincentive type, period, or method of construction, and will not add significant information important to history. Qualities of integrity of location and setting are conveyed through the in-situ value of the road, the route of which, has not altered since the historic period. Feeling is compromised because the road does not convey a sense of its historic use. Because the road has been Maintained and updated throughout its use, and the ubiquity and standardization of road Maintenance, the integrity elements of design, materials, and workmanship, do not apply to the site and because the site fails to meet Criteria A and B, the integrity of association is lacking.

Site No./Name: 42SP1105 (ML-5727)
Location: [redacted]
Land Designation: U.S. Forest Service
NRHP Eligibility: Eligible, Criterion A

Description: Site 42SP1105 (ML-5727) is a hydroelectric system that was originally identified and documented in 2019 and included portions of two penstocks, two powerhouses, and an aqueduct in [redacted] A 1947 description of the system states that the original dam was made of timber with a timber headgate intake. The conduit was an 18 inch wooden stave pipeline that spanned 3,150 feet that replaced an open canal that was used with the first power plant. The first penstock was 800 feet of 18 inch pipe that extended to and was tapped above the first power plant. The second penstock extended to the second, newer power plant for a total of 950 feet (Wooley 1947:189). Presently, two large metal pipelines follow along the corridor of the penstock and wooden stave pipeline. A conversation in 2021 with Kent Kummer, the current Spring City Power Superintendent indicated that the date of manufacture of the riveted metal pipelines is unknown, but under 50 years old. Previously unrecorded portions of the aqueduct were identified and recorded during 2021 fieldwork. These segments/exposed portions represent the original wooden stave water conveyance for power generation. These are three segments/exposed portions of wood and wire-bound pipeline that are eroding out of a hillside overlooking Oak Creek. All three sections are located on an old roadbed that was likely built for the pipeline construction. At least one segment is no longer in situ. A newer riveted steel pipeline that is still in use and is actively maintained also runs along this road and replaced the old wood stave pipe. This site update [redacted].

Eligibility: The site was previously determined eligible for listing on the National Register of Historic Places (NRHP) under Criterion A due to its association with the settlement of Spring City and the arrival of electricity to Sanpete County. The 2019 eligibility justification indicates that the site meets the integrity of location, setting, design, materials, and association. The updates made to this site do not warrant a change in that determination. The site does not possess association with known historically significant persons, does not possess unique or artistic value or represent the work of a master, and will not add significant information important to history. The aqueduct does not possess the criteria of workmanship because the elements of the aqueduct do not possess extraordinary craftsmanship.

Newly Recorded Archaeological Sites and Site Segments

Site No./Name: 42SP1206
Temp Number: 21-08-HR-14
Location: [redacted]
Land Designation: Private
NRHP Eligibility: Eligible, Criterion A

Description: Site 1206 consists is a multi-component historic site. The first component consists of a diffuse artifact scatter and the evidence of a raised structure. The second component consists of irrigation elements and a cattle trough. According to [redacted] Kaye Watson, the first component is associated with the Penstock Aqueduct and probably represents the first power station associated with the hydroelectric system. The artifacts associated with this component include fragmentary glass, ceramic, square cut nails, cans, construction materials, a bullet casing, and the handle from cutlery. The second component includes the remains of an irrigation ditch, a cattle trough, and the displaced remains of irrigation structure. The first component is related to the Penstock Aqueduct dates to the beginning of the 20th century. The limited artifact scatter supports that time frame. No diagnostic materials are directly associated with the second agricultural use of the site, however, historic aerial imagery from 1939 shows a corral located adjacent to the site. The corral has since been razed, however, its presence in the vicinity of the site may indicate that the pastoral use of the site was contemporaneous with that corral. The displaced irrigation materials also suggest the site's use for animal husbandry extends well beyond the 1930s as those materials appear modern.

Eligibility: If the site is associated with Penstock Aqueduct (42SP1105), then the site is recommended eligible under Criterion A for its historical importance in proving the first electricity to the area. The site is not associated with known important persons and so the site is not eligible under Criterion B. The site does not possess unique or artistic value or indicate the work of a master and is not eligible under Criterion C. The components of the site appear to have been used for only short periods of time or were sporadically used. It is not likely to yield additional information that would be important to history. Therefore, the site is not eligible under Criterion D because it is unlikely to yield information valuable to history. The site is recommended ineligible for NRHP inclusion. The quality of integrity of setting remains intact because the character of the place is consistent with the historical use of the site. Location is compromised for the earlier component because the main component of the site, as the power station has been razed. However, it remains intact for the second agricultural component. Feeling has been compromised for the power station component of the site, because the site does not convey that historical use of the site, however, it remains intact for the second component because the historical use for ranching and grazing is evident. Because the majority of the structural materials have been removed from the site, integrity elements of design, materials, workmanship, or association cannot apply to the site. The power station component of the site meets Criterion A. The agricultural component does not meet Criteria A-D.

Site No./Name: 42SP1207
Temp Number: 21-08-HR-13
Location: [redacted]

Land Designation: Private
NRHP Eligibility: Not Eligible

Description: Site 42SP1207 consists of a deteriorated building foundation [redacted] A small homestead or residence may have once existed at the site. An indentation in the middle of the structural remains appears to signify the possible presence of a cellar or crawl space at one point in time. The stones making up the remains of the foundation appear to be the same white/yellow sandstone that is used in many of the historic houses in Spring City. In the area surrounding the remains, there is significant plant growth which impacted ground visibility. No artifacts save for several shards of window glass (found adjacent to one of the walls) were found. Historic aerial photographs, dating back to 1939, are not clear enough to show if a structure is visible here, mainly due to shadows. Additionally, there are no structures listed at this location on the 1978 National Register of Historic Places nomination for the Spring City Historic District. Historic preservationists who work around Spring City have indicated that historic buildings end up being moved and reused on other properties, this may be why there are not more material remains at the site.

Eligibility: No records could be located that provide information about the history of the structural remains. Because the site is not associated with known important events or persons, it is not eligible under Criteria A and B. The site does not possess unique or artistic value or indicate the work of a master and is not eligible under Criterion C. The lack of materials at the site indicates a low probability of significant subsurface deposit and it is not likely to add significant information to the understanding of history. Therefore, the site is not eligible under Criterion D because it is unlikely to yield information valuable to history._The site is recommended not eligible for NRHP inclusion. Qualities of integrity of setting, and feeling remain intact because the character of the place is consistent with the historical use of the site and the setting is able to convey the feeling of the historical place. Location is compromised because the superstructure over the foundation and the materials associated with the site have been removed from the site. Because the site does not meet the standards of Criteria A through D, and because the majority of the structure and materials have been removed from the site, integrity elements of design, materials, workmanship, or association cannot apply to the site.

Site No.: 42SP1208

Temp Number: 21-08-HR-12

Location: [redacted]

Land Designation: Private

NRHP Eligibility: Eligible/Contributing

Description: Site 42SP1208 is a log granary located [redacted] The structure faces [redacted] The structure itself is constructed of stacked logs with a tin roof and a foundation that appears to be drylaid blocky sandstone. There are several modern additions including a concrete patio. The addition at the back of the structure is modern, made of plywood, and painted gray. The structure also appears to be hooked up to the Main house's electricity. It may be used as a sort of guest house.

This property is located within Spring City, and the town limits make up the Spring City Historic District. According to Sanpete County records, the Main residence at this property was built in 1981. This property, [redacted] has 5 structures that were inventoried in the 1978 National Register nomination for this historic district, all listed as part of the Roy Black property. Based on the descriptions, this structure may be the granary (Site No. 57A). At the time of recording, the structure was described as having "a rectangular floor plan, gable end door, and gable roof which projects forward over the door...The corner notching is a variant of square or half-notch. The logs are sawed square on all sides and require no chinking." The roof has been replaced and no longer projects over the door. The site form notes that the construction date was c.1920 and was originally owned by Roy Black. At the time of recording, in 1978, the structure was unaltered, in excellent condition, and recommended contributory. The other structures on the property and in the 1978 nomination are a t-shaped dwelling, a barn, a log hog house, and a shed. All these structures appear to be missing or replaced with more modern structures. However, the 1978 nomination is missing photos of this property, and therefore it is difficult to confirm changes.

Eligibility: The historic granary is listed as contributing to the Spring City National Register Historical District. It is not associated with known significant historical events or persons and so does not meet the standards of Criteria A and B. Despite the alterations to the structure, the granary embodies distinctive characteristics of a type and period of construction—grain storage in a frontier, agricultural, Mormon settlement. As a contributing feature to the historical quality of Spring City, the structure can add to the understanding of the structural development and pastoral qualities of historical Spring City. The site is therefore recommended eligible under Criterion D as a contributing member of the National Register District. The structure retains the integrity of location and feeling as the structure remains in situ and contributes to the historical feeling of Spring City. The integrity of materials remains intact because the physical elements used by the original builders to construct the body of the granary is intact. The alterations to the property have impacted the integrity of setting. The structure does not meet the standard of workmanship because the elements of the granary do not possess extraordinary craftsmanship. The site does not meet the standards of association because the site does not meet Criteria A or B.

Site No.: 42SP1209
Temp Number: 21-08-HR-02
Location: [redacted]
Land Designation: Private
NRHP Eligibility: Not Eligible

Description: Site 42SP1209 is a historic roadside dumping site located [redacted]. The layered nature of the deposit indicates that it was used for multiple dumping episodes, with stone and organized strand board scraps overlaying an estimated 300+ cans, fragments of cans, broken glass, automotive parts, and unknown metal, plastic and rubber materials. Much of the deposit is embedded in soil and the mortar and stone of the more recent deposits. At the time of recording the soil was frozen, so some items visible at the surface were not conducive to detailed documentation. Materials identified in the deposit indicate that the site was used between the 1960s and the 1990s, but there were some items that were likely manufactured earlier in time (automotive seat springs, headlight, and potentially some of the materials embedded in frozen soil and building material waste).

Eligibility: The site appears to be an expedient dump site that has been in use from the 1960s until the 1980s or 1990s. There are no historical records, patents, or otherwise significant documents concerning the habitation and use of this area. The site is a small, discrete roadside dump that is not associated with significant events or persons and is not eligible under Criteria A or B. It does not possess unique or artistic value or represent the work of a master and is not eligible under Criterion C. There is little likelihood that the site could contribute information important to history and is not eligible under Criterion D. The site retains the integrity elements of location, setting, and feeling as the materials deposited at the site are in situ and the site conveys a feeling of the historical rural landscape. As the site does not meet the standards of Criteria A through D no other integrity elements can apply.

Site No.: 42SP1210
Temp Number: 21-08-HR-17
Location: [redacted]
Land Designation: Private
NRHP Eligibility: Not Eligible

Description: Site 42SP1210 is a concrete sidewalk that runs [redacted] The condition of the sidewalk is better than many others in town with the least amount of erosion, decay, and plant growth, although the color, construction, and aggregate in the concrete is consistent with other sidewalks in town suggesting that it is contemporaneous with the other town sidewalks. According to a local history of Spring City, an effort to replace wooden boardwalks with concrete sidewalks began in 1913 on Main Street, and "perhaps in other areas" (Watson 1984: 69). Segments of sidewalk are visible on the earliest available photographs of the city in 1939 (UGS 1939).

Eligibility: This stretch of concrete sidewalk is in relatively good condition. When exactly it was constructed and what changes, repairs, or replacements have taken place since its construction are unclear. The historical development of Spring City's sidewalks does not constitute a significant historic event and so the site is not eligible under Criterion A. The sidewalk does not possess association with persons of historical significance and so is not eligible under Criterion B. The site does not possess artistic or unique value and so the site is not eligible under Criterion C. The site will not add significant information to the understanding of history and so is not eligible under Criterion D. The site is recommended not eligible for NRHP inclusion. Qualities of integrity of location, setting, and feeling are conveyed through the in-situ value of the sidewalk segment and the relatively unaltered historical nature of the setting of the site. The sidewalk segment invokes the feeling of the historic Spring City landscape. Because the site does not meet the standards of Criteria A through D, integrity elements of design, materials, workmanship, or association cannot apply to the site.

Site No.: 42SP1211
Temp Number: 21-08-HM-05
Location: [redacted]
Land Designation: Private
NRHP Eligibility: Not Eligible

Description: Site 42SP1211 is a sparse historic scatter located [redacted] The site includes 24 cans including tobacco tins, a powdered cleanser can, sanitary cans, cans that are too crushed and corroded to determine manufacture and two machine-made bottles including an Owens Illinois alcohol bottle that appears to date to 1952. The site is located on a gently west-sloping grassy flat among juniper trees. The site is surrounded by private land primarily used for agrarian pursuits or by households on large lots.

Eligibility: The site is a limited historic artifact scatter that is not associated with significant events or persons and is not eligible under Criteria A or B. It does not possess unique or artistic value or represent the work of a master and is not eligible under Criterion C. There is little likelihood that the site could contribute information important to history and is not eligible under Criterion D. The site retains the integrity elements of location, setting, and feeling as the materials deposited at the site are in situ and the site conveys a feeling of the historical rural landscape. As the site does not meet the standards of Criteria A through D no other integrity elements can apply.

Site No.: 42SP1212
Temp Number: 21-08-HM-02
Location: [redacted]
Land Designation: Private
NRHP Eligibility: Not Eligible

Description: Site 42SP1212 is a limited historic trash scatter consisting of the remains of nine glass vessels, seven ceramic items, a crushed frozen orange juice can, bicycle parts, shotgun shells, plastic, and a modern WD-40 can. The site has one completely intact green glass medicine bottle with a screw-top closure and two complete bottle bases. The assemblage is indicative of the mid-20th century. The site is located [redacted] The site is adjacent to a road and has been impacted by that, as evidenced by modern litter throughout the site. The site likely represents a single episode of a roadside dumping event.

Eligibility: The site was likely an expedient dump, a ubiquitous and common site type. It is not associated with significant events or persons and is not eligible under Criteria A or B. It does not possess unique or artistic value or represent the work of a master and is not eligible under Criterion C. There is little likelihood that the site could contribute information important to history and is not eligible under Criterion D. The site retains the integrity elements of location, setting, and feeling as the area as the materials deposited at the site are in situ and the ability of the site to convey the historical setting and use of the area for domestic refuse dumping is intact. As the site does not meet the standards of Criteria A through D no other integrity elements can apply.

Site No.: 42SP1213
Temp Number: 21-08-HM-01
Location: [redacted]
Land Designation: Private
NRHP Eligibility: Not Eligible

Description: Site 42SP1213 is a discrete historic artifact scatter that consists of 13 cans, including sanitary cans and tobacco tins, five glass vessels including a Pond's milk glass jar, and the remains of three earthenware vessels. All of the artifacts are fragmentary or crushed and the site is located [redacted] The site likely represents a single dumping event of domestic refuse that dates to the mid-20th century.

Eligibility: The site was likely an expedient dump, a ubiquitous and common site type. It is not associated with significant events or persons and is not eligible under Criteria A or B. It does not possess unique or artistic value or represent the work of a master and is not eligible under Criterion C. There is little likelihood that the site could contribute information important to history and is not eligible under Criterion D. The site retains the integrity elements of location, setting, as the materials deposited at the site are in situ. The site does not retain the element of feeling as the site and its setting does not convey a feeling of the historical landscape. As the site does not meet the standards of Criteria A through D no other integrity elements can apply.

Site No.: 42SP1214
Temp Number: 21-08-HR-15
Location: [redacted]
Land Designation: Private
NRHP Eligibility: Not Eligible

Description: Site 42SP1214 is a multi-purpose assemblage of interconnecting pastoral structures. The features include a chicken coop, a hayshed, and a horse shelter. The structures are still in active use and have been at least updated and ,maintained as many of the materials are newer. The walls are primarily wood planks and most of the roof and wall stud lumber is modern 2x4s and newer pressure-treated posts are utilized as uprights for pole construction of walls and are set in concrete. Newer-looking corrugated metal is also used as both roofing and for the siding of the southern portion of the complex (horse shelter). Many of the nails and carriage bolts used to fasten structural lumber and siding are modernly sourced and galvanized. While it is likely that the chicken coop was built some years prior to the construction of the lean-to hay shed and horse shelter, it is difficult to tell given the extent of Maintenance and rebuilding. From north to south this structure measures 48 feet long, and from east to west it shares a common width of approximately 14 feet wide. It was recorded as a singular feature because the spaces are conjoined.

This site is located [redacted]. The modern materials used at the site, however, indicate it is not related to that early occupation. No other historical records or otherwise significant documents could be located that might provide context to this site and the age of the structure is unknown. No artifacts are associated with the site.

Eligibility: The site is not related to events or persons of known significance and is not eligible under Criteria A or B. The site does not possess unique or artistic value, represent the work of a master, or embody a distinct style or period of construction and is not eligible under Criterion C. There is little likelihood that the site could contribute information important to history and is not eligible under Criterion D. The structure is currently in use and maintained, with most construction materials being modern. The age of the structure and modifications or changes from its original form cannot be determined. The site retains integrity of location and setting because there is no evidence that is has been moved, and the surrounding physical environment still resembles the agricultural, rural area in which it was originally constructed. The modifications to the structure and the use of modern materials on it have impacted integrity of design and materials, and integrity of workmanship is not applicable. These modern materials have also affected the site's ability to convey a sense of its historical nature and integrity of feeling is not intact. Integrity of association is also not applicable at this site.

<u>Site No.:</u> 42SP1215
<u>Temp Number:</u> 21-08-HM-06
<u>Location</u> [redacted]
<u>Land Designation</u>: Private
<u>NRHP Eligibility: Eligible, Criterion D</u>

<u>Description:</u> Site 42SP1215 is a sparse lithic scatter of predominantly dull luster white chert, with several obsidian flakes and other chert materials. A dense locus measuring [redacted] was recorded on the eastern edge of the site with one gray-white mottled chert biface, which was likely a projectile point or knife blade tip. Elsewhere on the site a multi-directional core and a utilized flake were also documented. Flakes were mainly observed in areas with exposed soil, often within small rills where rain and snowmelt have sorted the sediments in shallow channels. In total, 51 pieces of lithic debitage were documented on site with reduction flakes dominating the assemblage. Rock outcrops on the site are mostly sedimentary or weakly metamorphosed mud and sand conglomerates.

<u>Eligibility:</u> Site 42SP1215 is a lithic scatter that exhibits spatial patterning and the potential for additional buried cultural materials and is therefore recommended eligible under Criterion D. The site does not possess association with events or persons of historical significance and so is not eligible under Criteria A and B. The site does not possess artistic or unique value and so is not eligible under Criterion C. The site retains the integrity elements of location, setting, and feeling as the site's elements are in situ and the setting is intact and the site conveys the feeling of the historical Indigenous use of the location. Because the site does not meet the standards for Criteria A through C, the site does not retain the integrity elements of design, materials, workmanship, or association.

<u>Site No.:</u> 42SP1216
<u>Temp Number:</u> 21-08-HM-07
<u>Location:</u> [redacted]
<u>Land Designation</u>: Private
<u>NRHP Eligibility: Eligible, Criterion D</u>

<u>Description:</u> Site 42SP1216 is a precontact temporary camp that consists of a possible thermal feature and 38 pieces of lithic debitage. The thermal feature measures [redacted] and includes discolored ashy soil with mineralized bone and wood. Most lithics were observed in a small, sandy rill that runs downslope from the thermal feature. Lithic materials include white and gray cherts and obsidian. Reduction flakes are most common in the sparse assemblage. No tools were observed that may indicate cultural or temporal affiliation.

<u>Eligibility:</u> Site 42SP1216 is low density precontact temporary that exhibits spatial patterning and the potential for additional buried cultural materials, especially within the thermal feature and is therefore recommended eligible under Criterion D. The site does not possess association with events or persons of historical significance and so is not eligible under Criteria A and B. The site does not possess artistic or unique value and so is not eligible under Criterion C. The site retains the integrity elements of location, setting, and feeling as the site's elements are in situ, the setting is intact, and the site conveys the feeling of the historical Indigenous use of the landscape. Because the site does not meet the standards for Criteria A through C, the site does not retain the integrity elements of design, materials, workmanship, or association.

Site No.: 42SP1217
Temp Number: 21-08-MR-09
Location: [redacted]
Land Designation: Private
NRHP Eligibility: Not Eligible

Description: Site 42SP1217 is a multi-component site that includes a sparse lithic scatter and a discrete mid-20th century artifact scatter. The lithic scatter consists of 37 pieces of lithic debitage manufactured from various colors of chert and a broken biface. Reduction flakes are most common throughout the assemblage. Within the scatter is a concentration (Feature 1) that includes 25 of the total 37 flakes. The feature measures 1 square meter. The precontact materials are located in and around a surficial erosional channel. No diagnostic features or artifacts were observed. The historic component consists of mechanical, automotive, and food related artifacts. Among the historic assemblage, artifacts include a gear and various tools, liquor bottles, beer cans, and food cans. The historic materials are primarily located around a juniper tree near a two-track dirt road. The assemblage appears to represent a single event where mechanical repair casually took place during the mid-20th century.

Eligibility: Site 42SP1217 is not associated with significant events or persons and is not eligible under Criteria A or B. It does not possess unique or artistic value and is not eligible under Criterion C. Due to the very small number of artifacts, the unlikelihood of significant subsurface deposits, and the overlap with the historic use of the site, it has little potential to provide information important to the history of the area and is not eligible under Criteria D. The site retains the integrity elements of location, setting, and feeling as the elements of both components are in situ, the setting is intact, and the landscape conveys the feeling of the Indigenous and historical use of the landscape. Because the site does not meet the standards for Criteria A through C, the site does not retain the integrity elements of design, materials, workmanship, or association.

Site No.: 42SP1218
Temp Number: 21-08-MR-06
Location [redacted]
Land Designation: Private
NRHP Eligibility: Eligible, Criterion D

Description: Site 42SP1218 is a multicomponent site. The first component is a Fremont affiliated temporary camp that consists of a concentration of Sevier gray ware pottery (Feature 1), and a sparse lithic scatter of different gradations of chert and siltstone. The feature likely represents a "pot drop" event as the dense concentration appears to be limited to a single vessel. In total, 54 pieces of lithic debitage were documented on the site. Secondary and tertiary reduction stages were most common on site. One tool, an edge modified flake was recorded approximately three meters west of the pottery concentration. The eastern part includes the second component, a limited historic artifact scatter. The historic scatter includes the remains of 13 cans, six glass vessels, and two ceramic items. The scatter includes machine made aqua, amber, and manganese solarized glass and so likely dates to the first decades of the 20th century. The site occurs [redacted] The precontact portion begins [redacted] The lithics and pottery concentration are visible in rockier, unvegetated areas, and in very shallow rills where snow melt and rainwater has washed and sorted sediments.

Eligibility: Site 42SP1218 is not associated with significant events or persons and is not eligible under Criteria A or B. The site does not possess unique or artistic value and so is not eligible under Criterion C. Despite the overall low artifact density at this site, artifact density in the concentration is high and there is some likelihood of substantial buried cultural deposits at the site. Further the site represented Fremont occupation at high altitude. Therefore, the site is recommended eligible for National Register inclusion under Criterion D because the site has the potential to add significant information to the understanding of history. Site 42SP1218 retains the integrity of location, setting, and feeling as the site is in situ, largely undisturbed, and conveys the sense of an intact precontact and historical landscape. Integrity of design, materials, workmanship, and association are not evident or applicable at this site.

Site No.: 42SP1219
Temp Number: 21-08-HM-08
Location: [redacted]
Land Designation: Private
NRHP Eligibility: Not Eligible

Description: Located on [redacted] this site is a very sparse and discrete Fremont affiliated artifact scatter of tertiary flakes and two potsherds. One of the potsherds is Ivy Creek black-on-white. The other fragment is Sevier grayware. Both pottery sherds have a black basalt and mica temper. In addition to the pottery, eight tertiary lithic flakes were identified. These flakes are most likely from 2-3 different nodules on the siltstone-to-chert continuum, with oolitic characteristics. Based on larger exterior flakes recorded in the same square-mile section, the same nodule of source material can be very cryptocrystalline on the interior and have a cortex and outer layer that is less lustrous and more like siltstone or is somewhere in-between with microfossils suspended in a matrix of chert and very fine-grain sedimentary stone.

Eligibility: Site 42SP1219 is not associated with significant events or persons and is not eligible under Criteria A or B. The site does not possess unique or artistic value and so is not eligible under Criterion C. The site is very limited and low density in an otherwise abundant lithic landscape with evidence of extensive precontact use and is therefore not recommended eligible under Criterion D. Site 42SP1219 retains the integrity of location, setting, and feeling as the site is in situ, largely undisturbed, and conveys the sense of the precontact use of the mountainous, forested landscape. Integrity of design, materials, workmanship, and association are not evident or applicable at this site.

Site No.: 42SP1220
Temp Number: 21-08-HM-09
Location: [redacted]
Land Designation: Private
NRHP Eligibility: Not Eligible

Description: Located [redacted] site 42SP1220 is a moderately sparse lithic scatter. The majority of flakes identified were of an off-white oolitic chert with different proportions of fossilization and calcium carbonate-to-silt matrices. Of the 50 flakes examined on this site, 48 are on the chert/oolitic/siltstone continuum and 2 are black obsidian. Only one secondary flake was identified, with almost all the other flakes being tertiary, bifacial thinning, and broken bifacial thinning flakes. No tools or features were observed on site.

Eligibility: Site 42SP1220 is recommended not eligible for inclusion in the NRHP. The site is not associated with known significant events or persons and is not eligible under Criteria A or B. It does not possess unique or artistic value and is not eligible under Criterion C. Due to the very small number of artifacts, the unlikelihood of significant subsurface deposits, and the lack of diagnostic elements, the site has little potential to provide information important to the history of the area and is not eligible under Criteria
D. Site 42SP1220 retains the integrity of location, setting, and feeling as the site is in situ, largely undisturbed, and conveys the sense of the precontact use of the mountainous, forested landscape. Integrity of design, materials, workmanship and association are not evident or applicable at this site.

Site No.: 42SP1221
Temp Number: 21-08-HR-07
Location: [redacted]
Land Designation: Private
NRHP Eligibility: Not Eligible

Description: This site is a wooden lean-to style animal shelter with two rooms divided by a wood plank interior wall. It resembles the type of shelter used for orphan calves but could have also served as a goat, sheep, or pig shelter. The layout is east/west on the long axis (10 feet), by 7.5 feet north/south. The north wall stands 2 ft 10 inches tall, and the south wall (with two entrances) stands 5 ft 5inches tall. Rectangular entrances framed into the south wall are slightly irregular, but average 2 ft 0.5 inches in width and 2 ft 9 inches in height. The original height of the entrances and walls may be partially obscured by soil, grass clumps, and the natural settling of the structure. No concrete foundation or footings appear to have been placed. The construction for this shelter utilizes an external stud frame on the four walls, with irregularly milled planks of varying widths nailed to the studs from the inside. The roof is internally framed and planked by the same one-inch thick, irregular planks (8.5 - 9.75 inch width), utilized in constructing the walls. No metal or shingles are present on the roof or in the vicinity. Exterior wall studs are thick-dimensioned 2x4s, irregularly spaced, and along the back wall, a juniper branch was utilized in place of one of the vertical dimensional supports. Also, a juniper fence post with a modern yellow plastic insulator stands against the back wall. The shelter stands [redacted]

An aerial photograph from 1939 shows several structures including a home in the vicinity of the site (UGS 1939). The structures are still present in a 1952 aerial photograph (UGS 1952), but only the footprint of a structure is visible by 1964 (Historic Aerials). The road near the site is first visible in imagery from 1983 (Historic Aerials). This land was sold to [redacted]. Based on the materials used to construct this animal shelter and its condition, it is likely related to the structures visible in aerial photographs between 1939 and 1964 rather than an earlier occupation but may also date to a later period of use.

Eligibility: Site 42SP1221 is not eligible for inclusion in the NRHP. The site is not related to known events or persons of significance and is not eligible under Criteria A or B. The site does not possess unique or artistic value, represent the work of a master, or a type or period of construction, and is not eligible under Criterion C. There is little likelihood that the site could contribute information important to history and is not eligible under Criterion D. The site lacks significant context and association and has likely been impacted by alterations and Maintenance to the structure. The integrity of location and setting are retained as there is no evidence of the structure being moved and the physical environment has likely not changed significantly since the time of construction. The integrity of materials and design are not retained due to the continued use and Maintenance and likely modifications made to the structure. The structure is a primitive, vernacular structure that does not possess distinct style or construction, and integrity of workmanship is not applicable. The site does not evoke the sense of any particular time period and cannot be linked to significant events or people, so the integrity of feeling is not intact and the integrity of association is not applicable.

Site No./Name: 42SP1222/Chester Pond No. 1
Temp Number: 21-08-HM-10
Location: [redacted]
Land Designation: Private
NRHP Eligibility: Eligible, Criterion A

Description: This site is one in a series of water impoundments utilizing the natural floodplain of the Oak Creek. An earthen dam bounds the impoundment on its west side, and a series of six turn-screw headgates control output on the southwest corner of the impoundment to a similarly sized impoundment downstream. The concrete and headgate waterworks of this impoundment seem to be recently installed or refurbished. In a similar upstream impoundment, the concrete retaining wall adjacent to a modern-looking headgate/spillway was inscribed "1957". This particular pond did not have much water in it during the survey, and a mangled old Dodge truck was observed in the water. On the south side of the impoundment a small inlet, spanned by a steel and plank bridge that serves as a modern pumping station for irrigation. This pumping station platform has missing and rotted planks and appears to have been salvaged from a bridge. Other large timbers, possibly from a bridge or other heavy-duty application are present as erosion control rip rap in a few spots at the edge of the cultivated field where it meets the reservoir on its southeast margin.

With the settlement of Sanpete County by Mormon emigrants beginning in the 1850s came an increased reliance on agriculture and livestock. Subsequently, massive irrigation developments were initiated to meet those growing demands in the late 19th century. Chester Ponds was part of this early effort, where water from Oak Creek was diverted and stored. *A History of Sanpete County* by Albert Antrei and Allen Roberts includes a photograph by L.P. Christensen of construction work on the Chester Ponds during the 1880s (1999:146). According to a July 29, 1953 Memo from the Utah State Engineer to Chester Reservoir and Ditch Co., this site is one of six reservoirs owned by the Chester Reservoir and Ditch Co.. Site 42SP1223 is known as "Chester No. 1" and was completed ca. 1865, with repairs approved in 1953 following damage from flooding (UDWR 1953; Salt Lake Telegram 1952). Documentation could not be located about the original design of the ponds. . In the oldest available aerial photograph, from 1939, the pond is visible, and its edges look slightly different than today, indicating possible changes to its structure.

Eligibility: Site 42SP1222 is recommended as eligible for inclusion in the NRHP under Criterion A. This impoundment and earthen dam of the Chester Ponds represent a significant contribution to the broad patterns of history in the development of water resources in the valley. The site does not have known association with significant historical persons and so does not meet the standards of Criterion B. The site does not possess unique or artistic value, represent the work of a master, or a type or period of construction, and is not eligible under Criterion C. There is little likelihood that the site could contribute information important to history and is not eligible under Criterion D. The development of water resources for irrigation was crucial to the local stability of the surrounding area and the development of a stable agricultural economy. The site retains integrity as an agricultural setting and its location has not changed. No records pertaining to the original construction and design, or of possible modifications exist, therefore the integrity of design is not present. It appears that the dam has remained earthen in construction and the integrity of materials is intact, and modern features of the dam do not have an effect on its ability to convey its historical function and significance. The dam does not possess unique style, design, or construction methods and the integrity of workmanship is not applicable. Integrity of feeling is intact as the site conveys a sense of the historic use of the landscape. Association is intact and linked directly with the historic development of the irrigation district which began at the turn of the century and continues to present.

Site No.: 42SP1223/ Chester Pond No. 2
Temp Number: 21-08-HM-11
Location: [redacted]
Land Designation: Private
NRHP Eligibility: Eligible, Criterion A

Description: This site is a segment of the Chester Ponds complex encompassing one earthen dam with a glass/ceramic historic scatter on its top and western slope, the seasonal wetland impoundment upstream to the willow-line at its bank full level, and the area below the dam, (its spillway, overflow pond, and riparian zone) downstream to the farm access road west of the dam. This site was recorded with three features; the earthen dam, the concrete spillway below the dam, and the headgate system with its retaining walls inset into the dam and opposite embankment. Additionally, the artifact scatter on the earthen dam represents a locus within the site. Because the Chester Ponds system has been maintained and improved for decades, elements of the concrete and retaining wall structures represent different ages and methods of construction. Additionally, the spillway and catchment boxes do not appear to have been constructed in a single year, but rather improved on and added to at different times in an effort to prevent high flows from damaging the southwest embankment where an access road leads up to a modern poultry and livestock complex. As with other sections of the Chester Ponds, this segment utilizes a combination of the naturally recessed floodplain of Canal Creek, along with manmade berms, to corral the runoff into retention areas. The artifact scatter on the dam includes six glass vessels including manganese solarized glass, cobalt blue glass, aqua glass, and milk glass; four ceramic vessels, including a Homer Laughlin vessel; scrap iron; and a hinged metal box.

With the settlement of Sanpete County by Mormon emigrants beginning in the 1850s came an increased reliance on agriculture and livestock. Subsequently, massive irrigation developments were initiated to meet those growing demands in the late 19th century. Chester Ponds was part of this early effort, where water from Oak Creek was diverted and stored. *A History of Sanpete County* by Albert Antrei and Allen Roberts includes a photograph by L.P. Christensen of construction work on the Chester Ponds during the 1880s (1999:146). According to a July 29, 1953 Memo from the Utah State Engineer to Chester Reservoir and Ditch Co., this site is one of six reservoirs owned by the Chester Reservoir and Ditch Co.. Site 42SP1223 is known as "Chester No. 2" and was completed ca. 1865, with repairs approved in 1953 following damage from flooding (UDWR 1953; Salt Lake Telegram 1952). Documentation could not be located about the original design of the ponds.. The oldest available aerial photograph from 1939 shows the dam and pond to be consistent with their present-day condition.

Eligibility: Site 42SP1223 is recommended as eligible for inclusion in the NRHP under Criterion A. This portion of the Chester Ponds and related features represents a significant contribution to the broad patterns of history in the development of water resources in the valley. The development of water resources for irrigation was crucial to the local stability of the surrounding area and the development of a stable agricultural economy. The site does not have known association with significant historical persons and so does not meet the standards of Criterion B. The site does not possess unique or artistic value, represent the work of a master, or a type or period of construction and is not eligible under Criterion
C. There is little likelihood that the site could contribute information important to history and is not eligible under Criterion D. The site retains integrity as an agricultural setting and its location has not changed. No records pertaining to the original construction and design, or of possible modifications exist, therefore the integrity of design is not present. It appears that the dam has remained earthen in

construction and integrity of materials is intact, and modern features of the dam do not have an effect on its ability to convey its historical function and significance. The dam does not possess unique style, design, or construction methods and integrity of workmanship is not applicable. Integrity of feeling is intact as the site conveys a sense of the historic use of the landscape. Association is intact and linked directly with historic development of the irrigation district which began at the turn of the century and continues to present.

Site No.: 42SP1224/ Chester Pond No. 3
Temp Number: 21-08-HM-04
Location: [redacted]
Land Designation: Private
NRHP Eligibility: Eligible, Criterion A

Description: This site includes the two easternmost impoundments of the Chester Ponds complex, the associated dams, and a historic artifact scatter. The historic scatter portion of the site is located [redacted] which defines the site's western boundary. Most materials within the site are fragmented (glass, ceramics, brick, concrete, and sanitary cans). The historic scatter portion of the site lacks context and may have been a dump spot, or possibly the remains of an old home or seasonal campsite that were redeposited through road or wetland earth moving activities. Some of the materials appear to have been exposed to fire. A modern sheepherder wagon was positioned across the road at the time of recording. Many items are partially to mostly buried.

The basins of the two ponds (Features 1 and 2) were excavated below the surrounding ground surface to a shallow depth (no greater than 20 feet) and the displaced soil was built up around the periphery of the ponds and used to construct the earthen dams (Features 3-5) that separate the two impoundments. The easternmost impoundment (Feature 1) measures 630 meters east-west by 230 meters north-south. The westernmost impoundment (Feature 2) measures 660 meters east-west by 200 north-south. The ponds are irregularly shaped, filled with non-native species throughout the basin, and follow along the natural corridor of Oak Creek.

With the settlement of Sanpete County by Mormon emigrants beginning in the 1850s came an increased reliance on agriculture and livestock. Subsequently, massive irrigation developments were initiated to meet those growing demands in the late 19th century. Chester Ponds was part of this early effort, where water from Oak Creek was diverted and stored. *A History of Sanpete County* by Albert Antrei and Allen Roberts includes a photograph by L.P. Christensen of construction work on the Chester Ponds during the 1880s (1999:146). According to a July 29, 1953 Memo from the Utah State Engineer to Chester Reservoir and Ditch Co., this site is one of six reservoirs owned by the Chester Reservoir and Ditch Co.. Site 42SP1223 is known as "Chester No. 3" and was completed ca. 1865, with repairs approved in 1953 following damage from flooding (UDWR 1953; Salt Lake Telegram 1952). Documentation could not be located about the original design of the ponds. The oldest available aerial photograph from 1939 shows the dam and pond to be nearly identical to its present-day condition.

Eligibility: Site 42SP1224 is recommended as eligible for inclusion in the NRHP under Criterion A. This portion of the Chester Ponds and related features represents a significant contribution to the broad patterns of history in the development of water resources in the valley. The development of water resources for irrigation was crucial to the local stability of the surrounding area and the development of a stable agricultural economy. The site does not have known association with significant historical persons and so does not meet the standards of Criterion B. The site does not possess unique or artistic value, represent the work of a master, or a type or period of construction and is not eligible under Criterion C. There is little likelihood that the site could contribute information important to history and is not eligible under Criterion D. The site retains integrity as an agricultural setting and its location has not changed. No records pertaining to the original construction and design, or of possible modifications exist, therefore the integrity of design is not present. It appears that the dam has remained earthen in construction and integrity of materials is intact, and modern features of the dam do not have an effect on its ability to convey its historical function and significance. The dam does not possess unique style, design, or construction methods and integrity of workmanship is not applicable. Integrity of feeling is intact as the site conveys a sense of the historic use of the landscape. Association is intact and linked directly with historic development of the irrigation district which began at the turn of the century and continues to present.

Site No.: 42SP1225
Temp Number: 21-08-MR-01
Location: [redacted]
Land Designation: Private
NRHP Eligibility: Not Eligible

Description: Site 42SP1225 is a very limited lithic scatter that likely represents a single flint knapping event by a limited number of individuals. The lithic scatter includes 49 pieces of debitage produced from oolitic chert (dominant material type), semi-transparent white quartzite, and opaque white chert. Secondary and tertiary reduction stages are most common. No tools or features were documented on site. The vast majority of artifacts occur within a surficial erosional channel. It is located in surficial erosional channels. There is evidence of wood cutting within the site as well as hunting, camping, and development activities in the surrounding area. No cultural or temporal diagnostic elements were documented on site.

Eligibility: Site 42SP1225 is recommended not eligible for inclusion in the NRHP. The site is not associated with known significant events or persons and is not eligible under Criteria A or B. It does not possess unique or artistic value and is not eligible under Criterion C. Due to the limited nature of the deposit, including the modest number of artifacts, the lack of diversity of the material types, the lack of tools, and the lack of spatial patterning, and the unlikelihood of significant subsurface deposits; the site has little potential to provide information important to the history of the area and is not eligible under Criteria D. Site 42SP1225 retains integrity of location, setting, and feeling as the site is in situ, largely undisturbed, and conveys the sense of the precontact use of the mountainous, forested landscape. Integrity of design, materials, workmanship, and association are not evident or applicable at this site.

Site No.: 42SP1226
Temp Number: 21-08-MR-02
Location: [redacted]
Land Designation: Private
NRHP Eligibility: Eligible, Criterion D

Description: This site is a large multi-component site that includes a precontact temporary camp with a possible Fremont affiliation and a possible Archaic temporal affiliation, and a limited historic component comprised of mid-century soda bottles and three wooden features. The precontact component consists of a substantial debitage scatter, including numerous tools, a Sevier grayware sherd, and an artifact concentration feature (Feature 4). The site [redacted] A representative number of tools were recorded within the site area, several of which were located [redacted] The recorded tools include a possible Elko or Rosegate projectile point, five cores or tested cobbles, four bifaces, two utilized flakes, and a chopper tool. Lithics were documented in two areas on site, including in Feature 4. In total, 165 pieces of lithic debitage were documented. Oolitic chert and white and gray siltstone were the most common material types and secondary and tertiary flakes were most common on site. The location and variety of these artifacts suggest that this landscape was used as a lithic production site, likely in several episodes. The scatter becomes more diffuse as one travels further upslope, and the increased density of scrub oak significantly limits ground visibility in some areas.

The historic component includes three historic features and two glass soda bottles. Two of the features were posts leaning across juniper trees, which could be the remains of Indigenous wickiups however, no artifacts were directly associated with the features. They could also be associated with agricultural and historic uses of the area, especially considering the proximity and similarity of Feature Three. Feature Three is the remnants of fence posts, likely related to cattle ranching in the area.

Eligibility: Site 42SP1226 is a large lithic scatter spread across the slope of a foothill with lithic tools and flakes densely concentrated in several drainages along the slope and less densely scattered across flat clearings between the drainages. This site is recommended as eligible as the site demonstrates a diversity of materials the potential for buried cultural remains, good spatial pattering, and a possible depth of temporal use of the site. Therefore, the site is recommended eligible under Criterion D. The site does not possess association with persons or events of historical significance and so is not eligible under Criteria A or B. The site does not possess artistic or unique value and so is not eligible under Criterion C. The site retains the integrity of location and setting, as the artifacts and features are located within their original area of deposition, and the size and diversity of the debitage displays that the site was repeatedly used as a lithic manufacturing camp and because the site appears undisturbed. The site also retains the integrity of feeling as the hillside location of the lithic scatter and possible wickiups provides insight into how the landscape was utilized. Integrity of design, materials, workmanship, and association are not evident or applicable at this site.

Site No.: 42SP1227
Temp Number: 21-08-JG-01
Location: [redacted]
Land Designation: Private
NRHP Eligibility: Eligible, Criterion D

Description: Site 42SP1227 is a sparse lithic scatter spread over a large area. In total, 72 pieces of lithic debitage were documented. Mottled semi-transparent gray chert and oolitic chert were the most common material types although obsidian and other colors of chert were also identified. Secondary and tertiary reduction stages were most commonly represented in the assemblage. Four tools, two broken bifaces, a chopper, and a hammerstone were also recorded on site. No pottery, diagnostic tools, or features were identified.

Eligibility: The site possesses a high likelihood of intact subsurface deposits and is therefore recommended as eligible for listing on the National Register under Criterion D due to its potential to add significant information to the understanding of history. Site 42SP1227 is not associated with significant events or persons and is not eligible under Criteria A or B. It does not possess unique or artistic value and is not eligible under Criterion C. The site retains the integrity of location, setting, and feeling as the site is in situ, undisturbed, and conveys the sense of the precontact landscape in which it was deposited. Site components provide no evidence of design, materials, or workmanship, and these elements of integrity are not applicable. Integrity of association is also not applicable as the site cannot be tied to significant events or persons.

Site No.: 42SP1228
Temp Number: 21-08-MR-05

Location: [redacted]

Land Designation: Private

NRHP Eligibility: Eligible, Criterion D

Description: Site 42SP1228 is a large multi-component site that includes a sparse precontact temporary camp and a historic artifact scatter. The precontact component includes 164 pieces of lithic debitage and two tools. Lithic artifacts were manufactured from various types of chert, siltstone, obsidian, and quartzite. Secondary and tertiary flakes were most common. No diagnostic tools or features were observed on site. Historic artifacts are also present on the site. These include 20 cans including hole-in-top cans, coffee cans, and tobacco tins; and two automatic manufacture glass vessels. Two rock alignments were also noted. The function of the alignments is not clear. The historical materials suggest a mid-20th century use of the site, possibly for camping or similar pursuit. A two-track dirt road runs through the site.

Eligibility: The precontact component of the site is in good condition with a high likelihood of intact subsurface deposits and is therefore recommended as eligible for listing on the National Register under Criterion D due to its potential to add significant information to the understanding of history. The components of the site are not associated with significant events or persons and are not eligible under Criteria A or B. The site does not possess unique or artistic value and is not eligible under Criterion C. The historic component is limited and a ubiquitous site type and will not contribute significant information important in understanding history. Both components of the site retain the integrity of location, setting, materials, and feeling as the site is in situ and conveys the sense of a precontact landscape. Integrity of association is also not applicable as the site cannot be tied to significant events or persons.

Site No.: 42SP1229
Temp Number: 21-08-HR-10
Location: [redacted]
Land Designation: Private
NRHP Eligibility: Not Eligible

Description: The site consists of a standing wood and metal animal shelter, several adjacent animal enclosures, and a cattle squeeze chute totaling six features. The animal shelter may still be used to house livestock, but the remaining features are in poor condition and are collapsing and deteriorating. The site is located [redacted]. There is no parcel information about this land on county online resources, so the current landowner is unknown. Artifacts on site are limited to an aerosol can, a washing machine drum, two car tires, a DUAL backhoe or tracker attachment, and various agricultural and building materials. No artifacts or features concretely indicate the age of the complex. The site is [redacted]. A concrete diversion structure [redacted] is inscribed with a 1915 date.

The site is located on land that was purchased in [redacted] In the earliest available aerial photograph, dating to 1939, several structures are visible within the same footprint as the site (UGS 1939). In an aerial photograph from 1952, the configuration of structures within the site appears to have shifted (UGS 1952). It is likely that the structures in this site were modified, Maintained, and replaced as needed, with old materials used to create new features. Further evidence of this is in recent imagery. Satellite imagery shows that the fence extending from the animal shelter (Feature 1) to create Feature 2, an enclosure, was erected between 2013 and 2015, likely out of reused material.

Eligibility: Site 42SP1229 is recommended as not eligible for inclusion in the NRHP. The site is not associated with significant persons or events and is not eligible under Criteria A or B. This agricultural, livestock-associated assemblage of features does not embody distinctive characteristics representative of type or period and does not embody unique or artistic values. Therefore, the site is not eligible under Criterion C. It is unlikely that further analysis of the site would yield important knowledge of history or land use in the area and is consequently not eligible under Criterion D. The site may not retain integrity of location, as there is some evidence of structures having moved. This has also affected integrity of design, as site components and their relationships to one another have changed over time. It does retain integrity of setting as a livestock enclosure area within a rural, agricultural community. The Maintenance and modifications of structures, and the use of modern materials has impacted integrity of materials. All structures on the site are primitive, vernacular constructions, and workmanship is not applicable. The mix of modern and historic materials has impacted the site's ability to convey a sense of its historic nature. Because the site is not associated with important events or persons, and the lack of context regarding its date of construction, integrity of association is not applicable.

Site No.: 42SP1230 (ML-5728)
Temp Number: 21-08-JG-02
Location: [redacted]
Land Designation: U.S. Forest Service
NRHP Eligibility: Not Eligible

Description: Site 42SP1230 consists of two carved aspen trees located [redacted] The two trees are approximately 9 inches in diameter and immediately adjacent to one another. Some of the carvings are likely historic, though difficult to read, and various modern carvings are also present. A possible date of 1968 is visible on one tree.

Eligibility: These arborglyphs are not associated with persons or events of significance and are not eligible under Criteria A or B. The arborglyphs are comprised of initials and dates and do not possess unique or artistic value and so the site is not eligible under Criterion C. There is little likelihood of the site yielding valuable knowledge about history, and is not eligible under Criterion D. The site retains the integrity of location and setting as the site is in situ and the character of the setting of the site remains historically the same. The integrity of feeling is compromised because the site does not convey a sense of the historical landscape, especially considering the more modern graffiti on the trees and the use of the access route as a hiking trail. Because the site fails to meet Criteria A-D, the integrity of design, materials, workmanship, and association do not apply to the site.

Site No./Name: 42SP1231/Big Ditch

Temp Number: 21-08-HR-08

Location: [redacted]

Land Designation: Private
NRHP Eligibility: Eligible, Criterion D

Description: Site 42SP1231 consists of an agricultural water ditch known as Big Ditch by Spring City locals. Former Spring City Mayor Craig Paulson referred to it by that name, and it is also named in the 2017 Spring City Management Plan and the 2022 Spring City Nomination (unevaluated PR ID 222759). The ditch is not named on any available maps, nor does it appear in a search of the Utah Division of Water Rights index. It is, however, visible on the earliest available aerial photographs of the area (UGS 1939). The ditch is actively used and impacted by ongoing Maintenance as well as dense vegetation growth and cattle grazing along the edges. The irrigation ditch runs [redacted] An inscription on a concrete feature of the ditch dates it to at least 1915. Big Ditch had running water in it at the time or recordation and appears to still be in use. Many nearby irrigation resources are owned by Horseshoe Irrigation Company, and they may also own this ditch.

Eligibility: The ditch is part of an intricate irrigation system created in Sanpete County. The history behind water development in this area is directly connected to early Mormon settlement in the region. Big Ditch was among several early irrigation ditches in Spring City that were integral to the success of the area as an agricultural and ranching economy. Big Ditch is listed as a contributing structure in the Spring City National Historic District and is explicitly called out as an example of the district's eligibility under Criterion A. Beyond the listing, the site has no known association with historically significant persons does not possess unique or artistic value or represent the work of a master and will not add significant information important to history and so does not meet Criteria B through D. There is no evidence that the ditch has significantly changed its footprint, and the ditch's design reflects its historic function and aesthetics—therefore, integrity of location and design are intact. The setting of the ditch has remained largely unchanged, as a feature in a rural agricultural community through a National Historic District. Materials are also likely intact, as the ditch has remained earthen. Other changes to the ditch, such as regular maintenance and updates to ditch features, have not impacted the site's ability to convey its significance. The ditch does not represent a unique or particularly skilled example of construction or labor, and integrity of workmanship is not applicable. The ditch is able to convey both a sense of its historical nature as well as its association with an important event, and integrity of feeling and association are intact.

Site No.: 42SP1232
Temp Number: 21-08-HM-12
Location: [redacted]
Land Designation: Private
NRHP Eligibility: Not Eligible

Description: Site 42SP1232 consists of a deteriorated sidewalk located [redacted] The recorded segment spans approximately three city blocks. The sidewalk is oriented [redacted] The sidewalk has deteriorated in places. One portion is almost completely eroded away, or the grass had completely covered the portion. There was weed growth in most of the segments, especially in the segments containing larger cracks or missing portions. According to a local history of Spring City, an effort to replace wooden boardwalks with concrete sidewalks began in 1913 on Main Street, and "perhaps in other areas" (Watson 1984: 69). Segments of sidewalk are visible on the earliest available photographs of the city, in 1939 (UGS 1939).

Eligibility: This stretch of concrete sidewalk is in poor condition. When exactly it was constructed and what changes, repairs, or replacements have taken place since its construction are unclear. The historical development of Spring City's sidewalks does not constitute a significant historic event and so the site is not eligible under Criterion A. The sidewalk does not possess association with persons of historical significance and so is not eligible under Criterion B. The site does not possess artistic or unique value and so the site is not eligible under Criterion C. The site will not add significant information to the understanding of history and so is not eligible under Criterion D. The site is recommended not eligible for NRHP inclusion. Qualities of integrity of location, setting, and feeling are conveyed through the in-situ value of the sidewalk segment and the relatively unaltered historical nature of the setting of the site. The sidewalk segment invokes the feeling of the historic Spring City landscape. Because the site does not meet the standards of Criteria A through D, integrity elements of design, materials, workmanship, or association cannot apply to the site.

Site No.: 42SP1233
Temp Number: 21-08-HR-11
Location: [redacted]
Land Designation: Private
NRHP Eligibility: Not Eligible

Description: Site 42SP1233 is a concrete sidewalk that runs [redacted] The sidewalk spans three blocks [redacted] Portions across all three blocks are discontinuous and significantly degraded and interrupted by grasses, tree roots, and other undetermined agents of time and neighborhood activity. The sidewalk was poured in segments, as such that structural gaps between slabs contribute to the impermanent tendency of the concrete. According to a local history of Spring City, an effort to replace wooden boardwalks with concrete sidewalks began in 1913 on Main Street, and "perhaps in other areas" (Watson 1984: 69). Segments of sidewalk are visible on the earliest available photographs of the city, in 1939 (UGS 1939).

Eligibility: This stretch of concrete sidewalk is in poor condition. When exactly it was constructed and what changes, repairs, or replacements have taken place since its construction are unclear. The historical development of Spring City's sidewalks does not constitute a significant historic event and so the site is not eligible under Criterion A. The sidewalk does not possess association with persons of historical significance and so is not eligible under Criterion B. The site does not possess artistic or unique value and so the site is not eligible under Criterion C. The site will not add significant information to the understanding of history and so is not eligible under Criterion D. The site is recommended not eligible for NRHP inclusion. Qualities of integrity of location, setting, and feeling are conveyed through the in-situ value of the sidewalk segment and the relatively unaltered historical nature of the setting of the site. The sidewalk segment invokes the feeling of the historic Spring City landscape. Because the site does not meet the standards of Criteria A through D, integrity elements of design, materials, workmanship, or association cannot apply to the site.

Site No.: 42SP1234
Temp Number: 21-08-HR-16
Location: [redacted]
Land Designation: Private
NRHP Eligibility: Not Eligible

Description: Site 42SP1234 consists of a concrete sidewalk that runs [redacted] Parts of the sidewalk are nearly or completely eroded away with plant growth destroying other parts of the sidewalk. For approximately one block, the sidewalk runs [redacted] This is also where the worst of the plant growth and erosion is. According to a local history of Spring City, an effort to replace wooden boardwalks with concrete sidewalks began in 1913 on Main Street, and "perhaps in other areas" (Watson 1984: 69). Segments of sidewalk are visible on the earliest available photographs of the city, in 1939 (UGS 1939).

Eligibility: This stretch of concrete sidewalk is in poor condition. When exactly it was constructed and what changes, repairs, or replacements have taken place since its construction are unclear. The historical development of Spring City's sidewalks does not constitute a significant historic event and so the site is not eligible under Criterion A. The sidewalk does not possess association with persons of historical significance and so is not eligible under Criterion B. The site does not possess artistic or unique value and so the site is not eligible under Criterion C. The site will not add significant information to the understanding of history and so is not eligible under Criterion D. The site is recommended not eligible for NRHP inclusion. Qualities of integrity of location, setting, and feeling are conveyed through the in-situ value of the sidewalk segment and the relatively unaltered historical nature of the setting of the site. The sidewalk segment invokes the feeling of the historic Spring City landscape. Because the site does not meet the standards of Criteria A through D, integrity elements of design, materials, workmanship, or association cannot apply to the site.

Site No.: 42SP1235
Temp Number: 21-08-HR-18
Location: [redacted]
Land Designation: Private
NRHP Eligibility: Not Eligible

Description: Site 42SP1235 is a concrete sidewalk that runs [redacted] According to a local history of Spring City, an effort to replace wooden boardwalks with concrete sidewalks began in 1913 on Main Street, and "perhaps in other areas" (Watson 1984: 69). Segments of sidewalk are visible on the earliest available photographs of the city, in 1939 (UGS 1939).

Eligibility: This stretch of concrete sidewalk is in relatively good condition. When exactly it was constructed and what changes, repairs, or replacements have taken place since its construction are unclear. The historical development of Spring City's sidewalks does not constitute a significant historic event and so the site is not eligible under Criterion A. The sidewalk does not possess association with persons of historical significance and so is not eligible under Criterion B. The site does not possess artistic or unique value and so the site is not eligible under Criterion C. The site will not add significant information to the understanding of history and so is not eligible under Criterion D. The site is recommended not eligible for NRHP inclusion. Qualities of integrity of location, setting, and feeling are conveyed through the in-situ value of the sidewalk segment and the relatively unaltered historical nature of the setting of the site. The sidewalk segment invokes the feeling of the historic Spring City landscape. Because the site does not meet the standards of Criteria A through D, integrity elements of design, materials, workmanship, or association cannot apply to the site.

Site No.: 42SP1236
Temp Number: 21-08-HR-19
Location: [redacted]
Land Designation: Private
NRHP Eligibility: Not Eligible

Description: Site 42SP1236 is a concrete sidewalk that runs [redacted] The color, construction, and aggregate in the concrete is consistent with other sidewalks in town suggesting that it is contemporaneous with the other town sidewalks in Spring City. Portions across all four blocks are noncontiguous and significantly degraded and interrupted by protruding grasses. The sidewalk was poured in segments. According to a local history of Spring City, an effort to replace wooden boardwalks with concrete sidewalks began in 1913 on Main Street, and "perhaps in other areas" (Watson 1984: 69). Segments of sidewalk are visible on the earliest available photographs of the city, in 1939 (UGS 1939).

Eligibility: This stretch of concrete sidewalk is in relatively good condition. When exactly it was constructed and what changes, repairs, or replacements have taken place since its construction are unclear. The historical development of Spring City's sidewalks does not constitute a significant historic event and so the site is not eligible under Criterion A. The sidewalk does not possess association with persons of historical significance and so is not eligible under Criterion B. The site does not possess artistic or unique value and so the site is not eligible under Criterion C. The site will not add significant information to the understanding of history and so is not eligible under Criterion D. The site is recommended not eligible for NRHP inclusion. Qualities of integrity of location, setting, and feeling are conveyed through the in-situ value of the sidewalk segment and the relatively unaltered historical nature of the setting of the site. The sidewalk segment invokes the feeling of the historic Spring City landscape. Because the site does not meet the standards of Criteria A through D, integrity elements of design, materials, workmanship, or association cannot apply to the site.

Site No.: 42SP1237
Temp Number: 21-08-HR-19
Location: [redacted]
Land Designation: Private
NRHP Eligibility: Eligible, Criterion A.

Description: Site 42SP1237 is the historic Spring City Power Plan Road. The road traverses generally [redacted] which was constructed in the 1930s. The road presently terminates at a private drive but historically would have terminated at a power station associated with the Penstock Aqueduct. That power station is still operational. The Penstock Aqueduct was initially constructed in 1901 and the most recent power station (along this road) was likely constructed in the 1930s when the road was also built to access the power station. The road is a graveled road that is still in use today, both by residents of the area and technicians for Spring City Power. The road is in good condition and appears to have been graded and repaired fairly recently.

Eligibility: The road is associated with the Penstock Aqueduct, a National Register of Historic Places eligible site. The road is important to the development and Maintenance of a historically significant electrical system and is therefore recommended eligible under Criterion A due to its association with the settlement of Spring City and the arrival of electricity to Sanpete County. The road is not associated with historically significant persons, does not possess unique or artistic value or represent the work of a master, and will not add significant information important to history and so does not meet the standards of Criteria B through D. The site meets the integrity of location, design, and association because the road does not appear to have substantially changed since its development and the association with the Penstock Aqueduct power station is clear. Setting and feeling are compromised because more private residences and modest modern infrastructure have been developed along the road. The road does not possess the criteria of workmanship and materials because the elements of the road does not possess extraordinary craftsmanship and because the road has undergone routine updates.

Isolated Finds

IF-21-08-HR01

Location[redacted]

Land Designation: Private

Description: Isolate 21-08-HR1 consists of a small artifact concentration that consists of a core and three pieces of lithic debitage. This isolated find may be a single knapping occurrence or single reduction locus. The assemblage consists of one core of banded white-grey siltstone that measures 5.9 by 4.9 by 4.0 cm, a primary banded grey-white siltstone flake, and two mottled light grey pieces of chert shatter. The Isolate occurs [redacted]

[redacted]

IF-21-08-HR1 overview facing 360 degrees

IF-21-08-HR02

Location: [redacted]

Land Designation: Private

Description: The isolated find consists of a broken early to mid-stage biface with an irregular shape. It is randomly flaked, made of semi-translucent dark-grey chert and measures 5.6 by 3.7 by 1.3 cm. Plant life in the adjacent area consists of Pinyon, Juniper, Gamble oak, and sagebrush. The soil in the area of the isolate is a light reddish-brown loam with a light sedimentary gravel matrix.

[redacted]

Close up of IF-21-08-HR2.

IF-21-08-HR03

Location: [redacted]

Land Designation: Private

Description: Isolated find 21-08-HR3, is a small wooden structure. The structure's dimensions are 8 feet 9 inches east-west by 9 feet 5 inches north-south by 6 feet 2 inches tall. The west wall has collapsed outward, and the east wall has also collapsed. There is no evidence of a roof. The entryway appears to be in the northwest corner on the north wall. The construction consists of three upright posts (including a live tree) on the south wall and three on the north wall (including 2 live trees). Rough milled end-cut boards are horizontally nailed with wire nails on the exterior. Other materials noted in the immediate area include a metal zipper, broken plastic, a Leviton brand porcelain lightbulb socket, a metal hinge, and an aluminum Milwaukee's Best beer can. None of the elements of the structure or the associated artifacts indicate antiquity, therefore the structure was recorded as an isolated find rather than a site. The structure is located [redacted]

[redacted]

IF-21-08-HR3 overview.

IF-21-08-HR04

Location: [redacted]

Land Designation: Private

Description: The isolate consists of a corner-notched projectile point (likely an Elko) with a diagonal medial fracture and a missing tip. The point appears to be randomly-flaked. It is made of opaque mottled-red chert. It is 2.6 cm long (incomplete length) by 1.9 by 0.5cm. Flora in the area consists of Galleta grass, snakeweed, and juniper. The soil is light brown silty sand with small gravels on a south-facing slope. Elko corner-notched projectile points date to the Archaic period.

[redacted]

IF-2-08-HR4 close-up

IF-21-08-HR05

Location: [redacted]

Land Designation: Private

Description: This isolated find consists of one utilized flake (likely a primary), one white oolitic flake, and a grey oolitic piece of shatter. One margin of the utilized flake is flaked along one lateral margin of the ventral face. The opposite lateral margin is flaked on the dorsal face. This tool is made from an opaque grey-mottled chert and measures 6.1 by 4.6 by 1.0 cm. The artifacts are clustered in an area that measures 9 meters north-south by 5 meters east-west. There is a stone campfire ring in the vicinity of the isolate. There is also a brass cadastral cemented to a sandstone boulder measuring 9.5cm in diameter with moss and lichen growth around the base of the concrete. The datum reads, "Utah State Engineer
B.M. Do not disturb. Elevation above Sea Level." Then secondarily stamped, [redacted] with a little triangle with a cross in it, "Feet Datum REF PT." The area is located [redacted]

[redacted]

Close-up of Utah Eng. Datum at IF-2-08-HR5.

IF-21-08-HR06

Location: [redacted]

Land Designation: Private

Description: The isolate is limited to four lithic artifacts including a semi-translucent gray-brown chert utilized flake. The tool appears to be possibly heat-treated and is a broken flake with one bifacially flaked, utilized margin. The tool measures 3.6 by 2.5 by 1.1 cm. The isolate also includes three semi-translucent gray-brown chert tertiary flakes. The limited scatter is located [redacted] The artifacts are cut through by a small, entrenched drainage. Vegetation includes juniper and sagebrush. The Isolate dimensions are 7 meters east -west by 4 meters north-south.

[redacted]

IF-21-08-HR6 close-up.

IF 21-08-JG1

Location: [redacted]

<u>Land Designation</u>: Private

Description: This isolate is a small historic scatter consisting of can, glass, and ceramic artifacts. The can is a large hole-in-cap food container that has been crushed with a nail hole near the top. It measures $2\ ^{15}/_{16}$ inches by $4\ ^{6}/_{16}$ inches and has a knife slit opening. The glass artifacts consist of a manganese solarized glass sherd from an unknown vessel and three aqua glass plate fragments. The manufacture of the glass artifacts is unknown. The ceramic artifacts consist of one ironstone rim sherd with white paste, which is likely from a cup and one earthenware body sherd with a clear glaze. The isolate is located [redacted] The soil of the area is a brown colluvial sandy loam and there is evidence that the area is likely affected by fire.

[redacted]

IF-21-08-JG1 overview.

IF-21-08-JG02

Location: [redacted]

Land Designation: Private

Description: This isolate consists of a collector's pile of flakes and is located [redacted] The collector's pile contains 39 flakes in a 40 x 40 cm area and includes siltstone and a variety of chert materials. A juniper tree located several meters from the pile also includes some items in its branches that may have been placed there by the same collector. These items are two deer skulls, an elk tooth, three long ungulate bones, and an obsidian primary flake. At the base of the tree is a modern flintknapping event likely made from television glass. Ground visibility is good (greater than 70%). The materials are not located on a precontact site, however more than one site is present in the immediate area.

Material	**Primary**	**Secondary**	**Tertiary**	**Shatter**	**Broken**	**Total**
Siltstone	1	2	1	0	0	4
Opaque white chert	1	1	2	0	0	4
Oolitic chert	0	1	8	3	2	14
Gray chert	0	0	0	1	0	1
Semi-transparent gray chert	0	0	3	1	0	4
Semi-transparent white chert	0	0	1	0	0	1
Unidentified, partially buried	0	0	0	0	0	11
						39

[redacted]

Isolate-21-08-JG02 close up.

IF21-08-JG03

Location: [redacted]

Land Designation: Private

Description: This isolate consists of four flakes within a 10 x 10 cm area located [redacted] Surrounding vegetation includes juniper, pinyon, sagebrush, and scrub oak, and soils are brown ashy loam. The isolate includes one tertiary siltstone flake, one tertiary oolitic chert flake, one broken semi-transparent gray chert flake, and one secondary semi-transparent gray chert flake. Ground visibility is moderate, approximately 50%, and the isolate appears undisturbed with no active impacts.

[redacted]

Isolate IF21-08-JG 03 overview facing 290 degrees.

IF21-08-JN01

Location: [redacted]

Land Designation: Private

Description: Isolate IFJN-01 consists of five broken flakes of white oolitic chert, one tertiary white chert flake, and one hole-in-top can that measures 4 ${}^{6}/_{16}$" tall by 2 ${}^{15}/_{16}$" in diameter. These artifacts were scattered over a radius of ~20 meters at [redacted] Vegetation is dominated by gamble oak and juniper. Soils are brown ashy loam and ground visibility is approximately 80%.

[redacted]

Isolate IF21-08-JN1 Overview

IF21-08-JN02

Location: [redacted]

Land Designation: Private

Description: Isolate IFJN-02 is limited to a small tin ointment canister with a rusted-on external friction lid. The tin measures ¾" diameter ½" tall. This isolate is located [redacted] Soils are brown ashy loam and ground visibility is approximately 80%. The age of the artifact is unknown by may be related to the historic hole-in-top can at IF-21-08-JN1, located [redacted]

[redacted]

IF21-08-JN02 Overview facing west.

IF 21-08-MR3

Location: [redacted]

Land Designation: Private

Description: This isolate is a single mid-stage opaque grey chert broken biface. The tool measures 3.4 by 2.5 by 0.8 centimeters. The shape of the biface is amorphous with more than one broken margin. The isolate is located [redacted] The sediments are a colluvial silt loam with gravel inclusions.

[redacted]

Close up of IF 21-08-MR3.

IF 21-08-MR8

Land Designation: Private

Location: [redacted]

Description: This isolate consists of two historic juniper posts bound together with bailing wire. The posts leans southwest and the taller of the two measures 7 feet 1 inch tall. The function of the posts is unknown but may be related to cowboying or ranching pursuits. It is located [redacted] The sediments are brown colluvial silt loam with gravel and cobble inclusions.

[redacted]

Figure 1: IF 21-08-MR8 Overview facing west.

IF 21-08-MR9

Location: [redacted]

Land Designation: Private

Description: This isolate consists of three primary tan sandstone flakes. The largest of the flakes was approximately five meters directly north of the other two flakes. That flake measures 5.8 by 4.2 by 1.3 centimeters. The other two flakes measure 4.2 by 2.1 by 0.6 centimeters and 4.5 by 2.9 by 0.9 centimeters. The isolate is located [redacted]

[redacted]

Figure 2: IF 21-08-MR9 Close-up in planview.

Management Recommendations

The cultural inventory for the Spring City Watershed Plan and Environmental Assessment in Sanpete County, Utah resulted in the update and recordation of 36 sites and site segments. These include the update of four previously recorded sites (42SP437, 42SP615, 42SP621, and 42SP1105) and the recordation of 32 new sites (42SP1206-42SP1237). In total, 14 sites are recommended eligible and 22 are recommended not eligible. The eligible sites include three precontact temporary camps (42SP1215, 42SP1216, and 42SP1227), three multi-component temporary camps (42SP1218, 42SP1226, and 42SP1228), three historic ponds (42SP1222-1224), two historic irrigation ditches (42SP437 and 42SP1231), one historic road (42SP1237), and two sites are related to irrigation and historic electricity (42SP1105 and 42SP1206). The project also crosses recently recorded eligible site 42SP1098, a historic road. Of the 14 recommended eligible sites recorded for the project and previously recorded eligible site 45SP1098, 12 sites cannot be avoided by the undertaking. Table 7 summarizes the sites that cannot be avoided, project impacts, and recommendations of effect.

In addition to the known and recorded archaeological sites, the project area also traverses through the SCNRHD. Within the Visual APE, which is established as 1/8 mile buffer around Big Ditch (42SP1231, PR No. 222759), there are 149 built environment structures and buildings within the SCNRHD.. Of these, 101 are listed as contributing to the significance of the SCNRHD. The project proposed to convert Big Ditch from open ditch to pipe. This will result in the eventual death of mature, historic trees that exist along portions of the ditch's riparian corridor. The death of these trees would affect the integrity of feeling associated with the areas of significance of agriculture and community planning under Criterion A.. The 2022 nomination document discusses the previous removal of street-side irrigation ditches in Spring City as a prior and unassessed impact to the feeling provided by the riparian plant life (Broschinsky 2022). Table 7 lists the specific historic buildings whose integrity of feeling would be affected as a result of the loss of the riparian corridor.

The secondary water meters In Spring City will be installed with a vacuum hose followed by restorative landscaping, and are not expected to cause an adverse effect to the SCNRHD. The new meters will be installed in-ground adjacent to existing primary water meters. The reconnaissance survey noted that the district presently includes modern infrastructure like buried utility lines and signage, street lights, fire hydrants, power lines, road signs, and some water meter boxes; none of these elements have been identified as elements thaadversely affect the integrity of the district or particular historic properties. The proposed meters will have a negligible visual impact and should not affect the integrity of the district.

Within the 100-year flood zone Indirect APE, there are 254 historic built environment features and 11 archaeological sites (See Tables 4 and 5). Of these 254 built environment features, 184 are eligible or listed on the National Register as contributing historic properties within the SCNRHD and two sites listed (Big Ditch/42SP1231) or recommended eligible (Chester Ponds/42SP1224). The Action Alternative for the 100-year flood zones listed in the associated Plan-Environmental Assessment states that the future with federal investment of the project would reduce the risk of flooding, would not result in a net rise of the floodplain, nor would there be additional vulnerabilities in the project areas. As a result, the Action Alternative for the 100-year flood zones should not have an adverse effect on historic properties. A secondary cultural assessment for additional areas of the undertaking is covered under SHPO project number U23HO0983.

In addition to the site-specific recommendations listed above, all ground disturbing activities associated with the Freeman Allred Reservoir and Day Use area should be monitored by an SOI-qualified archaeologist. Where an archaeological monitor is recommended, ground disturbing activities include but are not limited to blading, grading, ripping, excavating, and boring. Procedures outlined for post-review discoveries in the NRCS Prototype Programmatic Agreement shall be followed. Based on the results of this inventory and the proposed projects measures, the project will result in "Adverse Effects" to historic properties, in accordance with Section 106 of the National Historic Preservation Act, 36 CFR 800 and Utah Code Section 9-8-404.

If cultural materials including, but not limited to precontact deposits, features, or human remains/funerary objects, or historic deposits, features, or burials are encountered in the course of the undertaking, work must be halted within 50 feet of the discovery and the NRCS archaeologist or USFS/UDOT (as applicable) must be notified. Post-review discovery procedures outlined in the NRCS Prototype Programmatic Agreement with the Utah SHPO shall be followed. The USFS Inadvertent Discovery Plan (Appendix C of the Memorandum of Understanding between the Utah State Historic Preservation Officer and the USDA Forest Service Intermountain Region regarding Compliance with Section 106 of the National Historic Preservation Act (2019)) shall be followed for discoveries on Forest Service lands.

Table 7: Specific Management Recommendations

Site/PR ID	Land Ownership	Project Measure(s)	Effect/Mitigation Recommendation
42SP437 Historic Irrigation (Mill Race Ditch)	Private	Project Measure: Mill Race Flood Ditch Piping and Outlet Pipeline from Reservoir: • 20 Linear Feet(LF) of new piping to be installed above ground via trenching through Site 42SP1211 and tied into the Mill Race Ditch. No air vents will be installed at site. All disturbance will be reseeded.	No Adverse Effect • Temporary disturbance to northern bank of the ditch to connect pipe to ditch. Feature 2 (CCC diversion) will be avoided and exclusionary fencing installed. • Site will be restored to pre-construction condition.
42SP1098 Historic Road (ML-5397)	USFS, Private	Project Measure: Outlet Pipeline from Reservoir: • Outlet pipeline would be installed across the historic road via trenching. The trench would be 30-feet long across the road and 3-feet deep.	No Adverse Effect • Site will be temporarily disturbed by installation of pipeline via trench across the historic road. • Site will be restored to pre-construction condition.
42SP1105 Historic Aqueduct, (Penstock Aqueduct) (ML-5727)	USFS, Private	Project Measure: Oak Creek Upper Diversion: • 8450 LF of new piping to be installed, offset 20 feet, via open trench and then buried and reseeded adjacent to existing operating pipeline. Trench will be approximately 5 ft deep. Existing operating steel pipeline to remain in service until construction is complete and will remain in place.	**Adverse Effect** • Portions of the above ground penstock aqueduct may be disturbed; the majority would be avoided. Buried portions of the stave pipeline may be disturbed without the possibility of restoration. • Develop a Historic Context with all eligible water related sites (42SP1105, 42SP1206, and • 42SP1231) • Develop interpretative materials. Work with Spring City Museum and historic society, as appropriate.
42SP1206 Historic Hydroelectric Site	Private	Project Measure: Oak Creek Upper Diversion Construction: • 310 LF of new piping to be installed via trenching through site, permanently buried, and reseeded. Trench will be approximately 5 ft deep. • Impact to site: All disturbance to site would be restored to preconstruction conditions.	**Adverse Effect** • Existing historic buried pipeline may be irreparably destroyed. • Develop a Historic Context with all eligible water related sites (42SP1105, 42SP1206, and 42SP1231)

42SP1222 Historic Pond (Chester Pond No. 1)	Private	Project Measure: Chester Ponds • Construction Methodology: Dredge ponds to depths of 2.5 ft to 5 ft using heavy equipment; access would be via established roads and private property. • Impact to site: The historic pond would be temporarily disturbed to restore original pond capacity. The embankment would not be modified, and the footprint would not increase.	No Adverse Effect
42SP1223 Historic Pond (Chester Pond No. 2)	Private	Project Measure: Chester Ponds • Construction Methodology: Dredge ponds to depths of 2.5 ft to 5 ft using heavy equipment; access would be via established roads on private property. • Impact to site: The historic pond would be temporarily disturbed to restore original pond capacity. The embankment would not be modified, and the footprint would not increase.	No Adverse Effect
42SP1224 Historic Pond (Chester Pond No. 3)	Private	Project Measure: Chester Ponds • Construction Methodology: Dredge ponds to depths of 2.5 ft to 5 ft using heavy equipment; access would be via established roads on private property. • Impact to site: The historic pond would be temporarily disturbed to restore original pond capacity. The embankment would not be modified, and the footprint would not increase.	No Adverse Effect
42SP1226 Multi-Component Temporary Camp	Private	Project Measure: Outlet Pipeline from Reservoir • Construction Methodology: 630 LF of new piping to be installed via trenching through site, permanently buried, and reseeded. Trench installation will disturb 50-ft-wide corridor through site and trench will be approximately 3 ft deep. No air vents would be placed within the site boundary. • Impact to site: The site will be irreparably damaged due to trenching and installation of the pipe.	**Adverse Effect** • SOI-qualified archaeological monitor for ground disturbing activities • Tribal monitor, as requested through consultation • Develop ethnographic report. • Excavate 10-20% of site within APE with emphasis on artifact concentrations (if present). Excavation efforts should expand beyond 10% perpendicularly to original unit if feature or high • concentration of diagnostic material encountered. • Obsidian sourcing as part of excavation report, if applicable

42SP1227 Precontact Temporary Camp	Private	Project Measure: Freeman Allred Reservoir • Construction Methodology: Clear and Grub reservoir using heavy equipment. Dam embankment width is 225 ft. across the site. • Impacts to site: The portion of the site that falls within the reservoir is 1.5 acres total. This portion of the site will be excavated using heavy equipment to an average depth of 15 feet, with a maximum depth of 42 ft. After construction, this portion of the site will be permanently inundated with water. The dam embankment will also be permanently constructed through the site using heavy equipment, which will permanently damage the surface of the site and bury any existing deposits beneath the berm, which will be approximately 42 feet wide. Approximately 0.5 acres of the site will remain undisturbed.	**Adverse Effect** • SOI-qualified archaeological monitor ground disturbing activities • Tribal monitor, as requested through consultation • Develop ethnographic report. • Excavate 10-20% of site within APE with emphasis on artifact concentrations (if present). Excavation efforts should expand beyond 10% perpendicularly to original unit if feature or high concentration of diagnostic material encountered. • Obsidian sourcing as part of excavation report, if applicable
42SP1228 Multi-Component Temporary Camp	Private	Project Measure: Access Road to Freeman Allred Reservoir • Construction Methodology: Clear, grub, and widen existing access road to 30ft wide path using existing dirt road and build 510 LF of access road through site. • Impact to site: A 30-ft by 510 LF corridor will be used for construction access, and the road will be maintained at Site will be permanently disturbed for a 25 ft wide access road to -day use facilities. Temporary width of construction road will be returned to pre-construction conditions.	**Adverse Effect** • Develop inadvertent discovery plan • SOI-qualified archaeological monitor ground disturbing activities • Tribal monitor, as requested through consultation • Develop ethnographic report • Excavate 10-20% of site within APE with emphasis on artifact concentrations (if present). Excavation efforts should expand beyond 10% perpendicularly to original unit if feature or high concentration of diagnostic material encountered. • Obsidian sourcing as part of excavation report, if applicable
42SP1231 Historic Irrigation Ditch (Big Ditch)	Private	Project Measure: Mill Race Ditch Clearing • Methodology: 11,567 LF of the historic ditch will be cleaned using heavy equipment and seeded, as needed. converted to pipe (via trenching of the ditch and burying pipe) and seeded. • Impact to site: The historic ditch will be returned to pre-construction condition. Project Measure: North Field Ditch Clearing • Methodology: 20,953 LF of the historic ditch will be cleaned using heavy equipment and seeded.	No Adverse Effect • All contributing features will be avoided by heavy equipment. • The cleaning of Big Ditch will cause temporary disturbance to the ditch but will not adversely affect those aspects of integrity that contribute to the site's eligibility to the NRHP. Once seeded and vegetation regrows, the ditch will return to pre-construction condition.

		• Impact to site: The historic ditch will be returned to pre-construction condition.	
42SP1237 Historic Road	Private	Project Measure: Outlet Pipeline from Reservoir • Construction Methodology: Historic Road would be trenched to a width of 30ft and a depth of 3 ft for installation of project measures. • Impact to site: The site would be temporarily disturbed due to trenching for the pipe. All road disturbance would be restored to pre-construction conditions.	No Adverse Effect • The site would be temporarily disturbed due to trenching for the pipe. All road disturbance would be restored to pre-construction conditions.
69130 100806 Spring City Pioneer Cemetery 222751 222758 222759 Big Ditch 222760 222762 222767 222768 222773 Beck Granary/Coop 222774 Barn 222775 Root Cellar 222776 222777 222779 222780 222782 222784 222792	Private	Project Measure: Mill Race Ditch Clearing • Methodology: 11,567 LF of the historic ditch will be cleaned using heavy equipment and seeded, as needed. converted to pipe (via trenching of the ditch and burying pipe) and seeded. • Impact to site: The historic ditch will be returned to pre-construction condition. Project Measure: North Field Ditch Clearing Methodology: 20,953 LF of the historic ditch will be cleaned using heavy equipment and seeded. • Impact to site: the modern-named Big Ditch (aka Mill Race/North Field Ditch) runs within 1/8 mile of the historic properties listed in Column 1, the majority of which are historic properties and are located within the SCNRHD. The cleaning of the ditches will cause temporary disturbance, and once reseeded, the ditches will return to pre-construction condition without a loss of riparian character.	No Adverse Effect • The cleaning of the modern named Big Ditch that runs in the backyards of the historic properties within the SCNRHD will cause temporary disturbance to the ditch and yards of the homes, but will not adversely affect those aspects of integrity that contribute to the homes individuality eligibility and district eligibility to the NRHP. Once seeded and vegetation regrows, the ditch and overall feeling and character of the area will return to pre-construction condition.

222793 222794 222795 222801 222802 222803 222825 259255 Rasmussen (Clawson), James, House 259258 Sterner, Annie, House 259260 Hudson-Adler House 259261 Madsen, Francis C., House 259263 Olsen, John, House 259264 Higsby-Christensen House 259267 Black, Roy, House 259278 Jorgensen House 259279 Rasmussen, Peter, House 259281 Peterson House 259282 Olsen/Jensen House 259286 259287 Mortensen House 259299 Sutliff, Edward, House 259301 Hyde, Anne			

E., House 259302 Petersen/Thompson House 259303 Allred, Eugene, House 259304 Barney House 259311 Frandsen, Anthon, House 259324 Petersen, Soren, House 259326 Sorensen, Christian, House/Billington, Zeke, House 259327 Benson, Niels, House 259337 Tulgreen House 259338 Blain, Bert, House 259345 Hyde, Sarah Ellen Justesen, House 259346 Downard, George, House 259349 Thompson, Fred, House 259352 Christensen, Jens Peter, House 259353 Beck House 259354 Robinson House 259360 [Granary] 259371 259373 Blain, John Thomas, House			

259378 Justesen House 259383 259384 Olsen-Justesen House 259385 259386 Hansen, Henming Edward, House 259404 Thompson, Anders "Chris", House 259424 Sorensen, Lee Ray, House 259426 Mortensen, Joe, House 259427 Thompson, James, House 259450 259452 Hansen, Orlan, House 259457 259460 Mickel-Sorenson House 259462 Hansen, Neils Peter, House 259466 Andersen-Madsen House 259472 [Barn] 259480 Viv Larsen/Don Petersen House 259488 Spring City Jail (Old) 259491 259494 259496 Pedersen,			

"Jimmy King," House 259501 Petersen, Jens, House & Log Barn 259502 Jensen House 259504 Hansen, Hans Jorgan, House 259509 Peterson, Marinus, House 259516 Spring City Junior High School 259517 Allred, Freeman, House 259518 Zabriskie-Justesen House 259530 Christiansen, Andres C., House 259533 Hansen, Carl House 259537 Christopherson House 259542 Monson-Larsen House 259543 Anderson, John T., House 259544 Thomson, Andrew "Fishman," House 259551 Spring City Bishop'S Storehouse 259552 Zabriskie, Charles, House 259567 Allred, Redick Newton, House 259616 Borreson Log			

House 259620 Grain Cleaning Shed 259636 Spring City School 259639 Andersen Slaughter House / Beef Gallows 259644			

(Note, PR ID Numbers starting with 259 are new; see appendix A for old and new PR number conversion)

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Appendix A:

New and Replaced PR ID Numbers Issued by SHPO

Original ID	Property Record ID	Address	Historic Property Name
82616	259247	69 W 300 SOUTH	SPRING CITY RELIEF SOCIETY GRANARY
98369	259248	469 S 300 EAST	ALLRED - JOHNSON HOUSE
98370	259249	110 S 300 EAST	
98371	259250	50 S 500 EAST	
98372	259251	24 S 500 EAST	
98373	259252	475 E 400 SOUTH	CHESTER SCHOOL
98374	259253	482 N 400 EAST	
98375	259254	575 N 100 EAST	
98376	259255	184 E 200 SOUTH	RASMUSSEN (CLAWSON), JAMES, HOUSE
98377	259256	263 S 300 EAST	
98378	259257	241 S 200 EAST	
98379	259258	379 N 200 EAST	STERNER, ANNIE, HOUSE
98380	259259	342 N 200 EAST	
98382	259260	388 E 300 SOUTH	HUDSON-ADLER HOUSE
98383	259261	389 E 400 SOUTH	MADSEN, FRANCIS C., HOUSE
98384	259264	415 S 400 EAST	HIGSBY-CHRISTENSEN HOUSE
98385	259262	11 E 100 SOUTH	KOFFORD HOUSE
98386	259263	393 E 200 SOUTH	OLSEN, JOHN, HOUSE
98387	259265	575 E 100 SOUTH	
98388	259266	313 E 100 SOUTH	MICKEL HOUSE
98389	259267	310 E 200 SOUTH	BLACK, ROY, HOUSE
98390	259268	165 W CENTER	SHERM'S GARAGE
98474	259269	70 N 100 WEST	DURFEY HOUSE
98475	259270	164 N 100 WEST	BOHLEEN - OLSEN HOUSE
98476	259271	546 S 200 WEST	LARSEN, OTTO, HOUSE
98477	259272	523 S 200 WEST	MAJOR'S PUG MILL/ADOBE YARD
98478	259273	407 N MAIN	KELSEY'S GARAGE
98481	259274	125 S MAIN	ANDERSON, SOREN, HOUSE
98482	259275	12 N MAIN	JUSTESEN, RASMUS HOUSE
98483	259276	13 N MAIN	FORD-BAXTER HOUSE
98485	259629	56 N MAIN	
98486	259277	160 N MAIN	JUSTESEN, ANNIE, HOUSE
98487	259278	181 E 300 NORTH	JORGENSEN HOUSE
98488	259282	269 E 300 NORTH	OLSEN/JENSEN HOUSE
98489	259283	389 E 400 NORTH	
98490	259284	361 E 400 NORTH	SAHLBERG, EDMUND, HOUSE
98491	259285	95 W 300 NORTH	RASMUSSEN/JAMES T. ELLIS HOUSE
98492	259286	139 E 100 NORTH	
98493	259287	181 E 100 NORTH	MORTENSEN HOUSE
98494	259288	389 S MAIN	CRAWFORTH-CARLSON HOUSE

98495	259289	87 E 200 NORTH	SORENSEN, PETER, HOUSE
Original ID	**Property Record ID**	**Address**	**Historic Property Name**
98496	259290	525 S 200 EAST	
98497	259291	132 S 200 EAST	
98498	259292	375 E 200 NORTH	
98500	259293	260 E CENTER	
98501	259294	160 W 100 SOUTH	
98502	259245	388 S 100 WEST	JOHNSON, JACOB, LAW OFFICE & COURT
98503	259295	480 E 100 SOUTH	
99174	259296	21 S 300 EAST	PETERSEN, JAMES, HOUSE
99175	259297	636 N 300 EAST	
99176	259298	487 S 200 EAST	ALLRED-BUNNELL HOUSE
99177	259299	395 S 500 EAST	SUTLIFF, EDWARD, HOUSE
99178	259642	610 N 400 EAST	SANDSTROM, EMIL, HOUSE
99179	259632	768 N 400 EAST	
99180	259300	679 N 400 EAST	
99182	259302	255 N 200 EAST	PETERSEN/THOMPSON HOUSE
99183	259303	291 S 200 EAST	ALLRED, EUGENE, HOUSE
99184	259301	151 S 200 EAST	HYDE, ANNE E., HOUSE
99185	259279	378 N 100 EAST	RASMUSSEN, PETER, HOUSE
99186	259280	367 N 200 EAST	STERNER HOUSE
99187	259304	409 E 300 SOUTH	BARNEY HOUSE
99188	259281	480 E 300 SOUTH	PETERSON HOUSE
99189	259305	317 E 400 SOUTH	MADSEN, HELEN, HOUSE
99190	259306	94 W 400 SOUTH	DYE, MAR, HOUSE
99191	259307	43 E 100 SOUTH	STRATE, RULON, HOUSE
99192	259308	90 E 100 SOUTH	JOHNSON, J. MORGAN & ANNA, HOUSE
99194	259309	583 E CENTER	
99197	259310	201 N 200 WEST	LARSEN, DAVID, HOUSE
99198	259311	189 E 500 NORTH	FRANDSEN, ANTHON, HOUSE
99199	259312	527 S 200 WEST	MAJOR, WILLIAM, HOUSE
99200	259313	520 S 200 WEST	NUNLEY HOUSE
99201	259652	398 N MAIN	OLSEN, MARTIN, HOUSE
99202	259651	443 N MAIN	
99203	259630	76 S MAIN	OSBORNE MERC
99204	259315	90 S MAIN	ALLRED, MARY ANN, HOUSE
99205	259316	24 N MAIN	SPRING CITY POST OFFICE
99206	259321	33 N MAIN	BAXTER CONFECTIONARY
99207	259322	190 N MAIN	BAXTER & BLAIN STORE
99208	259323	113 N MAIN	MICKELSON HOUSE
99209	259324	116 E 300 NORTH	PETERSEN, SOREN, HOUSE

99210	259325	125 E 300 NORTH	
Original ID	**Property Record ID**	**Address**	**Historic Property Name**
99212	259326	83 E 400 NORTH	SORENSEN, CHRISTIAN, HOUSE/BILLINGTON, ZEKE, HOUSE
99213	259327	115 E 100 NORTH	BENSON, NIELS, HOUSE
99214	259328	221 E 100 NORTH	
99216	259314	453 E 100 NORTH	SPRING CITY ELEMENTARY SCHOOL
99217	259329	351 N 200 EAST	
99218	259330	288 S 200 EAST	GRAHAM HONEY CO.
99219	259331	320 S 200 WEST	
99220	259332	192 N 300 EAST	
99221	259333	370 N 300 EAST	
99222	259334	218 E 100 NORTH	
99223	259335	675 E CENTER	
99225	259336	475 S 100 EAST	
99987	259337	186 S 300 EAST	TULGREEN HOUSE
99989	259338	560 N 300 EAST	BLAIN, BERT, HOUSE
99990	259339	361 N 300 EAST	CHRISTIANSEN, BRUCE, HOUSE
99991	259340	45 S 400 EAST	
99992	259317	20 S 400 EAST	
99993	259341	479 N 400 EAST	FRANDSEN, PETER, HOUSE
99994	259342	343 S 400 EAST	
99996	259343	310 E 400 SOUTH	ALLRED, JAMES T.S. , JR, HOUSE
99997	259344	472 S 200 EAST	BLAIN, GARY, HOUSE
99998	259345	185 S 200 EAST	HYDE, SARAH ELLEN JUSTESEN, HOUSE
99999	259346	109 S 200 EAST	DOWNARD, GEORGE, HOUSE
100000	259347	93 E 300 SOUTH	ALLRED, MARY ANN POLLARD, HOUSE
100001	259348	190 E 300 SOUTH	
100002	259349	190 E 500 NORTH	THOMPSON, FRED, HOUSE
100003	259350	210 E 200 SOUTH	LARSEN, LOUIS, HOUSE
100004	259351	233 E 600 NORTH	
100005	259352	317 E 700 NORTH	CHRISTENSEN, JENS PETER, HOUSE
100006	259318	185 E 200 SOUTH	
100007	259353	112 E 200 SOUTH	BECK HOUSE
100008	259354	275 E CENTER	ROBINSON HOUSE
100009	259355	355 E CENTER	
100012	259356	411 S 100 WEST	OLSEN, MARTIN HOUSE
100013	259357	670 S 200 WEST	DAHL, RULON HOUSE
100014	259361	450 S 100 WEST	BECKSTROM, DANIEL HOUSE
100017	259358	79 S MAIN	STRATE'S GARAGE

Original ID	Property Record ID	Address	Historic Property Name
100018	259362	197 S MAIN	BORRESON HOUSE
100019	259359	216 S MAIN	OSBORNE, WILLIAM, HOUSE
100020	259363	265 N MAIN	BECK, ALLAN, HOUSE
Original ID	**Property Record ID**	**Address**	**Historic Property Name**
100021	259634	46 N MAIN	SPRING CITY HALL (OLD)
100022	259244	95 N MAIN	WILLIAM BLAIN SPRING
100023	259364	80 N MAIN	FULLMER, DARRELL, HOUSE
100024	259365	85 W 400 NORTH	JUSTENSEN, PETER, HOUSE
100025	259366	515 E 400 NORTH	MALMGREEN, HOGAN, HOUSE
100029	259367	94 W 100 NORTH	ALLRED - HANSEN HOUSE
100031	259360	245 E 200 NORTH	[GRANARY]
100033	259633	425 E 500 NORTH	
100035	259368	147 N MAIN	STRATE, FRED, HOUSE
100036	259369	420 N MAIN	SORENSEN, KEITH, HOUSE
100037	259370	280 N 100 EAST	
100038	259643	612 N 500 EAST	WORKMAN, MICHAEL & LAUREL, HOUSE
100666	259371	220 S 300 EAST	
100667	259372	75 N 400 EAST	HANSEN, RICHARD, HOUSE
100668	259373	110 N 300 EAST	BLAIN, JOHN THOMAS, HOUSE
100669	259374	287 S 100 EAST	BECK, JOSEPH, HOUSE
100670	259375	470 N 500 EAST	SORENSEN, F.C., HOUSE
100671	259376	115 S 400 EAST	BLAIN, ODELL, HOUSE
100672	259377	435 N 100 EAST	BLAIN , BOYD, HOUSE
100673	259378	195 S 100 EAST	JUSTESEN HOUSE
100798	259319	490 S 300 EAST	ALLRED, JOHN, HOUSE
100800	259320	240 N 400 EAST	HARRIS, DON HOME
100801	259379	615 N 300 EAST	
100802	259380	525 E CENTER	OMANSEN, NEILS, HOUSE
100804	259381	283 N 400 EAST	
100805	259382	10 S 100 EAST	
100807	259383	469 S 500 EAST	
100808	259384	93 S 200 EAST	OLSEN-JUSTESEN HOUSE
100809	259385	419 N 200 EAST	
100810	259386	288 N 200 EAST	HANSEN, HENMING EDWARD, HOUSE
100811	259387	320 E 300 SOUTH	
100812	259388	530 E 300 SOUTH	
100813	259389	185 E 400 SOUTH	ZABRISKIE, JOHN H., HOUSE
100814	259390	240 E 500 NORTH	HARDING, GRACE, HOUSE
100815	259391	725 E 600 NORTH	
100816	259392	297 S 100 WEST	ALLRED, JAMES HOUSE
100817	259394	385 E 100 SOUTH	BLAIN, JOHN HOUSE

100819	259395	255 E CENTER	PETERSEN, ANNA, HOUSE
100820	259396	395 E CENTER	
100821	259399	47 W CENTER	PUZEY, JOSEPH H., HOUSE
100822	259400	309 N 100 WEST	SORENSEN, WILLIAM HENRY, HOUSE
Original ID	**Property Record ID**	**Address**	**Historic Property Name**
100825	259397	179 W 400 SOUTH	LARSEN, DANIEL HOUSE
100826	259645	488 N MAIN	AIKEN HOUSE
100827	259631	53 S MAIN	FRANTZEN, JOHN, HOUSE
100828	259401	164 S MAIN	SPRING CITY LDS MEETINGHOUSE
100830	259626	37 N MAIN	SANDSTROM'S POOL AND DANCE HALL
100831	259402	297 N MAIN	JUSTESEN, ERNEST, HOUSE
100832	259398	309 N MAIN	PETERSEN, IVER, HOUSE
100833	259403	169 W 200 NORTH	
100834	259404	289 N 300 EAST	THOMPSON, ANDERS "CHRIS", HOUSE
100835	259405	435 E 300 NORTH	MOTT, HARRISON, HOUSE
100836	259406	60 W 400 NORTH	STRATE, GENEVA, HOUSE
100837	259407	490 S MAIN	HANSEN, LORELL, HOUSE
100838	259408	265 E 200 NORTH	
100839	259409	116 W 100 NORTH	
100841	259410	586 N 300 EAST	JONES, DARLENE, HOUSE
100842	259411	255 S 300 EAST	
100843	259412	450 S 200 WEST	
100844	259590	485 E 500 NORTH	
100845	259413	495 E 400 NORTH	
100846	259414	515 E 100 SOUTH	
101044	259418	191 S 300 EAST	ALLRED, SAMUEL, HOUSE
101046	259419	211 S 400 EAST	
101047	259420	515 E 500 NORTH	PETERSON HOUSE
101048	259421	84 N 500 EAST	
101049	259422	75 W 200 NORTH	LARSEN-JENSEN BARN (DISASSEMBLED)
101050	259423	121 S 100 EAST	
101051	259424	291 N 100 EAST	SORENSEN, LEE RAY, HOUSE
101053	259425	458 N 200 EAST	
101054	259426	390 N 200 EAST	MORTENSEN, JOE, HOUSE
101055	259427	318 N 200 EAST	THOMPSON, JAMES, HOUSE
101056	259428	268 N 200 EAST	STRATE HOUSE
101057	259429	522 S 200 EAST	WATSON HOME
101058	259430	157 E 400 SOUTH	
101059	259431	217 E 400 SOUTH	MICKEL HOUSE
101060	259432	296 E 400 SOUTH	
101061	259433	525 E 300 SOUTH	

101062	259434	281 E 400 SOUTH	ALLRED, SANFORD, HOUSE
101063	259435	485 E 100 SOUTH	WINONA, DANNY, HOUSE
101064	259436	415 E 100 SOUTH	
101065	259437	682 S 200 WEST	
101066	259438	750 S 200 WEST	CRAWFORTH, JAMES, HOUSE
Original ID	**Property Record ID**	**Address**	**Historic Property Name**
101067	259439	59 W CENTER	PUZEY, LYDIA, HOUSE
101068	259440	586 S 200 WEST	DAHL, NIELS HOUSE
101069	259441	16 S 100 WEST	OLSEN, CHARLES A., HOUSE
101070	259442	92 S 100 WEST	OLSEN, ANDREW HOUSE
101072	259443	379 N MAIN	IRVING, MORONI, HOUSE
101073	259650	451 N MAIN	MELLOR, VON, HOUSE
101074	259444	487 N MAIN	NIELSEN, MADS, HOUSE
101075	259445	57 N 600 EAST	
101077	259627	35 N MAIN	LYCEUM THEATER/VICTORY THEATER
101078	259635	38 N MAIN	SPRING CITY FIREHOUSE (OLD)
101079	259446	119 W 200 NORTH	ERICKSON-PAULSEN HOUSE
101080	259447	190 W 200 NORTH	GRIFFITHS/BECK HOUSE
101081	259448	315 E 300 NORTH	
101083	259449	19 E 100 NORTH	BEHUNIN-BECK HOUSE
101084	259450	95 E 100 NORTH	
101085	259451	12 W 200 NORTH	BAXTER, JOHN , SR. HOUSE
101086	259452	267 E 200 NORTH	HANSEN, ORLAN, HOUSE
101087	259453	161 E 200 NORTH	NELSON HOUSE
101089	259393	220 S 100 EAST	
101091	259454	50 S 100 EAST	
101092	259455	155 E 300 NORTH	
101093	259458	135 E 200 NORTH	
101096	259459	410 S 400 EAST	
101300	259649	505 N MAIN	
101301	259456	155 S 500 EAST	[GRANARY & OUTBUILDINGS)
101478	259460	389 N 100 EAST	MICKEL-SORENSON HOUSE
101480	259457	120 S 200 EAST	
101481	259461	317 S 200 EAST	
101564	259462	190 N 200 EAST	HANSEN, NEILS PETER, HOUSE
101565	259415	185 E 300 SOUTH	GRAHAM, ROBERT M., HOUSE
101567	259463	218 E 400 SOUTH	ALLRED, JOHN FRANK HOUSE
101568	259464	295 E 100 SOUTH	ALLRED, ALVIN E., HSE
101570	259416	153 E 200 SOUTH	
101571	259465	450 E 100 SOUTH	
101572	259417	166 W 400 SOUTH	JENSEN, JAMES HOUSE

101573	259466	325 E CENTER	ANDERSEN-MADSEN HOUSE
101575	259467	73 W CENTER	BLAIN, ROBERT, HOUSE
101577	259468	58 S 100 WEST	LARSEN, LAURITZ O., HOUSE
101578	259469	428 S 100 WEST	JUSTESEN-OLSEN HOUSE
101580	259470	441 S 200 WEST	LARSEN, SOREN JR., HOUSE
101582	259471	465 N MAIN	AIKEN, TERRANCE, HOUSE
Original ID	**Property Record ID**	**Address**	**Historic Property Name**
101583	259648	625 N MAIN	STRATE, KENNETH, HOUSE
101585	259476	209 S MAIN	HYDE, ORSON, HOUSE
101586	259477	390 N 600 EAST	
101587	259628	48 N MAIN	SPRING CITY JAIL
101588	259478	260 N MAIN	ANDERSEN, NIELS, HOUSE
101589	259479	87 N MAIN	SPRING CITY SERVICE
101590	259480	81 E 300 NORTH	VIV LARSEN/DON PETERSEN HOUSE
101591	259481	409 E 200 NORTH	
101592	259482	397 E 300 NORTH	
101594	259638	45 E 100 NORTH	METHODIST CHURCH LIVING QUARTERS
101595	259483	165 W 100 NORTH	DOWNARD, WILLIAM, HOUSE
101596	259484	615 E 100 NORTH	
101598	259485	458 N 300 EAST	
101599	259486	405 N 100 WEST	[TURKEY COOPS]
101600	259644	240 E 600 NORTH	[SHED]
101601	259487	612 E 100 NORTH	
101602	259488	275 S 200 EAST	SPRING CITY JAIL (OLD)
101603	259489	350 S MAIN	
101605	259490	460 E 400 SOUTH	
103141	259491	285 S 300 EAST	
103142	259492	454 S 300 EAST	
103143	259493	276 N 300 EAST	JENSEN, SEVERINE, HOUSE
103144	259496	74 N 300 EAST	PEDERSEN, "JIMMY KING," HOUSE
103145	259494	323 S 400 EAST	
103146	259495	118 S 400 EAST	
103147	259498	323 S 100 EAST	CHRISTENSEN, JAMES, HOUSE
103148	259499	420 S 100 EAST	CRISP, FLOYD, HOUSE
103149	259500	383 S 100 EAST	BROUGH, MORONI, HOUSE
103150	259501	147 N 100 EAST	PETERSEN, JENS, HOUSE & LOG BARN
103151	259502	80 N 100 EAST	JENSEN HOUSE
103152	259503	15 S 200 EAST	JONSSON HOUSE
103153	259504	93 N 200 EAST	HANSEN, HANS JORGAN, HOUSE
103154	259505	48 W 300 SOUTH	
103155	259506	12 E 300 SOUTH	LARSEN, LAURITZ, HOUSE

103156	259507	161 W 300 SOUTH	
103157	259508	96 E 400 SOUTH	ALLRED, JAMES T.S., HOUSE
103158	259509	285 E 500 NORTH	PETERSON, MARINUS, HOUSE
103159	259497	383 E 500 NORTH	JENSEN, HYRUM, HOUSE
103160	259511	91 E 100 SOUTH	ANDERSON, JENS C. HOUSE
103161	259515	248 E 100 SOUTH	
103162	259516	150 E CENTER	SPRING CITY JUNIOR HIGH SCHOOL
Original ID	**Property Record ID**	**Address**	**Historic Property Name**
103163	259517	121 E CENTER	ALLRED, FREEMAN, HOUSE
103164	259518	195 E CENTER	ZABRISKIE-JUSTESEN HOUSE
103165	259519	187 W CENTER	ACORD HOUSE
103167	259520	116 S 100 WEST	JENSEN, RASMUS, HOUSE
103168	259521	355 S 100 WEST	CARLSON, JENS PETER, HOUSE
103169	259522	402 S 200 WEST	EVERITT/OWEN HOUSE
103172	259523	219 E 500 NORTH	
103173	259524	296 S MAIN	ADLER, NIELS, HOUSE
103174	259525	59 N MAIN	CRISP-ALLRED HOUSE
103175	259526	187 N MAIN	JUSTESEN, ALEX, HOUSE
103176	259653	298 N MAIN	OLSEN, FREDERICK, HOUSE
103177	259527	245 N MAIN	BAXTER, JOHN, HOUSE
103178	259528	310 S MAIN	ALLRED, ALBERT M., HOUSE
103179	259529	112 W 200 NORTH	LARSEN, EPHRAIM, HOUSE
103180	259530	115 E 500 NORTH	CHRISTIANSEN, ANDRES C., HOUSE
103182	259531	415 S MAIN	ALLRED, REUBEN WARREN SR., HOUSE
103183	259532	424 S MAIN	SYME, COURTNEY D., HOUSE
103185	259534	296 E 100 NORTH	ROBINSON, JOHN, HOUSE
103186	259533	280 E 300 SOUTH	HANSEN, CARL HOUSE
103187	259639	650 N 100 EAST	ANDERSEN SLAUGHTER HOUSE / BEEF GALLOWS
103188	259512	225 S 200 WEST	
103189	259535	480 S 200 WEST	STRATE, RANDY, HOUSE
103190	259513	585 E 400 NORTH	
103191	259536	155 N 400 EAST	(OUTBUILDINGS ONLY)
103192	259514	570 E 400 NORTH	
103193	259472	55 E 300 NORTH	[BARN]
103194	259473	340 S 400 EAST	
103196	259474	285 E 300 SOUTH	ALLRED, TOM AND DORA, HOUSE
111027	259475	353 S 300 EAST	
111029	259537	191 N 300 EAST	CHRISTOPHERSON HOUSE
111030	259538	55 S 500 EAST	MONSON, DAVE, HOUSE
111031	259539	253 N 400 EAST	OMANSEN, AUGUST HOUSE

111032	259540	450 S 100 EAST	ALLRED, EDWARD F., HOUSE
111033	259541	415 S 100 EAST	ALLRED-WATSON HOUSE
111034	259542	85 N 100 EAST	MONSON-LARSEN HOUSE
111036	259543	560 N 200 EAST	ANDERSON, JOHN T., HOUSE
111037	259544	488 N 200 EAST	THOMSON, ANDREW "FISHMAN," HOUSE
111038	259545	89 W 200 SOUTH	JUSTENSEN, JOHN F., HOUSE
111039	259546	40 E 300 SOUTH	ALLRED, OSRAL, HOUSE
111040	259547	63 W 300 SOUTH	ENDOWMENT HOUSE/ROCK SCHOOL HOUSE
111041	259548	95 E 400 SOUTH	ROBINSON, JOHN & EMMA HOUSE
Original ID	**Property Record ID**	**Address**	**Historic Property Name**
111042	259641	325 E 500 NORTH	SANDSTROM, ANNIE, HOUSE
111043	259640	323 E 500 NORTH	CHRISTENSEN, IVER & MARIA, HOUSE
111044	259549	186 W 100 SOUTH	NIELSEN, JACOB, HOUSE
111045	259550	52 W 100 SOUTH	ERICKSON, EMIL, SECOND HOME
111046	259551	95 E CENTER	SPRING CITY BISHOP'S STOREHOUSE
111047	259552	163 E CENTER	ZABRISKIE, CHARLES, HOUSE
111048	259553	427 E CENTER	JENSEN, NIELS PETER, HOUSE
111049	259554	120 W CENTER	OSBORNE, OSMAN HOUSE
111050	259555	316 S 100 WEST	ALLRED, MARIA, HOUSE
111051	259556	390 S 100 WEST	JOHNSON, JACOB, HOUSE
111053	259557	275 N 200 WEST	LARSEN-JENSEN HOUSE
111054	259646	498 N MAIN	AIKEN SERVICE
111055	259558	551 N MAIN	
111056	259559	278 S MAIN	ARTHUR JOHNSON MEAT MARKET
111057	259560	595 N MAIN	
111058	259561	345 N MAIN	HANSEN, WILLARD, HOUSE
111059	259562	390 S MAIN	SCHRODER, THOMAS, HOUSE
111060	259563	80 W 300 NORTH	MORTENSEN-PETERSEN HOUSE
111061	259564	87 W 200 NORTH	PUZEY, ALBERT, HOUSE
111062	259568	25 E 500 NORTH	SORENSEN, JENS, "ROCK", HOUSE
111063	259565	70 W 400 NORTH	DYCHES, LAMAR, HOUSE
111064	259569	420 S MAIN	BLACK, LEWIS, HOUSE
111065	259566	475 S MAIN	ALLRED, REUBEN W. JR., HOUSE
111066	259570	117 E 200 NORTH	SORENSEN, MARK, HOUSE
111067	259571	15 E 200 NORTH	OLE PETERSEN - NIELSEN HOUSE
111068	259567	115 S 100 EAST	ALLRED, REDICK NEWTON, HOUSE
111069	259572	275 S 200 WEST	NIELSEN, JACOB, LOG HOUSE
111070	259510	730 S 200 WEST	
111072	259573	260 S 100 EAST	
111073	259574	591 E 300 SOUTH	

111074	259575	151 S 100 EAST	
111075	259655	75 S 700 EAST	CATTLE CORRALS (TOWN)
114251	259636	45 S 100 EAST	SPRING CITY SCHOOL
168557	259580	424 N 100 EAST	
168558	259605	455 N 100 EAST	
168559	259581	490 N 100 EAST	
168562	259602	324 S 100 EAST	FRYER, DOUG AND TERESA, HOUSE
168563	259606	320 E 100 SOUTH	
168564	259582	570 E 100 NORTH	
168578	259579	455 S 100 WEST	
168581	259583	287 E 300 NORTH	
Original ID	**Property Record ID**	**Address**	**Historic Property Name**
168582	259576	480 E 300 NORTH	
168583	259584	469 E 300 NORTH	
168584	259607	30 W 300 NORTH	
168585	259585	485 E 300 SOUTH	
168586	259603	124 W 300 SOUTH	
168587	259604	287 E 400 NORTH	
168588	259586	346 E 400 NORTH	
168591	259608	450 E 400 NORTH	
168592	259587	460 E 400 NORTH	
168593	259609	470 E 500 NORTH	
168594	259578	625 E CENTER	
168595	259610	180 W CENTER	
168596	259611	97 S 100 WEST	
168598	259654	225 N MAIN	
168599	259647	600 N MAIN	
168600	259612	436 S 200 EAST	
168601	259591	490 S 200 EAST	
168609	259613	235 S 500 EAST	
168610	259592	210 S 500 EAST	
168611	259593	160 N 700 EAST	
168612	259614	315 N 700 EAST	
168615	259615	127 N 200 WEST	SOPER HOUSE
168616	259588	370 S 200 WEST	
168621	259589	341 N 600 EAST	
168636	259616	205 E 200 NORTH	BORRESON LOG HOUSE
168638	259594	517 E 300 NORTH	
168639	259595	584 E 300 NORTH	
168640	259617	75 E 200 NORTH	
168641	259618	155 S MAIN	

168642	259596	360 S MAIN	
168643	259597	381 N 300 EAST	
168644	259598	441 S 300 EAST	
168645	259619	350 N 400 EAST	
168646	259599	391 N 400 EAST	
168647	259577	390 N 400 EAST	
168650	259600	424 N 400 EAST	LAMBSON, DON, HOUSE
168655	259601	570 N 400 EAST	
168676	259620	250 E 100 NORTH	GRAIN CLEANING SHED
168677	259621	123 S MAIN	JOCK JONES WINDSOR CHAIRS
168678	259625	500 S 100 EAST	
168681	259622	81 E 400 NORTH	KOYLES AUTOMOTIVE
Original ID	**Property Record ID**	**Address**	**Historic Property Name**
175421	259623	165 N 200 WEST	
175422	259624	50 E CENTER	SLOAN, MARTA, HOUSE
198653	259637	194 N 300 EAST	PETER MO(U)LTER GRANARY
198757	259656	81 S 700 EAST	SHEEP CORRALS (TOWN)
201476	259246	386 S 100 WEST	JOHNSON, JACOB, CARRIAGE HOUSE/HORSE BARN

Appendix B:

USFS Inadvertent Discovery Plan
(See Attached)

Appendix C:

2022 SCNRHD Additional Documentation
(See Attached)

Technical Memo 001 – Hydraulics and Hydrology

J·U·B ENGINEERS, INC.

TECHNICAL MEMORANDUM 001

Date:	April 18, 2022
To:	Bronson Smart, PE, State Conservation Engineer Norm Evenstad, P.G., Water Resources Coordinator Aimee Rohner, P.E, State Design Engineer NRCS - Utah
Cc:	Bryce Wilcox, PE J-U-B ENGINEERS, Inc.
From:	Tracy Allen, PE J-U-B ENGINEERS, Inc.
Project:	Spring City-Watershed Plan-EA
Subject:	Technical Memorandum No. 001 - Hydraulics and Hydrology

Revision No.	Revision Date	Note
001	November 2, 2023	Revisions to data in response to comments from NRCS

1.0 Introduction

Spring City has contracted with J-U-B ENGINEERS, Inc. (J-U-B) to complete a Supplemental Watershed Plan-Environmental Assessment (Plan-EA) of the Proposed Projects. Part of the Scope of Work includes analysis of the hydraulics and hydrology for both flood water and agricultural water management. The Proposed projects that have been included in the flooding analysis include the Freeman Allred Reservoir, Mill Race canal piping, and Point Ditch canal piping.

1.1 Purpose

The purpose of Technical Memorandum (TM) No. 001 is to present a summary of the methodology and results of the flood water and agricultural water hydraulics and hydrology analysis conducted for the Freeman Allred Reservoir and canal piping in support of the Plan-EA. The information presented in this TM will be used to determine flooding, risk analysis, economic analysis.

2.0 Proposed Projects Overview

Spring City is located in Sanpete County, Utah and has a population of 1,178 people. The Freeman Allred Reservoir is located approximately 2.6 miles east of the city limits and at the base of the Oak Creek watershed. The Reservoir was designed to provide flood protection for Spring City and storage of secondary water. The Canal Creek watershed is located adjacent to the Oak Creek watershed and contributes to flooding potential of Spring City. The Mill Race canal carries flood water from Canal Creek into Oak Creek. Because of the impact which the flood waters from Canal Creek have on the flooding of Oak Creek, the Canal Creek watershed was included in the hydraulics and hydrology analysis. The drainage area of the Oak Creek watershed above the Reservoir was delineated and is 10.1 square miles. The drainage area of Canal Creek watershed is 18.5 square miles. There is no existing flood control structure for the Oak Creek or Canal Creek watersheds.

2.1 Hydrograph Development

The hydrologic review was completed using the HEC-1 interface in the Watershed Modeling System (WMS) software to estimate the range of modeled peak run flows for the Oak Creek and Canal Creek watersheds. Within the larger Oak Creek and Canal creek watersheds, smaller sub watersheds (approximately area of1- 2 square miles) were divided up to more accurately assignment watershed data. The flood water analysis was completed to meet the requirements of the Natural Resources Conservation Service (NRCS) as defined in Technical Release 60 (TR-60) and Utah Dam Safety design criteria as defined in Utah Administrative Rule R655-11.

2.1.1 Design Criteria Storms

Design criteria storms are a series of theoretical precipitation events used to calculate the watershed runoff and required flood storage. Hyetographs for the watershed were created to follow a typical NOAA 24-hour storm event and precipitation amounts were obtained from NOAA's Hydrometeorological Design Studies Center, Precipitation Frequency Data Server at hdsc.nws.noaa.gov/hdsc/pfds/pfds_gis.html. These high-resolution data were downloaded as an ASCII grid of rainfall depths for each storm recurrence interval. The data are created through spatially interpolating the NOAA Atlas 14 precipitation frequency estimates with confidence limits.

Precipitation data of the 500-year, 200-year, 100-year, 50-year, 25-year, 10-year, 5-year, 2-year storms were used to create flood hydrographs for the watershed. The watersheds were delineated by using the best available elevation data for the area. The watersheds are in an unpopulated mountainous area and 10-meter elevation data from USGS was the best available.

Flood hydrographs were created using the Soil Conservation Service (SCS) Curve Number Method. The composite curve number for the watershed is calculated by importing the NRCS soil type map and the United States Geological Survey (USGS) land use map into the WMS model. The software then computes a weighted curve number for the watershed, initial abstraction, and the time of concentration which are used to compute the runoff hydrograph. The watershed was modeled as a single sub-watershed and all hydrologic properties are assumed to be homogeneous throughout the watershed. The average of the weighted curve numbers for all sub watersheds within Oak Creek and Canal Creek watersheds is 59.7.

2.1.2 PSH and SDH Hydrographs

In TR-60 it is required to develop a 100-year, 10-day principal spillway hydrograph (PSH) to test the capacity of the outlet structure to drain the detention Reservoir. The climatic index for the Oak Creek watershed is calculated to be 0.5, which allows for transmission losses to be included in the 100-year hyetograph. The transmission loss factor is 0.72 according to the NEH 4 chapter 21.

2.2 Flood Model

J-U-B analyzed the Oak Creek and Canal Creek watersheds with existing conditions and under proposed conditions to determine flooding limits during various storm events. The Freeman Allred Reservoir was also analyzed to determine the impacts of a dam breach to analyze the flood impacted area. The WMS model was utilized for this evaluation to determine the inflow hydrographs of the existing detention pond for the 1000-, 500-, 200-, 100-, 50-, 25-, 10-, and 5-year storm events. The hydrographs are in Tables 9 through 17 at the end of the memo.

2.2.1 Existing System Model Analysis

The inflow hydrographs were input into a Surface-water Modeling System (SMS) model, which was used to model the routing of water through the existing condition of Oak Creek, Canal Creek, and surrounding area. The SMS model was used to determine the max flow rate in each channel. Flooding is calculated as the difference between the channel capacity and the inflow hydrographs. **Table *1*:** below shows the totalized flood rates and volumes for each of the storm events.

Table 1:Totalized Runoff for Existing Scenario

Storm Event	Oak Creek Peak Flooding (cfs)	Oak Creek Flooding Volume (ac-ft)	Canal Creek Peak Flooding (cfs)	Canal Creek Flooding Volume (ac-ft)
2 Year	5.9	2.8	2.4	1.1
5 Year	31.0	23.2	29.4	19.9
10 Year	57.6	52.6	62.8	53.2
25 Year	100.9	109.5	119.0	122.2
50 Year	138.9	164.3	168.5	191.6
100 Year	199.6	230.7	235.8	277.6
200 Year	270.9	306.4	328.1	377.6
500 Year	381.8	421.7	476.0	533.3

The SMS model is a 2-dimmensional surface water model that calculates where water travels in all directions via overland flow. Figure 2 through Figure 16 at the end of the memo show the results from the SMS mode. The SMS model was used to identify the number of structures that were flooded during each storm event.

Table ***2*** identifies the total number of homes, commercial buildings, and other buildings flooded. Table 3 identified the acres of agricultural lands which were flooded. Table 4 identified the number of road segments flooded.

Table 2: Summary of Flooded Structures of Existing Conditions

Storm Event	Depth Ranges	500 Year	200 Year	100 Year	50 Year	25 Year	10 Year	5 Year	2 Year
Number of Residential Homes Flooded	0-1 ft	14	15	22	14	6	2	2	2
	1-2 ft	0	108	90	83	21	17	12	0
	2-3 ft	131	2	1	1	0	1	1	0
	3-4 ft	0	73	70	64	1	0	1	0
	4-5 ft	56	0	0	12	0	0	0	0
	5-6 ft	0	11	11	2	0	0	0	0
	6-7 ft	6	0	0	0	0	0	0	0
Number of Mobile Homes Flooded	0-1 ft	0	0	0	0	4	0	0	0
	1-2 ft	0	6	6	7	0	4	0	0
	2-3 ft	7	0	0	0	0	0	0	0
	3-4 ft	0	2	2	1	0	0	0	0
	4-5 ft	1	0	0	0	0	0	0	0
Number of Commercial Properties Flooded	0-1 ft	0	0	0	0	0	0	0	0
	1-2 ft	0	1	3	3	0	0	0	0
	2-3 ft	5	0	0	0	0	0	0	0
	3-4 ft	0	8	8	6	0	0	0	0
	4-5 ft	8	0	0	3	0	0	0	0
	5-6 ft	0	3	1	0	0	0	0	0
Number of Detached Garages, Sheds, and Farming Buildings Flooded	0-1 ft	12	7	12	10	2	2	1	0
	1-2 ft	0	115	88	72	34	22	15	1
	2-3 ft	124	1	0	0	0	3	5	0
	3-4 ft	0	52	61	54	3	0	2	0
	4-5 ft	43	0	0	13	0	0	0	0
	5-6 ft	0	12	10	1	0	0	0	0
	6-7 ft	3	0	0	0	0	0	0	0
Number of Other Buildings Flooded	0-1 ft	0	0	0	0	0	0	0	0
	1-2 ft	0	4	4	3	1	1	1	0
	2-3 ft	4	0	0	0	0	0	0	0
	3-4 ft	0	1	0	0	0	0	0	0
	4-5 ft	1	0	0	0	0	0	0	0

Table 3: Summary of Flooded Agricultural Land of Existing Conditions

Depth	500 Year (Acres)	200 Year (Acres)	100 Year (Acres)	50 Year (Acres)	25 Year (Acres)	10 Year (Acres)	5 Year (Acres)	2 Year (Acres)
0-1 ft	47.186	45.496	32.321	21.888	17.246	12.515	5.404	0.588

Depth	500 Year (Acres)	200 Year (Acres)	100 Year (Acres)	50 Year (Acres)	25 Year (Acres)	10 Year (Acres)	5 Year (Acres)	2 Year (Acres)
1-2 ft	0.000	113.881	87.709	76.689	62.597	44.330	18.922	0.007
2-3 ft	118.149	0.602	0.361	0.240	0.001	3.214	3.036	0.000
3-4 ft	0.000	10.801	9.935	7.601	2.501	0.005	1.514	0.000
4-5 ft	10.284	0.247	0.220	4.522	0.182	0.234	0.150	0.000
5-6 ft	0.000	5.273	4.786	0.074	0.000	0.000	0.000	0.000
6-7 ft	1.814	0.121	0.190	0.132	0.006	0.000	0.000	0.000
7-8 ft	0.000	0.000	0.000	0.000	0.004	0.000	0.000	0.000
8-9 ft	0.000	0.005	0.005	0.004	0.000	0.000	0.000	0.000
9-10 ft	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000
10-11 ft	0.000	0.002	0.002	0.000	0.000	0.000	0.000	0.000

Table 4: Summary Number of Flooded Road Crossings of Existing Conditions

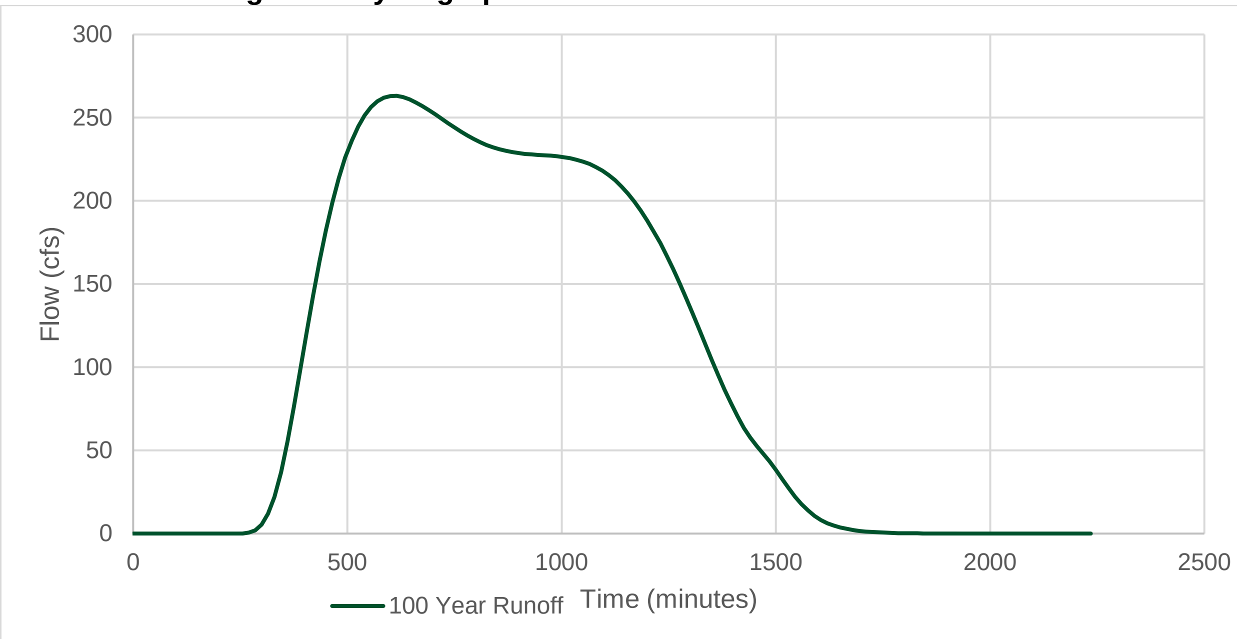
Depth	500 Year	200 Year	100 Year	50 Year	25 Year	10 Year	5 Year	2 Year
0-1 ft	7	9	10	5	3	1	4	11
1-2 ft	0	100	90	86	48	41	27	4
2-3 ft	113	0	0	1	0	7	5	0
3-4 ft	0	59	59	56	10	1	5	0
4-5 ft	53	0	0	11	1	1	1	0
5-6 ft	0	14	11	1	0	0	0	0
6-7 ft	8	0	0	0	0	0	0	0
7-8 ft	0	0	0	0	1	0	0	0
8-9 ft	1	1	1	1	0	0	0	0

2.2.2 Proposed System Model Analysis

The SMS model was updated to include the Freeman Allred Reservoir, Mill Race canal piping, and Point Ditch canal piping. The procedure for determining the principal and auxiliary spillways hydrographs meets the guidelines that are included in TR 210-60 Hydrology section. Precipitation data was obtained from the most recent National Oceanic and Atmospheric Administration (NOAA) National Weather Service (NWS) and runoff volumes were calculated using the NRCS runoff curve number procedure. Using the tables 2-1 and 2-2 in TR 210-60 hydrology section to determine the minimum hydrologic criteria for the principal and auxiliary spillways for high hazard dams. The precipitation data used in the analysis of spillways is the 100-year return period storm

The purposes of the Reservoir include irrigation storage, catch sediment, and provide water runoff retention. The volume allocated to storm water runoff was sized by finding the runoff volume of the Oak Creek Watershed for the 100-year storm event. Figure 1 shows the hydrograph for the 100-year storm minus a constant 8 cfs, which bypasses the Reservoir and is routed through the Spring City hydropower plant. The calculated area below the curve is the required volume of detention that prevents flooding from occurring downstream of the Reservoir. The calculated storm water runoff volume required for the Reservoir is 231 acre-ft and was calculated by partitioning the region into rectangles and summing the areas. The time step used for each rectangle was 0.25 hours.

Figure 1: Hydrograph Used to Calculate Reservoir Volume



The remainder of the proposed design of the Freeman Allred Reservoir is included below. The total volume is 1,034-acre ft with 231 acre-ft for storm water runoff retention. 703-acre-ft is designated as irrigation storage and an extra 100 acre-ft to catch sediment. The Reservoir has a wall height of 42 feet. The low-level outlet structure of the Reservoir is a 36” HDPE piped outlet and the emergency spillway is 37 feet above the Reservoir bottom and is 50 feet long.

In the proposed SMS model, the Reservoir was modeled as flows. When the inflow hydrograph indicated flows above the flood stage, flows were diverted into the Reservoir. The Reservoir was sufficient to limit flooding for the 100-year event and storm events with greater frequency. For the 200- and 500-year storm events, flows were diverted until the volume of water which could be stored in the Reservoir (231 acre-ft) was exceeded. Flow beyond the storage limit continued down the natural channel. There is flooding in the proposed 200- and 500-year events, through it is less than the existing flooding for the corresponding events because of the 231 acre-ft that was diverted at the beginning of the hydrograph. 5 shows the totalized impacts of the storm event scenarios in the SMS model. It is important to note that the Reservoir only decreased flooding on Oak Creek. The piped ditches on Canal Creek helped with flooding, but there is still no storage designed for the Canal Creek drainage, so flooding continues in all storm events.

Table 5: Totalized Flooding for Proposed System Scenario

Storm Event	Peak Flooding Before Detention (cfs)	Peak Flooding After Detention (cfs)	Flooding Volume Before Detention (acre-ft)	Flooding Volume After Detention (acre-ft)
2 Year	8.2	2.4	3.9	1.1

Storm Event	Peak Flooding Before Detention (cfs)	Peak Flooding After Detention (cfs)	Flooding Volume Before Detention (acre-ft)	Flooding Volume After Detention (acre-ft)
5 Year	60.3	29.4	43.2	19.9
10 Year	120.4	62.8	105.8	53.2
25 Year	219.9	119.0	231.7	122.2
50 Year	307.4	168.5	355.9	191.6
100 Year	435.4	235.8	508.3	277.6
200 Year	599.0	545.5	684.0	454.4
500 Year	857.9	775.3	955.1	726.9

The SMS model was again used to identify the number of residential homes, other buildings, roads, and agricultural land with would be flooded by each storm event (See Tables 6 through 8). Flood Maps are provided in Figures 10 through 16.

Table 6: Summary of Flooded Buildings with Proposed Reservoir

Storm Event	Depth Ranges	500 Year	200 Year	100 Year	50 Year	25 Year	10 Year	5 Year
Number of Residential Homes Flooded	0-1 ft	5	9	9	6	4	1	1
	1-2 ft	0	46	34	14	14	12	5
	2-3 ft	52	1	0	0	1	2	4
	3-4 ft	0	1	1	1	0	0	1
	4-5 ft	1	0	0	0	0	0	0
	5-6 ft	0	1	1	0	0	0	0
	6-7 ft	1	0	0	0	0	0	0
Number of Mobile Homes Flooded	0-1 ft	0	0	0	0	0	0	0
	1-2 ft	0	4	0	0	0	0	0
	2-3 ft	4	0	0	0	0	0	0
	3-4 ft	0	0	0	0	0	0	0
	4-5 ft	0	0	0	0	0	0	0
Number of Commercial Properties Flooded	0-1 ft	0	0	0	0	0	0	0
	1-2 ft	0	0	0	0	0	0	0
	2-3 ft	0	0	0	0	0	0	0
	3-4 ft	0	0	0	0	0	0	0
	4-5 ft	0	0	0	0	0	0	0
	5-6 ft	0	0	0	0	0	0	0
Number of Detached Garages, Sheds, and	0-1 ft	10	8	7	3	1	1	2
	1-2 ft	0	57	39	20	19	14	6
	2-3 ft	67	2	0	0	5	3	5
	3-4 ft	0	3	5	5	0	0	0

Storm Event	Depth Ranges	500 Year	200 Year	100 Year	50 Year	25 Year	10 Year	5 Year
Farming Buildings Flooded	4-5 ft	2	0	0	0	0	0	2
	5-6 ft	0	0	0	0	0	0	0
	6-7 ft	0	0	0	0	0	0	0
Number of Other Buildings Flooded	0-1 ft	0	0	0	0	0	0	0
	1-2 ft	0	1	1	1	0	0	0
	2-3 ft	1	0	0	0	0	0	0
	3-4 ft	0	0	0	0	0	0	0
	4-5 ft	0	0	0	0	0	0	0
Maximum Flood Depth	feet	17.0	15.4	15.1	14.9	13.5	11.7	9.2

Table 7: Summary of Flooded Agricultural Land with Proposed Reservoir

Depth	500 Year	200 Year	100 Year	50 Year	25 Year	10 Year	5 Year
0-1 ft	26.064	29.572	21.474	11.547	8.219	4.564	1.616
1-2 ft	0.000	94.162	36.804	23.710	20.097	11.561	4.596
2-3 ft	103.872	0.264	0.003	0.050	3.141	2.953	2.768
3-4 ft	0.000	3.357	3.396	3.176	0.002	0.004	1.469
4-5 ft	1.253	0.256	0.214	0.314	0.190	0.394	0.550
5-6 ft	0.000	0.133	0.162	0.007	0.005	0.000	0.061
6-7 ft	0.001	0.007	0.007	0.007	0.000	0.000	0.000
7-8 ft	0.000	0.000	0.000	0.000	0.002	0.000	0.000
8-9 ft	0.000	0.005	0.005	0.004	0.000	0.000	0.000
9-10 ft	0.000	0.000	0.000	0.001	0.000	0.000	0.000
10-11 ft	0.000	0.002	0.002	0.000	0.000	0.000	0.000

Table 8: Summary Number of Flooded Road Crossings with Proposed Reservoir

Depth	500 Year	200 Year	100 Year	50 Year	25 Year	10 Year	5 Year
0-1 ft	4	4	7	2	2	2	2
1-2 ft	0	63	29	19	17	14	4
2-3 ft	73	3	0	0	8	6	4
3-4 ft	0	13	12	8	1	1	3
4-5 ft	11	0	0	1	1	1	2
5-6 ft	0	2	1	0	1	0	1
6-7 ft	0	0	0	0	0	0	0
7-8 ft	0	0	0	0	0	0	0
8-9 ft	1	1	1	1	0	0	0

2.3 Flood Control Requirements

To be able to control and minimize flooding, a 1000-acre-foot Reservoir is sufficient for the Oak Creek Watershed. The Freeman Allred Reservoir will detain runoff water from the Oak Creek watershed to decrease the flood flowrate in Oak Creek and reduce the risk of downstream flooding.

2.4 Spillways

The principal spillway for the Reservoir is a 36” diameter HDPE low-level outlet Structure. The flow from the main outlet will be directed to the Last Chance Diversion located south of Oak Creek where the water can be delivered to the systems regulating ponds.

The auxiliary spillway for the Reservoir will be a 50 ft long concrete broad crested weir which will be armored with large rock. The weir will be 5 ft from the top of the embankment. The flow over the spillway will be directed to flow back to the existing drainage. The auxiliary spillway is designed to have a maximum flow rate of 270 cfs; this is just under the peak flow of 279 cfs that would flow in the drainage for the existing flood conditions.

3.0 Conclusions

This report is to present a summary of the methodology and results of the flood water and hydraulic and hydrology analysis conducted for Freeman Allred Reservoir as part of the Plan-EA. Key results of the analyses include the following:

- Flood water detention requirement is 231 acre-ft.

4.0 Statement of Limitations

This document represents J-U-B Engineers, Inc.’s professional judgement based on the information available at the time of its completion and as appropriate for the project Scope of Work. Services performed in developing the content of this document have been conducted in a manner consistent with that level and skill ordinarily exercised by members of the engineering profession currently practicing under similar conditions. No warranty, express or implied, is made.

5.0 References

Infowater Suite Version 12.4, Innovyze, 2019

ESRI ArcMAP Version 10.6.1

Aquaveo SMS Version 13.0

Aquaveo SMS Version 10.1

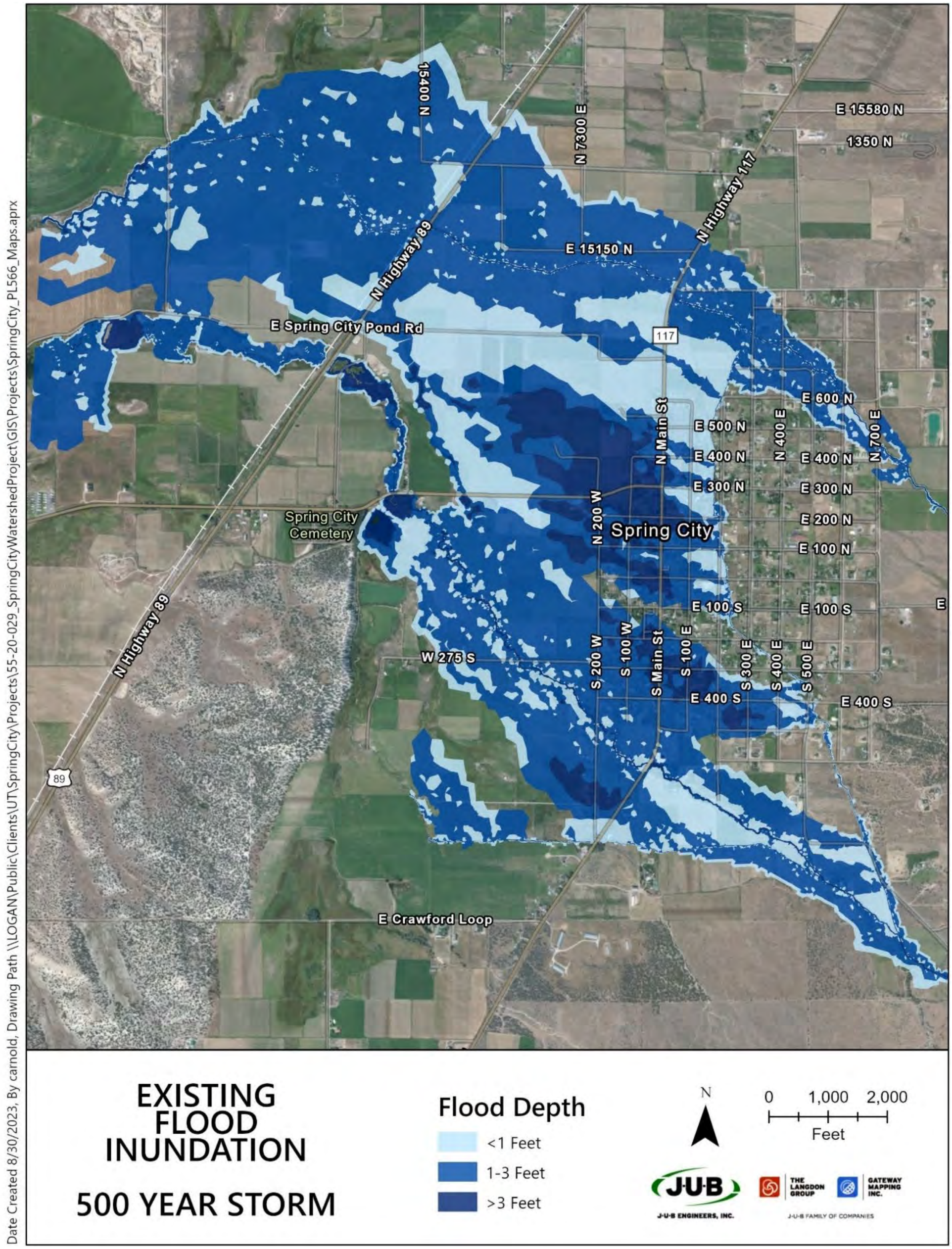


Figure 2: Existing 500-year Floodplain Depths (ft)

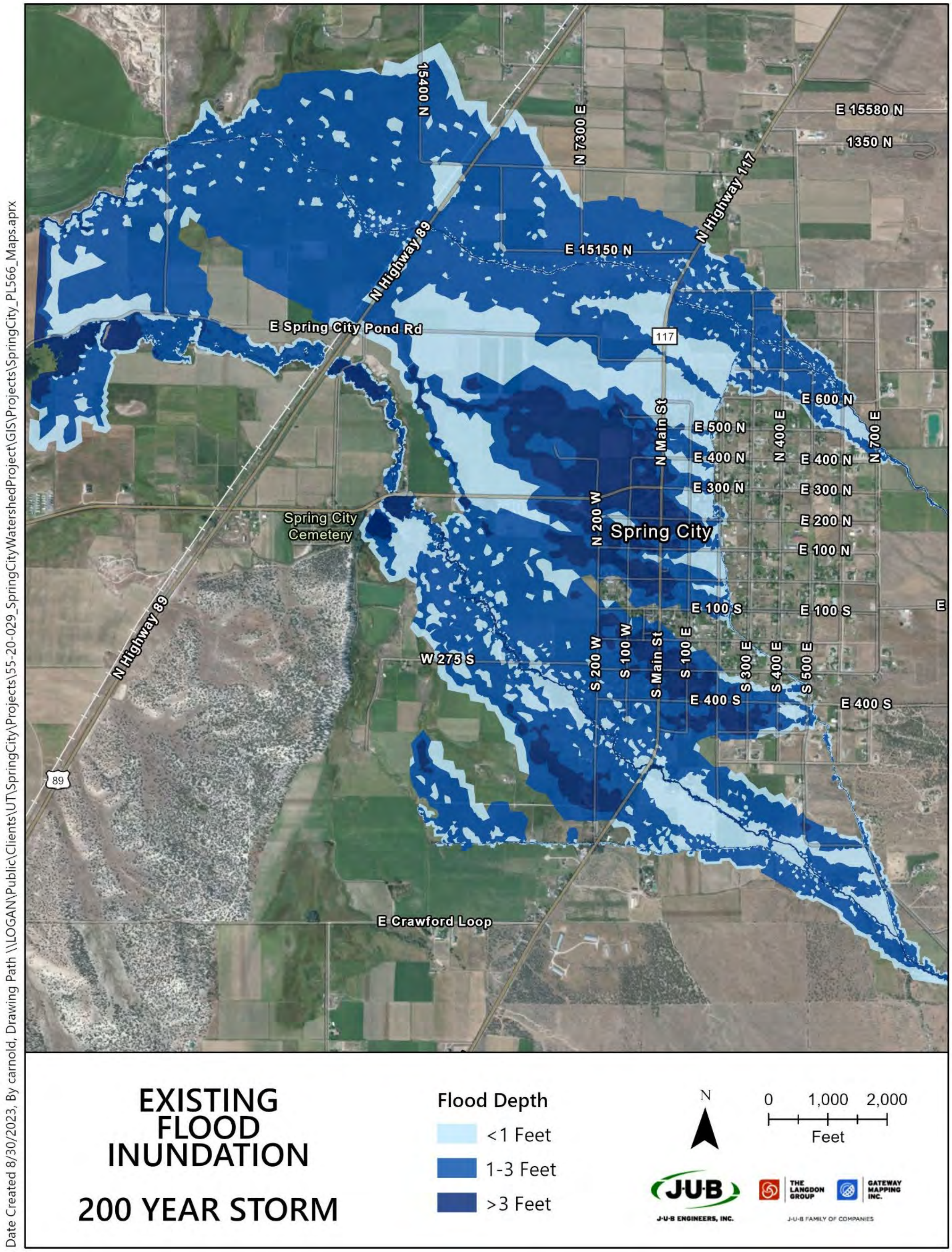


Figure 3: Existing 200-year Floodplain Depths (ft)

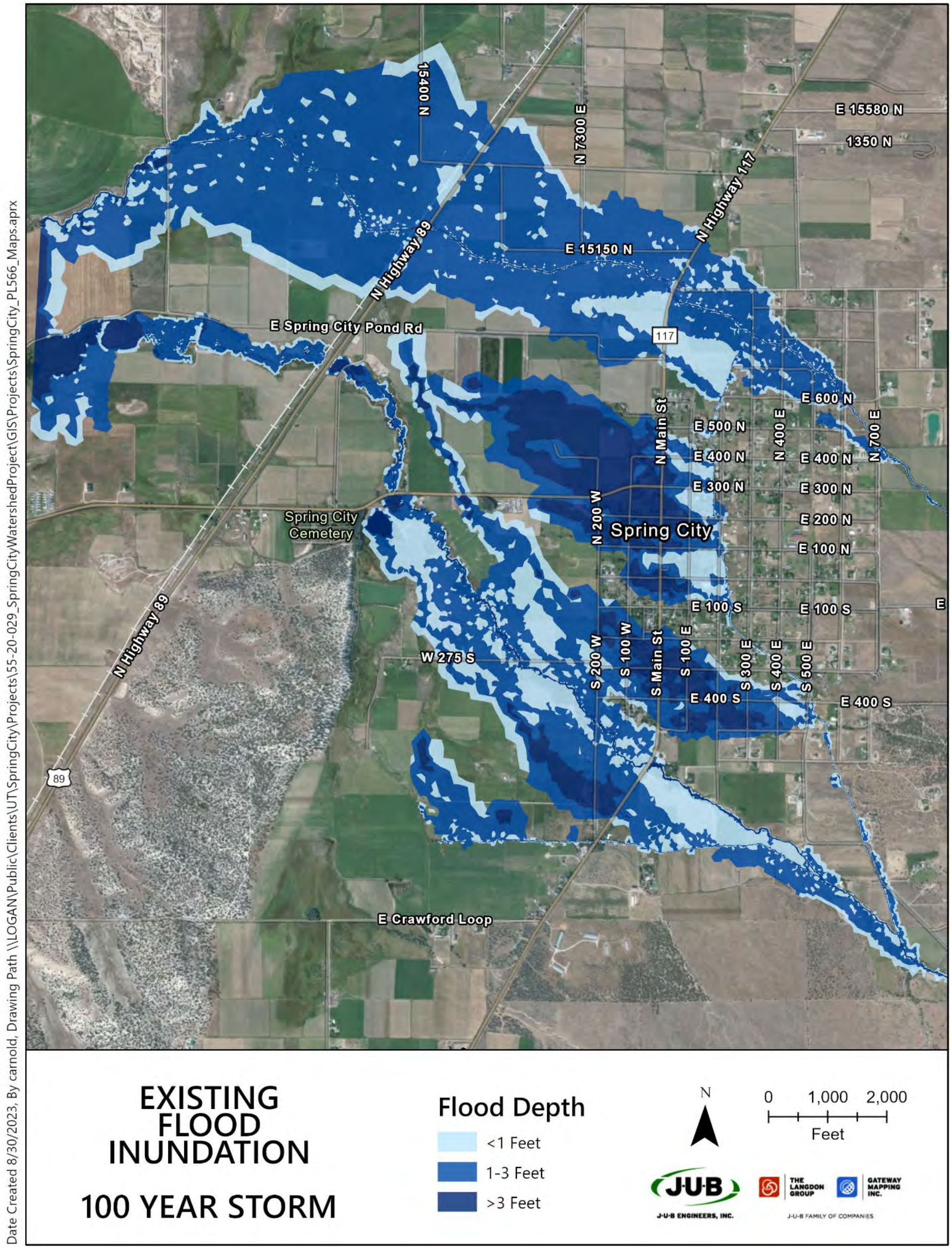


Figure 4: Existing 100-year Floodplain Depths (ft)

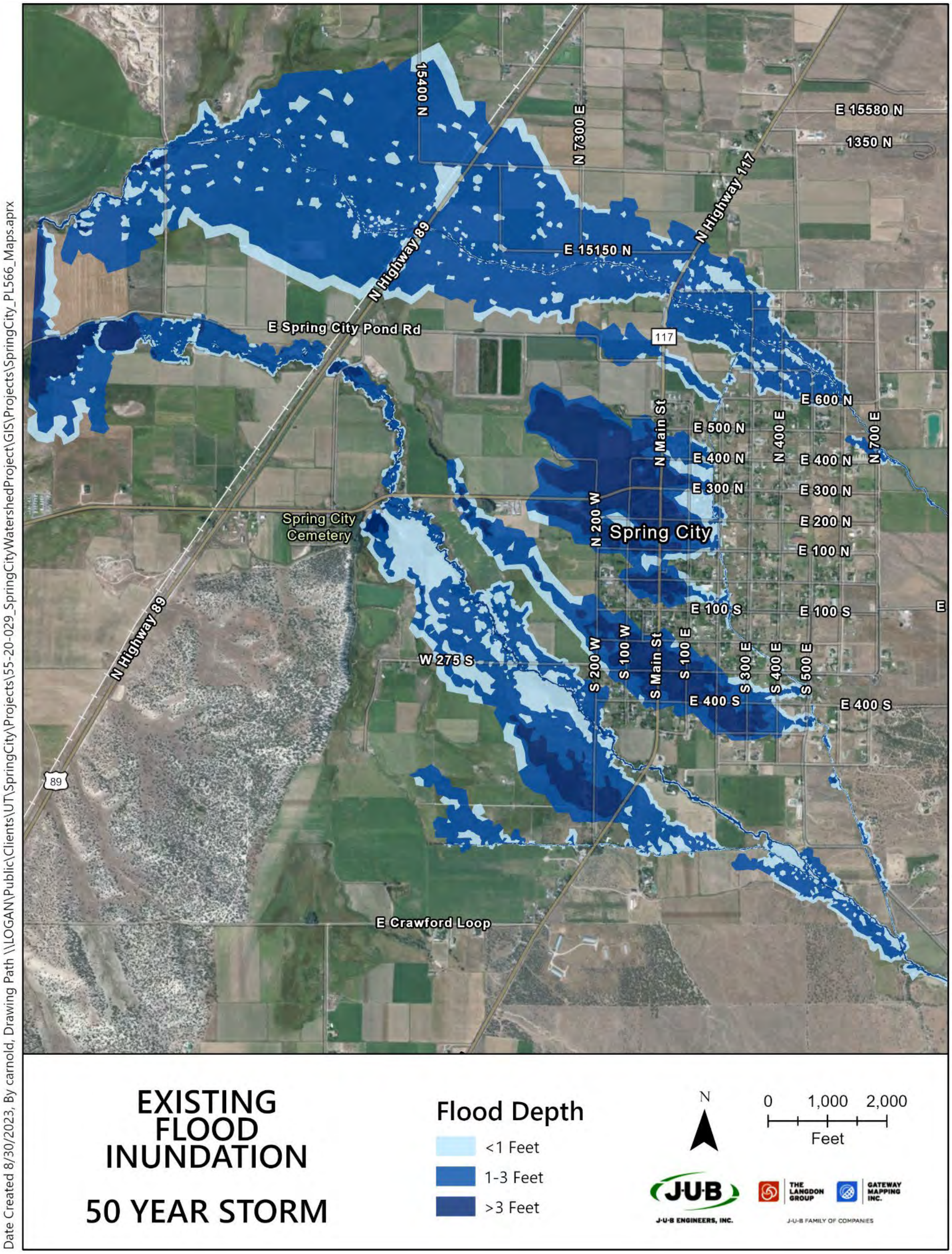


Figure 5: Existing 50-year Floodplain Depths (ft)

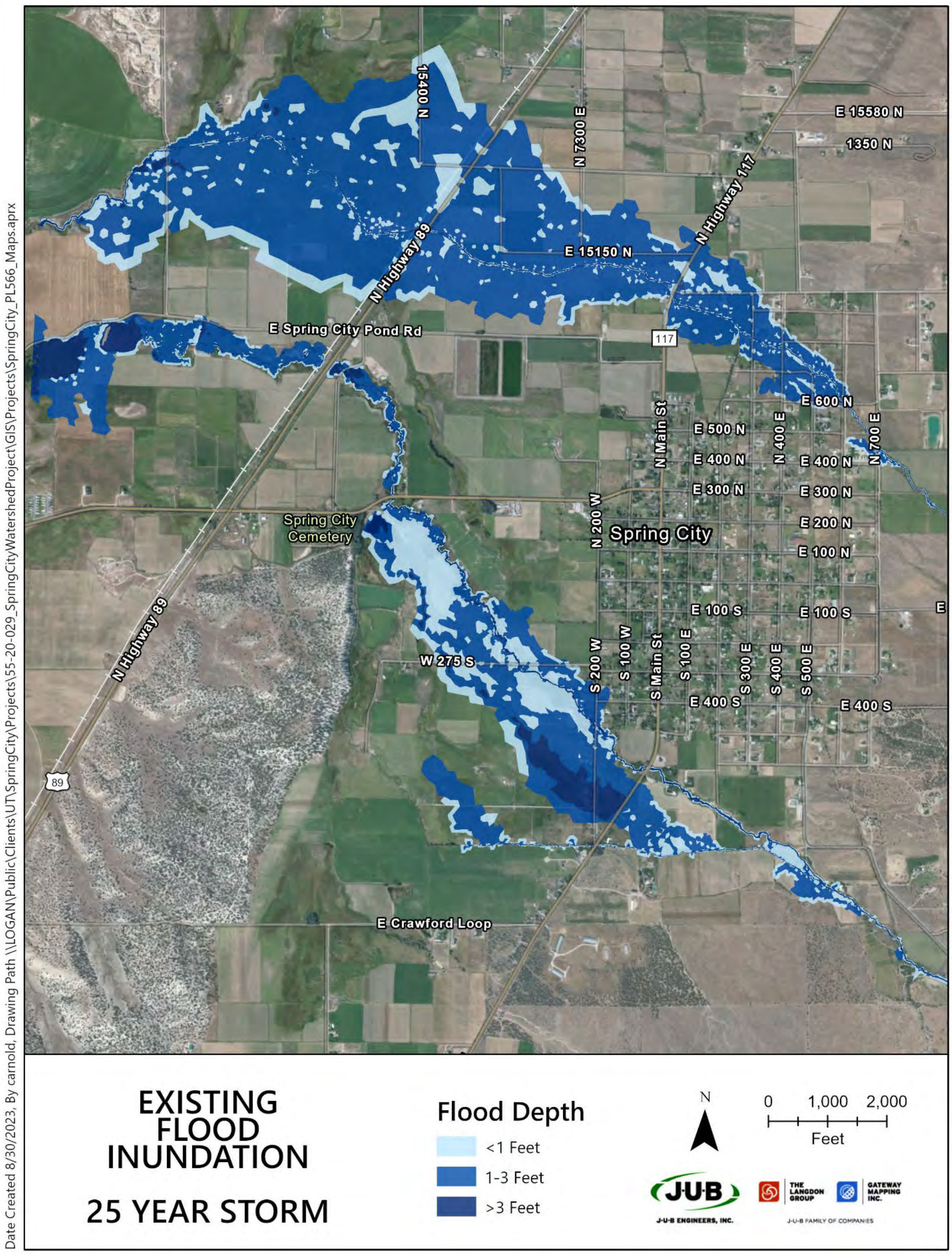


Figure 6: Existing 25-year Floodplain Depths (ft)

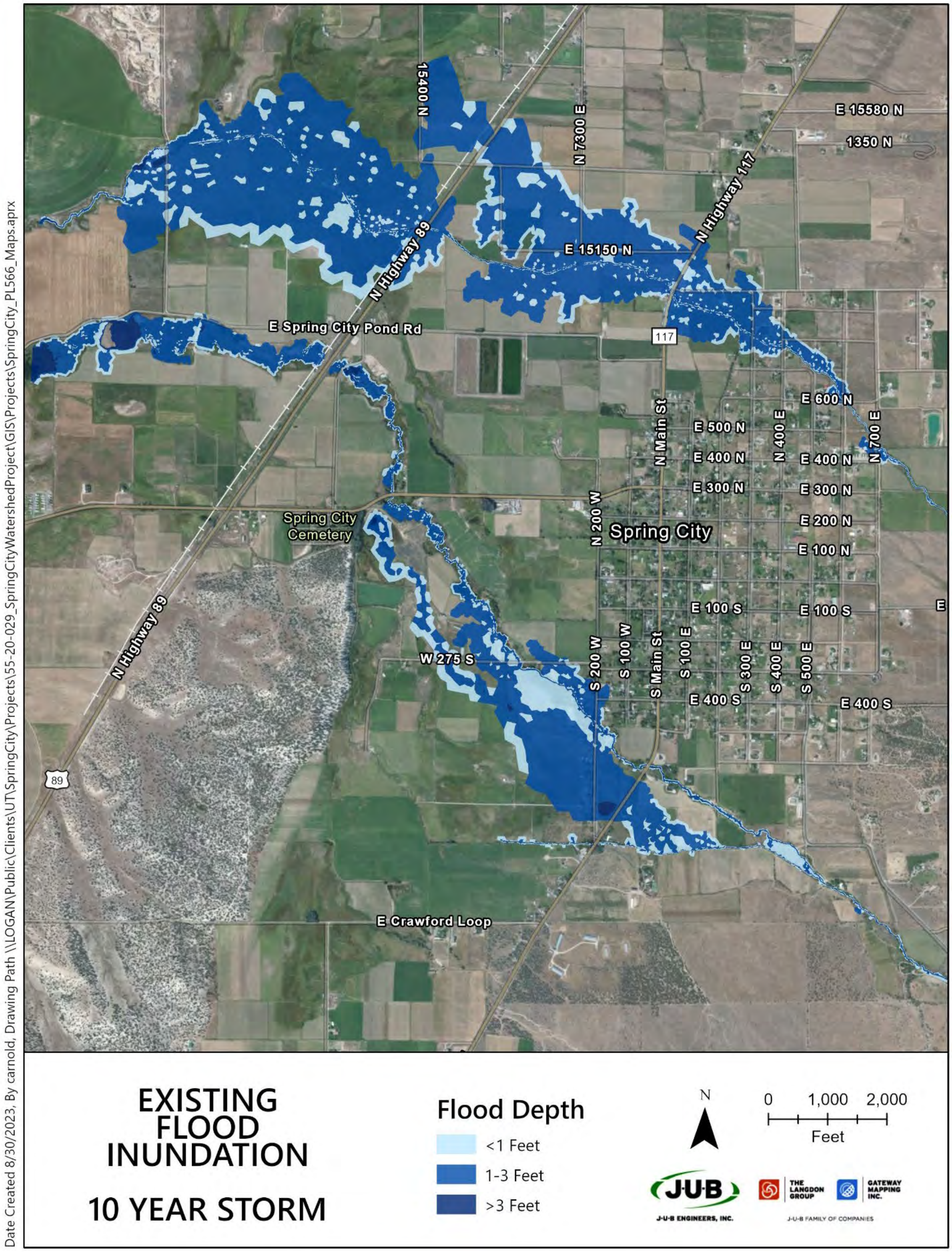


Figure 7: Existing 10-year Floodplain Depths (ft)

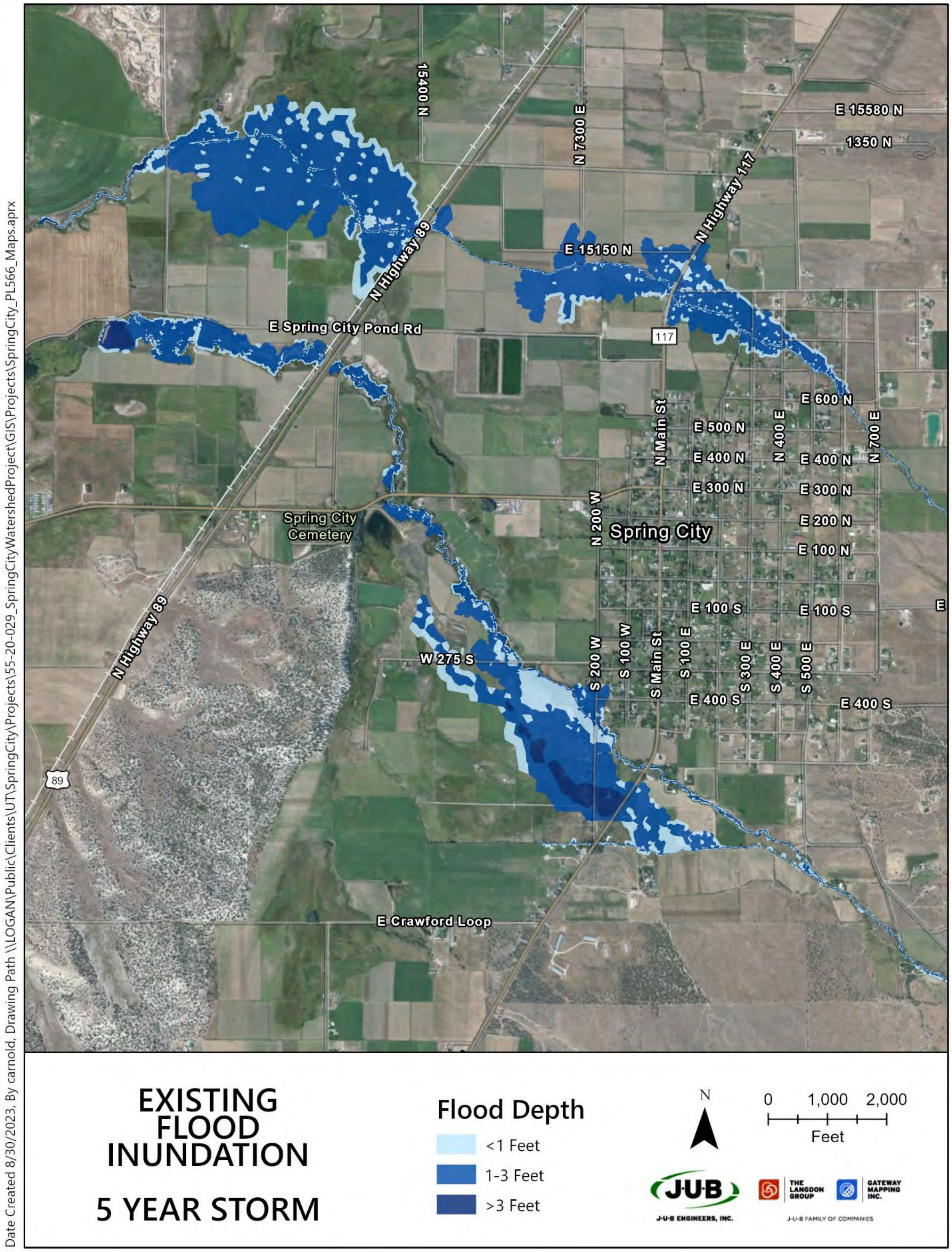


Figure 8: Existing 5-year Floodplain Depths (ft)

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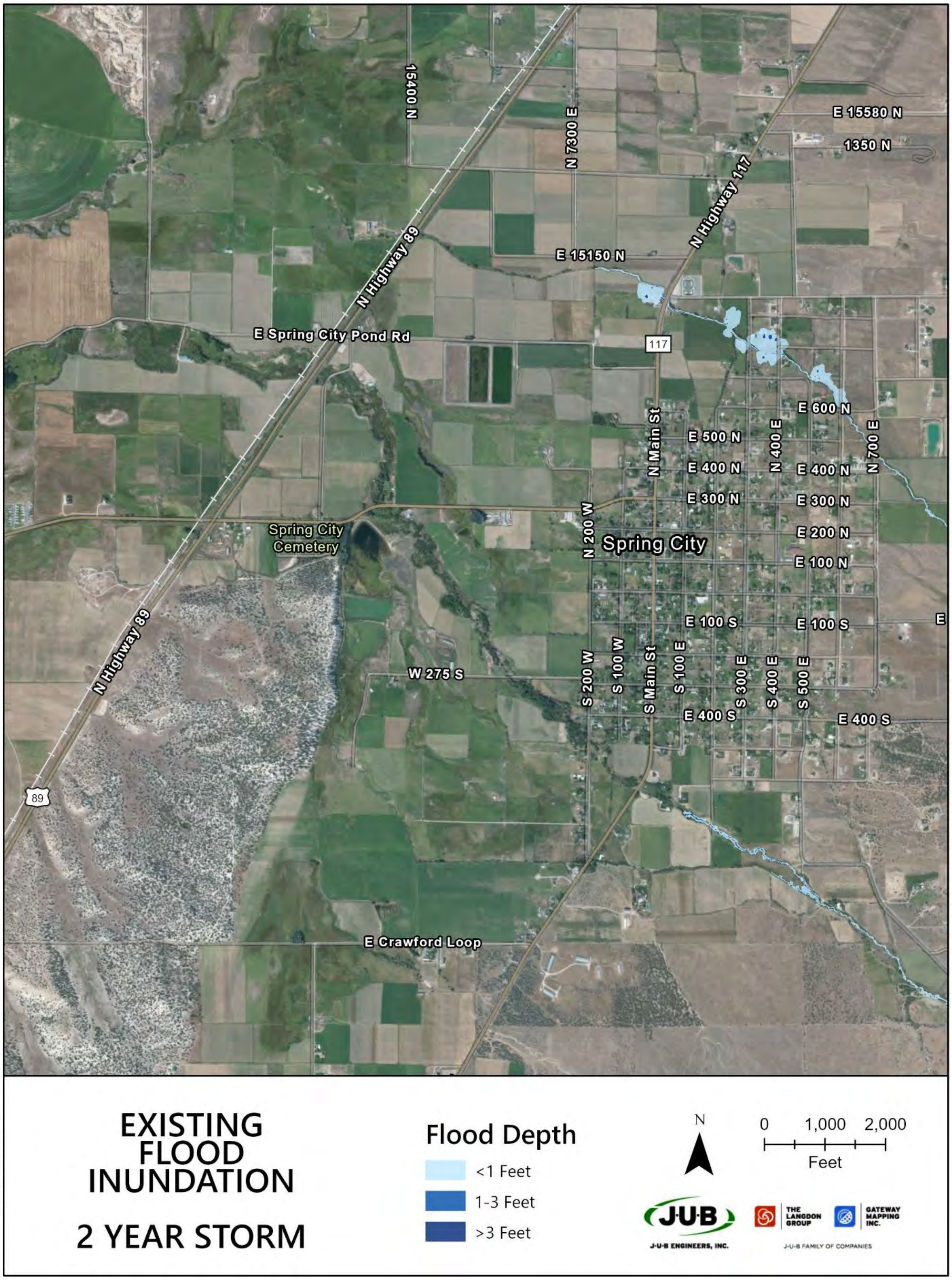

Figure 9: Existing 2-year Floodplain Depths (ft)

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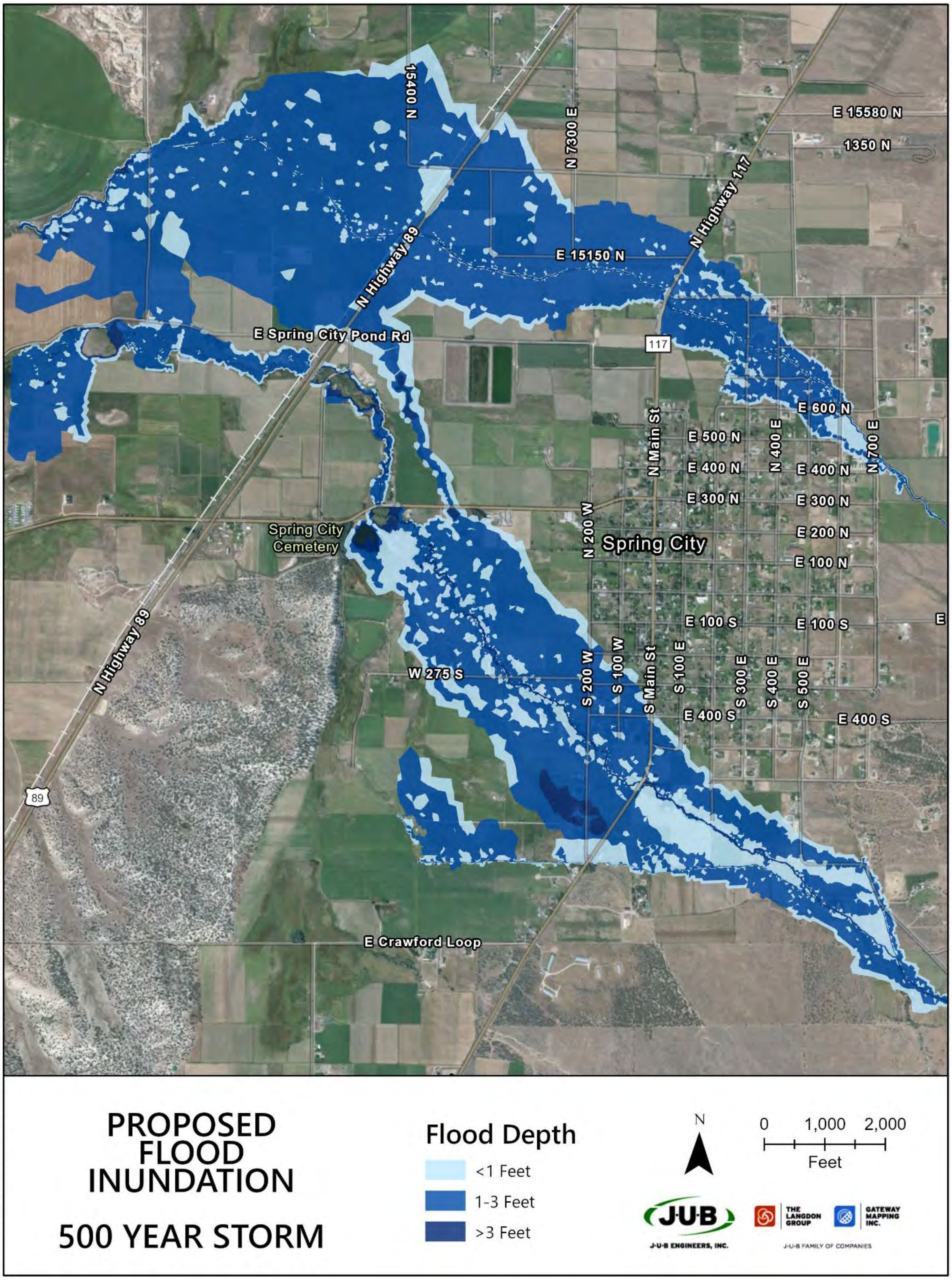

Figure 10: Proposed 500-year Floodplain Depths (ft)

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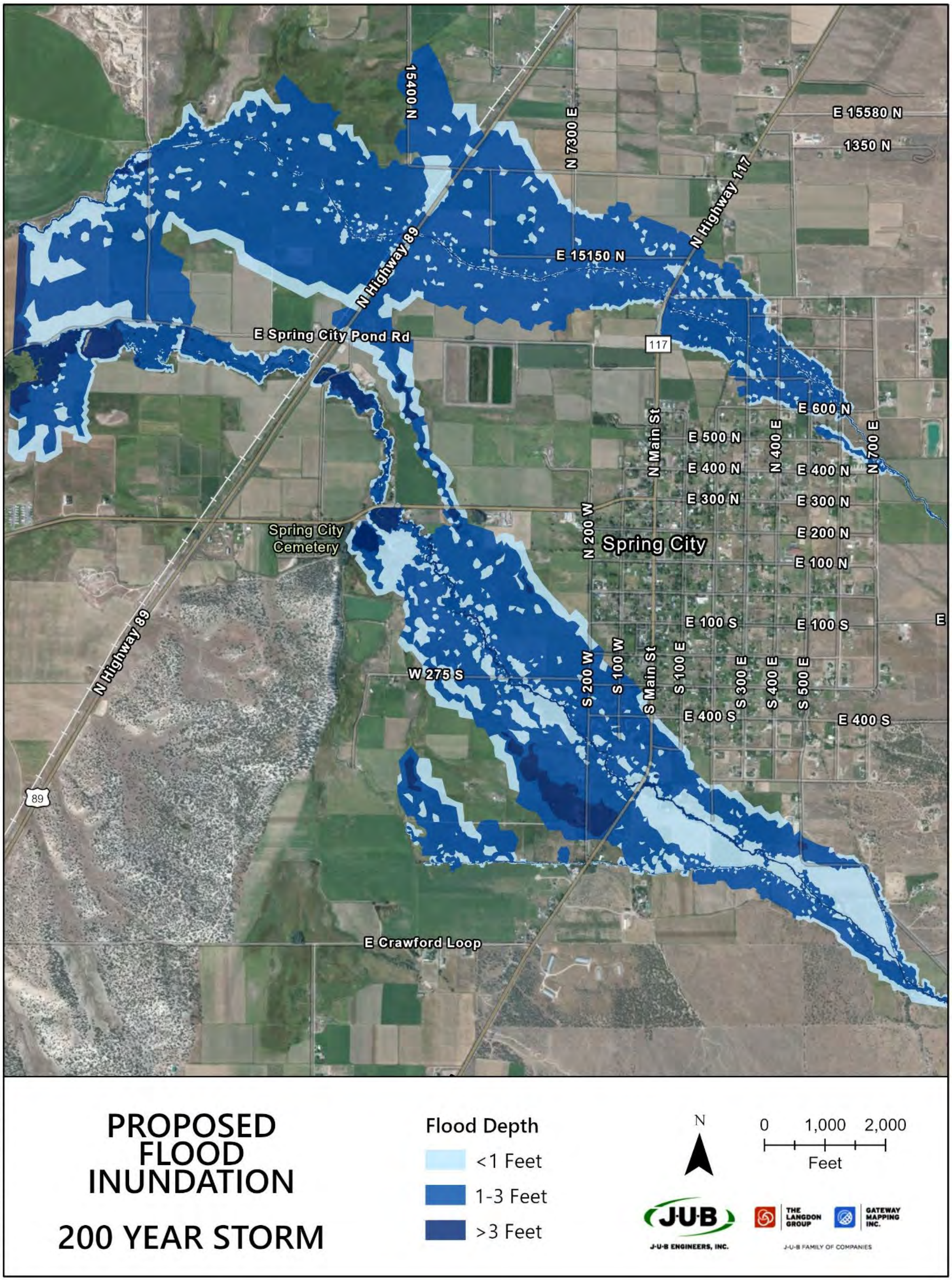

Figure 11: Proposed 200-year Floodplain Depths (ft)

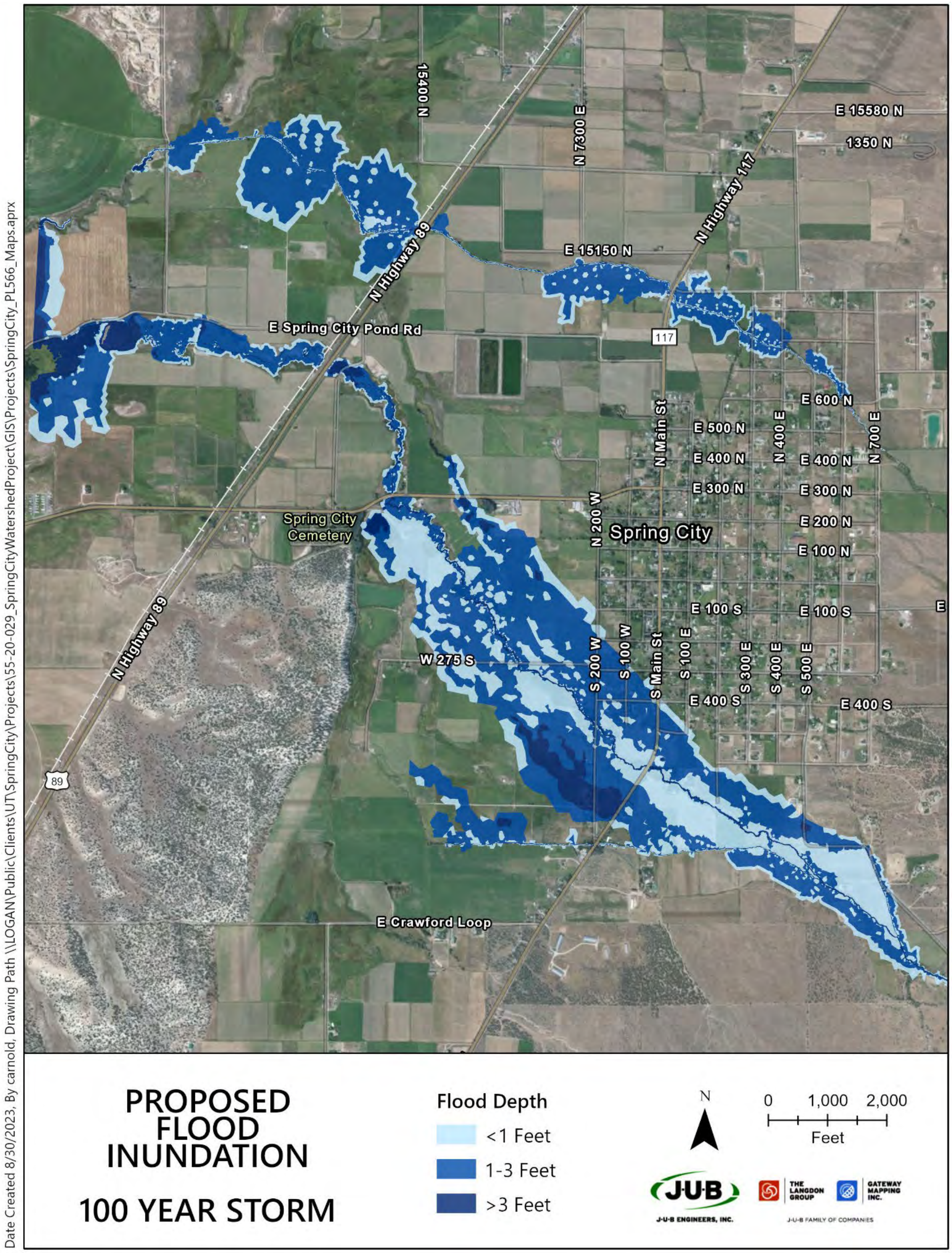

Figure 12: Proposed 100 year Floodplain Depths (ft)

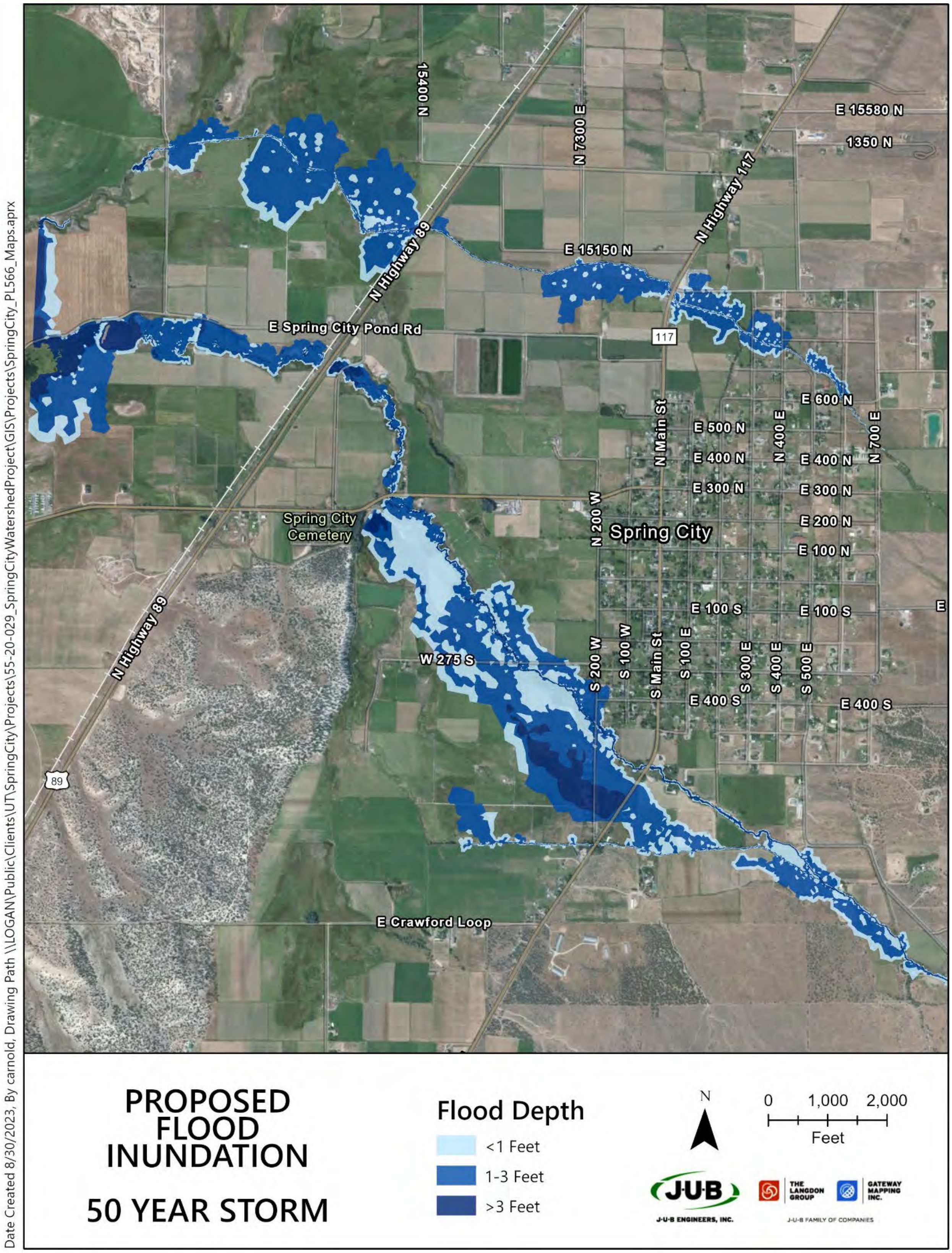

Figure 13: Proposed 50-year Floodplain Depths (ft)

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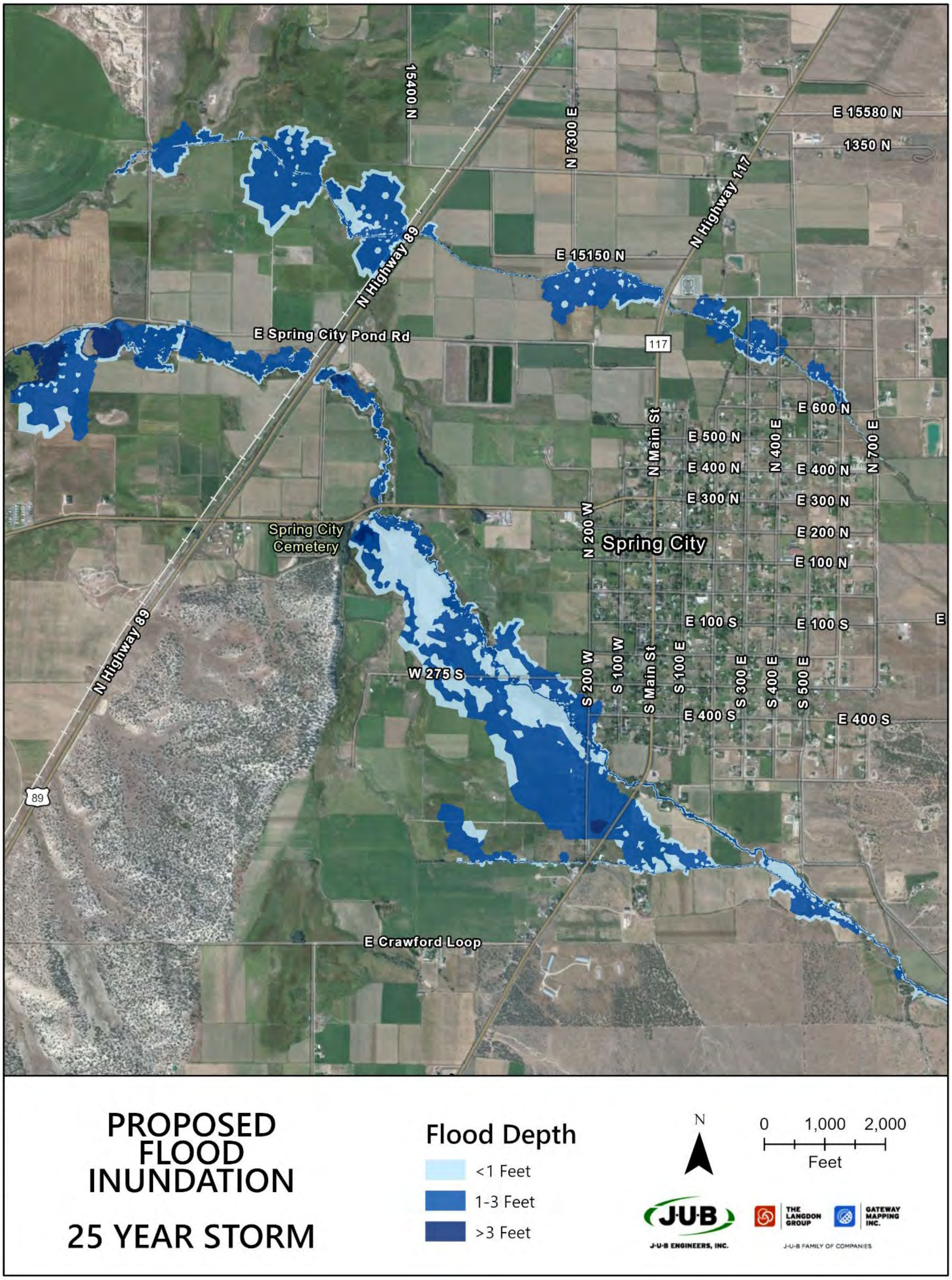

Figure 14: Proposed 25-year Floodplain Depths (ft)

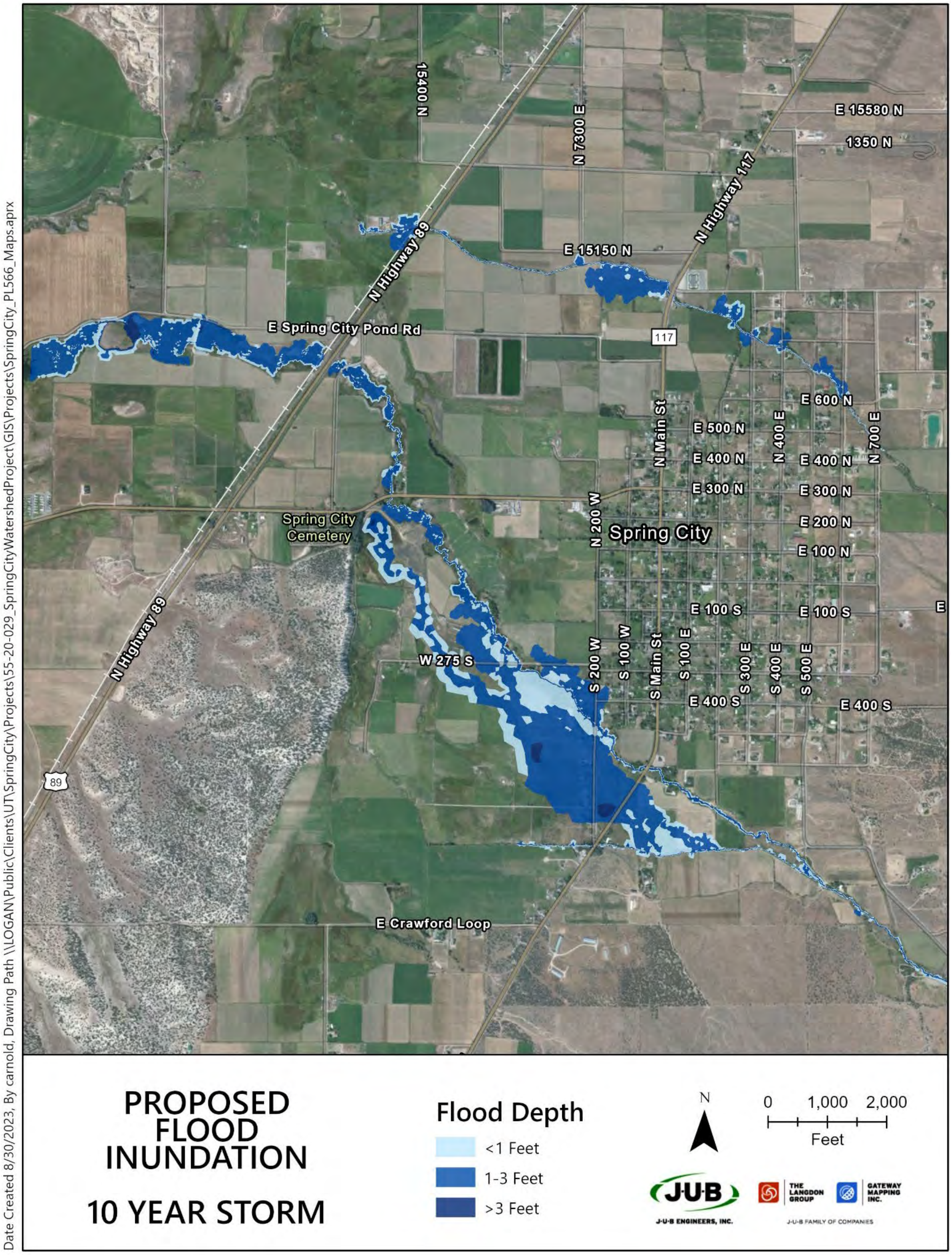

Figure 15: Proposed 10-year Floodplain Depths (ft)

Figure 16: Proposed 5-year Floodplain Depths (ft)

Table 9: 1000-Year WMS Inflow Hydrograph Oak Creek

Time (min)	Flow (cfs)	Time (min)	Flow (cfs)	Time (min)	Flow (cfs)	Time (min)	Flow (cfs)	Time (min)	Flow (cfs)
0	0.0	510	620.2	1020	428.2	1530	48.7	2040	0.0
15	0.0	525	622.7	1035	425.3	1545	39.4	2055	0.0
30	0.0	540	622.4	1050	422.0	1560	31.3	2070	0.0
45	0.0	555	619.8	1065	418.1	1575	24.4	2085	0.0
60	0.0	570	615.1	1080	413.6	1590	18.6	2100	0.0
75	0.0	585	608.7	1095	408.4	1605	14.2	2115	0.0
90	0.0	600	600.8	1110	402.5	1620	10.9	2130	0.0
105	0.0	615	591.9	1125	395.6	1635	8.4	2145	0.0
120	0.0	630	582.1	1140	387.8	1650	6.4	2160	0.0
135	0.0	645	571.9	1155	379.1	1665	4.9	2175	0.0
150	0.0	660	561.3	1170	369.3	1680	3.8	2190	0.0
165	0.0	675	550.7	1185	358.6	1695	2.9	2205	0.0
180	0.0	690	540.2	1200	346.9	1710	2.2	2220	0.0
195	0.4	705	530.0	1215	334.3	1725	1.6	2235	0.0
210	2.3	720	520.0	1230	320.8	1740	1.2		
225	7.9	735	510.5	1245	306.4	1755	0.9		
240	19.9	750	501.4	1260	291.2	1770	0.7		
255	40.2	765	493.0	1275	275.3	1785	0.5		
270	71.0	780	485.2	1290	258.8	1800	0.4		
285	111.3	795	478.1	1305	241.9	1815	0.3		
300	158.4	810	471.7	1320	224.7	1830	0.2		
315	209.9	825	466.0	1335	207.4	1845	0.1		
330	263.2	840	460.8	1350	190.2	1860	0.1		
345	315.9	855	456.3	1365	173.3	1875	0.1		
360	366.2	870	452.4	1380	157.1	1890	0.0		
375	412.7	885	448.9	1395	141.7	1905	0.0		
390	454.9	900	446.0	1410	127.5	1920	0.0		
405	492.2	915	443.3	1425	114.8	1935	0.0		
420	524.5	930	441.1	1440	104.1	1950	0.0		
435	551.7	945	439.1	1455	95.0	1965	0.0		
450	574.0	960	437.1	1470	86.8	1980	0.0		
465	591.7	975	435.1	1485	78.2	1995	0.0		
480	605.1	990	433.0	1500	68.8	2010	0.0		
495	614.4	1005	430.8	1515	58.7	2025	0.0		

Table 10: 500-Year WMS Inflow Hydrograph

Time (min)	Flow (cfs)	Time (min)	Flow (cfs)	Time (min)	Flow (cfs)	Time (min)	Flow (cfs)	Time (min)	Flow (cfs)
0	0.0	510	474.6	1020	354.1	1530	40.9	2040	0.0
15	0.0	525	479.8	1035	351.9	1545	33.2	2055	0.0
30	0.0	540	482.5	1050	349.4	1560	26.4	2070	0.0
45	0.0	555	483.1	1065	346.5	1575	20.6	2085	0.0
60	0.0	570	481.7	1080	343.0	1590	15.7	2100	0.0
75	0.0	585	478.8	1095	338.9	1605	12.0	2115	0.0
90	0.0	600	474.5	1110	334.2	1620	9.2	2130	0.0
105	0.0	615	469.1	1125	328.7	1635	7.1	2145	0.0
120	0.0	630	462.9	1140	322.4	1650	5.4	2160	0.0
135	0.0	645	456.1	1155	315.3	1665	4.2	2175	0.0
150	0.0	660	449.0	1170	307.3	1680	3.2	2190	0.0
165	0.0	675	441.6	1185	298.6	1695	2.4	2205	0.0
180	0.0	690	434.3	1200	289.0	1710	1.8	2220	0.0
195	0.0	705	427.0	1215	278.7	1725	1.4	2235	0.0
210	0.2	720	419.8	1230	267.6	1740	1.0		
225	1.2	735	412.9	1245	255.7	1755	0.8		
240	4.7	750	406.3	1260	243.1	1770	0.6		
255	12.6	765	400.1	1275	229.9	1785	0.4		
270	26.5	780	394.4	1290	216.3	1800	0.3		
285	48.1	795	389.2	1305	202.2	1815	0.2		
300	77.8	810	384.5	1320	187.9	1830	0.2		
315	113.3	825	380.4	1335	173.4	1845	0.1		
330	152.6	840	376.6	1350	159.1	1860	0.1		
345	193.8	855	373.4	1365	145.1	1875	0.1		
360	235.0	870	370.6	1380	131.5	1890	0.0		
375	274.6	885	368.2	1395	118.7	1905	0.0		
390	311.5	900	366.1	1410	106.8	1920	0.0		
405	345.1	915	364.3	1425	96.2	1935	0.0		
420	374.9	930	362.8	1440	87.2	1950	0.0		
435	400.7	945	361.5	1455	79.6	1965	0.0		
450	422.7	960	360.2	1470	72.7	1980	0.0		
465	440.9	975	358.9	1485	65.6	1995	0.0		
480	455.4	990	357.5	1500	57.7	2010	0.0		
495	466.6	1005	355.9	1515	49.3	2025	0.0		

Table 11: 200-Year WMS Inflow Hydrograph

Time (min)	Flow (cfs)	Time (min)	Flow (cfs)	Time (min)	Flow (cfs)	Time (min)	Flow (cfs)	Time (min)	Flow (cfs)
0	0.0	510	331.0	1020	278.0	1530	32.9	2040	0.0
15	0.0	525	338.4	1035	276.7	1545	26.7	2055	0.0
30	0.0	540	343.7	1050	275.0	1560	21.2	2070	0.0
45	0.0	555	347.0	1065	272.9	1575	16.6	2085	0.0
60	0.0	570	348.8	1080	270.4	1590	12.7	2100	0.0
75	0.0	585	349.0	1095	267.5	1605	9.7	2115	0.0
90	0.0	600	348.0	1110	264.0	1620	7.5	2130	0.0
105	0.0	615	346.0	1125	259.9	1635	5.7	2145	0.0
120	0.0	630	343.2	1140	255.2	1650	4.4	2160	0.0
135	0.0	645	339.7	1155	249.7	1665	3.4	2175	0.0
150	0.0	660	335.8	1170	243.6	1680	2.6	2190	0.0
165	0.0	675	331.6	1185	236.9	1695	2.0	2205	0.0
180	0.0	690	327.2	1200	229.4	1710	1.5	2220	0.0
195	0.0	705	322.8	1215	221.4	1725	1.1	2235	0.0
210	0.0	720	318.4	1230	212.7	1740	0.9		
225	0.0	735	314.0	1245	203.3	1755	0.6		
240	0.3	750	309.8	1260	193.5	1770	0.5		
255	1.5	765	305.8	1275	183.1	1785	0.4		
270	4.8	780	302.2	1290	172.3	1800	0.3		
285	11.6	795	298.9	1305	161.2	1815	0.2		
300	23.1	810	295.9	1320	149.9	1830	0.1		
315	40.4	825	293.2	1335	138.4	1845	0.1		
330	63.2	840	290.9	1350	127.0	1860	0.1		
345	89.8	855	288.9	1365	115.9	1875	0.0		
360	118.8	870	287.2	1380	105.1	1890	0.0		
375	148.8	885	285.8	1395	94.9	1905	0.0		
390	178.4	900	284.6	1410	85.4	1920	0.0		
405	206.5	915	283.6	1425	77.0	1935	0.0		
420	232.4	930	282.8	1440	69.8	1950	0.0		
435	255.8	945	282.2	1455	63.7	1965	0.0		
450	276.3	960	281.5	1470	58.2	1980	0.0		
465	294.1	975	280.9	1485	52.5	1995	0.0		
480	309.0	990	280.1	1500	46.3	2010	0.0		
495	321.3	1005	279.2	1515	39.6	2025	0.0		

Table 12: 100-Year WMS Inflow Hydrograph

Time (min)	Flow (cfs)	Time (min)	Flow (cfs)	Time (min)	Flow (cfs)	Time (min)	Flow (cfs)	Time (min)	Flow (cfs)
0	0.0	510	236.3	1020	225.6	1530	27.3	2040	0.0
15	0.0	525	244.7	1035	224.7	1545	22.1	2055	0.0
30	0.0	540	251.3	1050	223.6	1560	17.6	2070	0.0
45	0.0	555	256.3	1065	222.1	1575	13.8	2085	0.0
60	0.0	570	259.8	1080	220.3	1590	10.6	2100	0.0
75	0.0	585	262.0	1095	218.1	1605	8.1	2115	0.0
90	0.0	600	263.0	1110	215.5	1620	6.2	2130	0.0
105	0.0	615	263.1	1125	212.3	1635	4.8	2145	0.0
120	0.0	630	262.4	1140	208.6	1650	3.7	2160	0.0
135	0.0	645	261.0	1155	204.3	1665	2.8	2175	0.0
150	0.0	660	259.2	1170	199.5	1680	2.2	2190	0.0
165	0.0	675	257.0	1185	194.1	1695	1.6	2205	0.0
180	0.0	690	254.6	1200	188.1	1710	1.3	2220	0.0
195	0.0	705	252.0	1215	181.6	1725	0.9	2235	0.0
210	0.0	720	249.3	1230	174.6	1740	0.7		
225	0.0	735	246.7	1245	167.1	1755	0.5		
240	0.0	750	244.0	1260	159.0	1770	0.4		
255	0.1	765	241.5	1275	150.6	1785	0.3		
270	0.5	780	239.2	1290	141.8	1800	0.2		
285	2.0	795	237.1	1305	132.7	1815	0.2		
300	5.4	810	235.2	1320	123.4	1830	0.1		
315	11.9	825	233.6	1335	114.1	1845	0.1		
330	22.0	840	232.1	1350	104.7	1860	0.1		
345	36.9	855	231.0	1365	95.6	1875	0.0		
360	55.5	870	230.0	1380	86.7	1890	0.0		
375	76.4	885	229.2	1395	78.3	1905	0.0		
390	98.7	900	228.6	1410	70.5	1920	0.0		
405	121.3	915	228.2	1425	63.6	1935	0.0		
420	143.2	930	227.8	1440	57.6	1950	0.0		
435	163.6	945	227.6	1455	52.7	1965	0.0		
450	182.3	960	227.4	1470	48.1	1980	0.0		
465	199.0	975	227.1	1485	43.4	1995	0.0		
480	213.5	990	226.7	1500	38.3	2010	0.0		
495	225.9	1005	226.3	1515	32.8	2025	0.0		

Table 13: 50-Year WMS Inflow Hydrograph

Time (min)	Flow (cfs)	Time (min)	Flow (cfs)	Time (min)	Flow (cfs)	Time (min)	Flow (cfs)	Time (min)	Flow (cfs)
0	0.0	510	150.8	1020	175.8	1530	21.8	2040	0.0
15	0.0	525	159.7	1035	175.4	1545	17.8	2055	0.0
30	0.0	540	167.1	1050	174.7	1560	14.2	2070	0.0
45	0.0	555	173.3	1065	173.8	1575	11.1	2085	0.0
60	0.0	570	178.1	1080	172.6	1590	8.6	2100	0.0
75	0.0	585	181.8	1095	171.1	1605	6.6	2115	0.0
90	0.0	600	184.5	1110	169.2	1620	5.1	2130	0.0
105	0.0	615	186.4	1125	166.9	1635	3.9	2145	0.0
120	0.0	630	187.4	1140	164.2	1650	3.0	2160	0.0
135	0.0	645	187.9	1155	161.0	1665	2.3	2175	0.0
150	0.0	660	187.9	1170	157.3	1680	1.8	2190	0.0
165	0.0	675	187.4	1185	153.2	1695	1.3	2205	0.0
180	0.0	690	186.7	1200	148.7	1710	1.0	2220	0.0
195	0.0	705	185.8	1215	143.7	1725	0.8	2235	0.0
210	0.0	720	184.7	1230	138.2	1740	0.6		
225	0.0	735	183.5	1245	132.4	1755	0.4		
240	0.0	750	182.3	1260	126.1	1770	0.3		
255	0.0	765	181.1	1275	119.5	1785	0.2		
270	0.0	780	180.0	1290	112.6	1800	0.2		
285	0.1	795	179.0	1305	105.5	1815	0.1		
300	0.4	810	178.1	1320	98.2	1830	0.1		
315	1.4	825	177.4	1335	90.8	1845	0.1		
330	3.9	840	176.7	1350	83.4	1860	0.0		
345	8.3	855	176.3	1365	76.1	1875	0.0		
360	15.4	870	176.0	1380	69.1	1890	0.0		
375	25.7	885	175.8	1395	62.4	1905	0.0		
390	38.8	900	175.7	1410	56.3	1920	0.0		
405	53.5	915	175.7	1425	50.7	1935	0.0		
420	69.4	930	175.8	1440	46.0	1950	0.0		
435	85.3	945	175.9	1455	42.0	1965	0.0		
450	100.9	960	176.0	1470	38.4	1980	0.0		
465	115.4	975	176.1	1485	34.7	1995	0.0		
480	128.7	990	176.1	1500	30.6	2010	0.0		
495	140.5	1005	176.0	1515	26.2	2025	0.0		

Table 14: 25-Year WMS Inflow Hydrograph

Time (min)	Flow (cfs)	Time (min)	Flow (cfs)	Time (min)	Flow (cfs)	Time (min)	Flow (cfs)	Time (min)	Flow (cfs)
0	0.0	510	81.1	1020	131.8	1530	17.0	2040	0.0
15	0.0	525	89.5	1035	131.7	1545	13.8	2055	0.0
30	0.0	540	97.0	1050	131.5	1560	11.1	2070	0.0
45	0.0	555	103.5	1065	131.1	1575	8.7	2085	0.0
60	0.0	570	109.1	1080	130.4	1590	6.7	2100	0.0
75	0.0	585	113.8	1095	129.5	1605	5.2	2115	0.0
90	0.0	600	117.6	1110	128.2	1620	4.0	2130	0.0
105	0.0	615	120.7	1125	126.7	1635	3.1	2145	0.0
120	0.0	630	123.2	1140	124.8	1650	2.4	2160	0.0
135	0.0	645	125.0	1155	122.6	1665	1.8	2175	0.0
150	0.0	660	126.4	1170	120.0	1680	1.4	2190	0.0
165	0.0	675	127.4	1185	117.0	1695	1.1	2205	0.0
180	0.0	690	128.0	1200	113.6	1710	0.8	2220	0.0
195	0.0	705	128.4	1215	109.9	1725	0.6	2235	0.0
210	0.0	720	128.6	1230	105.9	1740	0.5		
225	0.0	735	128.6	1245	101.5	1755	0.4		
240	0.0	750	128.5	1260	96.8	1770	0.3		
255	0.0	765	128.4	1275	91.8	1785	0.2		
270	0.0	780	128.3	1290	86.6	1800	0.1		
285	0.0	795	128.2	1305	81.2	1815	0.1		
300	0.0	810	128.2	1320	75.6	1830	0.1		
315	0.0	825	128.2	1335	70.0	1845	0.1		
330	0.1	840	128.2	1350	64.3	1860	0.0		
345	0.6	855	128.3	1365	58.8	1875	0.0		
360	1.7	870	128.5	1380	53.4	1890	0.0		
375	3.9	885	128.8	1395	48.3	1905	0.0		
390	7.6	900	129.1	1410	43.5	1920	0.0		
405	13.2	915	129.5	1425	39.2	1935	0.0		
420	20.9	930	129.9	1440	35.6	1950	0.0		
435	30.1	945	130.4	1455	32.5	1965	0.0		
450	40.3	960	130.8	1470	29.8	1980	0.0		
465	51.0	975	131.2	1485	26.9	1995	0.0		
480	61.6	990	131.5	1500	23.8	2010	0.0		
495	71.7	1005	131.7	1515	20.4	2025	0.0		

Table 15: 10-Year WMS Inflow Hydrograph

Time (min)	Flow (cfs)	Time (min)	Flow (cfs)	Time (min)	Flow (cfs)	Time (min)	Flow (cfs)	Time (min)	Flow (cfs)
0	0.0	510	13.2	1020	78.0	1530	11.0	2040	0.0
15	0.0	525	17.8	1035	78.4	1545	9.0	2055	0.0
30	0.0	540	22.8	1050	78.6	1560	7.2	2070	0.0
45	0.0	555	27.9	1065	78.7	1575	5.7	2085	0.0
60	0.0	570	32.8	1080	78.6	1590	4.4	2100	0.0
75	0.0	585	37.4	1095	78.4	1605	3.4	2115	0.0
90	0.0	600	41.6	1110	78.0	1620	2.6	2130	0.0
105	0.0	615	45.4	1125	77.3	1635	2.0	2145	0.0
120	0.0	630	48.8	1140	76.4	1650	1.6	2160	0.0
135	0.0	645	51.7	1155	75.3	1665	1.2	2175	0.0
150	0.0	660	54.4	1170	73.9	1680	0.9	2190	0.0
165	0.0	675	56.7	1185	72.3	1695	0.7	2205	0.0
180	0.0	690	58.6	1200	70.4	1710	0.5	2220	0.0
195	0.0	705	60.4	1215	68.3	1725	0.4	2235	0.0
210	0.0	720	61.9	1230	66.0	1740	0.3		
225	0.0	735	63.2	1245	63.4	1755	0.2		
240	0.0	750	64.3	1260	60.6	1770	0.2		
255	0.0	765	65.4	1275	57.6	1785	0.1		
270	0.0	780	66.3	1290	54.4	1800	0.1		
285	0.0	795	67.2	1305	51.1	1815	0.1		
300	0.0	810	68.0	1320	47.7	1830	0.1		
315	0.0	825	68.8	1335	44.2	1845	0.0		
330	0.0	840	69.6	1350	40.7	1860	0.0		
345	0.0	855	70.4	1365	37.3	1875	0.0		
360	0.0	870	71.1	1380	33.9	1890	0.0		
375	0.0	885	71.9	1395	30.7	1905	0.0		
390	0.0	900	72.7	1410	27.7	1920	0.0		
405	0.1	915	73.5	1425	25.0	1935	0.0		
420	0.3	930	74.2	1440	22.7	1950	0.0		
435	0.9	945	75.0	1455	20.8	1965	0.0		
450	1.9	960	75.7	1470	19.0	1980	0.0		
465	3.5	975	76.4	1485	17.2	1995	0.0		
480	5.9	990	77.0	1500	15.2	2010	0.0		
495	9.0	1005	77.6	1515	13.1	2025	0.0		

Table 16: 5-Year WMS Inflow Hydrograph

Time (min)	Flow (cfs)	Time (min)	Flow (cfs)	Time (min)	Flow (cfs)	Time (min)	Flow (cfs)	Time (min)	Flow (cfs)
0	0.0	510	0.2	1020	45.0	1530	7.1	2040	0.0
15	0.0	525	0.6	1035	45.6	1545	5.9	2055	0.0
30	0.0	540	1.0	1050	46.0	1560	4.7	2070	0.0
45	0.0	555	1.8	1065	46.4	1575	3.7	2085	0.0
60	0.0	570	2.7	1080	46.7	1590	2.9	2100	0.0
75	0.0	585	4.0	1095	46.8	1605	2.3	2115	0.0
90	0.0	600	5.6	1110	46.9	1620	1.8	2130	0.0
105	0.0	615	7.6	1125	46.7	1635	1.4	2145	0.0
120	0.0	630	9.9	1140	46.4	1650	1.0	2160	0.0
135	0.0	645	12.2	1155	46.0	1665	0.8	2175	0.0
150	0.0	660	14.6	1170	45.4	1680	0.6	2190	0.0
165	0.0	675	16.9	1185	44.6	1695	0.5	2205	0.0
180	0.0	690	19.1	1200	43.6	1710	0.4	2220	0.0
195	0.0	705	21.1	1215	42.4	1725	0.3	2235	0.0
210	0.0	720	23.0	1230	41.1	1740	0.2		
225	0.0	735	24.8	1245	39.7	1755	0.2		
240	0.0	750	26.4	1260	38.0	1770	0.1		
255	0.0	765	27.9	1275	36.3	1785	0.1		
270	0.0	780	29.3	1290	34.4	1800	0.1		
285	0.0	795	30.6	1305	32.4	1815	0.1		
300	0.0	810	31.9	1320	30.3	1830	0.0		
315	0.0	825	33.1	1335	28.1	1845	0.0		
330	0.0	840	34.2	1350	26.0	1860	0.0		
345	0.0	855	35.3	1365	23.8	1875	0.0		
360	0.0	870	36.3	1380	21.7	1890	0.0		
375	0.0	885	37.3	1395	19.7	1905	0.0		
390	0.0	900	38.3	1410	17.8	1920	0.0		
405	0.0	915	39.3	1425	16.1	1935	0.0		
420	0.0	930	40.2	1440	14.6	1950	0.0		
435	0.0	945	41.1	1455	13.4	1965	0.0		
450	0.0	960	42.0	1470	12.3	1980	0.0		
465	0.0	975	42.8	1485	11.1	1995	0.0		
480	0.0	990	43.6	1500	9.9	2010	0.0		
495	0.1	1005	44.3	1515	8.5	2025	0.0		

Table 17: 2-Year WMS Inflow Hydrograph

Time (min)	Flow (cfs)	Time (min)	Flow (cfs)	Time (min)	Flow (cfs)	Time (min)	Flow (cfs)	Time (min)	Flow (cfs)
0	0.0	510	0.0	1020	8.9	1530	2.8	2040	0.0
15	0.0	525	0.0	1035	9.6	1545	2.3	2055	0.0
30	0.0	540	0.0	1050	10.3	1560	1.9	2070	0.0
45	0.0	555	0.0	1065	10.9	1575	1.5	2085	0.0
60	0.0	570	0.0	1080	11.5	1590	1.2	2100	0.0
75	0.0	585	0.0	1095	12.1	1605	0.9	2115	0.0
90	0.0	600	0.0	1110	12.5	1620	0.7	2130	0.0
105	0.0	615	0.0	1125	12.9	1635	0.6	2145	0.0
120	0.0	630	0.0	1140	13.2	1650	0.4	2160	0.0
135	0.0	645	0.0	1155	13.5	1665	0.3	2175	0.0
150	0.0	660	0.0	1170	13.7	1680	0.3	2190	0.0
165	0.0	675	0.0	1185	13.7	1695	0.2	2205	0.0
180	0.0	690	0.0	1200	13.7	1710	0.2	2220	0.0
195	0.0	705	0.0	1215	13.6	1725	0.1	2235	0.0
210	0.0	720	0.0	1230	13.5	1740	0.1		
225	0.0	735	0.0	1245	13.2	1755	0.1		
240	0.0	750	0.1	1260	12.8	1770	0.1		
255	0.0	765	0.2	1275	12.4	1785	0.0		
270	0.0	780	0.3	1290	11.9	1800	0.0		
285	0.0	795	0.4	1305	11.4	1815	0.0		
300	0.0	810	0.6	1320	10.7	1830	0.0		
315	0.0	825	0.8	1335	10.1	1845	0.0		
330	0.0	840	1.1	1350	9.4	1860	0.0		
345	0.0	855	1.3	1365	8.7	1875	0.0		
360	0.0	870	1.7	1380	8.0	1890	0.0		
375	0.0	885	2.1	1395	7.3	1905	0.0		
390	0.0	900	2.7	1410	6.6	1920	0.0		
405	0.0	915	3.4	1425	6.0	1935	0.0		
420	0.0	930	4.2	1440	5.5	1950	0.0		
435	0.0	945	5.0	1455	5.1	1965	0.0		
450	0.0	960	5.8	1470	4.7	1980	0.0		
465	0.0	975	6.6	1485	4.2	1995	0.0		
480	0.0	990	7.4	1500	3.8	2010	0.0		
495	0.0	1005	8.2	1515	3.3	2025	0.0		

Technical Memo 002 – Flooding and Risk Analysis

J·U·B ENGINEERS, INC.

TECHNICAL MEMORANDUM 002

Date:	April 18, 2022
To:	Bronson Smart, PE, State Conservation Engineer Norm Evenstad, P.G., Water Resources Coordinator Aimee Rohner, P.E, State Design Engineer NRCS - Utah
Cc:	Bryce Wilcox, PE J-U-B ENGINEERS, Inc.
From:	Tracy Allen, PE J-U-B ENGINEERS, Inc.
Project:	Spring City- Watershed Plan-EA
Subject:	Technical Memorandum No. 002 - Flooding and Risk Analysis

Revision No.	Revision Date	Note
001	November 2, 2023	Revisions to data in response to comments from NRCS

1.0 Introduction

Spring City contracted with J-U-B ENGINEERS, Inc. (J-U-B) to complete a Supplemental Watershed Plan-Environmental Assessment (Plan-EA) of the Freeman Allred Reservoir. Part of the Scope of Work included a breach flooding and risk analysis for the project site.

The flood inundation analysis consists of modeling a breach of the proposed Freeman Allred Reservoir embankment under sunny day conditions per Technical Release 60 (TR-60) NRCS, 2005 and Utah Dam Safety criteria. The analysis also includes the development of a map delineating the extents of inundation. Results of the inundation analysis are then used to (1) assess the hazard classification of the dam, (2) determine the population at risk (PAR) downstream of the structure, and (3) assess the risks due to the potential failure of the dam over the projected life of the dam.

1.1 Purpose

The purpose of Technical Memorandum (TM) No. 002 is to present the methodology and results of the flooding and risk analysis conducted for the Freeman Allred Reservoir in support of the Plan-EA. The information presented in the TM will be used to determine the PAR in the event of a breach, total loss-of-life (LOL) expected, and the NRCS and Utah Division of Dam Safety hazard classification for the pond.

1.2 Data Sources

The structural information for the embankment and reservoir is shown in Table 1. For additional hydraulic information on the reservoir see TM No. 001 and Appendix D.

Table 1: Proposed Freeman Allred Reservoir Dam Summary Data

Feature	Dimension
Maximum Dam Height	52 ft
Dam Crest Elevation	6722 ft
Auxiliary Spillway Crest Elevation	6717 ft
Principle Spillway Crest Elevation	6688 ft
Lowest Natural Ground Elevation at Dam	6670 ft
Max Depth of Water Above Natural Ground (Auxiliary Spillway – Natural Ground Elevation)	47 ft
Reservoir Capacity at Auxiliary Spillway	1034 ac-ft
Reservoir Capacity above Lowest Natural Ground Elevation	1034 ac-ft
Reservoir Capacity Below Natural Ground Elevation	0 ac-ft
Dam Crest Length	2382 ft
Dam Crest Width	237 ft
Upstream Slope of Dam	3H : 1V
Downstream Slope of Dam	2H : 1V

Table 2 presents the data sources used in the breach and inundation analysis.

Table 2: *Model Development Data Sources*

Data	Source	Description
LiDAR	Utah Automated Geographic Reference Center, (AGRC) 2017&2011	.5-meter resolution bare earth surface data set of Spring City and downstream of channel used for development of the SRH-2D model.
DEM	National Land Cover Database, (NLCD)	30-meter resolution Digital Elevation Model (DEM) surface data set of Oak Creek Watershed used for development of the HEC-1 model.
Aerial Imagery	ESRI Imagery Service: DigitalGlobe, Vivid, September 2016	Aerial imagery was used in model development and inundation mapping.

LiDAR = Light Detection and Ranging

2.0 Dam Breach Analysis

The dam breach analysis was conducted in support of the risk assessment and hazard classification process for Freeman Allred Reservoir. The purpose of the breach analysis is to develop the breach hydrograph to be used as the upstream condition for the SRH-2D inundation model. Per Utah Administrative Rule R655-10-5A, the breach analysis assumes a full pool dam breach (water level at the dam crest), with no concurrent flooding, and the low-level outlet is discharging at capacity. As a matter of policy, NRCS-Utah has adopted this criterion as well.

Based on the above assumptions, the breach scenario will consist of a piping failure in which the breach initiates at the elevation of the natural ground and extends to the crest of the embankment. The breach analysis was conducted using methods outlined in TR-60 for a depth of water (H_W) less than 103 feet to obtain a Q_{max} value.

2.1 Peak Discharge Criteria – TR-60

TR-60 provides a methodology and equations to determine a minimum peak discharge that is used to generate the breach hydrograph. These equations are based on the depth of water at the time of failure and the theoretical breach width at the water surface elevation corresponding to the depth of water. A flow chart was provided by NRCS that demonstrates the steps followed and is provided in Figure 1.

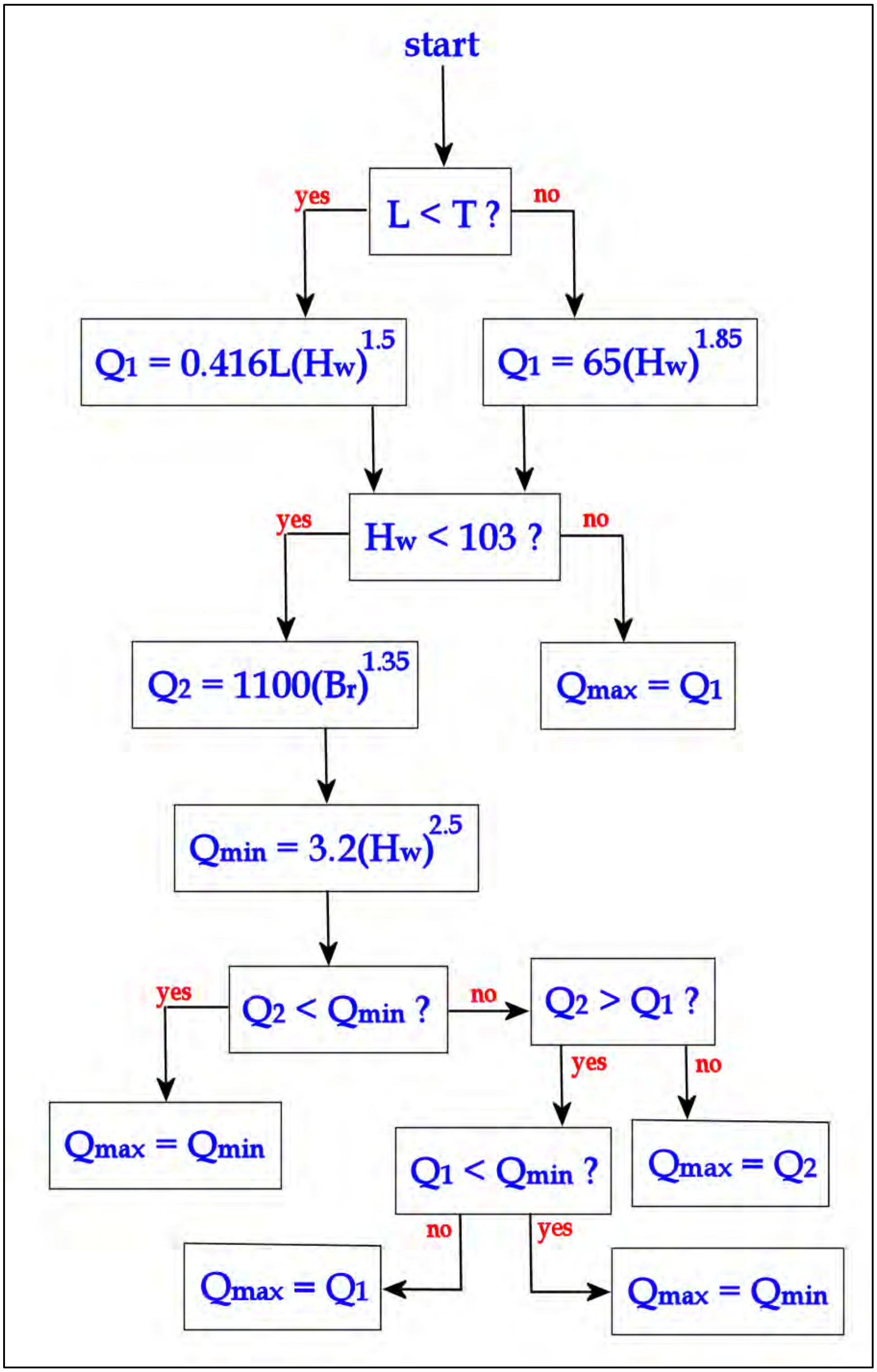

Figure 1: TR-60 Peak Discharge Flow Chart

For the Freeman Allred reservoir, the value of H*w* will be less than 103 feet. The following equations, from TR- 60, define "the minimum peak discharge of the breach hydrograph, regardless of the technique used to analyze the downstream inundation area":

$$Q_{max} = (1{,}100)B_r^{1.35} \qquad (1)$$

$$\text{Where } B_r = (V_s)(H_w)/A$$

B_r = breach factor (acre)
V_s = reservoir storage at time of failure (acre-ft)
H_W = depth of water at the dam at the time of failure (ft)
A = cross-sectional area of embankment at the assumed location of the breach (ft^2)

But, not less than $Q_{max} = (3.2)H_w^{2.5}$ (2)

Or more than $Q_{max} = (65)H_w^{1.8}$ (3)

The TR-60 definition for H*w* is the "depth of water at the dam at the time of failure". TR-60 and TR-66 are acceptable methods by the NRCS for peak breach flow and flow hydrograph and they were used in the development of the peak breach flow and flow hydrograph for the Freeman Allred reservoir.

2.1.1 Freeman Allred Reservoir Breach Q_{max}

The TR-60 minimum peak breach discharge (Q_{max}) was calculated for the height of water above the existing natural grade. The pond will overflow at the dam crest at elevation 6717 feet and the existing ground elevation is approximately 6670 feet, for a depth of water (H_w) of 47 feet. Q_{max} at a breach water height of 47 feet is 48,461 cubic feet per second (cfs).

Equation (2) was used to determine the Q_{max} for the Hw of 47 feet. The other equations were checked but did not govern the flow rate. The results of the analysis are shown in the Peak Breach Discharge spreadsheet provided by NRCS-Utah (see Table 3 with a Q_{max} of 48,4161 cfs calculated flow rate).

Table 3: Proposed Freeman Allred TR 60 and TR 66 Breach Hydrograph Calculations

data	variable	explanation	output variable	results
6722	crestEL	dam crest elevation	T	601
6722	wsEL	w.s. elev at time of breach	(L < T)?	N
20	TW	dam top width (feet)	H_w	47
3	SSup	dam side slope (upstream, SSup:1)	Q_1	80592
2.5	SSdn	dam side slope (downstream, SSdn:1)	(H_w < 103)?	Y
6675	floorEL	valley floor elev (see note)	Awave	0
1034	Vs	resv vol at time of breach (acre-feet)	Astab	0
1980	L	valley width at dam axis & w.s. elev (feet)	A	7015
	ELwave	top of wave berm elevation	Br	7
	Wwave	width of top of wave berm feet	Q_2	15004
	SSwave	wave berm side slope (SSwave:1)	Q_{min}	48461
	ELstab	top of stability berm elevation	($Q_2 < Q_{min}$)?	Y
0	Wstab	width of top of stability berm (feet)	($Q_2 > Q_1$)?	N
	SSstab	stability berm side slope (SSstab:1)	($Q_1 < Q_{min}$)?	N
1	ts	timestep (minutes) for breach hydrograph	**Q_{max}**	**48461**

2.2 Breach Analysis Results

The reservoir in the Spring City Watershed dam breach analysis was assumed to fail due to piping with water at the level of the overflow crest. The volume of water at the time of the dam breach for the Freeman Allred Reservoir is 1034 acre-feet. TR-66, Simplified Dam-Breach Routing Procedure, was used to develop the Breach Hydrograph. Figure 2 presents the breach hydrograph of the proposed reservoir resulting from the NRCS-Utah supplied breach hydrograph development spreadsheet.

Figure 2 presents the breach hydrograph of the proposed reservoir resulting from the NRCS-Utah supplied breach hydrograph development spreadsheet.

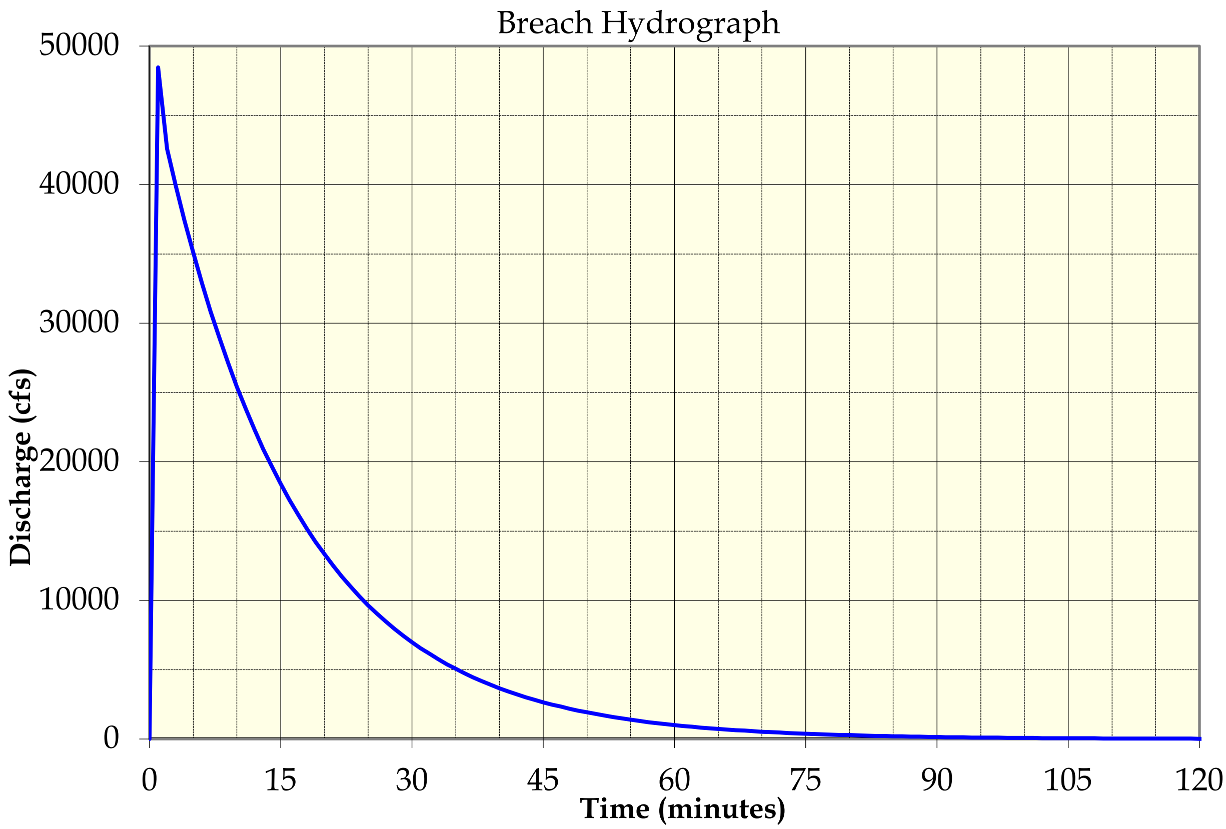

Figure 2: Proposed Freeman Allred Reservoir Breach Hydrograph

3.0 Inundation Analysis

The purpose of the inundation analysis is to simulate the breach waves from the failure of Proposed Freeman Allred Reservoir as it travels through Spring City and surrounding area. This section shows the SRH-2D model development, the inundation model results, and inundation maps.

3.1 Breach Model Development

SRH-2D is a two-dimensional hydrodynamic model capable of simulating unsteady free surface flow through open-channel systems. Aquaveo's software package, Surface-water Modeling System (SMS), was used to set up the modeling domain and parameters for the SRH-2D engine. The continuity and momentum equations are solved by the model using a central, finite difference scheme applied to a grid. The grid is constructed using a high-resolution array of elevation points and is populated with initial and boundary conditions as necessary. The computational grid can incorporate floodplain features and characteristics such as Manning's roughness, flow blockage due to buildings, hydraulic structures, etc. Upstream boundary conditions can accept user-specified hydrographs like the dam breach outflow hydrograph provided in Figure 2. Table 4 presents the parameters and data used to develop the Spring City reservoir SRH-2D model.

Table 4: SRH-2D Model Parameter

Grid Input	
Parameter	Input
Upstream Boundary Condition	Breach Hydrograph
Downstream Boundary Condition	Normal Depth (No Hydrograph)
Number of Elements	253,325
Grid Elevation	2011 FEMA LiDAR

Major assumptions of the SRH-2D model include the following:

- Roughness Coefficients, see Table 5;
- No infiltration or evaporation losses;
- Flow is steady for a given time step;
- Pressure distribution is hydrostatic;
- Hydraulic roughness based on steady, uniform, fully turbulent flow; and
- Channel element represented by uniform channel geometry and roughness.

Table 5: Roughness Coefficients

Roughness	
Land Use	Manning's n
Roadway	0.015
Residential	0.05
Channel	0.045
Open Space	0.065

Arc boundaries were placed along the features such as the Oak Creek banks and roads. Grid spacing was densified to approximately 20 feet along the arc boundaries. The model domain extends from approximately the Freeman Allred Reservoir to 6840 East, and Cedar Creek North on the north to approximately Mill Race Ditch on the south (see Figure 3). The model domain was expanded for modeling needs for other portions of the project. For this reason, the modeling domain extends beyond the point at which the breach wave is fully attenuated.

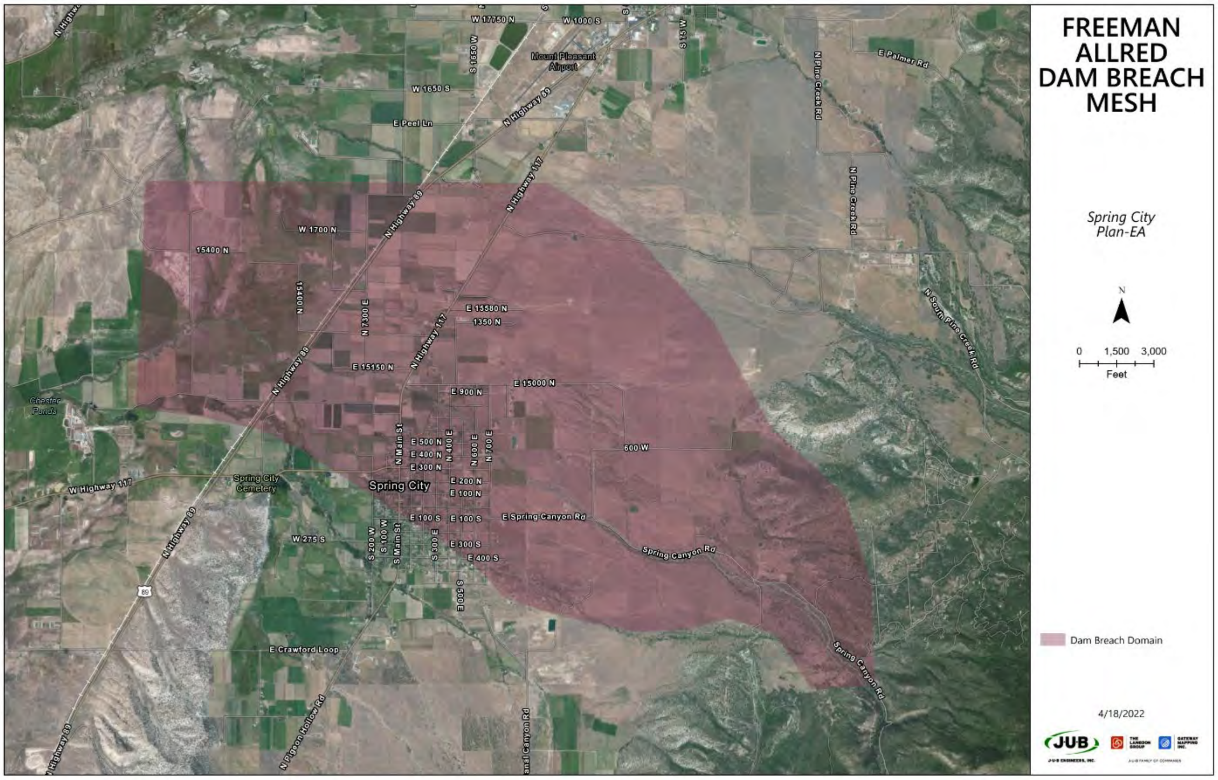

Figure 3: SRH-2D Model Domain and Grid Extents

3.2.1 Breach Model Results

The results of the dam breach analysis of the reservoir are summarized in Table 6 and a map of the inundation extents is provided in Figure 4. The breach wave would cover 1,681 acres downstream of the reservoir. The breach wave travels downhill to the city limits of Spring City and through to the west side of the city limits until it reaches the natural drainages of Oak Creek. The average depth of the wave is 2.3 feet and the average wave velocity is 3.1 ft/s. The results of this inundation model were used to assess the population at risk (PAR) and damage to structures, vehicles, agriculture, and so forth, and to estimate the loss of life due to such an event.

Table 6: Inundation Summary

Reservoir	Acres	Average Depth (ft)
Freeman Allred Reservoir	1,681	2.3

Figure 4: Freeman Allred Reservoir Breach Flood Inundation

4.0 Risk Analysis

This section describes the consequences that would result from a sunny day failure of the Freeman Allred Reservoir in the Oak Creek Watershed. Although a failure of the reservoir is not expected, there is always a risk of failure. If a failure were to occur, damage could be sustained downstream.

Dam failure consequences were estimated using a Population at Risk (PAR) Computation Worksheet developed by NRCS in 2013 (NRCS, 2013). The worksheet determines the total estimated PAR due to a flood event by multiplying a prescribed PAR per exposure by the total number of exposures during the event, broken up by exposure type and depth. The PAR and Loss of Life (LOL) worksheet results are provided in Tables 7 and 8.

The total PAR due to a sunny day breach of Freeman Allred Reservoir is 228 people. The calculated Fatality Rate at 0.04 (4.0%) and the Failure Index at 4 which, when multiplied by the PAR, gives a total LOL (Risk Index) of 120 persons (rounded).

COMPUTATION OF POPULATION AT RISK (PAR) DURING DAM FAILURE						
STATE	UT		BY	CRA	DATE	4/12/22
DAM	Spring City Freeman Allred Reservoir		CHECKED BY		DATE	
YEAR BUILT	Proposed	DESIGN HAZARD CLASS	H	DRAINAGE AREA	11.41	mi^2
WORK PLAN DATE		CURRENT HAZARD CLASS	H	DAM HEIGHT	47	ft
sht 1 of 3	STATIC FAILURE SCENARIO (ver. 2013-01)				NID ID	UT00507
Structures (Elevated) Impacted by Potential Breach	Number of Structures			PAR per Exposure with Inundation Depths >=2.0 Ft.		PAR
	Inundation Depth Above Natural Ground		Total			
	<2.0 Ft	>=2.0 Ft.				
Mobile Homes	0	0		3		
Seasonal Use RV's	0	0		2		
Other						
Structures (With Foundations) Impacted by Potential Breach	Number of Structures			PAR per Exposure with Inundation Depths >=1.0 Ft.		PAR
	Inundation Depth Above Natural Ground		Total			
	<1.0 Ft	>=1.0 Ft.				
Homes	4	26	30	3		78
Fire Station	0	0		1.5		
Library	0	0		5		
Storage Facilities	0	0		4		
Restaurants	0	0		11		
Commercial Buildings	0	2	2	1.5		3
Grocery Store	0	0		5		
Churches	0	0		3		
Other						
Highways and Railroads	Number of Roads, Highways and Railways			PAR per Exposure with Inundation Depths >=1.0 Ft.		PAR
	Road Overflow Depth		Total			
	<1.0 Ft	>=1.0 Ft.				
Main Local Roads and Minor State Highways						
State Route 117	1	3	4	2		6
Other Local Roads	14	31	45	2		62
Major State and Minor Federal Highways						
Highway 89	0	3	3	4		12
				4		
Major Federal and Interstate Highways						
none	0	0		8		
none	0	0		8		
Railroads						
UPSF Freight Traffic Only	1	1	2	3		3
Passenger Traffic	0	0		20		
TOTAL NUMBER OF PEOPLE AT RISK (PAR)						**164**

Table 7: Computation of Population at Risk (PAR) during Freeman Allred Reservoir Dam Failure

EVALUATION OF POTENTIAL REHABILITATION PROJECTS							
STATE	UT	**DAM**	Spring City Freeman Allred Reservoir	**BY**	CRA	**DATE**	4/12/2022
sht 2 of 5	**FAILURE & RISK INDEXES**						ver 2013-01

Adopted from Bureau of Reclamation "Risk Based Profile System"

see: http://www.usbr.gov/dsis/risk/rbpsdocumentation.pdf

LIFE LOSS:

Population-at-Risk [PAR], see NRCS dams inventory definition (number of people)

Estimate PAR for static loading failure; typically assume water at or above invert of the lowest open channel auxiliary spillway	164	A
Estimate PAR for hydrologic loading failure; typically assume water at or above invert of the lowest open channel auxiliary spillway	0	B
Estimate PAR for seismic loading failure; typically assume water at or above invert of the lowest non-gated spillway (sunny day failure)	0	C

Fatality Rates [FR] from dam breach

Adopted from BuRec "A Procedure for Estimating Loss of Life Caused by Dam Failure" DSO-99-06

see: http://www.usbr.gov/research/dam_safety/documents/dso-99-06.pdf

Flood Severity/Lethality [DV] is the average depth [D] times velocity [V] across flood plain (ft2/sec)

DV= (breach discharge - bank full discharge) / breach floodplain width

Warning Time [T] between failure warning and flood wave at population (minutes)

Flood Severity Understanding [U] of the warning issuer of the likely flooding magnitude

Scenario	Breach Discharge	Bankfull Discharge	Breach Floodplain Width	DV	Warning Time, T	Understanding, U
	(cfs)	(cfs)	(ft)	(ft2/sec)	(minutes)	(N/A or Vague)
Static	36,582		4400	8	18	Vague
Hydrologic						
Seismic						

For DV≥50	T≤60	U=vague	FR=0.04
	T>60		FR=0.03
For DV<50	T≤60	U=vague	FR=0.007
	T>60		FR=0.0003

Estimate FR for static loading failure scenario	0.007	D
Estimate FR for hydrologic loading failure scenario		E
Estimate FR for seismic loading failure scenario		F

Scenario	Load Factor	Response Factor	Failure Index	Fatality Rate	PAR	Risk Index
Static	1	75	75	0.007	164	86
Hydrologic	*	*			0	
Seismic					0	
		TOTAL=	75		TOTAL=	86

Table 8: Computation of Loss of Life (LOL) during Freeman Allred Flood Basin Dam Failure

5.0 Freeman Allred Reservoir Hazard Classification

The Freeman Allred Reservoir is located approximately 2.6 miles east of Spring City. The PAR for the site is 228. With a water depth of 47 feet only occurring during storm events and a dam height of 52 feet, the downstream risks are high. NRCS has classified the structure as a high hazard dam. The Utah Division of Dam safety has preliminarily classified the dam a high hazard dam. The dam will follow the Application Procedure for approval through the Division of Dam Safety. An emergency action plan will be developed for the Freeman Allred Reservoir as part of the design process.

The following are some of the characteristics of a dam that are considered when classifying its hazard potential:

- **Location:** Oak Creek Watershed, Spring City, Sanpete County, Utah, Latitude: 39°28'28.43"N, Longitude: 111°26'04.15"W
- **Description:** The Freeman Allred Reservoir is used as a combination agricultural water storage and for flood control. The proposed design has a maximum volume of 1034 acre-feet. The reservoir is an earthen structure with a controlled low-level piped outlet and an auxiliary spillway. All water is diverted off of Oak Creek and water drains back towards Oak Creek downstream of where it was diverted.
- **Existing Condition:** The location of the proposed reservoir is an open meadow owned by Horseshoe Irrigation Co. The irrigation company has the ability to divert a small amount of flood water to the meadow to slowly drain to the north in a different drainage. The are no existing structures at the Freeman Allred Meadow site.

6.0 Conclusions

The purpose of this report is to present the methodology and results of the flooding and risk analysis conducted Spring City Watershed Project as part of the Plan-EA. Key results of the flooding and risk analyses include the following:

- The peak breach flow from the Freeman Allred Reservoir was 48,461 cfs.
- The height of the water impounded (above natural ground) is 47 feet with a volume of 1034 acre-feet.
- The maximum wave velocity in the model is approximately 32.5 ft/s below the pond.
- The maximum wave height is approximately 23.8 feet.
- The total inundated area is approximately 1,681 acres.
- Total number of homes inundated is 38.
- Estimated PAR is 228 people.
- Estimated Loss of Life is 120 people.

7.0 Statement of Limitations

This document represents J-U-B Engineers, Inc.'s professional judgement based on the information available at the time of its completion and as appropriate for the project Scope of Work. Services performed in developing the content of this document have been conducted in a manner consistent with that level and skill ordinarily exercised by members of the engineering profession currently practicing under similar conditions. No warranty, express or implied, is made. It is recommended that further coordination with Utah Dam Safety be conducted throughout the design and construction phase of the project.

8.0 References

Surface Water Modeling System (SMS), Aquaveo, 2019.

SRH-2D Version 2: Theory and User’s Manual, U.S. Bureau of Reclamation (USBR), 2008.

2019 Final Technical Memorandum No. T001 – Hydrology, J-U-B Engineers, Inc (J-U-B), November 11, 2019.

National Land Cover Database 2011, created by the Multi-Resolution Land Characteristic Consortium

Earth Dams and Reservoirs, Technical Release (TR) 60, *2005.* Natural Resources Conservation Service (NRCS), July 2005.

Computation of Population at Risk (PAR) during Dam Failure, Steve Durgin, Natural Resources Conservation Service (NRCS), March 2013.

Dam Safety Guidelines. Washington State Department of Ecology (Washington Ecology), 2007.

Technical Note 1: Dam Break Inundation Analysis and Downstream Hazard Classification. Dated July 1992, Revised October 2007.

National Economic Efficiency Benefit-Cost Analysis

BBC RESEARCH & CONSULTING

Spring City Watershed Environmental Assessment National Economic Efficiency Benefit-Cost Analysis

DRAFT FINAL REPORT

Draft Final Report

December 2023

Spring City Watershed Plan and Environmental Assessment National Economic Efficiency Benefit-Cost Analysis

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Table of Contents

Spring City Watershed Plan-EA Benefit-Cost Analysis

1. Introduction

This report estimates the benefits and costs of proposed flood mitigation and agricultural water management measures proposed as part of the Spring City Watershed Flood Prevention and Irrigation Improvement Project (Project) in central Utah's Upper Oak Creek, Canal Creek, Cedar Creek, and Cottonwood Creek sub watersheds (watershed), situated in Sanpete County. Oak Creek itself is a tributary of the San Pitch River, which flows south to join the Sevier River in the City of Gunnison, UT. The project area and its surroundings are predominately agricultural, and contain Spring City, which is defined by large-lot residential development and has a population of approximately 1,000 people.

The area's municipal and agricultural water supply faces several infrastructure challenges that negatively impact flood risk and water management. Presently, there are no flood control structures upstream of Spring City, which puts the City's residents and building stock at risk of flood damage. The City experienced significant flooding events in 1965, 1983, and 1995.[1] The existing irrigation distribution system also contains several open and unlined canals and laterals that are prone to severe seepage, particularly during periods of drought. The local energy utility utilizes flows from Oak Creek to generate electricity through an aged and failing diversion in Upper Oak Creek. And lastly, pressure in the agricultural and municipal water systems is maintained through a 20-acre regulating pond. The pond presents challenges for water managers in their attempt to maintain system pressure.

This report considers the benefits and costs of flood mitigation and water management measures proposed to reduce flood damages and improve water management in the watershed by addressing the challenges cited above. Specifically, this report considers the benefits and costs of the Action Alternative, which consists of constructing one large flood control and water supply reservoir, a smaller regulating pond, pressurized piping systems, and associated works of improvement at different locations throughout the watershed. The benefits and costs of the Action Alternative are compared against a baseline of no action, which is also referred to as the Future Without Federal Investment (FWOFI).

This report is structured into the following sections:

- Federal Guidelines of Benefit-Cost Analysis of Flood Mitigation Measures
- Alternatives and Ecosystem Services Evaluated
- National Economic Efficiency Analysis Data and Methodology

[1] Spring City Municipal Government. 2021. Spring City Risk Summary. Available at: https://www.springcityutah.org/wp-content/uploads/2021/03/SPRING-CITY-RISK-SUMMARY-2.pdf

- Current Economic Damages
- Economic and Structural Tables

2. Federal Guidelines of Benefit-Cost Analysis of Flood Mitigation Measures

The National Economic Efficiency Benefit-Cost Analysis (NEE BCA) conducted as part of this report uses federal water resource project and National Resources Conservation Service (NRCS) guidelines for the evaluation of benefits and costs of the no action and action alternatives, relying primarily on the Principles, Requirements and Guidelines (PR&G)(NRCS, 2014a), the NRCS Natural Resources Economics Handbook (NRCS 1998), and the National Watershed Program Manual (NRCS 2014b).

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

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

The PR&G further state:

> *Federal investments in water resources as a whole should strive to maximize public benefits, with appropriate consideration of costs. Public benefits encompass environmental, economic and social goals; include monetary and non-monetary effects; and allow for the consideration of both quantified and unquantified measures.*

The PR&G also require benefits and costs to be evaluated in an ecosystem service framework. An ecosystem is a natural unit of living and non-living things that function together to create goods and services valued by people (Olander et al., 2016). Ecosystem services is a broad term used to describe the benefits humanity receives from ecosystems as a byproduct of their functioning.

By putting nature at the center, ecosystem services frameworks give economic, social, and environmental costs and benefits equal standing in decision-making processes and therefore help to accomplish the federal objective of maximizing national economic efficiency, ensuring federal investments protect and restore ecosystem functions and values and avoid irreversible impacts (NRCS, 2014a). Economic efficiency requires that resources are used in their highest valued use.

Projects that create more benefits than costs utilize resources more efficiently than baseline conditions and therefore increase NEE.

The four-category ecosystem framework adopted in the PR&G, and utilized in this report, is shown in Table 1.

Table 1. Ecosystem Services Framework Used to Evaluate Benefits and Costs Project

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

Source: USDA, 2014b.

As Table 1 shows, ecosystem services can be placed into one of four categories. Provisioning services supply goods that directly benefit people. The production of crops, fuel, water, timber, and other raw materials are all provisioning services. Regulating services describe the benefits people receive from an ecosystem's ability to regulate things like air quality, climate, and hazards, both natural and manmade. Cultural services describe the benefits people derive from an ecosystem's ability to provide a good view, a recreation opportunity, a place to travel and visit, or spiritual or religious values.

2.1. Guiding Principles.[2] In addition to requiring projects to be evaluated using an ecosystem service framework, the PR&G also seek to promote projects that fulfill guiding principles related to federal investments in water resources. These include:

- Healthy and Resilient Ecosystems – Federal investments in water resources should protect and restore functions of ecosystems and mitigate any unavoidable damage to these natural systems.

- Sustainable Economic Development – Federal investments in water resources should encourage sustainable economic development that improve the economic well-being of the Nation for present and future generations through the sustainable use and management of water resources.

- Floodplains – Federal investments in water resources should avoid the unwise use of flood prone-areas and avoid and minimize adverse impacts and vulnerabilities in any case in which a flood-prone area must be used. Federal investments should seek to reduce the Nation's vulnerability to floods and storms.

- Public Safety – Federal investments in water resources should avoid, reduce, or mitigate risks to people, including both loss of life and injury, from natural events.

- Environmental Justice – Federal investments in water resources should ensure that disproportionately high and adverse public safety, human health, or environmental burdens of projects on tribal, minority, or low-income populations are identified, mitigated, or eliminated.

[2] NRCS, 2014.

- Watershed Approach - Federal investments in water resources should use a watershed approach that properly frames a problem by evaluating it on a systems level that identifies root causes and interconnectedness of watershed problems that enables the design of solutions that considers the benefits of water resources for a wide range of stakeholders within and around the watershed.

The Watershed Plan and Environmental Assessment (Plan-EA) for the Project considered these principles in the characterization of flood risks and water management challenges faced by stakeholders in the watershed and the formulation of solutions as defined in the Action Alternative.

3. Alternatives and Ecosystem Services Evaluated

To reduce the risk of flooding and improve water management in the watershed, the project sponsors developed an Action Alternative that was evaluated alongside a No Action Alternative as part of the NEE BCA analysis. The No Action Alternative, also known as the Future Without Federal Investment (FWOFI), describes the most likely future if no federal investment is made in the watershed. The Action Alternative describes the proposed actions to be taken to reduce future flood damages and improve water management in the watershed.

3.1. Alternatives Evaluated. Under the FWOFI, Spring City would be at continued risk of flooding events as those experienced in the past with the associated impacts on ecosystem services. Water used for agricultural irrigation would also continue to be lost to seepage in open canals and laterals, the aging diversion would be at continued risk of failure, and pressure management of the agricultural and municipal water systems would remain an ongoing challenge. Under the Action Alternative, each of these challenges would be addressed through specific works of improvement as shown in Table 2.

Table 2. Works of Improvement Proposed as Part of the Spring City Watershed Plan-EA.

Purpose/Work of Improvement	Description
Flood Control and Detention	
F1/A7 – Freeman Allred Reservoir and Debris Basin	Flood control and water agricultural water supply structure
F2 – Concrete Flood Channel to Reservoir	Transmit flood water, debris, and irrigation water to Freeman Allred Reservoir
F3 – Mill Race Flood Ditch Piping	Pressure pipe moving water supplies to irrigation canals downstream
Agricultural Water Management	
A1 – North Field Ditch Piping	Pipe sections of the North Field Ditch to reduce water loss/increase water supply
A2 – Point Ditch Piping	Pipe sections of the Point Ditch to reduce water loss/increase water supply
A3 – Upper Oak Creek Diversion Replacement	Replace Upper Oak Creek Diversion to protect hydropower production
A4 – Water Transmission Pipeline	Pipe sections of an open transmission canal from the Freeman Allred Reservoir site to reduce water loss/increase water supply
A5 – Oak Creek Diversion Structure Replacement	New flood diversion structure to channel flood flows on Oak Creek
A6 – Regulating Pond	Construct 20-acre-foot regulating pond to separate agricultural and municipal water delivery systems
A8 – Secondary Water Meters	Install secondary water meters on pressure residential outdoor irrigation system in Spring City
A9 – Oak Creek Bypass Piping	Bypass pipeline to move flows from Oak Creek
A10 – Chester Ponds Capacity Restoration	Dredge and remove sediment from existing ponds to increase water storage
Recreation	
R1 – Freeman Allred Day Use Area	Construct day use facilities at the Freeman Allred Reservoir

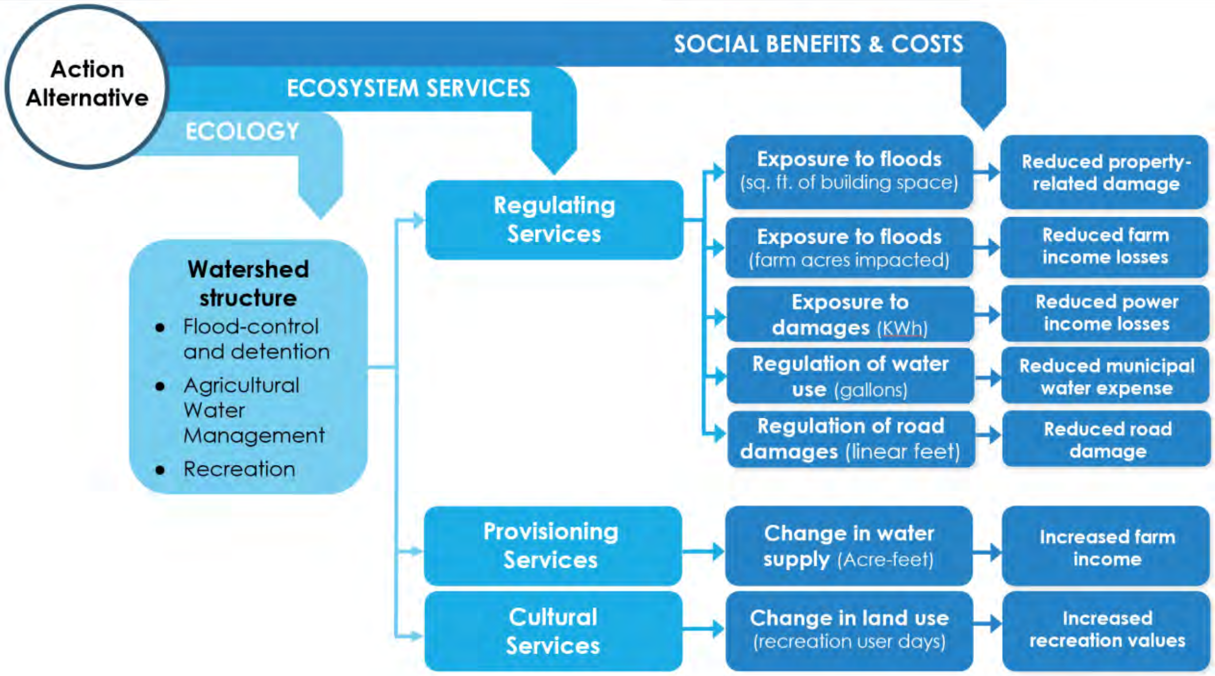
Source: J-U-B ENGINEERS, Inc.

3.2. Types of Services Impacted. Public scoping comments, planning documents, watershed plans from surrounding areas, and discussions with the project sponsors suggest that the project's primary benefits will result from regulating flood risk so that the associated damages to properties, contents, vehicles, and farmland in and surrounding Spring City would be reduced under the Action Alternative. The Action Alternative would also improve agricultural water management by increasing the amount of water available for agricultural producers and reduce competition with municipal water use, protect power generating facilities, and increase recreational opportunities in the watershed.

Figure 1 shows the causal chain describing how the Action Alternative would create social benefits and costs as part of the Spring City Watershed Project. Causal chains are models describing how changes to the structure of an ecosystem affect its functioning and the goods and services it provides to society (Olander et al., 2016). When used as part of a NEE analysis, a causal chain assessment of ecosystem services impacts traces changes in ecosystem composition all the way through to effects on social outcomes and human well-being.

As Figure 1 shows, the Action Alternative would change the ecological structure of the watershed through the construction of the works of improvement described in Table 2.

Figure 1. Description of Alternatives Evaluated Project and Anticipated Impacts on Ecosystem Services



The change in watershed structure would regulate flood-related damages, including damage to structures, contents, and vehicles. The change in watershed structure would also regulate damages to agricultural land and reduce damages to agricultural diversions, in addition to reducing municipal water use and expense through the installation of water meters. Road damage would also be reduced. The changes in the watershed structures would also enhance provisioning services by making conserved water available for crop irrigation, thereby increasing farm incomes. Additionally, the Action Alternative would install recreation facilities that would increase opportunities for recreation, leading to an increase in recreation values.

3.3. Ability to Characterize, Quantify, and Monetize Services. The ecosystem services described in Figure 1 can all be characterized, quantified, and monetized using publicly available information and accepted methodologies that relate biophysical values to economic values. The methods to quantify and value each ecosystem service evaluated as part of this analysis are described in more detail in Section 4.

3.4. Metrics to Evaluate Services. The metrics used to evaluate the change in ecosystem service values under the Action Alternative are shown in Figure 1. Regulating services are evaluated by quantifying and valuing changes to the square footage of buildings affected by flooding of different depths; the number of agricultural acres impacted by flooding of different depths; kilowatt hours of electricity production; and gallons of municipal water use. Changes in provisioning services are evaluated using the increase in irrigation water supply, measured in acre feet, and changes in recreation values are measured using the change in recreation user days and the resulting change in consumer surplus. Changes in road damage are measured in dollars and road miles.

3.5. Prioritizing Services. Services were prioritized based on their expected contribution to the project's primary purposes of reducing damages from floods and infrastructure failure, improving agricultural water management, and increasing recreation opportunities. As a result, the regulating, provisioning, and cultural services shown in Figure 1 were prioritized for analysis as part of the evaluation of the Action Alternative's impact on National Economic Efficiency (NEE). The project may also result in smaller, secondary changes to other ecosystem services. For example, many residents of cities like Spring City have lived there for many years or multiple generations and have a strong sense of place. Knowing that the community is at lower risk of flooding, and is therefore more secure, could create cultural benefits for the city's residents (Fabbricattie et. al., 2020). The creation of a large water body would also enhance some provisioning services, like providing important habitat for aquatic wildlife, supporting biological diversity, and other similar provisioning services.

3.6. Summary and Comparison of Ecosystem Service Changes. A summary of the Action Alternative's impact on ecosystem services in the watershed and fulfillment of federal investment principles in water resources are shown in Table 3. The Action Alternative was created and supported through a local stakeholder process. As part of this process, stakeholders were invited to provide public comment and input into the design and evaluation of the Action Alternative. As a result of this input, the Action Alternative is the locally preferred alternative. The FWOFI is the no action alternative; without federal investment, there would be no other changes to the structures in the watershed, other than those already planned through regular maintenance. Non-structural alternatives were eliminated from detailed study because none were brought forward that would meet the purpose and need of the Project. The Action Alternative is the alternative that increases National Economic Efficiency by reducing flood damages, infrastructure damages, conserving municipal water, enhancing the provision of farm income, and enhancing recreation values, thereby increasing the value of ecosystem services produced by the watershed. The Action Alternative is also the environmentally preferred alternative as defined in Section 101 of the National Environmental Policy Act.[3]

[3] Section 101 of NEPA states that "…It is the continuing responsibility of the Federal Government to (1) fulfill the responsibilities of each generation as trustee of the environment for succeeding generations; (2) assure for all Americans safe, healthful, productive, and aesthetically and culturally pleasing surroundings; (3) attain the widest range of beneficial uses of the environment without degradation, risk to health or safety, or other undesirable and unintended consequences; (4) preserve important historic, cultural, and natural aspects of our national heritage, and maintain wherever possible an environment which supports diversity and variety of individual choice; (5) achieve balance between population and resource use which will permit high standards of living and wide sharing of life's amenities; and (6) enhance the quality of renewable resources and approach the maximum attainable recycling of depletable resources."

Table 3. Summary of Project Alternatives and Associated Ecosystem Services Evaluated as Part of the Spring City Watershed Plan-EA Benefit-Cost Analysis (2022 $).

	Alternatives	
	FWOFI	**Action Alterative[1]**
Alternatives		
Locally Preferred		X
Non-structural[2]	-	-
National Economic Efficiency		X
Environmentally Preferable		X
Guiding Principles		
Healthy and Resilient Ecosystems		X
Sustainable Economic Development		X
Watershed Approach		X
Environmental Justice		X
Public Safety		X
Floodplains		X
Total Project Investment (Annualized Average)[3]	**$-**	**$893,900**
Monetized Net Benefits (Annualized Average)[4]	**-$1,149,600**	**$1,143,100**
Provisioning Services (Annualized Average)		
Farm income	$-	$143,100
Regulating Services (Annualized Average)		
Property-related damage reductions	-$842,700	$658,400
Farm income damage reductions	-$2,500	$2,500
Power income damage reductions	-$42,600	$42,600
Municipal water supply expense reductions	-$90,300	$90,300
Road damage reductions	-$171,500	$171,500
Cultural Services (Annualized Average)		
Recreation values	$-	$34,700

Notes: (1) Note that all costs and benefits for Action Alternative are compared to the Future Without Federal Investment (FWOFI) here and elsewhere in this document. Benefits and costs were calculated over a 100 year analysis period using a discount rate of 2.25 percent. All values reported in 2022 dollars.

(1) Non-structural alternatives, if they exist, may be included in the final analysis (see Section 6c(2)(c) of PR&G, NRCS 2014a). Non-structural alternatives were eliminated from detailed study because none were brought forward that would meet the purpose and need of the Project.

(2) Annualized costs for the Action Alternative include design, engineering, administration, permitting, construction, and operations and maintenance.

(3) The net benefits of the FWOFI are negative to reflect the annualized damages and expenses in the study area due to flood events and monetary expenditures.

The Action Alternative, which used a watershed approach to characterize problems and solutions in the watershed, meets the federal principles for investments in water resources. The Action Alternative would restore the watershed's ability to regulate flood damage impacting Spring City, thereby increasing the health and resiliency of the ecosystem. By reducing flood damages, the Action Alternative improves sustainable economic development by improving the economic well-being of present and future generations living within the watershed. The Action Alternative also avoids the unwise use of flood-prone areas by reducing the watershed's vulnerability to future flood events. Public safety is also enhanced by the Action Alternative because it would result in lower rates of injury and death related to flooding. The Action Alternative would not adversely affect environmental justice communities because there are no such communities located within the watershed.

In terms of benefits and costs, the Action Alternative's investment in the watershed would generate economic returns in excess of the upfront installation and ongoing management costs of the flood control structures as compared to the FWOFI. Under the FWFOI, average annual economic damages and expenses are approximately $1.1 million. This damage is the result of expenses residents of the watershed face to provide municipal water, repair property-related damages as well as damages to farmland and infrastructure. The Action Alternative would invest an average annual amount of $893,900 in built infrastructure to avoid these damages and expenses, thereby avoiding damages and expenses and enhancing farm incomes and recreational opportunities in the watershed. The annualized discounted value of the enhanced regulating, provisioning and cultural service benefits generated by the project amount to $1,143,100, outweighing the Action Alternative's annualized expense.[4]

4. National Economic Efficiency Analysis Data and Methodology

To evaluate the extent to which the Action Alternative would maximize public benefits relative to costs, the expected effects of the Action Alternative were quantified, valued, and compared against the FWOFI or No Action Alternative. The NEE BCA analysis evaluated the costs of the Action Alternative based on cost estimates for each work of improvement from J-U-B ENGINEERS, Inc. (J-U-B), which included costs for engineering, permitting, administration, and construction. Costs for operations and maintenance were estimated separately as a percentage of each work's construction cost. These costs were compared against benefits received by regulating damages, avoiding expenses, and increasing farm income and recreational benefits in the watershed.

Projected benefits and costs are based on a full employment economy and assume no change in relative prices during the period of analysis. Effects of the Action Alternative were evaluated over a 102-year time horizon including the two-years required to complete installation and the 100-year useful life of the improvements. This analysis period is equal to the length of time over which the works of improvement are expected to have significant beneficial effects. Benefits are expected to begin accruing the year after the works of improvement are installed and continue to accrue until the end of the 102-year time horizon. Since all the project elements have design lives of 100-years, replacement costs were not included in the analysis as the project time horizon does not exceed the life of the measures (PR&G Section 9, NWPM 501.37.B and the Economics Handbook, Part 611, 1.12.).

Benefits and costs are discounted using the discount rate for federal projects of 2.25 percent for 2022 (NRCS, 2022). Results are reported in average annualized values in 2022 dollars.

[4] Benefits and costs were calculated over a 100-year analysis period using a discount rate of 2.25 percent. All values reported in 2022 dollars.

The unit of analysis in this study is the Action Alternative. For this study, costs and benefits are estimated jointly for all works of improvement for the Action Alternative. However, Section 6 considers the impact of each work of improvement separately, beginning with the most beneficial improvement and ending with the least beneficial improvement, as part of the incremental analysis (390-NWPH, Part 606, Subpart B, Section 606.20).

4.1 Reduced Property-Related Damages. Reduced property-related damages, including: structures, contents, and vehicles, were estimated for the FWOFI and Action Alternative. Data from the Sanpete County Assessors' office was combined with Hydrology and Hydraulic (H&H) modeling to identify properties impacted by different depths of flooding for 5-, 10-, 25-, 50-, 100-, 200-, and 500-year flood events for the FWOFI and Action Alternative.

The County Assessor's data contained information about each impacted structure, including its market value, built square footage, and primary use. The County Assessor's data and a review on Google Earth indicated that most structures in the city are single-story homes and businesses with small basements. Table 4 shows the number of residential, commercial, and other structures impacted by flooding under the FWOFI at different flood depths. Structures without valuations from the County Assessor and structures defined as sheds or agricultural outbuildings were excluded from the building count and property-related damage analysis.

Table 4. Count of Structures Impacted by Flooding in the Project Area Under the FWOFI for Storm Events of Different Frequency

Storm Event	Depth Ranges	500 Year	200 Year	100 Year	50 Year	25 Year	10 Year	5 Year
Number of Residential Buildings Flooded	0-1 ft	14	13	19	13	5	3	3
	1-2 ft	0	93	79	74	13	11	8
	2-3 ft	116	2	1	1	0	0	0
	3-4 ft	0	66	66	58	0	0	0
	4-5 ft	50	0	0	11	0	0	0
	5-6 ft	0	10	10	2	0	0	0
	6-7 ft	5	0	0	0	0	0	0
Number of Commercial Buildings Flooded	0-1 ft	0	0	0	0	0	0	0
	1-2 ft	0	0	2	2	0	0	0
	2-3 ft	4	0	0	0	0	0	0
	3-4 ft	0	7	7	6	0	0	0
	4-5 ft	7	0	0	2	0	0	0
	5-6 ft	0	3	1	0	0	0	0
	6-7 ft	0	0	0	0	0	0	0
Number of Other Buildings Flooded	0-1 ft	0	0	0	0	0	0	0
	1-2 ft	0	2	2	1	1	1	1
	2-3 ft	2	0	0	0	0	0	0
	3-4 ft	0	1	0	0	0	0	0
	4-5 ft	1	0	0	0	0	0	0
	5-6 ft	0	0	0	0	0	0	0
	6-7 ft	0	0	0	0	0	0	0

Notes: Residential includes mobile homes, but excludes sheds, agricultural outbuildings, and buildings without an assessor's building valuation. Source: J-U-B ENGINEERS, Inc.

The total market value of structures at risk was calculated from the County Assessor's data and estimated to be approximately $37,750,000. The H&H modeling was used to estimate the number of structures as well as the associated built square footage that would be removed from flood risk under the Action Alternative. Table 5 shows the number of buildings impacted by flooding under the Action Alternative.

Table 5. Count of Structures Impacted by Flooding in the Project Area Under the Action Alternative for Storm Events of Different Frequency

Storm Event	Depth Ranges	500 Year	200 Year	100 Year	50 Year	25 Year	10 Year	5 Year
Number of Residential Structures Flooded	0-1 ft	5	7	5	4	2	1	1
	1-2 ft	0	33	25	8	8	8	5
	2-3 ft	36	1	0	0	0	0	0
	3-4 ft	0	0	0	0	0	0	0
	4-5 ft	0	0	0	0	0	0	0
	5-6 ft	0	1	1	0	0	0	0
	6-7 ft	1	0	0	0	0	0	0
Number of Commercial Properties Flooded	0-1 ft	0	0	0	0	0	0	0
	1-2 ft	0	0	0	0	0	0	0
	2-3 ft	0	0	0	0	0	0	0
	3-4 ft	0	0	0	0	0	0	0
	4-5 ft	0	0	0	0	0	0	0
	5-6 ft	0	0	0	0	0	0	0
	6-7 ft	0	0	0	0	0	0	0
Number of Other Buildings Flooded	0-1 ft	0	0	0	0	0	0	0
	1-2 ft	0	1	1	1	0	0	0
	2-3 ft	1	0	0	0	0	0	0
	3-4 ft	0	0	0	0	0	0	0
	4-5 ft	0	0	0	0	0	0	0
	5-6 ft	0	0	0	0	0	0	0
	6-7 ft	0	0	0	0	0	0	0

Source: J-U-B ENGINEERS, Inc.

The information in Tables 4 and 5 were used to calculate building damages and content loss under the FWOFI and Action Alternative using depth to damage functions from the U.S. Army Corps of Engineers (USACE) and parameters from the Federal Emergency Management Agency's HAZUS model.[5]

[5] S. Army Corps of Engineers. 2003. Economic Guidance Memorandum (EGM) 04-01, Generic Depth-Damage Relationships for Residential Structures with Basements; Federal Emergency Management Agency. 2021. HAZUS 5.0 Release Notes. Available at: https://www.fema.gov/sites/default/files/documents/fema_hazus-5.0-release-notes.pdf

4.1.1 Building damages. Building and content damages under the FWOFI and Action Alternative were derived using depth damage functions from the U.S. Army Corps of Engineers (USACE) as shown in Table 6. The depth damage functions relate flooding depth to a corresponding percentage reduction in building and content value. The analysis assumed that building contents represent 75 percent of building value for residential structures and 100 percent of building value for commercial and other structures, following assumptions used in the Federal Emergency Management Agency's HAZUS model.[6]

Table 6. Building and Contents Depth Damage Functions Used in the Benefit-Cost Analysis

Source:

USACE EMG04-01 (Buildings); USACE 1992 (Contents).

Flood Depth	Percent Reduction in Building Value	Percent Reduction in Content Value
0-1 ft	26%	12%
1-2 ft	32%	20%
2-3 ft	39%	28%
3-4 ft	46%	34%
4-5 ft	52%	42%
5-6 ft	59%	46%
6-7 ft	65%	47%
7-8 ft	70%	47%

4.1.2 Building content loss. Parameters from the HAZUS model were used to estimate the lost value of building contents as a percent of the structure replacement value as shown in Table 7. Contents included in the estimate include furniture, equipment, computers, appliances, clothing, and personal possessions. Contents do not include items like light fixtures, ceiling lamps, or mechanical or electronic components that are integral to the structure of a building. As the table shows, content value is assumed to be equal to 75 percent of building value for residential structures and 100 percent of building value for commercial and other structures.

Table 7. Building Content Loss as a Percent of Building Replacement Value Used to Calculate Building Content Loss in the Benefit-Cost Analysis

Source:

HAZUS v.5.0.

Occupancy Type	Content Value as Percent of Building Replacement Value
Residential	75%
Commercial	100%
Other	100%

[6] Federal Emergency Management Agency. 2021. HAZUS 5.0 Release Notes. Available at: https://www.fema.gov/sites/default/files/documents/fema_hazus-5.0-release-notes.pdf

4.1.3 Vehicle damages. The analysis also accounted for damages to vehicles at residents and commercial properties. Data from the U.S. Census' American Community Survey 2021 5-year Estimates Table B25046 (Aggregated Number of Vehicles Available by Tenure) and Table B25032 (Tenure by Units in Structure) were used to identify the average number of vehicles per household. The data showed that there was an average of 914 vehicles in Spring City between 2017 and 2021. During that same period, there were an average of 387 housing units, for an average of 2.36 vehicles per unit. Commercial businesses were assumed to have the same number of vehicles as residential units. An average depreciated vehicle value of $10,000 was conservatively used. Flood damages to vehicles located at damaged properties were estimated using building flood depths and depth-damage functions for vehicles from the U.S. Army Corps of Engineers as shown in Table 8.

Table 8. Depth Damage Function for Vehicles

Flood Depth (Feet)	Damage as a Percent of Total Vale
0-1	18%
1-2	37%
2-3	54%
3-4	69%
4-5	82%
6-7	100%

Source:

Department of the Army. 2009. Economic Guidance Memorandum, 09-04, Generic Depth-Damage Relationships for Vehicles

4.2 Reduced Farm Income Damages. The H&H projections of flood depth and extent were used to estimate the number of acres of farmland that would be impacted during 5-, 10-, 25-, 50-, 100-, and 500-year flood events. In total, there are approximately 6,150 acres of irrigated agricultural land in the study, but not all the irrigated acreage is damaged by flooding. Table 9 shows the number of acres of agricultural land in the watershed impacted by flooding under the No Action Alternative (FWOFI) and Action Alternative for 5-, 10-, 25-, 50-, 100-, and 500-year flood events. As the table shows, the Action Alternative will significantly reduce the number of agricultural acres impacted by flooding for floods of all frequencies.

Table 9. Acres of Farmland Impacted by Flood Events in the Project Area Under the No Action (FWOFI) and Action Alternative

Flood Depth (Feet)	Alternative/Flood Frequency													
	FWOFI	FWFI	FWOFI	FWFI	FWOFI	FWFI	FWOFI	FWFI	FWOFI	FWFI	FWOFI	FWFI	FWOFI	FWFI
	500-Year		200-Year		100-Year		50-Year		25-Year		10-Year		5-Year	
0-1	47.19	26.06	45.50	29.57	32.32	21.47	21.89	11.55	17.25	8.22	12.52	4.56	5.40	1.62
1-2	0	0	113.88	94.16	87.71	36.80	76.69	23.71	62.60	20.10	44.33	11.56	18.92	4.60
2-3	118.15	103.87	0.60	0.26	0.36	0	0.24	0.05	0	3.14	3.21	2.95	3.04	2.77
3-4	0	0	10.80	3.36	9.93	3.40	7.60	3.18	2.50	0	0.01	0	1.51	1.47
4-5	10.28	1.25	0.25	0.26	0.22	0.21	4.52	0.31	0.18	0.19	0.23	0.39	0.15	0.55
5-6	0	0	5.27	0.13	4.79	0.16	0.07	0.01	0	0.01	0	0	0	0.06
6-7	1.81	0	0.12	0.01	0.19	0.01	0.13	0.01	0.01	0	0	0	0	0
Total	**177.43**	**131.18**	**176.42**	**127.75**	**135.52**	**62.05**	**111.14**	**38.82**	**82.54**	**31.66**	**60.3**	**19.46**	**29.02**	**11.07**

Source: J-U-B ENGINEERS, Inc.

Communication with the project sponsors indicated that alfalfa is the predominant crop grown in the study area using a pressurized wheel line for irrigation. The gross value of acreage impacted by flooding was estimated using state-level yield and price data from the USDA's NASS and the Utah Department of Agriculture and Food as shown in Table 10.

Table 10. Crop Prices, Yields, and Gross Revenues Used to Estimate Avoided Damages in the Benefit-Cost Analysis (2022 $)

Crop	Units	Price Per Unit	Yield Units	Yield per Acre	Gross Value per Acre
Alfalfa	TON	$175	TON/AC	4.1	$718

Source: USDA NASS, 2022 (Unit Price); Utah Department of Agriculture and Food (Yield).

To estimate the value of reducing the number of acres impacted by flooding, a depth-damage function was used to relate the depth of flooding in Table 9 to a corresponding percent reduction in gross revenue as shown in Table 11. For example, an alfalfa field flooded with more than three feet of water would be expected to lose approximately 38.8 percent of its gross value.

Table 11. Depth-Damage Function Used to Estimate Avoided Crop Damages in the Benefit-Cost Analysis

Source: NRDF, 2000.

Crop	Flood Depth (Feet)		
	0 to 1	1 to 3	3+
Alfalfa	18.9%	31.9%	38.8%

Applying the information in Tables 10 and 11 to the agricultural acreages in Table 9 yields an average annual farm income damage of approximately $2,596 that would be avoided under the Action Alternative.[7]

4.3 Reduced Municipal Water Supply Expenses. The Project will install secondary water meters to measure the amount of water used to irrigate home lawns and gardens in Spring City. Metering of outdoor water use is estimated to conserve approximately 142 acre-feet of municipal water per year based on results from other utilities.[8] This figure represents a 26% savings over the current usage. Recent studies by large water districts in Utah have estimated that water savings on large residential lots like those of Spring City will be as high as 40%.[9]

The municipal water rates for Spring City were used to value the conserved municipal water. Municipal water rates reflect the material expenses of distributing water to customers. These expenses include capital, labor, energy, materials, and water supply. Some expenses are fixed, while others are variable. Conserving municipal water supply would avoid the variable expenses associated with delivering water. To estimate the variable portion of municipal water supply costs, the average cost of water was estimated using Spring City's municipal water rates and assuming a monthly water usage profile of 20,000 gallons per month, which reflects approximately 10,000 gallons per month of indoor use and 10,000 gallons per month of outdoor use.

Spring City's water utility uses an increasing block-rate pricing structure, whereby the average cost of

[7] This value is equal to $2,261 once it is discounted and annualized over a 100-year period.
[8] J-U-B ENGINEERS, Inc., personal communication, August, 2022; https://www.allianceforwaterefficiency.org/resources/metering
[9] J-U-B ENGINEERS, Inc., personal communication, August, 2022.

1,000 gallons of water increases with monthly use as shown in Table 12. Like most water utilities, Spring City's water utility recovers its fixed operating costs through the first tier of pricing, which leads to each thousand gallons of water in the first-tier costing $6.40. In the second usage tier, each thousand gallons costs an average of $1.50. In the third and fourth usage tiers, water costs and average of $2.00 and $2.50 per thousand gallons, respectively. Averaging the price across the second, third, and fourth tiers reduces the influence of the fixed cost component of the first tier and approximates the variable cost of providing municipal water to customers. Assuming an average monthly use of 20,000 gallons, the average variable cost of municipal water is $2.00 per thousand gallons under Spring City's municipal water pricing structure.

Table 12. Municipal Water Rates for Spring City

Source:
Spring City Municipal Government.

	Usage Tier (Gallons)			Average price for 20,000 gal of use
	6,000 to 11,000	**11,000 to 16,000**	**16,000 to 20,000**	
Price per 1,000 gal	$1.50	$2.00	$2.50	**$2.00**

The information in Table 12 was used to estimate the value of conserving 142 acre-feet as part of the metering component of the Project. In total, the metering project would conserve an annual total of 46.27 million gallons. At an average value of $2.00 per 1,000 gallons, the water metering component of the project is expected to save approximately $92,540 per year in municipal water supply expenses.

4.4. Reduced Power Generation Income Loss. Spring City owns and operates its own electrical grid, including a small hydroelectric generating plant located east of the City's limits. The facility's primary purpose is to serve as an agricultural water conveyance structure, but it also generates hydropower as it conveys irrigation water. The structure, known as the Oak Creek Upper Diversion, diverts flows from Oak Creek into a pipeline. The diversion was installed in the 1920's and has now exceed a 100-year service life. The City reports that the diversion has been damaged by multiple leaks due to corrosion reducing its thickness. In some sections, the diversion is reportedly so thin that a well-placed blow with a hammer or kick would be enough to cause a catastrophic failure.

Assessments by City staff indicate the diversion could fail catastrophically at any time. Should the diversion fail, the power it generates would have to be purchased on the wholesale market. Table 13 shows the power generated by the diversion during the 6-month period from July 2020 through December 2020 as well as the wholesale market value of the produced energy at a price of $0.09 per kilowatt-hour.

Table 13. Energy Produced by the Oak Creek Upper Diversion in Spring City, Utah and Wholesale Market Value of Power Produced from July Through December 2020 (2022 $)

Source: J-U-B ENGINEERS, Inc.

July 2020	137,300	$ 12,357
August 2020	108,100	$9,729
September 2020	99,500	$ 8,959
October 2020	91,500	$ 8,235
November 2020	79,800	$ 7,182
December 2020	78,800	$ 7,092
Total	**595,500**	**$ 53,554**
12-month Total	**1,191,000**	**$107,000**

As Table 13 shows, annual power production is valued at approximately $107,000 per year. Should the diversion fail during a water year similar to 2020, there will be a 100 percent loss of power generation revenue to the City for the period of time that the diversion is out of service. It is likely that the full replacement would impact an entire year while design, permitting and construction are completed.

J-U-B estimates that the annual probability of failure is more than 90 percent. As a result, the expected value of power production losses from a diversion failure is approximately $96,300 per year. Without the project, the diversion would likely fail in the next two years based on the above probability. If the diversion failed, it would have to be replaced at a cost of approximately $1.58 million, which is based on the cost of replacing the diversion plus a 25 percent premium to account for the emergency nature of the replacement. Based on these assumptions, the benefit of replacing the diversion before it fails is equal to avoiding the expected loss of income and replacement costs that would be incurred. These benefits are valued at approximately $223,583.

4.5. Increased Farm Income from Use of Conserved Water. There are approximately 6,150 acres of agricultural land in the study area. Piping the North Field Ditch and the Point Ditch is expected to save substantial amounts of water that are currently lost to leakage and seepage. In total, approximately 2,426 acre-feet of water per year are projected to be saved and made available to irrigate existing cropland.[10]

Based on conversations with the project sponsors, the primary crop grown in the area is alfalfa.[11] The water conserved by the Action Alternative would primarily be used to produce a final late-season cutting of alfalfa on existing irrigated acreage. While agricultural producers could respond to the increased supply by planting higher value crops, this analysis assumes that they will adapt by applying any additional water to existing crops to avoid the costs of converting fields and limiting their financial exposure to uncertain conditions in the future.

4.5.1. Conveyance and on-farm irrigation efficiencies. Overall efficiency is represented by conveyance efficiency and on-farm efficiency. Conversations with the project sponsors indicate that the areas served by the piped ditches would likely be irrigated with wheel lines.[12]

[10] J-U-B ENGINEERS, Inc., personal communication, August, 2022.
[11] J-U-B ENGINEERS, Inc., personal communication, August, 2022.
[12] J-U-B ENGINEERS, Inc., personal communication, August, 2022.

The water conserved by the proposed improvements would be gained after the water is diverted from the river and stored in Freeman Allred Reservoir (so would not be diminished by reservoir evaporative losses), but before the water is delivered to farm and ranch headgates.

Based on these considerations, the average on-farm efficiency of wheel lines is about 65 percent.[13] Based on this efficiency factor, the 2,426 acre-feet per year of conserved water from the Action Alternative would make an additional 1,577 acre-feet of water available for crop production.

4.5.2. Additional agricultural production. The primary benefit of a late season cutting of alfalfa is the marginal income it creates for producers by increasing crop production. Alfalfa is a perennial crop which grows for several years after planting. In Utah, irrigators generally start watering the crop in the spring. Depending on the water availability and other factors, two to three cuttings of alfalfa are made each season. Generally, a cutting is made in late spring, summer, and the early fall if water supplies allow for it. When water supplies are scarce, cuttings may only occur in the spring and summer.

Crop production functions can be used to estimate how additional water supplies increase crop yields. Generally, these equations are linear univariate functions relating consumptive water use to crop yields. The linear functional form is appropriate for modeling marginal increases in alfalfa production because studies have shown that yield response to water applied is linear for alfalfa up to yields of 10 tons or more per acre, which is well below the average yield of 4.43 tons per acre in the study area (Table 14).[14] A recent study by economists at the University of Utah found that it takes about 1.38 acre-feet to produce one ton of alfalfa in Utah.[15] Table 14 uses this figure to estimate the increase in alfalfa yields that would result from applying to the conserved water to existing farmland as proposed under the Action Alternative.

Table 14. Crop Production Function and Additional Crop Yield for Alfalfa in the Benefit-Cost Analysis

Crop Production Function (Acre-feet per ton)	**1.38**
Water Available (acre-feet)	**1,577**
Additional Crop Production	**1,143 Tons**

Source: USDA National Agricultural Statistics Service (2011-2021). NASS - Quick Stats. USDA National Agricultural Statistics Service. https://data.nal.usda.gov/dataset/nass-quick-stats. Accessed July 2022. Crop Water Requirements from Utah State University Extension Economics. 2006. Costs and Returns Per Acre from Growing Irrigated Alfalfa, North Sanpete County.

The crop production function indicates that producing one ton of alfalfa requires 1.38 acre-feet of water. To estimate the amount of additional crop production that would result from the Action Alternative, the additional irrigation supply was divided by the crop production function. Based on this calculation, alfalfa production would be expected to increase by 1,143 tons per year because of the water conserved under the Action Alternative.

4.5.3. Valuation of increased crop production. The additional alfalfa yield produced under the Action Alternative was valued by estimating gross revenue based on a 9-year average of state-wide alfalfa prices and subtracting marginal production costs.

[13] NRCS. 2019. Utah Irrigation Efficiency Worksheet. Available at: https://www.nrcs.usda.gov/wps/PA_NRCSConsumption/download?cid=nrcseprd1442639&ext=pdf
[14] NRCS. 2019. Utah Irrigation Efficiency Worksheet. Available at: https://www.nrcs.usda.gov/wps/PA_NRCSConsumption/download?cid=nrcseprd1442639&ext=pdf
[15] Lozada, G. 2023. Agricultural Water Use, Hay, and Utah's Water Future. University of Utah's Economics Department.

Marginal production costs were estimated using crop enterprise budgets developed by Utah State University for established irrigated alfalfa in Northern Sanpete County.[16]

The enterprise budget expresses crop production costs in terms of capital, labor, and materials. The costs are further categorized by activity, including pre-planting, planting, growing, and harvesting. These cost categories were reviewed to determine which cost categories would apply to the application of finishing water. We determined that costs related to irrigation and harvesting were the only cost categories that would increase as a result of applying finishing water. These costs were itemized and standardized to report expenses in terms of tons as shown in Table 15, below. The values in the enterprise budget were updated to 2022 dollars using the CPI and expressed in dollars per ton.

Table 15. Marginal Production Costs for Irrigated Alfalfa Used in the Benefit-Cost Analysis (2022 $)

Source:

Utah State University. 2006. Costs and Returns per Acre from Growing Irrigated Alfalfa Hay, North Sanpete County. Utah State University, Extension Economics.

Labor	$19.82
Water assessment	$3.28
Repairs	$3.43
Swathing	$6.00
Turning/raking	$2.07
Baling	$7.14
Hauling/stacking	$5.41
Total	**$47.14**

Table 16 shows statewide average prices for alfalfa from 2012 through 2020. Crop prices were adjusted for inflation using the CPI for their respective year and reported in 2022 dollars. Gross crop revenues were estimated by multiplying the average price in Table 16 by the additional alfalfa yield calculated in Table 14. Based on these calculations, the Action Alternative would increase farm income by approximately $146,716 per year, net of costs.

[16] Utah State University Extension Economics. 2006. Costs and Returns Per Acre from Growing Irrigated Alfalfa, North Sanpete County. Available at: https://extension.usu.edu/apec/files/uploads/Agribusiness-anFood/Budgets/Crops/Sanpete/NS-Alfalfa.pdf

Table 16 Average Prices, Gross Revenues, Gross Costs, and Net Operating Income for Alfalfa (Utah State Averages) (2022 $)

Source:

Price data form USDA National Agricultural Statistics Service (2011-2020). NASS - Quick Stats. USDA National Agricultural Statistics Service. https://data.nal.usda.gov/dataset/nass-quick-stats. Accessed August 2022.

2020	$231.00
2019	$187.00
2018	$182.00
2017	$172.00
2016	$134.00
2015	$127.00
2014	$162.00
2013	$188.00
2012	$182.00
Average	**$175.50**
Additional Crop Production	**1,143 Tons**
Gross Revenue	**$200,597**
Total Cost	**$53,881**
Net Revenue	**$146,716**

4.6. Increased Recreation Value. The proposed Freeman Allred reservoir would install recreation facilities that allow for different types of day uses. Recreation values associated with new reservoirs can be estimated using a variety of methods. The most robust approaches include using contingent valuation or travel cost methods to estimate user's willingness-to-pay (WTP) to recreate at a proposed site. While robust, these approaches require time and cost-intensive surveys of potential reservoir users, which is beyond the scope of this study. An alternative approach is to use the Unit Day Method (UDM). This method relies on informed opinions and judgements to estimate the WTP of users of proposed federal or federally-assisted recreation resources.[17]

The U.S. Army Corps of Engineers (USACE) unit-day values were used to value recreational user days (USACE 2021). The NRCS urges caution when using the USACE values because they have been found to systematically undercount recreation benefits (NRCS, n.d.). Still, the USACE values can provide a conservative, lower-bound estimate of the impacts on recreation values. Moreover, if recreation benefits estimated with the USACE values outweigh the project costs, it provides a strong indicator that realized impacts on recreation values would be likely to exceed estimates.

The USACE unit-day method provides a range of daily recreation values for general and specialized recreation that range from $4.27 to $50.72 in 2021 dollars (Table 17). General recreation refers to recreation activities that are accessible to the majority of a site's visitors without any specialized planning, equipment, or skills. General recreation often refers to activities like hiking, swimming, boating, picnicking, and fishing. Specialized recreation, in contrast, refers to activities where participation is limited by requiring some combination of special facilities, equipment, and skill.

[17] U.S. Army Corp of Engineers. 2021. Memorandum for Planning Community of Practice. Economic Guidance Memorandum, 22-03, Unit Day Values for Recreation for Fiscal Year 2022.

More specialized versions of fishing, boating, hunting, and similar activities are included in the USACE definition of specialized recreation (USACE 2021).

The exact amount used to value recreation user days relies on the evaluation of the type of recreation experience and the quality of experience available at a site. Sites are evaluated based on the number of recreation activities available, the number of alternative sites nearby, and the site's carrying capacity, accessibility, and environmental quality. Each criterion is associated with a score range. Once each criterion has been evaluated, the scores are added and the point total is used to select a daily use value that is applied to the recreation user days impacted by each alternative.

Table 17. User Day Values for General Recreation Based on Site Point Values (2022 $)

Source:

USACE. 2021. Economic Guidance Memorandum, 22-03, Unit Day Values for Recreation for Fiscal Year 2022.

Site Point Values	General Recreation Values
0	$4.50
10	$5.35
20	$5.91
30	$6.75
40	$8.44
50	$9.57
60	$10.41
70	$10.97
80	$12.10
90	$12.94
100	$13.50

Recreation user days at Freeman Allred Reservoir were defined as general recreation and the site was evaluated following USACE's site evaluation criteria (Table 18). Based on a review of the facilities that would be constructed at the proposed reservoir, the recreation experience at the site was determined to offer users the ability to participate in a few general activities, including hiking, picnicking, wildlife viewing, fishing, and other types of day use activities. A review of nearby sites determined that several other flatwater recreation facilities are within an hour drive, with one alternative site (Palisade Lake State Park) located within a 30-minute drive. The carrying capacity of the site was determined to be adequate to meet the demands of recreation users, access to the site was determined to be good, and the site was assessed to deliver a high aesthetic quality based on its proposed location above the town. In total, the site scored 47 out of 100 possible points, corresponding to a daily recreation use value of $8.44 per user day (Table 17 above).

Table 18. Guidelines for Assigning Points for General Recreation Sites

Criteria	Judgment Factors				
Recreation experience	Two general activities (0 - 4)	Several general activities (5 - 10)	Several general and one high-value activity (11 - 16)	Several general and more than one high-value activity (17 - 23)	Numerous high-value activities; some general activities (24 - 30)
Availability of opportunity	Several within 1 hour travel time; a few within 30 minutes (0 - 3)	Several within 1 hour travel time; none within 30 minutes (4 - 6)	One or two within 1 hour travel time; none within 45 minutes (7 - 10)	None within 1 hour travel time (11 - 14)	None within 2 hours travel time (15 - 18)
Carrying capacity	Minimum facilities for public health and safety (0 - 2)	Basic facilities for activities (3 - 5)	Adequate facilities for activities without degrading resource or user experience (6 - 8)	Optimum facilities to conduct activity at site potential (9 - 11)	Ultimate facilities to achieve intent of selected alternative (12 - 14)
Accessibility	Limited access by any means (0 - 3)	Fair access, poor quality roads to site, limited access within site (4 - 6)	Fair access, fair quality roads to site, good roads within site (7 - 10)	Good access, fair quality roads to site, good roads within site (11 - 14)	Good access, high standard road to site, good access within site (15 - 18)
Environmental quality	Low aesthetic factors that significantly lower quality (0 - 2)	Average aesthetic quality; factors exist that lower quality to minor degree (3 - 6)	Above average aesthetic quality; any limiting factors can be addressed (7 - 10)	High aesthetic quality; no limiting factors (11 - 15)	Outstanding aesthetic quality; no factors exist to lower quality (16 - 20)

Source: USACE, 2021.

Use of the proposed site was estimated following analyses of other federal reservoir projects in Utah by applying a use-estimating equation that projects use as a function of reservoir surface area. The use-estimating equation used in this study was taken from an Environmental Impact Statement (EIS) of a proposed reservoir project in Sanpete County, Utah, which is where the Freeman Allred Reservoir would be sited. The EIS for the Narrows Project, a proposed 17,000 acre-foot reservoir in Sanpete County, projected that recreation use at the site would average 77.7 user days per surface acre.[18] The Narrows Reservoir, while large than the proposed Freeman Allred Reservoir, had similar

[18] U.S. Department of the Interior, Bureau of Reclamation, Upper Colorado Region, Provo Area Office. 2012. Narrows Project Final Environmental Impact Statement, Narrows Project, Sanpete County, Utah.

proposed recreation facilities, including 11 picnic sites, a boat ramp, and a 20-site campground. The analysis of the Action Alternative adopts this equation to project annual recreation use at the proposed Freeman Allred Reservoir.

As Table 19 shows, the surface acreage of the proposed Freeman Allred Reservoir could vary from a maximum of 58.4 acres to a low if 40.2 acres, depending on the operating conditions. Discussions with J-U-B indicates that under normal operating conditions, the reservoir's surface acreage would vary from a maximum of 58.4 acres in the early spring to a low of 50.2 acres in the late fall.[19]

Projected recreation use at the proposed reservoir was estimated using the average of the maximum pool and late season pool surface acreages. As Table 19 shows, the average annual use of the reservoir, assuming an average surface acreage of 54.3 acres, which reflects the average surface area between the maximum and late season pools, would be approximately 4,220 user days. Under the minimum pool conditions, recreational use could be as low as 3,124 users per year. However, the average annual use of 4,220 was used to project the recreational benefits for the Action Alternative since it reflects the most likely operation conditions of the proposed reservoir. Based on the unit day value of $8.44 derived above, the recreation component of the Action Alternative would create an average annual benefit of $35,617 as shown in Table 19.

Table 19. Estimated Annual Recreation User Days and Recreation Values at Freeman Allred Reservoir Under Different Reservoir Operating Conditions

Freeman Allred Reservoir Surface Acreage	User Days per Surface Acre	Impact on Recreation User Days[1]
Maximum Pool - 58.4 acres	X 77.7 =	4,538
Late Season Pool - 50.2 acres	X 77.7 =	3,901
Minimum Pool - 40.2 acres	X 77.7 =	3,124
Maximum and Late Season Average		**4,220**
Average Annual Benefit	**X $8.44 =**	**$35,617**

Note: Sums may not add to totals as a result of rounding. User day equation from U.S. Department of the Interior, Bureau of Reclamation, Upper Colorado Region, Provo Area Office. 2012. Narrows Project Final Environmental Impact Statement, Narrows Project, Sanpete County, Utah.

4.7. Reduced Road Damages. Discussions with city staff indicated that past flood events in the late 1990's caused significant physical damage to local roads, creating hundreds of thousands of dollars in repair costs that would be well into the millions in 2023 dollars. City staff filled out form NRCS-ECN-044 to estimate the physical extent of roadways impacted by past flooding. According to the staff responses, approximately 2.84 lane miles of roads within Spring City were damaged by past flood events. The impacted sections of road had to be cleaned, flood debris had to be removed, roads had to be milled, and repaved. The road segments included seven blocks on 400 South Street, four blocks of 200 West Street, and four blocks of Center Street. City staff estimated that flood depths were 6 to 8 inches and that damage would increase (decrease) proportionally with flood depth.

[19] J-U-B ENGINEERS Inc., personal communication, August, 2022.

An analysis of road flooding within the watershed under existing and proposed conditions for the 5-year through 500-year flood events was also conducted as shown in Table 20. As the modeling shows, the proposed action would reduce the area of flooded roadways in the watershed by 168 linear feet to more than 38,000 linear feet under the 2-year and 500-year event, respectively.

Table 20. Estimated Reduction in Linear Feet of Flooded Roadways Under the Proposed Action, Spring City Watershed, Utah

Depth	Flood Return Frequency						
	500 Years	200 Years	100 Years	50 Years	25 Years	10 Years	5 Years
0-3 ft	25,274	23,478	39,566	38,632	18,228	14,848	8,336
3 - 6 ft	12,126	16,028	15,610	15,874	1,290	16	104
6 ft +	836	0	0	0	12	0	0
Total	**38,236**	**39,506**	**55,176**	**54,506**	**19,530**	**14,832**	**8,232**

Source: J-U-B Engineers, Inc.

While flood depth is an important determinant for assessing building damage, flood damage to roads is primarily a function of velocity. As a result, there are no depth-damage functions relating flood depths to road damages. To estimate the reduction in road-related damages that would be expected under the Action Alternative, the analysis follows previous watershed studies by assuming 85 percent of flooded road surfaces have to be cleaned and that 15 percent of road surfaces have to be replaced.[20] This study also adopts the cost estimates from previous studies which used civil engineers to estimate cleaning, repair, and replacement costs for arterial, collector, and local roads. To be conservative, this study uses cleaning and replacement costs for local roads since they are the lowest cost roads to clean, repair, and replace compared to collectors and arterial roadways. Assumptions and estimates used in the analysis are shown in Table 21.

Table 21. Road Cleaning, Repair, and Replacement Assumptions, Spring City Watershed, Utah (2022 $)

Metric	Value
Local road width	20 feet
Debris depth	2 feet
Debris deposit rate	1.48 CY/LF
Debris removal cost	$30/CY
Local road replacement cost	$172/LF

Source: Allen Dam Preliminary Draft Supplemental EA, Economic Appendix. 2023.

Based on the information and assumptions in Tables 20 and 21, the analysis estimates the Action Alternative will reduce road damages by $523,000 under the 5-year flood event to more than $2.4 million under the 500-year event (Table 22). On an annualized basis, road damages would be reduced by approximately $175,800.

[20] Allen Dam Preliminary Draft Supplemental EA, Economic Appendix. 2023. Available at: https://www.nrcs.usda.gov/sites/default/files/2023-02/MA%20Allen%20Dam%20Prelim%20Draft%20Suppl%20Plan%20EA%20-%20Econ%20Appendix%20D4%202.22.2023.pdf

Table 22. Estimated Reduction in Flood Damage to Roadways Under the Action Alternative, Spring City Watershed, Utah (Linear Feet)

Metric	Flood Return Frequency						
	500 Years	200 Years	100 Years	50 Years	25 Years	10 Years	5 Years
Reduction in damaged road (linear feet)	38,236	39,506	55,176	54,506	19,530	14,832	8,232
Total Cleaning Cost (85% at $30/LF)	$1,443,000	$1,491,000	$2,082,300	$2,057,100	$737,100	$559,800	$310,700
Total Replacement Cost (15% at $172/LF)	$986,500	$1,019,300	$1,423,500	$1,406,300	$503,900	$382,700	$212,400
Total Damage Reduction	**$2,429,500**	**$2,510,300**	**$3,505,800**	**$3,463,400**	**$1,241,000**	**$942,500**	**$523,100**

Note: Sums may not add to totals because of rounding.

4.8. Costs. Project costs include all expenses incurred as part of the development, installation, operation, and maintenance of a project. Preliminary engineering work was completed by J-U-B, who was hired by the Sponsoring Local Organization to lead design and planning work on the project. J-U-B is the lead engineer on the project. Based on this work, J-U-B provided cost estimates for the Action Alternative. The cost estimates were allocated to particular categories, which included:

- Permitting;
- Administration;
- Engineering and design;
- Construction; and
- Operations and Maintenance.

Each cost was allocated to federal sources or the project sponsor.

4.8.1. Installation costs. Installation costs were estimated using the bottom-up approach. This method breaks projects and structures into lower-level components and then costs those components for their direct costs, including labor, materials, and professional services. In addition, installation cost estimates include cost contingencies of 15 percent of construction costs.

Tables 23 through 36 show the estimated installation costs for the three structures included in the Action Alternative.

Table 23. Estimated Installation Costs of Structure F1 of the Action Alternative (2022 $).[1]

ESTIMATE OF QUANTITIES					
Item #	**Description**	**Unit**	**Unit Cost**	**Quantity**	**Total**
F1 – 1,000 AF Debris Basin/Storage Reservoir					
1.	Mobilization	LS	$91,268.00	1	**$91,268.00**
2.	Clear and Grub	ACRE	$356.31	100	**$35,631.00**
3.	Exc to Clay Core	CY	$2.18	70,600	**$153,908.00**
4.	Exc to Dam Embankment	CY	$1.26	250,000	**$315,000.00**
5.	Exc to Haul to Waste (4 miles)	CY	$1.49	680,000	**$1,013,200.00**
6.	Import Sand Filter	CY	$28.81	11,700	**$337,077.00**
7.	Import RipRap Inside Face	CY	$25.25	8,100	**$204,525.00**
8.	Toe Drain Piping	LF	$8.43	3,000	**$25,290.00**
9.	Toe Drain Gravel	CY	$4.22	2,300	**$9,706.00**
10.	Energy Dissipation/Concrete Sediment Deposit/Cleaning Structure	LS	$35,125.00	1	**$35,125.00**
11.	Concrete Emergency Spillway	LS	$140,500.00	1	**$140,500.00**
12.	Concrete Access Ramp	LS	$7,025.00	1	**$7,025.00**
				Contingency (15%)	**$355,238.25**
				Total Opinion of Cost - Construction	**$2,723,493.25**
PROFESSIONAL SERVICES					
1.	Engineering (16% Construction Costs)	LS	1	$378,920.80	$378,920.80
2.	Permitting	LS	1	$5,000.00	$5,000.00
3.	Administration and Other Fees	LS	1	$48,698.43	$48,698.43
				Total Professional Services Estimated Cost	**$432,619.23**
				Total Project Cost	**$3,156,112.48**

Source: J-U-B ENGINEERS, Inc. Prepared August 2022.

Table 24. Estimated Installation Costs of Structure F2 of the Action Alternative (2022 $).[1]

ESTIMATE OF QUANTITIES					
Item #	**Description**	**Unit**	**Unit Cost**	**Quantity**	**Total**
F2 – Concrete Flood Channel to Reservoir Site					
1.	Mobilization	LS	$123,000.00	1	**$123,000.00**
2.	Access Road Improvement and Maintenance for Construction	LF	$20.00	5,800	**$116,000.00**
3.	Unclassified Excavation	LS	$250,000.00	1	**$250,000.00**
4.	Foundation Material	TON	$40.00	9,800	**$392,000.00**
5.	Concrete Trapezoidal Channel Bottom Width 6 ft	LF	$550.00	5,900	**$3,245,000.00**
6.	Non-woven Geotechnical Fabric	SY	$2.00	17,700	**$35,400.00**
7.	Misc Concrete Ramps and Outlet Structure to Reservoir	LS	$50,000.00	1	**$50,000.00**
				Contingency (15%)	**$631,710.00**
				Total Opinion of Cost - Construction	**$4,843,110.00**
PROFESSIONAL SERVICES					
1.	Engineering (16% Construction Costs)	LS	1	$673,824.00	$673,824.00
2.	Permitting	LS	1	$5,000.00	$5,000.00
3.	Administration and Other Fees	LS	1	$85,561.33	$85,561.33
				Total Professional Services Estimated Cost	**$764,385.33**
				Total Project Cost	**$5,607,495.33**

Source: J-U-B ENGINEERS, Inc. Prepared August 2022.

Table 25. Estimated Installation Costs of Structure F3 of the Action Alternative (2022 $).[1]

ESTIMATE OF QUANTITIES					
Item #	**Description**	**Unit**	**Unit Cost**	**Quantity**	**Total**
F3 – Mill Race Flood Ditch Piping					
1.	Mobilization	LS	$33,000.00	1	**$33,000.00**
2.	24" HDPE DR 26	LF	$71.28	11,594	**$826,420.32**
3.	24" Culvert Road Reconstruction	LF	$50.00	682	**$34,100.00**
4.	Foundation Material	TON	$18.00	7,554	**$135,972.00**
5.	Imported Backfill	TON	$18.00	812	**$14,616.00**
6.	Air Valve Assembly	EA	$2,500.00	6	**$15,000.00**
7.	Storm Drainage Ditch	LF	$5.00	11,594	**$57,970.00**
				Contingency (15%)	**$167,561.70**
				Total Opinion of Cost - Construction	**$1,284,639.70**
PROFESSIONAL SERVICES					
1.	Engineering (16% Construction Costs)	LS	1	$178,732.48	$178,732.48
2.	Permitting	LS	1	$5,000.00	$5,000.00
3.	Administration and Other Fees	LS	1	$23,674.90	$23,674.90
				Total Professional Services Estimated Cost	**$207,407.38**
				Total Project Cost	**$1,492,047.08**

Source: J-U-B ENGINEERS, Inc. Prepared August 2022.

Table 26. Estimated Installation Costs of Structure A1 of the Action Alternative (2022 $).[1]

ESTIMATE OF QUANTITIES					
Item #	**Description**	**Unit**	**Unit Cost**	**Quantity**	**Total**
A1 – North Field Ditch Piping					
1.	Mobilization	LS	$48,000.00	1	**$48,000.00**
2.	12" HDPE DR 32.5	LF	$29.67	8,608	**$255,399.36**
3.	16" HDPE DR 32.5	LF	$42.26	7,231	**$305,582.06**
4.	6" HDPE DR 32.5	LF	$15.20	3,836	**$58,307.20**
5.	4" HDPE DR 32.5	LF	$5.75	1,400	**$8,050.00**
6.	Turnouts	EA	$7,000.00	18	**$126,000.00**
7.	Modify Diversion Structure	LS	$15,000.00	1	**$15,000.00**
8.	Outlet Structure	LS	$6,000.00	1	**$6,000.00**
9.	Imported Backfill	TON	$18.00	7,790	**$140,220.00**
10.	Foundation Material	TON	$18.00	975	**$17,550.00**
11.	Air Valve Assembly	EA	$2,500.00	8	**$20,000.00**
				Contingency (15%)	**$150,016.00**
				Total Opinion of Cost - Construction	**$1,150,124.91**
PROFESSIONAL SERVICES					
1.	Engineering (16% Construction Costs)	LS	1	$160,017.38	$160,017.38
2.	Permitting	LS	1	$1,500.00	$1,500.00
3.	Administration and Other Fees	LS	1	$20,402.17	$20,402.17
				Total Professional Services Estimated Cost	**$181,919.55**
				Total Project Cost	**$1,332,044.46**

Source: J-U-B ENGINEERS, Inc. Prepared August 2022.

Table 27. Estimated Installation Costs of Structure A2 of the Action Alternative (2022 $).[1]

ESTIMATE OF QUANTITIES					
Item #	**Description**	**Unit**	**Unit Cost**	**Quantity**	**Total**
A2 – Point Ditch Piping					
1.	Mobilization	LS	$25,000.00	1	**$25,000.00**
2.	22" HDPE DR 32.5	LF	$55.13	6,888	**$379,735.44**
3.	Inlet Structure	LS	$15,000.00	1	**$15,000.00**
4.	Outlet Structure	LS	$6,000.00	1	**$6,000.00**
5.	Imported Backfill	TON	$18.00	4,124	**$74,232.00**
6.	Foundation Material	TON	$18.00	47	**$846.00**
7.	Air Valve Assembly	EA	$2,500.00	3	**$7,500.00**
8.	Highway Crossing	LS	$12,000.00	1	**$12,000.00**
9.	22" Flow Meter	LS	$9,000.00	1	**$9,000.00**
				Contingency (15%)	**$79,397.02**
				Total Opinion of Cost - Construction	**$608,710.46**
PROFESSIONAL SERVICES					
1.	Engineering (16% Construction Costs)	LS	1	$84,690.15	$84,690.15
2.	Permitting	LS	1	$1,500.00	$1,500.00
3.	Administration and Other Fees	LS	1	$10,986.27	$10,986.27
				Total Professional Services Estimated Cost	**$97,176.42**
				Total Project Cost	**$705,886.88**

Source: J-U-B ENGINEERS, Inc. Prepared August 2022.

Table 28. Estimated Installation Costs of Structure A3 of the Action Alternative (2022 $).[1]

ESTIMATE OF QUANTITIES					
Item #	**Description**	**Unit**	**Unit Cost**	**Quantity**	**Total**
A3 – Diversion Replacement					
1.	Mobilization	LS	$45,000.00	1	**$45,000.00**
2.	20" HDPE DR 32.5	LF	$47.96	3,767	**$180,665.32**
3.	24" HDPE DR 13.5	LF	$108.64	1,928	**$209,457.92**
4.	24" HDPE DR 11	LF	$125.19	1,659	**$207,690.21**
5.	24" HDPE DR 9	LF	$144.10	1,097	**$158,077.70**
6.	Imported Backfill	TON	$18.00	5,114	**$92,052.00**
7.	Foundation Material	TON	$18.00	686	**$12,348.00**
8.	20" Flow Meter	EA	$7,500.00	1	**$7,500.00**
9.	Air Valve Assembly	EA	$2,500.00	4	**$10,000.00**
10.	Modifications to Upper Structure	LS	$10,000.00	1	**$10,000.00**
11.	Hydroelectric Plant Modifications	LS	$15,000.00	1	**$15,000.00**
				Contingency (15%)	**$142,168.67**
				Total Opinion of Cost - Construction	**$1,089,959.82**
PROFESSIONAL SERVICES					
1.	Engineering (16% Construction Costs)	LS	1	$151,646.58	$151,646.58
2.	Permitting	LS	1	$1,500.00	$1,500.00
3.	Administration and Other Fees	LS	1	$19,355.82	$19,355.82
				Total Professional Services Estimated Cost	**$172,502.41**
				Total Project Cost	**$1,262,462.23**

Source: J-U-B ENGINEERS, Inc. Prepared August 2022.

Table 29. Estimated Installation Costs of Structure A4 of the Action Alternative (2022 $).[1]

ESTIMATE OF QUANTITIES					
Item #	**Description**	**Unit**	**Unit Cost**	**Quantity**	**Total**
A4 – Water Transmission Pipeline from Reservoir Site					
1.	Mobilization	LS	$50,000.00	1	**$50,000.00**
2.	26" HDPE DR 19	LF	$108.11	2,798	**$302,491.78**
3.	36" HDPE DR 26	LF	$137.95	1,676	**$231,204.20**
4.	36" HDPE DR 21	LF	$160.25	4,083	**$654,300.75**
5.	Imported Backfill	TON	$18.00	6,195	**$111,510.00**
6.	Foundation Material	TON	$18.00	546	**$9,828.00**
7.	26" Flow Meter	EA	$9,000.00	1	**$9,000.00**
8.	Outlet Structure	EA	$10,000.00	1	**$10,000.00**
9.	Air Valve Assembly	EA	$2,500.00	4	**$10,000.00**
				Contingency (15%)	**$208,250.21**
				Total Opinion of Cost - Construction	**$1,596,584.94**
PROFESSIONAL SERVICES					
1.	Engineering (16% Construction Costs)	LS	1	$222,133.56	$222,133.56
2.	Permitting	LS	1	$1,500.00	$1,500.00
3.	Administration and Other Fees	LS	1	$28,166.69	$28,166.69
				Total Professional Services Estimated Cost	**$251,800.25**
				Total Project Cost	**$1,848,385.19**

Source: J-U-B ENGINEERS, Inc. Prepared August 2022.

Table 30. Estimated Installation Costs of Structure A5 of the Action Alternative (2022 $).[1]

ESTIMATE OF QUANTITIES					
Item #	**Description**	**Unit**	**Unit Cost**	**Quantity**	**Total**
A5 – Oak Creek Diversion Structure Replacement					
1.	Mobilization	LS	$4,000.00	1	**$4,000.00**
2.	Structure	LS	$100,000.00	1	**$100,000.00**
3.	Control Slide Gate	EA	$10,000.00	1	**$10,000.00**
4.	Rip Rap	TON	$35.00	140	**$4,900.00**
5.	Clear and Grub	LS	$15,000.00	1	**$15,000.00**
				Contingency (15%)	**$20,085.00**
				Total Opinion of Cost - Construction	**$153,985.00**
PROFESSIONAL SERVICES					
1.	Engineering (16% Construction Costs)	LS	1	$21,424.00	$21,424.00
2.	Permitting	LS	1	$1,500.00	$1,500.00
3.	Administration and Other Fees	LS	1	$3,078.00	$3,078.00
				Total Professional Services Estimated Cost	**$26,002.00**
				Total Project Cost	**$179,987.00**

Source: J-U-B ENGINEERS, Inc. Prepared August 2022.

Table 31. Estimated Installation Costs of Structure A6 of the Action Alternative (2022 $).[1]

ESTIMATE OF QUANTITIES					
Item #	**Description**	**Unit**	**Unit Cost**	**Quantity**	**Total**
A6 – 20 Acre Regulating Pond					
1.	Mobilization	1	Lump Sum	$47,500.00	**$47,500.00**
2.	Clear and Grub	3	Acre	$1,268.00	**$3,804.00**
3.	Excavate and Place as Clay Core	11000	Cubic Yards	$7.76	**$85,360.00**
4.	Excavate and Place as Dam Embankment	14700	Cubic Yards	$4.47	**$65,709.00**
5.	Imported Sand Filter	2200	Cubic Yards	$102.54	**$225,588.00**
6.	Imported Rip Rap Inside Embankment Face	8100	Cubic Yards	$89.84	**$727,704.00**
7.	Toe Drain Piping	1400	Linear Feet	$30.00	**$42,000.00**
8.	Toe Drain Gravel	1300	Cubic Yards	$15.00	**$19,500.00**
9.	Concrete Spillway	1	Lump Sum	$10,000.00	**$10,000.00**
10.	Concrete Access Ramp	1	Lump Sum	$5,000.00	**$5,000.00**
11.	Irrigation Outlet Works	1	Lump Sum	$5,000.00	**$5,000.00**
12.	Mobilization	1	Lump Sum	$47,500.00	**$47,500.00**
				Contingency (15%)	**$185,574.75**
				Total Opinion of Cost - Construction	**$1,422,739.75**
PROFESSIONAL SERVICES					
1.	Engineering (16% Construction Costs)	LS	1	$197,946.40	$197,946.40
2.	Permitting	LS	1	$1,500.00	$1,500.00
3.	Administration and Other Fees	LS	1	$25,143.30	$25,143.30
				Total Professional Services Estimated Cost	**$224,589.70**
				Total Project Cost	**$1,647,329.45**

Source: J-U-B ENGINEERS, Inc. Prepared August 2022.

Table 32. Estimated Installation Costs of Structure A7 of the Action Alternative (2022 $).[1]

ESTIMATE OF QUANTITIES					
Item #	**Description**	**Unit**	**Unit Cost**	**Quantity**	**Total**
A7 – 1,000 AF Debris Basin/Storage Reservoir					
1.	Mobilization	LS	$233,528.00	1	**$233,528.00**
2.	Clear and Grub	ACRE	$911.69	100	**$91,169.00**
3.	Exc to Clay Core	CY	$5.58	70,600	**$393,948.00**
4.	Exc to Dam Embankment	CY	$3.21	250,000	**$802,500.00**
5.	Exc to Haul to Waste (4 miles)	CY	$3.82	680,000	**$2,597,600.00**
6.	Import Sand Filter	CY	$73.73	11,700	**$862,641.00**
7.	RipRap Inside Face	CY	$64.59	8,100	**$523,179.00**
8.	Toe Drain Piping	LF	$21.57	3,000	**$64,710.00**
9.	Toe Drain Gravel	CY	$10.79	2,300	**$24,817.00**
10.	Energy Dissipation/Concrete Sediment Deposit/Cleaning Structure	LS	$89,975.00	1	**$89,975.00**
11.	Concrete Emergency Spillway	LS	$359,500.00	1	**$359,500.00**
12.	Concrete Access Ramp	LS	$17,975.00	1	**$17,975.00**
13.	Irrigation Outlet Works (100%)	LS	$15,000.00	1	**$15,000.00**
				Contingency (15%)	**$911,481.30**
				Total Opinion of Cost - Construction	**$6,988,023.33**
PROFESSIONAL SERVICES					
1.	Engineering (16% Construction Costs)	LS	1	$972,246.72	$972,246.72
2.	Permitting	LS	1	$1,500.00	$1,500.00
3.	Administration and Other Fees	LS	1	$121,930.84	$121,930.84
				Total Professional Services Estimated Cost	**$1,095,677.56**
				Total Project Cost	**$8,083,700.86**

Source: J-U-B ENGINEERS, Inc. Prepared August 2022.

Table 33. Estimated Installation Costs of Structure A8 of the Action Alternative (2022 $).[1]

ESTIMATE OF QUANTITIES					
Item #	**Description**	**Unit**	**Unit Cost**	**Quantity**	**Total**
A8 – Water Meters					
1.	Mobilization	LS	$4,110.00	1	**$4,110.00**
2.	Water Meter Installation	EA	$1,695.00	502	**$850,890.00**
				Contingency (15%)	**$128,250.00**
				Total Opinion of Cost - Construction	**$983,250.00**
PROFESSIONAL SERVICES					
1.	Engineering (16% Construction Costs)	LS	1	$136,800.00	$136,800.00
2.	Permitting	LS	1	$1,500.00	$1,500.00
3.	Administration and Other Fees	LS	1	$17,500.00	$17,500.00
				Total Professional Services Estimated Cost	**$155,800.00**
				Total Project Cost	**$1,139,050.00**

Source: J-U-B ENGINEERS, Inc. Prepared August 2022.

Table 34. Estimated Installation Costs of Structure A9 of the Action Alternative (2022 $).[1]

ESTIMATE OF QUANTITIES					
Item #	**Description**	**Unit**	**Unit Cost**	**Quantity**	**Total**
A9 – Oak Creek Bypass Piping					
1.	Mobilization	LS	$18,000.00	1	**$18,000.00**
2.	12" HDPE DR 32.5	LF	$30.00	5,326	**$159,780.00**
3.	Modify Existing Pond	LS	$10,000.00	1	**$10,000.00**
4.	Outlet Structure	LS	$6,000.00	1	**$6,000.00**
5.	Imported Backfill	TON	$18.00	1,990	**$35,820.00**
6.	Foundation Material	TON	$18.00	250	**$4,500.00**
7.	Air Valve Assembly	EA	$2,500.00	3	**$7,500.00**
				Contingency (15%)	**$36,240.00**
				Total Opinion of Cost - Construction	**$277,840.00**
PROFESSIONAL SERVICES					
1.	Engineering (16% Construction Costs)	LS	1	$38,656.00	$38,656.00
2.	Permitting	LS	1	$1,500.00	$1,500.00
3.	Administration and Other Fees	LS	1	$5,232.00	$5,232.00
				Total Professional Services Estimated Cost	**$45,388.00**
				Total Project Cost	**$323,228.00**

Source: J-U-B ENGINEERS, Inc. Prepared August 2022.

Table 35. Estimated Installation Costs of Structure A10 of the Action Alternative (2022 $).[1]

ESTIMATE OF QUANTITIES					
Item #	**Description**	**Unit**	**Unit Cost**	**Quantity**	**Total**
A10 – Chester Ponds Capacity Restoration					
1.	Mobilization	LS	$40,000.00	1	**$40,000.00**
2.	Pond 1 Restoration/Dredging	CY	$9.75	32,000	**$312,000.00**
3.	Pond 2 Restoration/Dredging	CY	$9.75	65,000	**$633,750.00**
4.	Pond 3 Restoration/Dredging	CY	$9.75	36,000	**$351,000.00**
5.	Pond 4 Restoration/Dredging	CY	$9.75	27,000	**$263,250.00**
				Contingency (15%)	**$240,000.00**
				Total Opinion of Cost - Construction	**$1,840,000.00**
PROFESSIONAL SERVICES					
1.	Engineering (16% Construction Costs)	LS	1	$256,000.00	$256,000.00
2.	Permitting	LS	1	$1,500.00	$1,500.00
3.	Administration and Other Fees	LS	1	$32,400.00	$32,400.00
				Total Professional Services Estimated Cost	**$289,900.00**
				Total Project Cost	**$2,129,900.00**

Source: J-U-B ENGINEERS, Inc. Prepared August 2022.

Table 36. Estimated Installation Costs of Structure R1 of the Action Alternative (2022 $).[1]

ESTIMATE OF QUANTITIES					
Item #	**Description**	**Unit**	**Unit Cost**	**Quantity**	**Total**
R1 – Freeman Allred Day Use Area					
1.	Mobilization	LS	$5,000.00	1	**$5,000.00**
2.	Trail	LF	$20.00	6,500	**$125,000.00**
3.	Day Use Camp Ground	LS	$200,000.00	1	**$200,000.00**
				Contingency (15%)	**$49,500.00**
				Total Opinion of Cost - Construction	**$379,500.00**
PROFESSIONAL SERVICES					
1.	Engineering (16% Construction Costs)	LS	1	$52,800.00	$52,800.00
3.	Administration and Other Fees	LS	1	$10,000.00	$10,600.00
				Total Professional Services Estimated Cost	**$63,400.00**
				Total Project Cost	**$442,900.00**

Source: J-U-B ENGINEERS, Inc. Prepared August 2022.

4.8.2. Other direct costs & adverse effects. According to the NRCS PR&G:

> *Other direct costs and adverse effects include uncompensated losses caused by the installation, operation, maintenance, and replacement of a project or group of projects. These other direct costs and adverse impacts can include costs caused by downstream flood damages cause by channel modifications, levies, dikes, and other structures, erosion of land along streambanks created by dams that prevent sediment export downstream, and through lost use value of the land where flood mitigation structures are cited (NRCS, 2014).*

The Action Alternative has two types of other direct costs. The nature of and methods used to calculate these other direct costs are discussed in more detail, below.

4.8.2.1. Operations and maintenance. Once the works of improvement are built, overheads for operations and maintenance will be required for the works of improvement to continue generating the benefits for which they were designed. Operations and maintenance costs were estimated to be 0.75 percent of each work of improvement's construction costs. Estimated annual operations and maintenance costs for each work of improvement are shown in Table 37, below.

Table 37: Estimated Annual Operations and Maintenance Costs for Works of Improvement Included in the Action Alternative (2022 $)

Note:

Annual operations and maintenance (O&M) costs are assumed to equal 0.75 percent of structure construction costs, which do not include costs for engineering, permitting, and administration.

Work of Improvement	Construction Cost	Annual O&M Costs
F1	$2,368,255	$17,762
F2	$4,211,400	$31,586
F3	$1,117,078	$8,378
A1	$1,000,109	$7,501
A2	$529,313	$3,970
A3	$947,791	$7,108
A4	$1,388,335	$10,413
A5	$133,900	$1,004
A6	$1,237,165	$9,279
A7	$6,076,542	$45,574
A8	$855,000	$6,413
A9	$241,600	$1,812
A10	$1,600,000	$12,000
R1	$330,000	$2,475
Total	**$22,036,488**	**$165,274**

4.8.2.2. Foregone power production. Replacing the diversion (work of improvement A3), would require the power produced by the diversion to be foregone during the one-year installation period. Based on the information on Table 13, above, the foregone power production would represent a one-time cost of approximately $107,000 in addition to the installation costs of the structure.

5. Current Economic Damages

Average annual expenses and flood losses and under the FWOFI were estimated to serve as a benchmark of comparison with the Action Alternative and are shown in Table 38, below (NWPM 501.36). In total, average annualized flood damages under the FWOFI are approximately $977,900 per year, including $842,700 of property-related damages, $90,263 of municipal water supply expenses, $2,300 of farm income damages, and $42,600 of power income damages related to expected damages to the Oak Creek Upper Diversion.

Table 38. Average Annualized Damages and Expenses Under the FWOFI (2022 $).[1]

	Agriculture-related				Average Annual Damages
Alternative	**Property-related Damages[2]**	**Farm Income Damages**	**Municipal Water Supply Expense**	**Power Income Damages**	**Total**
FWOFI	$842,700	$2,300	$90,300	$42,600	$977,900
Total	**$842,700**	**$2,300**	**$90,300**	**$42,600**	**$977,900**

Notes: Totals may not sum due to rounding. Prepared: August 2022.

1. Price base: 2022 dollars; amortized over 100 years at a discount rate of 2.25 percent.

2. Property-related damages include losses to structures as well as structure contents, business inventories, income, and relocation expenses.

6. Economic and Structural Tables

The results of the cost-benefit analysis for the Action Alternative are compared against the FWOFI or No Action Alternative and serve as the best estimate of the additional economic value that would be created under the Action Alternative. Results are presented using the Economic and Structural Tables (NWPM Part 506, NRCS 2014b) as shown below.

Table 39 (National Watershed Program Manual [NWPM] 506.11, Economic Table 1; NRCS 2014),Table 40 (NWPM 506.12, Economic Table 2; NRCS 2014), and Table 41 (NWPM 506.18, Economic Table 4) below summarize installation costs, distribution of costs, and total annual average costs for the Action Alternative.

Table 39. Economic Table 1—Estimated Installation Cost of the Action Alternative (2022 $).[1,2]

Works of Improvement	Unit	Number			Estimated Project Cost		Project Total
		Federal Land	Non-Federal Land	Total	Public Law 83-566 Funds (Non- Federal land)	Other Funds (Non-Federal land)	
Flood Control and Detention Agricultural Water Management Recreation	Acres	0.1	77.8	77.9	$25,090,974	$4,259,554	$29,350,529
	Linear Feet	5,027	67,441	72,468			
	Cubic Yards	0	160,000	160,000			
Total					**$25,090,974**	**$4,259,554**	**$29,350,529**

Notes: Totals may not sum due to rounding. Prepared: August 2022.

1. Price base: 2022 dollars. 2. Project cost prepared by J-U-B ENGINEERS, Inc. 3. Costs are for Freeman Allred Reservoir based on the percentage of the project designed to serve flood control and agricultural water management purposes.

Table 40. Economic Table 2 —Estimated Cost Distribution of the Action Alternative (2022 $).[1,2]

Works of Improvement	Installation Costs—PL 83-566 Funds					Installation Cost—Other Funds					Total
	Construction	Engineering	Permitting	Administration	Total PL 83-566	Construction	Engineering	Permitting	Administration	Total Other	
Spring City Watershed Project Action Alternative	$21,124,407	$3,525,838	$-	$440,730	$25,090,974	$4,217,554	$-	$30,000	$12,000	4,259,554	$29,350,529
Total	**$21,124,407**	**$3,525,838**	**$-**	**$440,730**	**$25,090,974**	**$4,217,554**	**$-**	**$30,000**	**$12,000**	**4,259,554**	**$29,350,529**

Notes: Totals may not sum due to rounding. Prepared: August 2022.

1. Price base: 2022 dollars. 2. Project cost prepared by J-U-B ENGINEERS, Inc.

In addition to the installation costs, the Action Alternative will entail costs associated with operations and maintenance of the works of improvement. These costs are included as “Other Direct Costs” in Table 38. The total annualized cost of installing, operating, and maintaining the various works of improvement included in the Action Alternative is approximately $893,900 over the 100-year analysis period.

Table 41. Economic Table 4—Estimated Average Annual NEE Costs (2022$).[1]

Action Alternative Component	Project Outlays (Amortization of Installation Cost)	Other Direct Costs[2]	Total Cost[3]
F1	$78,531	$17,229	$95,800
F2	$139,536	$30,638	$170,200
F3	$37,125	$8,127	$45,300
A1	$33,144	$7,276	$40,400
A2	$17,564	$3,851	$21,400
A3	$34,545	$7,070	$41,600
A4	$45,992	$10,100	$56,100
A5	$4,478	$974	$5,500
A6	$40,989	$9,001	$50,000
A7	$201,139	$44,208	$245,300
A8	$28,342	$6,220	$34,600
A9	$8,043	$1,758	$9,800
A10	$52,996	$11,640	$64,600
R1	$11,020	$2,401	$13,400
Total	**$733,444**	**$160,493**	**$893,900**

Notes: Totals may not sum due to rounding. Prepared: August 2022.

1. Price base: 2022 dollars, amortized over 100 years at a discount rate of 2.25 percent.
2. Other direct costs include annual operations and maintenance associated with each work of improvement based on 0.75 percent of construction costs.
3. Total cost rounded to nearest 100

The impact of the Action Alternative on ecosystem flows and values is shown in Table 42, below. The Action Alternative would positively impact regulating, provisioning, and cultural services in the watershed by avoided property-related damages, damages to farm incomes and power generation infrastructure, avoiding expenses associated with supplying municipal water, increasing farm income, and increasing recreation values. In total, the Action Alternative would create average annual gross benefits of approximately $1,143,100 per year.

Table 42. Economic Table 5a—Estimated Average Annual Benefits of the Action Alternative (2022 $).[1]

Benefit/Avoided Damage	Agricultural- related	Non-Agricultural- related
Onsite		
Reduced property-related damages	$658,400	
Reduced farm income losses	$2,500	
Reduced power income losses	$42,600	
Reduced municipal water supply expenses	$90,300	
Reduced road damages	$171,500	
Increased farm income	$143,100	
Increased recreation values		$34,700
Subtotal	**$1,108,400**	**$34,700**
Offsite		
N/A	-	-
Subtotal	**$1,108,400**	**$34,700**
Total Quantified Benefits	**$1,143,100**	

Notes: Totals may not sum due to rounding. Prepared: August 2022.

1. Price base: 2022 dollars amortized over 100 years at a discount rate of 2.25 percent.

Using the resulting benefits and costs from the previous two tables, Table 43 (NWPM 506.21, Economic Table 6, NRCS 2014b) presents a comparison of the NEE average annual benefits and average annual costs for the Action Alternative. In total, the Action Alternative will generate average annual benefits of $1,143,100 compared to average annual costs of $893,900, for a benefit-cost ratio of 1.3.

The increments of benefit and cost for each work of improvement of the Action Alternative are also shown in Table 43. Works of improvement were analyzed together to reflect their interrelated nature. While the costs of each work of improvement were analyzed separately, in practice many of the works are interrelated and cannot function independently of one another. As a result, works of improvement related to the proposed Freeman Allred reservoir, which include F1, F2, F3, A4, A5, A6, and A7, were analyzed as a single work of improvement. Since the primary purpose of the reservoir is flood mitigation, its cost was compared against the benefits received from avoided property-related damages and avoided farm income damages.

Work of improvement A3 (i.e. diversion replacement) was analyzed in isolation since it operates independently of other works. Its costs were compared against the avoided damages that would result from lost power generation income and emergency replacement expenses. Work of improvement A8 (i.e. secondary water meters) was also analyzed in isolation since it operates independently of other works. Its costs were compared against the benefits of avoiding municipal water supply expenditures. Works of improvement related to piping open irrigation laterals, which include A1, A2, A9, and A10, were analyzed as a single work of improvement since their intended purpose is to increase irrigation efficiency. The cost of the combined works were compared against the benefit of the increased farm income that would be produced with the conserved irrigation water. Lastly, work of improvement R1 (i.e. recreation facilities) was also analyzed in isolation since it operates independently of other works. Its costs were compared against the benefits of increasing recreation values.

Table 43. Economic Table 6—Comparison of Average Annual Costs, Avoided Damages, and Benefits of the Action Alternative (2022$).[1]

Works of Improvement	Agriculture-related						Non-Agriculture-related	Average Annual Benefits	Average Annual Cost	Benefit Cost Ratio
	Reduced Property- related Damages	Reduced Farm Income Damages	Reduced Power Income Damages	Increased Farm Income	Reduced road damages	Reduced Municipal Water Supply Expenses	Recreation Values			
A3			$42,600					$42,600	$41,600	1.0
F1, F2, F3, A4, A5, A7, A6	$658,400	$2,500			$171,500			$832,400	$668,100	1.2
A1, A2, A9, A10				$143,100				$143,100	$136,300	1.1
R1							$34,700	$34,700	$13,400	2.6
A8						$90,300		$90,300	$34,600	2.6
Total	**$658,400**	**$2,500**	**$42,600**	**$143,100**	**$171,500**	**$90,300**	**$34,700**	**$1,143,100**	**$893,900**	**1.3**

Notes: Totals may not sum due to rounding. Prepared: August 2022.

1. Price base: 2022 dollars amortized over 100 years at a discount rate of 2.25 percent.

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BMP and Mitigation Measures

Best Management Practices and Conservation Measures List

Spring City Mitigation Plan-EA

The following BMPs will be implemented during and post-construction to avoid and minimize impacts to environmental resources in the project area that could occur because of the Preferred Alternative.

Best Management Practices	Relevant Resource Category	Section of EA / Resource Report Identified
Disturbed areas will be restored after construction completion. Stockpiles will be spread. Disturbed areas will be reseeded to encourage the establishment of native vegetation, and native seed mixes appropriate to the surrounding habitat and that are drought resistant will be utilized to re-establish vegetation in all areas with ground disturbance to prevent construction related erosion and sediment delivery and noxious weed establishment.	Soils & Geology; Clean Water Act / Waters of the U.S., including Wetlands; Noxious Weeds & Invasive Plants; Riparian Areas; Wildlife & Wildlife Habitat; Visual Resources & Scenic Beauty	EA Sections: 5.1.1.2, 5.2.2.2; 5.4.2.2; 5.4.3.2; 5.5.1.2; 5.6.8.2 Biological Evaluation
A Utah Pollution Elimination System (UDPES) Permit, Storm Water Pollution Prevention Plan (SWPPP), and Spill Prevention, Countermeasure, and Control (SPCC) Plan will be implemented to protect water quality and to prevent water pollution from runoff, spills, leaks, and leaching. Meet associated permit conditions during construction operations.	Soils & Geology; Clean Water Act / Waters of the U.S., including Wetlands; Hazardous Materials	EA Sections: 5.1.1.2, 5.2.2.2, 5.6.4.2 Biological Evaluation
Comply with all measures in the associated SWPPP or similar document for implementing temporary erosion and sediment controls (TESCs), covering and storing materials, and other erosion prevention measures. Do not perform construction activities during extreme wet weather conditions, whenever practicable. If heavy precipitation is predicted to occur within 24 hours, take appropriate measures to cover up any stockpiles and check that TESCs are functioning.	Soils & Geology; Clean Water Act / Waters of the U.S., including Wetlands; Wildlife & Wildlife Habitat	EA Sections: 5.1.1.2, 5.2.2.2, 5.5.1.2 Biological Evaluation
Protect native site vegetation and plant communities, including wetland vegetation, milkweed, and ULT (*Spiranthes diluvialis*), when practicable. Clearly mark, flag, or fence areas where vegetation is to be protected.	Special Status Plant Species; Wildlife & Wildlife Habitat; Visual Resources & Scenic Beauty	EA Sections: 5.4.1.2; 5.5.1.2; 5.6.8.2 Biological Evaluation

Best Management Practices	Relevant Resource Category	Section of EA / Resource Report Identified
Contain all work activities, including those within staging areas, to upland areas to minimize potential impacts to surface water quality, whenever feasible. Work within wetland areas will be avoided or minimized to the extent practical.	Soils & Geology; Special Status Plant Species; Wildlife & Wildlife Habitat; Clean Water Act / Waters of the U.S., including Wetlands	EA Sections: 5.1.1.2; 5.4.1.2; 5.5.1.2; 5.2.2.2 Biological Evaluation
Locate borrow areas outside the 100-year floodplain or greater than 200 feet from any identified waters within the Survey Area, whichever is greater.	Clean Water Act / Waters of the U.S., including Wetlands; Wildlife & Wildlife Habitat	EA Sections: 5.2.2.2; 5.5.1.2 Biological Evaluation
Dispose of excavated sediment and debris at a pre-approved area more than 200 feet from any surface water feature.	Soils & Geology; Clean Water Act / Waters of the U.S., including Wetlands; Wildlife & Wildlife Habitat	EA Sections: 5.1.1.2; 5.2.2.2; 5.5.1.2 Biological Evaluation
Construction activities on irrigation related components will be timed to occur outside of the irrigation season (early May through end of September).	Clean Water Act / Waters of the U.S., including Wetlands; Migratory Birds / Bald and Golden Eagles	EA Sections: 5.2.2.2; 5.5.3.2 Biological Evaluation
Construction activities will occur during established daytime working hours and construction equipment will use properly functioning equipment mufflers, to minimize temporary noise impacts. All work will be completed within the designated project area during established working hours.	Noise	EA Sections: 5.6.10.2 Biological Evaluation
The project shall secure a stream alteration permit from UDWRi prior to beginning construction activities on any irrigation system improvements adjacent to Oak Creek or Canal Creek, as appropriate.	Clean Water Act / Waters of the U.S., including Wetlands	EA Sections: 5.2.2.2 Biological Evaluation
When feasible, construction equipment and vehicles will be fueled offsite. If offsite fueling is impractical, fueling will occur in designated fueling areas. Adequate spill response equipment (i.e., spill kits and cleanup materials) shall always be maintained and present. All spills will be cleaned up immediately.	Hazardous Materials; Wildlife & Wildlife Habitat; Special Status Plant Species; Special Status Animal Species	EA Sections: 5.6.4.2; 5.5.1.2; 5.4.1.2; 5.5.2.1 Biological Evaluation

Best Management Practices	Relevant Resource Category	Section of EA / Resource Report Identified
The contractor shall follow proper storage, handling, use, and disposal of petroleum products and other hazardous materials.	Hazardous Materials; Water Resources; Special Status Plant Species; Special Status Animal Species	EA Sections: 5.6.4.2; 5.2; 5.4.1.2; 5.5.2.1 Biological Evaluation
Rehabilitate all areas of ground disturbance. Spread or grade stockpiled materials and use a native seed mix (99.9% noxious weed-free seed) approved by the NRCS to reseed all areas where ground disturbance has occurred. Ensure the seed mix and plants are appropriate to the region and reseed areas disturbed during construction. If appropriate for the area, apply seed by hydroseeding, using a temporary erosion control mulch tackifier to provide stabilization, eliminate erosion concerns, and create vegetation recruitment opportunities.	Clean Water Act / Waters of the U.S., including Wetlands; Wildlife & Wildlife Habitat	EA Sections: 5.2.2.2; 5.5.1.2 Biological Evaluation
Fugitive dust control measures will be in place. Water trucks or other dust abatement measures will be used during construction to minimize dust impacts. Vehicle speeds will be restricted in the project area.	Air Quality; Wildlife & Wildlife Habitat	EA Sections: 5.3.1.2, 5.5.1.2
Construction activities will be confined to the project footprint to preserve and to minimize impacts to existing and native vegetation and wildlife habitat. The construction activity footprint will be limited to the smallest extent practicable within the project area.	Clean Water Act / Waters of the U.S., including Wetlands; Riparian Areas; Wildlife & Wildlife Habitat	EA Sections: 5.2.2.2; 5.4.3.2, 5.5.1.2 Biological Evaluation
Undisturbed areas will be maximized within project area boundaries wherever possible to retain vegetation for erosion control purposes.	Soils & Geology; Plants; Wildlife & Wildlife Habitat	EA Sections: 5.1.1.2; 5.4.1.2; 5.5.1.2 Biological Evaluation
Clean equipment of mud and other debris to avoid noxious weed or seed dispersal within or near the Project Area. Use pressure washing where appropriate to remove soil, plant parts, or other materials that may carry invasive and noxious weed seeds before arriving at the Project Area. Ensure this cleaning occurs each time equipment is brought into the Survey Area from a different location.	Clean Water Act / Waters of the U.S., including Wetlands; Noxious Weeds and Invasive Plants; Riparian Areas; Wildlife & Wildlife Habitat	EA Sections: 5.2.2.2, 5.4.2.2; 5.4.3.2, 5.5.1.2 Biological Evaluation

Best Management Practices	Relevant Resource Category	Section of EA / Resource Report Identified
Ensure the contractor provides the site inspector with the opportunity to inspect the equipment before unloading at the construction site. If upon inspection, dirt, debris, and seeds are visible, ensure the contractor immediately removes the equipment from the Survey Area and rewashes it. Ensure the equipment is clean by having the site inspector re-inspect the equipment.		
Noxious weed and invasive plant transport will be avoided by minimizing the amount of exposed soil without cover; pressure washing construction equipment to remove plant parts, seeds, and soil; and identifying and protecting areas where existing vegetation will not be disturbed by construction activities. Continue implementing the existing Sanpete County Weed Management Plan.	Noxious Weeds & Invasive Plants	EA Sections: 5.4.2.2
Perform pre-construction surveys for migratory birds and raptors in all areas where vegetation removal will occur. These surveys should occur no more than 7 days before vegetation removal and disturbance, when construction activities or vegetation removal would occur during the breeding and nesting season of Cassin's finch (May–July) or bald eagles (January–August). Repeat surveys if construction and vegetation removal are paused and resumed. If an active nest is discovered within the Survey Area, halt construction and/or vegetation removal and contact the appropriate regulatory agency for guidance. The raptor survey should adhere to the *USFWS Wyoming Ecological Services Field Office Raptor Guidelines* (2022) for appropriate nesting windows and protocols.	Wildlife & Wildlife Habitat; Migratory Birds / Bald and Golden Eagles	EA Sections: 5.5.1.2, 5.5.3.2 Biological Evaluation
An inadvertent discovery plan shall be prepared for the construction phase of the project. If construction activities uncover any materials of cultural or historic significance (i.e., bone fragments, pottery, stone tools, burial features, etc.) construction will halt and coordination with the SHPO, THPO, and Sanpete County Sheriff will occur.	Cultural & Historic Resources	EA Sections: 5.6.3.2

Best Management Practices	Relevant Resource Category	Section of EA / Resource Report Identified
Flaggers will be utilized, where necessary, to control traffic along roadways.	Transportation & Infrastructure	EA Sections: 5.6.9.2