STORMWATER MASTER PLAN

(HAL Project No.: 260.57.100)

May 2024

THE CITY OF SPRINGVILLE

STORMWATER MASTER PLAN

(HAL Project No.: 260.57.100)

PROFESSIONAL ENGINEER
5/29/2024
9437366-2202
KAYSON M.
SHURTZ
STATE OF UTAH

Kayson M Shurtz, P.E.
Project Manager

HANSEN ALLEN & LUCE INC
ENGINEERS

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Several individuals contributed to the successful completion of this study. We sincerely appreciate the cooperation, assistance, and expertise provided by members of the project team:

<u>The City of Springville</u>
Jake Nostrom, Assistant Public Works Director
Terrance Harris, Field Supervisor
Tyson Bartlett, Field Supervisor
Jeff Anderson, City Engineer
Chris Wilson, Chief Engineer
Gina Young, Civil Engineer

<u>Hansen, Allen & Luce, Inc.</u>
Gordon Jones, Principal in Charge
Kayson Shurtz, Project Manager
Ry Weber, Project Engineer
Dan Jones, Project Engineer

ABBREVIATIONS AND UNITS

AF	acre-foot
cfs	cubic foot per second (ft^3/s)
CIP	Capital Improvement Plan
CMP	corrugated metal pipe
Cont.	contingency
CY	cubic yard
E	east
Eng	Engineering
ERU	Equivalent Residential Unit
FF	Farmer–Fletcher (1971) storm distribution
ft.	foot
GIS	geographic information system
HAL	Hansen, Allen & Luce, Inc.
HEC	Hydrologic Engineering Center (U.S. Army Corps of Engineers)
HMS	Hydrologic Modeling System
ID	identification
In	inches
N	north
NOAA	National Oceanic and Atmospheric Administration
NRCS	National Resources Conservation Service (formerly SCS)
RCP	Reinforced Concrete Pipe
s	second
S	south
SF	square foot
SCS	Soil Conservation Service (now NRCS)
SWMM	Stormwater Management Model
TR-55	Technical Release 55 (NRCS 1986)
USGS	U.S. Geological Survey
W	west
yr	year

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CHAPTER 1 – INTRODUCTION

PURPOSE

This Stormwater Master Plan (Master Plan) for the City of Springville (City) presents technical activities to manage and regulate stormwater runoff caused by development and to help mitigate flooding and environmental impacts. The Master Plan will educate developers, private property owners, City staff, and elected officials regarding the capability and needs of the City's stormwater system. The Master Plan examines the existing stormwater system. Existing deficiencies are identified, and the preferred solution alternatives are presented with conceptual cost estimates. A Capital Improvement Plan (CIP) is developed with master plan projects.

Computer models were developed as part of the Master Plan to simulate runoff during storm events in the City. Not only were the model's vital tools in analyzing the stormwater situation for the master plan, but they will allow the City to continue to update and analyze for potential stormwater deficiencies and facilitate conceptual design of future projects.

BACKGROUND

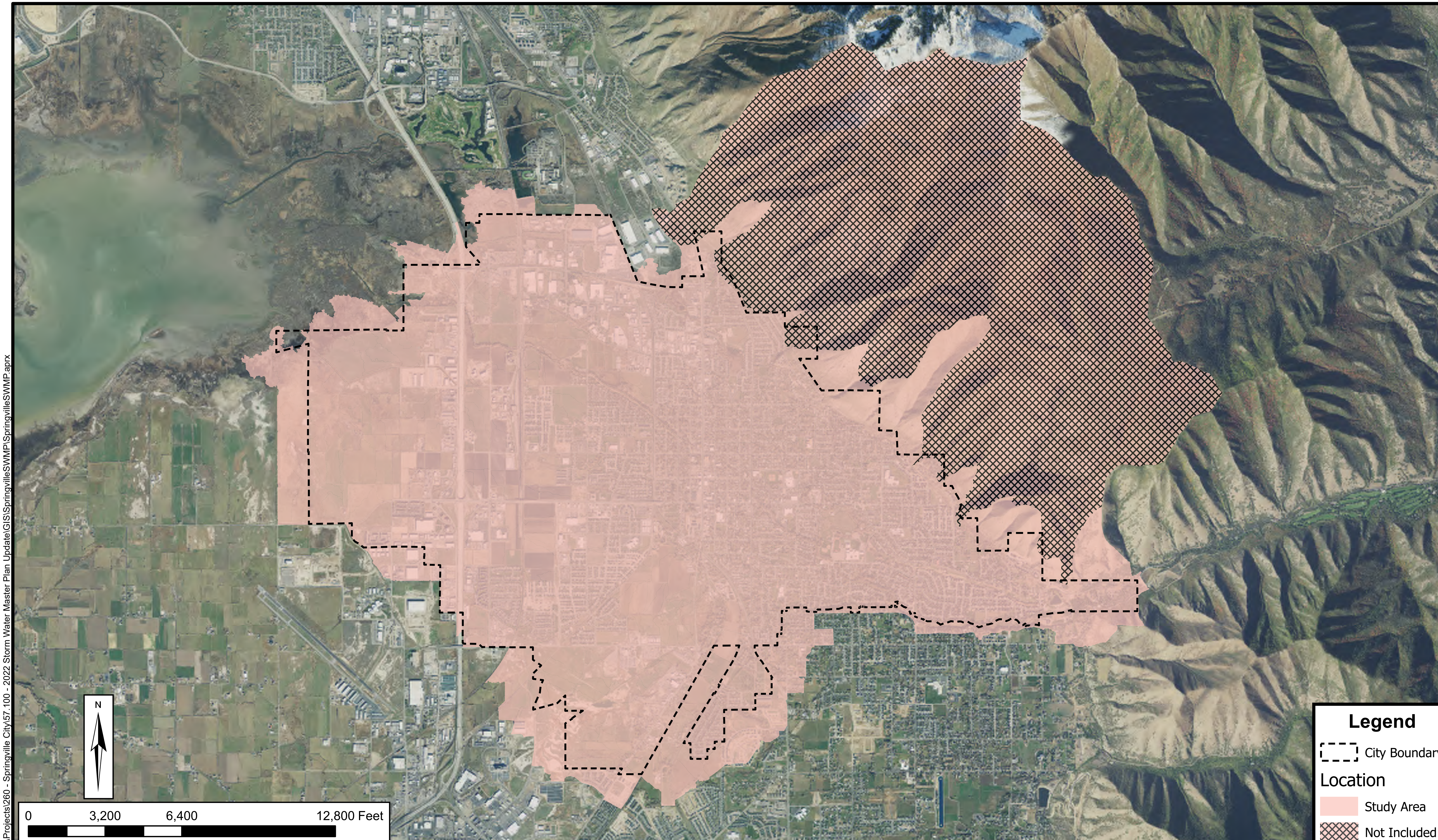
Located along the Wasatch Front in central Utah County, Utah, the City of Springville extends from Utah Lake to the Wasatch Mountains and just North of 1400 N to just South of 4800 S. The terrain has a vertical relief of approximately 1,080 ft from the foothills of the Wasatch Mountains to Utah Lake on the West. Soil types range from stony loams to saline and alkali silt loams. Land use varies from dense urban developments to undeveloped farmland and foothills. The City of Springville was incorporated in 1853 and continues to experience growth and development, particularly to the West and Southwest. As of 2021, the population of Springville is 36,135, the average growth rate for the City has been 620 people over the last 5 years. In an ongoing effort to regulate growth and redevelopment, the City desires to plan an effective stormwater system to manage nuisance water, prevent flooding, and protect downstream waters from adverse quality and quantity impacts.

AUTHORIZATION

The City of Springville selected Hansen, Allen & Luce to prepare the Master Plan. The Master Plan has been completed in accordance with the agreement between the City of Springville and HAL dated March 1, 2022. The Master Plan was completed under the direction of and in cooperation with City staff.

STUDY AREAS

The study area for the Master Plan includes the incorporated area of Springville, flows from the foothills of the Wasatch Mountains to the East of the City boundary, and flows from basins which border the South and Southwest City boundary. Portions of the study area that fall outside of the City boundary were included for a more conservative estimate of potential flows which may burden the City's stormwater infrastructure. However, these basins do not extend past natural channels, it was assumed any flows that propagate outside of the City and open channels would be directed into these channels prior to burdening Springville's stormwater system. Approximately 17,130 acres directly tributary to the City's stormwater system are hydrologically modeled to determine the runoff. The 17,130 acres also includes mountainous watersheds and basins outside of Springville City limits. The study area and City boundaries are shown on Figure 1-1. From Figure 1-1 it should be noted that although mountainous watersheds were delineated, very few of the basins were included in the calculations.



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CITY OF SPRINGVILLE
STORMWATER MASTER PLAN

STUDY AREA

FIGURE 1-1

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CHAPTER 2 – EXISTING STORMWATER SYSTEM

This section discusses the features that make up the stormwater facilities in Springville. Figure 2-1 shows the non-exhaustive map of existing stormwater system including structures, pipes (irrigation and stormwater), open channel (irrigation and stormwater), culverts, and detention basins. Elements not included in this figure include but are not limited to pretreatment structures, basin control inlets/outlets, combination boxes, pumps, and irrigation diversions.

NATURAL STORMWATERS

The City of Springville incorporates several natural drainages in its stormwater system. Natural drainages in the City generally flow from east to west or from south to north. The natural stormwaters serve as outlets for the City's stormwater system which ultimately terminate in Utah Lake. It is important to note that much of the City and specifically the west portion of Springville between Dry Creek and I-15 consists of an interwoven network of irrigation ditches and stormwater open channels.

Dry Creek

Dry Creeks' headwaters begin in Springville just south of the intersection between I-89 and S State Street. Dry Creek's primary source of flow is ground water. Dry Creek flows west across I-15 leaving Springville's City boundaries then flows north along the City boundary and terminating in Utah Lake. Much of the southern portion of the City's stormwater network has outflows into Dry Creek.

Hobble Creek

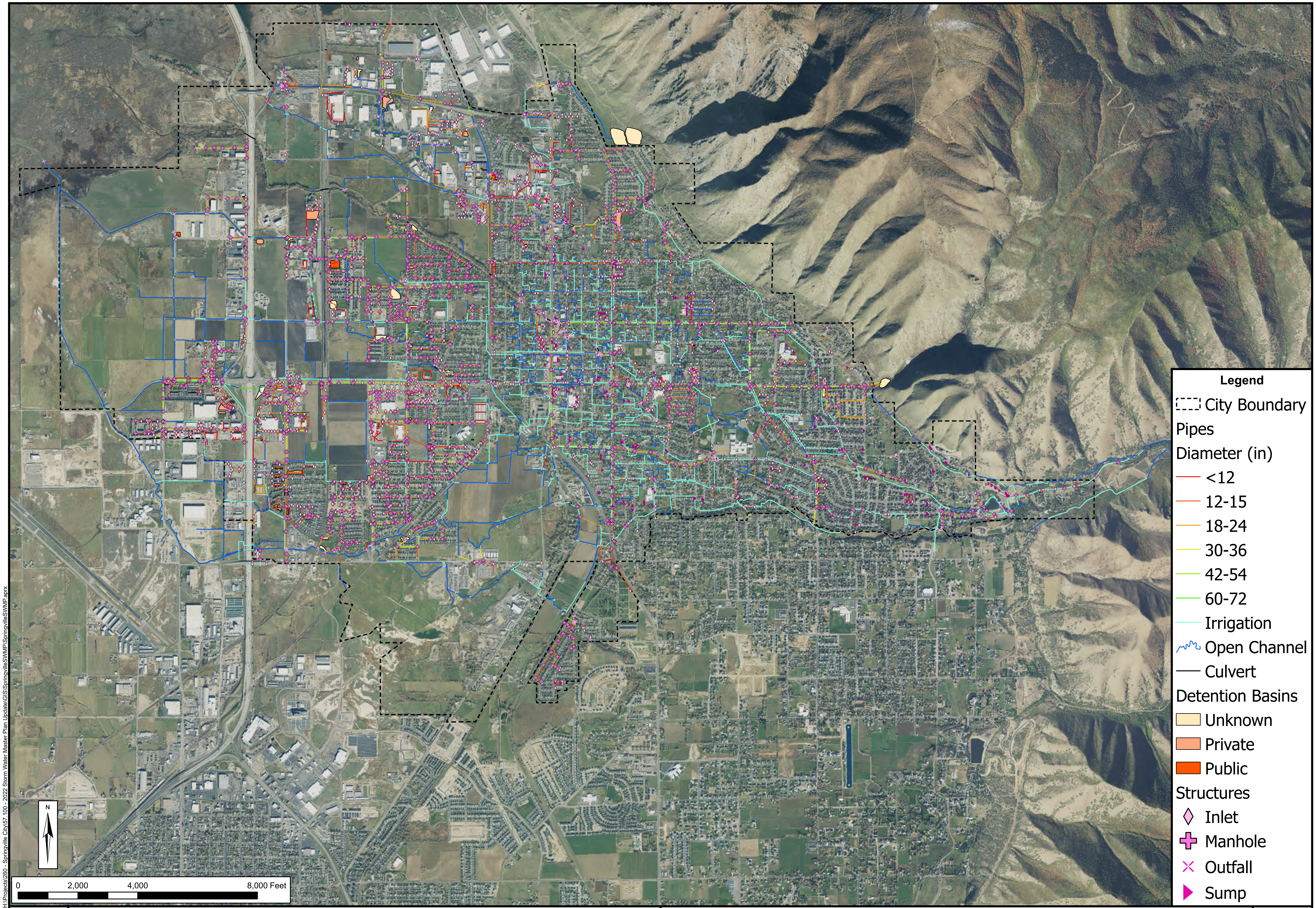
Hobble Creek is Springville's largest natural stormwater having its head waters approximately 13 miles northeast from the head of Hobble Creek Canyon within the Wasatch Mountains. Hobble Creek runs through the center of Springville where it is available as an outfall for some of the stormwater discharge within the City. Hobble creek is a perennial stream driven primarily by snow melt.

Spring Creek

Spring Creek's headwaters are within Springville close to the intersection of 400 N and 600 E running northwest and following the foothills of the Wasatch mountains. Spring Creek flows through a series of detention ponds and follows Springville's City boundary to the north and flowing west as part of a series of irrigation ditches and further detention ponds prior to terminating in Utah Lake.

IRRIGATION CONVEYANCES

Irrigation canals, ditches, and diversion structures are common in Springville. In many parts of the City, irrigation ditches and pipes also act as stormwater conveyances during storm events. Much of the irrigation within the City is open channels comprised of ditches, gutters, curbs, or canals. With many of the ditches and irrigation structures having diversion structures to facilitate the distribution of water. The extent of this system can be seen in Figure 2-1. As a result of this configuration, much of the irrigation system also acts as structures for capturing and routing storm runoff.



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NON-EXHAUSTIVE EXISTING STORMWATER SYSTEM

FIGURE
2-1

Irrigation ditches are not ideal conveyances for stormwater because they are designed to distribute irrigation water rather than collect stormwater. Ditch capacities decrease from upstream to downstream, while runoff flows increase from upstream to downstream. Water quality, debris, sediment, liability, and canal maintenance are problems associated with utilizing these facilities to convey stormwater.

FLOWS OUTSIDE OF SPRINGVILLE

Runoff from outside the City that could potentially impact Springville's stormwater system is limited. One known area of concern is the potential overflows that could originate from Upper Spring Creek. If Upper Spring Creek debris basins become full, water can spill into 400 S. There is an outlet structure from the Central Utah Project which discharges into Hobble Creek, the magnitude and timing of these discharge events is unknown and not included in the study. Furthermore, the study area extends into Mapleton along Springville's East facing southern border. Except for older developments on the edge of the city boundary all basins with new development in Mapleton are required to retain the 24-hour 100-year event. The analysis for the storm system included discharge from basins with old developments from Mapleton adjacent to Springville City boundaries.

STORMWATER FACILITIES

The City provided HAL with their existing stormwater related GIS data. The GIS data provides an accurate depiction of where the stormwater facilities are located, but in some cases lacked sufficient data for detailed stormwater modeling to be performed. The City provided HAL with a SWMM based model that included conveyance and detention facility details from a previous master planning effort. Some assumptions and corrections were made to the data for modeling purposes. Additional surveying was performed by the City on some of the detention facilities to acquire outlet works data for modeling purposes.

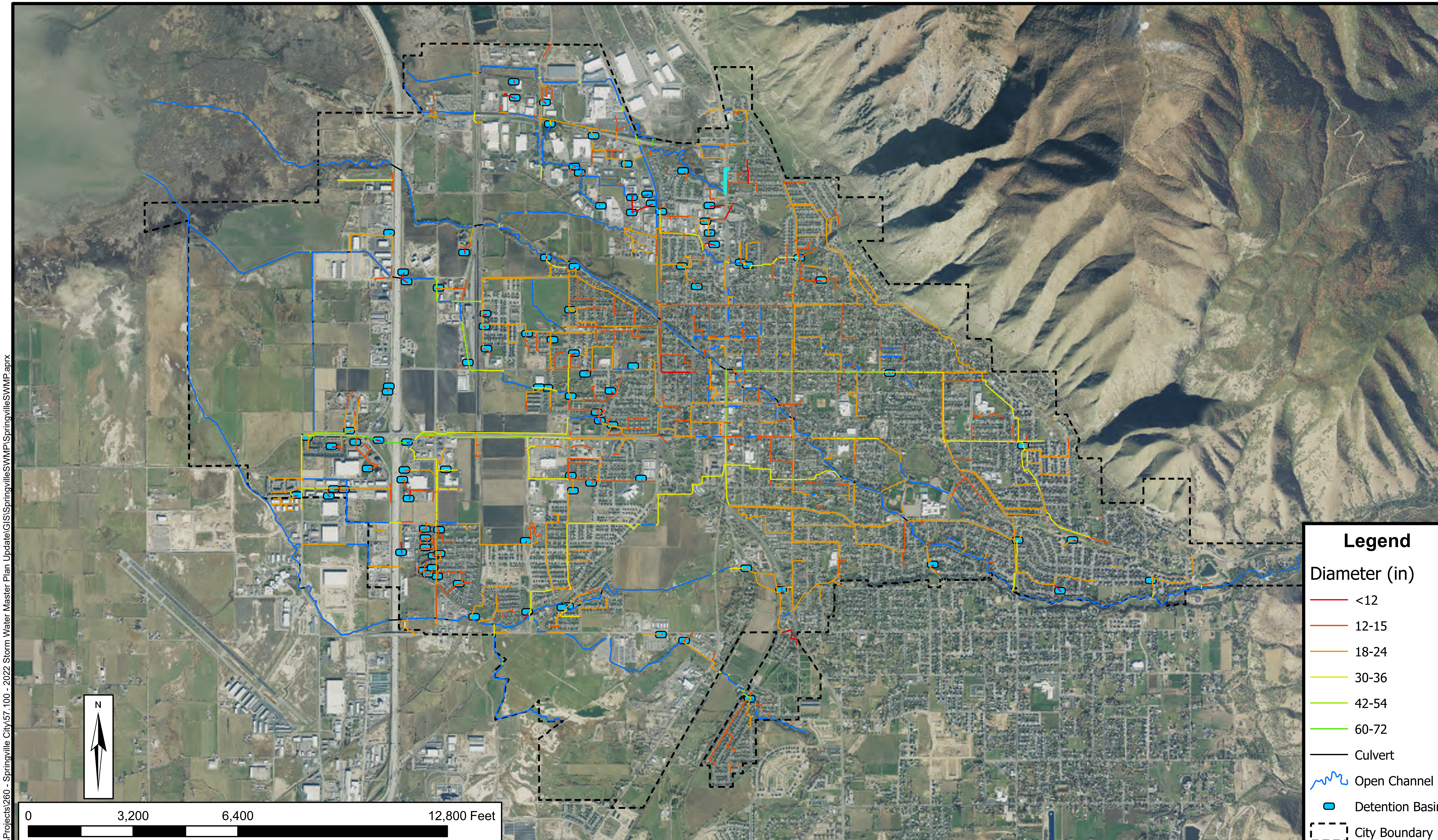
As infrastructure is added to the system it is recommended that more detailed information be collected and included in the GIS dataset moving forward. Data that should be compiled in the system inventory moving forward include locations, descriptions, elevations, and measure down depths at each point, as well as location, shape, offset, type, and size for each conveyance.

City staff provided HAL GIS files that included all updates to their stormwater facility inventory since the last master plan was completed including developments. HAL used this dataset to identify missing information and data gaps. HAL created a list of detention facilities that appeared to have been added since the last master plan that did not have adequate information for modeling purposes. City personnel went through development drawings and extracted the detention basin details so they could be included in the model. If the details were unavailable assumptions were made such that facilities meet current City detention requirements of 0.15 cfs/acre.

Collection and Conveyance

The City of Springville has roughly 151 miles of stormwater pipes with a wide range of sizes. The City has an estimated 1845 inlets that introduce runoff into the stormwater network. The stormwater system also relies on natural drainages, roadside swales, and irrigation conveyances to convey runoff to the Utah Lake.

As part of our scope, HAL was given an existing SWMM model by the City of Springville which included the stormwater collection and conveyance system to be modeled in this master plan. Through discussion with City engineering staff, modifications to the given model were made which



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MODELED EXISTING STORMWATER SYSTEM

FIGURE
2-2

included appending collection and conveyance structures deemed necessary to have within the model. The modeled portion of the Springville stormwater system can be seen in Figure 2-2.

Furthermore, the original inventory treated combination boxes (combo box) as two separate nodes with a connecting link. A combo box is a feature that acts as a manhole and a curb inlet. However, combo boxes are a single feature and do not contain a pipe between the inlet grate and the manhole lid. In the updated inventory it is recommended that combo boxes be treated as a single feature to reduce the inventory size and better model hydraulics through the system.

Detention

The City maintains several detention facilities. Detention facilities are designed to store the 25-year event. Stage storage curves for the detention basins were provided to HAL as part of the SWMM model received. The City of Springville has 121 georeferenced detention basins of those 121, 103 detention basins are included in the SWMM model. Some detention basins were not modeled as they were determined to not be critical within the model, in total 103 detention basins were modeled. All the current detention basins as provided by the City can be seen on Figure 2-1. The features within this figure can also be accessed online through Springville's E-Map service. All the modeled detention basins can be seen on Figure 2-2. Within Figure 2-1, the detention basins are colored based on the entity that owns or manages the basin. City Owned Detention basins are owned and managed by Springville City, Private Detention basins are installed by private developers, and the ownership status of the Unknown Detention basins could not be readily determined from the provided GIS data.

CHAPTER 3 – METHODOLOGY

The project team adopted a workshop approach with City engineering staff to determine the design criteria, study areas, analysis processes, deficiencies, alternatives, and solutions. This section describes the methodology followed in developing the Master Plan.

HYDROLOGY

Hydrology is the study of the movement, distribution, accumulation, and management of water. For this Master Plan, the hydrology performed includes selecting a rainfall design frequency and storm distribution, subbasin area delineations and calculations, calculating runoff potential using soil data, land cover, and impervious surface estimates, and estimating the timing of peak runoff. The first portion of this chapter details these methods in greater detail.

Design Frequencies

The City selected design storm frequencies of 10-year (10% chance of being equaled or exceeded in any given year), 25-year (4% chance of being equaled or exceeded in any give, year), and 100-year (1% chance of being equaled or exceeded in any given year) for this study. Criteria included:

- 10-year design capacity for the initial stormwater system. The initial stormwater system includes pipes, gutters, and roadside ditches.
- 25-year design capacity includes the initial stormwater system as well as detention ponds.

Section 5.07 from Springville's design criteria manual seen below, describes the cities design guidelines for 10, 25, and 100 year events.

Section 5.07 STORM WATER QUANTITY CRITERIA AND DESIGN GUDELINES

The following storm drainage criteria and design guidelines apply to all storm drainage plans in Springville and shall be used in storm drainage calculations. The City Engineer has authority to modify the criteria and guidelines as needed to meet changing or unusual needs or conditions.

Sub-Section A. Design Storm:

1) Frequency
   i. Design the piping system for a 10-year storm
   ii. Design detention for a 25-year storm with a 0.15 cfs/acre release rate.
   iii. Control the point of discharge and the flooding hazard of a 100-year storm

Design Storms

How the precipitation falls throughout a storm of a particular duration is called the storm's distribution. Selection of an appropriate storm distribution is important because it determines peak flows through pipes and channels and peak storage volumes in detention ponds. These results, determined in part by storm distribution, ultimately dictate what is flagged as a deficiency and what projects are planned for capital improvement.

The storm distribution selected in the previous Master Plan was a unitized version of the Modified Farmer Fletcher (FF) distribution. The storm distribution selected for use in this Plan is the 3 hour Modified Farmer Fletcher distribution (Figure 3-1). This distribution was selected to remove the need for the duration sensitivity analyses which is required of the FF distributions while maintaining an appropriately intense event.

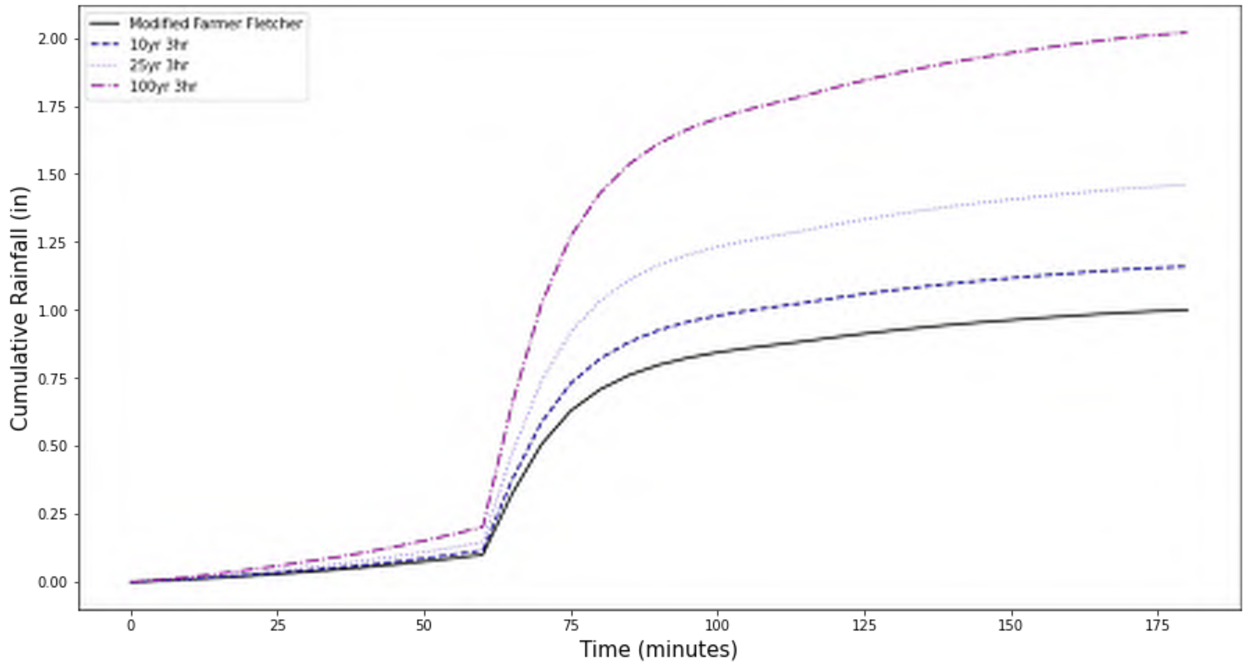


Figure 3-1 Design Rainfall Depths

Precipitation depths were obtained from *NOAA Atlas 14: Precipitation-Frequency Atlas of the United States* (Bonnin et al. 2004; NOAA 2013) at location 40.179, -111.5955. The design storm rainfall depths modeled for this Master Plan are seen in Table 3-1.

Table 3-1
Modeled Rainfall Depths

Storm Frequency	3 hr
10-yr Rainfall Amount (in)	1.16
25-yr Rainfall Amount (in)	1.46
100-yr Rainfall Amount (in)	2.02

DEVELOPMENT OF THE HYDROLOGIC MODELS

Subbasins

A stormwater basin, also called a subbasin, watershed or catchment, is an area in which all rainfall or snowmelt runoff will collect to a common point (the lowest point in the basin). Stormwater basin boundaries depend upon both the topography and the location of stormwater facilities. Subbasin characteristics developed for this plan were based on field observation, aerial imagery, soil data, GIS mapping, land use information from the City, and engineering literature. Important subbasin characteristics described below include 1) area, 2) hydrologic soil group, 3) percentage of impervious area, 4) SCS curve number (CN), 5) Subbasin width, and 6) overland flow characteristics. Much of the methodology is documented in *Technical Release 55: Urban Hydrology for Small Watersheds* (NRCS, 1986), hereafter referred to as TR-55.

Subbasin Area

The amount of runoff is proportional to the area of the subbasin. The previous Master Plan completed by BCA amended the prior's basin delineation. The scope of this masterplan required a new delineation of basins with an area ranging 10-30 acres The median subbasin size for the 505 delineated subbasins in the study area is approximately 20.7 acres. Roughly 355 of these delineated basins fall within City boundaries which have a median area of approximately 18.3 acres. Figure 3-2 shows a map of all the basins delineated within this plan as well as an accompanying distribution of basin area for basins completely within City boundary.

Hydrologic Soil Group

Hydrologic soil group is a general indication of a soil's infiltration capacity and is a key determinant of runoff behavior. The Natural Resources Conservation Service (NRCS) has classified soils into four hydrologic groups A, B, C, and D. Soils of group A have the highest infiltration rate and therefore produce the least amount of runoff. Group A soils include permeable gravels and well-drained sands. Group B soils have moderate infiltration rates and moderately fine or coarse textures. Group C soils have a lower infiltration rate and finer textures, sometimes with a layer that impedes infiltration. Soils of group D have the lowest infiltration rate and produce the highest amount of runoff. Group D soils include fine silts, fine, clays, and other soils with low infiltration rates. Soil groups are described in TR-55 (NRCS, 1986).

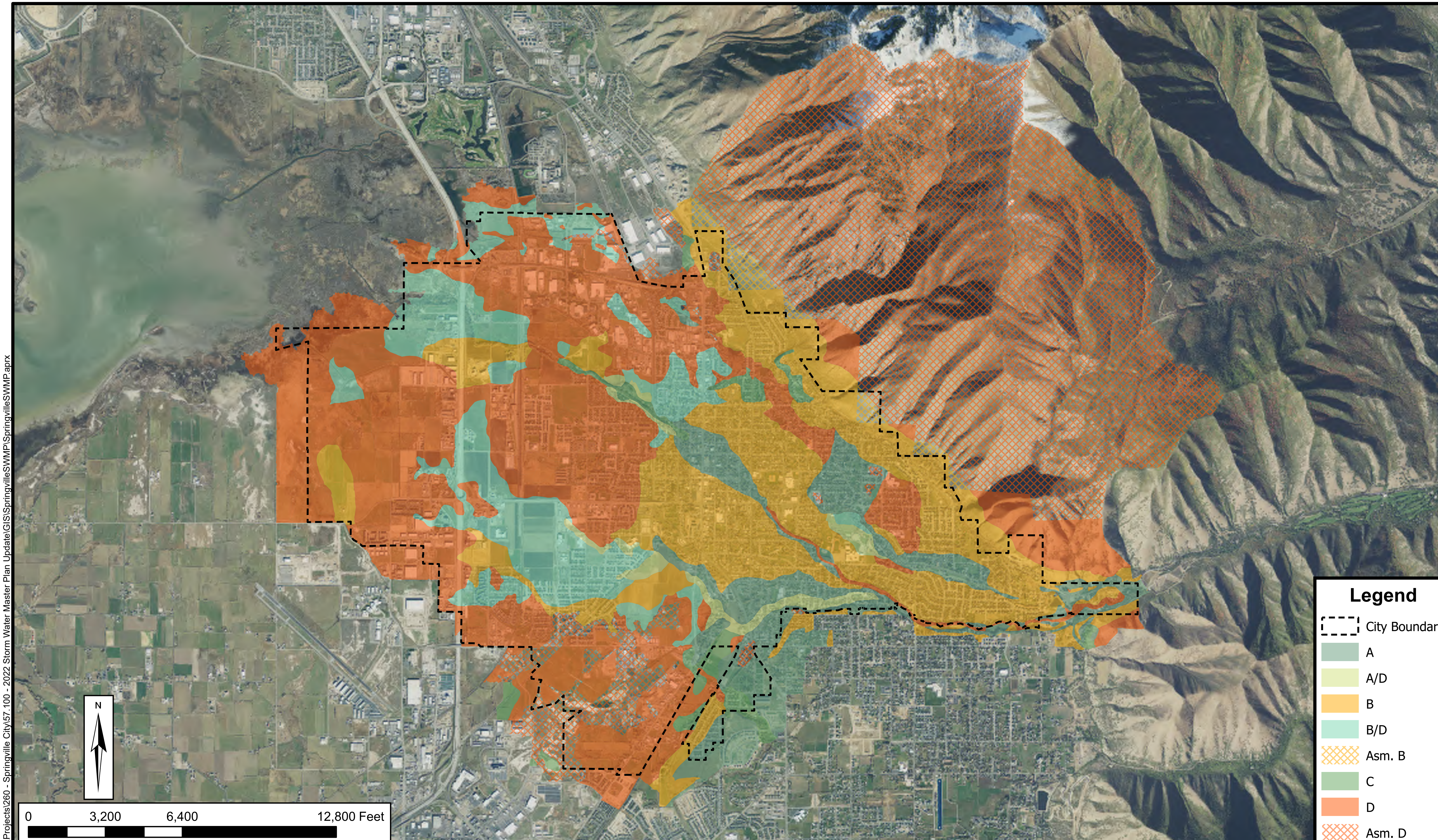
Although all four soil groups are found in the City, Group B and D soils are the most prevalent in the City, comprising approximately 17% and 75% of the soil within the study area respectively. Dual soil groups were also observed within the study area, it was assumed that the areas with dual soil groups can be classified as Group D. Soil data for this study originated from the NRCS Web Soil Survey (NRCS 2020). A soil map of the study area is shown in Figure 3-3. The hydrologic soil group is a factor used to determine the CN for each subbasin.

Land Use

Four data sets were used when building the land use map for the study area. Two of the data sources for land use in this master plan are City-provided GIS shapefiles showing the designated land uses for Springville as well as the general zoning plan. The other two data sets are the National Land Cover Dataset (NLCD) and Utah Water Related Land Use (WRLU) distributed by the USGS and UGRC respectively. The NLCD dataset was used to capture the land use distribution of natural areas within the foothills of the Wasatch. The WRLU dataset was used to capture specific land cover types for agricultural land. These four-land use shapefile were layered with each other coupled with quality control to develop a comprehensive land use map of the study area. Quality control was done by confirming with the 2021 NAIP imagery that the general classification was correct, this was more applicable towards the WRLU data set. Figure 3-4 shows a simplified land use map and Table 3-2 shows the general mapping of land use types to their simplified land use. Table 3-2 also contains the percent area of imperviousness and percent of impervious which is directly connected based on TR-55 and various case studies within Springville.

Impervious Area

Impervious areas within each subbasin were estimated using multispectral image analysis and the type of land uses within each subbasin as specified below in Table 3-2. There are two types of impervious area: directly connected impervious areas (DCIA) and unconnected impervious areas (UCIA). Directly connected impervious areas provide a direct path for runoff to a conveyance such as a pipe, gutter, or channel. Directly connected impervious areas often include



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NRCS SOIL DATA - HYDROLOGIC SOIL GROUP
(SURVEYED JUNE 2020)

FIGURE
3-3

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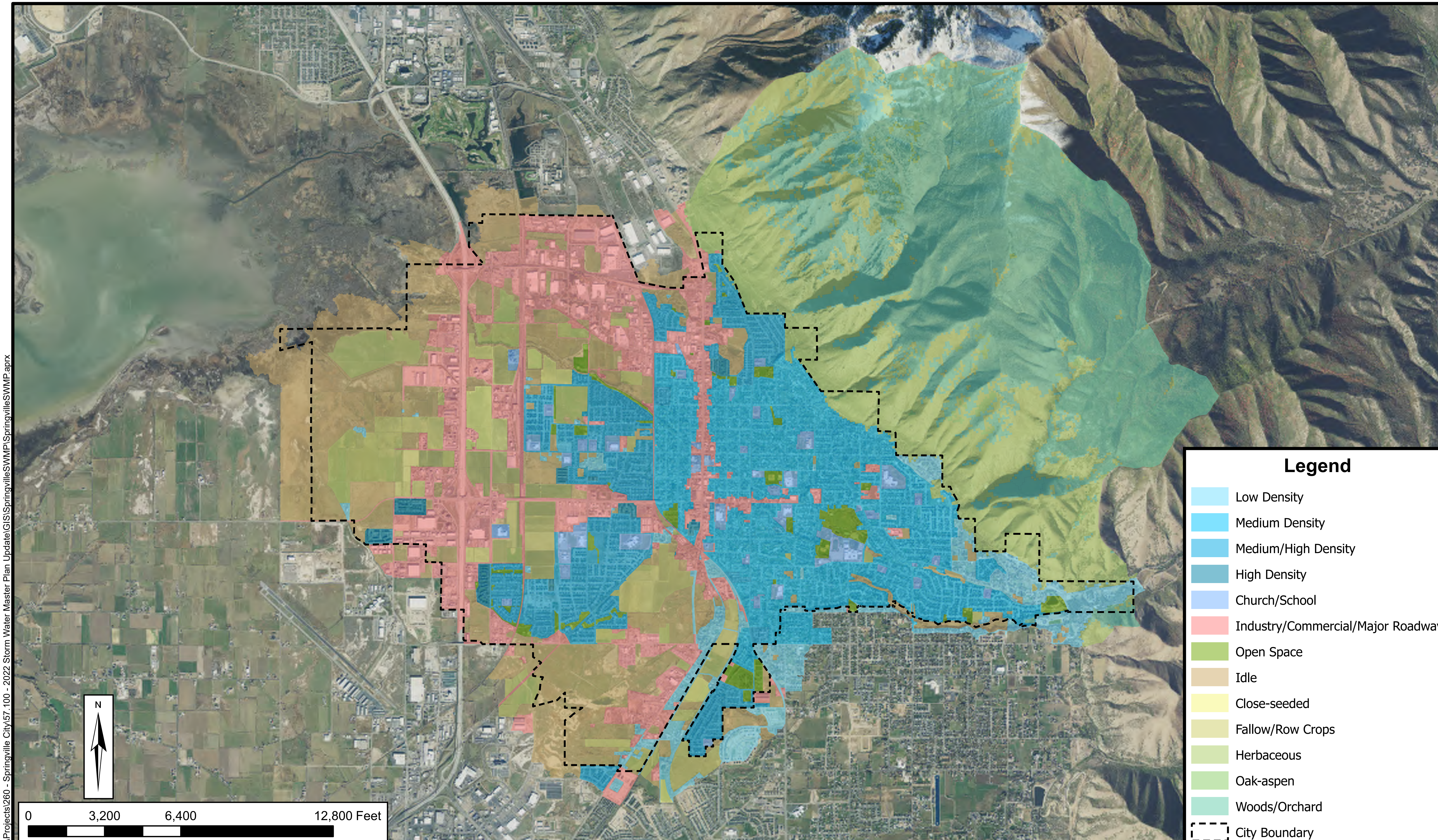

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EXISTING LAND COVER AND ZONING

FIGURE 3-4

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roadways, parking lots, driveways, and roofs. Runoff from unconnected impervious areas must cross a pervious area before reaching the stormwater node for the subbasin. Examples of unconnected impervious areas include sidewalks that are not adjacent to the curb, patios, sheds, and usually some portion of house roofs.

Table 3-2
Land Uses in Springville

Land Use Type	Simplified Land Use Type	Percent of Area which is Impervious	Percent of Impervious which is Directly Connected
Low Density Residential	Low Density†	33%	25%
Medium Low Density Residential			
Medium Density Residential	Medium Density†	53%	45%
Medium High Density Residential	Medium/High Density†	63%	50%
High Density Residential	High Density†*	71%	40%
Church	Church/School†	80%	55%
School			
Public			
Commercial Services	Industry/Commercial/Major Roadway*	85%	75%
Commercial Retail			
Commercial			
Light Industry			
Industrial Manufacturing			
Interstate			
Mixed Use			
Park	Open Space†	15%	5%
Idle	Idle	<5%	0%
Idle Pasture			
Pasture			
Dryland			
Alfalfa	Close-Seeded	0%	0%
Alfalfa - Fallow	Fallow/Row	0%	0%
Corn - Fallow			
Grain - Fallow			
Hay - Fallow			
Oats - Fallow			
Emergent Herbaceous Wetlands	Herbaceous	0%	0%
Herbaceous			

Land Use Type	Simplified Land Use Type	Percent of Area which is Impervious	Percent of Impervious which is Directly Connected
Shrub/Scrub			
Woody Wetlands			
Mixed Forest	Oak-aspen	0%	0%
Deciduous Forest	Woods/Orchard	0%	0%
Evergreen Forest			
Orchard			

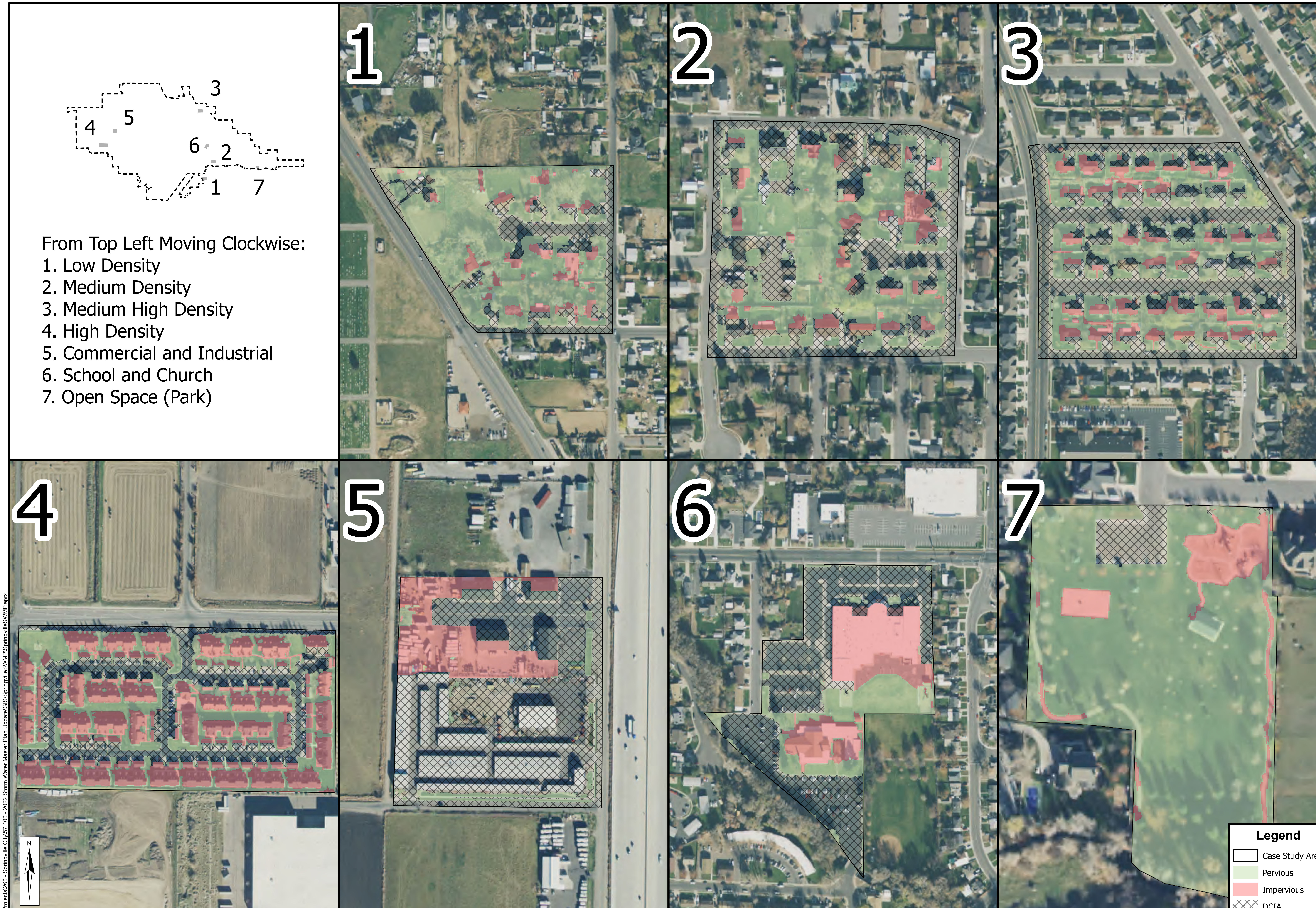
†Case studies were completed for these land use types.
*Impervious area is based on TR-55 Table 2-2a.
†*Secondary case study for Outlook Apartments showed a percent of impervious which is DCIA as 70%.

It is important to distinguish between directly connected and unconnected impervious areas. Runoff from the directly connected impervious areas reach the stormwater conveyance system and usually determines the magnitude of the peak flow rate. Impervious areas such as backyard patios which drain to grassed or landscaped areas have much less impact on peak runoff.

Unconnected impervious area for residential land use is included in the pervious area with a composite curve number based on an area-weighted average. Impervious percentages areas not completed in the case study were assumed to have 0% directly connected impervious area. These percentages also closely correspond to those published in TR-55. The directly connected impervious area is included explicitly in the subbasin characteristics as a percentage. See Figure 3-5 for the example case studies done for low density, medium density, medium/high density, high density, church/school, industry/commercial/major roadway, and open space land uses within the study area for the analysis on DCIA and UCIA.

SCS Curve Number

Each subbasin was assigned an SCS curve number based on hydrologic soil group, land use, and ground cover type as outlined in Chapter 2 of TR-55 (NRCS, 1986). The curve number describes the relationship between precipitation and runoff for the pervious and unconnected impervious portions of the subbasin. Practical curve numbers range from 30 to 98. Areas that are more pervious have lower curve numbers. For example, a well vegetated subbasin with sandy soils and little unconnected impervious area would have a lower curve number than a poorly vegetated subbasin with clay soils and a significant amount of unconnected impervious area. The vegetation condition and unconnected impervious area were determined based on the land use. See Table 3-3 for the criteria for the curve number assignment.



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CASE STUDIES:
DCIA AND IMPERVIOUS AREA

FIGURE 3-5

Table 3-3
Curve Number Assignment Table

Land Use	TR-55 Cover	Curve Number by Soil Type			
		A	B	C	D
Low Density†	Open space, good	39	61	74	80
Medium Density†	Open space, good	39	61	74	80
Medium/High Density†	Open space, good	39	61	74	80
High Density†	Open space, good	39	61	74	80
Church/School†	Open space, good	39	61	74	80
Industry/Commercial/Major Roadway	Open space, good	39	61	74	80
Open Space†	Open space, good	39	61	74	80
Idle	Pasture, Fair	49	69	79	84
Close-seeded	Legumes, SR, Good	58	72	81	85
Fallow/Row Crops	Row, SR, Good	67	78	85	89
Herbaceous	Herbaceous, Fair to Good	66.5	66.5	77.5	87
Oak-aspen	Oak-aspen, Fair to Good	30	30	41	48
Woods/Orchard	Woods, Fair to Good	33	57.5	71.5	78

†The zoning case study was used to determine how much area is impervious and how much of the impervious area is directly connected. Unconnected impervious and pervious CN is based on TR-55, cover description of Open space, good condition.

DEVELOPMENT OF THE HYDRAULIC MODELS

Links

Conveyances (called links in SWMM and SSA-SWMM) convey runoff between the junctions in the model. Typical conveyances include pipes, box culverts, ditches, canals, natural channels, outlet pipes, orifice plates, weirs, pumps, and in some cases gutters. Conveyance characteristics for each model were defined from the SWMM model provided by the City. Amended data regarding links was also provided by the City. This information is used in the model to perform the hydraulic analysis for timing and routing of storm runoff hydrographs.

Some uncertainty is associated with modeled stormwater paths. In much of the City stormwater conveyances frequently coincide with irrigation pipes and ditches. Flow paths in irrigation conveyances can be altered by gates and diversions, complicating the modeling of flow paths. Irrigation base flows were provided by the City.

SWMM based models will limit flow through conduits based on the conduit's capacity. For example, if a subbasin has a peak flow of 10 cfs while the conduit only has a capacity of 6 cfs, flooding would occur at the upstream node and the conduit would be limited to its peak capacity creating surcharged conditions. The upstream node would experience flooding near 4 cfs. This is helpful when analyzing how the system functions but can hinder efforts to determine the potential peak flows at a given point. During the design process conveyances can be modified with a group edit to drastically increase the size of the conduits so that the peak flows are not restricted and specific points in the system experience the maximum possible flows during a precipitation event. Changing pipe sizes was done to evaluate potential capital improvements.

Nodes

In the model, nodes are points where conveyances or subbasins connect. Nodes generally represent manholes, inlets, outfalls, detention basins, or points where multiple conveyances combine. Nodes contain elevation data which determines the elevation of attached conveyances. Nodes also have depth data to determine if the point is experiencing flooding due to surcharging conditions.

Flooding at nodes can be handled in several ways. If the surface ponding option is used, the volume of water at a node above the maximum depth is stored at the node and released back into the system once surcharging conditions recede. If the surface ponding option is not used, any flooding is lost from the system. To conservatively estimate the volume of water entering storage nodes, the surface ponding option was used in this Master Plan.

IRRIGATION INPUTS

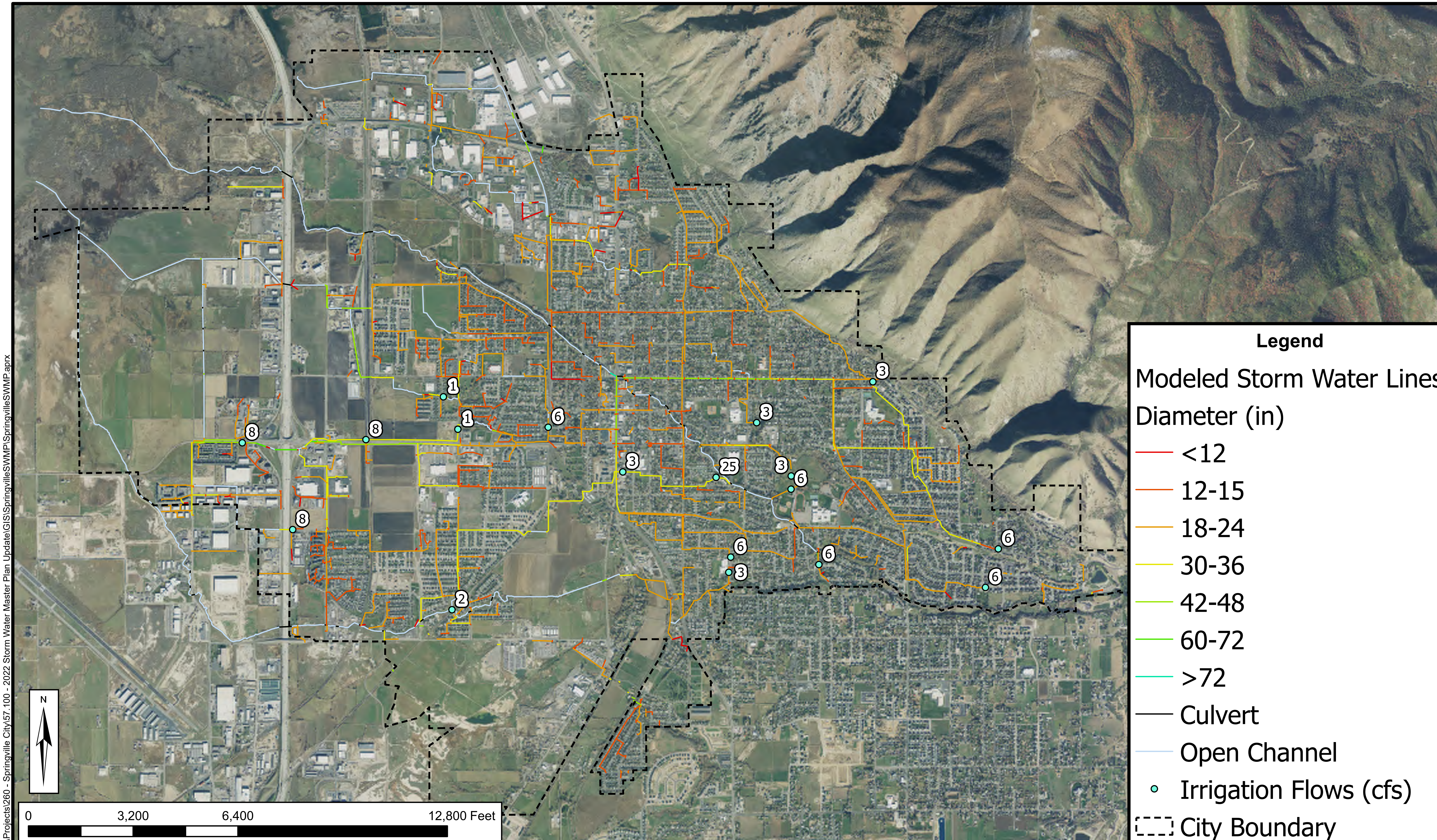
The SWMM model can add external inflows at nodes. This function was used to add irrigation flows to the model (which were modeled as a constant baseflow). Irrigation flows were determined based on discussions with City personnel. Irrigation flows were added to nodes based on the current model alignment and cumulative magnitudes of irrigation flows moving upstream in the network. Figure 3-6 provides the magnitude of flows used at each node in the model.

DESIGN FLOW RATES

The model computes hydrographs for each subbasin, conveyance, and junction. The City stormwater system was analyzed with the 10-year 3-hour and 25-year 3-hour precipitation events. The 25-year 3-hour precipitation event was used to determine regional detention pond sizing for the future CIP projects.

CAPACITY ANALYSIS

The SWMM model can determine the water depth, flow rate, and capacity of conveyances during a given precipitation event. This detailed analysis includes calculating surcharged conditions and backwater effects if the Dynamic Wave routing method is selected. This capability makes the SWMM engine a very useful tool in analyzing the hydraulic capability of a stormwater system.



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CITY OF SPRINGVILLE
STORMWATER MASTER PLAN

IRRIGATION FLOWS

FIGURE 3-6

CHAPTER 4 – STORM DRAINAGE ANALYSIS

The Springville stormwater system was analyzed using the model, observations from City staff and best management practices for the industry.

DEFICIENCIES

Deficiencies were identified based on input from City staff and on results from the model. Locations where the City had experienced flooding were analyzed in the model to determine the cause of the flooding. For example, a cul-de-sac that frequently floods could have issues with inlet capacity, pipe capacity, backwater effects, runoff from areas not directly tributary to the cul-de-sac, or the curb and gutter configuration.

Generally, stormwater systems are designed to carry the peak 10-year runoff event, with the 100-year runoff event being conveyed in pipes, in the roadway, through regional detention, through natural channels, and land drains which ultimately discharge into Utah Lake. It was determined that for the existing Springville Stormwater system, full pipe flow is acceptable with minor surcharging being contained in the curb and gutter system.

Table 4-1 and Figure 4-1 summarizes the stormwater deficiencies identified in this study. Each deficiency has a Deficiency ID (used in this study), a location description, and problem definition.

Not all deficiencies necessitate capital improvements. Because stormwater systems are designed to convey the 10-year event, a 10-year event will produce flows at or near the pipe capacity of the system. Some nodes in the model identified areas of surcharging which were determined to not be a deficiency because the surcharging is contained in the curb and gutter system. A pipe at capacity or a surcharged node in the model was only added to the deficiency list if flooding was significant in the model and/or City staff had identified previous flooding at the location. For this study a threshold of 3 acre-inches was identified as the threshold for defining significant flooding. After identifying the deficiencies in Table 4-1, the project team and City staff met in a series of workshops to discuss which deficiencies warranted action. Deficiencies identified as not warranting action will be monitored by City staff for flooding. In figure 4-1, nodes that are colored green should be monitored by City personnel to determine if any of these locations need to be added to future Capital Improvement Plan projects. Deficiency locations identified with a B## are locations in the model which showed surcharging beyond 3 acre-inches, but the City staff were unaware of flooding problems associated with the locations identified by the model. These 'watch' areas also signify locations where City personal should monitor for flooding and collect additional data to determine if model updates are needed which may remove these locations from the 'watch' list or confirm they should be added to a future capital improvement plan.

Table 4-1
Stormwater Deficiencies†

Deficiency ID	Location	Problem Description
A02	Furthest downstream railroad culvert for Spring Creek.	Under sizing of 2nd and 3rd culvert's causing backwater affect and flooding upstream.
A03	Irrigation line through corner of 700 East and 1355 South.	Losses due to undersized pipe and inconsistent material.
A04	Northwest corner of 800 East and 100 South.	Losses due to undersized and type in irrigation line.
A06	Corner of W 500 North and N 2400 West (501 N 2400 West Street).	Losses due to inlet capacity and pipe size.
A07	Irrigation line at W 400 North west under railroad tracks.	Losses due to reverse grade.
A08	962 North Main Street (SDIP02275).	Losses due to undersized line from inlet (SDIS00964),
A10	751 W 1600 South St (SDIP03244).	Losses due to backwater from undersized culvert.
A11	Inlet under road directly south of 1024 West 1600 South and culvert under railroad at 1160 West 1600 South.	Losses due to backwater from undersized pipe and culvert as flow transitions from open channel flow to closed conduit.
A12	900 South between 400 East and 800 East.	Losses along 900 South due to undersized irrigation line capturing stormwater.
A13	655 W 255 South	Losses at localized detention facility.
A14	Intersection of 700 South and Main Street.	Losses at 700 South and Main Street with minor losses from 500 South to 700 South on Main Street.
A15	1300 East from 51 S 1300 East to Center Street.	Major losses at 51 S 1300 East and minor losses extending to Center Street.
A17	Corner of 700 East and 200 North.	Major and Minor losses from 800 East around corner on 700 East.
A18	1100 West crossing over Spring Creek.	Undersized culvert causing losses upstream of crossing.

†Projects are not ordered in a particular way.

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STORMWATER MASTER PLAN

EXISTING DEFICIENCIES - 10 YEAR

FIGURE 4-1

CHAPTER 5 – CAPITAL IMPROVEMENT PLAN

This Capital Improvement Plan (CIP) presents the problems, alternatives, and recommendations identified in the study to improve stormwater in the City of Springville. The CIP was developed from the hydrologic models, deficiency analysis, and workshops with City personnel.

PREFERRED STORMWATER PLAN DEVELOPMENT

Which resolution a deficiency merits is based on what type of deficiency it is. Some deficiencies such as maintenance or replacement have a straightforward linear resolution. Resolving a deficiency related to flooding has more than a singular solution option. Where these deficiencies existed, HAL evaluated possible alternatives and whether it could be resolved with upstream detention and/or required a pipe or inlet improvement. Selection of the preferred alternative for each problem was a process of evaluation and refinement rather than a simple choice between alternatives.

The process of selecting a preferred alternative included:

- reviewing the list of stormwater inadequacies
- brainstorming possible solutions
- screening alternatives based on feasibility and public acceptance
- developing alternatives
- comparing cost, function, human safety, and damage prevention
- selecting the preferred alternative

Design criteria included:

- 10-year minimum capacity
- 25-year detention capacity

PRECISION OF COST ESTIMATES

When considering cost estimates, there are several levels or degrees of precision depending on the purpose of the estimate and the percentage of detailed design that has been completed. The following levels of precision are typical:

Type of Estimate	Precision
Master Planning	±50%
Preliminary Design	±30%
Final Design or Bid	±10%

For example, at the master planning level (or conceptual or feasibility design level), if a project is estimated to cost $1,000,000, then the precision or reliability of the cost estimate would typically be expected to range between approximately $500,000 and $1,500,000. While this may seem very imprecise, the purpose of master planning is to develop general sizing, location, cost, and scheduling information on several individual projects that may be designed and constructed over a period of many years. Master planning also typically includes the selection of common design criteria to help ensure uniformity and compatibility among future individual projects. Details such as the exact capacity of individual projects, the level of redundancy, the location of facilities, the alignment and depth of pipelines, the extent of utility conflicts, the cost of land and easements, the construction methodology, the types of equipment and material to be used, the time of construction, interest, inflation rates, permitting requirements, etc., are typically developed during the more detailed levels of design.

At the preliminary or 10% design level, some of the aforementioned information will have been developed. Major design decisions such as the size of facilities, selection of facility sites, pipeline alignments and depths, and the selection of the types of equipment and material to be used during construction will typically have been made. At this level of design, the precision of the cost estimate for a $1,000,000 project would typically be expected to range between approximately $700,000 and $1,300,000.

After the project has been completely designed and is ready to bid, all design plans and technical specifications will have been completed and nearly all the significant details about the project should be known. At this level of design, the precision of the cost estimate for the same $1,000,000 project would typically be expected to range between approximately $900,000 and $1,100,000.

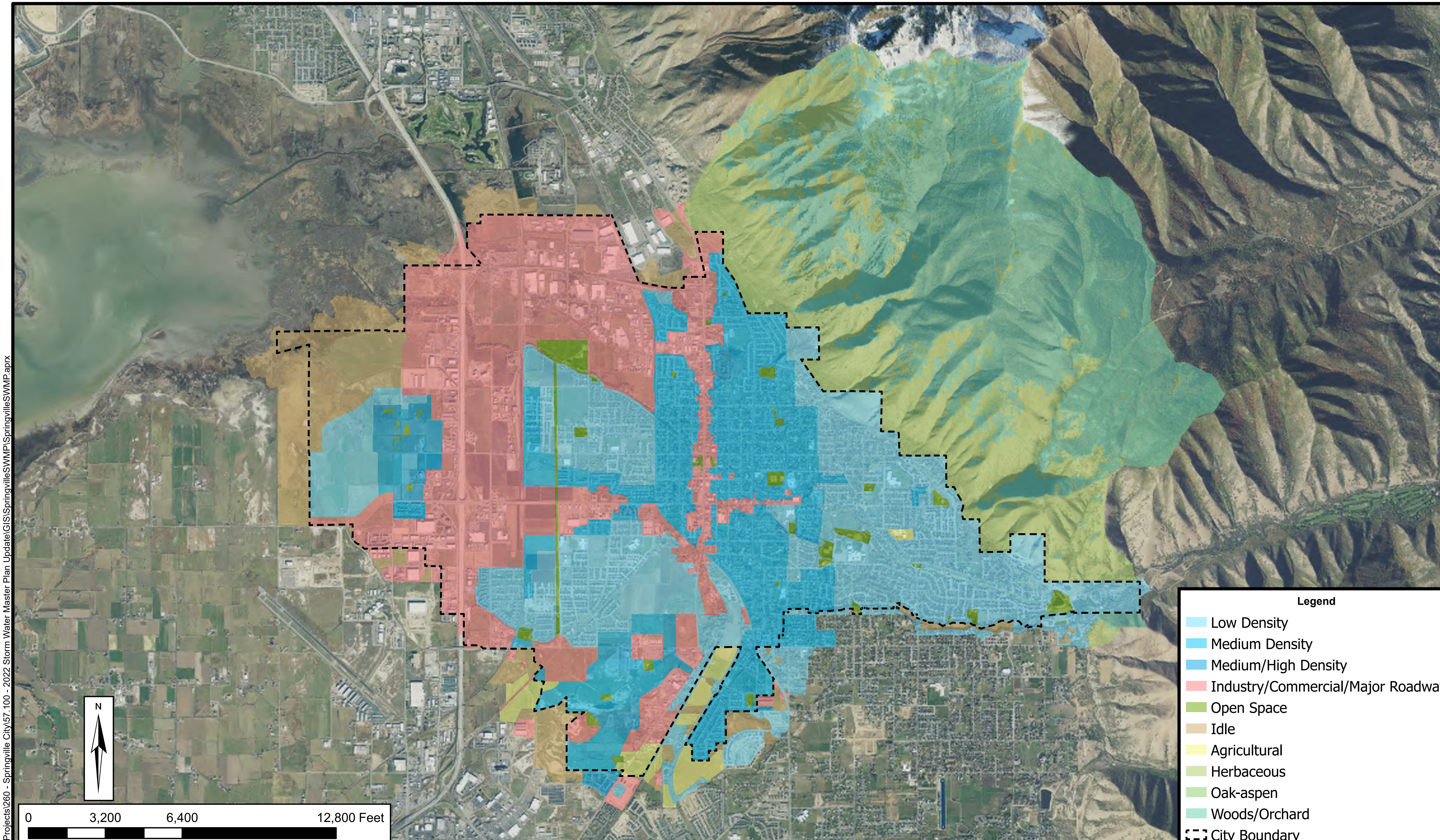
The flows and pipe diameters provided in the following Capital Improvement Plan (CIP) descriptions are approximate and are for planning purposes only. A detailed hydrologic and hydraulic analysis shall be performed during the design process of the projects to identify final design and sizing.

ESTIMATED CONSTRUCTION COSTS

Cost estimates are based on conceptual-level engineering. Unit construction costs were estimated based on construction cost indices (ENR 2023), communication with material suppliers, heavy construction data references (RSMeans 2022), and HAL's experience with similar construction. Engineering cost estimates given in this study should be regarded as conceptual and appropriate for use as a planning guide. Only during final design can a definitive and more accurate estimate be provided. A detailed cost estimate of each alternative is provided in Appendix C.

CAPITAL IMPROVEMENT PLAN

Tables 5-1 through 5-3 present the recommended capital improvements which are shown on Figure 5-2. Table 5-1 includes existing projects determined by HAL and projects proposed in the 2014 master plan which HAL also recommends for completion. The Capital improvement plan for the future projects was based on a master planned zoning and future land use provided by the City. Drainage area DA-RD8 is being developed by Wavetronix. Wavetronix has their own drainage analysis for this drainage area which has been provided by the City. This analysis can be found in Appendix D. Discussions with the City, analysis of the model, and LiDAR provided information on the feasibility of out falling RD11 into Hobble Creek. It was determined that DA-RD11 is topographically sunk below Hobble Creek furthermore. Further discussion with the City encouraged introduction of fill and grading of DA-RD11 such that discharge from developments within DA-RD11 goes south and is captured in C21. Master planned land use zoning used the same land use and curve number association found in Tables 3-2 and 3-3 respectively. A figure of the master planned land use zoning can be seen inf figure 5-1. Table 5-2 includes the capital improvement plan for future stormwater alignment projects see Figure 5-2 for general project locations. Table 5-3 includes the capital improvement plan for future regional detention projects.



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STORMWATER MASTER PLAN

MASTER PLANNED LAND COVER AND ZONING

FIGURE 5-1

Table 5-1
Capital Improvement Plan for Existing Projects

Project ID	Deficiency ID	Location	Problem Description	Preferred Solution	Total with Eng & Cont.	Impact Fee
Springville City Master Plan Projects						
A02	A02	Furthest downstream railroad culvert for Spring Creek.	Under sizing of 2nd and 3rd culvert's causing backwater affect and flooding upstream.	Increase size of 2nd and 3rd culverts to 5 ft. H x 8 ft. W matching size of 1st culvert.	$359,000	10%
A03	A03	Irrigation line through corner of 700 East and 1355 South.	Losses due to undersized pipe and inconsistent material.	Upsize pipe and move alignment into public utility right of way along 1355 South. Up size irrigation line along railroad to basin at 1219 S Main St.	$1,498,000	Not eligible
A04	A04	Northwest corner of 800 East and 100 South.	Losses due to undersized and type in irrigation line.	Add a new line on 800 East from Hillcrest Drive to Center Street.	$567,000	Not eligible
A06	A06	Corner of W 500 North and N 2400 West (501 N 2400 West Street).	Losses due to inlet capacity and pipe size.	Upsize outfall and pipe size from inlets.	$42,000	100%
A07	A07	Irrigation line at W 400 North west under railroad tracks.	Losses due to reverse grade.	Dedicated line diverting stormwater to Hobble Creek.	$288,000	Not eligible
A08	A08	962 North Main Street.	Losses due to undersized line from inlet at 1014 North Main Street.	Upsize and tie line into line at 1011North Main Street.	$72,000	Not eligible
A10	A10	751 W 1600 South St.	Losses due to backwater from undersized culvert.	Increase culvert sizes.	$67,000	60%
A11	A11	Inlet under road south of 1024 West 1600 South and culvert under railroad at 1160 West 1600 South.	Losses due to backwater from undersized pipe and culvert from open channel flow to closed conduit.	Increase capacity of inlet and culvert to 48-inch.	$75,000	70%
A12	A12	900 South between 400 East and 800 East.	Losses along 900 South due to undersized irrigation line capturing stormwater.	Add dedicated 24-inch stormwater line for 900 South.	$606,000	5%
A13	A13	655 W 255 South	Losses at localized detention facility.	Increasing orifice size to 10-inch	-	Not eligible

Project ID	Deficiency ID	Location	Problem Description	Preferred Solution	Total with Eng & Cont.	Impact Fee
Springville City Master Plan Projects						
A14	A14	Intersection of 700 South and Main Street.	Losses at 700 South and Main Street with minor losses from 500 South to 700 South on Main Street.	Increase pipe size to 36-inch along Main Street from 400 South to 700 South.	$1,156,000	Not eligible
A16[2]	A16	400 S Canyon Road Southwest across park to Hobble Creek.		Extend 30, 36, and 48-inch pipeline from roundabout in Center St. through High School property to Hobble Creek.	$1,163,000	10%
A18	A18	1100 West crossing over Spring Creek.	Undersized culvert causing losses upstream of crossing.	Increase capacity of culvert under 1100 West by increasing size to 4 f.t H x 5 ft. W.	$171,000	Not eligible
A19	A19	1550 N South along and crossing Main Street		24-inch pipe along 1550 N and South down Main Street. 30-inch pipe crossing Main Street.	$162,000	Not eligible
Springville City Projects Subtotal					**$6,226,000**	**$318,000**
Springville City Master Plan Projects – 2014 Master Plan						
PE14	2014 MP[1] A17	200 East	No alignment.	Approximately 2150-feet of new pipe at a diameter of 36-inches.	$773,000	Not Eligible
PE15	2014 MP[1] A17	200 East	No alignment.	Approximately 1500-feet of new pipe at a diameter of 42-inches.	$639,000	Not Eligible
PE27	2014 MP[1] A17	200 North	No alignment.	Approximately 700-feet of new pipe at a diameter of 18-inches.	$174,000	Not Eligible
PE28	2014 MP[1] A17	200 North	No alignment.	Approximately 500-feet of new pipe at a diameter of 30-inches.	$141,000	Not Eligible
PE29	2014 MP[1] A17	200 North	No alignment.	Approximately 4800-feet of new pipe at a diameter of 36-inches.	$1,777,000	Not Eligible
Springville City Master Plan Projects – 2014 Master Plan Subtotal[1]					**$3,504,000**	**$0**

[1]Project description, location, and cost from the 20014 Stormwater Plan Update (Bowen, Collins & Associates, 20014). Costs were updated to 2023 dollars using the ENR Cost Index (ENR, 2023).
[2]Cost for A16 is Springville's associated cost for the project which includes bids for construction on the first portion of the project (4/1/24) at $430,000. The remaining portion is itemized in Table C-2 of appendix C.

Table 5-2
Capital Improvement Plan for Future Projects (Pipes)

Project ID	Length (ft.)	Diameter (in)	Estimated Capacity (cfs)	Total with Eng & Cont.	Impact Fee
Springville City Master Plan Projects					
C01	2,321	36	55	$1,178,000	100%
C02	1,562	30	27	$606,000	100%
C03	4,713	36	95	$2,391,000	100%
C04	2,085	48	154	$1,514,000	100%
C05	2,527	48	137	$1,835,000	100%
C06	1,535	24	42	$453,000	100%
C07	2,469	36	59	$1,253,000	100%
C08	2,433	24	31	$719,000	100%
C09	2,649	54	113	$2,080,000	100%
C10	1,601	42	66	$972,000	100%
C11	1,788	30	25	$693,000	100%
C12	992	42	45	$602,000	100%
C13	1,365	30	17	$529,000	100%
C14	1,250	24	14	$369,000	100%
C15	1,252	42	70	$760,000	100%
C16	1,614	36	30	$819,000	100%
C17	3,325	48	69	$2,414,000	100%
C18	1,000	30	34	$388,000	100%
C19	3,241	42	54	$1,968,000	100%
C21	1,938	30	26	$900,000	100%
C22	2,517	24	12	$743,000	100%
C23	3,457	36	37	$2,234,000	100%
C25	1,692	48	52	$1,228,000	100%
C26	2,129	36	25	$1,080,000	100%
C27	1,667	60	101	$1,557,000	100%
C28	1,128	42	73	$685,000	100%
C29	1,489	30	39	$578,000	100%

Project ID	Length (ft.)	Diameter (in)	Estimated Capacity (cfs)	Total with Eng & Cont.	Impact Fee
Springville City Master Plan Projects					
C30	1,277	24	10	$377,000	100%
C31	341	30	13	$133,000	100%
C32	996	36	40	$506,000	100%
C33	1,200	36	42	$776,000	100%
C34	1,283	42	56	$958,000	100%
C35	828	42	76	$618,000	100%
C36	797	48	72	$579,000	100%
C37	653	30	42	$254,000	100%
C38	1,793	36	35	$1,159,000	100%
C39	1,017	36	52	$195,000	100%
C40	663	24	10	$246,000	100%
Springville City Projects Subtotal				**$36,349,000**	**$36,349,000**

Table 5-3
Capital Improvement Plan for Future Projects (Regional Detention)

Project ID	Contributing Area (Acres)	Contributing Area ID	Volume (AF)	Allowable Discharge (cfs)	Total with Eng & Cont.	Impact Fee
Springville City Master Plan Projects						
RD01	190	DA-RD01	1.5	29	$366,000	100%
RD02	100	DA-RD02	1.5	15	$366,000	100%
RD03	105	DA-RD03	2.1	16	$499,000	100%
RD04	213	DA-RD04	2.3	32	$533,000	100%
RD05	150	DA-RD05	3.0	23	$699,000	100%
RD06	167	DA-RD06	7.5	25	$1,698,000	100%
RD07	139	DA-RD07	3.3	21	$766,000	100%
RD08[1]	88	DA-RD08	1.5	13	$366,000	100%
RD10	150	DA-RD10	3.0	23	$699,000	100%
RD12	189	DA-RD12	3.8	28	$866,000	100%
RD13	219	DA-RD13	3.8	33	$866,000	100%
RD14	46	DA-RD14	1.1	7	$266,000	100%
RD15	442	DA-RD15	9.0	66	$2,031,000	100%
RD16	124	DA-RD16	0.2	19	$66,000	100%
RD17	118	DA-RD17	3.0	18	$699,000	100%
RD18	20	DA-RD18	0.4	3	$120,000	100%
Springville City Projects Subtotal					**$10,906,000**	**$10,906,000**

[1]Detention pond sized based on limited downstream conveyance capacity under the railroad.

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CITY OF SPRINGVILLE
STORMWATER MASTER PLAN

CAPITAL IMPROVEMENT PLAN PROJECTS

FIGURE 5-2

SUMMARY OF CAPITAL IMPROVEMENTS

Costs of the Capital Improvements are summarized in Tables 5-1 through 5-3.

Table 5-4
Capital Improvement Plan Summary

Projects	Cost ($)	Impact Fee Eligible
Springville City Existing Projects	$6,226,000	$318,000
2014 Master Plan Springville City Projects	$3,504,000	-
Future Projects	$47,255,000	$47,255,000
Total Cost	**$56,985,000**	**$47,573,000**

OPERATIONAL RECOMMENDATIONS

Flow Outside of Springville

As discussed in Chapter 2, there are limited surrounding areas outside of Springville City have significant runoff that enters Springville's closed conduit stormwater system. Older Mapleton developments which precede the ordinance to detain the 24-hour 100-year event are included in the storm system calculations. Spanish Fork and Mapleton do drain into open channels which includes Dry Creek, Big Hollow, and Packard Drain. An outlet structure from the Central Utah Project discharges into Hobble Creek, the magnitude and timing of these discharge events is unknown and not included in the study. As the municipalities to the South and Southeast of Springville develop, there is a potential for increased runoff into Springville, however Mapleton requires the onsite detention of the 24-hour 100-year event. It is advisable to ensure that future development from Mapleton is accounted for in their network such that flows do not burden Springville's stormwater drainage efforts.

Pipe Type

Many of the stormwater pipes in Springville are composed of a pipe material with a high roughness. Mannings equation and modeling of the system suggests that generally many of the rougher pipes such as corrugated metal do not have the capacity to convey the 10-year 3 hr flows. By decreasing the roughness by half, the capacity of the pipe is roughly doubled. If any of these pipes are due for replacement the City should consider utilizing a smoother pipe as a replacement to provide the additional capacity needed. If replacement is not a reasonable solution, lining the pipe is another option to improve surface roughness. When evaluating the lining option, there should be consideration for the decrease in cross sectional area and how it impacts overall capacity of the pipe.

Inventory

The current Master Plan consolidated different inventories of the Springville stormwater network. These inventories include an inventory contained as a SWMM model and a GIS inventory of the system. Multiple inventories increase the likelihood of incorrect or outdated information being used and require more time to maintain. For example, as part of this Master Plan, the City sent HAL their GIS data and the models from the previous Master Plan. Both datasets were evaluated, and it became evident that neither dataset was current. This required additional time to put all the updated GIS data into the current model.

Therefore, it is recommended that the City maintain and update a master GIS inventory of the stormwater system. The stormwater model should be maintained and updated based upon the master GIS inventory. The GIS inventory should be maintained separate from the SWMM model to increase accessibility to the inventory by City personnel. Updates should occur as information about additional land use, conveyance, capacity, and detention data become available.

Irrigation and Stormwater Conveyances

Several older areas of the Springville Stormwater System have conveyances which serve as both stormwater facilities and irrigation facilities. The dual stormwater/ irrigation conveyances generally lack the capacity to convey the 10-year flow through the system. Therefore, it is recommended that an ongoing effort be made to separate stormwater conveyances from local irrigation conveyances in addition to the recommended projects in the Capital Improvement Plan.

Watch and Maintenance Recommendations

Areas identified as not warranting action include those shown in Figure 4-1 and classified as areas to watch. These areas should be monitored for future flooding. If conditions become unacceptable, a project should be added to the CIP to remedy the deficiency. Further analysis should be done to understand the impact of storm water on the Dry Creek and Hobble Creek conveyances. The Dry Creek and Hobble Creek drainage analysis should be completed for the 100-year event frequency. Complementary to addressing capacity concerns for Springville's open channel conveyances via an analysis, HAL recommends annual or bi-annual maintenance on Springville's open channels. Maintenance can and should be done on Hobble Creek, Spring Creek, Dry Creek, the Packard Drain and all their tributary open channels.

Stormwater Master Plan Updates

The stormwater master plan should be periodically reviewed and updated dependent upon change and new development, at least every 5 years.

CHAPTER 6 – REFERENCES

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APPENDIX A
System Data

APPENDIX B
Capital Projects List

Table B-1
Itemized Table of Segments in Existing CIP Projects

Project ID	Model ID	Length (ft.)	Proposed Diameter (in)	Notes
Springville City Master Plan Projects				
A02	SDP0360	92	5x8	
A02	SDP0361	82	5x8	
A03	SDP1204	172	30	
A03	SDP2029	50	30	
A03	SDP1205	323	30	
A03	SDP1214	136	30	
A03	SDP1203	228	24	
A03	SDP2011	11	30	
A03	SDP2527	824	30	
A03	SDP2526	207	30	
A03	SDP2334	689	30	
A03	SDP2291	77	30	
A03	SDIP04573	343	30	
A03	SDP2291(A)	61	30	
A03	SDP2367	151	30	
A03	PND548			Increase orifice to 10 inches
A04	SDP3635	664	30	
A04	SDP3634	697	24	
A06	SDP3518	31	24	
A06	SDP3516	10	18	
A06	SDP3515	85	18	
A07	SDP3636	507	24	
A07	SDP2153	194	24	
A07	SDP0336	75	24	
A08	SDP3425	226	15	
A08	SDP0731	20	15	
A10	SDP2298	89	42	
A11	SDP2299	52	48	
A11	SDP2300	34	48	
A12	SDP3639	438	24	
A12	SDP3640	1115	24	
A12	SDP3641	65	30	
A13	PND713			Increase orifice to 10 inches
A14	SDP2628	503	36	
A14	SDP2630	500	36	
A14	SDP2632	464	36	
A14	SDP2634	322	36	
A16	SDP3646	1600	36	
A16	SDP3646			Modification to force water down to SDP3646
A16	SDP3648	900	48	
A18	SDP2459	103	4x5	
A19	SDP3422	320	24	
A19	SDP0347	92	30	
PE14	-	2129	36	

Project ID	Model ID	Length (ft.)	Proposed Diameter (in)	Notes
Springville City Master Plan Projects				
PE15	-	1466	42	
PE27	-	702	18	
PE28	-	460	30	
PE29	-	4820	36	

APPENDIX C
Cost Data

Table C-1
Cost Assumptions for Regional Detention Ponds

ID	Volume	Area	Cost of Excavation				Cost of Land			Cost of outlet structure		Cost of vegetation		Project Cost ($)	With Eng & Cont. ($)
	AF	ac	per cy	per AF	AF	Cost ($)	per acre	ac	Cost ($)	Lump Sum		per sf	Cost ($)		1.3
RD01	1.5	0.6	10	16,133	1.5	24,200	400,000	0.6	220,000	1	$25,000	0.5	11,979	281,179	365,533
RD02	1.5	0.6	10	16,133	1.5	24,200	400,000	0.6	220,000	1	$25,000	0.5	11,979	281,179	365,533
RD03	2.1	0.8	10	16,133	2.1	33,880	400,000	0.8	308,000	1	$ 25,000	0.5	16,771	383,651	499,000
RD04	2.3	0.8	10	16,133	2.3	36,300	400,000	0.8	330,000	1	$ 25,000	0.5	17,969	409,269	532,049
RD05	3.0	1.1	10	16,133	3.0	48,400	400,000	1.1	440,000	1	$ 25,000	0.5	23,958	537,358	698,565
RD06	7.5	2.8	10	16,133	7.5	121,000	400,000	2.8	1,100,000	1	$25,000	0.5	59,895	1,305,895	1,697,664
RD07	3.3	1.2	10	16,133	3.3	53,240	400,000	1.2	484,000	1	$25,000	0.5	26,354	588,594	765,172
RD08	1.5	0.6	10	16,133	1.5	24,200	400,000	0.6	220,000	1	$25,000	0.5	11,979	281,179	365,533
RD10	3.0	1.1	10	16,133	3.0	48,400	400,000	1.1	440,000	1	$25,000	0.5	23,958	537,358	698,565
RD12	3.8	1.4	10	16,133	3.8	60,500	400,000	1.4	550,000	1	$25,000	0.5	29,948	665,448	865,082
RD13	3.8	1.4	10	16,133	3.8	60,500	400,000	1.4	550,000	1	$25,000	0.5	29,948	665,448	865,082
RD14	1.1	0.4	10	16,133	1.1	16,940	400,000	0.4	154,000	1	$25,000	0.5	8,385	204,325	265,623
RD15	9.0	3.3	10	16,133	9.0	145,200	400,000	3.3	1,320,000	1	$25,000	0.5	71,874	1,562,074	2,030,696
RD16	0.2	0.1	10	16,133	0.2	2,420	400,000	0.1	22,000	1	$25,000	0.5	1,198	50,618	65,803
RD17	3.0	1.1	10	16,133	3.0	48,400	400,000	1.1	440,000	1	$25,000	0.5	23,958	537,358	698,565
RD18	0.4	0.1	10	16,133	0.4	6,292	400,000	0.1	57,200	1	$25,000	0.5	3,115	91,607	119,089

Table C-2
Cost Assumptions for Existing and Future Pipe Alignments

ID	Diameter (in)	Length (ft.)	Cost/LF	Cost	Total Cost	Total with Eng & Cont.
A02	5x8	174	$1585	$275,960	$275,960	$358,748
A03	24	228	$285	$64,980	$1,151,835	$1,497,386
	30	3044	$357	$1,086,855		
	-	-	-	-		
A04	24	697	$285	$198,571	$435,619	$566,305
	30	664	$357	$237,048		
A06	18	95	$242	$22,990	$31,825	$41,373
	24	31	$285	$8,835		
A07	24	776	$285	$221,043	$221,043	$287,356
A08	15	246	$225	$55,350	$55,350	$71,955
A10	42	89	$574	$51,086	$51,086	$66,412
A11	48	86	$667	$57,362	$57,362	$74,571
A12	24	1553	$285	$442,548	$465,753	$605,479
	30	65	$357	$23,205		
A13	-	-	-	-	-	-
A14	36	1789	$497	$889,133	$889,133	$1,155,873
A16	36[1]	1600	$390/2	$312,095	$993,338	$1,162,340
	48[1]	900	$558/2	$251,243		
	City's Portion of 30-inch segment (Bid Price)			$430,000		
A18	4x5	103	$1273	$131,119	$131,119	$170,454
A19	24	320	$285	$91,200	$124,044	$161,257
	30	92	$357	$32,844		
C01[1]	36	2321	390	-	$905,387	$1,177,004
C02[1]	30	1562	298	-	$465,582	$605,257
C03[1]	36	4713	390	-	$1,838,630	$2,390,219
C04[1]	48	2085	558	-	$1,164,068	$1,513,288
C05[1]	48	2527	558	-	$1,410,984	$1,834,280
C06[1]	24	1535	227	-	$348,440	$452,972
C07[1]	36	2469	390	-	$963,349	$1,252,354
C09[1]	24	2433	227	-	$552,367	$718,078
C08[1]	54	2649	604		$1,599,496	$2,079,345
C10[1]	42	1601	467	-	$747,383	$971,598
C11[1]	30	1788	298	-	$532,987	$692,884
C12[1]	42	992	467	-	$463,005	$602,000
C13[1]	30	1365	298	-	$406,770	$528,801
C14[1]	24	1250	227	-	$283,750	$368,875
C15[1]	42	1252	467	-	$584,450	$759,786
C16[1]	36	1614	390	-	$629,591	$818,469
C17[1]	48	3325	558	-	$1,856,607	$2,413,590
C18[1]	30	1000	298	-	$298,095	$387,524
C19[1]	42	3241	467	-	$1,513,385	$1,967,401

ID	Diameter (in)	Length (ft.)	Cost/LF	Cost	Total Cost	Total with Eng & Cont.
C21	30	1938	357	-	$691,866	$899,426
C22[1]	24	2517	227	-	$571,350	$742,756
C23	36	3457	497	-	$1,718,129	$2,233,568
C25[1]	48	1692	558	-	$944,479	$1,227,823
C26[1]	36	2129	390	-	$830,695	$1,079,905
C27[1]	60	1667	718	-	$1,197,084	$1,556,210
C28[1]	42	1128	467	-	$526,715	$684,730
C29[1]	30	1489	298	-	$443,858	$577,016
C30	24	1277	227	-	$289,875	$376,837
C31[1]	30	342	298	-	$101,649	$132,144
C32[1]	36	996	390	-	$388,558	$505,126
C33	36	1200	497	-	$596,400	$775,320
C34	42	1283	574	-	$736,442	$957,375
C35	42	828	574	-	$475,272	$617,854
C36[1]	48	797	558	-	$444,979	$578,474
C37[1]	30	653	298	-	$194,654	$253,050
C38	36	1793	497	-	$891,121	$1,158,458
C39[1]	36	1017	147	-	$149,499	$194,349
C40	24	663	285	-	$188,955	$245,642

[1]Out of street costs.

Table C-2 main assumptions include an average distance of 200 feet per manhole, one set of inlets every 100 feet of pipe, and three feet of cover. Unless stated, all costs are in street costs.

APPENDIX D
Supplementary Data

WAVETRONIX PHASE I
APPROX 1750 WEST 700 NORTH
SPRINGVILLE, UTAH 84663
PRELIMINARY STORM WATER STUDY
Project No. 16N235
3-29-2018
Updated 4-16-2018
Updated 5-30-2018
Updated 7-6-2018

General Site Information:

The proposed Wavetronix site is located at approximately 1750 West 700 North along the east side of Interstate 15 in Springville, Utah. Construction will consist of a new commercial campus with buildings, parking lots, sidewalks, curb and gutter, underground utilities, and landscaped areas when completed.

Storm water from the site will be collected in inlet boxes and catch basins and will continue via storm drain collection pipes to the southwest portion of the site. Storm water will be retained in some areas and detained in other areas in a series of staged detention facilities across the site. The site is allowed a unit-release of 0.15 cfs per acre for the 25-yr storm into the existing Packard Drain irrigation ditch along the south side of the site and will continue westerly in a historical fashion. The attached figure shows the project site and location of the storm water outfall. Detention calculations have been provided for the site. (See attached figure and calculations).

The study area is broken up into 7 drainage areas (labeled A-1 through A-7). A runoff coefficient of 0.15 is used for natural ground and landscaped areas. A runoff coefficient of 0.90 is used for asphalt, concrete, buildings, and other hard surfaced areas. Average runoff coefficients of 0.251, 0.156, 0.900, 0.900, 0.467, 0.900 and 0.900 were calculated for areas A-1 through A-7, respectively. This yields a coefficient of 0.350 for the study area as a whole.

Times of concentration are calculated using the FAA method assuming flow resistance coefficients of K=0.35 for landscape and K=0.91 for hardscape for each of the areas. The times of concentration range from about 5 to 41 minutes for areas A-1 through A-7. These times are based on the hydraulically longest drainage path inside each respective drainage area over grass or other vegetation, asphalt, concrete, and/or through a pipeline as applicable. Times calculated to be less than 5 minutes should be rounded to 5 minutes when using this method. Rainfall Intensities were taken from the NOAA website for pipe sizing and detention requirements. The values obtained were interpolated as necessary. A copy of these data is attached.

Data showing area information, runoff coefficient, time of concentration, peak flow, and required detention for the site are also provided and can be found in the attached calculations.

Orifice Plates & Flow Restrictions:

Areas A-1 and A-2 will remain undeveloped at this phase of construction, and orifice plates will be added to restrict flow from these areas at that time. From areas A-3, A-4, A-6 and A-7 flow will be restricted through a 4” diameter pipe to the storm drain lines in area A-5. An orifice plate will be used to control the rate that storm water flows from the A-5 detention facility. The orifice plate will be located at the storm drain structure at node 105 (See attached figure). The orifice plate opening has been sized to allow the detention facility to utilize its capacity during a 25-yr storm with a release rate of 0.15 cfs/ac (See Table 1). The orifice plate has also been sized to adequately handle the flows from areas A-1 & A-2. The orifice plate will allow small flows to pass through without detention. As the rate of storm water into the pipes and detention facilities increases, the orifice plates will restrict the flow. The maximum flow through the plate will occur when the detention facilities reach the maximum design depth. A detail of the orifice plate can be found in the construction documents for this project.

Required Detention/Retention:

The required detention volumes of each respective area for the 25-year storm is shown in Table 1 below. For area A-5 a release rate of 0.15 cfs/acre was used. In the event the detention facilities experience a storm larger than the design storm water will then spill out into the existing drainage ditch to the south and continue westerly in a historical fashion.

At this phase of development, areas A-1 and A-2 will be left as agricultural farm land, and all rainwater will remain in the individual areas. Upon future development, the water will be detained in areas A-1 and A-2 prior to being released into area A-5. The pipes in Area A-5 have been sized to accommodate the additional 0.15 cfs/acre passthrough flows from these sites. The pond in area A-5 has been sized to accommodate the additional volume.

For areas A-3, A-4, A-6 and A-7, storm water will be stored underground, utilizing a permeable pavement system. The pavement is designed to utilize 0.275 feet of storage volume per 1 square foot of area. The available volumes are indicated in Table 1 below. The storm water from these areas is then released through 4” diameter pipe to the storm drainage system in area A-5.

TABLE 1: Orifice Plate Sizes & Detention/Retention Volumes

Area	Orifice Node	Restriction Size & Type	Required Detention (cubic feet)	Storage Type	Available Volume (cubic feet)
A-1	101	Future Orifice Plate	12,488	Future On-site Detention	
A-2	102	Future Orifice Plate	4,289	Future On-site Detention	
A-3	103	4”ϕ Pipe	2,048	Underground Detention	8,835
A-4	104	4”ϕ Pipe	407	Underground Detention	2,957
A-5	105	17.22”ϕ Orifice Plate	35,434	Aboveground Detention	126,584
A-6	106	4”ϕ Pipe	3,188	Underground Detention	12,599
A-7	107	4”ϕ Pipe	1,457	Underground Detention	6,883

Great Basin Engineering, Inc.

Updated by Heather Avner, E.I.T.

Reviewed by Mark E. Babbitt, P.E.

LICENSED PROFESSIONAL ENGINEER
No. 166484
MARK EUGENE
BABBITT
8-9-18
STATE OF UTAH

FFKR ARCHITECTS

730 Pacific Avenue • Salt Lake City, Utah 84104

o 801.521.6186 • FFKR.COM

Wavetronix

PROJECT # 17098

DATE STATUS

STORM WATER STUDY EXHIBIT

SWS

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Storm Water Calculations
Wavetronix

7/6/2018

16N235-S5 SWS.dwg

7 Detained Areas

Hardscape C =	0.90
Landscape C =	0.15

Drainage Areas	Total Area (ft^2)	Total Area (acres)	Hardscape Area (ft^2)	Hardscape Area (ft^2)	Landscape (ft^2)	Landscape Area (acres)	C
Σ Det. Areas	3403633	78.137	908760	20.862	2494873	57.274	0.350
Σ All Areas	3403633	78.137	908760	20.862	2494873	57.274	0.350
A-1	980036	22.499	131978	3.030	848058	19.469	0.251
A-2	756064	17.357	6064	0.139	750000	17.218	0.156
A-3	32128	0.738	32128	0.738	0	0.000	0.900
A-4	10752	0.247	10752	0.247	0	0.000	0.900
A-5	1553810	35.671	656995	15.083	896815	20.588	0.467
A-6	45814	1.052	45814	1.052	0	0.000	0.900
A-7	25029	0.575	25029	0.575	0	0.000	0.900

Time of Concentration--use FAA Method

For FAA Method, use K's of..

K = 0.35 for landscape

K = 0.91 for hardscape

$$t_c = \frac{1.8(1.1 - K)\sqrt{L}}{\sqrt[3]{S}}$$

Assume Pipe Flow is at 2 ft/s Scour Speed

**Note: S is in percent, 5 min is smallest allowed Tc

Area	Length on Landscape (ft)	Slope of Landscape (%)	Time on Landscape (min.)	Length on Hardscape (ft)	Slope of Hardscape (%)	Time on Hardscape (min.)	Length in Pipe (ft)	Time in Pipe (min.)	TC for entire Area (min.)
A-1	400.00	2.00	21.43	30.00	2.00	1.49	115.00	0.96	23.88
A-2	800.00	2.00	30.31	80.00	2.00	2.43	1000.00	8.33	41.07
A-3	0.00	0.00	0.00	121.00	2.00	2.99	0.00	0.00	5.00
A-4	0.00	0.00	0.00	90.00	2.00	2.58	0.00	0.00	5.00
A-5	600.00	2.00	26.25	10.00	2.00	0.86	160.00	1.33	28.44
A-6	0.00	0.00	0.00	115.00	2.00	2.91	0.00	0.00	5.00
A-7	0.00	0.00	0.00	122.00	2.00	3.00	0.00	0.00	5.00

Rainfall Intensities
Data From NOAA

10-Year and 25-Year Intensities

The equations used for the 10-Year and 25-Year Intensities were found using the attached Rainfall data as well as Interpolated data where applicable.

		Storm Intensities	
AREA	Tc (minutes)	I (10-yr.) (in./hr.)	I (25-yr.) (in./hr.)
A-1	23.9	1.57	2.07
A-2	41.1	1.12	1.48
A-3	5.0	3.24	4.26
A-4	5.0	3.24	4.26
A-5	28.4	1.42	1.86
A-6	5.0	3.24	4.26
A-7	5.0	3.24	4.26

Peak Flow Information
Use Rational Method
10-Year and 25-Year Intensities

Q=CIA

AREA	C	I10 (in./hr.)	I25 (in./hr.)	A (acres)	Q (10-yr.) (cfs)	Q (25-yr.) (cfs)
					Peak Flows	
				Σ detained =	43.18	56.76
A-1	0.251	1.573	2.068	22.50	8.89	11.68
A-2	0.156	1.123	1.477	17.36	3.04	4.00
A-3	0.900	3.240	4.260	0.74	2.15	2.83
A-4	0.900	3.240	4.260	0.25	0.72	0.95
A-5	0.467	1.419	1.865	35.67	23.64	31.07
A-6	0.900	3.240	4.260	1.05	3.07	4.03
A-7	0.900	3.240	4.260	0.57	1.68	2.20

Node Inlet Requirements

Size pipes for 10 year storm

Area	Node #	% of Total	Q (cfs)
A-1	70	100.0%	8.89
A-1	101	-62.0%	(5.51)
A-2	71	100.0%	3.04
A-2	102	-14.4%	(0.44)
A-3	1	100.0%	2.15
A-3	103	-91.9%	(1.98)
A-4	2	100.0%	0.72
A-4	104	-75.7%	(0.54)
A-5	8	2.0%	0.47
A-5	7	1.0%	0.24
A-5	10	1.0%	0.24
A-5	9	0.8%	0.19
A-5	12	0.8%	0.19
A-5	13	1.0%	0.24
A-5	15	4.0%	0.95
A-5	14	1.5%	0.35
A-5	17	2.5%	0.59
A-5	16	1.5%	0.35
A-5	19	1.5%	0.35
A-5	18	0.7%	0.17
A-5	20	0.7%	0.17
A-5	11	0.8%	0.19
A-5	22	1.2%	0.28
A-5	72	1.0%	0.24
A-5	23	3.0%	0.71
A-5	24	2.0%	0.47
A-5	25	0.8%	0.19
A-5	21	0.8%	0.19
A-5	40	0.6%	0.14
A-5	39	0.4%	0.09
A-5	26	0.0%	0.00
A-5	36	0.8%	0.19
A-5	35	0.2%	0.05
A-5	38	0.8%	0.19
A-5	37	0.2%	0.05
A-5	27	0.8%	0.19
A-5	29	5.0%	1.18
A-5	28	0.7%	0.17
A-5	30	0.7%	0.17
A-5	31	0.2%	0.05
A-5	33	0.7%	0.17
A-5	32	0.2%	0.05
A-5	34	0.0%	0.00
A-5	42	1.5%	0.35

A-5	43	1.5%	0.35
A-5	41	0.0%	0.00
A-5	45	0.4%	0.09
A-5	46	0.6%	0.14
A-5	44	0.0%	0.00
A-5	48	0.3%	0.06
A-5	60	0.2%	0.05
A-5	59	1.2%	0.28
A-5	58	0.0%	0.00
A-5	56	0.5%	0.12
A-5	57	0.3%	0.07
A-5	55	0.0%	0.00
A-5	47	0.0%	0.00
A-5	49	0.8%	0.19
A-5	50	0.8%	0.19
A-5	51	1.0%	0.24
A-5	52	1.5%	0.35
A-5	53	0.3%	0.06
A-5	61	3.6%	0.85
A-5	62	13.5%	3.19
A-5	64	3.7%	0.87
A-5	63	0.5%	0.12
A-5	66	2.0%	0.47
A-5	65	0.2%	0.05
A-5	67	0.2%	0.05
A-5	68	0.2%	0.05
A-5	69	0.2%	0.05
A-5	54	0.2%	0.05
A-5	105	25.0%	5.91
A-6	3	50.0%	1.53
A-6	4	50.0%	1.53
A-6	106	-94.3%	(2.89)
A-7	5	50.0%	0.84
A-7	6	50.0%	0.84
A-7	107	-89.6%	(1.50)

Summary of Node Inlet Requirements

Node	Is required to take (cfs)
1	2.15
2	0.72
3	1.53
4	1.53
5	0.84
6	0.84
7	0.24
8	0.47
9	0.19
10	0.24
11	0.19
12	0.19
13	0.24
14	0.35
15	0.95
16	0.35
17	0.59
18	0.17
19	0.35
20	0.17
21	0.19
22	0.28
23	0.71
24	0.47
25	0.19
26	0.00
27	0.19
28	0.17
29	1.18
30	0.17
31	0.05
32	0.05
33	0.17
34	0.00
35	0.05
36	0.19
37	0.05
38	0.19
39	0.09
40	0.14
41	0.00
42	0.35
43	0.35
44	0.00
45	0.09

46	0.14
47	0.00
48	0.06
49	0.19
50	0.19
51	0.24
52	0.35
53	0.06
54	0.05
55	0.00
56	0.12
57	0.07
58	0.00
59	0.28
60	0.05
61	0.85
62	3.19
63	0.12
64	0.87
65	0.05
66	0.47
67	0.05
68	0.05
69	0.05
70	8.89
71	3.04
72	0.24
101	-5.51
102	-0.44
103	-1.98
104	-0.54
105	5.91
106	-2.89
107	-1.50

PIPE FLOWS

Upstream Node	Downstream node	Pipe Flow (cfs)
1	103	2.15
2	104	0.72
3	106	1.53
4	106	1.53
5	107	0.84
6	107	0.84
7	9	0.88
8	7	0.65
9	11	1.48
10	9	0.24
11	21	5.03
12	13	0.19
13	14	0.43
14	16	1.73
15	14	0.95
16	18	2.67
17	16	0.59
18	20	3.19
19	18	0.35
20	11	3.36
21	26	7.29
22	72	0.28
23	24	1.40
24	25	1.88
25	21	2.07
26	35	7.52
27	28	0.19
28	30	1.54
29	28	1.18
30	31	1.70
31	32	1.75
32	34	1.96
33	32	0.17
34	105	9.96
35	37	7.76
36	35	0.19
37	34	8.00
38	37	0.19
39	26	0.24
40	39	0.14
41	44	3.31
42	41	0.35
43	41	0.35
44	47	3.55
45	44	0.09

46	44	0.14
47	49	7.50
48	47	3.43
49	50	7.69
50	51	7.88
51	52	8.12
52	53	8.65
53	54	8.71
54	105	14.45
55	47	0.52
56	55	0.12
57	55	0.07
58	55	0.33
59	58	0.28
60	58	0.05
61	62	0.85
62	63	4.04
63	65	5.04
64	63	0.87
65	67	5.56
66	65	0.47
67	68	5.60
68	69	5.65
69	54	5.70
70	101	8.89
71	102	3.04
72	23	0.52
101	48	3.38
102	41	2.60
103	52	0.18
104	23	0.18
105	Outfall	30.32
106	8	0.17
107	9	0.18

Options for Pipe Sizes Between the Specified Nodes

Up Stream Node	Dn Stream Node	Q (cfs)	Pipe Size (in)	Design Min Slope (%)	Area (ft^2)	Rh (ft)	Manning's n	Scour Min. Slope (%)	First Trial Pipe Size
1	103	2.15	8	2.268%	0.349	0.167	0.011	0.400%	12
		2.15	10	0.690%	0.545	0.208	0.011	0.280%	
		2.15	12	0.364%	0.785	0.250	0.013	0.200%	
2	104	0.72	6	1.178%	0.196	0.125	0.011	1.000%	8
		0.72	8	0.254%	0.349	0.167	0.011	0.400%	
		0.72	10	0.077%	0.545	0.208	0.011	0.280%	
3	106	1.53	6	5.347%	0.196	0.125	0.011	1.000%	10
		1.53	8	1.153%	0.349	0.167	0.011	0.400%	
		1.53	10	0.351%	0.545	0.208	0.011	0.280%	
4	106	1.53	6	5.347%	0.196	0.125	0.011	1.000%	10
		1.53	8	1.153%	0.349	0.167	0.011	0.400%	
		1.53	10	0.351%	0.545	0.208	0.011	0.280%	
5	107	0.84	6	1.596%	0.196	0.125	0.011	1.000%	8
		0.84	8	0.344%	0.349	0.167	0.011	0.400%	
		0.84	10	0.105%	0.545	0.208	0.011	0.280%	
6	107	0.84	6	1.596%	0.196	0.125	0.011	1.000%	8
		0.84	8	0.344%	0.349	0.167	0.011	0.400%	
		0.84	10	0.105%	0.545	0.208	0.011	0.280%	
7	9	0.88	6	1.778%	0.196	0.125	0.011	1.000%	8
		0.88	8	0.383%	0.349	0.167	0.011	0.400%	
		0.88	10	0.117%	0.545	0.208	0.011	0.280%	
8	7	0.65	6	0.954%	0.196	0.125	0.011	1.000%	8
		0.65	8	0.206%	0.349	0.167	0.011	0.400%	
		0.65	10	0.063%	0.545	0.208	0.011	0.280%	
9	11	1.48	6	5.013%	0.196	0.125	0.011	1.000%	10
		1.48	8	1.081%	0.349	0.167	0.011	0.400%	
		1.48	10	0.329%	0.545	0.208	0.011	0.280%	
10	9	0.24	6	0.127%	0.196	0.125	0.011	1.000%	8
		0.24	8	0.027%	0.349	0.167	0.011	0.400%	
		0.24	10	0.008%	0.545	0.208	0.011	0.280%	
11	21	5.03	12	1.994%	0.785	0.250	0.013	0.200%	18
		5.03	15	0.607%	1.227	0.313	0.013	0.150%	
		5.03	18	0.229%	1.767	0.375	0.013	0.120%	
12	13	0.19	6	0.081%	0.196	0.125	0.011	1.000%	8
		0.19	8	0.018%	0.349	0.167	0.011	0.400%	
		0.19	10	0.005%	0.545	0.208	0.011	0.280%	
13	14	0.43	6	0.412%	0.196	0.125	0.011	1.000%	8
		0.43	8	0.089%	0.349	0.167	0.011	0.400%	
		0.43	10	0.027%	0.545	0.208	0.011	0.280%	

14	16	1.73	8	1.460%	0.349	0.167	0.011	0.400%	
		1.73	10	0.444%	0.545	0.208	0.011	0.280%	10
		1.73	12	0.235%	0.785	0.250	0.013	0.200%	
15	14	0.95	6	2.034%	0.196	0.125	0.011	1.000%	
		0.95	8	0.438%	0.349	0.167	0.011	0.400%	8
		0.95	10	0.133%	0.545	0.208	0.011	0.280%	
16	18	2.67	10	1.064%	0.545	0.208	0.011	0.280%	
		2.67	12	0.562%	0.785	0.250	0.013	0.200%	15
		2.67	15	0.171%	1.227	0.313	0.013	0.150%	
17	16	0.59	6	0.794%	0.196	0.125	0.011	1.000%	
		0.59	8	0.171%	0.349	0.167	0.011	0.400%	8
		0.59	10	0.052%	0.545	0.208	0.011	0.280%	
18	20	3.19	10	1.519%	0.545	0.208	0.011	0.280%	
		3.19	12	0.802%	0.785	0.250	0.013	0.200%	15
		3.19	15	0.244%	1.227	0.313	0.013	0.150%	
19	18	0.35	6	0.286%	0.196	0.125	0.011	1.000%	
		0.35	8	0.062%	0.349	0.167	0.011	0.400%	8
		0.35	10	0.019%	0.545	0.208	0.011	0.280%	
20	11	3.36	10	1.681%	0.545	0.208	0.011	0.280%	
		3.36	12	0.888%	0.785	0.250	0.013	0.200%	15
		3.36	15	0.270%	1.227	0.313	0.013	0.150%	
21	26	7.29	15	1.272%	1.227	0.313	0.013	0.150%	
		7.29	18	0.481%	1.767	0.375	0.013	0.120%	18
		7.29	24	0.104%	3.142	0.500	0.013	0.080%	
22	72	0.28	6	0.183%	0.196	0.125	0.011	1.000%	
		0.28	8	0.039%	0.349	0.167	0.011	0.400%	8
		0.28	10	0.012%	0.545	0.208	0.011	0.280%	
23	24	1.40	6	4.485%	0.196	0.125	0.011	1.000%	
		1.40	8	0.967%	0.349	0.167	0.011	0.400%	10
		1.40	10	0.294%	0.545	0.208	0.011	0.280%	
24	25	1.88	8	1.728%	0.349	0.167	0.011	0.400%	
		1.88	10	0.526%	0.545	0.208	0.011	0.280%	12
		1.88	12	0.278%	0.785	0.250	0.013	0.200%	
25	21	2.07	8	2.093%	0.349	0.167	0.011	0.400%	
		2.07	10	0.637%	0.545	0.208	0.011	0.280%	12
		2.07	12	0.336%	0.785	0.250	0.013	0.200%	
26	35	7.52	15	1.356%	1.227	0.313	0.013	0.150%	
		7.52	18	0.513%	1.767	0.375	0.013	0.120%	24
		7.52	24	0.111%	3.142	0.500	0.013	0.080%	
27	28	0.19	6	0.081%	0.196	0.125	0.011	1.000%	
		0.19	8	0.018%	0.349	0.167	0.011	0.400%	8
		0.19	10	0.005%	0.545	0.208	0.011	0.280%	
28	30	1.54	6	5.370%	0.196	0.125	0.011	1.000%	
		1.54	8	1.158%	0.349	0.167	0.011	0.400%	10

		1.54	10	0.352%	0.545	0.208	0.011	0.280%	
29	28	1.18	6	3.177%	0.196	0.125	0.011	1.000%	
		1.18	8	0.685%	0.349	0.167	0.011	0.400%	**10**
		1.18	10	0.208%	0.545	0.208	0.011	0.280%	
30	31	1.70	8	1.421%	0.349	0.167	0.011	0.400%	
		1.70	10	0.432%	0.545	0.208	0.011	0.280%	**10**
		1.70	12	0.228%	0.785	0.250	0.013	0.200%	
31	32	1.75	8	1.501%	0.349	0.167	0.011	0.400%	
		1.75	10	0.456%	0.545	0.208	0.011	0.280%	**10**
		1.75	12	0.241%	0.785	0.250	0.013	0.200%	
32	34	1.96	8	1.888%	0.349	0.167	0.011	0.400%	
		1.96	10	0.574%	0.545	0.208	0.011	0.280%	**12**
		1.96	12	0.303%	0.785	0.250	0.013	0.200%	
33	32	0.17	6	0.062%	0.196	0.125	0.011	1.000%	
		0.17	8	0.013%	0.349	0.167	0.011	0.400%	**8**
		0.17	10	0.004%	0.545	0.208	0.011	0.280%	
34	105	9.96	15	2.376%	1.227	0.313	0.013	0.150%	
		9.96	18	0.899%	1.767	0.375	0.013	0.120%	**24**
		9.96	24	0.194%	3.142	0.500	0.013	0.080%	
35	37	7.76	15	1.443%	1.227	0.313	0.013	0.150%	
		7.76	18	0.546%	1.767	0.375	0.013	0.120%	**24**
		7.76	24	0.118%	3.142	0.500	0.013	0.080%	
36	35	0.19	6	0.081%	0.196	0.125	0.011	1.000%	
		0.19	8	0.018%	0.349	0.167	0.011	0.400%	**8**
		0.19	10	0.005%	0.545	0.208	0.011	0.280%	
37	34	8.00	15	1.532%	1.227	0.313	0.013	0.150%	
		8.00	18	0.579%	1.767	0.375	0.013	0.120%	**24**
		8.00	24	0.125%	3.142	0.500	0.013	0.080%	
38	37	0.19	6	0.081%	0.196	0.125	0.011	1.000%	
		0.19	8	0.018%	0.349	0.167	0.011	0.400%	**8**
		0.19	10	0.005%	0.545	0.208	0.011	0.280%	
39	26	0.24	6	0.127%	0.196	0.125	0.011	1.000%	
		0.24	8	0.027%	0.349	0.167	0.011	0.400%	**8**
		0.24	10	0.008%	0.545	0.208	0.011	0.280%	
40	39	0.14	6	0.046%	0.196	0.125	0.011	1.000%	
		0.14	8	0.010%	0.349	0.167	0.011	0.400%	**8**
		0.14	10	0.003%	0.545	0.208	0.011	0.280%	
41	44	3.31	10	1.637%	0.545	0.208	0.011	0.280%	
		3.31	12	0.865%	0.785	0.250	0.013	0.200%	**15**
		3.31	15	0.263%	1.227	0.313	0.013	0.150%	
42	41	0.35	6	0.286%	0.196	0.125	0.011	1.000%	
		0.35	8	0.062%	0.349	0.167	0.011	0.400%	**8**
		0.35	10	0.019%	0.545	0.208	0.011	0.280%	

43	41	0.35	6	0.286%	0.196	0.125	0.011	1.000%	
		0.35	8	0.062%	0.349	0.167	0.011	0.400%	**8**
		0.35	10	0.019%	0.545	0.208	0.011	0.280%	
44	47	3.55	10	1.879%	0.545	0.208	0.011	0.280%	
		3.55	12	0.993%	0.785	0.250	0.013	0.200%	**15**
		3.55	15	0.302%	1.227	0.313	0.013	0.150%	
45	44	0.09	6	0.020%	0.196	0.125	0.011	1.000%	
		0.09	8	0.004%	0.349	0.167	0.011	0.400%	**8**
		0.09	10	0.001%	0.545	0.208	0.011	0.280%	
46	44	0.14	6	0.046%	0.196	0.125	0.011	1.000%	
		0.14	8	0.010%	0.349	0.167	0.011	0.400%	**8**
		0.14	10	0.003%	0.545	0.208	0.011	0.280%	
47	49	7.50	15	1.349%	1.227	0.313	0.013	0.150%	
		7.50	18	0.510%	1.767	0.375	0.013	0.120%	**24**
		7.50	24	0.110%	3.142	0.500	0.013	0.080%	
48	47	3.43	10	1.759%	0.545	0.208	0.011	0.280%	
		3.43	12	0.929%	0.785	0.250	0.013	0.200%	**15**
		3.43	15	0.283%	1.227	0.313	0.013	0.150%	
49	50	7.69	15	1.418%	1.227	0.313	0.013	0.150%	
		7.69	18	0.536%	1.767	0.375	0.013	0.120%	**24**
		7.69	24	0.116%	3.142	0.500	0.013	0.080%	
50	51	7.88	15	1.489%	1.227	0.313	0.013	0.150%	
		7.88	18	0.563%	1.767	0.375	0.013	0.120%	**24**
		7.88	24	0.121%	3.142	0.500	0.013	0.080%	
51	52	8.12	15	1.579%	1.227	0.313	0.013	0.150%	
		8.12	18	0.597%	1.767	0.375	0.013	0.120%	**24**
		8.12	24	0.129%	3.142	0.500	0.013	0.080%	
52	53	8.65	15	1.792%	1.227	0.313	0.013	0.150%	
		8.65	18	0.678%	1.767	0.375	0.013	0.120%	**24**
		8.65	24	0.146%	3.142	0.500	0.013	0.080%	
53	54	8.71	15	1.817%	1.227	0.313	0.013	0.150%	
		8.71	18	0.687%	1.767	0.375	0.013	0.120%	**24**
		8.71	24	0.148%	3.142	0.500	0.013	0.080%	
54	105	14.45	18	1.893%	1.767	0.375	0.013	0.120%	
		14.45	24	0.408%	3.142	0.500	0.013	0.080%	**24**
		14.45	30	0.124%	4.909	0.625	0.013	0.060%	
55	47	0.52	6	0.615%	0.196	0.125	0.011	1.000%	
		0.52	8	0.133%	0.349	0.167	0.011	0.400%	**8**
		0.52	10	0.040%	0.545	0.208	0.011	0.280%	
56	55	0.12	6	0.032%	0.196	0.125	0.011	1.000%	
		0.12	8	0.007%	0.349	0.167	0.011	0.400%	**8**
		0.12	10	0.002%	0.545	0.208	0.011	0.280%	
57	55	0.07	6	0.011%	0.196	0.125	0.011	1.000%	
		0.07	8	0.002%	0.349	0.167	0.011	0.400%	**8**

		0.07	10	0.001%	0.545	0.208	0.011	0.280%	
58	55	0.33	6	0.249%	0.196	0.125	0.011	1.000%	8
		0.33	8	0.054%	0.349	0.167	0.011	0.400%	
		0.33	10	0.016%	0.545	0.208	0.011	0.280%	
59	58	0.28	6	0.183%	0.196	0.125	0.011	1.000%	8
		0.28	8	0.039%	0.349	0.167	0.011	0.400%	
		0.28	10	0.012%	0.545	0.208	0.011	0.280%	
60	58	0.05	6	0.005%	0.196	0.125	0.011	1.000%	8
		0.05	8	0.001%	0.349	0.167	0.011	0.400%	
		0.05	10	0.000%	0.545	0.208	0.011	0.280%	
61	62	0.85	6	1.647%	0.196	0.125	0.011	1.000%	8
		0.85	8	0.355%	0.349	0.167	0.011	0.400%	
		0.85	10	0.108%	0.545	0.208	0.011	0.280%	
62	63	4.04	10	2.437%	0.545	0.208	0.011	0.280%	15
		4.04	12	1.287%	0.785	0.250	0.013	0.200%	
		4.04	15	0.392%	1.227	0.313	0.013	0.150%	
63	65	5.04	12	1.998%	0.785	0.250	0.013	0.200%	18
		5.04	15	0.608%	1.227	0.313	0.013	0.150%	
		5.04	18	0.230%	1.767	0.375	0.013	0.120%	
64	63	0.87	6	1.740%	0.196	0.125	0.011	1.000%	8
		0.87	8	0.375%	0.349	0.167	0.011	0.400%	
		0.87	10	0.114%	0.545	0.208	0.011	0.280%	
65	67	5.56	12	2.431%	0.785	0.250	0.013	0.200%	18
		5.56	15	0.740%	1.227	0.313	0.013	0.150%	
		5.56	18	0.280%	1.767	0.375	0.013	0.120%	
66	65	0.47	6	0.508%	0.196	0.125	0.011	1.000%	8
		0.47	8	0.110%	0.349	0.167	0.011	0.400%	
		0.47	10	0.033%	0.545	0.208	0.011	0.280%	
67	68	5.60	12	2.473%	0.785	0.250	0.013	0.200%	18
		5.60	15	0.752%	1.227	0.313	0.013	0.150%	
		5.60	18	0.284%	1.767	0.375	0.013	0.120%	
68	69	5.65	12	2.515%	0.785	0.250	0.013	0.200%	18
		5.65	15	0.765%	1.227	0.313	0.013	0.150%	
		5.65	18	0.289%	1.767	0.375	0.013	0.120%	
69	54	5.70	12	2.557%	0.785	0.250	0.013	0.200%	18
		5.70	15	0.778%	1.227	0.313	0.013	0.150%	
		5.70	18	0.294%	1.767	0.375	0.013	0.120%	
70	101	8.89	15	1.892%	1.227	0.313	0.013	0.150%	24
		8.89	18	0.715%	1.767	0.375	0.013	0.120%	
		8.89	24	0.154%	3.142	0.500	0.013	0.080%	
71	102	3.04	10	1.379%	0.545	0.208	0.011	0.280%	15
		3.04	12	0.728%	0.785	0.250	0.013	0.200%	
		3.04	15	0.222%	1.227	0.313	0.013	0.150%	

72	23	0.52	6	0.615%	0.196	0.125	0.011	1.000%	**8**
		0.52	8	0.133%	0.349	0.167	0.011	0.400%	
		0.52	10	0.040%	0.545	0.208	0.011	0.280%	
101	48	3.38	10	1.699%	0.545	0.208	0.011	0.280%	**15**
		3.38	12	0.897%	0.785	0.250	0.013	0.200%	
		3.38	15	0.273%	1.227	0.313	0.013	0.150%	
102	41	2.60	8	3.324%	0.349	0.167	0.011	0.400%	**OOPS!**
		2.60	10	1.011%	0.545	0.208	0.011	0.280%	
		2.60	12	0.534%	0.785	0.250	0.013	0.200%	
103	52	0.18	6	0.070%	0.196	0.125	0.011	1.000%	**8**
		0.18	8	0.015%	0.349	0.167	0.011	0.400%	
		0.18	10	0.005%	0.545	0.208	0.011	0.280%	
104	23	0.18	6	0.070%	0.196	0.125	0.011	1.000%	**8**
		0.18	8	0.015%	0.349	0.167	0.011	0.400%	
		0.18	10	0.005%	0.545	0.208	0.011	0.280%	
105	Outfall	30.32	24	1.796%	3.142	0.500	0.013	0.080%	**36**
		30.32	30	0.546%	4.909	0.625	0.013	0.060%	
		30.32	36	0.207%	7.069	0.750	0.013	0.050%	
106	8	0.17	6	0.070%	0.196	0.125	0.011	1.000%	**8**
		0.17	8	0.015%	0.349	0.167	0.011	0.400%	
		0.17	10	0.005%	0.545	0.208	0.011	0.280%	
107	9	0.18	6	0.070%	0.196	0.125	0.011	1.000%	**8**
		0.18	8	0.015%	0.349	0.167	0.011	0.400%	
		0.18	10	0.005%	0.545	0.208	0.011	0.280%	

Wavetronix
Area A-1 Detention

C = 0.25
Area = 22.50 acres

Remaining Unit Discharge = 0.150 cfs/acre
Release through Restriction = 3.375 cfs

Detention Pond Sized For The 25 Year Storm

Time min	Rainfall Intensity in./hr.	Accumulated Volume (CF)	Allowable Release (CF)	Needed Detention (CF)	
5	4.26	7217	1012	6205	
10	3.24	10978	2025	8953	
15	2.68	13621	3037	10584	
20	2.28	15460	4050	11410	
25	2.01	16998	5062	11936	
30	1.80	18297	6075	12222	
35	1.65	19575	7087	12488	<- Req. Det.
40	1.50	20369	8099	12270	
45	1.38	21053	9112	11942	
50	1.28	21622	10124	11497	
55	1.19	22164	11137	11027	
60	1.12	22769	12149	10620	
90	0.80	24428	18224	6204	
120	0.62	25371	24298	1073	
180	0.45	27140	36448	-9308	
360	0.25	30982	72895	-41913	
720	0.15	37325	145790	-108465	
1440	0.09	43424	291581	-248157	

Required Storage Volume = **12488** ft^3

Wavetronix

Area A-2 Detention

C = 0.16

Area = 17.36 acres

Remaining Unit Discharge = 0.150 cfs/acre

Release through Restriction = 2.604 cfs

Detention Pond Sized For The 25 Year Storm

Time	Rainfall Intensity	Accumulated Volume	Allowable Release	Needed Detention	
min	in./hr.	(CF)	(CF)	(CF)	
5	4.26	3461	781	2680	
10	3.24	5264	1562	3702	
15	2.68	6532	2343	4188	
20	2.28	7413	3124	4289	<- Req. Det.
25	2.01	8151	3905	4246	
30	1.80	8774	4686	4087	
35	1.65	9387	5467	3919	
40	1.50	9768	6248	3519	
45	1.38	10096	7030	3066	
50	1.28	10368	7811	2558	
55	1.19	10628	8592	2036	
60	1.12	10918	9373	1546	
90	0.80	11714	14059	-2345	
120	0.62	12166	18745	-6579	
180	0.45	13014	28118	-15104	
360	0.25	14857	56236	-41379	
720	0.15	17898	112472	-94574	
1440	0.09	20823	224945	-204122	

Required Storage Volume = **4289** ft^3

Wavetronix

Area A-3 Detention

C = 0.90   Outlet Pipe Diameter Size = 4.000 inches

Area = 0.74 acres

Release to A-5 (pipe D * scour velocity (2 ft/s)) = 0.175 cfs

Detention Pond Sized For The 25 Year Storm

Time	Rainfall Intensity	Accumulated Volume	Allowable Release	Needed Detention	
min	in./hr.	(CF)	(CF)	(CF)	
5	4.26	848	52	796	
10	3.24	1290	105	1186	
15	2.68	1601	157	1444	
20	2.28	1817	209	1608	
25	2.01	1998	262	1736	
30	1.80	2151	314	1837	
35	1.65	2301	367	1934	
40	1.50	2394	419	1975	
45	1.38	2475	471	2004	
50	1.28	2542	524	2018	
55	1.19	2605	576	2029	
60	1.12	2676	628	2048	<- Req. Det.
90	0.80	2871	942	1929	
120	0.62	2982	1257	1726	
180	0.45	3190	1885	1305	
360	0.25	3642	3770	-128	
720	0.15	4387	7540	-3152	
1440	0.09	5104	15080	-9975	

Required Storage Volume = **2048** ft^3

Wavetronix

Area A-4 Detention

C = 0.90 | Outlet Pipe Diameter Size = 4.000 inches

Area = 0.25 acres

Release to A-5 (pipe D * scour velocity (2 ft/s)) = 0.175 cfs

Detention Pond Sized For The 25 Year Storm

Time min	Rainfall Intensity in./hr.	Accumulated Volume (CF)	Allowable Release (CF)	Needed Detention (CF)	
5	4.26	284	52	232	
10	3.24	432	105	327	
15	2.68	536	157	379	
20	2.28	608	209	399	
25	2.01	669	262	407	<- Req. Det.
30	1.80	720	314	406	
35	1.65	770	367	404	
40	1.50	801	419	382	
45	1.38	828	471	357	
50	1.28	851	524	327	
55	1.19	872	576	296	
60	1.12	896	628	267	
90	0.80	961	942	18	
120	0.62	998	1257	-259	
180	0.45	1068	1885	-817	
360	0.25	1219	3770	-2551	
720	0.15	1468	7540	-6072	
1440	0.09	1708	15080	-13371	

Required Storage Volume = **407** ft^3

Wavetronix

Area A-6 Detention

C = 0.90 Outlet Pipe Diameter Size = 4.000 inches

Area = 1.05 acres

Release to A-5 (pipe D * scour velocity (2 ft/s)) = 0.175 cfs

Detention Pond Sized For The 25 Year Storm

Time	Rainfall Intensity	Accumulated Volume	Allowable Release	Needed Detention	
min	in./hr.	(CF)	(CF)	(CF)	
5	4.26	1210	52	1157	
10	3.24	1840	105	1735	
15	2.68	2283	157	2126	
20	2.28	2591	209	2382	
25	2.01	2849	262	2587	
30	1.80	3067	314	2753	
35	1.65	3281	367	2915	
40	1.50	3414	419	2995	
45	1.38	3529	471	3058	
50	1.28	3624	524	3101	
55	1.19	3715	576	3139	
60	1.12	3817	628	3188	<- Req. Det.
90	0.80	4095	942	3152	
120	0.62	4253	1257	2996	
180	0.45	4549	1885	2664	
360	0.25	5193	3770	1423	
720	0.15	6256	7540	-1283	
1440	0.09	7279	15080	-7801	

Required Storage Volume = **3188** ft^3

Wavetronix

Area A-7 Detention

C = 0.90 Outlet Pipe Diameter Size = 4.000 inches

Area = 0.57 acres

Release to A-5 (pipe D * scour velocity (2 ft/s)) = 0.175 cfs

Detention Pond Sized For The 25 Year Storm

Time	Rainfall Intensity	Accumulated Volume	Allowable Release	Needed Detention	
min	in./hr.	(CF)	(CF)	(CF)	
5	4.26	661	52	609	
10	3.24	1005	105	901	
15	2.68	1247	157	1090	
20	2.28	1416	209	1206	
25	2.01	1557	262	1295	
30	1.80	1675	314	1361	
35	1.65	1793	367	1426	
40	1.50	1865	419	1446	
45	1.38	1928	471	1457	
50	1.28	1980	524	1456	
55	1.19	2030	576	1454	
60	1.12	2085	628	1457	<- Req. Det.
90	0.80	2237	942	1294	
120	0.62	2323	1257	1067	
180	0.45	2485	1885	600	
360	0.25	2837	3770	-933	
720	0.15	3418	7540	-4122	
1440	0.09	3977	15080	-11103	

Required Storage Volume = **1457** ft^3

Wavetronix

Area A-5 Detention

C = 0.47

Area = 35.67 acres

Remaining Unit Discharge = 0.150 cfs/acre

Release through Restriction = 5.351 cfs

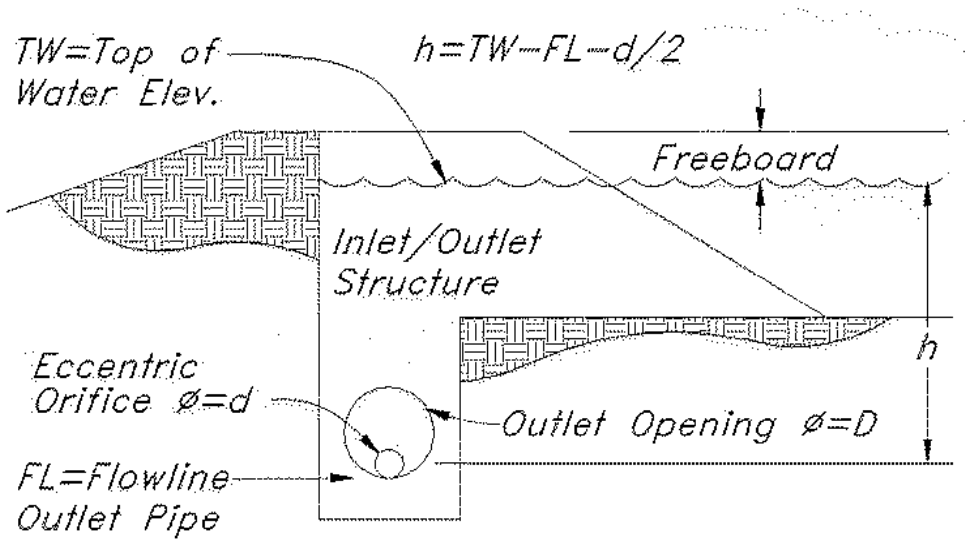
Pass Through Flow from A-1 & A-2 = 5.978 cfs

Detention Pond Sized For The 25 Year Storm

Time min	Rainfall Intensity in./hr.	Accumulated Volume (CF)	Allowable Release (CF)	Needed Detention (CF)	
5	4.26	21504	3399	18105	
10	3.24	32811	6797	26013	
15	2.68	40818	10196	30622	
20	2.28	46453	13595	32858	
25	2.01	51201	16993	34208	
30	1.80	55243	20392	34851	
35	1.65	59225	23791	35434	<- Req. Det.
40	1.50	61778	27189	34588	
45	1.38	64005	30588	33417	
50	1.28	65892	33987	31905	
55	1.19	67701	37385	30315	
60	1.12	69696	40784	28912	
90	0.80	75847	61176	14671	
120	0.62	79888	81568	-1680	
180	0.45	87620	122352	-34732	
360	0.25	106497	244704	-138207	
720	0.15	140292	489408	-349116	
1440	0.09	188446	978816	-790370	

Required Storage Volume = **35434** ft^3

Area A-5 Orifice Plate Calculations



Q = Total Discharge Rate

$$Q = 0.62 \cdot A_o \cdot \sqrt{64.4 \cdot h}$$

$$A_o = \frac{\pi \cdot d^2}{4}$$

Solving for d, we have…..

$$d = \sqrt{\frac{4 \cdot Q}{0.62 \cdot \pi \cdot \sqrt{64.4 \cdot \left(TW - FL - d/2\right)}}}$$

Let

$$\Delta = d - \sqrt{\frac{4 \cdot Q}{0.62 \cdot \pi \cdot \sqrt{64.4 \cdot \left(TW - FL - d/2\right)}}}$$

Goal-seek Δ to zero by changing "trial d"

TW =	4494.00	
FL =	4491.30	
Q =	11.329	cfs
trial d=	1.4348	ft
Δ =	0.000	ft

d =	17.22	inches

STORM DRAIN
IMPACT FEE FACILITY PLAN

(HAL Project No.: 260.57.100)

October 2024

CITY OF SPRINGVILLE

STORM DRAIN
IMPACT FEE FACILITY PLAN

(HAL Project No.: 260.57.100)

Kayson M. Shurtz, P.E.

Project Engineer

October 2024

IMPACT FEE FACILITY PLAN CERTIFICATION

The Utah Impact Fee Act requires certifications for the Impact Fee Facilities Plan (IFFP). Hansen, Allen & Luce provides these certifications with the understanding that the recommendations in the IFFP are followed by City Staff and elected officials. If all or a portion of the IFFP are modified or amended, or if assumptions presented in this analysis change substantially, this certification is no longer valid. All information provided to Hansen, Allen & Luce, Inc. is assumed to be correct, complete, and accurate.

IFFP Certification

Hansen, Allen & Luce, Inc. certifies that the Impact Fee Facilities Plan (IFFP) prepared for the storm water system:

1. includes only the costs of public facilities that are:
    a. allowed under the Impact Fees Act; and
    b. actually incurred; or
    c. projected to be incurred or encumbered within six years after the day on which each impact fee is paid;
2. does not include:
    a. costs of operation and maintenance of public facilities;
    b. costs for qualifying public facilities that will raise the level of service for the facilities, through impact fees, above the level of service that is supported by existing residents;
    c. an expense for overhead, unless the expense is calculated pursuant to a methodology that is consistent with generally accepted cost accounting practices and the methodological standards set forth by the federal Office of Management and Budget for federal grant reimbursement; and
3. complies in each and every relevant respect with the Impact Fees Act.

HANSEN, ALLEN & LUCE, INC.

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IMPACT FEE SUMMARY

The **purpose** of the Impact Fee Facilities Plan (IFFP) is to comply with the requirements of the Utah Impact Fees Act by identifying demands placed on the existing storm water system by new development and by identifying how the City will meet these new demands. The Storm Drain Master Plan and Capital Facility Plan have also been updated to support this analysis.

The significant **driver** for this IFFP is the City has experienced rapid growth and capital improvement costs have increased dramatically over the past few years with record inflation. These projects will add excess capacity to the storm drain system available to new development. This cost must be borne by those who will benefit from the added capacity.

The **service area** is the storm water system service area, which includes the current city boundary and future areas anticipated to be annexed into the city.

The three **components** of the storm water impact fee are regional detention, conveyance, and planning. All capacities and costs are summarized into these components. Each project from the Capital Facility Plan is categorized into either detention or conveyance; planning is provided herein as a separate estimate.

Impervious square feet are the recommended **fee unit** for calculating the impact fee for developments that are non-residential. The typical single-family residential storm water impervious area unit was estimated based on impervious surface within the parcel boundaries. The estimated typical impervious area for single family residential lots were estimated for the following lot size groupings:

- less than 2,000 sf – lot size (sf) x 85%
- between 2,000 sf and 3,999 sf - 1,900 sf of impervious surface
- between 4,000 sf and 5,999 sf - 2,650 sf of impervious surface
- between 6,000 sf and 7,999 sf - 3,450 sf of impervious surface
- between 8,000 sf and 10,889 sf - 4,200 sf of impervious surface
- between 10,890 sf and 21,779 sf - 5,450 sf of impervious surface
- greater than 21,780 sf – 10,400 sf of impervious surface

An Equivalent Residential Unit (ERU) represents 4,200 square feet of impervious surface area. Residential units will be assessed based on the average impervious surface found throughout the City for similar sized lots. While roadways are not part of this ERU definition, their impervious surfaces are included in the runoff calculations. As a result, future stormwater facilities are designed to accommodate all anticipated impervious areas, including roads. The cost impact of these future roads will be distributed evenly across future developments.

It is assumed that developments coming into the City will be classified as residential or non-residential. The assessment of the Impact Fee and future monthly stormwater utility fees will be guided by the following principles:

- Non-Residential units will be assessed based on actual impervious surface within their parcel.
- Residential units equipped with their own water meter will be assessed based on the appropriate lot size grouping.

- Residential units with a single water meter servicing multiple homes, condos, townhomes, or apartments will be assessed in the same fashion as a non-residential unit.

The **level of service** for the storm water system is that it should handle the following:

- 10-year storm for the initial drainage system
- 25-year storm for regional detention/retention basins
- 100-year storm must receive consideration in locations where flooding of homes may occur.

The initial drainage system includes inlets, laterals, minor trunk lines, gutters, and roadside ditches. The design distribution is the 3-hour modified Farmer Fletcher distribution. This design standard has been applied to the stormwater modeling and the results have been used to develop a Capital Improvement Plan (CIP). The design flows and volumes can be found in Springville's Storm Drain Master Plan (SDMP) report (HAL, 2023).

The existing system has approximately 3,583 impervious acres (37,161 ERUs) according to a multispectral imagery analysis based on the National Agricultural Imagery Program (NAIP) imagery flown in the summer and fall of 2021. Projected **growth** based on zoning assumptions adds approximately 1,678 impervious acres (17,403 ERUs) through buildout for a total of 5,261 impervious acres (54,564 ERUs). This means approximately 68% of the built-out impervious area is currently installed.

The existing stormwater system has a few existing facilities that have excess capacity for buy-in. All projects called out in the Master Plan include estimates for impact fee eligibility. These costs along with future growth projections will be used to estimate an equitable Impact Fee. It is estimated that Springville will construct stormwater facilities providing sufficient capacity for approximately 13,056 ERUs of impervious surface over the next 10-years. The impact eligible costs for the projects that have been identified as likely to be constructed over the next 10 years are summarized below.

SUMMARY OF STORMWATER IMPACT FEE ELIGIBLE COSTS OVER NEXT 10-YEARS

COMPONENT	EXISTING DEFICIENCY COSTS	IMPACT FEE ELIGIBLE COSTS	PROJECT FEE COSTS
BUY-IN CONVEYANCE	-	$68,100	$68,100
BUY-IN DETENTION	-	$202,900	$202,900
CONVEYANCE	$9,730,000	$29,481,200	$39,211,200
DETENTION	-	$8,675,000	$8,675,000
PLANNING	-	$250,000[1]	$250,000
TOTAL COST	**$9,730,000**	**$38,677,200**	**$48,407,200**

1. Includes cost of the 2023 Stormwater Master Plan and IFFP and IFA Analysis at $109,000.

SECTION 1
INTRODUCTION

1.1 Background

The City of Springville has experienced steady growth and as this growth continues additional storm water facilities will be required to provide an adequate drainage system that meets the City's current level of service for storm drainage.

The City has recognized the importance to plan for increased burden on its storm drain system from new development as a result of the rapid growth. The Storm Drain Master Plan and Capital Facility Plan have also been updated to support this analysis.

1.2 Purpose

The purpose of the IFFP is to comply with the requirements of the Utah Impact Fees Act by identifying demands placed on the existing storm drain system by new development and by identifying how the City will meet these new demands. This analysis was necessary due to significant growth in the City and increases in project costs. Typically, IFFPs project the need for new growth-related facilities for the 6 to 10-year planning range; to be conservative, this IFFP projects the need for facilities through buildout. To ensure equitable cost sharing, both the capital costs and future growth are estimated through buildout; while not all projects may be completed within 10 years, required projects will be funded by new growth.

This report identifies those items that the Utah Impact Fees Act specifically requires including demands placed upon existing facilities by new development activity and the proposed means by which the municipality will meet those demands. In preparing this report a systematic approach was utilized to evaluate the existing and planned storm water facilities identified in the City's master planning efforts. Each facility's capacity was evaluated in accordance with the selected level of service to determine the appropriate share between existing demand and future demands. The system was evaluated and several projects were found to be eligible for "buy-in". This approach was taken in order to determine the "proportional share" of improvement costs between existing users and future development users. The basis for this report was to provide proposed project costs and the fractional cost associated with future development to be used within the impact fee analysis.

1.3 Impact Fee Collection

Impact fees enable local governments to finance public facility improvements necessary to service new developments without burdening existing development with capital facility construction costs that are exclusively attributable to growth.

An impact fee is a one-time charge on new development to pay for that portion of a public facility that is required to support that new development.

To determine the appropriate impact fee, the cost of the facilities associated with future development must be proportionately distributed. As a guideline in determining the "proportionate share", the fee must be found to be roughly proportionate and reasonably related to the impact caused by the new development.

1.4 Master Planning

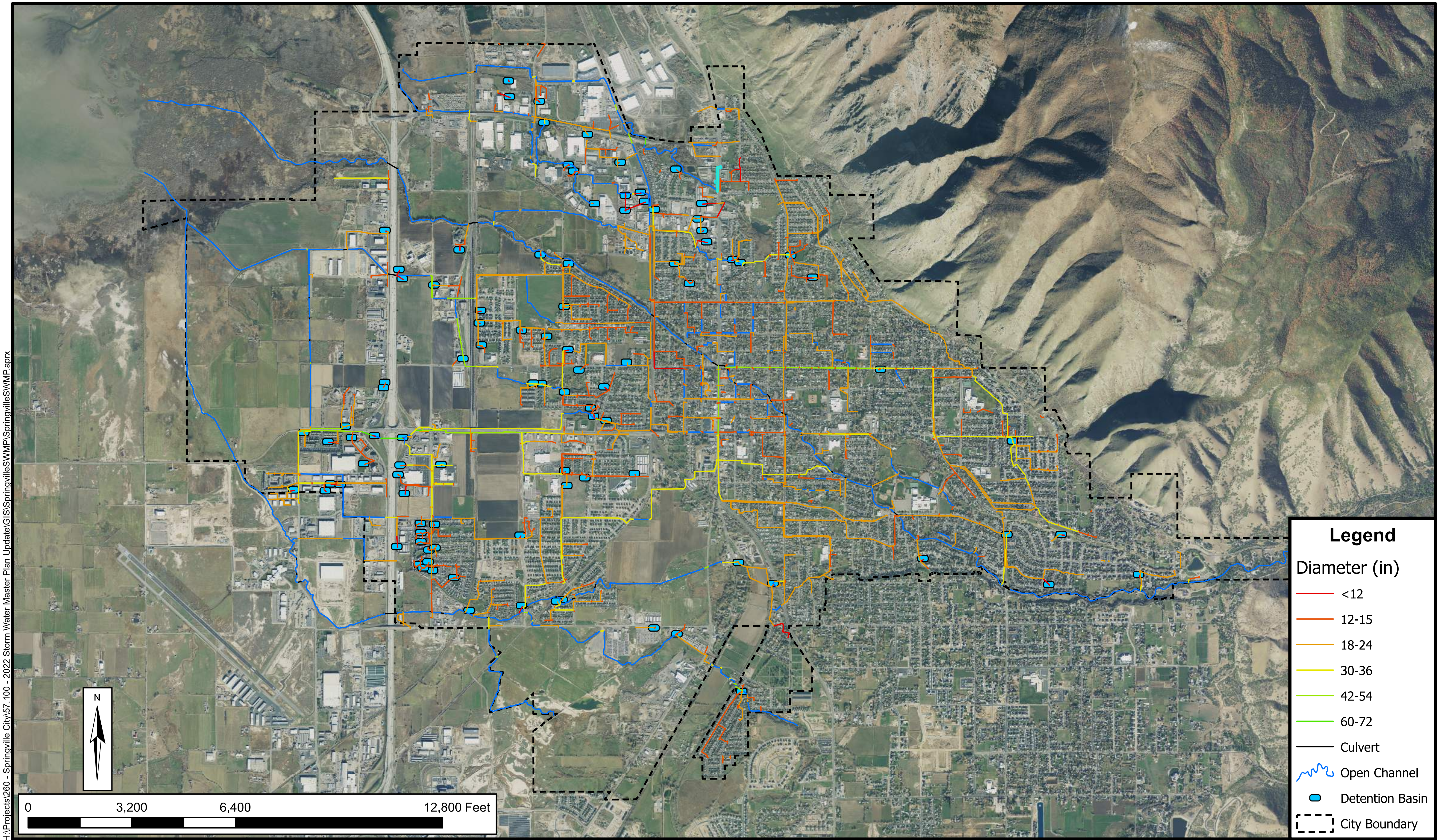
The Storm Drain Master Plan and Capital Facility Plan have been developed to support this analysis. The master plan for the City's storm water system is more comprehensive than the IFFP. It provides the basis for the IFFP as well as identifies all Capital Facilities required of the Storm Drain System for the buildout planning range including maintenance, repair, replacement, as well as growth related project recommendations. The recommendations made within the master plan report are in compliance with current City policies and standard engineering practices.

A hydrologic and hydraulic model of the storm system was prepared to aid in the analyses performed to complete the Storm Drain Master Plan. The model was used to assess existing performance, level of service, and to develop the flows used to size the proposed capital facility projects to maintain the proposed level of service.

SECTION 2
EXISTING STORM DRAIN SYSTEM

2.1 General

The purpose of this section is to provide information regarding the existing storm drain system, identify the current level of service, and determine the remaining capacity of the existing system's facilities. Springville's existing storm drain system is comprised of a pipe network, sumps, retention and detention ponds, streams, canals, and surface drains. While some of the projects in the Capital Facility Plan have shared cost between existing and future users, most of the projects will be completely funded by future growth. **Figure 2-1** illustrates the existing storm water system.



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HANSEN ALLEN & LUCE inc ENGINEERS

CITY OF SPRINGVILLE
STORMWATER MASTER PLAN

MODELED EXISTING STORMWATER SYSTEM

FIGURE 2-1

2.2 Existing Impervious Area

Storm runoff in urban areas is primarily generated by rain falling on impervious area. The unit used for the Storm Water Impact Fee is per equivalent residential unit (ERU). The ERU was determined by calculating the typical impervious area within a residential parcel given the typical area of the residential parcel. Multispectral imagery analysis was used to determine the impervious and pervious areas within the City of Springville for residential parcels. Residential parcels were determined by joining the City of Springville parcel data with the land use map for the City of Springville developed by HAL. Figure 2-2 shows an example of residential parcels along with the result of impervious area produced by the multispectral imagery analysis. Once a distribution of parcel size and parcel impervious area is produced, HAL was able to determine a range of ERU's based on parcel size ranges, median, and average.

Average Percent Impervious and typical impervious area are usually correlated to lot size. In general, as lot size increases the typical impervious area also increases but, the percentage of impervious area per lot decreases.

Figure 2-2 Example of Residential Area Impervious Surface Delineation

The typical amount of impervious square footage for single-family residential developments is shown below in **Table 2-1**.

Table 2-1 Typical Percent Impervious and Impervious Area for Single Family Residential

Lot Size	< 2,000 sf	2,000 sf – 3,999 sf	4,000 sf - 5,999 sf	6,000 sf - 7,999 sf	8,000 sf - 10,889 sf	10,890 sf - 21,779 sf	> 21,780 sf
Average Percent Impervious	85%	67%	51%	47%	45%	39%	32%
Typical Impervious Area (sf)	Lot Size x 85%	1,900	2,650	3,450	4,200	5,450	10,400
Equivalent Residential Unit (ERU)	Lot Size x 85% / 4,200 sf	0.45	0.63	0.82	1	1.30	2.48

For residential developments between the typical impervious area for the lot size groupings provided should be applied rather than requiring an exact measurement. The number of ERUs for non-residential developments should be based on the impervious square footage shown on the development plans. It is the City's policy to receive impact fees at plat recordation for the storm water system.

Data in this report is presented by impact fee unit (impervious area) and by typical single-family residential connection of six different lot size classifications. A typical single-family residential unit is defined in this report as 4,200 impervious square feet. This does not include the amount of impervious area outside of the parcel boundaries. Developments that are non-residential will be assessed based on actual impervious area. The cost of the impact of roadways are assumed to be spread evenly between all future development.

The total number of existing impervious acres based on our analysis of the 2021 NAIP imagery is approximately 3,583 acres or approximately 37,161 ERUs. An estimate of the number of additional ERU's anticipated at full buildout was developed based on areas likely to develop defined in the master plan. The latest available planning data was overlaid on the future development drainage basins to facilitate developing an estimate for future impervious area. Table 2-2 details the assumed percent impervious for each type of planned development. The estimate for future development impervious surface to buildout was 1,678 acres or 17,403 ERUs.

Table 2-2 Summary of Estimated Future Impervious Area by Land Use Type

Land Use	Total Future Drainage Area (acres)	Assumed % Impervious	Future Impervious Area (acres)
Agricultural	66.1	33	21.8
Idle	12.2	33	4.0
Industry/Commercial/Major Roadway	1247.2	85	1060.2
Low Density	572.5	33	188.9
Medium Density	396.1	53	210.0
Medium/High Density	286.7	63	180.6
Open Space	84.1	15	12.6
Totals	2,664.9	N/A	1,678.1

2.3 Level of Service

The level of service for the storm water system is that it should handle the 3-hour 10-year storm (approximately 1.16 inches) for the initial drainage system. In the case of a detention or retention facility the 3-hour 25-year storm (approximately 1.46 inches) must be applied, and consideration should be given to the 100-year storm in locations where flooding of homes may occur. The initial drainage system includes inlets, laterals, minor trunk lines, gutters, and roadside ditches. The design distribution is the modified 3-hour Farmer Fletcher distribution which can be seen in Figure 2-3. Individual developments should use the NOAA's Atlas 14 to establish specific point precipitation estimates for their development. This design standard has been modeled in the CIP and design flows and volumes can be found in Springville's SDMP(HAL, 2023).

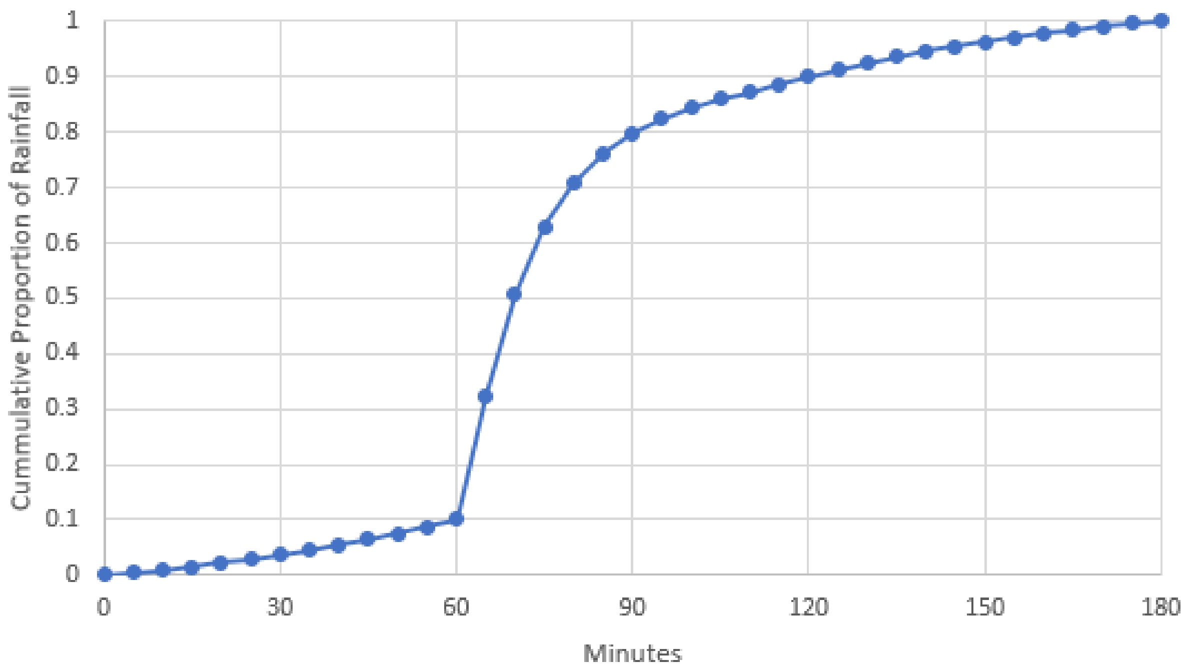

Figure 2-3 Dimensionless Cumulative Modified Farmer Fletcher 3-hour Distribution

2.4 Methodology Used to Determine Existing System Capacity

A stormwater model was developed as part of the City's Stormwater Master Plan where flows and volumes were calculated and assessed for the established level of service for both existing and future facilities. Springville City has several projects that have been constructed that included capacity for future development per previous master planning efforts. A list of these projects is included in Table 2-3. The available capacity for "buy-in" was estimated by reviewing the location of each project and estimating the amount of existing vs future drainage area that would utilize each facility. The cost of each project along with the percentage of excess capacity available for buy-in is provided in Table 2-3.

Table 2-3 Summary of Projects with Excess Capacity Available for Buy-In

Location	Description	Capacity Remaining (%)	Project Costs
1500 W and 375 N	Regional Detention Pond	50	$100,000.00
2600 W and 700 S	Regional Detention Pond	25	$285,438.62
1200 W and 400 S	Regional Detention Pond	10	$815,403.79
1500 W and 375 N	36-inch pipeline from basin to 1200 west	50	$85,016.52
400 S (I-15 to 2600 W)	42 and 48-inch pipeline along 400 South	25	$98,375.00

SECTION 3
IMPACT FEE FACILITY PLAN

3.1 10-Year Growth Projections

The City is expected to continue with significant growth over the next 10 years. Recent planning documents including the City's drinking water and wastewater master plans suggest a typical growth rate of approximately 1.6%. Table 3-1 provides projections for impervious surface increases over the next 10-years assuming the same rate of 1.6% annual growth.

Table 3-1 Projected 10-Year Growth (Impervious Surface)

Year	Total Impervious Surface (ERUs)	Incremental Impervious Surface (ERUs)
2023	37,161	-
2024	37,756	595
2025	38,360	604
2026	38,973	614
2027	39,597	624
2028	40,231	634
2029	40,874	644
2030	41,528	654
2031	42,193	664
2032	42,868	675
2033	43,554	686

3.2 Capital Facilities to Meet System Deficiencies

The City has several capital projects planned to improve existing system operation and provide capacity for future growth. The capital projects presented in the Master Plan will create a system that will meet the proposed level of service and provide capacity for future growth. Table 3-2 through Table 3-4 are copies from the CIP tables in the master plan that estimate impact fee eligibility for each project. Figure 3-1 and Figure 3-2 are copies of the figures from the Master Plan that correlate with Table 3-2 through 3-4 are provided for reference.

HANSEN ALLEN & LUCE INC

CITY OF SPRINGVILLE
STORMWATER MASTER PLAN

EXISTING DEFICIENCIES - 10 YEAR

FIGURE 3-1

HANSEN ALLEN & LUCE INC

CITY OF SPRINGVILLE
STORMWATER MASTER PLAN

CAPITAL IMPROVEMENT PLAN PROJECTS

FIGURE 3-2

Table 3-2 Capital Improvement Plan for Existing Deficiency Projects

Project ID	Deficiency ID	Location	Problem Description	Preferred Solution	Total with Eng & Cont.	Impact Fee
Springville City Master Plan Projects						
A02	A02	Furthest downstream railroad culvert for Spring Creek.	Under sizing of 2nd and 3rd culvert's causing backwater affect and flooding upstream.	Increase size of 2nd and 3rd culverts to 5 ft. H x 8 ft. W matching size of 1st culvert.	$359,000	10%
A03	A03	Irrigation line through corner of 700 East and 1355 South.	Losses due to undersized pipe and inconsistent material.	Upsize pipe and move alignment into public utility right of way along 1355 South. Up size irrigation line along railroad to basin at 1219 S Main St.	$1,498,000	Not eligible
A04	A04	Northwest corner of 800 East and 100 South.	Losses due to undersized and type in irrigation line.	Add a new line on 800 East from Hillcrest Drive to Center Street.	$567,000	Not eligible
A06	A06	Corner of W 500 North and N 2400 West (501 N 2400 West Street).	Losses due to inlet capacity and pipe size.	Upsize outfall and pipe size from inlets.	$42,000	100%
A07	A07	Irrigation line at W 400 North west under railroad tracks.	Losses due to reverse grade.	Dedicated line diverting stormwater to Hobble Creek.	$288,000	Not eligible
A08	A08	962 North Main Street.	Losses due to undersized line from inlet at 1014 North Main Street.	Upsize and tie line into line at 1011North Main Street.	$72,000	Not eligible
A10	A10	751 W 1600 South St.	Losses due to backwater from undersized culvert.	Increase culvert sizes.	$67,000	60%
A11	A11	Inlet under road south of 1024 West 1600 South and culvert under railroad at 1160 West 1600 South.	Losses due to backwater from undersized pipe and culvert from open channel flow to closed conduit.	Increase capacity of inlet and culvert to 48-inch.	$75,000	70%
A12	A12	900 South between 400 East and 800 East.	Losses along 900 South due to undersized irrigation line capturing stormwater.	Add dedicated 24-inch stormwater line for 900 South.	$606,000	5%
A13	A13	655 W 255 South	Losses at localized detention facility.	Increasing orifice size to 10-inch	-	Not eligible
A14	A14	Intersection of 700 South and Main Street.	Losses at 700 South and Main Street with minor losses from 500 South to 700 South on Main Street.	Increase pipe size to 36-inch along Main Street from 400 South to 700 South.	$1,156,000	Not eligible

Project ID	Deficiency ID	Location	Problem Description	Preferred Solution	Total with Eng & Cont.	Impact Fee
Springville City Master Plan Projects						
A16[2]	A16	400 S Canyon Road Southwest across park to Hobble Creek.		Extend 30, 36, and 48-inch pipeline from roundabout in Center St. through High School property to Hobble Creek.	$1,163,000	10%
A18	A18	1100 West crossing over Spring Creek.	Undersized culvert causing losses upstream of crossing.	Increase capacity of culvert under 1100 West by increasing size to 4 f.t H x 5 ft. W.	$171,000	Not eligible
A19	A19	1550 N South along and crossing Main Street		24-inch pipe along 1550 N and South down Main Street. 30-inch pipe crossing Main Street.	$162,000	Not eligible
Springville City Projects Subtotal					**$6,226,000**	**$317,200**
Springville City Master Plan Projects – 2014 Master Plan						
PE14	2014 MP[1]	200 East	No alignment.	Approximately 2150-feet of new pipe at a diameter of 36-inches.	$773,000	Not Eligible
PE15	2014 MP[1]	200 East	No alignment.	Approximately 1500-feet of new pipe at a diameter of 42-inches.	$639,000	Not Eligible
PE27	2014 MP[1] A17	200 North	No alignment.	Approximately 700-feet of new pipe at a diameter of 18-inches.	$174,000	Not Eligible
PE28	2014 MP[1] A17	200 North	No alignment.	Approximately 500-feet of new pipe at a diameter of 30-inches.	$141,000	Not Eligible
PE29	2014 MP[1] A17	200 North	No alignment.	Approximately 4800-feet of new pipe at a diameter of 36-inches.	$1,777,000	Not Eligible
Springville City Master Plan Projects – 2014 Master Plan Subtotal[1]					**$3,504,000**	**$0**

[1]Project description, location, and cost from the 20014 Stormwater Plan Update (Bowen, Collins & Associates, 2014). Costs were updated to 2023 dollars using the ENR Cost Index (ENR, 2023).

[2]Cost for A16 is Springville's associated cost for the project which includes bids for construction on the first portion of the project (4/1/24) at $430,000. The remaining portion is itemized in Table C-2 of appendix C.

Table 3-3 Capital Improvement Plan for Future Projects (Pipes)

Project ID	Length (ft.)	Diameter (in)	Estimated Capacity (cfs)	Total with Eng & Cont.	Impact Fee
Springville City Master Plan Projects					
C01	2,321	36	55	$1,178,000	100%
C02	1,562	30	27	$606,000	100%
C03	4,713	36	95	$2,391,000	100%
C04	2,085	48	154	$1,514,000	100%
C05	2,527	48	137	$1,835,000	100%
C06	1,535	24	42	$453,000	100%
C07	2,469	36	59	$1,253,000	100%
C08	2,433	24	31	$719,000	100%
C09	2,649	54	113	$2,080,000	100%
C10	1,601	42	66	$972,000	100%
C11	1,788	30	25	$693,000	100%
C12	992	42	45	$602,000	100%
C13	1,365	30	17	$529,000	100%
C14	1,250	24	14	$369,000	100%
C15	1,252	42	70	$760,000	100%
C16	1,614	36	30	$819,000	100%
C17	3,325	48	69	$2,414,000	100%
C18	1,000	30	34	$388,000	100%
C19	3,241	42	54	$1,968,000	100%
C21	1,938	30	26	$900,000	100%
C22	2,517	24	12	$743,000	100%
C23	3,457	36	37	$2,234,000	100%
C25	1,692	48	52	$1,228,000	100%
C26	2,129	36	25	$1,080,000	100%
C27	1,667	60	101	$1,557,000	100%
C28	1,128	42	73	$685,000	100%

Project ID	Length (ft.)	Diameter (in)	Estimated Capacity (cfs)	Total with Eng & Cont.	Impact Fee
Springville City Master Plan Projects					
C29	1,489	30	39	$578,000	100%
C30	1,277	24	10	$377,000	100%
C31	341	30	13	$133,000	100%
C32	996	36	40	$506,000	100%
C33	1,200	36	42	$776,000	100%
C34	1,283	42	56	$958,000	100%
C35	828	42	76	$618,000	100%
C36	797	48	72	$579,000	100%
C37	653	30	42	$254,000	100%
C38	1,793	36	35	$1,159,000	100%
C39	1,017	15	5	$195,000	100%
C40	663	24	10	$246,000	100%
Springville City Projects Subtotal				**$36,349,000**	**$36,349,000**

Table 3-4 Capital Improvement Plan for Future Projects (Regional Detention)

Project ID	Contributing Area (Acres)	Contributing Area ID	Volume (AF)	Allowable Discharge (cfs)	Total with Eng & Cont.	Impact Fee
Springville City Master Plan Projects						
RD01	190	DA-RD01	1.5	29	$366,000	100%
RD02	100	DA-RD02	1.5	15	$366,000	100%
RD03	105	DA-RD03	2.1	16	$499,000	100%
RD04	213	DA-RD04	2.3	32	$533,000	100%
RD05	150	DA-RD05	3.0	23	$699,000	100%
RD06	167	DA-RD06	7.5	25	$1,698,000	100%
RD07	139	DA-RD07	3.3	21	$766,000	100%
RD08[1]	88	DA-RD08	1.5	13	$366,000	100%
RD10	150	DA-RD10	3.0	23	$699,000	100%
RD12	189	DA-RD12	3.8	28	$866,000	100%
RD13	219	DA-RD13	3.8	33	$866,000	100%
RD14	87	DA-RD14	1.1	7	$266,000	100%
RD15	442	DA-RD15	9.0	66	$2,031,000	100%
RD16	124	DA-RD16	0.2	19	$66,000	100%
RD17	118	DA-RD17	3.0	18	$699,000	100%
RD18	20	DA-RD18	0.4	3	$120,000	100%
Springville City Projects Subtotal					**$10,906,000**	**$10,906,000**

1Detention pond sized based on limited downstream conveyance capacity under the railroad.

Table 3-5 summarizes the projects that are anticipated to be triggered by growth over the next 10-years. These projects will provide excess capacity for growth beyond the 10-year window.

Table 3-5. Summary of Impact Fee Eligible Projects Anticipated Over Next 10-Years

Project ID	Total with Eng & Cont.	Impact Fee	Impact Fee Eligible Costs
A02	$359,000	10%	$35,900
A06	$42,000	100%	$42,000
A10	$67,000	60%	$40,200
A11	$75,000	70%	$52,500
A12	$606,000	5%	$30,300
A16	$1,163,000	10%	$116,300
C01	$1,178,000	100%	$1,178,000
C02	$606,000	100%	$606,000
C04	$1,514,000	100%	$1,514,000
C05	$1,835,000	100%	$1,835,000
C06	$453,000	100%	$453,000
C07	$1,253,000	100%	$1,253,000
C08	$719,000	100%	$719,000
C09	$2,080,000	100%	$2,080,000
C10	$972,000	100%	$972,000
C11	$693,000	100%	$693,000
C12	$602,000	100%	$602,000
C13	$529,000	100%	$529,000
C14	$369,000	100%	$369,000
C17	$2,414,000	100%	$2,414,000
C18	$388,000	100%	$388,000
C19	$1,968,000	100%	$1,968,000
C21	$900,000	100%	$900,000
C22	$743,000	100%	$743,000
C23	$2,234,000	100%	$2,234,000
C25	$1,228,000	100%	$1,228,000
C28	$685,000	100%	$685,000
C30	$377,000	100%	$377,000
C31	$133,000	100%	$133,000
C32	$506,000	100%	$506,000
C33	$776,000	100%	$776,000
C34	$958,000	100%	$958,000
C35	$618,000	100%	$618,000
C36	$579,000	100%	$579,000
C37	$254,000	100%	$254,000
C38	$1,159,000	100%	$1,159,000
C39	$195,000	100%	$195,000
C40	$246,000	100%	$246,000
RD01	$366,000	100%	$366,000
RD02	$366,000	100%	$366,000
RD03	$499,000	100%	$499,000

Project ID	Total with Eng & Cont.	Impact Fee	Impact Fee Eligible Costs
RD05	$699,000	100%	$699,000
RD06	$1,698,000	100%	$1,698,000
RD08	$366,000	100%	$366,000
RD10	$699,000	100%	$699,000
RD12	$866,000	100%	$866,000
RD14	$266,000	100%	$266,000
RD15	$2,031,000	100%	$2,031,000
RD17	$699,000	100%	$699,000
RD18	$120,000	100%	$120,000
Total Impact Fee Eligible Costs			$38,156,200

Total project costs that are impact fee eligible over the next 10-years are $38,156,200. These projects are estimated to provide capacity for approximately 13,056 ERUs of future development.

As noted in Table 2-3 there are several projects that have excess capacity for buy-in. The total impact fee eligible costs for completed projects that have existing buy-in capacity is $271,000 as shown in Table 3-6. The remaining capacity of these facilities is approximately 97 ERUs.

Table 3-6. Summary of Impact Fee Eligible Costs for Buy-In

Location	Capacity Remaining (%)	Project Cost	Impact Fee Eligible Costs
1500 W and 375 N	50	$100,000.00	$50,000
2600 W and 700 S	25	$285,438.62	$71,360
1200 W and 400 S	10	$815,403.79	$81,540
1500 W and 375 N	50	$85,016.52	$42,507
400 S (I-15 to 2600 W)	25	$98,375.00	$25,593
		Total	$271,000

The costs for the 2023 Master Plan Study and preparing the IFFP and the IFA were $109,000. Including the projected cost for additional master planning ($141,000) within the 10-year window we estimate planning costs that are impact fee eligible to be $250,000 total.

The total impact fee eligible costs would therefore be $38,156,200 + $271,000 + $250,000 = $38,677,200. The capacity of the stormwater system will increase by approximately 13,056 ERUs because of the proposed projects.

3.2 Revenue Options

Revenue options for the recommended projects include: general obligation bonds, revenue bonds, State/Federal grants and loans, user fees, and impact fees. Although this analysis focuses on impact fees, the City may need to consider a combination of these funding options. The following discussion describes each of these options.

General Obligation Bonds through Property Taxes

This form of debt enables the City to issue general obligation bonds for capital improvements and replacement. General Obligation (G.O.) Bonds would be used for items not typically financed through the Water Revenue Bonds. G.O. bonds are debt instruments backed by the full faith and credit of the City which would be secured by an unconditional pledge of the City to levy assessments, charges or ad valorem taxes necessary to retire the bonds. G.O. bonds are the lowest-cost form of debt financing available to local governments and can be combined with other revenue sources such as specific fees, or special assessment charges to form a dual security through the City's revenue generating authority. These bonds are supported by the City as a whole, so the amount of debt issued for the water system is limited to a fixed percentage of the real market value of taxable property within the City. For growth-related projects this type of revenue places an unfair burden on existing residents as they had previously paid for their level of service.

Revenue Bonds

This form of debt financing is also available to the City for utility-related capital improvements. Unlike G.O. bonds, revenue bonds are not backed by the City as a whole, but constitute a lien against the water service charge revenues of a Water Utility. Revenue bonds present a greater risk to the investor than do G.O. bonds, since repayment of debt depends on an adequate revenue stream, legally defensible rate structure /and sound fiscal management by the issuing jurisdiction. Due to this increased risk, revenue bonds generally require a higher interest rate than G.O. bonds, although currently interest rates are at historic lows. This type of debt also has very specific coverage requirements in the form of a reserve fund specifying an amount, usually expressed in terms of average or maximum debt service due in any future year. This debt service is required to be held as a cash reserve for annual debt service payment to the benefit of bondholders. Typically, voter approval is not required when issuing revenue bonds. For growth-related projects this type of revenue places an unfair burden on existing residents as they had previously paid for their level of service.

State/Federal Grants and Loans

Historically, both local and county governments have experienced significant infrastructure funding support from state and federal government agencies in the form of block grants, direct grants in aid, interagency loans, and general revenue sharing. Federal expenditure pressures and virtual elimination of federal revenue sharing dollars are clear indicators that local government may be left to its own devices regarding infrastructure finance in general. However, state/federal grants and loans should be further investigated as a possible funding source for needed water system improvements.

It is also important to assess likely trends regarding federal / state assistance in infrastructure financing. Future trends indicate that grants will be replaced by loans through a public works revolving fund. Local governments can expect to access these revolving funds or public works trust funds by demonstrating both the need for and the ability to repay the borrowed monies, with interest. As with the revenue bonds discussed earlier, the ability of infrastructure programs to wisely manage their own finances will be a key element in evaluating whether many secondary funding sources, such as federal/state loans, will be available to the City.

User Fees

Similar to property taxes on existing residents, User Fees to pay for improvements related to new growth related projects places an unfair burden on existing residents as they had previously paid for their level of service.

Impact Fees

An impact fee is a one-time charge to a new development for the purpose of raising funds for the construction of improvements required by the new growth and to maintain the current level of service. Impact fees in Utah are regulated by the Impact Fee Statute and substantial case law. Impact fees are a form of a development exaction that requires a fee to offset the burdens created by the development on existing municipal services. Funding the future improvements required by growth through impact fees does not place the burden on existing residents to provide funding of these new improvements.

Appendix A

Cost Estimates

Table A-1
Cost Assumptions for Regional Detention Ponds

ID	Volume	Area	Cost of Excavation				Cost of Land			Cost of outlet structure		Cost of vegetation		Project Cost ($)	With Eng & Cont.
	AF	ac	per cy	per AF	AF	Cost ($)	per acre	ac	Cost ($)	Lump Sum		per sf	Cost ($)		1.3
RD01	1.5	0.6	10	16,133	1.5	24,200	400,000	0.6	220,000	1	$25,000	0.5	11,979	281,179	365,533
RD02	1.5	0.6	10	16,133	1.5	24,200	400,000	0.6	220,000	1	$25,000	0.5	11,979	281,179	365,533
RD03	2.1	0.8	10	16,133	2.1	33,880	400,000	0.8	308,000	1	$ 25,000	0.5	16,771	383,651	499,000
RD04	2.3	0.8	10	16,133	2.3	36,300	400,000	0.8	330,000	1	$ 25,000	0.5	17,969	409,269	532,049
RD05	3.0	1.1	10	16,133	3.0	48,400	400,000	1.1	440,000	1	$ 25,000	0.5	23,958	537,358	698,565
RD06	7.5	2.8	10	16,133	7.5	121,000	400,000	2.8	1,100,000	1	$25,000	0.5	59,895	1,305,895	1,697,664
RD07	3.3	1.2	10	16,133	3.3	53,240	400,000	1.2	484,000	1	$25,000	0.5	26,354	588,594	765,172
RD08	1.5	0.6	10	16,133	1.5	24,200	400,000	0.6	220,000	1	$25,000	0.5	11,979	281,179	365,533
RD10	3.0	1.1	10	16,133	3.0	48,400	400,000	1.1	440,000	1	$25,000	0.5	23,958	537,358	698,565
RD12	3.8	1.4	10	16,133	3.8	60,500	400,000	1.4	550,000	1	$25,000	0.5	29,948	665,448	865,082
RD13	3.8	1.4	10	16,133	3.8	60,500	400,000	1.4	550,000	1	$25,000	0.5	29,948	665,448	865,082
RD14	1.1	0.4	10	16,133	1.1	16,940	400,000	0.4	154,000	1	$25,000	0.5	8,385	204,325	265,623
RD15	9.0	3.3	10	16,133	9.0	145,200	400,000	3.3	1,320,000	1	$25,000	0.5	71,874	1,562,074	2,030,696
RD16	0.2	0.1	10	16,133	0.2	2,420	400,000	0.1	22,000	1	$25,000	0.5	1,198	50,618	65,803
RD17	3.0	1.1	10	16,133	3.0	48,400	400,000	1.1	440,000	1	$25,000	0.5	23,958	537,358	698,565
RD18	0.4	0.1	10	16,133	0.4	6,292	400,000	0.1	57,200	1	$25,000	0.5	3,115	91,607	119,089

Note: Cost tables in the body of the report have been rounded up to nearest thousand

Table A-2
Cost Assumptions for Existing and Future Pipe Alignments

ID	Diameter (in)	Length (ft.)	Cost/LF	Cost	Total Cost	Total with Eng & Cont.
A02	5x8	174	$1585	$275,960	$275,960	$358,748
A03	24	228	$285	$64,980	$1,151,835	$1,497,386
	30	3044	$357	$1,086,855		
	-	-	-	-		
A04	24	697	$285	$198,571	$435,619	$566,305
	30	664	$357	$237,048		
A06	18	95	$242	$22,990	$31,825	$41,373
	24	31	$285	$8,835		
A07	24	776	$285	$221,043	$221,043	$287,356
A08	15	246	$225	$55,350	$55,350	$71,955
A10	42	89	$574	$51,086	$51,086	$66,412
A11	48	86	$667	$57,362	$57,362	$74,571
A12	24	1553	$285	$442,548	$465,753	$605,479
	30	65	$357	$23,205		
A13	-	-	-	-	-	-
A14	36	1789	$497	$889,133	$889,133	$1,155,873
A16	36[1]	1600	$390/2	$312,095	$993,338	$1,162,340
	48[1]	900	$558/2	$251,243		
	City’s Portion of 30-inch segment (Bid Price)			$430,000		
A18	4x5	103	$1273	$131,119	$131,119	$170,454
A19	24	320	$285	$91,200	$124,044	$161,257
	30	92	$357	$32,844		
C01[1]	36	2321	390	-	$905,387	$1,177,004
C02[1]	30	1562	298	-	$465,582	$605,257
C03[1]	36	4713	390	-	$1,838,630	$2,390,219
C04[1]	48	2085	558	-	$1,164,068	$1,513,288
C05[1]	48	2527	558	-	$1,410,984	$1,834,280
C06[1]	24	1535	227	-	$348,440	$452,972
C07[1]	36	2469	298	-	$963,349	$1,252,354
C09[1]	24	2433	227	-	$552,367	$718,078
C08[1]	54	2649	558		$1,599,496	$2,079,345
C10[1]	42	1601	467	-	$747,383	$971,598
C11[1]	30	1788	298	-	$532,987	$692,884
C12[1]	42	992	467	-	$463,005	$602,000
C13[1]	30	1365	298	-	$406,770	$528,801
C14[1]	24	1250	227	-	$283,750	$368,875
C15[1]	42	1252	390	-	$584,450	$759,786
C16[1]	36	1614	298	-	$629,591	$818,469

ID	Diameter (in)	Length (ft.)	Cost/LF	Cost	Total Cost	Total with Eng & Cont.
C17[1]	48	3325	467	-	$1,856,607	$2,413,590
C18[1]	30	1000	298	-	$298,095	$387,524
C19[1]	42	3241	390	-	$1,513,385	$1,967,401
C21	30	1938	357	-	$691,866	$899,426
C22[1]	24	2517	227	-	$571,350	$742,756
C23	36	3457	497	-	$1,718,129	$2,233,568
C25[1]	48	1692	467	-	$944,479	$1,227,823
C26[1]	36	2129	390	-	$830,695	$1,079,905
C27[1]	60	1667	604	-	$1,197,084	$1,556,210
C28[1]	42	1128	390	-	$526,715	$684,730
C29[1]	30	1489	298	-	$443,858	$577,016
C30	24	1277	227	-	$289,875	$376,837
C31[1]	30	342	298	-	$101,649	$132,144
C32[1]	36	996	390	-	$388,558	$505,126
C33	36	1200	497	-	$596,400	$775,320
C34	42	1283	574	-	$736,442	$957,375
C35	42	828	574	-	$475,272	$617,854
C36[1]	48	797	558	-	$444,979	$578,474
C37[1]	30	653	298	-	$194,654	$253,050
C38	36	1793	497	-	$891,121	$1,158,458
C39[1]	36	1017	147	-	$149,499	$194,349
C40	24	663	285	-	$188,955	$245,642

[1]Out of street costs.

Table C-2 main assumptions include an average distance of 200 feet per manhole, one set of inlets every 100 feet of pipe, and three feet of cover. Unless stated, all costs are in street costs.

Note: Cost tables in the body of the report have been rounded up to nearest thousand.

SPRINGVILLE CITY

DRAFT Storm Water Impact Fee Analysis

Prepared by:
Zions Public Finance, Inc.
November 2024

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Executive Summary

Background Information

Zions Public Finance, Inc. (ZPFI) has prepared this Impact Fee Analysis (IFA) for the calculation of appropriate storm water impact fees in Springville (the "City"). This IFA relies on Springville's Storm Water Impact Fee Facilities Plan ("IFFP") prepared by Hansen Allen Luce (HAL) in October 2024 regarding current system capacity and future storm water capital facility needs, cost, and timing.

An impact fee is a one-time fee imposed on new development activity to mitigate the impact of new development on capital facilities. The recommended impact fee structure presented in this analysis has been prepared to satisfy the Impact Fees Act, Utah Code Ann. § 11-36a-101 et. seq., and represents the maximum impact fees that the City may assess. The City will be required to use revenue sources other than impact fees to fund any projects that constitute repair and replacement, cure any existing deficiencies, or increase the level of service for existing users.

Service Area. There is one service area in the City for the purpose of calculating storm water impact fees. This service area matches the City boundaries.

Level of Service. Based on information provided in the IFFP, the level of service for the storm water system is as follows:

- 10-year storm for the initial drainage system
- 25-year for regional detention/retention basins
- 100-year storm must receive consideration in locations where flooding of homes may occur[1]

Growth Projections. The City is anticipated to grow from 37,161 impervious surface ERUs in 2023 to 43,554 impervious surface ERUs in 2033 – an increase of 6,393 ERUs. This will place increased demand on the City's storm water system.[2]

Need for Improvements. The IFFP identifies existing excess capacity in the amount of $271,000 and also identifies the need for construction of new projects totaling over $47 million. New development will be responsible for $38,156,200 of the new construction costs. The existing excess capacity can serve 97 ERUs while the new construction projects will serve 13,056 ERUs.[3]

Credits for Projects that Benefit Existing Development. The IFFP identifies a portion of the new construction costs ($9,730,000) that will benefit existing development. Therefore, a credit must be made so that new development does not pay twice – once in the form of impact fees and then again through higher taxes over time to pay for the portion of the system improvements that benefit existing development.

Credits for Outstanding Bonds. The City does not currently have any outstanding bonds used to pay for storm water improvements.

[1] Springville Storm Water IFFP, p. iv
[2] Springville Storm Water IFFP, p. 2-6
[3] Springville Storm Water IFFP, p. 3-9

Impact on Consumption of Existing Capacity

Utah Code 11-36a-304(1)(a)

The IFFP identifies five projects with excess capacity, acquired at an actual cost of $1,384,234, of which $271,000 is impact-fee eligible and available to serve new development.[4]

Impact on System Improvements by Anticipated New Development

Utah Code 11-36a-304(1)(b)

The City has determined to maintain its current level of storm water service and therefore new improvements to the system are needed as there is not sufficient excess capacity to maintain current service levels given the projected growth. The new system improvements (conveyance and detention) needed years have been identified at a total cost of $47,886,200 of which $38,156,200 can be attributed to new development. Existing development will benefit from $9,730,000 of the costs and credits will therefore need to be made so that new development does not pay twice.

Proportionate Share Analysis and Impact Fee Calculation

Utah Code 11-36a-304(1)(d) and (e) and (2)(a) and (b)

New development will be required to pay for its fair share of existing excess capacity as well as the construction of new system improvements necessitated by new development and consultant costs.

TABLE 1: SUMMARY OF IMPACT FEE BEFORE CREDITS

Summary	Amount
Capacity Cost per ERU	$2,921.55
Consultant Costs	$17.05
Gross Fee before Credits	**$2,938.60**

The maximum allowable impact fee changes each year in the table below in the shaded, far right column, to account for the credits due from the construction costs that benefit existing development. The impact fee fund balance of $1,450,814.86[5] was applied to reduce the cost of new construction that benefits existing development ($9,730,000).

TABLE 2: SUMMARY OF MAXIMUM IMPACT FEE, 2024-2033

Year	Payment	ERUs	Payment per ERU	NPV*	Max Fee per ERU
2024	$827,919	37,756	$21.93	$158.67	$2,779.94
2025	$827,919	38,360	$21.58	$144.67	$2,793.93
2026	$827,919	38,973	$21.24	$130.32	$2,808.28
2027	$827,919	39,957	$20.72	$115.59	$2,823.01
2028	$827,919	40,231	$20.58	$100.65	$2,837.95
2029	$827,919	40,874	$20.26	$85.11	$2,853.50
2030	$827,919	41,528	$19.94	$69.11	$2,869.50

[4] Springville Storm Water IFFP, p. 3-9
[5] Source: Springville City as of June 2024

Year	Payment	ERUs	Payment per ERU	NPV*	Max Fee per ERU
2031	$827,919	42,193	$19.62	$52.63	$2,885.98
2032	$827,919	42,868	$19.31	$35.64	$2,902.97
2033	$827,919	43,554	$19.01	$18.10	$2,920.50
*NPV = net present value discounted at 5 percent					

Based on the IFFP, one ERU is equivalent to 4,200 square feet of impervious surface.[6] Therefore, fees can be charged on the ratios of impervious surface for various residential lot sizes as shown in the IFFP.[7] The IFFP states that, "for residential developments between the typical impervious area for the lot size groupings provided, [these groupings] should be applied rather than requiring an exact measurement. The number of ERUs for non-residential developments should be based on the impervious square footage shown on the development plans. It is the City's policy to receive impact fees at plat recordation for the storm water system."[8] Ratios and fees by year are shown in detail in Tables 12 and 13 of this IFA.

Overview of the Storm Water Impact Fees

Summary

An impact fee is intended to recover the City's costs of building storm water system capacity to serve new residential and non-residential development rather than passing all these growth-related costs on to existing users through rates. The Utah Impact Fees Act allows only certain costs to be included in an impact fee so that only the fair cost of expansionary projects or existing unused capacity paid for by the City is assessed through an impact fee.

Costs to be Included in the Impact Fee

The impact fees proposed in this analysis are calculated based upon:

- Excess capacity in the City's storm water system;
- New capital infrastructure for storm water systems that will serve new development; and
- Professional and planning expenses related to the construction of system improvements that will serve new development.

The costs that cannot be included in the impact fee are as follows:

- Costs for projects that cure system deficiencies;
- Costs for projects that increase the Level of Service (LOS) above that which is currently provided;
- Operations and maintenance costs;
- Costs of facilities funded by grants or other funds that the City does not have to repay; and
- Costs of reconstruction of facilities that do not have capacity to serve new growth.

Utah Code Legal Requirements

Utah law requires that communities prepare an Impact Fee Analysis (IFA) before enacting an impact fee. Utah law also requires that communities give notice of their intent to prepare and adopt an IFA. This IFA

[6] Springville Storm Water IFFP, p. 2-3
[7] Springville Storm Water IFFP, p. 2-3
[8] Springville Storm Water IFFP, p. 2-3

follows all legal requirements as outlined below. The City has retained ZPFI to prepare this IFA in accordance with legal requirements.

Notice of Intent to Prepare Impact Fee Analysis
A local political subdivision must provide written notice of its intent to prepare an IFA before preparing the Plan (Utah Code §11-36a-503). This notice must be posted on the Utah Public Notice website.

Preparation of Impact Fee Analysis
Utah Code requires that each local political subdivision, before imposing an impact fee, prepare an impact fee analysis. (Utah Code 11-36a-304).
Section 11-36a-304 of the Utah Code outlines the requirements of an impact fee analysis as follows:

(1) An impact fee analysis shall:
- (a) identify the anticipated impact on or consumption of any existing capacity of a public facility by the anticipated development activity;
- (b) identify the anticipated impact on system improvements required by the anticipated development activity to maintain the established level of service for each public facility;
- (c) demonstrate how the anticipated impacts described in Subsections (1)(a) and (b) are reasonably related to the anticipated development activity;
- (d) estimate the proportionate share of:
  - (i) the costs for existing capacity that will be recouped; and
  - (ii) the costs of impacts on system improvements that are reasonably related to the new development activity; and
- (e) identify how the impact fee was calculated.

(2) In analyzing whether or not the proportionate share of the costs of public facilities are reasonably related to the new development activity, the local political subdivision or private entity, as the case may be, shall identify, if applicable:
- (a) the cost of each existing public facility that has excess capacity to serve the anticipated development resulting from the new development activity;
- (b) the cost of system improvements for each public facility;
- (c) other than impact fees, the manner of financing for each public facility, such as user charges, special assessments, bonded indebtedness, general taxes, or federal grants;
- (d) the relative extent to which development activity will contribute to financing the excess capacity of and system improvements for each existing public facility, by such means as user charges, special assessments, or payment from the proceeds of general taxes;
- (e) the relative extent to which development activity will contribute to the cost of existing public facilities and system improvements in the future;
- (f) the extent to which the development activity is entitled to a credit against impact fees because the development activity will dedicate system improvements or public facilities that will offset the demand for system improvements, inside or outside the proposed development;
- (g) extraordinary costs, if any, in servicing the newly-developed properties; and
- (h) the time-price differential inherent in fair comparisons of amounts paid at different times.

Calculating Impact Fees
Utah Code states that for purposes of calculating an impact fee, a local political subdivision or private entity may include:
- (a) the construction contract price;
- (b) the cost of acquiring land, improvements, materials, and fixtures;

(c) the cost for planning, surveying, and engineering fees for services provided for and directly related to the construction of the system improvements; and

(d) for political subdivision, debt service charges, if the political subdivision might use impact fees as a revenue stream to pay the principal and interest on bonds, notes or other obligations issued to finance the costs of the system improvements.

Certification of Impact Fee Analysis

Utah Code states that an Impact Fee Analysis shall include a written certification from the person or entity that prepares the Impact Fee Analysis. This certification is included at the conclusion of this analysis.

Impact Fee Enactment

Utah Code states that a local political subdivision or private entity wishing to impose impact fees shall pass an impact fee enactment in accordance with Section 11-36a-402. Additionally, an impact fee imposed by an impact fee enactment may not exceed the highest fee justified by the impact fee analysts. An impact fee enactment may not take effect until 90 days after the day on which the impact fee enactment is approved.

Impact from Growth Upon the City's Facilities and Level of Service

Utah Code 11-36a-304(1)(a)(c)

Storm Water Service Area

The City has one service area for the purpose of calculating storm water impact fees. This service area matches the boundaries of Springville City.

Growth in Demand

The City projects that it will grow by approximately 6,393 impervious surface ERUs during the 10-year impact fee planning horizon in this IFA.

TABLE 3: STORM WATER GROWTH PROJECTIONS

Year	Impervious Surface ERUs
2023	37,161
2024	37,756
2025	38,360
2026	38,973
2027	39,957
2028	40,231
2029	40,874
2030	41,528
2031	42,193
2032	42,868
2033	43,554

Source: Springville Storm Water IFFP, p. 3-1

Existing and Proposed Level of Service Analysis

According to the City's IFFP, the existing service level for storm water collection in Springville is as follows:

- 10-year storm for the initial drainage system
- 25-year for regional detention/retention basins
- 100-year storm must receive consideration in locations where flooding of homes may occur.[9]

Impact on Capacity from Development Activity

Utah Code 11-36a-304(1)(a)

Existing Capacity

According to the IFFP, there is currently excess capacity in the storm water system. Therefore, new development will be charged a buy-in fee as a part of the proposed storm water impact fee. The IFFP estimates that the remaining capacity is sufficient to serve 97 ERUs.[10]

TABLE 4: SUMMARY OF EXISTING EXCESS CAPACITY

Description	Capacity Remaining (%)	Project Costs	Impact-Fee Eligible Costs
Regional Detention Pond	50%	$100,000.00	$50,000.00
Regional Detention Pond	25%	$285,438.62	$71,360.00
Regional Detention Pond	10%	$815,403.79	$81,540.00
36-inch pipeline from basin to 1200 West	50%	$85,016.52	$42,507.00
42 and 48-inch pipeline along 400 South	25%	$98,375.00	$25,593.00
TOTAL		**$1,384,234**	**$271,000**
Source: Springville Storm Water IFFP, p. 2-5; ZPFI			

System Improvements Required from Development Activity

Utah Code 11-36a-304(1)(b)(c), (2)(b)

Impact on System Improvements by Anticipated New Development

The City has determined to maintain its current level of storm water service. Therefore, additional storm water improvements will be required to maintain the established storm water level of service. The means by which the City will meet growth demands include constructing the following projects as set forth in the IFFP. This will occur through requiring new development to pay for its fair share of new construction projects over the next 10 years.

New construction projects are estimated to cost $47,886,200 with $38,156,200 allocated to new growth and the capacity to serve an additional 13,056 ERUs. The remaining $9,730,000 is necessary for existing development.

[9] Springville Storm Water IFFP, p. iv
[10] Springville Storm Water IFFP, p. 3-9

TABLE 5: NEW SYSTEM IMPROVEMENTS SUMMARY

	Existing Deficiency Costs	Impact Fee Eligible Costs	Project Fee Costs
Conveyance	$9,730,000	$29,481,200	$39,211,200
Detention		$8,675,000	$8,675,000
TOTAL	**$9,730,000**	**$38,156,200**	**$47,886,200**
Source: IFFP, p. iv			

A more detailed breakdown of the capital facilities required is shown in Table 6.

TABLE 6: NEW SYSTEM IMPROVEMENTS BY PROJECT

Project ID	Total with Eng & Cont.	Impact Fee Eligible
A02	$359,000	$35,900
A06	$42,000	$42,000
A10	$67,000	$40,200
A11	$75,000	$52,500
A12	$606,000	$30,300
A16	$1,163,000	$116,300
C01	$1,178,000	$1,178,000
C02	$606,000	$606,000
C04	$1,514,000	$1,514,000
C05	$1,835,000	$1,835,000
C06	$453,000	$453,000
C07	$1,253,000	$1,253,000
C08	$719,000	$719,000
C09	$2,080,000	$2,080,000
C10	$972,000	$972,000
C11	$693,000	$693,000
C12	$602,000	$602,000
C13	$529,000	$529,000
C14	$369,000	$369,000
C17	$2,414,000	$2,414,000
C18	$388,000	$388,000
C19	$1,968,000	$1,968,000
C21	$900,000	$900,000
C22	$743,000	$743,000
C23	$2,234,000	$2,234,000
C25	$1,228,000	$1,228,000
C28	$685,000	$685,000
C30	$377,000	$377,000

Project ID	Total with Eng & Cont.	Impact Fee Eligible
C31	$133,000	$133,000
C32	$506,000	$506,000
C33	$776,000	$776,000
C34	$958,000	$958,000
C35	$618,000	$618,000
C36	$579,000	$579,000
C37	$254,000	$254,000
C38	$1,159,000	$1,159,000
C39	$195,000	$195,000
C40	$246,000	$246,000
RD01	$366,000	$366,000
RD02	$366,000	$366,000
RD03	$499,000	$499,000
RD05	$699,000	$699,000
RD06	$1,698,000	$1,698,000
RD08	$366,000	$366,000
RD10	$699,000	$699,000
RD12	$866,000	$866,000
RD14	$266,000	$266,000
RD15	$2,031,000	$2,031,000
RD17	$699,000	$699,000
RD18	$120,000	$120,000
TOTAL	**$40,150,000**	**$38,156,200**

*Additional projects which are solely attributable to curing deficiencies for existing development are not listed in this table. However, the total amount of $9,730,000 of existing deficiencies is included in the calculation of credits.

Relation of Anticipated Development Activity to Impacts on System Improvements

The demand placed on existing storm water improvements by new development activity is attributed to the increased developed (impervious) acres and ERUs related to both residential and nonresidential growth.

Proportionate Share Analysis

Utah Code 11-36a-304(1)(d)(e)

Maximum Legal Storm Water Impact Fee per Acre

The Impact Fees Act requires the Impact Fee Analysis to estimate the proportionate share of the existing excess capacity and future costs for system improvements that benefit new growth that can be recouped through impact fees.

Existing Capacity and New Construction Costs

The existing storm water system has existing, excess capacity; therefore, a buy-in component is factored into the impact fee calculation which is based on the actual cost of the improvements at the time acquired. In addition, new construction projects are needed.

TABLE 7: PROPORTIONATE SHARE ANALYSIS, CAPACITY COSTS

Existing Capacity and New Construction	
Existing Excess Capacity Cost	$271,000
Excess Capacity ERUs	97
New Construction Cost	$38,156,200
New Construction Capacity	13,056
Total Cost	$38,427,200
Total Capacity	13,153
Cost per ERU	**$2,921.55**

Consultant Costs

The Impact Fees Act allows for fees charged to include the reimbursement of consultant costs incurred in the preparation of the IFA.

Consultant costs are estimated at $109,000 to prepare the IFFP and IFA that was necessary to calculate defensible impact fees.[11] The consultant studies are considered to serve development over the next 10 years. Based on the ERUs served over the next 10 years, the total consultant cost per ERU is calculated at $17.05.

TABLE 8: PROPORTIONATE SHARE ANALYSIS, CONSULTANT COSTS

Category	Amount
Total Consultant Costs	$109,000
Growth in ERUs, 2023-2033	6,393
Cost per ERU	**$17.05**

Impact Fee Fund Balance

The City has $1,450,814.86 of funds in its storm water impact fee account.[12] This credit will be used to reduce the cost of the facilities for existing development for which impact fees were collected.

Credits for Projects Benefitting Existing Development

Credits need to be made for the portion of new projects that benefit existing development. The IFFP identifies portions of the new improvement projects that will benefit existing development. Therefore, a credit must be made for these projects so that new development does not pay twice – once through the collection of an impact fee and then again through increased taxes to offset the portion benefitting existing development. The total amount of project costs benefitting existing development is $9,730,000 as shown

[11] An additional $141,000 will be needed for planning costs during the timeframe of this analysis but will be included when impact fees are updated.
[12] Source: Springville City

in Table 5. These costs are first reduced by the City's fund balance of $1,450,814.86 and then spread across 10 years in the following analysis so that credits can be made.

TABLE 9: CREDITS FOR COSTS BENEFITTING EXISTING DEVELOPMENT

Year	Payment	ERUs	Payment per ERU	NPV*
2024	$827,919	37,756	$21.93	$158.67
2025	$827,919	38,360	$21.58	$144.67
2026	$827,919	38,973	$21.24	$130.32
2027	$827,919	39,957	$20.72	$115.59
2028	$827,919	40,231	$20.58	$100.65
2029	$827,919	40,874	$20.26	$85.11
2030	$827,919	41,528	$19.94	$69.11
2031	$827,919	42,193	$19.62	$52.63
2032	$827,919	42,868	$19.31	$35.64
2033	$827,919	43,554	$19.01	$18.10
*NPV = net present value discounted at 5 percent				

Summary of Impact Fees

The calculated maximum cost per ERU, before credits, is $2,938.60 as shown in Table 10 below.

TABLE 10: SUMMARY OF 2024 IMPACT FEE PER ERU

Summary	
Capacity Cost per ERU	$2,921.55
Consultant Costs	$17.05
Gross Fee before Credits	**$2,938.60**

The maximum allowable impact fee changes each year in the table below to account for the credits due from the remaining construction cost amounts that benefit existing development.

TABLE 11: SUMMARY OF MAXIMUM IMPACT FEE, 2024-2033

Year	Gross Fee	Credit	Max Fee per ERU
2024	$2,938.60	$158.67	$2,779.94
2025	$2,938.60	$144.67	$2,793.93
2026	$2,938.60	$130.32	$2,808.28
2027	$2,938.60	$115.59	$2,823.01
2028	$2,938.60	$100.65	$2,837.95
2029	$2,938.60	$85.11	$2,853.50
2030	$2,938.60	$69.11	$2,869.50
2031	$2,938.60	$52.63	$2,885.98
2032	$2,938.60	$35.64	$2,902.97
2033	$2,938.60	$18.10	$2,920.50

Based on the IFFP, one ERU is equivalent to 4,200 square feet of impervious surface.[13] Therefore, fees can be charged on the ratios of impervious surface for various residential lot sizes as shown in the IFFP.[14] The IFFP states that, "for residential developments between the typical impervious area for the lot size groupings provided, [these groupings] should be applied rather than requiring an exact measurement. The number of ERUs for non-residential developments should be based on the impervious square footage shown on the development plans. It is the City's policy to receive impact fees at plat recordation for the storm water system."[15]

TABLE 12: SUMMARY OF MAXIMUM IMPACT FEE, 2024-2033, BY LOT SIZE, PART 1

	<2,000 sf	2,000-3,999 sf	4,000-5,999 sf	6,000- 7,999 sf
Average % Impervious	85%	67%	51%	47%
Typical Impervious Area (sf)	Lot size x 85%	1,900	2,650	3,450
ERU	Lot size x 85% / 4,200 sf	0.45	0.63	0.82
Fee by Year				
2025	Lot size x 85% / 4,200 sf x cost for 1 ERU (8,000 sf to 10,889 sf)	$1,257	$1,760	$2,291
2026	Lot size x 85% / 4,200 sf x cost for 1 ERU (8,000 sf to 10,889 sf)	$1,264	$1,769	$2,303
2027	Lot size x 85% / 4,200 sf x cost for 1 ERU (8,000 sf to 10,889 sf)	$1,270	$1,778	$2,315
2028	Lot size x 85% / 4,200 sf x cost for 1 ERU (8,000 sf to 10,889 sf)	$1,277	$1,788	$2,327
2029	Lot size x 85% / 4,200 sf x cost for 1 ERU (8,000 sf to 10,889 sf)	$1,284	$1,798	$2,340
2030	Lot size x 85% / 4,200 sf x cost for 1 ERU (8,000 sf to 10,889 sf)	$1,291	$1,808	$2,353
2031	Lot size x 85% / 4,200 sf x cost for 1 ERU (8,000 sf to 10,889 sf)	$1,299	$1,818	$2,367
2032	Lot size x 85% / 4,200 sf x cost for 1 ERU (8,000 sf to 10,889 sf)	$1,306	$1,829	$2,380
2033	Lot size x 85% / 4,200 sf x cost for 1 ERU (8,000 sf to 10,889 sf)	$1,314	$1,840	$2,395

TABLE 13: SUMMARY OF MAXIMUM IMPACT FEE, 2024-2033, BY LOT SIZE, PART 2

	8,000-10,889 sf	10,890 sf-21,779 sf	>21,780 sf
Average % Impervious	45%	39%	32%
Typical Impervious Area (sf)	4,200	5,450	10,400

[13]Springville Storm Water IFFP, p. 2-3
[14]Springville Storm Water IFFP, p. 2-3
[15]Springville Storm Water IFFP, p. 2-3

ERU	1.00	1.30	2.48
Fee by Year			
2025	$2,794	$3,632	$6,929
2026	$2,808	$3,651	$6,965
2027	$2,823	$3,670	$7,001
2028	$2,838	$3,689	$7,038
2029	$2,853	$3,710	$7,077
2030	$2,869	$3,730	$7,116
2031	$2,886	$3,752	$7,157
2032	$2,903	$3,774	$7,199
2033	$2,921	$3,797	$7,243

Manner of Financing, Credits, Etc.

Utah Code 11-36a-304(2)(c)(d)(e)(f)(g) and (h)

An impact fee is a one-time fee that is implemented by a local government on new development to fund and pay for the proportionate costs of public facilities (system improvements) that are needed to serve new development. As a matter of policy and legislative discretion, a City may choose to have new development pay the full cost of its proportionate share of new public facilities and existing facilities that have excess capacity to service new development through impact fees. Alternatively, local governments may elect to subsidize new development by using other sources of revenue (user charges, special assessments, bonds, taxes, grants) to pay for the new facilities required to service new development and use impact fees to recover the cost difference between the total cost of the new facilities and the other sources of revenue.

At the current time, no other sources of funding other than impact fees have been identified, but to the extent that any are identified and received in the future, then impact fees will be reduced accordingly. The City has found that it is necessary to charge an impact fee to maintain the existing level of service into the future.

Additional system improvements beyond those funded through impact fees that are desired to raise the level of service will be paid for by the community through other revenue sources such as user charges, special assessments, General Obligation bonds, general taxes, etc.

Impact Fee Credits

The Impact Fee Act requires that the IFA consider the relative extent to which new development activity will contribute to financing the excess capacity of and system improvements for new and public facilities, by such means as user charges, special assessments, or payment from the proceeds of general taxes so that new development is not charged twice. This IFA clearly identifies the amount of excess capacity to be paid for by new development. This portion of the impact fee calculation can be credited back to the General Fund as a repayment for prior investment in capital facilities.

In terms of new facilities, all impact fee amounts collected must be spent for the specific project improvements identified by the engineering firm contracted by the City and incorporated into this IFA.

Impact fees are required to be used within 6 years of collection. No user fees, special assessments, etc., are contemplated to offset any of the costs associated with the new storm water facilities.

Credits may also be paid back to developers who have constructed or directly funded system improvements that are identified by the City's contracted engineering firm or donated to the City in lieu of impact fees, including the dedication of land for system improvements. This situation does not apply to developer exactions for project improvements. Any item for which a developer receives credit should be included in the approved infrastructure and must be agreed upon with the City before construction begins.

The standard impact fee can also be decreased to respond to unusual circumstances in specific cases to ensure that impact fees are imposed fairly. In certain cases, a developer may submit studies and data that clearly show a need for adjustment.

Extraordinary Costs and Time Price Differential

It is not anticipated that there will be any extraordinary costs in servicing newly developed properties. To account for the time-price differential inherent in fair comparisons of amounts paid at different times, actual costs have been used to compute current costs in order to compute impacts on system improvements required by anticipated development activity to maintain the established level of service for each public facility.

Certification

Zions Public Finance, Inc. certifies that the attached impact fee analysis:

1. Includes only the costs of public facilities that are:
    a. allowed under the Impact Fees Act; and
    b. actually incurred; or
    c. projected to be incurred or encumbered within six years after the day on which each impact fee is paid.
2. Does not include:
    a. costs of operation and maintenance of public facilities; or
    b. costs for qualifying public facilities that will raise the level of service for the facilities, through impact fees, above the level of service that is supported by existing residents;
3. Offsets costs with grants or other alternate sources of payment; and
4. Complies in each and every relevant respect with the Impact Fees Act.