CITY OF SALEM

STORM WATER MASTER PLAN

(HAL Project No.: 406.06.100)

May 2023

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HANSEN ALLEN & LUCE inc
ENGINEERS

May 2023

ACKNOWLEDGMENTS

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:

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ABBREVIATIONS AND UNITS

ac	acre
ac-ft	acre-foot
cfs	cubic foot per second (ft^3/s)
CIP	Capital Improvement Plan
CMP	corrugated metal pipe
E	east
EPA	US Environmental Protection Agency
FEMA	Federal Emergency Management Association
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.	inch
irr	irrigation
mi	mile
N	north
NOAA	National Oceanic and Atmospheric Administration
NLCD	National Land Cover Dataset
NRCS	National Resources Conservation Service (formerly SCS)
RR	railroad
s	second
S	south
SCS	Soil Conservation Service (now NRCS)
SWMM	Storm Water Management Model
TR-55	Technical Release 55 (NRCS 1986)
USGS	U.S. Geological Survey
USFWS	U.S. Fish and Wildlife Services
W	west
w/	with
w/o	without
xing	crossing
yr	year

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CHAPTER 1 – INTRODUCTION

PURPOSE

This Storm Water Master Plan (Master Plan) for the City of Salem (City) presents solutions to manage and regulate storm water runoff 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 storm water system. The master plan examines the existing and future storm drainage 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 prepared as part of the master plan to simulate runoff during storm events in the City. The models were also used to determine solutions to system deficiencies.

BACKGROUND

Located in Utah County, Utah south of Spanish Fork and east of Payson, the City of Salem extends from Spanish Fork on the north to Elk Ridge and Woodland Hills on the south and from Payson on the west to the Wasatch Mountains on the east. Developments within the city have elevations between 4,530 and 5,000 feet with the terrain having higher elevations to the south and east. Soil types range from silty clay to gravelly or sandy loam. Land use varies from urban developments to farmland, desert, and alpine landscapes.

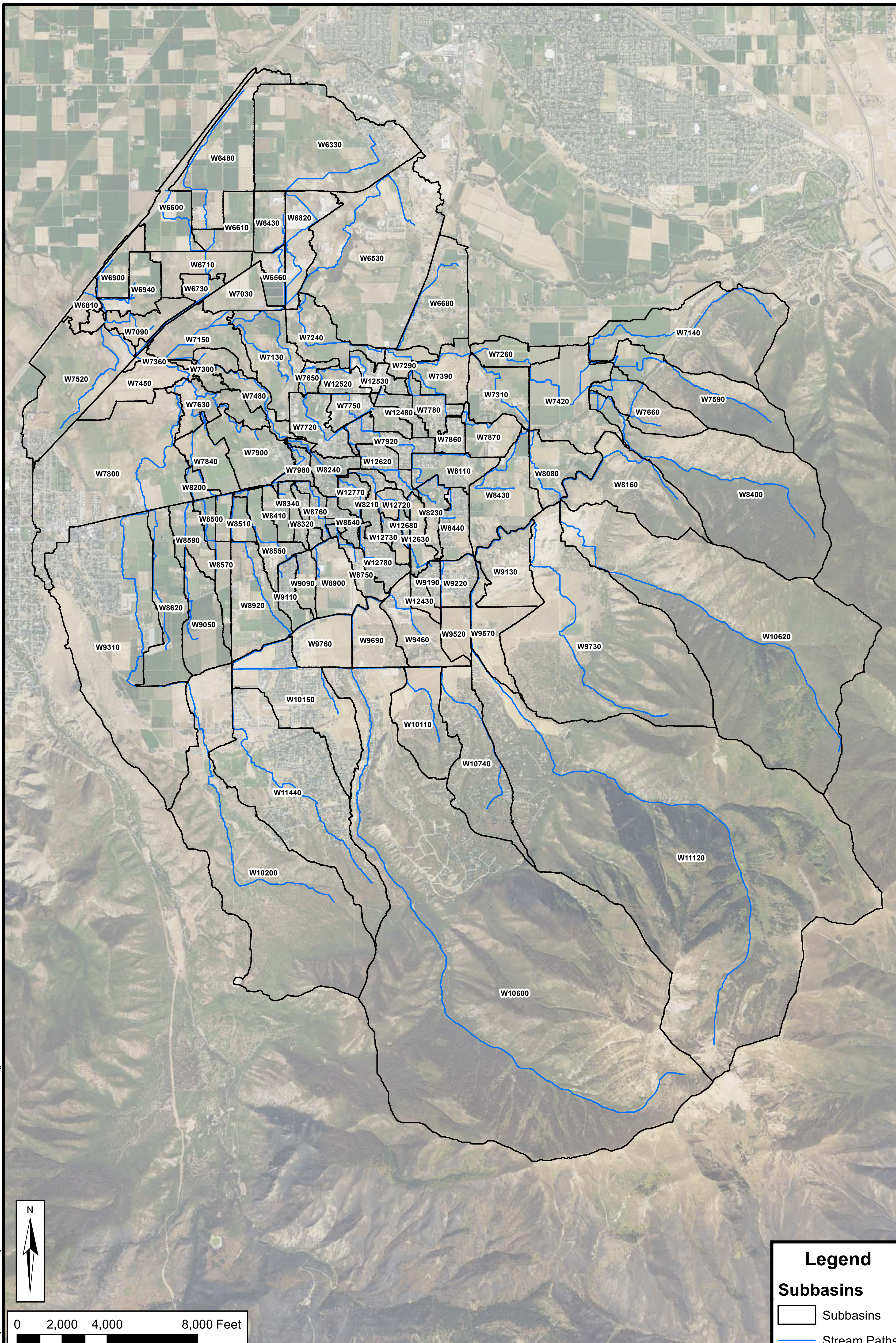
The City was incorporated in 1920 and traditionally relied on farming and livestock as the major economic activities. Impoundment of water in Salem Pond by early pioneers led to growth in the City. The City's current economic landscape is more diverse and includes manufacturing, health care, and professional services. Salem had an estimated population of 6,423 in 2010. In an ongoing effort dealing with continued growth and unique existing storm drainage system, the City desires to plan an effective drainage system to manage nuisance water and prevent flooding.

AUTHORIZATION

The City of Salem selected Hansen, Allen & Luce, Inc. (HAL) to prepare the Storm Water Master Plan. The master plan has been completed in accordance with the agreement between the City of Salem and HAL from May 2019. 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 planned annexation area of Salem and the hydrologically contributing basins. Approximately 27,240 acres (42.6 mi^2) were hydrologically modeled to determine the runoff tributary to the City's storm drainage system. The modeled subbasins representing the study area as well as the City boundaries are shown on Figure 1-1.



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MODELED SUBBASINS

FIGURE
1-1

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CHAPTER 2 – EXISTING STORM DRAINAGE SYSTEM

This section discusses the features that make up the storm drainage facilities in Salem. Figure 2-1 shows the existing storm drainage system including the surface drainages that function as outfalls for the system.

SURFACE DRAINAGES

The City of Salem contains three categories of surface drainages: Beer Creek, Mountain Streams, and Canals. Each type of surface drainage behaves differently and is discussed in detail below. Surface runoff generally flows from southeast to northwest.

Beer Creek

Beer Creek is the largest surface drainage in the study area and is the final outlet for all storm runoff from the City. Beer Creek originates at the outfall of Salem Pond and runs from southeast to northwest. Its crossing at Interstate 15 is a concrete box with wingwalls, with an estimated size of 6’x6’ and a corresponding capacity of 400 cfs.

Mountain Creeks from Flat Canyon, Water Canyon, Maple Canyon, Broad and Snell Hollows, and Loafer Canyon

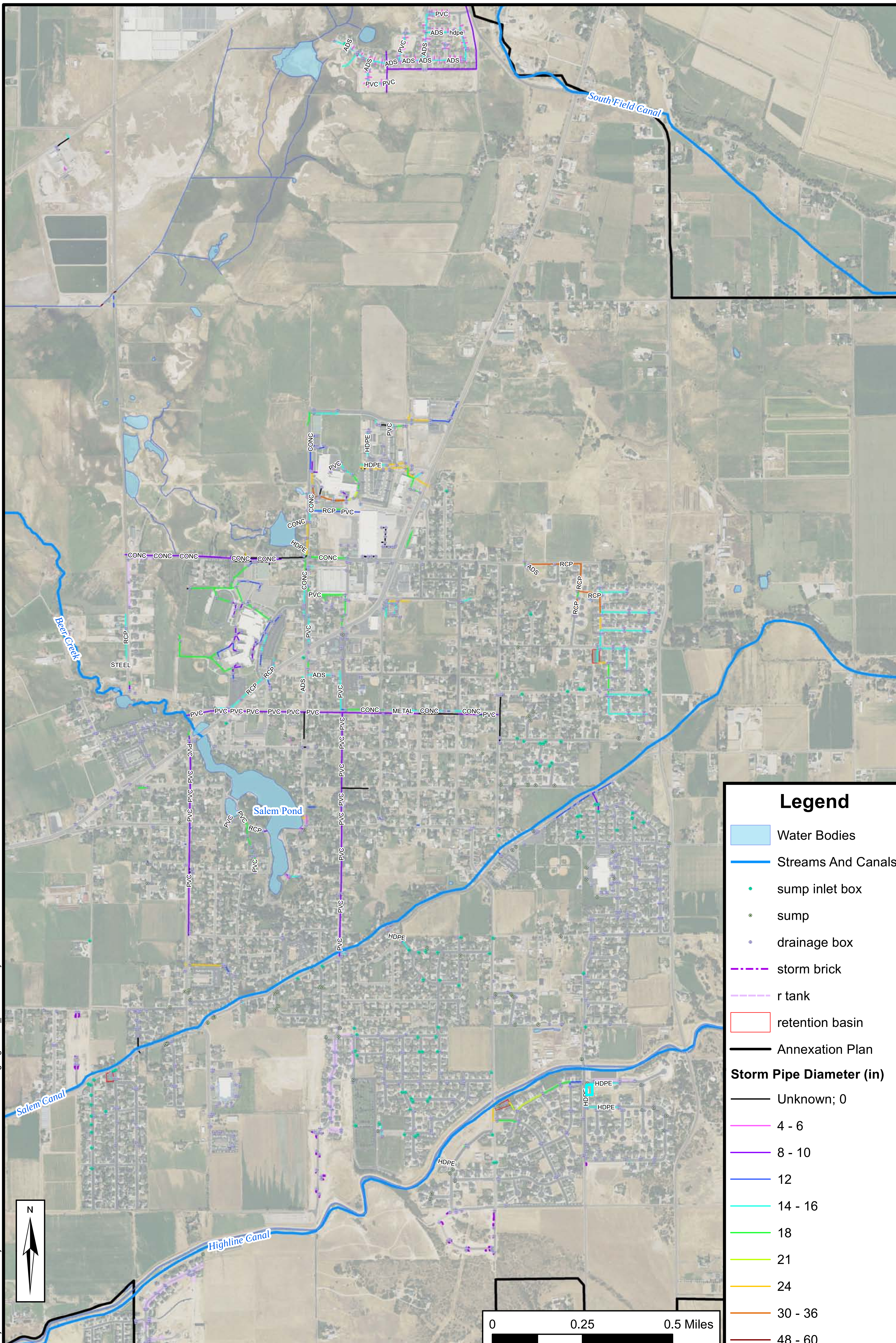
There are several mountainous streams that originate from the canyons east and south of Salem. These streams generally terminate near the mouth of their origination canyon, indicating that generally the water seeps into the ground or evaporates prior to their confluence with another waterbody. The consequence of this distinctive fluvial geomorphology is that during small, frequent events, the runoff is absorbed and is insufficient to carve a channel past the canyon mouth. Then, during large, infrequent events no surface channel exists to convey the runoff that continues past canyon mouth.

Strawberry Highline and Salem Canals

Two canals run from northeast to southwest through Salem: the Salem Canal and the Highline Canal. While these canals are designed to provide irrigation water to residents of Salem and neighboring communities, they intercept runoff and serve as a drainage path. Piping either canal would increase flood risk; under the City’s direction, this Master Plan assumes that both canals will be piped.

STORM DRAINAGE 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 lack sufficient data for detailed stormwater modeling to be performed. The stormwater pipes lacked invert elevations and therefore simplifying assumptions were needed to evaluate existing pipeline capacity. It was assumed that the pipeline slopes were equal to the existing ground slopes. 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.



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STORM SEWER SYSTEM

FIGURE 2-1

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Although the inventory provided in this master plan is mostly complete, ongoing efforts should be made to continue to update and refine the inventory. HAL performed a field visit to collect data on major culverts and the Salem Pond; this data was included in the modeling efforts.

Collection and Conveyance

The City of Salem has approximately 10 miles of buried storm drain conveyances with a range of sizes from 30 inches to less than 12 inches. However, most of the City does not have underground storm sewer and the portion that does is largely disconnected from each other. The City has an estimated 92 sump inlet boxes, 81 sumps, 340 storm sewer manholes, and 872 drainage boxes. The storm drain system primarily relies on surface drainages, irrigation canals, roadside swales, and curbs and gutters to convey runoff to Beer Creek. All runoff is ultimately discharged into Utah Lake. The collection and conveyance system with available pipe diameters and materials can be seen on Figure 2-1.

Detention

The City maintains four detention facilities located in Whisper Ridge, Harvest Ridge, Salem Heights, and Old Cherrywood Estates. The area, storage volume, and elevation were calculated using LiDAR data and evaluated for sufficiency based on an assumed tributary area. The results can be seen below in Table 2-1. The locations of the dry ponds can be seen in Figure 2-1.

Table 2-1
Detention/Retention Basin Summary

Name	Unit	Whisper Ridge[1]	Harvest Ridge	Salem Heights	Old Cherrywood Estates[2]
Pond Area	ac	0.296	0.36	0.47	0.31
Est.Tributary Area	ac	10.909	10.222	9.02	5.6
Pond Volume	AF	0.553	0.672	0.823	0.61
Est. Volume Required	AF	0.676	0.609	0.823	0.59
Rim Elevation	ft	4842.5	4834.5	4664	4705
Avg. Depth	ft	1.868	1.866	1.752	1.99

[1] Pond was constructed in 2016 (after LiDAR); volume was estimated based on assumed average depth, no recommended action due to insufficient data.
[2] Based on City-provided GIS, this basin does not appear to be connected to any pipe; consider adding pipe if overflow or standing water is a problem.

CHAPTER 3 – METHODOLOGY

The project team adopted a workshop approach with City 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

Design Frequencies

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

- 25-year design capacity for the initial drainage system. The initial drainage system includes inlets, laterals, minor trunk lines, gutters, and roadside ditches.
- 100-year capacity where flooding of homes may occur.
- 100-year capacity on major detention/retention, culverts, and major conveyance facilities (limited to storm drain hydraulic capacities of the upstream initial drainage system).

Additional design requirements, such as capturing the 90^{th} percentile volume, can be found in the Drainage Criteria Manual.

Design Storms

The storm distribution used to evaluate existing surface water flooding was derived from the NRCS NOAA Atlas 14 distribution for 24-hour storms. This distribution is recognized as a severe distribution and does not require a duration sensitivity analyses as it nests the point precipitation estimates within each other. The 100-year NRCS nested distributions can be seen in Figure 3-1.

The Farmer Fletcher 1-hour, 3-hour, and 6-hour distributions were used to evaluate future conditions including sizing Capital Improvement Projects (CIP) and the existing storm drain pipe capacity. This distribution was derived from a study performed along the Wasatch Front by Farmer and Fletcher in 1971 and is frequently used throughout Utah.

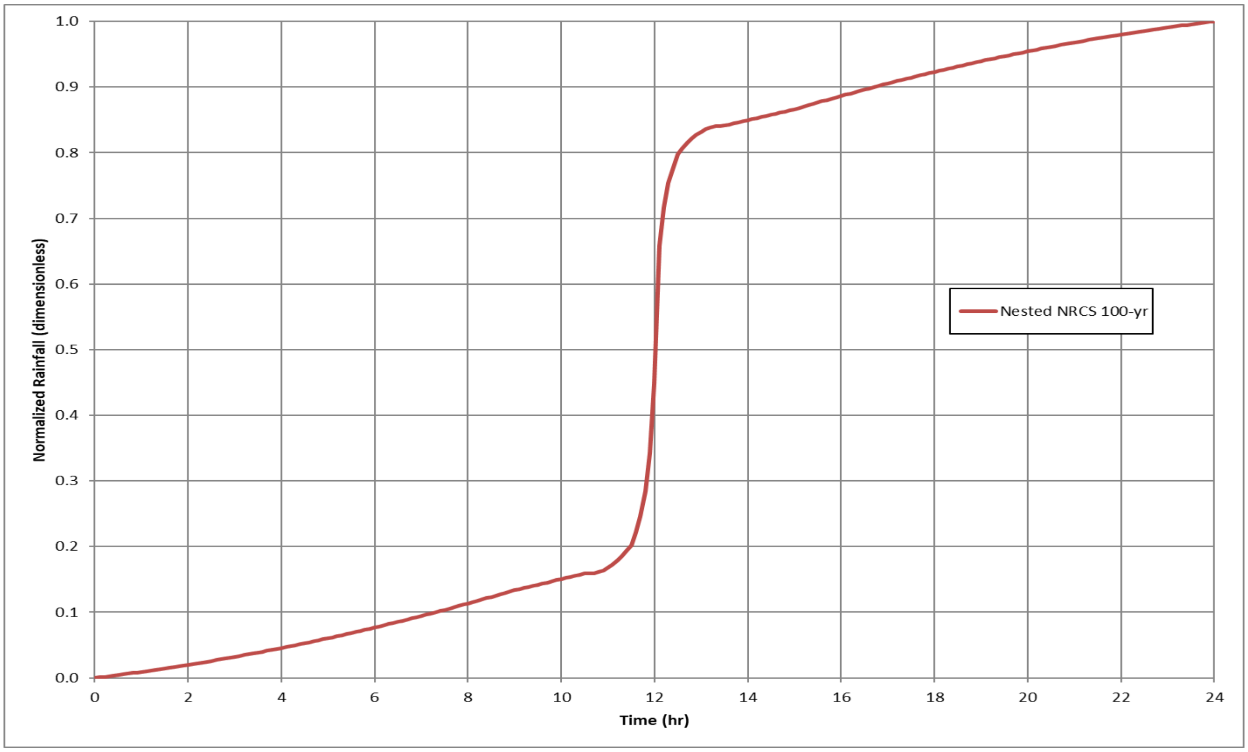


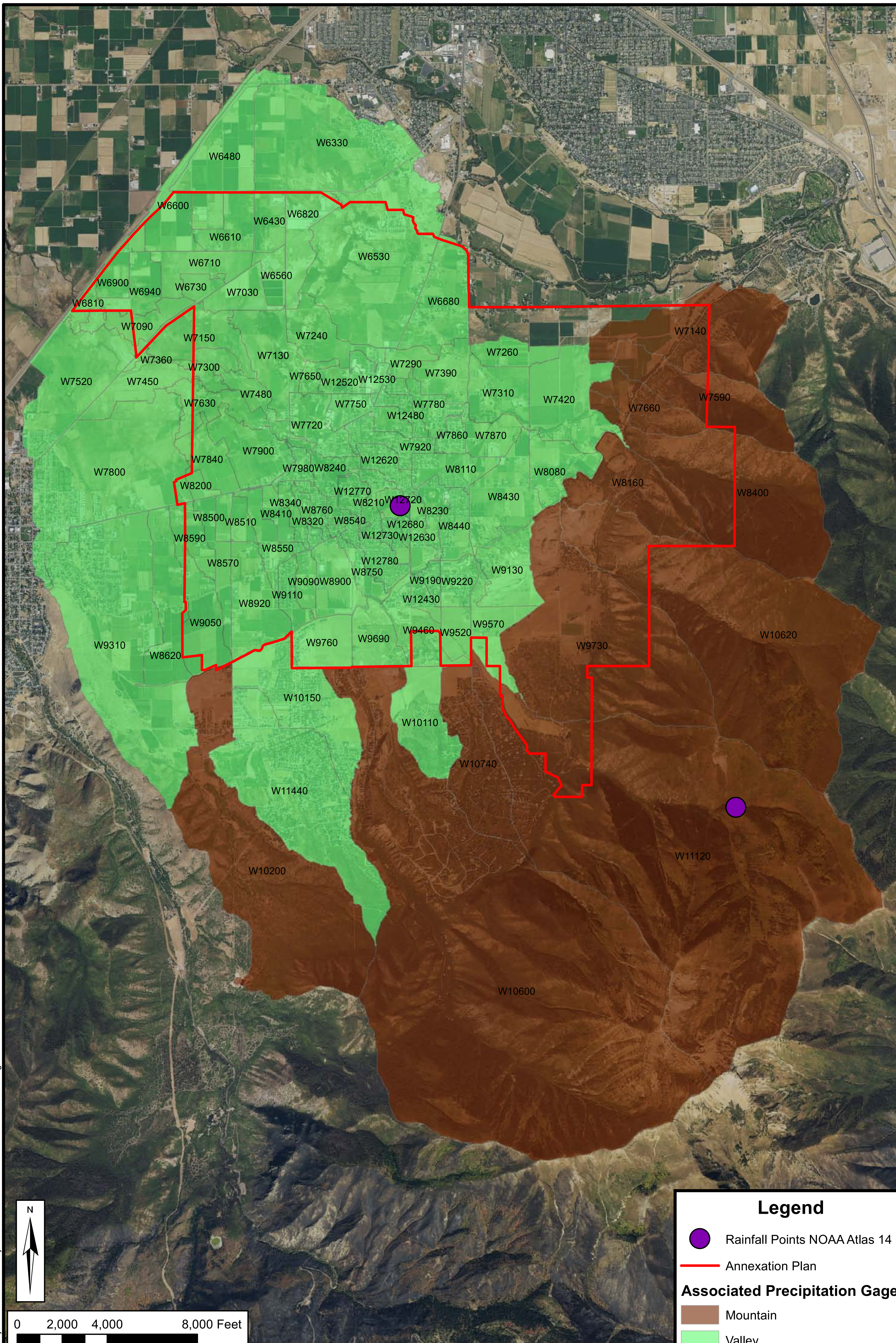
Figure 3-1 Dimensionless NRCS Nested 100-year 24-hour Distributions

Precipitation depths were obtained from *NOAA Atlas 14 Point Precipitation Frequency Estimates* (NOAA, 2019). Two locations were selected as having typical precipitation totals with one representing the non-mountainous basins and another representing the mountainous basins. These values were used at the Master Planning level. Developers will not use these locations for their design but should go to Atlas 14 to obtain a site-specific rainfall estimate. The Master Plan design storm rainfall depths for the two locations that were used to evaluate the 100-year surface water flooding are seen in Table 3-1 and Figure 3-2. Additional rainfall information is in Appendix A.

Table 3-1
Salem 24-hour Rainfall Depths

Frequency of Storm / Location	100-yr
Valleys	2.8
Mountains	3.37

*All rainfall totals are from NOAA Atlas 14.



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REPRESENTATIVE
RAINFALL POINTS

FIGURE
3-2

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As the rainfall totals provided by NOAA Atlas 14 are point estimates, they overrepresent the rainfall that falls on an area larger than at a point. Due to this, a depth area reduction factor of 0.886 (source: SLC Hydrology Manual) was applied to the totals for the 100-year surface water model because it involves a rainfall event over the entire watershed. Depth area reduction factors were not used in other areas since the evaluations involved looking at smaller portions of the City.

A 3-hour, 100-year Farmer Fletcher model was used in the future development CIP model, as it was the governing storm between the 1-hr, 3-hr, and 6-hr Farmer-Fletcher storms. All CIP projects were sized based on this distribution.

DEVELOPMENT OF THE HYDROLOGIC MODELS

As part of the master plan, HAL developed a computer model for the study area to simulate runoff during storm events. The U.S. Army Corps of Engineers' HEC-Hydrologic Modeling System (HMS) version 4.3 was used to model the storm drainage system. HMS utilizes an integrated computation designed as a successor to the HEC-1 program. The model can simulate rainfall, determining runoff, and routing the runoff through the system.

A drainage 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). Subbasin characteristics developed for this plan were based on LiDAR, 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, and 5) Lag time. Much of the methodology is documented in *Technical Release 55: Urban Hydrology for Small Watersheds* (NRCS, 1986), hereafter referred to as TR-55 and also in *Lag Time Characteristics for Small Watersheds in the U.S.* (Simas and Hawkins, 2002).

Subbasin Area

The amount of runoff is proportional to the area of the subbasin. Subbasin boundaries depend upon both topography and location of storm drainage facilities. As the City has sparse and relatively disconnected storm drainage facilities, the subbasin boundaries for the City depend upon topography. Subbasin boundaries and streams were automatically delineated using the ArcMap extension HEC-GeoHMS and the following data sources: a 0.5-meter digital elevation model (DEM) from the Automated Geographic Reference Center (AGRC) and USGS 3DEP 10-meter data (used for mountainous areas where 0.5-meter LiDAR is unavailable). These outputs were then used calculate watershed, routing, and other hydrologic characteristics. A minimum threshold size of 25 acres was used to delineate the stream network. Subbasins were further consolidated by similar hydrologic characteristics, including land use homogeneity and degree of undevelopedness.

One hundred total subbasins were developed using the processes described above. Subbasin names were autogenerated using the HEC-GeoHMS tools. The subbasins with their names and rainfall category can be seen in Figure 3-2.

Hydrologic Soil Group

The 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. Developed portions of each study area were assumed to have a minimum of nonnative group B soils to represent the desert landscaping common on developed parcels. 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).

Soil data were retrieved from the Natural Resource Conservation Service's (NRCS) Web Soil Survey. Most of the map units came from the Utah County, Utah – Central Part soil survey area though defining some of the map units for the mountainous regions required the use of the soil surveys covering the Sanpete Valley Area or Fairfield-Nephi Area.

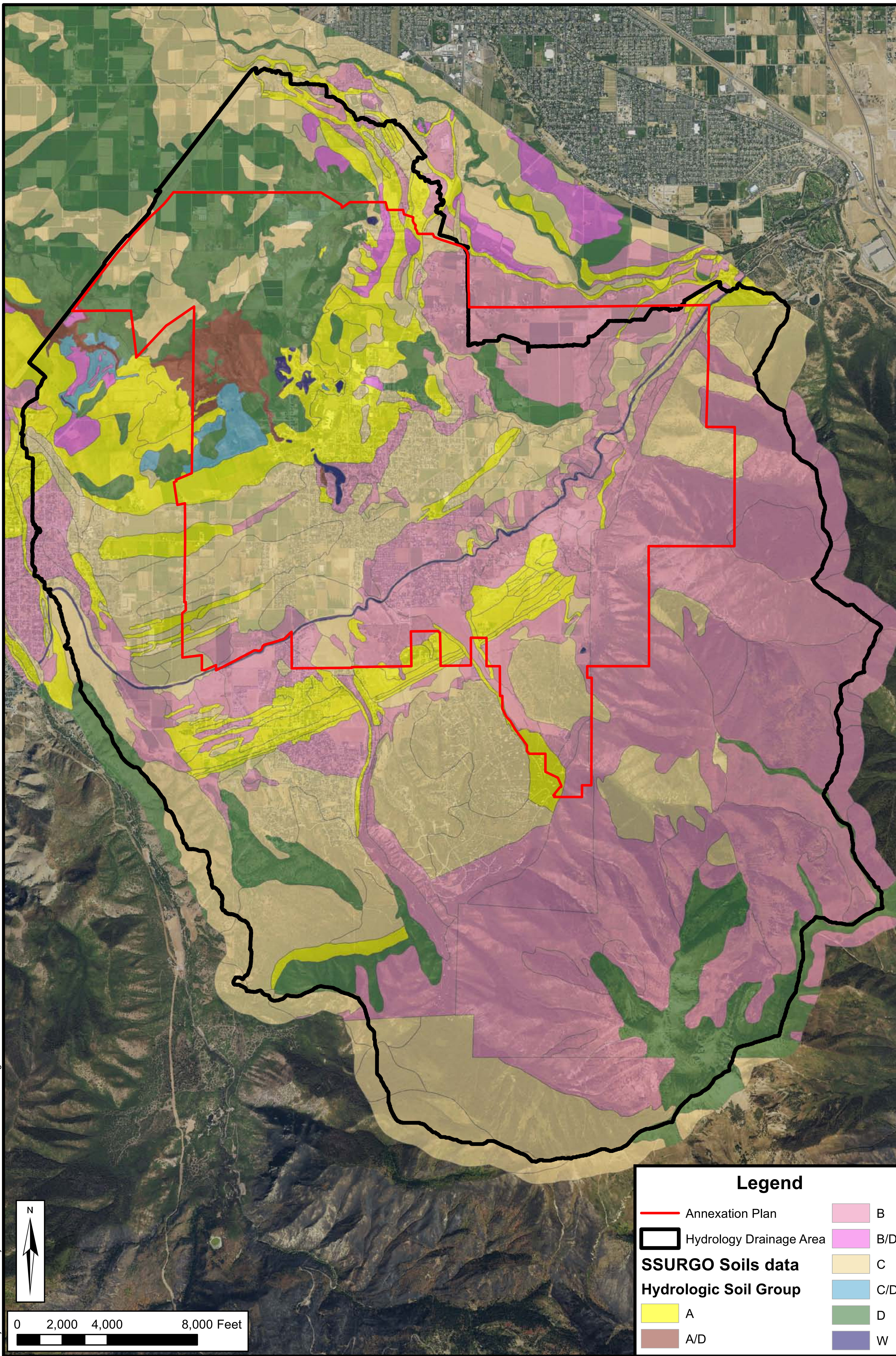
Approximately 70% of the soils within the City annexation plan are Group B or Group C. Marshy soils in the northwest are categorized as Group D. A soil map of the City is shown in Figure 3-3. The hydrologic soil group, in combination with Land Use and a lookup table (see Table 3-2), determines the curve number for each subbasin.

Land Use

Land use data was obtained from the National Land Cover Dataset (NLCD 2011) to simulate current conditions. This data was modified by enforcing the roads shapefile obtained from State Geographic Information Database (SGID) with a 40-foot buffer as a separate 'Roads' land use type. Table 3-2 maps the various land uses to a Curve Number using the soil type and TR-55. The various land uses can also be seen on Figure 3-4.

Table 3-2
Land Uses and Hydrologic Soil Groups in Salem

		Hydrologic Soil Group			
Cover Type - TR-55	NLCD Description	A	B	C	D
Water	Open Water	98	98	98	98
Open space (Good)	Developed, open space	39	61	74	80
Residential - 1/2 acre	Developed, low intensity	54	70	80	85
Residential - 1/4 acre	Developed, medium intensity	61	75	83	87
Residential - 1/8 acre	Developed, high intensity	77	85	90	92
Fallow-Bare soil	Barren land	77	86	91	94
Oak-Aspen (Fair)	Deciduous forest	30	48	57	63
Woods (Fair)	Evergreen forest	36	60	73	79
Average of Forests	Mixed forest	33	54	65	71
Brush (Fair)	Shrub/scrub	35	56	70	77
Pasture/grassland (Fair)	Grassland/herbaceous	49	69	79	84
Pasture/grassland (Good)	Pasture/hay	39	61	74	80
Row crops - SR (good)	Cultivated crops	67	78	85	89
Wetlands	Woody wetlands	98	98	98	98



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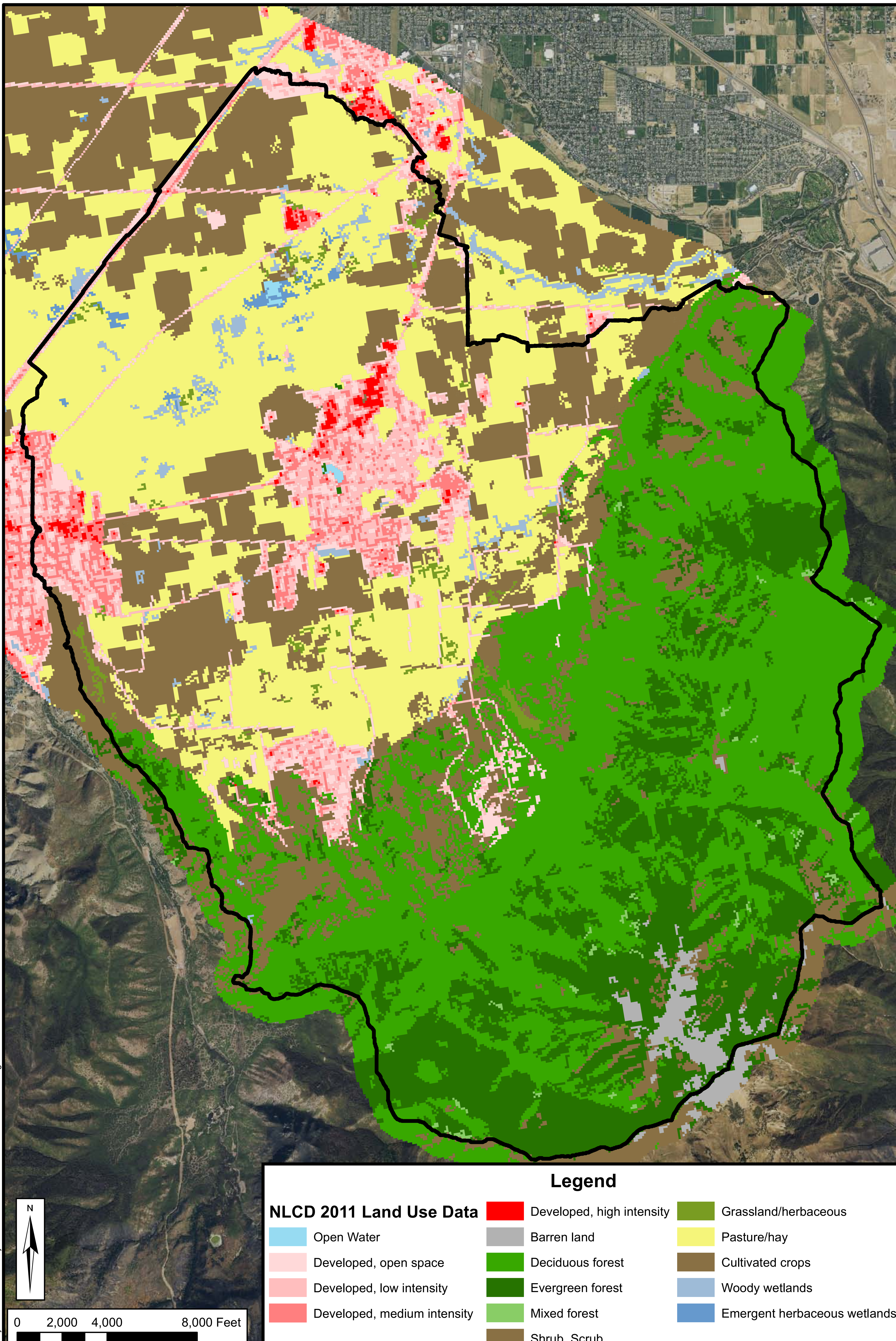
SSURGO SOILS
HYDROLOGIC SOIL GROUP

FIGURE 3-3



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NLCD 2011 LAND USE

FIGURE 3-4

		Hydrologic Soil Group			
Cover Type - TR-55	NLCD Description	A	B	C	D
Wetlands	Emergent herbaceous wetlands	98	98	98	98
Impervious Areas	Roads (Not found in NLCD)	98	98	98	98

SCS Curve Number

Each subbasin was assigned an SCS curve number based on hydrologic soil group and land use, as seen in Table 3-2 and outlined in Chapter 2 of TR-55 (NRCS, 1986). The curve number describes the relationship between precipitation and runoff from the pervious portions of the subbasin. Curve numbers range from 0 to 100. Areas that are more pervious have lower curve numbers. For example, a well vegetated subbasin with sandy soils would have a lower curve number than a poorly vegetated subbasin with clay soils. Composite curve numbers were calculated for each basin based on its unique combination of hydrologic soil group and land cover and are shown in Figure 3-5. The amount of impervious area also affects the relationship between precipitation and runoff.

Impervious Area

Impervious areas within each subbasin were estimated using the 2011 (amended in 2014) NLCD Urban Imperviousness layer. This dataset contains urban impervious surfaces as a percentage of developed surface over every 30-meter pixel in the United States. Each basin was assigned a percent impervious using the basin average of this NLCD impervious data. This percent impervious was input to the model as directly connected impervious area.

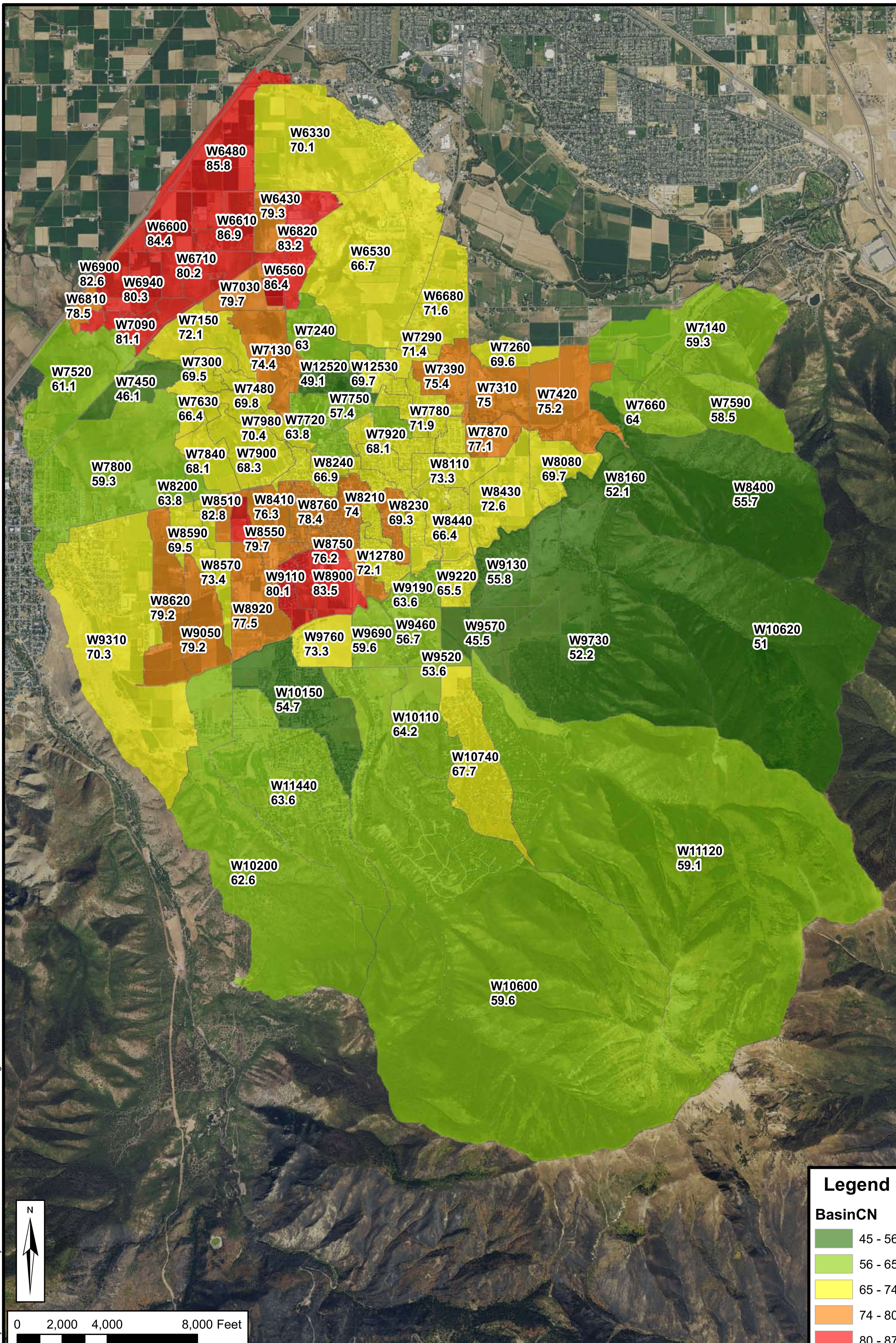
Impervious areas within each subbasin were estimated using the type of land uses within each subbasin. There are two types of impervious area: directly connected impervious areas and unconnected impervious areas. Directly connected impervious areas provide a direct path for runoff to a conveyance such as a pipe, gutter, or channel. Directly connected impervious areas often include roadways, parking lots, driveways, and roofs. Runoff from unconnected impervious areas must cross a pervious area before reaching the drainage 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.

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

The directly connected impervious area is included explicitly in the model subbasin characteristics as a percentage and was assumed to be the same as total impervious percent reported in the NLCD Urban Imperviousness data.

Lag Time

The lag time is the time between the center of mass of rainfall to the peak of the hydrograph (Linsley and Franzini, 1979). Lag time is often estimated as 0.6 multiplied by the time of concentration (NRCS, 1986). The time of concentration is the time it takes for runoff to travel from the hydraulically most distant point of the subbasin to the outlet of the subbasin.



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COMPOSITE CURVE NUMBER

FIGURE 3-5

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Lag times for the master plan were calculated using a method developed by Simas and Hawkins (1998), with times ranging from 17 to 113 minutes. The calculation is shown below.

$$Lag\ Time = 0.0051 * Width^{0.594} * Slope^{-0.15} * (\frac{1{,}000}{CN} - 10)^{0.313}$$

$$Width = \frac{Watershed\ Area}{Watershed\ Length}$$

$$Slope = \frac{Maximum\ Elevation\ Difference}{Watershed\ Length}$$

$$Watershed\ Length = Longest\ flow\ path\ from\ the\ highest\ elevation\ to\ the\ outlet$$

DEVELOPMENT OF THE HYDRAULIC MODELS

HAL developed a two-dimensional computer model based on 2013-2014 LiDAR for the study area to simulate and visualize runoff during storm events. The U.S. Army Corps of Engineers' HEC-River Analysis System (RAS) version 5.0.6 was used to model the surface flooding within the City. RAS is an integrated system of software, which allows modeling surface flooding with steady or unsteady flow calculations. The geometry files may be one-dimensional and/or two-dimensional.

The Horizontal Coordinate Projection was set to NAD 1983 State Plane Utah Central FIPS 4302 Feet. 2013-2014 Wasatch Front LiDAR data was used as the base terrain with edits being made to the Salem Pond to ascertain effects of a possible future gate. The terrain holds the geometric and hydraulic properties of the land in its 2D cells and faces. NLCD 2011 with 40-foot roads enforced was used as the Manning's roughness layer. A summary of the assumed roughness values can be seen below in Table 3-3. Web Mapping Service (WMS) aerial photography was added for enhanced visualization.

Table 3-3
Assumed roughness values

Output File

RAS Description	ID	Mann. N
NoData	0	
Barren Land Rock/Sand/Clay	2	0.025
Cultivated Crops	3	0.04
Deciduous Forest	4	0.12
Developed, High Intensity	5	0.1
Developed, Low Intensity	6	0.06
Developed, Medium Intensity	7	0.08
Developed, Open Space	8	0.04
Emergent Herbaceous Wetlands	9	0.08
Evergreen Forest	10	0.12
Grassland/Herbaceous	11	0.035
Mixed Forest	12	0.12
Open Water	13	0.03
Pasture/Hay	14	0.035
Roads_40ftwide	1	0.018
Shrub/Scrub	15	0.08
Woody Wetlands	16	0.1

Output ID Standards: NLCD 2011

A boundary polygon was drawn for the City which designates the 2D flow area to be modeled. The boundary polygon does not include the whole City but extends to the closest of the internal boundary conditions, flow extents, or LiDAR boundary. This was done to reduce the number of cells and hence processing time and does not reduce the accuracy of the model. Break lines were enforced on the 2D mesh to capture the high ground and reduce inaccurate leakage.

Major hydraulic structures were added to the geometry, including: the Beer Creek culverts at Arrowhead Drive and at Interstate 15, the culverts near the treatment lagoon, the control structure at the Salem Pond outfall. A downstream boundary condition of normal depth was applied. Internal boundary conditions were added throughout the mesh using the results of the HMS 100-year run. The model was set to run using the diffusive wave equations for a simulation time of 24 hours. The general cell size was 25 feet by 25 feet and was adjusted to match road centerlines and internal boundary conditions. The total number of cells in the model is over 615,000.

It is important to state that this surface model ignored any underground drainage facilities and therefore may overrepresent the volume and extent of flooding. However, the City has communicated that clogged inlets are a common occurrence and it is hard to keep the inlets clear of debris. Additionally, for a large 100-year event, the underground network would be overwhelmed and be unable to appreciably reduce flooding.

The HEC-RAS model can determine the water depth, flow rate, and capacity of overland flow during a precipitation event. This detailed analysis includes mapping inundation areas. The HEC-RAS model does not include the functionality of analyzing pipe capacity; therefore, this analysis was calculated separately in an Excel spreadsheet.

PIPE CAPACITY ANALYSIS

The design flow rates were calculated as a percent of the primary HMS basin; for example, if a collection area to a pipe primarily falls in basin which produces a peak runoff of 20 cfs and the collection area comprises 25% of the basin, the expected runoff from the event would be 5 cfs (20 cfs * 0.25). The City provided pipe data which could typically include pipe diameter, pipe length, pipe material. Neither pipe invert elevations nor pipe slopes were available; therefore, it was assumed that the pipe had the same grade as the ground elevation. Using this assumption, a few pipes had negative slopes; for lack of better data, these were assumed to have a slope of the absolute value of the ground slope.

R TANK CAPACITY ANALYSIS

An analysis was conducted on the existing R tanks and storm bricks within the City. This was done as the City has expressed that some R tanks have been pressurized during rain events. To evaluate the R tank adequacy, R tank lengths were calculated using GIS. As R tank slopes were unavailable, the slopes were assumed to be the same as ground slopes. The height of each R tank was unknown so a height of three feet for all R tanks was assumed. The evaluation returned that seven R tanks and one storm brick section would become pressurized during a sufficient event. It is recommended that these be evaluated by the City and deemed worthy of repair or not. They can be seen in Figure 4-1.

A calculator was designed and is recommended for future use by the City or developers to determine the maximum length without causing pressure conditions. The calculator specifies a maximum length of R tank given a slope and R tank height and is limited to a City-defined maximum length of 300 feet.

CHAPTER 4 – STORM DRAINAGE ANALYSIS

The Salem Storm Drain System was analyzed using the spreadsheet and HEC-RAS models, observations from City staff, and best management practices for the industry.

DEFICIENCIES

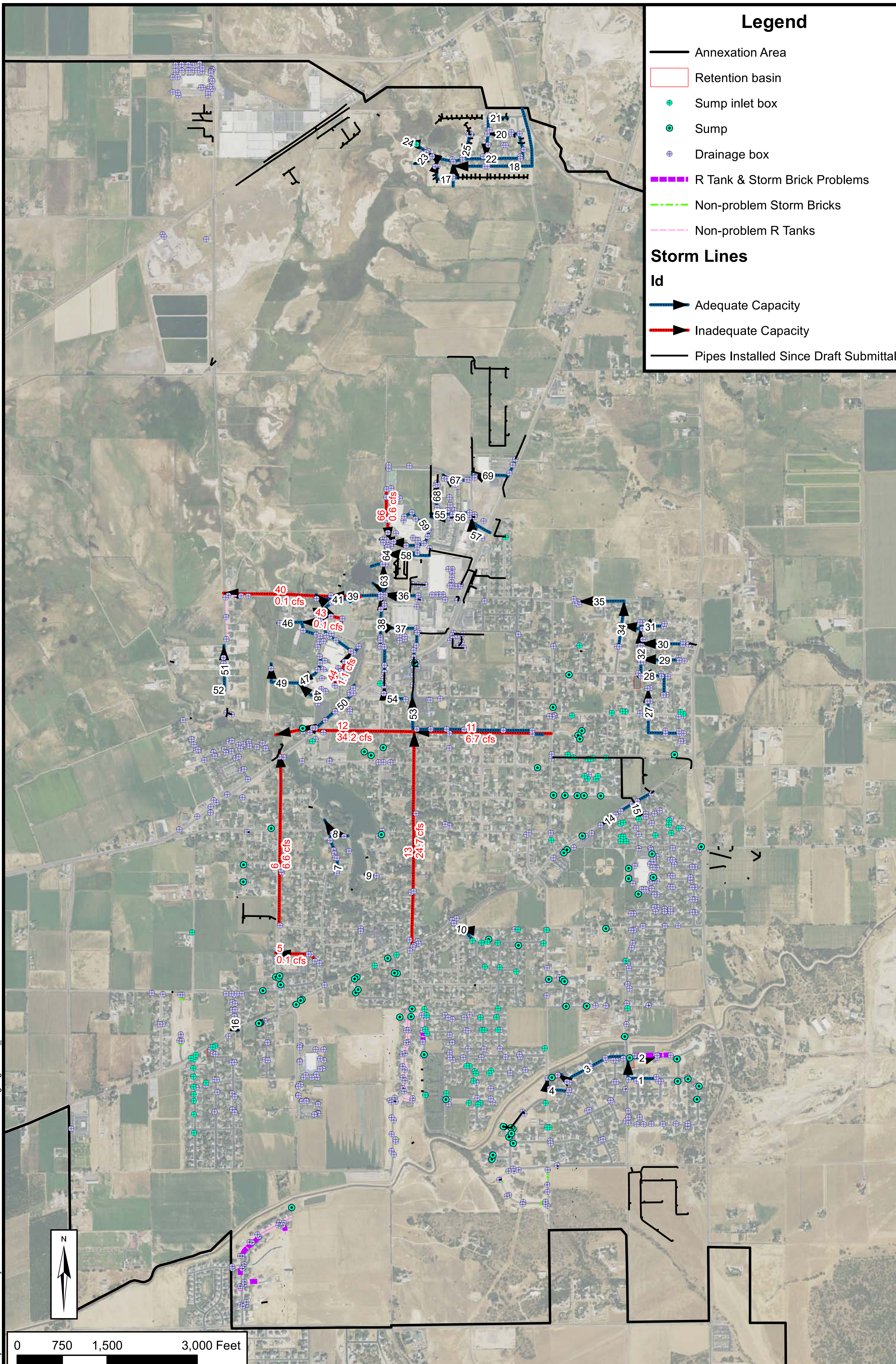
Deficiencies were identified based on results from the models and input from City staff. Locations where the City has experienced flooding were analyzed in the model to determine the cause of the flooding. The HEC-RAS model is helpful in determining where surface flooding is likely to occur. The spreadsheet model identifies pipe capacity deficiencies based on the minor 25-year event.

Table 4-1 and Figure 4-1 summarize the pipe drainage deficiencies identified in this study. Each deficiency has a Deficiency ID (used in this study), a location description, an estimated physical capacity based on LiDAR ground elevations and City-provided storm line data, an estimated required capacity based on the HEC-HMS model, and a discharge deficiency value.

Not all deficiencies necessitate capital improvements. Because storm drain systems are designed to convey the minor storm event, a minor storm event will produce flows at or near the pipe capacity of the system. The pipes in the spreadsheet model which were identified as areas of insufficient capacity were determined by City staff to not have been an issue historically. The pipes which are most undersized (pipe IDs 6, 11, 12, and 13) have a diameter of eight inches and were originally sewer lines and were not designed as storm sewer. As the pipes identified have not been a concern in the past, it is recommended that they be monitored in the future. If flooding in certain pipes worsens, it is recommended to upsize the affected pipes. All the deficiencies in Table 4-1 represent areas with estimated capacity deficiencies. Sediment and repair issues were not examined in the master plan. Pipes installed since the analysis was performed are assumed to have adequate capacity.

Table 4-1
Storm Pipe Capacity Deficiencies

Pipe Deficiency ID	Location of pipes	$Q_{capacity}$	Q_{HMS}	ΔQ
		cfs	cfs	cfs
5	From 760 S to 300 W – N of church building	6.0	6.1	-0.1
6	300 West	2.1	8.7	-6.6
11	Center St from 500 E to 100 E	2.4	9.2	-6.8
12	Center St from 100 E to Beer Creek	1.9	36.1	-34.2
13	100 E	2.2	27.0	-24.8
40	400 N, from ~60 W to 460 W	1.1	1.3	-0.2
43	parking lots north of Salem Hills HS	2	2.1	-0.1
44	east side of Salem Hills HS	1.1	3.3	-2.2
66	800 W tennis courts to Salem JHS	1.1	2.2	-1.1



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CITY OF SALEM

STORM SEWER NETWORK EVALUATION

FIGURE 4-1

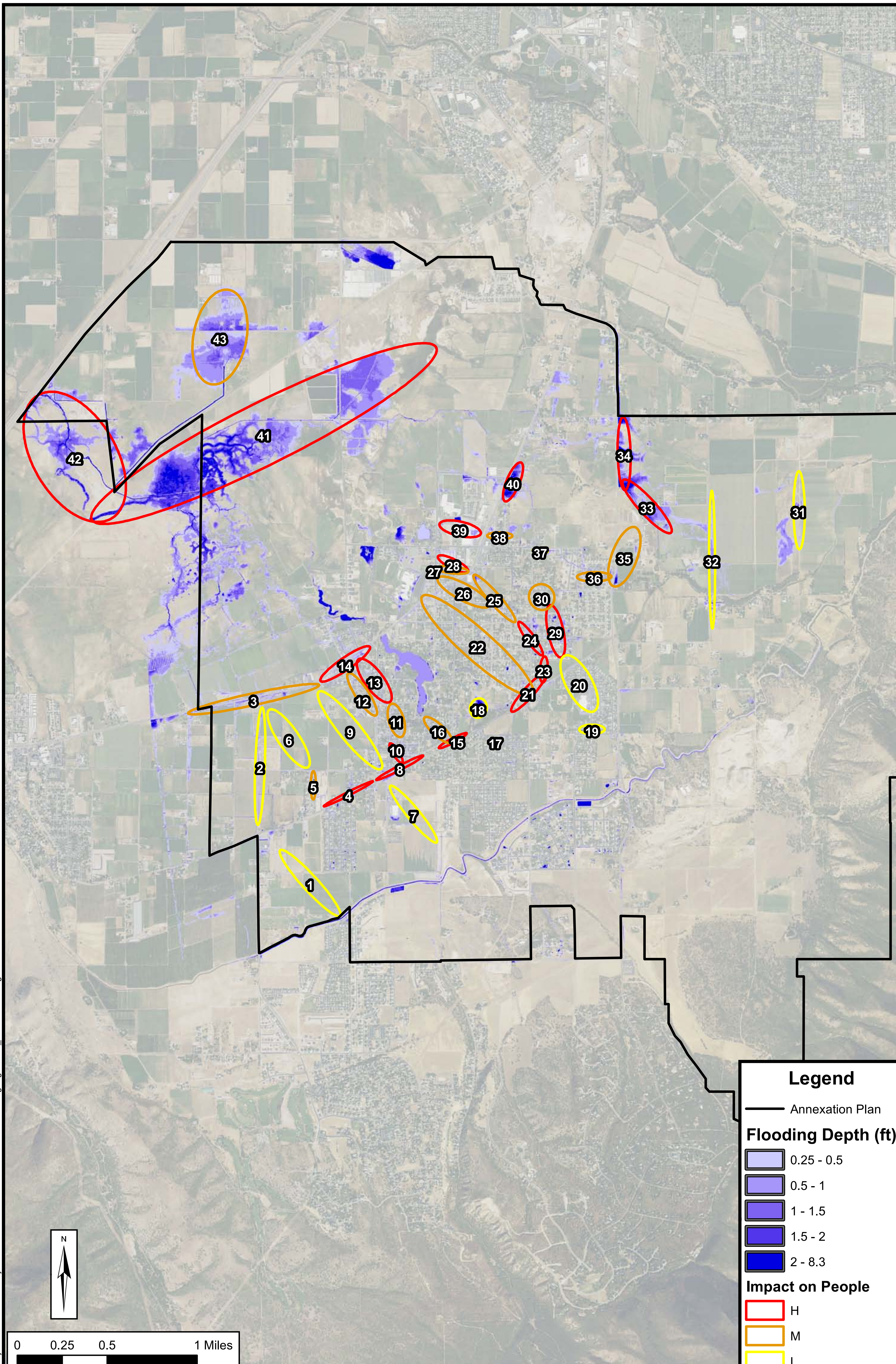
The results of the HMS model were supplied as inputs to the RAS model. The RAS model helped to identify areas of surface conveyance. Salem’s surface conveyance system is limited. This results in minor and major flood events relying on surface depression paths to drain. To date, Salem has not been master planned to have underground or surface storm infrastructure. As a result, the City’s existing stormwater infrastructure has been implemented one development at a time producing a system where individual developments are isolated from each other and do not account for the impacts of upstream or downstream stormwater conveyance. Figure 4-2 shows areas of concern with their respective impact on people based on current development and modeled flood courses and depths.

It is important to note the physical capacity of Beer Creek is limited by the structures and grading along it. The major structures on Beer Creek include from downstream to upstream: the I-15 culvert, the Arrowhead trail culvert, the Sheen Rd, and the Public Works Department culvert. These have estimated capacities of 400 cfs, 50 cfs, unknown and 36” which is halfway sedimented in with an approximate capacity of 22 cfs (could be more if it were cleaned out), respectively. The grading suggests an approximate capacity of 30-50 cfs though some areas have more or less than this. It is recommended to limit the outflow of Salem Pond to a maximum of 30 cfs and to clean out the culvert under the Public Works Department building.

Areas 41 and 42 overlap with USFWS-mapped wetlands and a site visit confirmed that this area is flat and marshy with standing water several days after rain events. While not mapped in FEMA’s 100-year floodplain as shown in Figure 4-3, the model demonstrates that much of the area in the northwest of the City provides natural floodplain storage for large storm events. The City has chosen to require a wetland delineation for areas within 300 feet of the USFWS wetland delineation as shown in Figure 4-4. If necessary, floodplain storage and wetland remediation should be conducted. Disregarding the lands natural value as flood storage could have severe consequences as storage is removed and structures become flooded and as wetland habitat is removed.

MINIMUM CONVEYANCE SIZE

The criteria selected by the City specifies minimum pipe conveyance dimensions. The City has selected a minimum pipe diameter of 18 inches as the standard for City facilities. Figure 4-2 shows which conveyances do not meet the City’s minimum size criteria. Some pipes that do not meet the minimum size are identified as under capacity as seen on Figure 4-1. A pipe not meeting the minimum size does not necessitate an immediate solution unless accompanied by frequent or significant flooding but should be monitored for surcharging and replaced with the proper size when possible.



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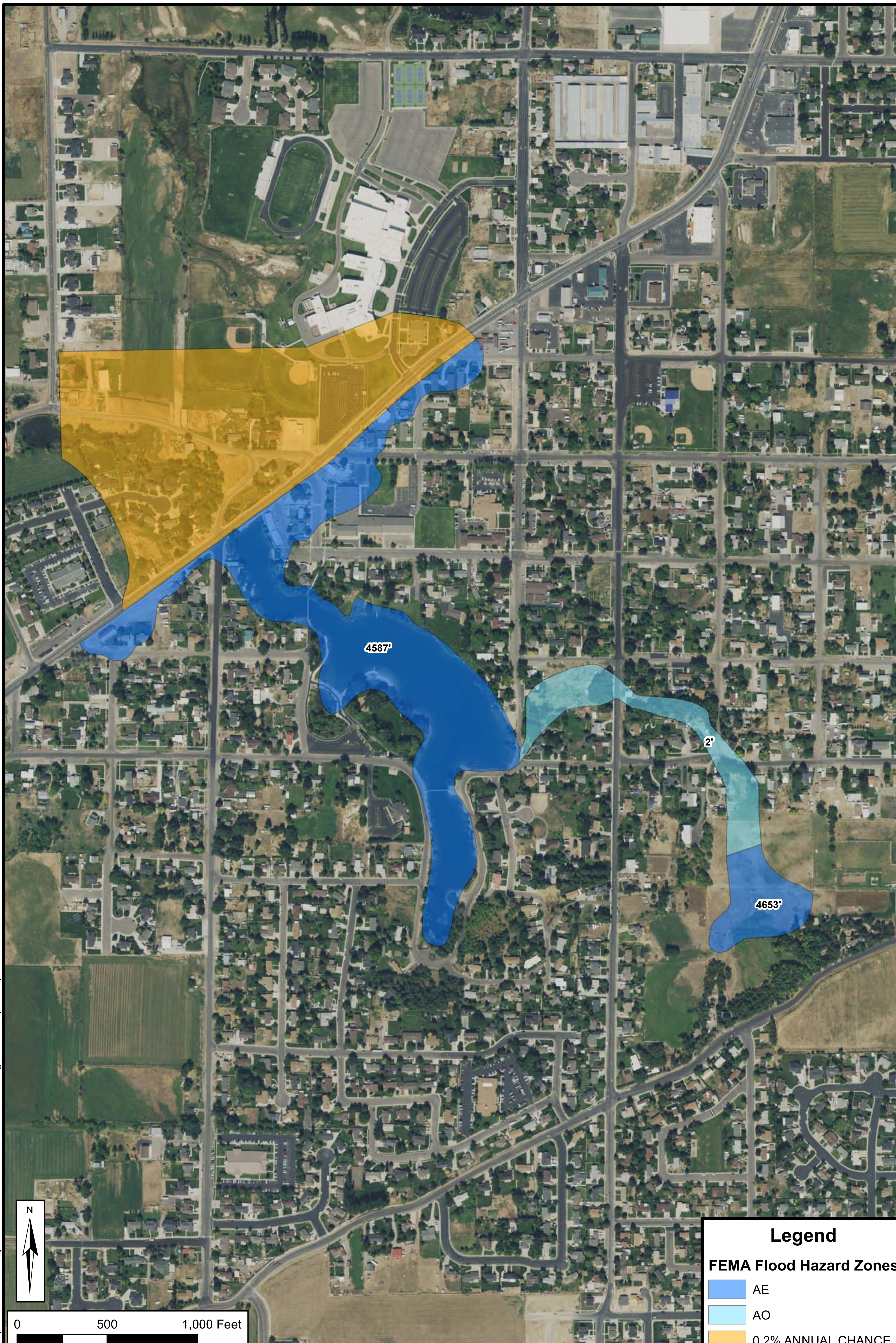
100-YR SURFACE FLOODING AND IMPACT ON PEOPLE

FIGURE 4-2



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FEMA FLOOD ZONES

FIGURE 4-3

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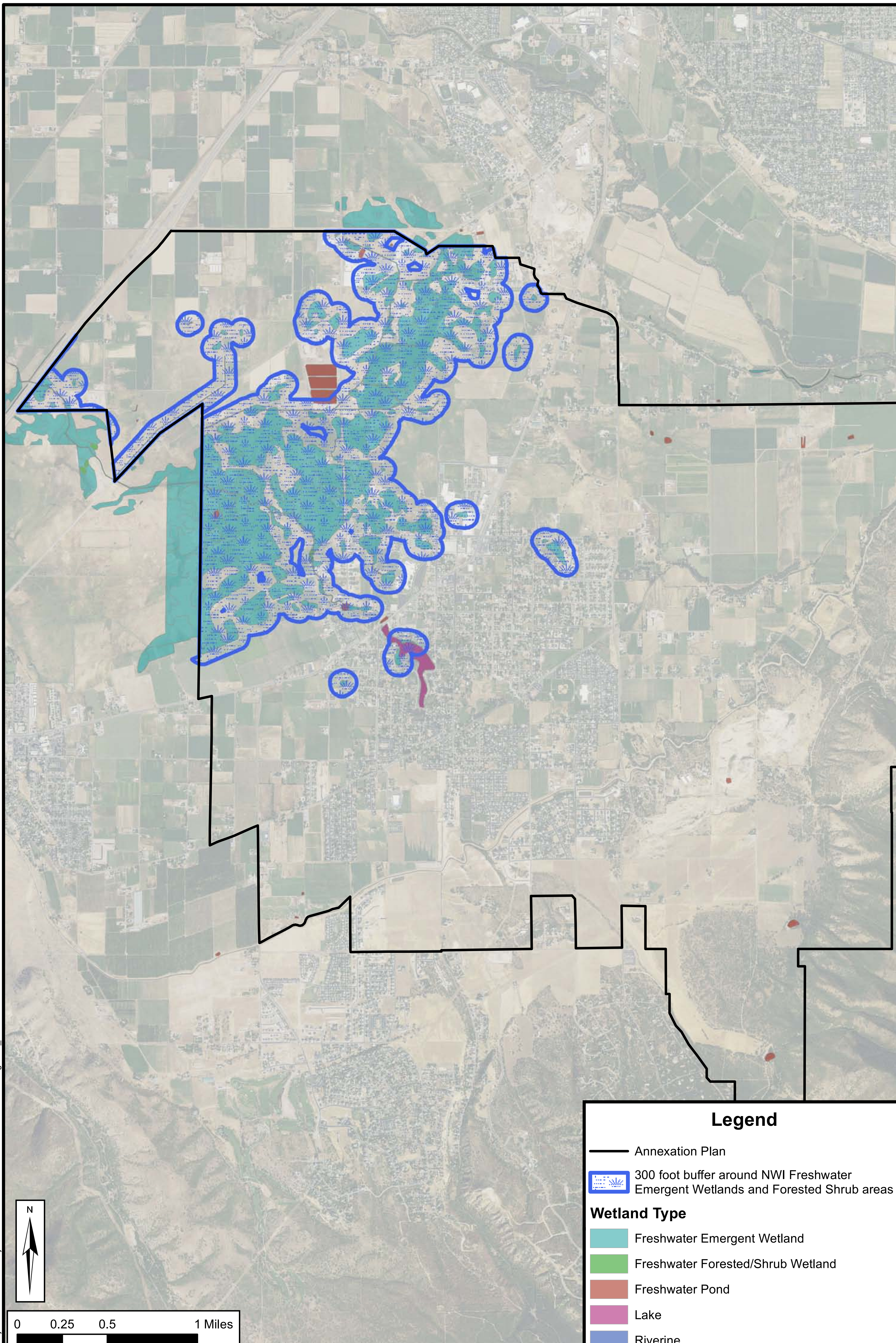

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300 FOOT BUFFER AROUND NWI WETLANDS

FIGURE 4-4

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CHAPTER 5 – CAPITAL IMPROVEMENT PLAN

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

PREFERRED DRAINAGE PLAN DEVELOPMENT

The project team held a workshop with City staff to evaluate the need for drainage improvements based on the deficiencies identified in Chapter 4. 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 storm drainage inadequacies,
- pre-screening drainage inadequacies,
- brainstorming possible solutions,
- screening alternatives based on feasibility and public acceptance,
- developing alternatives,
- comparing cost and function, and
- selecting the preferred alternative.

Design criteria included:

- 25-year design capacity for the initial drainage system. The initial drainage system includes inlets, laterals, minor trunk lines, gutters, and roadside ditches.
- 100-year capacity where flooding of homes may occur.
- 100-year capacity on major detention/retention, culverts, and major conveyance facilities (limited to storm drain hydraulic capacities).

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 $500,000 and $1,500,000. While this may seem very imprecise, the purpose of master planning is to develop general sizing, location, relative cost, and scheduling information on a number of 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 and 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 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 project is provided in Appendix B.

DETENTION BASIN AND CHANNEL SIZING

The preferred solutions presented in the capital improvement plan include a series of open channels and detention basins. These were sized using the 100-year modified Farmer-Fletcher 3-hr distribution, which governs the peak flows at the CIP scale. They were also sized based on an allowable release rate as shown in Figure 5-1. In general, the allowable release rate (shown in Figure 5-1) that has been selected by the City is 0.1 cfs/acre due to the limited capacity of culverts at the downstream end of the system. In a few cases, local downstream conveyance is more limited than the system conveyance; these areas have an allowable release rate of 0.05 cfs/acre.

The design of Beer Creek through the Public Works Department is recommended to mimic existing conditions. Based on information reported in Chapter 4, a maximum of 30 cfs is recommended for the Salem Pond release rate. As additional flood volume is planned to be stored in Salem Pond, the outlet works may necessitate revision. One concept could be to install a metal plate on the upstream side of UT-198 which has a low-level opening for equalization and a V-notch or stepped weir pattern to pass the high flows. Another concept would be to retrofit the current outlet works to have a gate which operates according to a depth obtained via SCADA.

Detention basin outlet size and elevation-area functions were designed to achieve a maximum depth of 3.5 feet and reduce peak flows to the allowable discharge. Outlets were modeled as

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DESIGN FLOWS FOR AND LOCATION OF CAPITAL IMPROVEMENT PROJECTS

FIGURE 5-1

concrete orifices with Manning's roughness values of 0.013. The entire orifice area is assumed in use at all depths. Volumes for regional detention found in Figure 5-1 and Table 5-1 are designed to serve a given area; development which comes in prior to regional detention will be responsible to provide onsite detention to the standard release rate. If detention basins are constructed in series, the downstream pond should be sized to handle the volume contribution from the upstream pond in addition to the storage required for local runoff. Volumes reported in Table 5-1 represent the magnitude if all regional ponds are not in series.

Trapezoidal channels were sized to accommodate the peak flows discharged by detention basins and junctions in HMS at normal depth. Manning's roughness values of 0.035 for all channels were used to represent vegetated and maintained channels. An average channel slope was used between the upstream and downstream ends of the channel, unless the average slope was steep enough to create erosion problems, in which case the recommended conveyance is pipe. Open channels with drop structures are also an option to dissipate the energy. Side slopes of 2H:1V were used for space efficiency and cost associated with acquiring land, while still allowing for channel maintenance. Channel bottom width and flow depth were sized such that normal depth generally did not exceed three feet and depth was roughly two times the hydraulic radius; this geometry achieves the greatest hydraulic and excavation volume efficiency. One foot of freeboard is included in the cost estimates for excavation and a twelve-foot access width is included in land acquisition costs.

CAPITAL IMPROVEMENT PLAN

Table 5-1 presents the recommended capital improvements which are shown in Figure 5-1. The projects in the Capital Improvement Plan have been planned at a conceptual level. The general concept behind these projects is to create regional solutions that address future stormwater management needs and reduce surface water flooding potential throughout the City. If regional conveyance facilities are not accessible, for any reason, the developer will be required to retain the 100-year volume on-site. The projects must go through a preliminary and final design process before construction. The CIP projects are designed to specify the channel, pipe, or detention pond size based on the required capacity as demonstrated in the model. CIP projects do not account for specific utility conflicts or inlet capacity. Utility conflicts and inlet capacity (type and number of inlets) should be determined during preliminary and final designs for each project. The preliminary and final designs should refer to the adopted storm drain criteria for the City. The criteria include guidelines for precipitation, inlet clogging, maximum velocities, sedimentation, erosion, and storage facilities, etc.

Table 5-1
Capital Improvement Plan

Project ID	Solution Type	Preferred Solution	Project Cost
Salem City Facilities			
P1	Open Channel	Install 0.49 miles of open channel (SS=2:1, Bottom width=1', depth=3') from 400 W to P2.	$606,000
P2	Pipe	Install 0.21 miles of 36" RCP from P1 to R1.	$483,000
P3	Pipe	Install 0.87 miles of 24"-36" pipe from R1 to R2.	$1,504,000
P4	Pipe	Install 0.35 miles of 36" pipe from R2 to P5.	$820,000
P5	Open Channel	Install 0.75 miles of open channel (SS=2:1, bottom width=1', depth=4') from P4 to Beer Creek.	$1,101,000
P6	Pipe	Install 0.71 miles of 24" RCP from Salem Canal Rd to Salem Pond through 300 W and Mtn View Dr.	$1,216,000

P7	Pipe	Install 0.26 miles of 24" RCP from Salem Canal Rd to Salem Pond through 100 E.	$436,000
P8	Pipe	Install 0.65 miles of 36" RCP from Salem Canal Rd to Salem Pond through 450 E and 300 S.	$1,926,000
P9	Pipe	Install 0.71 miles of 30" RCP from 100 E to Beer Creek through Center St.	$2,109,000
P10	Open Channel	Install 0.86 miles of open channel (SS=2:1, bottom width=1', depth=2.5') from 600 S to 9500 S along Woodland Hills Blvd.	$965,000
P11	Open Channel	Install 0.31 miles of open channel (SS=2:1, bottom width=1', depth=3') from P11 to R5.	$388,000
P12	Open Channel	Install 0.25 miles of open channel (SS=2:1, bottom width 1.5', depth=3') from R5 to P14.	$310,000
P13	Pipe	Install 0.01 miles of 18" RCP from P13 to Woodland Hills Blvd.	$14,000
P14	Open Channel	Install 0.54 miles of open channel (SS=2:1, bottom width 3', depth=3.5') from R5 to Woodland Hills Blvd.	$782,000
P15	Open Channel	Install 0.56 miles of open channel (SS=2:1, bottom width 2', depth=3.5') from Woodland Hills Blvd to P17.	$787,000
P16	Open Channel	Install 0.17 miles of open channel (SS=2:1, bottom width 1', depth=2.5') from P16 to R7.	$186,000
P17	Open Channel	Install 0.37 miles of open channel (SS=2:1, bottom width 1.2', depth=3.2') from 400 N to R7.	$477,000
P18	Pipe	Install 0.96 miles of 42" RCP from ~530 E to Beer Creek through 400 N.	$3,271,000
P19	Pipe	Install 0.36 miles of 48" RCP from R7 to P21.	$1,448,000
P20	Open Channel	Install 0.33 miles of open channel (SS=2:1, bottom width 1.5', depth=4') from P20 to P22.	$489,000
P21	Open Channel	Install 0.28 miles of open channel (SS=2:1, bottom width 1.3', depth=3.7') from P21 to P23.	$389,000
P22	Open Channel	Install 0.29 miles of open channel (SS=2:1, bottom width 18', depth=4.5') from P22 to P29.	$736,000
P23	Pipe	Install 0.45 miles of 24" RCP from R8 to P25.	$762,000
P24	Open Channel	Install 0.39 miles of open channel (SS=2:1, bottom width 1', depth=2.5') from P24 to P26.	$438,000
P25	Open Channel	Install 0.59 miles of open channel (SS=2:1, bottom width 2', depth=4') from P25 to P28.	$890,000
P26	Open Channel	Install 0.61 miles of open channel (SS=2:1, bottom width 1', depth=3.5') from ~Arrowhead Trail to P28.	$821,000
P27	Open Channel	Install 0.19 miles of open channel (SS=2:1, bottom width 5', depth=4') from P27 to P29.	$315,000
P28	Open Channel	Install 0.80 miles of open channel (SS=2:1, bottom width 25', depth=5') from P28 to Salem City limits.	$2,413,000
P29	Open Channel	Install 1.08 miles of open channel (SS=2:1, bottom width 1', depth=3') along Arrowhead Trail.	$1,558,000
P30	Pipe	Install 0.38 miles of 42" RCP connecting to P30.	$1,312,000
P31	Pipe	Install 1.78 miles of 18"–42" RCP along Salem Canal Road.	$5,460,000
P32	Open Channel	Install 1.28 miles of open channel (SS=2:1, bottom width 25', depth=5')	$1,861,000
R1	Detention	Install 6.0 AF of storage at west end of annexation boundary and Salem Canal Rd.	$937,000

R2	Detention	Install 4.1 AF of storage on Elk Ridge Dr midway between SR 198 and Salem Canal Road.	$813,000
R3	Detention	Install 4.5 AF of storage SE of Salem Canal Rd and 250 W.	$707,000
R4	Detention	Modify outlet works on Salem Pond. Install low level equalization outlet with stepped weir for flood flows. Concept design of 1.5' deep, 5.5' wide to accommodate releases up to the 100-year event.	$130,000
R5	Detention	Install 8.2 AF of storage near 500 N and Woodland Hills Blvd.	$1,268,000
R6	Detention	Install 20.2 AF of storage near 700 N and 400 E.	$3,041,000
R7	Detention	Install 4.1 AF of storage near SR 198 and 700 N.	$887,000
R8	Detention	Install 1.6 AF of storage near SR 198 and 8400 S.	$271,000
R9	Detention	Utilize 12.0 AF of storage near 400 N and 460 W.	$1,435,000
		Salem City Facilities Projects Subtotal	**$45,762,000**

The priority of a project was not determined in this Master Plan and should be determined by the City as needed. Factors determining project prioritization may include existing flooding, flooding history, development plans in the area, and capacity determined by the model.

SUMMARY OF CAPITAL IMPROVEMENTS

Costs of the Capital Improvements are summarized in Table 5-2. These costs, as well as those presented in Table 5-1, include 30% for engineering and contingency.

Table 5-2
Capital Improvement Plan Summary

Project Type	Cost ($)
Channels	$15,512,000
Pipes	$20,761,000
Reservoirs	$9,489,000
Total Cost	**$45,762,000**

OPTIONAL BENEFIT

To provide an additional benefit to the City, a paved trail could be constructed with the primary purpose of recreation. The access (land) required to maintain the channels (an eight-foot-wide access trail with four feet of additional clearance) is included in the channel costs above. Adding pavement would provide a pedestrian connection within the community and allow for an opportunity for walkers, runners, and bikers to enjoy the outdoors in Salem. The paved trail has not been costed in with the above projects. A 4" thick, 8-wide asphalt trail would cost approximately $24 per linear foot assuming asphalt with install costs $120/ton. If these trails are constructed along all open channel conveyances, the trail network would cost approximately **$1,068,300**. The trail could be constructed at the same time as the channels and would provide paved access for the city to maintain the channels.

OPERATIONAL RECOMMENDATIONS

Minimum Pipe Diameter

Some of the storm drain pipes in Salem are 15 inches in diameter or less. Previous experience and the pipe capacity spreadsheet have shown that many 15-inch pipes do not have the capacity to convey the 25-year flows. The City has selected a diameter of 18 inches as the standard minimum for future City facilities.

Inventory

This master plan did not include a field survey of Salem storm drain facilities. It is recommended that the City maintain and update the GIS inventory of the storm drainage system as the system is replaced or expanded. Updates should occur as information about additional land use, conveyance, capacity, and detention data become available. If a more accurate underground capacity evaluation is desired, it is recommended to conduct a field survey prior to or with the next Master Plan.

Irrigation and Storm Drain Conveyances

Some areas of the Salem Storm Drainage System have conveyances which have historically served as both storm drain facilities and irrigation facilities. Intentional discharge into these conveyances is discouraged and it is recommended that an ongoing effort be made to separate storm drainage conveyances from irrigation conveyances in addition to the recommended projects in the Capital Improvement Plan.

Salem Canal is currently under the design phase to be piped with cooperation with Central Utah Water Conservancy District. Costs for roadway improvements are not included in this Master Plan which will also occur as part of this project. It is anticipated that CUWCD will share in these project costs.

Channel Erosion Control

When open channels require drop structures to prevent erosion, please refer to the UDFCD Urban Storm Drainage Criteria Manual: Volume 2: Structures, Storage, and Recreation for detailed drop structure design. Additionally, each channel should be seeded with low-maintenance, drought-resistant vegetation and grasses which will not require irrigation and will survive on the annual rainfall alone. It is anticipated that the selected vegetation may require mowing 2-4 times per year.

Watch and Maintenance Recommendations

In addition to the above proposed projects, it is recommended that the existing system be inspected at least annually with more frequent inspection for problematic areas. A maintenance schedule for the system deficiencies could include removing debris, sediment, and clearing weed growth as needed to keep the inlets and surface drainage courses functioning or until corrective CIP projects can be completed.

A substantial majority of the proposed conveyance channels and detention basins are on private property. These channels and detention basins would significantly impact the Storm Water System and their failure or improper function could cause flooding within the City. Agreements should be made with the property owners to allow City personnel to construct and maintain the channels and detention basins. The channels and basins should be evaluated annually to determine if sediment deposits are affecting the capacity of the basin, and if so, maintenance efforts should include removing sediment. Deficiencies identified as not warranting action include 15, 16, 17, 41, and 42. These deficiencies should be monitored for future flooding. If conditions become unacceptable, a project should be added to the CIP to remedy the deficiency.

Storm Water Quality Management Plan

Salem City is listed as an MS4 (UPDES Permit ID: UTR 090064) on the Utah MS4 List (06/28/18); therefore, Salem is required to develop a Storm Water Management Plan in accordance with Utah's Utah Pollutant Discharge Elimination System (UPDES) permit which they have published and revised in 2016. Chapter 6 will further discuss how the City will approach improving stormwater quality into the future.

Storm Water Master Plan Updates

The Storm Water Master Plan should be periodically reviewed and updated dependent upon change and new development, at least every 5 years.

CHAPTER 6 – STORM WATER QUALITY

STORM WATER MANAGEMENT PLAN REQUIREMENTS

Salem is included in the Utah MS4 list and is required to meet UPDES Permit UTR 090064 standards. Therefore, this chapter is included to help Salem identify how they are meeting the requirements of the MS4 permit and implementing LID into their development requirements. The UPDES permit is intended to reduce discharge of pollutants through the storm drainage system to the maximum extent possible (MEP). The permit helps cities reduce pollutants by requiring a Storm Water Management Plan (SWMP) and offering suggestions of best management practices (BMPs). This Storm Water Master Plan does **NOT** constitute a Storm Water Management Plan.

LID PLANNING AND IMPLEMENTATION

The City of Salem has taken initial steps to promote stormwater quality and meet the requirements of their MS4 permit. They have an existing Storm Water Management Plan (SWMP) with the latest revision occurring in 2016 that addresses many key items including: public education, public engagement, public outreach, illicit discharge detection and elimination (IDDE), construction site storm water runoff control, post construction stormwater management, pollution prevention, and record keeping. The intent of the SWMP is to limit to the maximum extent possible the discharge of pollutants to the Salem City Municipal Separate Storm Sewer System (MS4).

Pursuant Section 4.2.1.6 of the SWMP Low Impact Development (LID) practices were reviewed and incorporated into the overall master planning effort. Utah Department of Environmental Quality Division of Water Quality has produced a draft document titled “A Guide to Low Impact Development within Utah” dated September 2018 (referred to hereafter as “Utah LID guide”). Salem City will use this document to guide LID applications within their City. Developers should familiarize themselves with this document and the principles contained therein.

LID principles should be applied to all development and redevelopment activities that are greater than one acre where possible. There are many different LID applications that can be applied to various situations. These concepts are often referred to as Best Management Practices (BMPs). LID BMPs are long-term structures, graded features, or practices that are designed to retain and/or treat runoff close to its origin after construction is complete. The following is a list of common BMPs that have been successfully implemented in various locations.

- Rain Garden
- Bioretention Cell
- Bioswale
- Vegetated Strip
- Tree Box Filter
- Green Roof
- Pervious Surface
- Infiltration Basin
- Infiltration Trench
- Dry Well
- Underground Infiltration Devices
- Harvest and Reuse

Careful planning in the design phase of each project makes for easier implementation of LID BMPs. Typically, LID BMPs function best when the soils have high infiltration rates and the slopes are less than 2%. Per the Utah LID guide "Soil conditions will determine if certain LID approaches are feasible. Soils that are classified as Hydrologic Soil Group 'A' are generally acceptable soils for bioretention and infiltration BMPs. 'B' Soils may not be acceptable for infiltration and bioretention. 'C' and 'D' soils generally are not. The Hydrologic Soil Group is a planning level analysis of soils." Figure 6-1 shows areas in Salem where the application of LID BMPs are most favorable based on a combination of the hydrologic soil group and slope. Additional site considerations when planning LID applications include high groundwater levels, existing drainage patterns, existing pervious areas and vegetation, reduction of impervious surfaces, disconnected impervious areas, and curb cuts.

CITY-REQUIRED LID VOLUME

The City has chosen to require on-site retention of the 90th Percentile Volume. The Utah LID guide refers to the "90th Percentile Volume" as the goal for volume retained onsite by LID BMPs. Simply stated the 90th percentile volume represents a threshold precipitation depth in which 90 percent of historical storm precipitation totals at a particular rain gage are less than the established threshold precipitation depth. The 90th percentile volume was calculated for the City of Salem based on the Spanish Fork Powerhouse rain gage. This gage has more than 30 years of data as recommended in the Utah LID guide. The total period of record was analyzed and sorted to establish the 90th percentile threshold precipitation depth. Figure 6-2 shows the precipitation depths along with their probability of occurrence. According to the dataset the 90th percentile volume is approximately 0.7 inches.

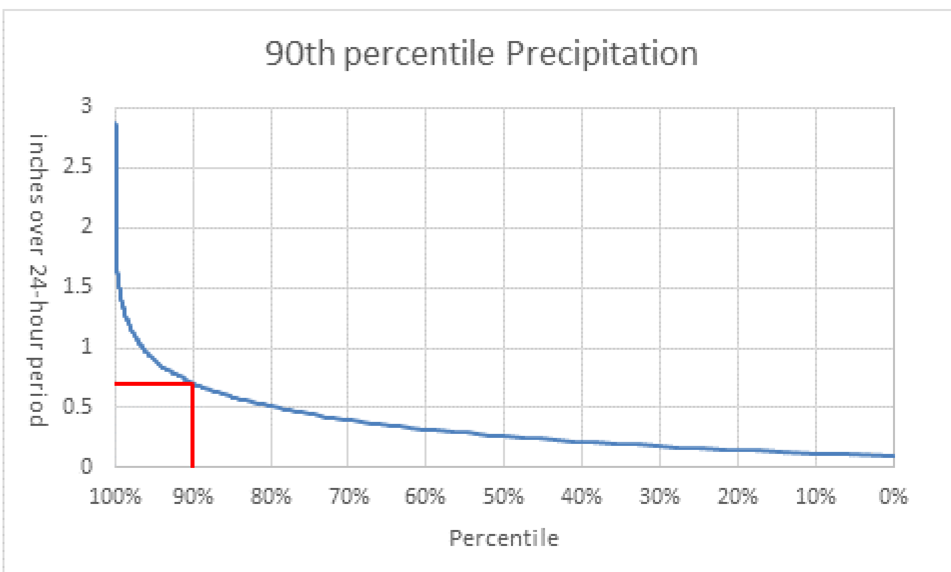
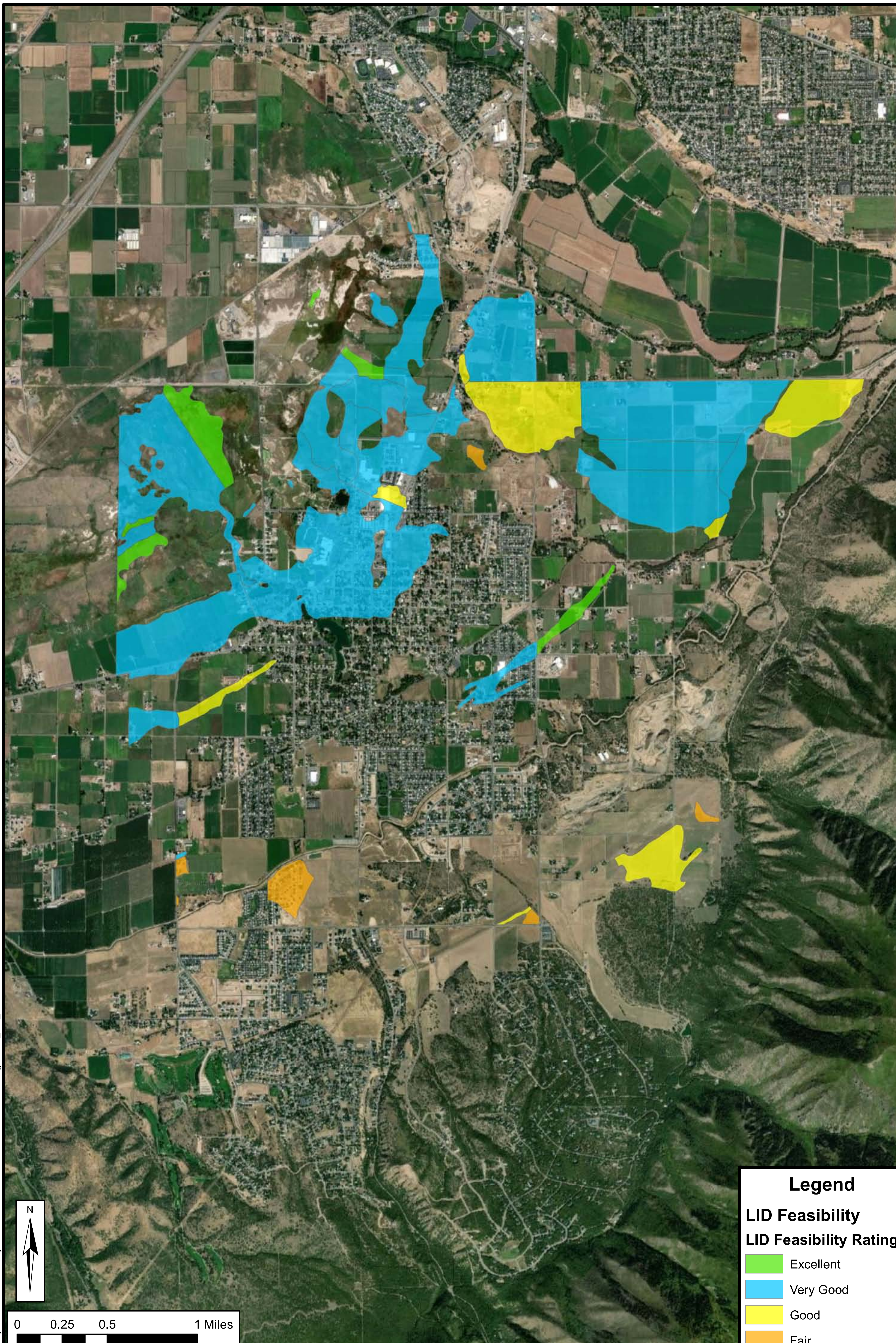


Figure 6-2. 90th Percentile Precipitation Depth Analysis for the Spanish Fork Powerhouse Rain Gage

Water quality is the main purpose for the implementation of the LID BMPs to capture the 90th percentile runoff volume. The larger design storm events produce a much greater volume and the retainage of the 90th percentile storm has little to no impact on anticipated peak flows from the 25-year event. The proposed regional detention facilities described in Chapter 5 account for the volume reductions the future LID BMPs are anticipated to provide during a 100-year event. The goal of LID BMPs is to retain the runoff volume of a 90th percentile storm rather than the entire precipitation depth. The Utah LID guide provides recommendations for estimating runoff volume



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LID FEASIBILITY RATING MAP

FIGURE 6-1

Date: 5/3/2021
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based on percent impervious and hydrologic soil group. Table 6-1 details the anticipated 90th percentile runoff volume (in inches) for varying levels of percent impervious assuming a minimum runoff volume of 0.1 inches. The 90th percentile runoff in inches is then multiplied by the area of the development to determine the required on-site volume retention using LID BMPs.

Table 6-3. 90th Percentile Runoff Volume based on Percent Impervious

Percent Impervious (%)	90th Percentile Runoff Volume (in.)
10	0.10
20	0.10
30	0.15
40	0.21
50	0.27
60	0.33
70	0.39
80	0.46
90	0.52
100	0.59

The success of retention will be based on three primary factors: infiltration capacity, inlet capacity and effectiveness, and volume sufficiency. If the site is unable to retain the required volume due to site limitations a local detention option may be approved at the discretion of the City. For flood control purposes, if regional conveyance facilities do not exist for an area, the site will be required to retain the 100-year runoff volume.

Because it is possible that the inlets will become plugged and/or the volume provided will be insufficient in some event, it is recommended that the City require developers to plan for an overflow situation where the excess water can be conveyed to a safe location. All inlets should be free from debris and construction materials. The inlet grate should be inspected for debris and oriented with the flow.

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APPENDIX A
Precipitation Data

NOAA Atlas 14, Volume 1, Version 5
Location name: Salem, Utah, USA*
Latitude: 40.047°, Longitude: -111.6651°
Elevation: 4711.96 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**0.126** (0.109-0.149)	**0.161** (0.140-0.192)	**0.224** (0.192-0.265)	**0.279** (0.237-0.331)	**0.364** (0.302-0.435)	**0.442** (0.358-0.530)	**0.531** (0.421-0.642)	**0.635** (0.487-0.776)	**0.800** (0.585-0.994)	**0.946** (0.667-1.20)
10-min	**0.192** (0.166-0.227)	**0.246** (0.213-0.292)	**0.340** (0.292-0.403)	**0.424** (0.361-0.504)	**0.554** (0.459-0.662)	**0.672** (0.545-0.807)	**0.808** (0.640-0.977)	**0.966** (0.740-1.18)	**1.22** (0.890-1.51)	**1.44** (1.01-1.82)
15-min	**0.238** (0.206-0.282)	**0.305** (0.264-0.362)	**0.421** (0.362-0.500)	**0.525** (0.446-0.625)	**0.687** (0.569-0.821)	**0.833** (0.676-1.00)	**1.00** (0.793-1.21)	**1.20** (0.917-1.46)	**1.51** (1.10-1.88)	**1.79** (1.26-2.26)
30-min	**0.321** (0.278-0.380)	**0.410** (0.355-0.487)	**0.567** (0.487-0.673)	**0.708** (0.601-0.842)	**0.925** (0.767-1.11)	**1.12** (0.910-1.35)	**1.35** (1.07-1.63)	**1.61** (1.24-1.97)	**2.03** (1.49-2.53)	**2.40** (1.69-3.04)
60-min	**0.397** (0.344-0.470)	**0.507** (0.439-0.603)	**0.702** (0.602-0.833)	**0.876** (0.744-1.04)	**1.15** (0.949-1.37)	**1.39** (1.13-1.67)	**1.67** (1.32-2.02)	**2.00** (1.53-2.44)	**2.51** (1.84-3.13)	**2.98** (2.10-3.77)
2-hr	**0.495** (0.436-0.575)	**0.621** (0.547-0.721)	**0.823** (0.721-0.958)	**1.00** (0.871-1.17)	**1.30** (1.10-1.51)	**1.55** (1.29-1.83)	**1.86** (1.50-2.20)	**2.20** (1.72-2.65)	**2.76** (2.06-3.38)	**3.26** (2.34-4.08)
3-hr	**0.571** (0.510-0.653)	**0.711** (0.636-0.814)	**0.910** (0.811-1.04)	**1.09** (0.964-1.25)	**1.38** (1.19-1.58)	**1.62** (1.37-1.88)	**1.91** (1.59-2.24)	**2.25** (1.82-2.67)	**2.81** (2.18-3.40)	**3.31** (2.48-4.10)
6-hr	**0.736** (0.668-0.824)	**0.908** (0.823-1.02)	**1.12** (1.01-1.25)	**1.30** (1.17-1.46)	**1.56** (1.38-1.76)	**1.79** (1.57-2.03)	**2.05** (1.76-2.36)	**2.36** (1.99-2.73)	**2.89** (2.37-3.42)	**3.37** (2.69-4.14)
12-hr	**0.939** (0.857-1.04)	**1.15** (1.05-1.28)	**1.40** (1.27-1.55)	**1.60** (1.45-1.78)	**1.90** (1.70-2.11)	**2.13** (1.88-2.38)	**2.37** (2.08-2.68)	**2.66** (2.29-3.04)	**3.12** (2.63-3.62)	**3.52** (2.91-4.19)
24-hr	**1.18** (1.09-1.27)	**1.45** (1.34-1.57)	**1.74** (1.62-1.88)	**1.98** (1.83-2.14)	**2.30** (2.12-2.49)	**2.55** (2.34-2.76)	**2.80** (2.56-3.03)	**3.05** (2.78-3.31)	**3.38** (3.06-3.68)	**3.63** (3.26-4.23)
2-day	**1.31** (1.22-1.42)	**1.61** (1.50-1.74)	**1.94** (1.81-2.10)	**2.22** (2.06-2.39)	**2.60** (2.40-2.80)	**2.89** (2.66-3.12)	**3.20** (2.93-3.45)	**3.51** (3.19-3.79)	**3.93** (3.54-4.27)	**4.26** (3.81-4.64)
3-day	**1.44** (1.34-1.56)	**1.77** (1.64-1.92)	**2.14** (1.99-2.33)	**2.46** (2.27-2.66)	**2.89** (2.66-3.13)	**3.23** (2.96-3.50)	**3.59** (3.27-3.89)	**3.95** (3.58-4.30)	**4.46** (4.00-4.87)	**4.85** (4.31-5.32)
4-day	**1.57** (1.45-1.71)	**1.93** (1.79-2.10)	**2.34** (2.17-2.55)	**2.69** (2.48-2.93)	**3.18** (2.92-3.46)	**3.57** (3.26-3.89)	**3.98** (3.62-4.34)	**4.40** (3.97-4.81)	**4.98** (4.45-5.46)	**5.44** (4.82-6.00)
7-day	**1.84** (1.70-1.99)	**2.26** (2.10-2.45)	**2.73** (2.53-2.96)	**3.12** (2.89-3.38)	**3.66** (3.37-3.95)	**4.07** (3.74-4.40)	**4.50** (4.12-4.87)	**4.93** (4.49-5.35)	**5.51** (4.97-6.00)	**5.97** (5.33-6.52)
10-day	**2.07** (1.93-2.23)	**2.55** (2.37-2.75)	**3.06** (2.85-3.29)	**3.47** (3.23-3.74)	**4.03** (3.74-4.33)	**4.45** (4.11-4.78)	**4.87** (4.49-5.24)	**5.29** (4.85-5.71)	**5.85** (5.32-6.34)	**6.27** (5.67-6.81)
20-day	**2.77** (2.57-2.98)	**3.41** (3.17-3.67)	**4.06** (3.78-4.38)	**4.58** (4.26-4.92)	**5.24** (4.87-5.63)	**5.73** (5.31-6.16)	**6.20** (5.73-6.67)	**6.66** (6.14-7.18)	**7.24** (6.65-7.84)	**7.66** (7.01-8.31)
30-day	**3.36** (3.14-3.61)	**4.13** (3.86-4.44)	**4.93** (4.60-5.29)	**5.58** (5.20-5.98)	**6.42** (5.97-6.88)	**7.05** (6.54-7.57)	**7.68** (7.10-8.25)	**8.30** (7.64-8.94)	**9.11** (8.32-9.85)	**9.70** (8.81-10.5)
45-day	**4.21** (3.93-4.52)	**5.17** (4.82-5.55)	**6.12** (5.71-6.57)	**6.86** (6.40-7.35)	**7.81** (7.28-8.37)	**8.51** (7.91-9.13)	**9.20** (8.52-9.87)	**9.85** (9.10-10.6)	**10.7** (9.82-11.5)	**11.3** (10.3-12.2)
60-day	**5.07** (4.73-5.42)	**6.22** (5.82-6.67)	**7.36** (6.87-7.88)	**8.22** (7.67-8.80)	**9.32** (8.68-9.97)	**10.1** (9.39-10.8)	**10.9** (10.1-11.7)	**11.6** (10.7-12.4)	**12.5** (11.5-13.4)	**13.1** (12.0-14.1)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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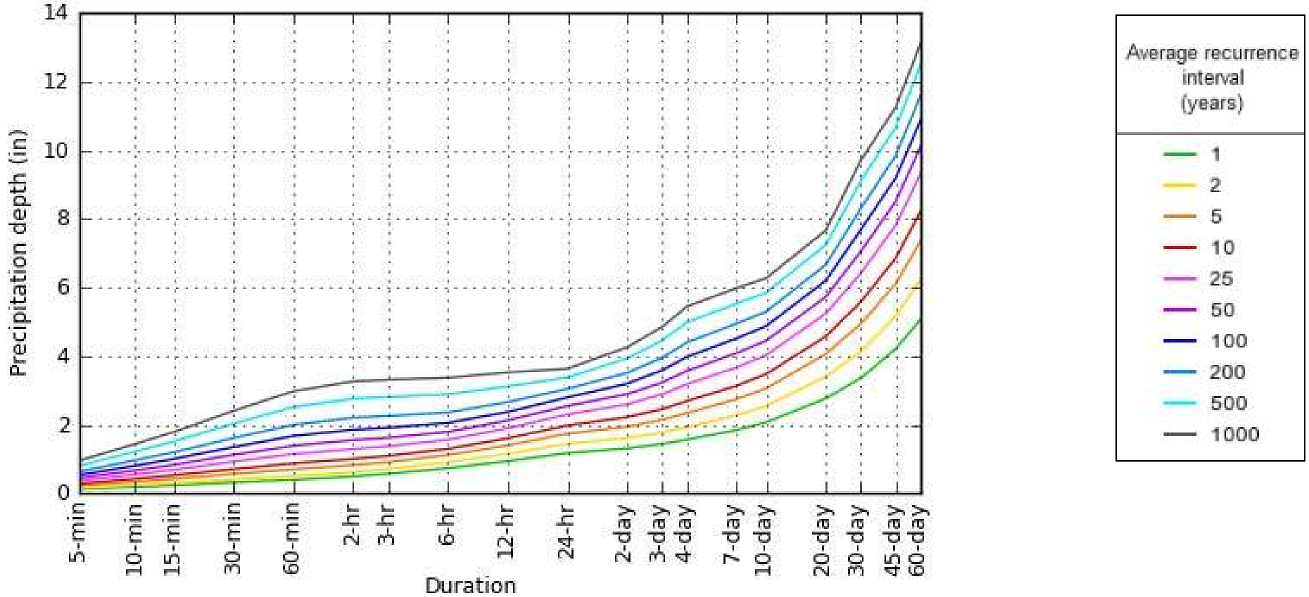
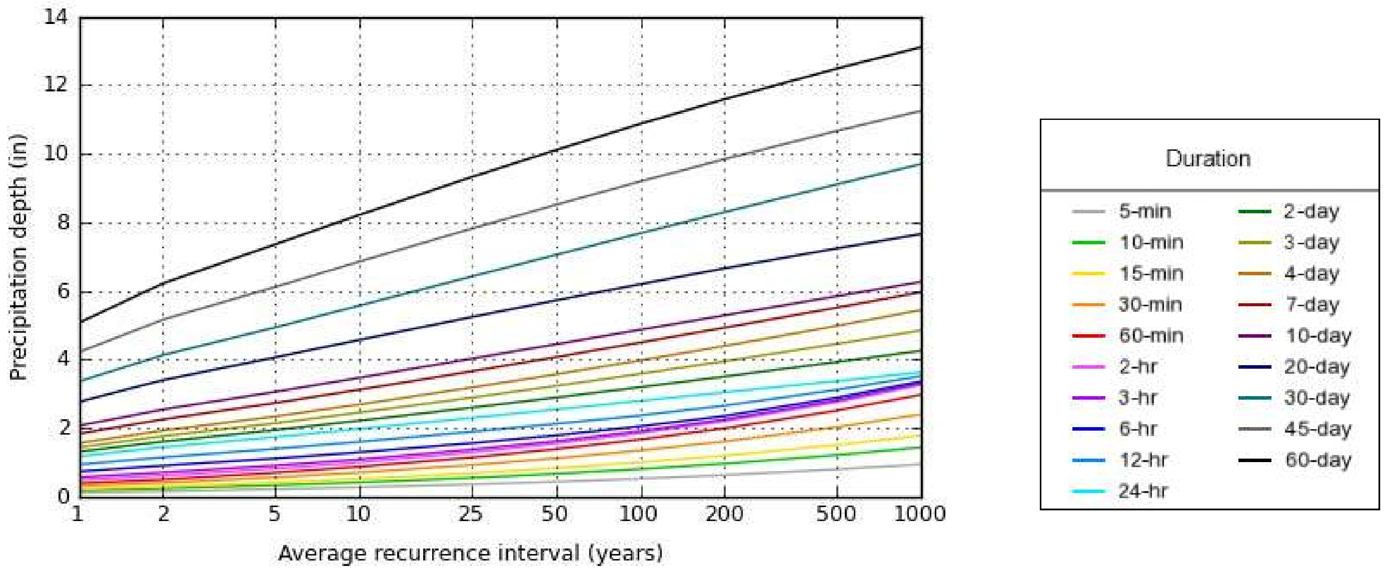
PF graphical

PDS-based depth-duration-frequency (DDF) curves
Latitude: 40.0470°, Longitude: -111.6651°





NOAA Atlas 14, Volume 1, Version 5

Created (GMT): Fri Apr 19 15:38:28 2019

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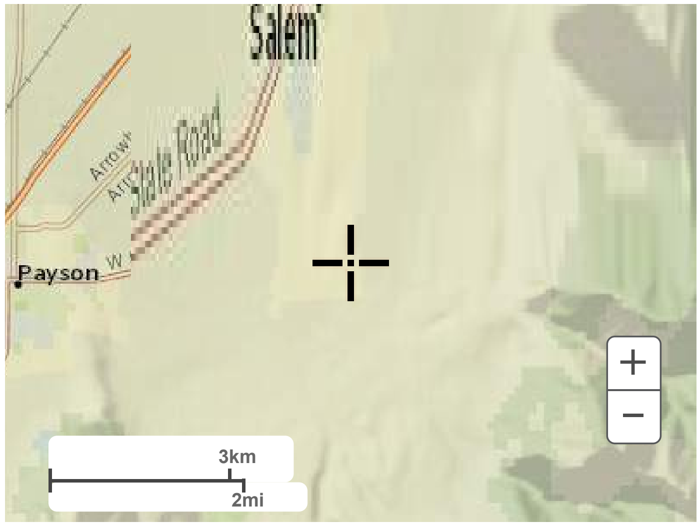
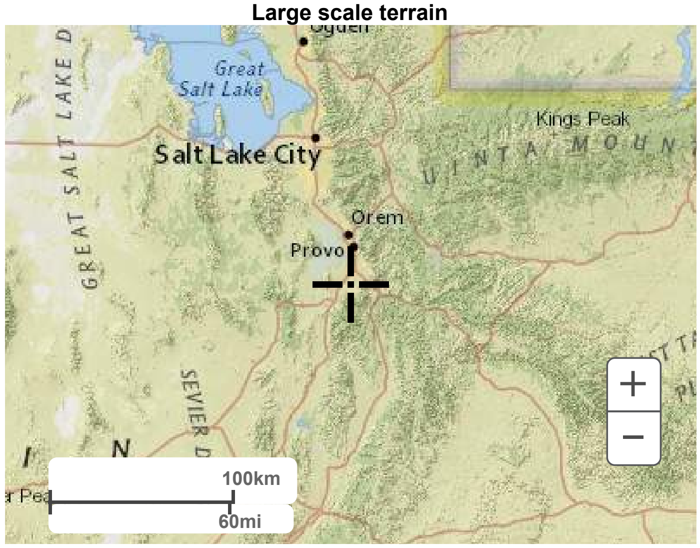
Maps & aerials

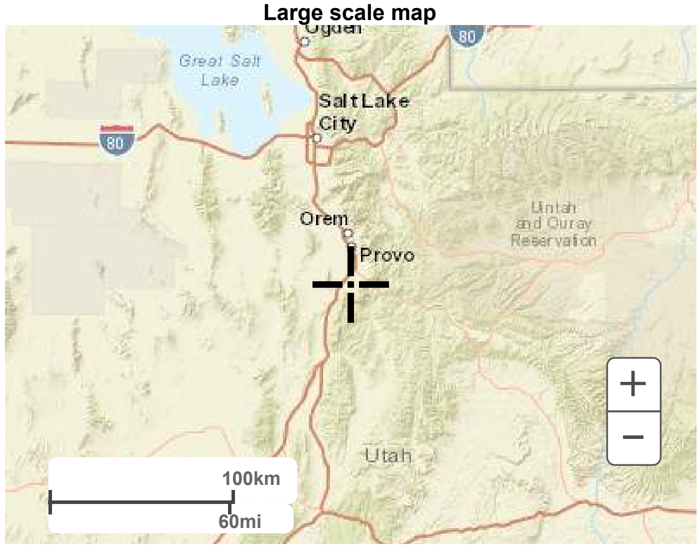
Small scale terrain



Large scale terrain



Large scale map



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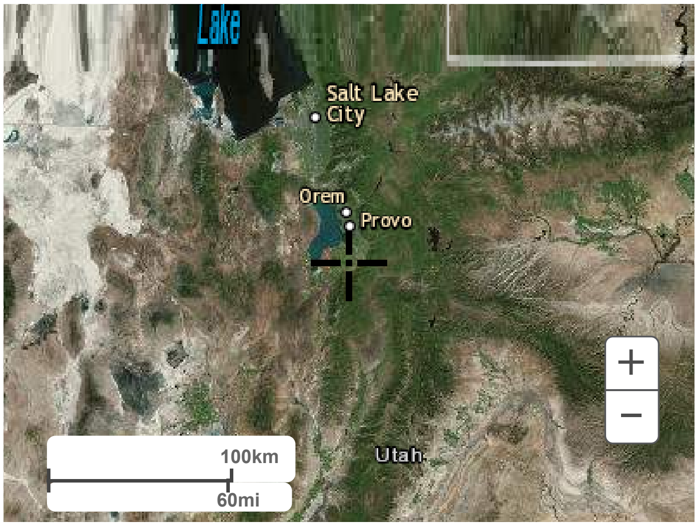

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US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
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1325 East West Highway
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Questions?: HDSC.Questions@noaa.gov

Disclaimer

NOAA Atlas 14, Volume 1, Version 5
Location name: Salem, Utah, USA*
Latitude: 40.0103°, Longitude: -111.6118°
Elevation: m/ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**0.141** (0.122-0.167)	**0.180** (0.156-0.214)	**0.248** (0.213-0.294)	**0.308** (0.262-0.365)	**0.399** (0.331-0.475)	**0.480** (0.390-0.574)	**0.574** (0.456-0.690)	**0.681** (0.525-0.829)	**0.852** (0.628-1.06)	**1.01** (0.713-1.27)
10-min	**0.214** (0.186-0.254)	**0.274** (0.238-0.325)	**0.378** (0.324-0.447)	**0.468** (0.398-0.555)	**0.607** (0.504-0.723)	**0.730** (0.594-0.874)	**0.872** (0.693-1.05)	**1.04** (0.799-1.26)	**1.30** (0.955-1.61)	**1.53** (1.09-1.93)
15-min	**0.266** (0.230-0.315)	**0.340** (0.295-0.403)	**0.468** (0.401-0.554)	**0.580** (0.494-0.689)	**0.752** (0.625-0.896)	**0.905** (0.736-1.08)	**1.08** (0.859-1.30)	**1.29** (0.990-1.56)	**1.61** (1.18-1.99)	**1.90** (1.35-2.40)
30-min	**0.358** (0.310-0.424)	**0.458** (0.397-0.543)	**0.631** (0.541-0.746)	**0.781** (0.665-0.927)	**1.01** (0.841-1.21)	**1.22** (0.991-1.46)	**1.46** (1.16-1.75)	**1.73** (1.33-2.11)	**2.17** (1.59-2.68)	**2.56** (1.81-3.23)
60-min	**0.443** (0.383-0.525)	**0.566** (0.491-0.672)	**0.781** (0.669-0.924)	**0.967** (0.823-1.15)	**1.25** (1.04-1.49)	**1.51** (1.23-1.81)	**1.80** (1.43-2.17)	**2.14** (1.65-2.61)	**2.68** (1.97-3.32)	**3.17** (2.24-4.00)
2-hr	**0.563** (0.495-0.656)	**0.711** (0.622-0.826)	**0.936** (0.815-1.09)	**1.14** (0.981-1.33)	**1.46** (1.23-1.71)	**1.74** (1.44-2.05)	**2.07** (1.67-2.46)	**2.44** (1.91-2.94)	**3.04** (2.27-3.72)	**3.59** (2.58-4.48)
3-hr	**0.667** (0.594-0.766)	**0.833** (0.740-0.954)	**1.06** (0.937-1.22)	**1.26** (1.11-1.46)	**1.59** (1.37-1.83)	**1.86** (1.58-2.16)	**2.19** (1.82-2.57)	**2.57** (2.08-3.05)	**3.19** (2.48-3.86)	**3.75** (2.82-4.62)
6-hr	**0.887** (0.802-0.994)	**1.09** (0.989-1.23)	**1.33** (1.20-1.50)	**1.55** (1.39-1.74)	**1.85** (1.63-2.09)	**2.11** (1.85-2.40)	**2.42** (2.08-2.78)	**2.78** (2.35-3.22)	**3.37** (2.78-3.99)	**3.91** (3.15-4.70)
12-hr	**1.17** (1.07-1.30)	**1.44** (1.31-1.60)	**1.74** (1.58-1.93)	**2.00** (1.80-2.22)	**2.35** (2.10-2.63)	**2.64** (2.33-2.96)	**2.94** (2.57-3.32)	**3.30** (2.84-3.77)	**3.88** (3.27-4.51)	**4.40** (3.65-5.18)
24-hr	**1.40** (1.28-1.53)	**1.73** (1.58-1.89)	**2.08** (1.91-2.28)	**2.37** (2.17-2.59)	**2.76** (2.51-3.02)	**3.06** (2.78-3.35)	**3.37** (3.04-3.69)	**3.67** (3.30-4.04)	**4.08** (3.63-4.54)	**4.44** (3.89-5.24)
2-day	**1.66** (1.53-1.82)	**2.05** (1.88-2.24)	**2.49** (2.28-2.74)	**2.87** (2.62-3.14)	**3.39** (3.08-3.72)	**3.80** (3.43-4.17)	**4.23** (3.80-4.65)	**4.68** (4.17-5.15)	**5.30** (4.67-5.87)	**5.78** (5.05-6.43)
3-day	**1.89** (1.73-2.07)	**2.33** (2.14-2.57)	**2.86** (2.62-3.15)	**3.31** (3.01-3.64)	**3.94** (3.57-4.33)	**4.44** (4.00-4.89)	**4.96** (4.45-5.48)	**5.52** (4.90-6.10)	**6.29** (5.52-6.98)	**6.90** (6.00-7.70)
4-day	**2.11** (1.93-2.33)	**2.62** (2.40-2.89)	**3.23** (2.95-3.57)	**3.75** (3.41-4.14)	**4.48** (4.06-4.95)	**5.07** (4.56-5.61)	**5.70** (5.09-6.30)	**6.35** (5.63-7.05)	**7.28** (6.37-8.10)	**8.02** (6.95-8.96)
7-day	**2.60** (2.39-2.86)	**3.23** (2.96-3.55)	**3.98** (3.64-4.38)	**4.61** (4.20-5.07)	**5.48** (4.96-6.03)	**6.18** (5.56-6.81)	**6.91** (6.18-7.63)	**7.67** (6.81-8.48)	**8.72** (7.65-9.70)	**9.57** (8.30-10.7)
10-day	**3.02** (2.78-3.30)	**3.75** (3.45-4.10)	**4.57** (4.19-5.01)	**5.25** (4.81-5.76)	**6.17** (5.62-6.76)	**6.89** (6.25-7.56)	**7.63** (6.88-8.39)	**8.39** (7.51-9.26)	**9.43** (8.35-10.4)	**10.3** (9.00-11.4)
20-day	**4.18** (3.86-4.53)	**5.18** (4.78-5.62)	**6.26** (5.76-6.80)	**7.10** (6.52-7.73)	**8.22** (7.52-8.95)	**9.07** (8.27-9.89)	**9.92** (9.00-10.8)	**10.8** (9.73-11.8)	**11.9** (10.6-13.1)	**12.7** (11.3-14.1)
30-day	**5.13** (4.75-5.54)	**6.35** (5.88-6.87)	**7.68** (7.09-8.32)	**8.75** (8.07-9.48)	**10.2** (9.36-11.0)	**11.3** (10.3-12.3)	**12.4** (11.3-13.5)	**13.6** (12.2-14.8)	**15.1** (13.5-16.5)	**16.2** (14.4-17.9)
45-day	**6.52** (6.03-7.05)	**8.05** (7.44-8.71)	**9.65** (8.91-10.5)	**10.9** (10.1-11.9)	**12.6** (11.6-13.7)	**13.9** (12.7-15.1)	**15.2** (13.8-16.6)	**16.6** (14.9-18.1)	**18.4** (16.4-20.2)	**19.8** (17.5-21.8)
60-day	**7.87** (7.31-8.49)	**9.73** (9.04-10.5)	**11.7** (10.8-12.6)	**13.1** (12.1-14.2)	**15.0** (13.8-16.3)	**16.5** (15.1-17.9)	**17.9** (16.3-19.5)	**19.3** (17.5-21.1)	**21.2** (19.1-23.2)	**22.6** (20.2-24.9)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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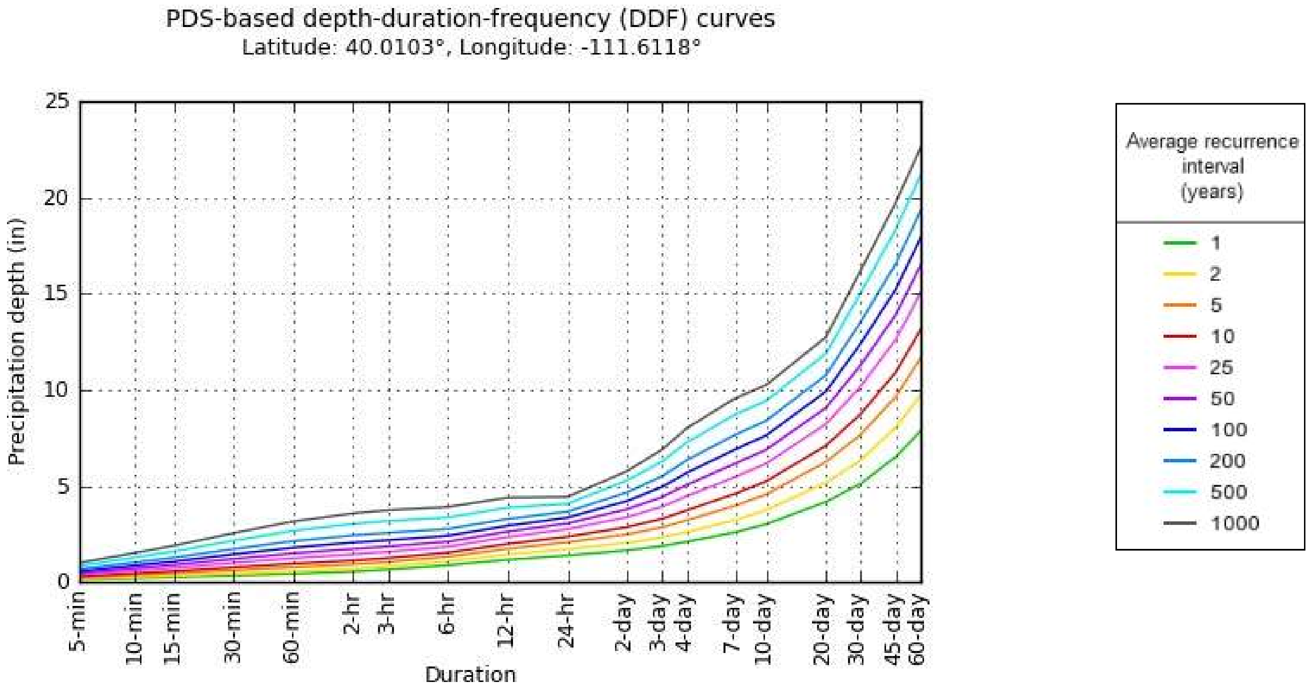
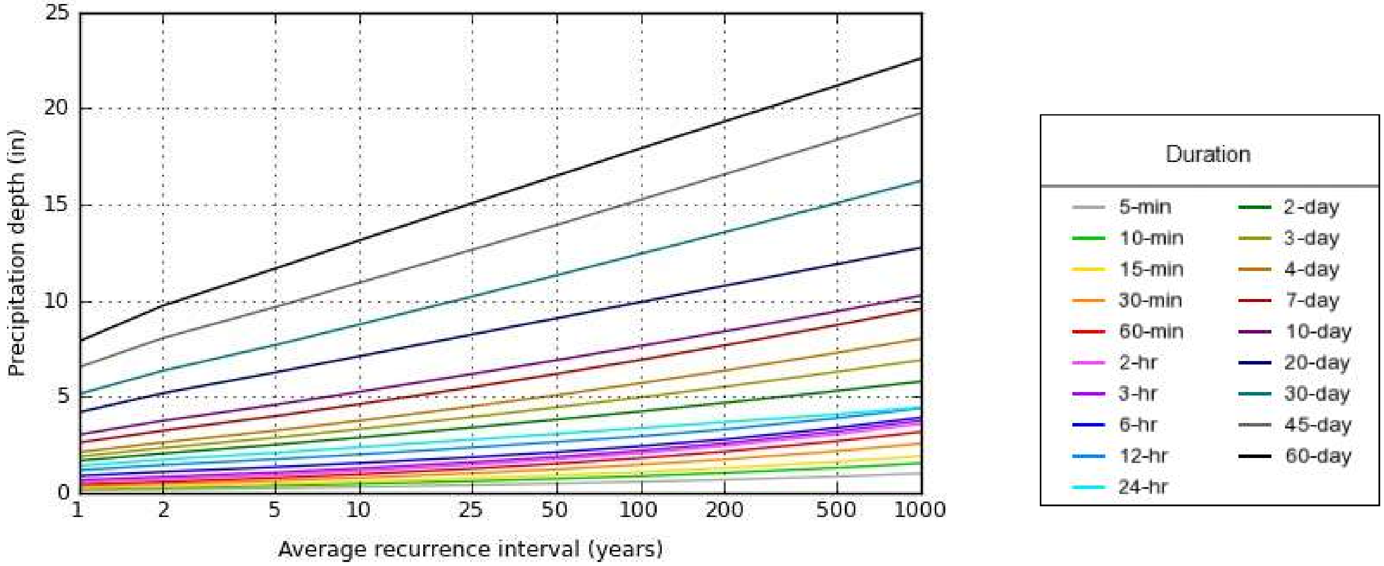
PF graphical





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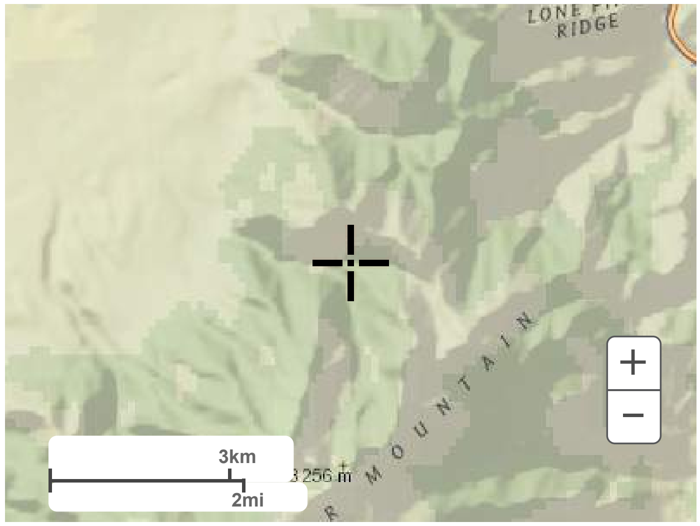
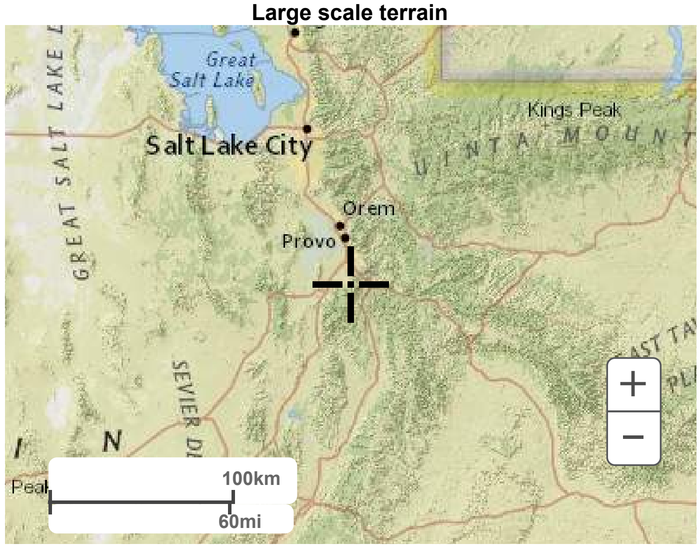
Maps & aerials

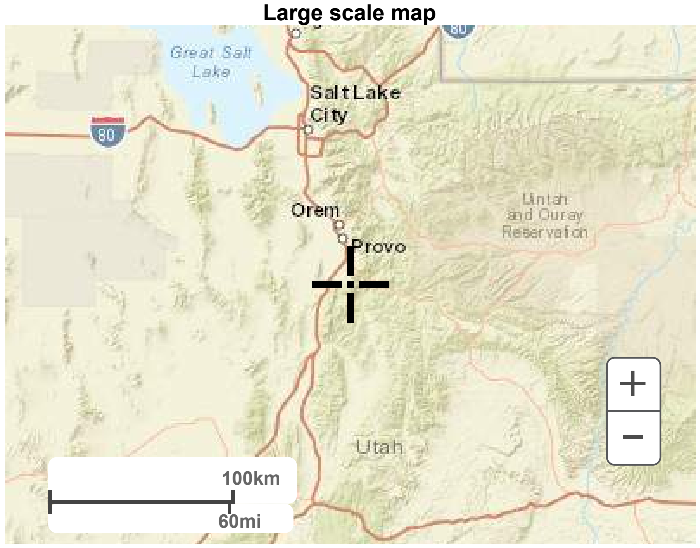
Small scale terrain



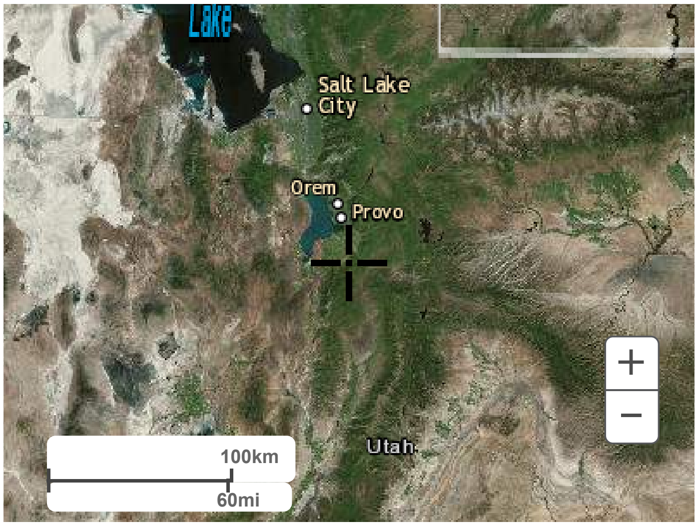
Large scale terrain



Large scale map



Large scale aerial



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Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

Disclaimer

Spanish Fork at Powerhouse Gage, rainfall depths >= 0.1 inches since 1909

Sorted Precip (in)	X %ile Storm	Sorted Precip (in)	X %ile Storm	Sorted Precip (in)	X %ile Storm	Sorted Precip (in)	X %ile Storm	Sorted Precip (in)	X %ile Storm	Sorted Precip (in)	X %ile Storm	Sorted Precip (in)	X %ile Storm
2.87	100.0%	1.1	97.4%	0.9	94.9%	0.78	92.1%	0.7	89.8%	0.64	87.2%	0.58	84.4%
2.86	99.9%	1.1	97.4%	0.9	94.9%	0.78	92.1%	0.7	89.8%	0.64	87.2%	0.58	84.4%
2.54	99.9%	1.1	97.4%	0.9	94.9%	0.78	92.1%	0.7	89.8%	0.64	87.2%	0.58	84.4%
2.08	99.9%	1.09	97.3%	0.89	94.7%	0.78	92.1%	0.7	89.8%	0.64	87.2%	0.58	84.4%
2.03	99.9%	1.09	97.3%	0.89	94.7%	0.78	92.1%	0.7	89.8%	0.64	87.2%	0.58	84.4%
1.97	99.9%	1.09	97.3%	0.89	94.7%	0.78	92.1%	0.69	89.5%	0.64	87.2%	0.58	84.4%
1.92	99.8%	1.09	97.3%	0.89	94.7%	0.78	92.1%	0.69	89.5%	0.64	87.2%	0.58	84.4%
1.88	99.8%	1.09	97.3%	0.89	94.7%	0.78	92.1%	0.69	89.5%	0.64	87.2%	0.58	84.4%
1.78	99.8%	1.08	97.2%	0.89	94.7%	0.78	92.1%	0.69	89.5%	0.64	87.2%	0.58	84.4%
1.74	99.8%	1.08	97.2%	0.89	94.7%	0.78	92.1%	0.69	89.5%	0.63	86.8%	0.58	84.4%
1.71	99.8%	1.08	97.2%	0.89	94.7%	0.78	92.1%	0.69	89.5%	0.63	86.8%	0.58	84.4%
1.71	99.8%	1.08	97.2%	0.88	94.6%	0.78	92.1%	0.69	89.5%	0.63	86.8%	0.58	84.4%
1.68	99.7%	1.07	97.2%	0.88	94.6%	0.78	92.1%	0.69	89.5%	0.63	86.8%	0.58	84.4%
1.68	99.7%	1.07	97.2%	0.88	94.6%	0.78	92.1%	0.69	89.5%	0.63	86.8%	0.58	84.4%
1.67	99.7%	1.06	97.1%	0.88	94.6%	0.78	92.1%	0.69	89.5%	0.63	86.8%	0.58	84.4%
1.65	99.7%	1.06	97.1%	0.88	94.6%	0.78	92.1%	0.69	89.5%	0.63	86.8%	0.58	84.4%
1.64	99.7%	1.06	97.1%	0.87	94.5%	0.78	92.1%	0.69	89.5%	0.63	86.8%	0.58	84.4%
1.6	99.6%	1.05	97.0%	0.87	94.5%	0.78	92.1%	0.69	89.5%	0.63	86.8%	0.58	84.4%
1.6	99.6%	1.05	97.0%	0.87	94.5%	0.77	91.9%	0.69	89.5%	0.63	86.8%	0.58	84.4%
1.59	99.6%	1.05	97.0%	0.87	94.5%	0.77	91.9%	0.68	89.1%	0.63	86.8%	0.58	84.4%
1.58	99.6%	1.05	97.0%	0.87	94.5%	0.77	91.9%	0.68	89.1%	0.63	86.8%	0.58	84.4%
1.57	99.6%	1.05	97.0%	0.87	94.5%	0.77	91.9%	0.68	89.1%	0.63	86.8%	0.58	84.4%
1.55	99.5%	1.05	97.0%	0.87	94.5%	0.77	91.9%	0.68	89.1%	0.63	86.8%	0.58	84.4%
1.55	99.5%	1.05	97.0%	0.87	94.5%	0.77	91.9%	0.68	89.1%	0.63	86.8%	0.58	84.4%
1.53	99.5%	1.05	97.0%	0.86	94.4%	0.77	91.9%	0.68	89.1%	0.63	86.8%	0.58	84.4%
1.51	99.5%	1.05	97.0%	0.86	94.4%	0.77	91.9%	0.68	89.1%	0.63	86.8%	0.57	83.8%
1.51	99.5%	1.04	96.9%	0.86	94.4%	0.77	91.9%	0.68	89.1%	0.63	86.8%	0.57	83.8%
1.5	99.5%	1.04	96.9%	0.86	94.4%	0.77	91.9%	0.68	89.1%	0.63	86.8%	0.57	83.8%
1.49	99.4%	1.04	96.9%	0.86	94.4%	0.77	91.9%	0.68	89.1%	0.63	86.8%	0.57	83.8%
1.49	99.4%	1.04	96.9%	0.86	94.4%	0.77	91.9%	0.68	89.1%	0.63	86.8%	0.57	83.8%
1.48	99.4%	1.04	96.9%	0.86	94.4%	0.76	91.6%	0.68	89.1%	0.63	86.8%	0.57	83.8%
1.47	99.4%	1.04	96.9%	0.85	94.1%	0.76	91.6%	0.68	89.1%	0.62	86.3%	0.57	83.8%
1.46	99.4%	1.03	96.7%	0.85	94.1%	0.76	91.6%	0.68	89.1%	0.62	86.3%	0.57	83.8%
1.45	99.3%	1.03	96.7%	0.85	94.1%	0.76	91.6%	0.68	89.1%	0.62	86.3%	0.57	83.8%
1.45	99.3%	1.03	96.7%	0.85	94.1%	0.76	91.6%	0.68	89.1%	0.62	86.3%	0.57	83.8%
1.43	99.3%	1.03	96.7%	0.85	94.1%	0.76	91.6%	0.68	89.1%	0.62	86.3%	0.57	83.8%
1.43	99.3%	1.03	96.7%	0.85	94.1%	0.76	91.6%	0.68	89.1%	0.62	86.3%	0.57	83.8%
1.42	99.2%	1.03	96.7%	0.85	94.1%	0.76	91.6%	0.68	89.1%	0.62	86.3%	0.57	83.8%
1.42	99.2%	1.03	96.7%	0.85	94.1%	0.76	91.6%	0.68	89.1%	0.62	86.3%	0.57	83.8%
1.42	99.2%	1.02	96.7%	0.85	94.1%	0.76	91.6%	0.68	89.1%	0.62	86.3%	0.57	83.8%
1.41	99.2%	1.02	96.7%	0.85	94.1%	0.76	91.6%	0.68	89.1%	0.62	86.3%	0.57	83.8%
1.4	99.2%	1.02	96.7%	0.85	94.1%	0.76	91.6%	0.68	89.1%	0.62	86.3%	0.57	83.8%
1.4	99.2%	1.02	96.7%	0.85	94.1%	0.76	91.6%	0.67	88.8%	0.62	86.3%	0.57	83.8%
1.4	99.2%	1.02	96.7%	0.85	94.1%	0.76	91.6%	0.67	88.8%	0.62	86.3%	0.57	83.8%
1.4	99.2%	1.01	96.4%	0.85	94.1%	0.76	91.6%	0.67	88.8%	0.62	86.3%	0.57	83.8%
1.38	99.1%	1.01	96.4%	0.84	93.9%	0.76	91.6%	0.67	88.8%	0.62	86.3%	0.57	83.8%
1.38	99.1%	1.01	96.4%	0.84	93.9%	0.76	91.6%	0.67	88.8%	0.62	86.3%	0.57	83.8%
1.38	99.1%	1.01	96.4%	0.84	93.9%	0.75	91.2%	0.67	88.8%	0.62	86.3%	0.57	83.8%
1.38	99.1%	1.01	96.4%	0.84	93.9%	0.75	91.2%	0.67	88.8%	0.62	86.3%	0.57	83.8%
1.35	99.0%	1.01	96.4%	0.84	93.9%	0.75	91.2%	0.67	88.8%	0.62	86.3%	0.57	83.8%
1.35	99.0%	1.01	96.4%	0.84	93.9%	0.75	91.2%	0.67	88.8%	0.62	86.3%	0.57	83.8%
1.34	99.0%	1.01	96.4%	0.84	93.9%	0.75	91.2%	0.67	88.8%	0.62	86.3%	0.57	83.8%
1.34	99.0%	1.01	96.4%	0.84	93.9%	0.75	91.2%	0.67	88.8%	0.62	86.3%	0.57	83.8%
1.34	99.0%	1.01	96.4%	0.84	93.9%	0.75	91.2%	0.67	88.8%	0.62	86.3%	0.57	83.8%
1.33	98.9%	1.01	96.4%	0.84	93.9%	0.75	91.2%	0.67	88.8%	0.62	86.3%	0.57	83.8%
1.33	98.9%	1.01	96.4%	0.83	93.7%	0.75	91.2%	0.67	88.8%	0.62	86.3%	0.56	83.2%
1.33	98.9%	1	96.4%	0.83	93.7%	0.75	91.2%	0.67	88.8%	0.62	86.3%	0.56	83.2%
1.32	98.9%	1	96.4%	0.83	93.7%	0.75	91.2%	0.67	88.8%	0.62	86.3%	0.56	83.2%
1.32	98.9%	1	96.4%	0.83	93.7%	0.75	91.2%	0.66	88.4%	0.62	86.3%	0.56	83.2%
1.32	98.9%	1	96.4%	0.83	93.7%	0.75	91.2%	0.66	88.4%	0.62	86.3%	0.56	83.2%
1.3	98.8%	0.99	96.3%	0.83	93.7%	0.75	91.2%	0.66	88.4%	0.61	85.9%	0.56	83.2%
1.3	98.8%	0.99	96.3%	0.83	93.7%	0.75	91.2%	0.66	88.4%	0.61	85.9%	0.56	83.2%
1.3	98.8%	0.98	96.2%	0.83	93.7%	0.75	91.2%	0.66	88.4%	0.61	85.9%	0.56	83.2%
1.29	98.8%	0.98	96.2%	0.83	93.7%	0.75	91.2%	0.66	88.4%	0.61	85.9%	0.56	83.2%
1.29	98.8%	0.98	96.2%	0.83	93.7%	0.75	91.2%	0.66	88.4%	0.61	85.9%	0.56	83.2%
1.29	98.8%	0.98	96.2%	0.83	93.7%	0.74	91.1%	0.66	88.4%	0.61	85.9%	0.56	83.2%
1.29	98.8%	0.98	96.2%	0.83	93.7%	0.74	91.1%	0.66	88.4%	0.61	85.9%	0.56	83.2%
1.28	98.7%	0.98	96.2%	0.82	93.5%	0.74	91.1%	0.66	88.4%	0.61	85.9%	0.56	83.2%
1.28	98.7%	0.98	96.2%	0.82	93.5%	0.74	91.1%	0.66	88.4%	0.61	85.9%	0.56	83.2%
1.28	98.7%	0.98	96.2%	0.82	93.5%	0.74	91.1%	0.66	88.4%	0.61	85.9%	0.56	83.2%
1.28	98.7%	0.97	96.1%	0.82	93.5%	0.74	91.1%	0.66	88.4%	0.61	85.9%	0.56	83.2%
1.27	98.7%	0.97	96.1%	0.82	93.5%	0.73	90.8%	0.66	88.4%	0.61	85.9%	0.56	83.2%
1.25	98.6%	0.97	96.1%	0.82	93.5%	0.73	90.8%	0.66	88.4%	0.61	85.9%	0.56	83.2%
1.25	98.6%	0.97	96.1%	0.82	93.5%	0.73	90.8%	0.66	88.4%	0.61	85.9%	0.56	83.2%
1.25	98.6%	0.97	96.1%	0.82	93.5%	0.73	90.8%	0.66	88.4%	0.61	85.9%	0.56	83.2%
1.25	98.6%	0.97	96.1%	0.82	93.5%	0.73	90.8%	0.66	88.4%	0.61	85.9%	0.56	83.2%
1.24	98.5%	0.97	96.1%	0.82	93.5%	0.73	90.8%	0.66	88.4%	0.61	85.9%	0.56	83.2%
1.24	98.5%	0.96	96.0%	0.82	93.5%	0.73	90.8%	0.66	88.4%	0.61	85.9%	0.56	83.2%
1.24	98.5%	0.96	96.0%	0.82	93.5%	0.73	90.8%	0.66	88.4%	0.61	85.9%	0.56	83.2%
1.24	98.5%	0.96	96.0%	0.82	93.5%	0.73	90.8%	0.66	88.4%	0.61	85.9%	0.56	83.2%
1.24	98.5%	0.96	96.0%	0.81	93.2%	0.73	90.8%	0.66	88.4%	0.61	85.9%	0.56	83.2%
1.24	98.5%	0.96	96.0%	0.81	93.2%	0.73	90.8%	0.66	88.4%	0.6	85.1%	0.56	83.2%
1.23	98.4%	0.96	96.0%	0.81	93.2%	0.73	90.8%	0.66	88.4%	0.6	85.1%	0.56	83.2%
1.23	98.4%	0.95	95.8%	0.81	93.2%	0.73	90.8%	0.65	87.7%	0.6	85.1%	0.56	83.2%
1.23	98.4%	0.95	95.8%	0.81	93.2%	0.73	90.8%	0.65	87.7%	0.6	85.1%	0.56	83.2%
1.22	98.4%	0.95	95.8%	0.81	93.2%	0.73	90.8%	0.65	87.7%	0.6	85.1%	0.56	83.2%
1.22	98.4%	0.95	95.8%	0.81	93.2%	0.73	90.8%	0.65	87.7%	0.6	85.1%	0.56	83.2%
1.22	98.4%	0.95	95.8%	0.81	93.2%	0.73	90.8%	0.65	87.7%	0.6	85.1%	0.56	83.2%
1.22	98.4%	0.95	95.8%	0.81	93.2%	0.73	90.8%	0.65	87.7%	0.6	85.1%	0.56	83.2%
1.21	98.3%	0.95	95.8%	0.81	93.2%	0.73	90.8%	0.65	87.7%	0.6	85.1%	0.56	83.2%
1.21	98.3%	0.95	95.8%	0.81	93.2%	0.73	90.8%	0.65	87.7%	0.6	85.1%	0.56	83.2%
1.2	98.3%	0.95	95.8%	0.81	93.2%	0.72	90.5%	0.65	87.7%	0.6	85.1%	0.55	82.3%
1.2	98.3%	0.94	95.6%	0.81	93.2%	0.72	90.5%	0.65	87.7%	0.6	85.1%	0.55	82.3%
1.18	98.1%	0.94	95.6%	0.8	92.7%	0.72	90.5%	0.65	87.7%	0.6	85.1%	0.55	82.3%
1.18	98.1%	0.94	95.6%	0.8	92.7%	0.72	90.5%	0.65	87.7%	0.6	85.1%	0.55	82.3%
1.18	98.1%	0.94	95.6%	0.8	92.7%	0.72	90.5%	0.65	87.7%	0.6	85.1%	0.55	82.3%
1.18	98.1%	0.94	95.6%	0.8	92.7%	0.72	90.5%	0.65	87.7%	0.6	85.1%	0.55	82.3%
1.18	98.1%	0.94	95.6%	0.8	92.7%	0.72	90.5%	0.65	87.7%	0.6	85.1%	0.55	82.3%
1.18	98.1%	0.94	95.6%	0.8	92.7%	0.72	90.5%	0.65	87.7%	0.6	85.1%	0.55	82.3%
1.18	98.1%	0.94	95.6%	0.8	92.7%	0.72	90.5%	0.65	87.7%	0.6	85.1%	0.55	82.3%
1.18	98.1%	0.93	95.5%	0.8	92.7%	0.72	90.5%	0.65	87.7%	0.6	85.1%	0.55	82.3%
1.17	98.1%	0.93	95.5%	0.8	92.7%	0.72	90.5%	0.65	87.7%	0.6	85.1%	0.55	82.3%
1.17	98.1%	0.93	95.5%	0.8	92.7%	0.72	90.5%	0.65	87.7%	0.6	85.1%	0.55	82.3%
1.17	98.1%	0.93	95.5%	0.8	92.7%	0.72	90.5%	0.65	87.7%	0.6	85.1%	0.55	82.3%
1.17	98.1%	0.93	95.5%	0.8	92.7%	0.72	90.5%	0.65	87.7%	0.6	85.1%	0.55	82.3%
1.16	98.0%	0.93	95.5%	0.8	92.7%	0.71	90.3%	0.65	87.7%	0.6	85.1%	0.55	82.3%
1.16	98.0%	0.93	95.5%	0.8	92.7%	0.71	90.3%	0.65	87.7%	0.6	85.1%	0.55	82.3%
1.16	98.0%	0.93	95.5%	0.8	92.7%	0.71	90.3%	0.65	87.7%	0.6	85.1%	0.55	82.3%
1.15	97.9%	0.93	95.5%	0.8	92.7%	0.71	90.3%	0.65	87.7%	0.6	85.1%	0.55	82.3%
1.15	97.9%	0.93	95.5%	0.8	92.7%	0.71	90.3%	0.65	87.7%	0.6	85.1%	0.55	82.3%
1.15	97.9%	0.92	95.3%	0.8	92.7%	0.71	90.3%	0.65	87.7%	0.6	85.1%	0.55	82.3%
1.15	97.9%	0.92	95.3%	0.8	92.7%	0.71	90.3%	0.65	87.7%	0.6	85.1%	0.55	82.3%
1.15	97.9%	0.92	95.3%	0.8	92.7%	0.71	90.3%	0.65	87.7%	0.6	85.1%	0.55	82.3%
1.15	97.9%	0.92	95.3%	0.8	92.7%	0.71	90.3%	0.65	87.7%	0.6	85.1%	0.55	82.3%
1.15	97.9%	0.92	95.3%	0.8	92.7%	0.71	90.3%	0.65	87.7%	0.6	85.1%	0.55	82.3%
1.15	97.9%	0.92	95.3%	0.8	92.7%	0.71	90.3%	0.65	87.7%	0.6	85.1%	0.55	82.3%
1.14	97.8%	0.92	95.3%	0.8	92.7%	0.71	90.3%	0.65	87.7%	0.6	85.1%	0.55	82.3%
1.14	97.8%	0.92	95.3%	0.8	92.7%	0.71	90.3%	0.65	87.7%	0.6	85.1%	0.55	82.3%
1.14	97.8%	0.92	95.3%	0.8	92.7%	0.7	89.8%	0.65	87.7%	0.6	85.1%	0.55	82.3%
1.14	97.8%	0.92	95.3%	0.8	92.7%	0.7	89.8%	0.64	87.2%	0.6	85.1%	0.55	82.3%
1.13	97.8%	0.92	95.3%	0.8	92.7%	0.7	89.8%	0.64	87.2%	0.6	85.1%	0.55	82.3%
1.13	97.8%	0.91	95.2%	0.8	92.7%	0.7	89.8%	0.64	87.2%	0.6	85.1%	0.55	82.3%
1.13	97.8%	0.91	95.2%	0.8	92.7%	0.7	89.8%	0.64	87.2%	0.6	85.1%	0.55	82.3%
1.12	97.6%	0.91	95.2%	0.8	92.7%	0.7	89.8%	0.64	87.2%	0.6	85.1%	0.55	82.3%
1.12	97.6%	0.91	95.2%	0.79	92.5%	0.7	89.8%	0.64	87.2%	0.6	85.1%	0.55	82.3%
1.12	97.6%	0.9	94.9%	0.79	92.5%	0.7	89.8%	0.64	87.2%	0.6	85.1%	0.55	82.3%
1.12	97.6%	0.9	94.9%	0.79	92.5%	0.7	89.8%	0.64	87.2%	0.6	85.1%	0.55	82.3%
1.12	97.6%	0.9	94.9%	0.79	92.5%	0.7	89.8%	0.64	87.2%	0.59	84.8%	0.55	82.3%
1.12	97.6%	0.9	94.9%	0.79	92.5%	0.7	89.8%	0.64	87.2%	0.59	84.8%	0.55	82.3%
1.12	97.6%	0.9	94.9%	0.79	92.5%	0.7	89.8%	0.64	87.2%	0.59	84.8%	0.55	82.3%
1.12	97.6%	0.9	94.9%	0.79	92.5%	0.7	89.8%	0.64	87.2%	0.59	84.8%	0.55	82.3%
1.12	97.6%	0.9	94.9%	0.79	92.5%	0.7	89.8%	0.64	87.2%	0.59	84.8%	0.55	82.3%
1.11	97.5%	0.9	94.9%	0.79	92.5%	0.7	89.8%	0.64	87.2%	0.59	84.8%	0.55	82.3%
1.11	97.5%	0.9	94.9%	0.79	92.5%	0.7	89.8%	0.64	87.2%	0.59	84.8%	0.55	82.3%
1.11	97.5%	0.9	94.9%	0.78	92.1%	0.7	89.8%	0.64	87.2%	0.59	84.8%	0.55	82.3%
1.11	97.5%	0.9	94.9%	0.78	92.1%	0.7	89.8%	0.64	87.2%	0.59	84.8%	0.55	82.3%
1.1	97.4%	0.9	94.9%	0.78	92.1%	0.7	89.8%	0.64	87.2%	0.59	84.8%	0.55	82.3%
1.1	97.4%	0.9	94.9%	0.78	92.1%	0.7	89.8%	0.64	87.2%	0.59	84.8%	0.55	82.3%
1.1	97.4%	0.9	94.9%	0.78	92.1%	0.7	89.8%	0.64	87.2%	0.59	84.8%	0.55	82.3%
1.1	97.4%	0.9	94.9%	0.78	92.1%	0.7	89.8%	0.64	87.2%	0.59	84.8%	0.54	81.6%

Spanish Fork at Powerhouse Gage, rainfall depths >= 0.1 inches since 1909

Sorted Precip (in)	X %ile Storm	Sorted Precip (in)	X %ile Storm	Sorted Precip (in)	X %ile Storm	Sorted Precip (in)	X %ile Storm	Sorted Precip (in)	X %ile Storm	Sorted Precip (in)	X %ile Storm	Sorted Precip (in)	X %ile Storm
0.54	81.6%	0.51	79.8%	0.47	76.7%	0.44	74.4%	0.41	71.9%	0.39	69.5%	0.37	67.0%
0.54	81.6%	0.5	78.8%	0.47	76.7%	0.44	74.4%	0.41	71.9%	0.39	69.5%	0.37	67.0%
0.54	81.6%	0.5	78.8%	0.47	76.7%	0.44	74.4%	0.41	71.9%	0.39	69.5%	0.37	67.0%
0.54	81.6%	0.5	78.8%	0.47	76.7%	0.44	74.4%	0.41	71.9%	0.39	69.5%	0.37	67.0%
0.54	81.6%	0.5	78.8%	0.47	76.7%	0.44	74.4%	0.41	71.9%	0.39	69.5%	0.37	67.0%
0.54	81.6%	0.5	78.8%	0.47	76.7%	0.44	74.4%	0.41	71.9%	0.39	69.5%	0.37	67.0%
0.54	81.6%	0.5	78.8%	0.47	76.7%	0.44	74.4%	0.41	71.9%	0.39	69.5%	0.37	67.0%
0.54	81.6%	0.5	78.8%	0.47	76.7%	0.44	74.4%	0.41	71.9%	0.39	69.5%	0.37	67.0%
0.54	81.6%	0.5	78.8%	0.47	76.7%	0.44	74.4%	0.41	71.9%	0.39	69.5%	0.36	65.8%
0.54	81.6%	0.5	78.8%	0.47	76.7%	0.44	74.4%	0.41	71.9%	0.39	69.5%	0.36	65.8%
0.54	81.6%	0.5	78.8%	0.47	76.7%	0.44	74.4%	0.41	71.9%	0.39	69.5%	0.36	65.8%
0.54	81.6%	0.5	78.8%	0.47	76.7%	0.44	74.4%	0.41	71.9%	0.38	68.2%	0.36	65.8%
0.54	81.6%	0.5	78.8%	0.47	76.7%	0.44	74.4%	0.41	71.9%	0.38	68.2%	0.36	65.8%
0.54	81.6%	0.5	78.8%	0.47	76.7%	0.44	74.4%	0.41	71.9%	0.38	68.2%	0.36	65.8%
0.54	81.6%	0.5	78.8%	0.47	76.7%	0.44	74.4%	0.41	71.9%	0.38	68.2%	0.36	65.8%
0.54	81.6%	0.5	78.8%	0.47	76.7%	0.44	74.4%	0.41	71.9%	0.38	68.2%	0.36	65.8%
0.54	81.6%	0.5	78.8%	0.47	76.7%	0.44	74.4%	0.41	71.9%	0.38	68.2%	0.36	65.8%
0.54	81.6%	0.5	78.8%	0.47	76.7%	0.44	74.4%	0.41	71.9%	0.38	68.2%	0.36	65.8%
0.54	81.6%	0.5	78.8%	0.47	76.7%	0.44	74.4%	0.41	71.9%	0.38	68.2%	0.36	65.8%
0.54	81.6%	0.5	78.8%	0.47	76.7%	0.44	74.4%	0.41	71.9%	0.38	68.2%	0.36	65.8%
0.54	81.6%	0.5	78.8%	0.47	76.7%	0.43	73.7%	0.4	70.4%	0.38	68.2%	0.36	65.8%
0.54	81.6%	0.5	78.8%	0.47	76.7%	0.43	73.7%	0.4	70.4%	0.38	68.2%	0.36	65.8%
0.54	81.6%	0.5	78.8%	0.47	76.7%	0.43	73.7%	0.4	70.4%	0.38	68.2%	0.36	65.8%
0.54	81.6%	0.5	78.8%	0.47	76.7%	0.43	73.7%	0.4	70.4%	0.38	68.2%	0.36	65.8%
0.54	81.6%	0.5	78.8%	0.47	76.7%	0.43	73.7%	0.4	70.4%	0.38	68.2%	0.36	65.8%
0.54	81.6%	0.5	78.8%	0.47	76.7%	0.43	73.7%	0.4	70.4%	0.38	68.2%	0.36	65.8%
0.54	81.6%	0.5	78.8%	0.47	76.7%	0.43	73.7%	0.4	70.4%	0.38	68.2%	0.36	65.8%
0.54	81.6%	0.5	78.8%	0.47	76.7%	0.43	73.7%	0.4	70.4%	0.38	68.2%	0.36	65.8%
0.54	81.6%	0.5	78.8%	0.47	76.7%	0.43	73.7%	0.4	70.4%	0.38	68.2%	0.36	65.8%
0.54	81.6%	0.5	78.8%	0.47	76.7%	0.43	73.7%	0.4	70.4%	0.38	68.2%	0.36	65.8%
0.54	81.6%	0.5	78.8%	0.47	76.7%	0.43	73.7%	0.4	70.4%	0.38	68.2%	0.36	65.8%
0.54	81.6%	0.5	78.8%	0.46	76.0%	0.43	73.7%	0.4	70.4%	0.38	68.2%	0.36	65.8%
0.54	81.6%	0.5	78.8%	0.46	76.0%	0.43	73.7%	0.4	70.4%	0.38	68.2%	0.36	65.8%
0.54	81.6%	0.5	78.8%	0.46	76.0%	0.43	73.7%	0.4	70.4%	0.38	68.2%	0.36	65.8%
0.54	81.6%	0.5	78.8%	0.46	76.0%	0.43	73.7%	0.4	70.4%	0.38	68.2%	0.36	65.8%
0.54	81.6%	0.5	78.8%	0.46	76.0%	0.43	73.7%	0.4	70.4%	0.38	68.2%	0.36	65.8%
0.54	81.6%	0.5	78.8%	0.46	76.0%	0.43	73.7%	0.4	70.4%	0.38	68.2%	0.36	65.8%
0.54	81.6%	0.5	78.8%	0.46	76.0%	0.43	73.7%	0.4	70.4%	0.38	68.2%	0.36	65.8%
0.54	81.6%	0.5	78.8%	0.46	76.0%	0.43	73.7%	0.4	70.4%	0.38	68.2%	0.36	65.8%
0.53	80.9%	0.5	78.8%	0.46	76.0%	0.43	73.7%	0.4	70.4%	0.38	68.2%	0.36	65.8%
0.53	80.9%	0.5	78.8%	0.46	76.0%	0.43	73.7%	0.4	70.4%	0.38	68.2%	0.36	65.8%
0.53	80.9%	0.5	78.8%	0.46	76.0%	0.43	73.7%	0.4	70.4%	0.38	68.2%	0.36	65.8%
0.53	80.9%	0.5	78.8%	0.46	76.0%	0.43	73.7%	0.4	70.4%	0.38	68.2%	0.36	65.8%
0.53	80.9%	0.5	78.8%	0.46	76.0%	0.43	73.7%	0.4	70.4%	0.38	68.2%	0.36	65.8%
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0.53	80.9%	0.49	78.2%	0.46	76.0%	0.42	72.8%	0.4	70.4%	0.38	68.2%	0.36	65.8%
0.53	80.9%	0.49	78.2%	0.46	76.0%	0.42	72.8%	0.4	70.4%	0.38	68.2%	0.36	65.8%
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0.53	80.9%	0.49	78.2%	0.45	75.0%	0.42	72.8%	0.4	70.4%	0.38	68.2%	0.35	64.4%
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0.52	80.3%	0.49	78.2%	0.45	75.0%	0.42	72.8%	0.4	70.4%	0.38	68.2%	0.35	64.4%
0.52	80.3%	0.49	78.2%	0.45	75.0%	0.42	72.8%	0.4	70.4%	0.38	68.2%	0.35	64.4%
0.52	80.3%	0.49	78.2%	0.45	75.0%	0.42	72.8%	0.4	70.4%	0.38	68.2%	0.35	64.4%
0.52	80.3%	0.49	78.2%	0.45	75.0%	0.42	72.8%	0.4	70.4%	0.37	67.0%	0.35	64.4%
0.52	80.3%	0.49	78.2%	0.45	75.0%	0.42	72.8%	0.4	70.4%	0.37	67.0%	0.35	64.4%
0.52	80.3%	0.48	77.5%	0.45	75.0%	0.42	72.8%	0.4	70.4%	0.37	67.0%	0.35	64.4%
0.52	80.3%	0.48	77.5%	0.45	75.0%	0.42	72.8%	0.4	70.4%	0.37	67.0%	0.35	64.4%
0.52	80.3%	0.48	77.5%	0.45	75.0%	0.42	72.8%	0.4	70.4%	0.37	67.0%	0.35	64.4%
0.52	80.3%	0.48	77.5%	0.45	75.0%	0.42	72.8%	0.4	70.4%	0.37	67.0%	0.35	64.4%
0.52	80.3%	0.48	77.5%	0.45	75.0%	0.42	72.8%	0.4	70.4%	0.37	67.0%	0.35	64.4%
0.52	80.3%	0.48	77.5%	0.45	75.0%	0.42	72.8%	0.4	70.4%	0.37	67.0%	0.35	64.4%
0.52	80.3%	0.48	77.5%	0.45	75.0%	0.42	72.8%	0.4	70.4%	0.37	67.0%	0.35	64.4%
0.52	80.3%	0.48	77.5%	0.45	75.0%	0.42	72.8%	0.4	70.4%	0.37	67.0%	0.35	64.4%
0.52	80.3%	0.48	77.5%	0.45	75.0%	0.42	72.8%	0.4	70.4%	0.37	67.0%	0.35	64.4%
0.52	80.3%	0.48	77.5%	0.45	75.0%	0.42	72.8%	0.4	70.4%	0.37	67.0%	0.35	64.4%
0.52	80.3%	0.48	77.5%	0.45	75.0%	0.42	72.8%	0.4	70.4%	0.37	67.0%	0.35	64.4%
0.52	80.3%	0.48	77.5%	0.45	75.0%	0.42	72.8%	0.4	70.4%	0.37	67.0%	0.35	64.4%
0.52	80.3%	0.48	77.5%	0.45	75.0%	0.42	72.8%	0.39	69.5%	0.37	67.0%	0.35	64.4%
0.52	80.3%	0.48	77.5%	0.45	75.0%	0.42	72.8%	0.39	69.5%	0.37	67.0%	0.35	64.4%
0.52	80.3%	0.48	77.5%	0.45	75.0%	0.42	72.8%	0.39	69.5%	0.37	67.0%	0.35	64.4%
0.52	80.3%	0.48	77.5%	0.45	75.0%	0.42	72.8%	0.39	69.5%	0.37	67.0%	0.35	64.4%
0.52	80.3%	0.48	77.5%	0.45	75.0%	0.42	72.8%	0.39	69.5%	0.37	67.0%	0.35	64.4%
0.52	80.3%	0.48	77.5%	0.45	75.0%	0.42	72.8%	0.39	69.5%	0.37	67.0%	0.35	64.4%
0.52	80.3%	0.48	77.5%	0.45	75.0%	0.42	72.8%	0.39	69.5%	0.37	67.0%	0.35	64.4%
0.52	80.3%	0.48	77.5%	0.45	75.0%	0.42	72.8%	0.39	69.5%	0.37	67.0%	0.35	64.4%
0.52	80.3%	0.48	77.5%	0.45	75.0%	0.41	71.9%	0.39	69.5%	0.37	67.0%	0.35	64.4%
0.52	80.3%	0.48	77.5%	0.45	75.0%	0.41	71.9%	0.39	69.5%	0.37	67.0%	0.35	64.4%
0.52	80.3%	0.48	77.5%	0.45	75.0%	0.41	71.9%	0.39	69.5%	0.37	67.0%	0.35	64.4%
0.51	79.8%	0.48	77.5%	0.45	75.0%	0.41	71.9%	0.39	69.5%	0.37	67.0%	0.35	64.4%
0.51	79.8%	0.48	77.5%	0.45	75.0%	0.41	71.9%	0.39	69.5%	0.37	67.0%	0.35	64.4%
0.51	79.8%	0.48	77.5%	0.45	75.0%	0.41	71.9%	0.39	69.5%	0.37	67.0%	0.35	64.4%
0.51	79.8%	0.48	77.5%	0.45	75.0%	0.41	71.9%	0.39	69.5%	0.37	67.0%	0.35	64.4%
0.51	79.8%	0.48	77.5%	0.45	75.0%	0.41	71.9%	0.39	69.5%	0.37	67.0%	0.35	64.4%
0.51	79.8%	0.48	77.5%	0.45	75.0%	0.41	71.9%	0.39	69.5%	0.37	67.0%	0.35	64.4%
0.51	79.8%	0.48	77.5%	0.45	75.0%	0.41	71.9%	0.39	69.5%	0.37	67.0%	0.35	64.4%
0.51	79.8%	0.48	77.5%	0.45	75.0%	0.41	71.9%	0.39	69.5%	0.37	67.0%	0.35	64.4%
0.51	79.8%	0.48	77.5%	0.45	75.0%	0.41	71.9%	0.39	69.5%	0.37	67.0%	0.35	64.4%
0.51	79.8%	0.48	77.5%	0.45	75.0%	0.41	71.9%	0.39	69.5%	0.37	67.0%	0.35	64.4%
0.51	79.8%	0.48	77.5%	0.45	75.0%	0.41	71.9%	0.39	69.5%	0.37	67.0%	0.35	64.4%
0.51	79.8%	0.48	77.5%	0.45	75.0%	0.41	71.9%	0.39	69.5%	0.37	67.0%	0.35	64.4%
0.51	79.8%	0.48	77.5%	0.45	75.0%	0.41	71.9%	0.39	69.5%	0.37	67.0%	0.35	64.4%
0.51	79.8%	0.48	77.5%	0.45	75.0%	0.41	71.9%	0.39	69.5%	0.37	67.0%	0.35	64.4%
0.51	79.8%	0.48	77.5%	0.44	74.4%	0.41	71.9%	0.39	69.5%	0.37	67.0%	0.35	64.4%
0.51	79.8%	0.48	77.5%	0.44	74.4%	0.41	71.9%	0.39	69.5%	0.37	67.0%	0.35	64.4%
0.51	79.8%	0.47	76.7%	0.44	74.4%	0.41	71.9%	0.39	69.5%	0.37	67.0%	0.35	64.4%
0.51	79.8%	0.47	76.7%	0.44	74.4%	0.41	71.9%	0.39	69.5%	0.37	67.0%	0.35	64.4%
0.51	79.8%	0.47	76.7%	0.44	74.4%	0.41	71.9%	0.39	69.5%	0.37	67.0%	0.35	64.4%
0.51	79.8%	0.47	76.7%	0.44	74.4%	0.41	71.9%	0.39	69.5%	0.37	67.0%	0.35	64.4%
0.51	79.8%	0.47	76.7%	0.44	74.4%	0.41	71.9%	0.39	69.5%	0.37	67.0%	0.35	64.4%
0.51	79.8%	0.47	76.7%	0.44	74.4%	0.41	71.9%	0.39	69.5%	0.37	67.0%	0.35	64.4%
0.51	79.8%	0.47	76.7%	0.44	74.4%	0.41	71.9%	0.39	69.5%	0.37	67.0%	0.35	64.4%
0.51	79.8%	0.47	76.7%	0.44	74.4%	0.41	71.9%	0.39	69.5%	0.37	67.0%	0.35	64.4%
0.51	79.8%	0.47	76.7%	0.44	74.4%	0.41	71.9%	0.39	69.5%	0.37	67.0%	0.35	64.4%
0.51	79.8%	0.47	76.7%	0.44	74.4%	0.41	71.9%	0.39	69.5%	0.37	67.0%	0.35	64.4%
0.51	79.8%	0.47	76.7%	0.44	74.4%	0.41	71.9%	0.39	69.5%	0.37	67.0%	0.35	64.4%
0.51	79.8%	0.47	76.7%	0.44	74.4%	0.41	71.9%	0.39	69.5%	0.37	67.0%	0.35	64.4%
0.51	79.8%	0.47	76.7%	0.44	74.4%	0.41	71.9%	0.39	69.5%	0.37	67.0%	0.35	64.4%
0.51	79.8%	0.47	76.7%	0.44	74.4%	0.41	71.9%	0.39	69.5%	0.37	67.0%	0.35	64.4%

Spanish Fork at Powerhouse Gage, rainfall depths >= 0.1 inches since 1909

Sorted Precip (in)	X %ile Storm	Sorted Precip (in)	X %ile Storm	Sorted Precip (in)	X %ile Storm	Sorted Precip (in)	X %ile Storm	Sorted Precip (in)	X %ile Storm	Sorted Precip (in)	X %ile Storm	Sorted Precip (in)	X %ile Storm
0.35	64.4%	0.33	61.9%	0.31	58.7%	0.3	56.4%	0.28	53.3%	0.27	51.7%	0.25	47.3%
0.35	64.4%	0.33	61.9%	0.31	58.7%	0.3	56.4%	0.28	53.3%	0.27	51.7%	0.25	47.3%
0.35	64.4%	0.33	61.9%	0.31	58.7%	0.3	56.4%	0.28	53.3%	0.27	51.7%	0.25	47.3%
0.35	64.4%	0.33	61.9%	0.31	58.7%	0.3	56.4%	0.28	53.3%	0.27	51.7%	0.25	47.3%
0.35	64.4%	0.33	61.9%	0.31	58.7%	0.3	56.4%	0.28	53.3%	0.27	51.7%	0.25	47.3%
0.35	64.4%	0.33	61.9%	0.31	58.7%	0.3	56.4%	0.28	53.3%	0.27	51.7%	0.25	47.3%
0.35	64.4%	0.33	61.9%	0.31	58.7%	0.3	56.4%	0.28	53.3%	0.27	51.7%	0.25	47.3%
0.35	64.4%	0.33	61.9%	0.31	58.7%	0.3	56.4%	0.28	53.3%	0.27	51.7%	0.25	47.3%
0.35	64.4%	0.33	61.9%	0.31	58.7%	0.3	56.4%	0.28	53.3%	0.27	51.7%	0.25	47.3%
0.35	64.4%	0.33	61.9%	0.31	58.7%	0.3	56.4%	0.28	53.3%	0.27	51.7%	0.25	47.3%
0.35	64.4%	0.33	61.9%	0.31	58.7%	0.3	56.4%	0.28	53.3%	0.27	51.7%	0.25	47.3%
0.35	64.4%	0.33	61.9%	0.31	58.7%	0.3	56.4%	0.28	53.3%	0.27	51.7%	0.25	47.3%
0.35	64.4%	0.33	61.9%	0.31	58.7%	0.3	56.4%	0.28	53.3%	0.27	51.7%	0.25	47.3%
0.34	63.2%	0.32	60.3%	0.31	58.7%	0.3	56.4%	0.28	53.3%	0.27	51.7%	0.25	47.3%
0.34	63.2%	0.32	60.3%	0.31	58.7%	0.3	56.4%	0.28	53.3%	0.27	51.7%	0.25	47.3%
0.34	63.2%	0.32	60.3%	0.31	58.7%	0.3	56.4%	0.28	53.3%	0.27	51.7%	0.25	47.3%
0.34	63.2%	0.32	60.3%	0.31	58.7%	0.3	56.4%	0.28	53.3%	0.27	51.7%	0.25	47.3%
0.34	63.2%	0.32	60.3%	0.31	58.7%	0.3	56.4%	0.28	53.3%	0.27	51.7%	0.25	47.3%
0.34	63.2%	0.32	60.3%	0.31	58.7%	0.3	56.4%	0.28	53.3%	0.27	51.7%	0.25	47.3%
0.34	63.2%	0.32	60.3%	0.31	58.7%	0.3	56.4%	0.28	53.3%	0.263	51.6%	0.25	47.3%
0.34	63.2%	0.32	60.3%	0.31	58.7%	0.3	56.4%	0.28	53.3%	0.263	51.6%	0.25	47.3%
0.34	63.2%	0.32	60.3%	0.31	58.7%	0.3	56.4%	0.28	53.3%	0.263	51.6%	0.25	47.3%
0.34	63.2%	0.32	60.3%	0.31	58.7%	0.3	56.4%	0.28	53.3%	0.26	49.8%	0.25	47.3%
0.34	63.2%	0.32	60.3%	0.31	58.7%	0.3	56.4%	0.28	53.3%	0.26	49.8%	0.25	47.3%
0.34	63.2%	0.32	60.3%	0.31	58.7%	0.3	56.4%	0.28	53.3%	0.26	49.8%	0.25	47.3%
0.34	63.2%	0.32	60.3%	0.31	58.7%	0.3	56.4%	0.28	53.3%	0.26	49.8%	0.25	47.3%
0.34	63.2%	0.32	60.3%	0.31	58.7%	0.3	56.4%	0.28	53.3%	0.26	49.8%	0.25	47.3%
0.34	63.2%	0.32	60.3%	0.31	58.7%	0.3	56.4%	0.28	53.3%	0.26	49.8%	0.25	47.3%
0.34	63.2%	0.32	60.3%	0.31	58.7%	0.3	56.4%	0.28	53.3%	0.26	49.8%	0.25	47.3%
0.34	63.2%	0.32	60.3%	0.31	58.7%	0.3	56.4%	0.28	53.3%	0.26	49.8%	0.25	47.3%
0.34	63.2%	0.32	60.3%	0.31	58.7%	0.3	56.4%	0.28	53.3%	0.26	49.8%	0.25	47.3%
0.34	63.2%	0.32	60.3%	0.31	58.7%	0.3	56.4%	0.28	53.3%	0.26	49.8%	0.25	47.3%
0.34	63.2%	0.32	60.3%	0.31	58.7%	0.3	56.4%	0.28	53.3%	0.26	49.8%	0.25	47.3%
0.34	63.2%	0.32	60.3%	0.31	58.7%	0.3	56.4%	0.28	53.3%	0.26	49.8%	0.25	47.3%
0.34	63.2%	0.32	60.3%	0.31	58.7%	0.3	56.4%	0.28	53.3%	0.26	49.8%	0.25	47.3%
0.34	63.2%	0.32	60.3%	0.31	58.7%	0.3	56.4%	0.28	53.3%	0.26	49.8%	0.25	47.3%
0.34	63.2%	0.32	60.3%	0.31	58.7%	0.3	56.4%	0.28	53.3%	0.26	49.8%	0.25	47.3%
0.34	63.2%	0.32	60.3%	0.31	58.7%	0.29	54.8%	0.28	53.3%	0.26	49.8%	0.25	47.3%
0.34	63.2%	0.32	60.3%	0.31	58.7%	0.29	54.8%	0.28	53.3%	0.26	49.8%	0.25	47.3%
0.34	63.2%	0.32	60.3%	0.31	58.7%	0.29	54.8%	0.28	53.3%	0.26	49.8%	0.25	47.3%
0.34	63.2%	0.32	60.3%	0.31	58.7%	0.29	54.8%	0.28	53.3%	0.26	49.8%	0.25	47.3%
0.34	63.2%	0.32	60.3%	0.31	58.7%	0.29	54.8%	0.28	53.3%	0.26	49.8%	0.25	47.3%
0.34	63.2%	0.32	60.3%	0.31	58.7%	0.29	54.8%	0.28	53.3%	0.26	49.8%	0.25	47.3%
0.34	63.2%	0.32	60.3%	0.31	58.7%	0.29	54.8%	0.28	53.3%	0.26	49.8%	0.25	47.3%
0.34	63.2%	0.32	60.3%	0.31	58.7%	0.29	54.8%	0.28	53.3%	0.26	49.8%	0.25	47.3%
0.34	63.2%	0.32	60.3%	0.31	58.7%	0.29	54.8%	0.28	53.3%	0.26	49.8%	0.25	47.3%
0.34	63.2%	0.32	60.3%	0.31	58.7%	0.29	54.8%	0.28	53.3%	0.26	49.8%	0.25	47.3%
0.34	63.2%	0.32	60.3%	0.31	58.7%	0.29	54.8%	0.28	53.3%	0.26	49.8%	0.25	47.3%
0.34	63.2%	0.32	60.3%	0.31	58.7%	0.29	54.8%	0.28	53.3%	0.26	49.8%	0.25	47.3%
0.34	63.2%	0.32	60.3%	0.31	58.7%	0.29	54.8%	0.28	53.3%	0.26	49.8%	0.25	47.3%
0.34	63.2%	0.32	60.3%	0.31	58.7%	0.29	54.8%	0.28	53.3%	0.26	49.8%	0.25	47.3%
0.34	63.2%	0.32	60.3%	0.3	56.4%	0.29	54.8%	0.28	53.3%	0.26	49.8%	0.25	47.3%
0.34	63.2%	0.32	60.3%	0.3	56.4%	0.29	54.8%	0.28	53.3%	0.26	49.8%	0.25	47.3%
0.34	63.2%	0.32	60.3%	0.3	56.4%	0.29	54.8%	0.28	53.3%	0.26	49.8%	0.25	47.3%
0.34	63.2%	0.32	60.3%	0.3	56.4%	0.29	54.8%	0.28	53.3%	0.26	49.8%	0.25	47.3%
0.34	63.2%	0.32	60.3%	0.3	56.4%	0.29	54.8%	0.28	53.3%	0.26	49.8%	0.25	47.3%
0.34	63.2%	0.32	60.3%	0.3	56.4%	0.29	54.8%	0.28	53.3%	0.26	49.8%	0.25	47.3%
0.34	63.2%	0.32	60.3%	0.3	56.4%	0.29	54.8%	0.28	53.3%	0.26	49.8%	0.25	47.3%
0.34	63.2%	0.32	60.3%	0.3	56.4%	0.29	54.8%	0.28	53.3%	0.26	49.8%	0.25	47.3%
0.34	63.2%	0.32	60.3%	0.3	56.4%	0.29	54.8%	0.28	53.3%	0.26	49.8%	0.25	47.3%
0.34	63.2%	0.32	60.3%	0.3	56.4%	0.29	54.8%	0.28	53.3%	0.26	49.8%	0.25	47.3%
0.34	63.2%	0.32	60.3%	0.3	56.4%	0.29	54.8%	0.28	53.3%	0.26	49.8%	0.25	47.3%
0.34	63.2%	0.32	60.3%	0.3	56.4%	0.29	54.8%	0.28	53.3%	0.26	49.8%	0.25	47.3%
0.34	63.2%	0.32	60.3%	0.3	56.4%	0.29	54.8%	0.28	53.3%	0.26	49.8%	0.25	47.3%
0.34	63.2%	0.32	60.3%	0.3	56.4%	0.29	54.8%	0.28	53.3%	0.26	49.8%	0.25	47.3%
0.34	63.2%	0.32	60.3%	0.3	56.4%	0.29	54.8%	0.28	53.3%	0.26	49.8%	0.25	47.3%
0.34	63.2%	0.32	60.3%	0.3	56.4%	0.29	54.8%	0.28	53.3%	0.26	49.8%	0.25	47.3%
0.34	63.2%	0.32	60.3%	0.3	56.4%	0.29	54.8%	0.28	53.3%	0.26	49.8%	0.25	47.3%
0.34	63.2%	0.32	60.3%	0.3	56.4%	0.29	54.8%	0.27	51.7%	0.26	49.8%	0.25	47.3%
0.34	63.2%	0.32	60.3%	0.3	56.4%	0.29	54.8%	0.27	51.7%	0.26	49.8%	0.25	47.3%
0.34	63.2%	0.32	60.3%	0.3	56.4%	0.29	54.8%	0.27	51.7%	0.26	49.8%	0.25	47.3%
0.34	63.2%	0.32	60.3%	0.3	56.4%	0.29	54.8%	0.27	51.7%	0.26	49.8%	0.25	47.3%
0.34	63.2%	0.32	60.3%	0.3	56.4%	0.29	54.8%	0.27	51.7%	0.26	49.8%	0.25	47.3%
0.34	63.2%	0.32	60.3%	0.3	56.4%	0.29	54.8%	0.27	51.7%	0.26	49.8%	0.25	47.3%
0.34	63.2%	0.32	60.3%	0.3	56.4%	0.29	54.8%	0.27	51.7%	0.26	49.8%	0.25	47.3%
0.34	63.2%	0.32	60.3%	0.3	56.4%	0.29	54.8%	0.27	51.7%	0.26	49.8%	0.25	47.3%
0.34	63.2%	0.32	60.3%	0.3	56.4%	0.29	54.8%	0.27	51.7%	0.26	49.8%	0.25	47.3%
0.33	61.9%	0.32	60.3%	0.3	56.4%	0.29	54.8%	0.27	51.7%	0.26	49.8%	0.25	47.3%
0.33	61.9%	0.32	60.3%	0.3	56.4%	0.29	54.8%	0.27	51.7%	0.26	49.8%	0.25	47.3%
0.33	61.9%	0.32	60.3%	0.3	56.4%	0.29	54.8%	0.27	51.7%	0.26	49.8%	0.25	47.3%
0.33	61.9%	0.32	60.3%	0.3	56.4%	0.29	54.8%	0.27	51.7%	0.26	49.8%	0.25	47.3%
0.33	61.9%	0.32	60.3%	0.3	56.4%	0.29	54.8%	0.27	51.7%	0.26	49.8%	0.25	47.3%
0.33	61.9%	0.32	60.3%	0.3	56.4%	0.29	54.8%	0.27	51.7%	0.26	49.8%	0.25	47.3%
0.33	61.9%	0.32	60.3%	0.3	56.4%	0.29	54.8%	0.27	51.7%	0.26	49.8%	0.25	47.3%
0.33	61.9%	0.32	60.3%	0.3	56.4%	0.29	54.8%	0.27	51.7%	0.26	49.8%	0.25	47.3%
0.33	61.9%	0.32	60.3%	0.3	56.4%	0.29	54.8%	0.27	51.7%	0.26	49.8%	0.25	47.3%
0.33	61.9%	0.32	60.3%	0.3	56.4%	0.29	54.8%	0.27	51.7%	0.26	49.8%	0.25	47.3%
0.33	61.9%	0.32	60.3%	0.3	56.4%	0.29	54.8%	0.27	51.7%	0.26	49.8%	0.25	47.3%
0.33	61.9%	0.32	60.3%	0.3	56.4%	0.29	54.8%	0.27	51.7%	0.26	49.8%	0.25	47.3%
0.33	61.9%	0.32	60.3%	0.3	56.4%	0.29	54.8%	0.27	51.7%	0.26	49.8%	0.25	47.3%
0.33	61.9%	0.32	60.3%	0.3	56.4%	0.29	54.8%	0.27	51.7%	0.26	49.8%	0.25	47.3%
0.33	61.9%	0.32	60.3%	0.3	56.4%	0.29	54.8%	0.27	51.7%	0.26	49.8%	0.25	47.3%
0.33	61.9%	0.32	60.3%	0.3	56.4%	0.29	54.8%	0.27	51.7%	0.26	49.8%	0.25	47.3%
0.33	61.9%	0.32	60.3%	0.3	56.4%	0.29	54.8%	0.27	51.7%	0.26	49.8%	0.25	47.3%
0.33	61.9%	0.32	60.3%	0.3	56.4%	0.29	54.8%	0.27	51.7%	0.26	49.8%	0.25	47.3%
0.33	61.9%	0.32	60.3%	0.3	56.4%	0.29	54.8%	0.27	51.7%	0.26	49.8%	0.25	47.3%
0.33	61.9%	0.32	60.3%	0.3	56.4%	0.29	54.8%	0.27	51.7%	0.26	49.8%	0.25	47.3%
0.33	61.9%	0.32	60.3%	0.3	56.4%	0.29	54.8%	0.27	51.7%	0.26	49.8%	0.25	47.3%
0.33	61.9%	0.31	58.7%	0.3	56.4%	0.29	54.8%	0.27	51.7%	0.26	49.8%	0.25	47.3%
0.33	61.9%	0.31	58.7%	0.3	56.4%	0.29	54.8%	0.27	51.7%	0.26	49.8%	0.25	47.3%
0.33	61.9%	0.31	58.7%	0.3	56.4%	0.29	54.8%	0.27	51.7%	0.26	49.8%	0.25	47.3%
0.33	61.9%	0.31	58.7%	0.3	56.4%	0.29	54.8%	0.27	51.7%	0.26	49.8%	0.25	47.3%
0.33	61.9%	0.31	58.7%	0.3	56.4%	0.29	54.8%	0.27	51.7%	0.26	49.8%	0.25	47.3%
0.33	61.9%	0.31	58.7%	0.3	56.4%	0.29	54.8%	0.27	51.7%	0.26	49.8%	0.25	47.3%
0.33	61.9%	0.31	58.7%	0.3	56.4%	0.29	54.8%	0.27	51.7%	0.26	49.8%	0.25	47.3%
0.33	61.9%	0.31	58.7%	0.3	56.4%	0.29	54.8%	0.27	51.7%	0.26	49.8%	0.25	47.3%
0.33	61.9%	0.31	58.7%	0.3	56.4%	0.29	54.8%	0.27	51.7%	0.26	49.8%	0.25	47.3%
0.33	61.9%	0.31	58.7%	0.3	56.4%	0.29	54.8%	0.27	51.7%	0.26	49.8%	0.25	47.3%
0.33	61.9%	0.31	58.7%	0.3	56.4%	0.29	54.8%	0.27	51.7%	0.26	49.8%	0.25	47.3%
0.33	61.9%	0.31	58.7%	0.3	56.4%	0.29	54.8%	0.27	51.7%	0.26	49.8%	0.25	47.3%
0.33	61.9%	0.31	58.7%	0.3	56.4%	0.29	54.8%	0.27	51.7%	0.26	49.8%	0.25	47.3%
0.33	61.9%	0.31	58.7%	0.3	56.4%	0.29	54.8%	0.27	51.7%	0.26	49.8%	0.25	47.3%
0.33	61.9%	0.31	58.7%	0.3	56.4%	0.29	54.8%	0.27	51.7%	0.26	49.8%	0.25	47.3%
0.33	61.9%	0.31	58.7%	0.3	56.4%	0.29	54.8%	0.27	51.7%	0.26	49.8%	0.25	47.3%
0.33	61.9%	0.31	58.7%	0.3	56.4%	0.29	54.8%	0.27	51.7%	0.26	49.8%	0.25	47.3%
0.33	61.9%	0.31	58.7%	0.3	56.4%	0.29	54.8%	0.27	51.7%	0.26	49.8%	0.25	47.3%
0.33	61.9%	0.31	58.7%	0.3	56.4%	0.29	54.8%	0.27	51.7%	0.26	49.8%	0.25	47.3%
0.33	61.9%	0.31	58.7%	0.3	56.4%	0.29	54.8%	0.27	51.7%	0.26	49.8%	0.25	47.3%
0.33	61.9%	0.31	58.7%	0.3	56.4%	0.29	54.8%	0.27	51.7%	0.26	49.8%	0.25	47.3%
0.33	61.9%	0.31	58.7%	0.3	56.4%	0.29	54.8%	0.27	51.7%	0.26	49.8%	0.25	47.3%
0.33	61.9%	0.31	58.7%	0.3	56.4%	0.29	54.8%	0.27	51.7%	0.26	49.8%	0.25	47.3%
0.33	61.9%	0.31	58.7%	0.3	56.4%	0.29	54.8%	0.27	51.7%	0.26	49.8%	0.25	47.3%
0.33	61.9%	0.31	58.7%	0.3	56.4%	0.29	54.8%	0.27	51.7%	0.26	49.8%	0.24	45.5%
0.33	61.9%	0.31	58.7%	0.3	56.4%	0.29	54.8%	0.27	51.7%	0.26	49.8%	0.24	45.5%
0.33	61.9%	0.31	58.7%	0.3	56.4%	0.29	54.8%	0.27	51.7%	0.26	49.8%	0.24	45.5%
0.33	61.9%	0.31	58.7%	0.3	56.4%	0.28	53.3%	0.27	51.7%	0.26	49.8%	0.24	45.5%
0.33	61.9%	0.31	58.7%	0.3	56.4%	0.28	53.3%	0.27	51.7%	0.25	47.3%	0.24	45.5%
0.33	61.9%	0.31	58.7%	0.3	56.4%	0.28	53.3%	0.27	51.7%	0.25	47.3%	0.24	45.5%
0.33	61.9%	0.31	58.7%	0.3	56.4%	0.28	53.3%	0.27	51.7%	0.25	47.3%	0.24	45.5%
0.33	61.9%	0.31	58.7%	0.3	56.4%	0.28	53.3%	0.27	51.7%	0.25	47.3%	0.24	45.5%
0.33	61.9%	0.31	58.7%	0.3	56.4%	0.28	53.3%	0.27	51.7%	0.25	47.3%	0.24	45.5%
0.33	61.9%	0.31	58.7%	0.3	56.4%	0.28	53.3%	0.27	51.7%	0.25	47.3%	0.24	45.5%
0.33	61.9%	0.31	58.7%	0.3	56.4%	0.28	53.3%	0.27	51.7%	0.25	47.3%	0.24	45.5%
0.33	61.9%	0.31	58.7%	0.3	56.4%	0.28	53.3%	0.27	51.7%	0.25	47.3%	0.24	45.5%
0.33	61.9%	0.31	58.7%	0.3	56.4%	0.28	53.3%	0.27	51.7%	0.25	47.3%	0.24	45.5%
0.33	61.9%	0.31	58.7%	0.3	56.4%	0.28	53.3%	0.27	51.7%	0.25	47.3%	0.24	45.5%
0.33	61.9%	0.31	58.7%	0.3	56.4%	0.28	53.3%	0.27	51.7%	0.25	47.3%	0.24	45.5%
0.33	61.9%	0.31	58.7%	0.3	56.4%	0.28	53.3%	0.27	51.7%	0.25	47.3%	0.24	45.5%
0.33	61.9%	0.31	58.7%	0.3	56.4%	0.28	53.3%	0.27	51.7%	0.25	47.3%	0.24	45.5%

Spanish Fork at Powerhouse Gage, rainfall depths >= 0.1 inches since 1909

Sorted Precip (in)	X %ile Storm	Sorted Precip (in)	X %ile Storm	Sorted Precip (in)	X %ile Storm	Sorted Precip (in)	X %ile Storm	Sorted Precip (in)	X %ile Storm	Sorted Precip (in)	X %ile Storm	Sorted Precip (in)	X %ile Storm
0.24	45.5%	0.23	43.3%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.19	33.0%	0.18	30.2%
0.24	45.5%	0.23	43.3%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.19	33.0%	0.18	30.2%
0.24	45.5%	0.23	43.3%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.19	33.0%	0.18	30.2%
0.24	45.5%	0.23	43.3%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.19	33.0%	0.18	30.2%
0.24	45.5%	0.23	43.3%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.19	33.0%	0.18	30.2%
0.24	45.5%	0.23	43.3%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.19	33.0%	0.18	30.2%
0.24	45.5%	0.23	43.3%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.19	33.0%	0.18	30.2%
0.24	45.5%	0.23	43.3%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.19	33.0%	0.18	30.2%
0.24	45.5%	0.23	43.3%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.19	33.0%	0.18	30.2%
0.24	45.5%	0.23	43.3%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.19	33.0%	0.18	30.2%
0.24	45.5%	0.23	43.3%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.19	33.0%	0.18	30.2%
0.24	45.5%	0.23	43.3%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.19	33.0%	0.18	30.2%
0.24	45.5%	0.23	43.3%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.19	33.0%	0.18	30.2%
0.24	45.5%	0.23	43.3%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.19	33.0%	0.18	30.2%
0.24	45.5%	0.23	43.3%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.19	33.0%	0.18	30.2%
0.24	45.5%	0.23	43.3%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.19	33.0%	0.18	30.2%
0.24	45.5%	0.23	43.3%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.19	33.0%	0.18	30.2%
0.24	45.5%	0.23	43.3%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.19	33.0%	0.18	30.2%
0.24	45.5%	0.23	43.3%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.19	33.0%	0.18	30.2%
0.24	45.5%	0.23	43.3%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.19	33.0%	0.18	30.2%
0.24	45.5%	0.23	43.3%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.19	33.0%	0.18	30.2%
0.24	45.5%	0.23	43.3%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.19	33.0%	0.18	30.2%
0.24	45.5%	0.23	43.3%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.19	33.0%	0.18	30.2%
0.24	45.5%	0.23	43.3%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.19	33.0%	0.18	30.2%
0.24	45.5%	0.23	43.3%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.19	33.0%	0.18	30.2%
0.24	45.5%	0.23	43.3%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.19	33.0%	0.18	30.2%
0.24	45.5%	0.23	43.3%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.19	33.0%	0.18	30.2%
0.24	45.5%	0.23	43.3%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.19	33.0%	0.18	30.2%
0.24	45.5%	0.23	43.3%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.19	33.0%	0.18	30.2%
0.24	45.5%	0.23	43.3%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.19	33.0%	0.18	30.2%
0.24	45.5%	0.23	43.3%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.19	33.0%	0.18	30.2%
0.24	45.5%	0.23	43.3%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.19	33.0%	0.18	30.2%
0.24	45.5%	0.23	43.3%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.19	33.0%	0.18	30.2%
0.24	45.5%	0.23	43.3%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.19	33.0%	0.18	30.2%
0.24	45.5%	0.23	43.3%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.19	33.0%	0.18	30.2%
0.24	45.5%	0.23	43.3%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.19	33.0%	0.18	30.2%
0.24	45.5%	0.23	43.3%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.19	33.0%	0.18	30.2%
0.24	45.5%	0.23	43.3%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.19	33.0%	0.18	30.2%
0.24	45.5%	0.23	43.3%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.19	33.0%	0.18	30.2%
0.24	45.5%	0.23	43.3%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.19	33.0%	0.18	30.2%
0.24	45.5%	0.23	43.3%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.19	33.0%	0.18	30.2%
0.24	45.5%	0.23	43.3%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.19	33.0%	0.18	30.2%
0.24	45.5%	0.23	43.3%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.19	33.0%	0.18	30.2%
0.24	45.5%	0.23	43.3%	0.22	41.0%	0.2	35.4%	0.2	35.4%	0.19	33.0%	0.18	30.2%
0.24	45.5%	0.23	43.3%	0.22	41.0%	0.2	35.4%	0.2	35.4%	0.19	33.0%	0.18	30.2%
0.24	45.5%	0.23	43.3%	0.22	41.0%	0.2	35.4%	0.2	35.4%	0.19	33.0%	0.18	30.2%
0.24	45.5%	0.23	43.3%	0.22	41.0%	0.2	35.4%	0.2	35.4%	0.19	33.0%	0.18	30.2%
0.24	45.5%	0.23	43.3%	0.22	41.0%	0.2	35.4%	0.2	35.4%	0.19	33.0%	0.18	30.2%
0.24	45.5%	0.23	43.3%	0.22	41.0%	0.2	35.4%	0.2	35.4%	0.19	33.0%	0.18	30.2%
0.24	45.5%	0.23	43.3%	0.22	41.0%	0.2	35.4%	0.2	35.4%	0.19	33.0%	0.18	30.2%
0.24	45.5%	0.23	43.3%	0.22	41.0%	0.2	35.4%	0.2	35.4%	0.19	33.0%	0.18	30.2%
0.24	45.5%	0.23	43.3%	0.22	41.0%	0.2	35.4%	0.2	35.4%	0.19	33.0%	0.18	30.2%
0.24	45.5%	0.23	43.3%	0.22	41.0%	0.2	35.4%	0.2	35.4%	0.19	33.0%	0.18	30.2%
0.24	45.5%	0.23	43.3%	0.21	38.7%	0.2	35.4%	0.2	35.4%	0.19	33.0%	0.18	30.2%
0.24	45.5%	0.23	43.3%	0.21	38.7%	0.2	35.4%	0.2	35.4%	0.19	33.0%	0.18	30.2%
0.24	45.5%	0.23	43.3%	0.21	38.7%	0.2	35.4%	0.2	35.4%	0.19	33.0%	0.18	30.2%
0.24	45.5%	0.23	43.3%	0.21	38.7%	0.2	35.4%	0.2	35.4%	0.19	33.0%	0.18	30.2%
0.24	45.5%	0.23	43.3%	0.21	38.7%	0.2	35.4%	0.2	35.4%	0.19	33.0%	0.18	30.2%
0.24	45.5%	0.23	43.3%	0.21	38.7%	0.2	35.4%	0.2	35.4%	0.19	33.0%	0.18	30.2%
0.24	45.5%	0.23	43.3%	0.21	38.7%	0.2	35.4%	0.2	35.4%	0.19	33.0%	0.18	30.2%
0.24	45.5%	0.23	43.3%	0.21	38.7%	0.2	35.4%	0.2	35.4%	0.19	33.0%	0.18	30.2%
0.24	45.5%	0.23	43.3%	0.21	38.7%	0.2	35.4%	0.2	35.4%	0.19	33.0%	0.18	30.2%
0.24	45.5%	0.23	43.3%	0.21	38.7%	0.2	35.4%	0.2	35.4%	0.19	33.0%	0.18	30.2%
0.24	45.5%	0.23	43.3%	0.21	38.7%	0.2	35.4%	0.2	35.4%	0.19	33.0%	0.18	30.2%
0.24	45.5%	0.23	43.3%	0.21	38.7%	0.2	35.4%	0.2	35.4%	0.19	33.0%	0.18	30.2%
0.24	45.5%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.2	35.4%	0.19	33.0%	0.18	30.2%
0.24	45.5%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.2	35.4%	0.19	33.0%	0.18	30.2%
0.24	45.5%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.2	35.4%	0.19	33.0%	0.18	30.2%
0.24	45.5%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.2	35.4%	0.19	33.0%	0.18	30.2%
0.24	45.5%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.2	35.4%	0.19	33.0%	0.18	30.2%
0.24	45.5%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.2	35.4%	0.19	33.0%	0.18	30.2%
0.24	45.5%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.2	35.4%	0.19	33.0%	0.18	30.2%
0.24	45.5%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.2	35.4%	0.19	33.0%	0.18	30.2%
0.24	45.5%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.2	35.4%	0.19	33.0%	0.18	30.2%
0.24	45.5%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.2	35.4%	0.18	30.2%	0.18	30.2%
0.24	45.5%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.2	35.4%	0.18	30.2%	0.18	30.2%
0.24	45.5%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.2	35.4%	0.18	30.2%	0.18	30.2%
0.24	45.5%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.2	35.4%	0.18	30.2%	0.18	30.2%
0.24	45.5%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.2	35.4%	0.18	30.2%	0.18	30.2%
0.24	45.5%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.2	35.4%	0.18	30.2%	0.18	30.2%
0.24	45.5%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.2	35.4%	0.18	30.2%	0.18	30.2%
0.24	45.5%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.2	35.4%	0.18	30.2%	0.18	30.2%
0.23	43.3%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.19	33.0%	0.18	30.2%	0.18	30.2%
0.23	43.3%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.19	33.0%	0.18	30.2%	0.18	30.2%
0.23	43.3%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.19	33.0%	0.18	30.2%	0.18	30.2%
0.23	43.3%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.19	33.0%	0.18	30.2%	0.18	30.2%
0.23	43.3%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.19	33.0%	0.18	30.2%	0.18	30.2%
0.23	43.3%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.19	33.0%	0.18	30.2%	0.18	30.2%
0.23	43.3%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.19	33.0%	0.18	30.2%	0.18	30.2%
0.23	43.3%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.19	33.0%	0.18	30.2%	0.18	30.2%
0.23	43.3%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.19	33.0%	0.18	30.2%	0.18	30.2%
0.23	43.3%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.19	33.0%	0.18	30.2%	0.17	27.6%
0.23	43.3%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.19	33.0%	0.18	30.2%	0.17	27.6%
0.23	43.3%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.19	33.0%	0.18	30.2%	0.17	27.6%
0.23	43.3%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.19	33.0%	0.18	30.2%	0.17	27.6%
0.23	43.3%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.19	33.0%	0.18	30.2%	0.17	27.6%
0.23	43.3%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.19	33.0%	0.18	30.2%	0.17	27.6%
0.23	43.3%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.19	33.0%	0.18	30.2%	0.17	27.6%
0.23	43.3%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.19	33.0%	0.18	30.2%	0.17	27.6%
0.23	43.3%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.19	33.0%	0.18	30.2%	0.17	27.6%
0.23	43.3%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.19	33.0%	0.18	30.2%	0.17	27.6%
0.23	43.3%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.19	33.0%	0.18	30.2%	0.17	27.6%
0.23	43.3%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.19	33.0%	0.18	30.2%	0.17	27.6%
0.23	43.3%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.19	33.0%	0.18	30.2%	0.17	27.6%
0.23	43.3%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.19	33.0%	0.18	30.2%	0.17	27.6%
0.23	43.3%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.19	33.0%	0.18	30.2%	0.17	27.6%
0.23	43.3%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.19	33.0%	0.18	30.2%	0.17	27.6%
0.23	43.3%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.19	33.0%	0.18	30.2%	0.17	27.6%
0.23	43.3%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.19	33.0%	0.18	30.2%	0.17	27.6%
0.23	43.3%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.19	33.0%	0.18	30.2%	0.17	27.6%
0.23	43.3%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.19	33.0%	0.18	30.2%	0.17	27.6%
0.23	43.3%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.19	33.0%	0.18	30.2%	0.17	27.6%
0.23	43.3%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.19	33.0%	0.18	30.2%	0.17	27.6%
0.23	43.3%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.19	33.0%	0.18	30.2%	0.17	27.6%
0.23	43.3%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.19	33.0%	0.18	30.2%	0.17	27.6%
0.23	43.3%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.19	33.0%	0.18	30.2%	0.17	27.6%
0.23	43.3%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.19	33.0%	0.18	30.2%	0.17	27.6%
0.23	43.3%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.19	33.0%	0.18	30.2%	0.17	27.6%
0.23	43.3%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.19	33.0%	0.18	30.2%	0.17	27.6%
0.23	43.3%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.19	33.0%	0.18	30.2%	0.17	27.6%
0.23	43.3%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.19	33.0%	0.18	30.2%	0.17	27.6%
0.23	43.3%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.19	33.0%	0.18	30.2%	0.17	27.6%
0.23	43.3%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.19	33.0%	0.18	30.2%	0.17	27.6%
0.23	43.3%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.19	33.0%	0.18	30.2%	0.17	27.6%
0.23	43.3%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.19	33.0%	0.18	30.2%	0.17	27.6%
0.23	43.3%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.19	33.0%	0.18	30.2%	0.17	27.6%
0.23	43.3%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.19	33.0%	0.18	30.2%	0.17	27.6%
0.23	43.3%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.19	33.0%	0.18	30.2%	0.17	27.6%
0.23	43.3%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.19	33.0%	0.18	30.2%	0.17	27.6%
0.23	43.3%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.19	33.0%	0.18	30.2%	0.17	27.6%
0.23	43.3%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.19	33.0%	0.18	30.2%	0.17	27.6%
0.23	43.3%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.19	33.0%	0.18	30.2%	0.17	27.6%
0.23	43.3%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.19	33.0%	0.18	30.2%	0.17	27.6%
0.23	43.3%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.19	33.0%	0.18	30.2%	0.17	27.6%
0.23	43.3%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.19	33.0%	0.18	30.2%	0.17	27.6%
0.23	43.3%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.19	33.0%	0.18	30.2%	0.17	27.6%
0.23	43.3%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.19	33.0%	0.18	30.2%	0.17	27.6%
0.23	43.3%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.19	33.0%	0.18	30.2%	0.17	27.6%
0.23	43.3%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.19	33.0%	0.18	30.2%	0.17	27.6%
0.23	43.3%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.19	33.0%	0.18	30.2%	0.17	27.6%
0.23	43.3%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.19	33.0%	0.18	30.2%	0.17	27.6%
0.23	43.3%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.19	33.0%	0.18	30.2%	0.17	27.6%
0.23	43.3%	0.22	41.0%	0.21	38.7%	0.2	35.4%	0.19	33.0%	0.18	30.2%	0.17	27.6%

Spanish Fork at Powerhouse Gage, rainfall depths >= 0.1 inches since 1909

Sorted Precip (in)	X %ile Storm	Sorted Precip (in)	X %ile Storm	Sorted Precip (in)	X %ile Storm	Sorted Precip (in)	X %ile Storm	Sorted Precip (in)	X %ile Storm	Sorted Precip (in)	X %ile Storm	Sorted Precip (in)	X %ile Storm
0.17	27.6%	0.16	25.0%	0.15	21.4%	0.15	21.4%	0.14	17.7%	0.13	14.1%	0.13	14.1%
0.17	27.6%	0.16	25.0%	0.15	21.4%	0.15	21.4%	0.14	17.7%	0.13	14.1%	0.13	14.1%
0.17	27.6%	0.16	25.0%	0.15	21.4%	0.15	21.4%	0.14	17.7%	0.13	14.1%	0.13	14.1%
0.17	27.6%	0.16	25.0%	0.15	21.4%	0.15	21.4%	0.14	17.7%	0.13	14.1%	0.13	14.1%
0.17	27.6%	0.16	25.0%	0.15	21.4%	0.15	21.4%	0.14	17.7%	0.13	14.1%	0.13	14.1%
0.17	27.6%	0.16	25.0%	0.15	21.4%	0.15	21.4%	0.14	17.7%	0.13	14.1%	0.13	14.1%
0.17	27.6%	0.16	25.0%	0.15	21.4%	0.15	21.4%	0.14	17.7%	0.13	14.1%	0.13	14.1%
0.17	27.6%	0.16	25.0%	0.15	21.4%	0.15	21.4%	0.14	17.7%	0.13	14.1%	0.13	14.1%
0.17	27.6%	0.16	25.0%	0.15	21.4%	0.15	21.4%	0.14	17.7%	0.13	14.1%	0.12	9.5%
0.17	27.6%	0.16	25.0%	0.15	21.4%	0.15	21.4%	0.14	17.7%	0.13	14.1%	0.12	9.5%
0.17	27.6%	0.16	25.0%	0.15	21.4%	0.15	21.4%	0.14	17.7%	0.13	14.1%	0.12	9.5%
0.17	27.6%	0.16	25.0%	0.15	21.4%	0.15	21.4%	0.14	17.7%	0.13	14.1%	0.12	9.5%
0.17	27.6%	0.16	25.0%	0.15	21.4%	0.15	21.4%	0.14	17.7%	0.13	14.1%	0.12	9.5%
0.17	27.6%	0.16	25.0%	0.15	21.4%	0.15	21.4%	0.14	17.7%	0.13	14.1%	0.12	9.5%
0.17	27.6%	0.16	25.0%	0.15	21.4%	0.15	21.4%	0.14	17.7%	0.13	14.1%	0.12	9.5%
0.17	27.6%	0.16	25.0%	0.15	21.4%	0.15	21.4%	0.14	17.7%	0.13	14.1%	0.12	9.5%
0.17	27.6%	0.16	25.0%	0.15	21.4%	0.15	21.4%	0.14	17.7%	0.13	14.1%	0.12	9.5%
0.17	27.6%	0.16	25.0%	0.15	21.4%	0.15	21.4%	0.14	17.7%	0.13	14.1%	0.12	9.5%
0.17	27.6%	0.16	25.0%	0.15	21.4%	0.15	21.4%	0.14	17.7%	0.13	14.1%	0.12	9.5%
0.17	27.6%	0.16	25.0%	0.15	21.4%	0.15	21.4%	0.14	17.7%	0.13	14.1%	0.12	9.5%
0.17	27.6%	0.16	25.0%	0.15	21.4%	0.15	21.4%	0.14	17.7%	0.13	14.1%	0.12	9.5%
0.17	27.6%	0.16	25.0%	0.15	21.4%	0.15	21.4%	0.14	17.7%	0.13	14.1%	0.12	9.5%
0.17	27.6%	0.16	25.0%	0.15	21.4%	0.14	17.7%	0.14	17.7%	0.13	14.1%	0.12	9.5%
0.17	27.6%	0.16	25.0%	0.15	21.4%	0.14	17.7%	0.14	17.7%	0.13	14.1%	0.12	9.5%
0.17	27.6%	0.16	25.0%	0.15	21.4%	0.14	17.7%	0.14	17.7%	0.13	14.1%	0.12	9.5%
0.17	27.6%	0.16	25.0%	0.15	21.4%	0.14	17.7%	0.14	17.7%	0.13	14.1%	0.12	9.5%
0.17	27.6%	0.16	25.0%	0.15	21.4%	0.14	17.7%	0.14	17.7%	0.13	14.1%	0.12	9.5%
0.17	27.6%	0.16	25.0%	0.15	21.4%	0.14	17.7%	0.14	17.7%	0.13	14.1%	0.12	9.5%
0.17	27.6%	0.16	25.0%	0.15	21.4%	0.14	17.7%	0.14	17.7%	0.13	14.1%	0.12	9.5%
0.17	27.6%	0.16	25.0%	0.15	21.4%	0.14	17.7%	0.14	17.7%	0.13	14.1%	0.12	9.5%
0.17	27.6%	0.16	25.0%	0.15	21.4%	0.14	17.7%	0.14	17.7%	0.13	14.1%	0.12	9.5%
0.17	27.6%	0.16	25.0%	0.15	21.4%	0.14	17.7%	0.14	17.7%	0.13	14.1%	0.12	9.5%
0.17	27.6%	0.16	25.0%	0.15	21.4%	0.14	17.7%	0.14	17.7%	0.13	14.1%	0.12	9.5%
0.17	27.6%	0.16	25.0%	0.15	21.4%	0.14	17.7%	0.14	17.7%	0.13	14.1%	0.12	9.5%
0.17	27.6%	0.16	25.0%	0.15	21.4%	0.14	17.7%	0.14	17.7%	0.13	14.1%	0.12	9.5%
0.17	27.6%	0.16	25.0%	0.15	21.4%	0.14	17.7%	0.14	17.7%	0.13	14.1%	0.12	9.5%
0.17	27.6%	0.16	25.0%	0.15	21.4%	0.14	17.7%	0.14	17.7%	0.13	14.1%	0.12	9.5%
0.17	27.6%	0.16	25.0%	0.15	21.4%	0.14	17.7%	0.14	17.7%	0.13	14.1%	0.12	9.5%
0.17	27.6%	0.16	25.0%	0.15	21.4%	0.14	17.7%	0.14	17.7%	0.13	14.1%	0.12	9.5%
0.17	27.6%	0.16	25.0%	0.15	21.4%	0.14	17.7%	0.14	17.7%	0.13	14.1%	0.12	9.5%
0.17	27.6%	0.16	25.0%	0.15	21.4%	0.14	17.7%	0.14	17.7%	0.13	14.1%	0.12	9.5%
0.17	27.6%	0.16	25.0%	0.15	21.4%	0.14	17.7%	0.14	17.7%	0.13	14.1%	0.12	9.5%
0.17	27.6%	0.16	25.0%	0.15	21.4%	0.14	17.7%	0.14	17.7%	0.13	14.1%	0.12	9.5%
0.17	27.6%	0.16	25.0%	0.15	21.4%	0.14	17.7%	0.14	17.7%	0.13	14.1%	0.12	9.5%
0.17	27.6%	0.16	25.0%	0.15	21.4%	0.14	17.7%	0.14	17.7%	0.13	14.1%	0.12	9.5%
0.17	27.6%	0.16	25.0%	0.15	21.4%	0.14	17.7%	0.14	17.7%	0.13	14.1%	0.12	9.5%
0.17	27.6%	0.16	25.0%	0.15	21.4%	0.14	17.7%	0.14	17.7%	0.13	14.1%	0.12	9.5%
0.17	27.6%	0.16	25.0%	0.15	21.4%	0.14	17.7%	0.14	17.7%	0.13	14.1%	0.12	9.5%
0.17	27.6%	0.16	25.0%	0.15	21.4%	0.14	17.7%	0.14	17.7%	0.13	14.1%	0.12	9.5%
0.17	27.6%	0.16	25.0%	0.15	21.4%	0.14	17.7%	0.14	17.7%	0.13	14.1%	0.12	9.5%
0.17	27.6%	0.16	25.0%	0.15	21.4%	0.14	17.7%	0.14	17.7%	0.13	14.1%	0.12	9.5%
0.17	27.6%	0.16	25.0%	0.15	21.4%	0.14	17.7%	0.14	17.7%	0.13	14.1%	0.12	9.5%
0.17	27.6%	0.16	25.0%	0.15	21.4%	0.14	17.7%	0.14	17.7%	0.13	14.1%	0.12	9.5%
0.17	27.6%	0.16	25.0%	0.15	21.4%	0.14	17.7%	0.14	17.7%	0.13	14.1%	0.12	9.5%
0.17	27.6%	0.16	25.0%	0.15	21.4%	0.14	17.7%	0.14	17.7%	0.13	14.1%	0.12	9.5%
0.17	27.6%	0.16	25.0%	0.15	21.4%	0.14	17.7%	0.14	17.7%	0.13	14.1%	0.12	9.5%
0.17	27.6%	0.16	25.0%	0.15	21.4%	0.14	17.7%	0.14	17.7%	0.13	14.1%	0.12	9.5%
0.17	27.6%	0.16	25.0%	0.15	21.4%	0.14	17.7%	0.14	17.7%	0.13	14.1%	0.12	9.5%
0.17	27.6%	0.16	25.0%	0.15	21.4%	0.14	17.7%	0.14	17.7%	0.13	14.1%	0.12	9.5%
0.17	27.6%	0.16	25.0%	0.15	21.4%	0.14	17.7%	0.14	17.7%	0.13	14.1%	0.12	9.5%
0.17	27.6%	0.16	25.0%	0.15	21.4%	0.14	17.7%	0.14	17.7%	0.13	14.1%	0.12	9.5%
0.17	27.6%	0.16	25.0%	0.15	21.4%	0.14	17.7%	0.14	17.7%	0.13	14.1%	0.12	9.5%
0.17	27.6%	0.16	25.0%	0.15	21.4%	0.14	17.7%	0.14	17.7%	0.13	14.1%	0.12	9.5%
0.17	27.6%	0.16	25.0%	0.15	21.4%	0.14	17.7%	0.14	17.7%	0.13	14.1%	0.12	9.5%
0.17	27.6%	0.16	25.0%	0.15	21.4%	0.14	17.7%	0.14	17.7%	0.13	14.1%	0.12	9.5%
0.17	27.6%	0.16	25.0%	0.15	21.4%	0.14	17.7%	0.14	17.7%	0.13	14.1%	0.12	9.5%
0.17	27.6%	0.16	25.0%	0.15	21.4%	0.14	17.7%	0.14	17.7%	0.13	14.1%	0.12	9.5%
0.17	27.6%	0.16	25.0%	0.15	21.4%	0.14	17.7%	0.14	17.7%	0.13	14.1%	0.12	9.5%
0.17	27.6%	0.16	25.0%	0.15	21.4%	0.14	17.7%	0.14	17.7%	0.13	14.1%	0.12	9.5%
0.17	27.6%	0.16	25.0%	0.15	21.4%	0.14	17.7%	0.14	17.7%	0.13	14.1%	0.12	9.5%
0.17	27.6%	0.16	25.0%	0.15	21.4%	0.14	17.7%	0.14	17.7%	0.13	14.1%	0.12	9.5%
0.17	27.6%	0.16	25.0%	0.15	21.4%	0.14	17.7%	0.14	17.7%	0.13	14.1%	0.12	9.5%
0.17	27.6%	0.16	25.0%	0.15	21.4%	0.14	17.7%	0.14	17.7%	0.13	14.1%	0.12	9.5%
0.17	27.6%	0.16	25.0%	0.15	21.4%	0.14	17.7%	0.14	17.7%	0.13	14.1%	0.12	9.5%
0.17	27.6%	0.16	25.0%	0.15	21.4%	0.14	17.7%	0.14	17.7%	0.13	14.1%	0.12	9.5%
0.17	27.6%	0.16	25.0%	0.15	21.4%	0.14	17.7%	0.14	17.7%	0.13	14.1%	0.12	9.5%
0.17	27.6%	0.16	25.0%	0.15	21.4%	0.14	17.7%	0.14	17.7%	0.13	14.1%	0.12	9.5%
0.17	27.6%	0.16	25.0%	0.15	21.4%	0.14	17.7%	0.14	17.7%	0.13	14.1%	0.12	9.5%
0.17	27.6%	0.16	25.0%	0.15	21.4%	0.14	17.7%	0.14	17.7%	0.13	14.1%	0.12	9.5%
0.17	27.6%	0.16	25.0%	0.15	21.4%	0.14	17.7%	0.14	17.7%	0.13	14.1%	0.12	9.5%
0.17	27.6%	0.16	25.0%	0.15	21.4%	0.14	17.7%	0.14	17.7%	0.13	14.1%	0.12	9.5%
0.17	27.6%	0.16	25.0%	0.15	21.4%	0.14	17.7%	0.14	17.7%	0.13	14.1%	0.12	9.5%
0.17	27.6%	0.16	25.0%	0.15	21.4%	0.14	17.7%	0.14	17.7%	0.13	14.1%	0.12	9.5%
0.17	27.6%	0.16	25.0%	0.15	21.4%	0.14	17.7%	0.14	17.7%	0.13	14.1%	0.12	9.5%
0.17	27.6%	0.16	25.0%	0.15	21.4%	0.14	17.7%	0.14	17.7%	0.13	14.1%	0.12	9.5%
0.17	27.6%	0.16	25.0%	0.15	21.4%	0.14	17.7%	0.13	14.1%	0.13	14.1%	0.12	9.5%
0.17	27.6%	0.16	25.0%	0.15	21.4%	0.14	17.7%	0.13	14.1%	0.13	14.1%	0.12	9.5%
0.17	27.6%	0.16	25.0%	0.15	21.4%	0.14	17.7%	0.13	14.1%	0.13	14.1%	0.12	9.5%
0.17	27.6%	0.16	25.0%	0.15	21.4%	0.14	17.7%	0.13	14.1%	0.13	14.1%	0.12	9.5%
0.17	27.6%	0.16	25.0%	0.15	21.4%	0.14	17.7%	0.13	14.1%	0.13	14.1%	0.12	9.5%
0.17	27.6%	0.16	25.0%	0.15	21.4%	0.14	17.7%	0.13	14.1%	0.13	14.1%	0.12	9.5%
0.17	27.6%	0.16	25.0%	0.15	21.4%	0.14	17.7%	0.13	14.1%	0.13	14.1%	0.12	9.5%
0.17	27.6%	0.16	25.0%	0.15	21.4%	0.14	17.7%	0.13	14.1%	0.13	14.1%	0.12	9.5%
0.17	27.6%	0.16	25.0%	0.15	21.4%	0.14	17.7%	0.13	14.1%	0.13	14.1%	0.12	9.5%
0.16	25.0%	0.16	25.0%	0.15	21.4%	0.14	17.7%	0.13	14.1%	0.13	14.1%	0.12	9.5%
0.16	25.0%	0.16	25.0%	0.15	21.4%	0.14	17.7%	0.13	14.1%	0.13	14.1%	0.12	9.5%
0.16	25.0%	0.16	25.0%	0.15	21.4%	0.14	17.7%	0.13	14.1%	0.13	14.1%	0.12	9.5%
0.16	25.0%	0.16	25.0%	0.15	21.4%	0.14	17.7%	0.13	14.1%	0.13	14.1%	0.12	9.5%
0.16	25.0%	0.16	25.0%	0.15	21.4%	0.14	17.7%	0.13	14.1%	0.13	14.1%	0.12	9.5%
0.16	25.0%	0.16	25.0%	0.15	21.4%	0.14	17.7%	0.13	14.1%	0.13	14.1%	0.12	9.5%
0.16	25.0%	0.16	25.0%	0.15	21.4%	0.14	17.7%	0.13	14.1%	0.13	14.1%	0.12	9.5%
0.16	25.0%	0.15	21.4%	0.15	21.4%	0.14	17.7%	0.13	14.1%	0.13	14.1%	0.12	9.5%
0.16	25.0%	0.15	21.4%	0.15	21.4%	0.14	17.7%	0.13	14.1%	0.13	14.1%	0.12	9.5%
0.16	25.0%	0.15	21.4%	0.15	21.4%	0.14	17.7%	0.13	14.1%	0.13	14.1%	0.12	9.5%
0.16	25.0%	0.15	21.4%	0.15	21.4%	0.14	17.7%	0.13	14.1%	0.13	14.1%	0.12	9.5%
0.16	25.0%	0.15	21.4%	0.15	21.4%	0.14	17.7%	0.13	14.1%	0.13	14.1%	0.12	9.5%
0.16	25.0%	0.15	21.4%	0.15	21.4%	0.14	17.7%	0.13	14.1%	0.13	14.1%	0.12	9.5%
0.16	25.0%	0.15	21.4%	0.15	21.4%	0.14	17.7%	0.13	14.1%	0.13	14.1%	0.12	9.5%
0.16	25.0%	0.15	21.4%	0.15	21.4%	0.14	17.7%	0.13	14.1%	0.13	14.1%	0.12	9.5%
0.16	25.0%	0.15	21.4%	0.15	21.4%	0.14	17.7%	0.13	14.1%	0.13	14.1%	0.12	9.5%
0.16	25.0%	0.15	21.4%	0.15	21.4%	0.14	17.7%	0.13	14.1%	0.13	14.1%	0.12	9.5%
0.16	25.0%	0.15	21.4%	0.15	21.4%	0.14	17.7%	0.13	14.1%	0.13	14.1%	0.12	9.5%
0.16	25.0%	0.15	21.4%	0.15	21.4%	0.14	17.7%	0.13	14.1%	0.13	14.1%	0.12	9.5%
0.16	25.0%	0.15	21.4%	0.15	21.4%	0.14	17.7%	0.13	14.1%	0.13	14.1%	0.12	9.5%
0.16	25.0%	0.15	21.4%	0.15	21.4%	0.14	17.7%	0.13	14.1%	0.13	14.1%	0.12	9.5%
0.16	25.0%	0.15	21.4%	0.15	21.4%	0.14	17.7%	0.13	14.1%	0.13	14.1%	0.12	9.5%
0.16	25.0%	0.15	21.4%	0.15	21.4%	0.14	17.7%	0.13	14.1%	0.13	14.1%	0.12	9.5%
0.16	25.0%	0.15	21.4%	0.15	21.4%	0.14	17.7%	0.13	14.1%	0.13	14.1%	0.12	9.5%
0.16	25.0%	0.15	21.4%	0.15	21.4%	0.14	17.7%	0.13	14.1%	0.13	14.1%	0.12	9.5%
0.16	25.0%	0.15	21.4%	0.15	21.4%	0.14	17.7%	0.13	14.1%	0.13	14.1%	0.12	9.5%
0.16	25.0%	0.15	21.4%	0.15	21.4%	0.14	17.7%	0.13	14.1%	0.13	14.1%	0.12	9.5%
0.16	25.0%	0.15	21.4%	0.15	21.4%	0.14	17.7%	0.13	14.1%	0.13	14.1%	0.12	9.5%
0.16	25.0%	0.15	21.4%	0.15	21.4%	0.14	17.7%	0.13	14.1%	0.13	14.1%	0.12	9.5%
0.16	25.0%	0.15	21.4%	0.15	21.4%	0.14	17.7%	0.13	14.1%	0.13	14.1%	0.12	9.5%
0.16	25.0%	0.15	21.4%	0.15	21.4%	0.14	17.7%	0.13	14.1%	0.13	14.1%	0.12	9.5%
0.16	25.0%	0.15	21.4%	0.15	21.4%	0.14	17.7%	0.13	14.1%	0.13	14.1%	0.12	9.5%
0.16	25.0%	0.15	21.4%	0.15	21.4%	0.14	17.7%	0.13	14.1%	0.13	14.1%	0.12	9.5%
0.16	25.0%	0.15	21.4%	0.15	21.4%	0.14	17.7%	0.13	14.1%	0.13	14.1%	0.12	9.5%
0.16	25.0%	0.15	21.4%	0.15	21.4%	0.14	17.7%	0.13	14.1%	0.13	14.1%	0.12	9.5%
0.16	25.0%	0.15	21.4%	0.15	21.4%	0.14	17.7%	0.13	14.1%	0.13	14.1%	0.12	9.5%
0.16	25.0%	0.15	21.4%	0.15	21.4%	0.14	17.7%	0.13	14.1%	0.13	14.1%	0.12	9.5%
0.16	25.0%	0.15	21.4%	0.15	21.4%	0.14	17.7%	0.13	14.1%	0.13	14.1%	0.12	9.5%
0.16	25.0%	0.15	21.4%	0.15	21.4%	0.14	17.7%	0.13	14.1%	0.13	14.1%	0.12	9.5%
0.16	25.0%	0.15	21.4%	0.15	21.4%	0.14	17.7%	0.13	14.1%	0.13	14.1%	0.12	9.5%
0.16	25.0%	0.15	21.4%	0.15	21.4%	0.14	17.7%	0.13	14.1%	0.13	14.1%	0.12	9.5%
0.16	25.0%	0.15	21.4%	0.15	21.4%	0.14	17.7%	0.13	14.1%	0.13	14.1%	0.12	9.5%
0.16	25.0%	0.15	21.4%	0.15	21.4%	0.14	17.7%	0.13	14.1%	0.13	14.1%	0.12	9.5%
0.16	25.0%	0.15	21.4%	0.15	21.4%	0.14	17.7%	0.13	14.1%	0.13	14.1%	0.12	9.5%
0.16	25.0%	0.15	21.4%	0.15	21.4%	0.14	17.7%	0.13	14.1%	0.13	14.1%	0.12	9.5%
0.16	25.0%	0.15	21.4%	0.15	21.4%	0.14	17.7%	0.13	14.1%	0.13	14.1%	0.12	9.5%
0.16	25.0%	0.15	21.4%	0.15	21.4%	0.14	17.7%	0.13	14.1%	0.13	14.1%	0.12	9.5%
0.16	25.0%	0.15	21.4%	0.15	21.4%	0.14	17.7%	0.13	14.1%	0.13	14.1%	0.12	9.5%
0.16	25.0%	0.15	21.4%	0.15	21.4%	0.14	17.7%	0.13	14.1%	0.13	14.1%	0.12	9.5%
0.16	25.0%	0.15	21.4%	0.15	21.4%	0.14	17.7%	0.13	14.1%	0.13	14.1%	0.12	9.5%

Spanish Fork at Powerhouse Gage, rainfall depths >= 0.1 inches since 1909

Sorted Precip (in)	X %ile Storm	Sorted Precip (in)	X %ile Storm	Sorted Precip (in)	X %ile Storm	Sorted Precip (in)	X %ile Storm	Sorted Precip (in)	X %ile Storm
0.12	9.5%	0.11	5.6%	0.11	5.6%	0.1	0.0%	0.1	0.0%
0.12	9.5%	0.11	5.6%	0.11	5.6%	0.1	0.0%	0.1	0.0%
0.12	9.5%	0.11	5.6%	0.11	5.6%	0.1	0.0%	0.1	0.0%
0.12	9.5%	0.11	5.6%	0.11	5.6%	0.1	0.0%	0.1	0.0%
0.12	9.5%	0.11	5.6%	0.11	5.6%	0.1	0.0%	0.1	0.0%
0.12	9.5%	0.11	5.6%	0.11	5.6%	0.1	0.0%	0.1	0.0%
0.12	9.5%	0.11	5.6%	0.11	5.6%	0.1	0.0%	0.1	0.0%
0.12	9.5%	0.11	5.6%	0.11	5.6%	0.1	0.0%	0.1	0.0%
0.12	9.5%	0.11	5.6%	0.11	5.6%	0.1	0.0%	0.1	0.0%
0.12	9.5%	0.11	5.6%	0.11	5.6%	0.1	0.0%	0.1	0.0%
0.12	9.5%	0.11	5.6%	0.11	5.6%	0.1	0.0%	0.1	0.0%
0.12	9.5%	0.11	5.6%	0.11	5.6%	0.1	0.0%	0.1	0.0%
0.12	9.5%	0.11	5.6%	0.11	5.6%	0.1	0.0%	0.1	0.0%
0.12	9.5%	0.11	5.6%	0.11	5.6%	0.1	0.0%	0.1	0.0%
0.12	9.5%	0.11	5.6%	0.11	5.6%	0.1	0.0%	0.1	0.0%
0.12	9.5%	0.11	5.6%	0.11	5.6%	0.1	0.0%	0.1	0.0%
0.12	9.5%	0.11	5.6%	0.11	5.6%	0.1	0.0%	0.1	0.0%
0.12	9.5%	0.11	5.6%	0.11	5.6%	0.1	0.0%	0.1	0.0%
0.12	9.5%	0.11	5.6%	0.11	5.6%	0.1	0.0%	0.1	0.0%
0.12	9.5%	0.11	5.6%	0.11	5.6%	0.1	0.0%	0.1	0.0%
0.12	9.5%	0.11	5.6%	0.11	5.6%	0.1	0.0%	0.1	0.0%
0.12	9.5%	0.11	5.6%	0.11	5.6%	0.1	0.0%	0.1	0.0%
0.12	9.5%	0.11	5.6%	0.11	5.6%	0.1	0.0%	0.1	0.0%
0.12	9.5%	0.11	5.6%	0.11	5.6%	0.1	0.0%	0.1	0.0%
0.12	9.5%	0.11	5.6%	0.11	5.6%	0.1	0.0%	0.1	0.0%
0.12	9.5%	0.11	5.6%	0.11	5.6%	0.1	0.0%	0.1	0.0%
0.12	9.5%	0.11	5.6%	0.11	5.6%	0.1	0.0%	0.1	0.0%
0.12	9.5%	0.11	5.6%	0.11	5.6%	0.1	0.0%	0.1	0.0%
0.12	9.5%	0.11	5.6%	0.11	5.6%	0.1	0.0%	0.1	0.0%
0.12	9.5%	0.11	5.6%	0.11	5.6%	0.1	0.0%	0.1	0.0%
0.12	9.5%	0.11	5.6%	0.11	5.6%	0.1	0.0%	0.1	0.0%
0.12	9.5%	0.11	5.6%	0.11	5.6%	0.1	0.0%	0.1	0.0%
0.12	9.5%	0.11	5.6%	0.11	5.6%	0.1	0.0%	0.1	0.0%
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0.12	9.5%	0.11	5.6%	0.1	0.0%	0.1	0.0%		
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0.12	9.5%	0.11	5.6%	0.1	0.0%	0.1	0.0%		
0.12	9.5%	0.11	5.6%	0.1	0.0%	0.1	0.0%		
0.12	9.5%	0.11	5.6%	0.1	0.0%	0.1	0.0%		
0.12	9.5%	0.11	5.6%	0.1	0.0%	0.1	0.0%		
0.12	9.5%	0.11	5.6%	0.1	0.0%	0.1	0.0%		
0.12	9.5%	0.11	5.6%	0.1	0.0%	0.1	0.0%		
0.12	9.5%	0.11	5.6%	0.1	0.0%	0.1	0.0%		
0.12	9.5%	0.11	5.6%	0.1	0.0%	0.1	0.0%		
0.12	9.5%	0.11	5.6%	0.1	0.0%	0.1	0.0%		
0.12	9.5%	0.11	5.6%	0.1	0.0%	0.1	0.0%		
0.12	9.5%	0.11	5.6%	0.1	0.0%	0.1	0.0%		
0.12	9.5%	0.11	5.6%	0.1	0.0%	0.1	0.0%		
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0.12	9.5%	0.11	5.6%	0.1	0.0%	0.1	0.0%		
0.12	9.5%	0.11	5.6%	0.1	0.0%	0.1	0.0%		
0.12	9.5%	0.11	5.6%	0.1	0.0%	0.1	0.0%		
0.12	9.5%	0.11	5.6%	0.1	0.0%	0.1	0.0%		
0.11	5.6%	0.11	5.6%	0.1	0.0%	0.1	0.0%		
0.11	5.6%	0.11	5.6%	0.1	0.0%	0.1	0.0%		
0.11	5.6%	0.11	5.6%	0.1	0.0%	0.1	0.0%		
0.11	5.6%	0.11	5.6%	0.1	0.0%	0.1	0.0%		
0.11	5.6%	0.11	5.6%	0.1	0.0%	0.1	0.0%		
0.11	5.6%	0.11	5.6%	0.1	0.0%	0.1	0.0%		
0.11	5.6%	0.11	5.6%	0.1	0.0%	0.1	0.0%		
0.11	5.6%	0.11	5.6%	0.1	0.0%	0.1	0.0%		
0.11	5.6%	0.11	5.6%	0.1	0.0%	0.1	0.0%		
0.11	5.6%	0.11	5.6%	0.1	0.0%	0.1	0.0%		
0.11	5.6%	0.11	5.6%	0.1	0.0%	0.1	0.0%		
0.11	5.6%	0.11	5.6%	0.1	0.0%	0.1	0.0%		
0.11	5.6%	0.11	5.6%	0.1	0.0%	0.1	0.0%		
0.11	5.6%	0.11	5.6%	0.1	0.0%	0.1	0.0%		
0.11	5.6%	0.11	5.6%	0.1	0.0%	0.1	0.0%		
0.11	5.6%	0.11	5.6%	0.1	0.0%	0.1	0.0%		
0.11	5.6%	0.11	5.6%	0.1	0.0%	0.1	0.0%		

APPENDIX B
Cost Estimates

Conveyance Sizing Calculations

Pipes

Project No.	Design Q (cfs)	Length (ft)	Slope	D (in)			n		A (ft2)	P (ft)	R	fps	Capacity (cfs)	% of Des Q	Excess Capacity (cfs)
P2	*91*	1095	0.0409	36			0.013		7.1	9.42	0.75	19	**135**	149%	45
P3	*24*	898	0.0199	24			0.013		3.1	6.28	0.50	10	**32**	133%	8
	31	655	0.0358	24			0.013		3.1	6.28	0.50	14	**43**	138%	12
	43	1373	0.0308	30			0.013		4.9	7.85	0.63	15	**72**	168%	29
	54	998	0.016	36			0.013		7.1	9.42	0.75	12	**85**	157%	31
	60	459	0.0152	36			0.013		7.1	9.42	0.75	12	**82**	137%	22
P4	*72*	1860	0.0167	36			0.013		7.1	9.42	0.75	12	**86**	120%	14
P6	*38*	3772	0.0284	24			0.013		3.1	6.28	0.50	12	**38**	101%	0
P7	*68*	1353	0.03	30			0.013		4.9	7.85	0.63	15	**71**	105%	3
P8	*75*	3429	0.0281	36			0.013		7.1	9.42	0.75	16	**112**	149%	37
P9	*43*	3755	0.0134	36			0.013		7.1	9.42	0.75	11	**77**	182%	35
P13	*17*	74	0.14146	18			0.013		1.8	4.71	0.38	22	**40**	228%	22
P18	*93*	5043	0.0113	42			0.013		9.6	11.00	0.88	11	**107**	116%	15
P19	*110*	1920	0.00636	48			0.013		12.6	12.57	1.00	9	**115**	105%	5
P23	*20*	2364	0.0211	24			0.013		3.1	6.28	0.50	10	**33**	162%	13
P30	*32*	2023	0.00139	42			0.013		9.6	11.00	0.88	4	**38**	118%	6
P31	***varies; designed under separate project***														

Open Channel

Project No.	Design Q (cfs)	Length (ft)	Slope	b (ft)	Top Width (ft)	SS (_H:1V)	n	yn (ft)	Ahyd (ft2)	P (ft)	R (ft)	yn/(2R)	Capacity (cfs)	% of Des Q	Excess Capacity (cfs)
P1	*56*	2596	0.0175	1	9	2	0.035	2	10	9.94	1.01	0.99	**57**	101%	1
P5	*91*	3976	0.00786	1	13	2	0.035	3	21	14.42	1.46	1.03	**102**	112%	11
P10	*13*	4537	0.0117	1	7	2	0.035	1.5	6	7.71	0.78	0.96	**23**	180%	10
P11	*15*	1663	0.00348	1	9	2	0.035	2	10	9.94	1.01	0.99	**25**	168%	10
P12	*17*	1300	0.00137	1.5	9.5	2	0.035	2	11	10.44	1.05	0.95	**18**	103%	1
P14	*69*	2841	0.00442	3	13	2	0.035	2.5	20	14.18	1.41	0.89	**71**	103%	2
P15	*87*	2971	0.0100	2	12	2	0.035	2.5	18	13.18	1.33	0.94	**90**	103%	3
P16	*23*	877	0.0115	1	7	2	0.035	1.5	6	7.71	0.78	0.96	**23**	101%	0
P17	*55*	1958	0.0115	1.2	10	2	0.035	2.2	12	11.04	1.12	0.99	**61**	110%	6
P20	*118*	1736	0.00875	1.5	13.5	2	0.035	3	23	14.92	1.51	0.99	**118**	100%	0
P21	*126*	1458	0.021	1.3	12.1	2	0.035	2.7	18	13.37	1.35	1.00	**136**	108%	10
P22	*139*	1550	0.000387	18	32	2	0.035	3.5	88	33.65	2.60	0.67	**139**	100%	0
P24	*32*	2061	0.0253	1	7	2	0.035	1.5	6	7.71	0.78	0.96	**34**	108%	2
P25	*44*	3101	0.00114	2	14	2	0.035	3	24	15.42	1.56	0.96	**46**	106%	2
P26	*20*	3225	0.00115	1	11	2	0.035	2.5	15	12.18	1.23	1.02	**25**	124%	5
P27	*64*	990	0.00115	5	17	2	0.035	3	33	18.42	1.79	0.84	**70**	110%	6
P28	*203*	4232	0.000298	25	41	2	0.035	4	132	42.89	3.08	0.65	**205**	101%	3
P29	*23*	5676	0.00066	5	13	2	0.035	2	18	13.94	1.29	0.77	**23**	101%	0
P32	*18*	6743	0.0003	2	13	2	0.035	2.75	21	14.30	1.44	0.95	**19**	108%	1

Reservoir Sizing Design

Detention Pond #	Location	Volume (AF)	Area (Acres)	Outlet Area (ft2)
R1	Salem Canal Road and ~Elk Ridge Dr	6	2.25	2
R2	Elk Ridge Dr approx. midway between SR 198 and Salem Canal Rd	4.2	2	4
R3	Salem Canal Road and ~250 W	4.5	1.7	1.5
R4	Salem Pond	27.5	N/A	5
R5	~Woodland Hills Blvd and ~500 N	8.2	3.05	1.9
R6	~400 E and ~700 N	20.2	7.3	7.6
R7	~SR 198 and ~700 N	4.1	2.2	2.6
R8	~SR 198 and ~8400 S	1.6	0.65	1.6
R9	~400 N and 460 W	12	4	1.8

Opinion of Probable Costs

Pipe Costs

Project No.	Length (ft)	D (in)	In-Street, Out-Street, Inlets?	Cost/LF	Project Cost
P2	1095	36	Out	$ 339	$ 371,457
P3	898	24	Out	$ 197	$ 177,177
	655	24	Out	$ 197	$ 129,235
	1373	30	Out	$ 259	$ 355,843
	998	36	Out	$ 339	$ 338,552
	459	36	Out	$ 339	$ 155,707
P4	1860	36	Out	$ 339	$ 630,968
P6	3772	24	In	$ 248	$ 935,456
P7	1353	24	In	$ 248	$ 335,544
P8	3429	36	In	$ 432	$ 1,481,328
P9	3755	36	In	$ 432	$ 1,622,160
P13	74	18	Out-NoInlets	$ 144	$ 10,666
P18	5043	42	In	$ 499	$ 2,516,457
P19	1920	48	In	$ 580	$ 1,113,600
P23	2364	24	In	$ 248	$ 586,272
P30	2023	42	In	$ 499	$ 1,009,477
P31	9398	varies			$ 4,200,000
					$ 15,969,899

Detention Basin Costs

		Cost of Land			Cost of Excavation			Cost of Outlet Works		
Project No.	Location	Area (Acres)	Cost/acre	Land Cost	Volume (AF)	Exc. (/AF)	Excavation Cost	Outlet Orifice (sf)	Outlet Works Cost	Project Cost
R1	Salem Canal Rd and ~Elk Ridge Dr	2.25	$ 275,000	$ 618,750	6	$ 16,133	$ 96,800	2.0	$ 5,000	$ 720,550
R2	Elk Ridge Dr	2	$ 275,000	$ 550,000	4.2	$ 16,133	$ 67,760	7.0	$ 8,000	$ 625,760
R3	Salem Canal Rd and ~250 W	1.7	$ 275,000	$ 467,500	4.5	$ 16,133	$ 72,600	1.5	$ 4,000	$ 544,100
R4	Salem Pond	18	$ 275,000	$ -	27.5	$ -	$ -	5.0	$ 100,000	$ 100,000
R5	~Woodland Hills Blvd and ~500 N	3.05	$ 275,000	$ 838,750	8.2	$ 16,133	$ 132,293	1.9	$ 4,000	$ 975,043
R6	~400 E and ~650 N	7.3	$ 275,000	$ 2,007,500	20.2	$ 16,133	$ 325,893	7.6	$ 6,000	$ 2,339,393
R7	~SR 198 and ~650 N	2.2	$ 275,000	$ 605,000	4.1	$ 16,133	$ 66,147	2.6	$ 11,000	$ 682,147
R8	~SR 198 and ~8400 S	0.65	$ 275,000	$ 178,750	1.6	$ 16,133	$ 25,813	1.6	$ 4,000	$ 208,563
R9	~400 N and 460 W	4	$ 275,000	$ 1,100,000	12	$ -	$ -	1.8	$ 4,000	$ 1,104,000
				$ 6,366,250			$ 787,307		$ 142,121	**$ 7,299,557**

Open Channel Costs

		Cost of Land					Cost of Excavation					Cost of Vegetation			
Project No.	Length (ft)	Trail Width (ft)	Total Width (ft)	Land Area (ac)	Cost/acre	Land Cost	Exc. Area (ft2)	Exc. Volume (AF)	Exc. (/CY)	Exc. (/AF)	Excavation Cost	Area to Revegetate (sf)	Cost (/sf)	Vegetation Cost	Project Cost
P1	2596	12	25	1.49	$ 275,000	$ 409,722	39	2.32	$ 10	$ 16,133	$ 37,498	37,425	$ 0.50	$ 18,712	$ 465,932
P5	3976	12	29	2.65	$ 275,000	$ 727,929	45	4.11	$ 10	$ 16,133	$ 66,267	104,562	$ 0.50	$ 52,281	$ 846,477
P10	4537	12	23	2.40	$ 275,000	$ 658,782	36	3.75	$ 10	$ 16,133	$ 60,493	45,433	$ 0.50	$ 22,716	$ 741,991
P11	1663	12	25	0.95	$ 275,000	$ 262,468	39	1.49	$ 10	$ 16,133	$ 24,021	23,974	$ 0.50	$ 11,987	$ 298,477
P12	1300	12	25.5	0.76	$ 275,000	$ 209,280	40.5	1.21	$ 10	$ 16,133	$ 19,500	19,391	$ 0.50	$ 9,696	$ 238,476
P14	2841	12	29	1.89	$ 275,000	$ 520,133	48	3.13	$ 10	$ 16,133	$ 50,507	62,070	$ 0.50	$ 31,035	$ 601,674
P15	2971	12	28	1.91	$ 275,000	$ 525,177	45	3.07	$ 10	$ 16,133	$ 49,517	61,940	$ 0.50	$ 30,970	$ 605,663
P16	877	12	23	0.46	$ 275,000	$ 127,342	36	0.72	$ 10	$ 16,133	$ 11,693	8,782	$ 0.50	$ 4,391	$ 143,427
P17	1958	12	26	1.17	$ 275,000	$ 321,389	40.8	1.83	$ 10	$ 16,133	$ 29,588	32,633	$ 0.50	$ 16,316	$ 367,293
P20	1736	12	29.5	1.18	$ 275,000	$ 323,308	46.5	1.85	$ 10	$ 16,133	$ 29,898	46,522	$ 0.50	$ 23,261	$ 376,467
P21	1458	12	28.1	0.94	$ 275,000	$ 258,648	44.1	1.48	$ 10	$ 16,133	$ 23,814	32,960	$ 0.50	$ 16,480	$ 298,942
P22	1550	12	48	1.71	$ 275,000	$ 469,697	99	3.52	$ 10	$ 16,133	$ 56,833	78,679	$ 0.50	$ 39,339	$ 565,870
P24	2061	12	23	1.09	$ 275,000	$ 299,261	36	1.70	$ 10	$ 16,133	$ 27,480	20,639	$ 0.50	$ 10,319	$ 337,061
P25	3101	12	30	2.14	$ 275,000	$ 587,311	48	3.42	$ 10	$ 16,133	$ 55,129	84,652	$ 0.50	$ 42,326	$ 684,765
P26	3225	12	27	2.00	$ 275,000	$ 549,716	42	3.11	$ 10	$ 16,133	$ 50,167	64,010	$ 0.50	$ 32,005	$ 631,888
P27	990	12	33	0.75	$ 275,000	$ 206,250	57	1.30	$ 10	$ 16,133	$ 20,900	29,995	$ 0.50	$ 14,998	$ 242,148
P28	4232	12	57	5.54	$ 275,000	$ 1,522,879	123	11.95	$ 10	$ 16,133	$ 192,791	280,290	$ 0.50	$ 140,145	$ 1,855,815
P29	5676	12	29	3.78	$ 275,000	$ 1,039,167	51	6.65	$ 10	$ 16,133	$ 107,213	104,532	$ 0.50	$ 52,266	$ 1,198,646
P32	6743	12	29	4.49	$ 275,000	$ 1,234,514	46.5	7.20	$ 10	$ 16,133	$ 116,129	161,470	$ 0.50	$ 80,735	$ 1,431,378
						$ 10,252,972					$ 1,029,438			$ 649,979	$ 11,932,389

		Total W/ Contingency
		130%
Open Channel	$ 11,932,389	$ 15,512,105
Pipes	$ 15,969,899	$ 20,760,869
Detention Basins	$ 7,299,557	$ 9,489,424
Total MP Costs	**$ 35,201,845**	**$ 45,762,398**

APPENDIX C

Digital Model Data

HEC-HMS – Existing and CIP
HEC-RAS – 100-year Surface
Excel – Pipe Capacity Evaluation

APPENDIX D
Digital GIS Data

APPENDIX E
Digital Calculation Spreadsheets

APPENDIX F
Salem City Storm Water Drainage Manual

SALEM CITY, UTAH
STORM WATER DRAINAGE MANUAL
DECEMBER 2022

A Guide for Owners, Developers, and Engineers

to prepare a site-specific

Stormwater Management Plan

SALEM CITY, UTAH

STORM WATER DRAINAGE MANUAL

1. INTRODUCTION – STORMWATER DRAINAGE MANUAL & SALEM CITY STORM WATER MASTER PLAN

Salem City has recently completed a City-wide Storm Water Master Plan (August 2019). That plan was developed by Hansen, Allen and Luce Engineers located in South Jordan, Utah. Copies of that plan in PDF format are available by requesting them from the City. That plan gives the overall stormwater management plan, needed facilities, a capital improvement plan and budget, and guidelines for future City-wide projects. It also gives background and technical basis for this Storm Water Drainage Manual.

This Storm Water Drainage Manual is intended to be a guide for property owners, developers, and engineers as they consider solutions to their storm water management problems and opportunities on each individual site. One may, but need not, read the entire Storm Water Master Plan when looking for specific development criteria for a particular localized site.

Specific guidance, methods for calculations, design standards, and some standard construction drawings are contained herein. Low Impact Development (LID) requirements and suggestions are contained herein, but actual LID techniques to be implemented on each site are to be chosen and implemented by the owner, developer, or engineer. Links and references are given to sources where these design options may be found.

Users of this manual will note that a key part of this document requires the owner, developer, or engineer to prepare a site-specific Storm Water Management Plan (SWMP) for each site. These requirements may apply both to existing and future sites. Requirements and an outline for that report is contained herein.

2. SALEM CITY - STORM WATER MANAGEMENT PHILOSOPHY

The overall storm drainage management philosophy of Salem City is described with the following items:

1. Comply with the State of Utah Municipal Separate Storm Sewer System (MS4), Low Impact Development (LID), and Storm Water Pollution Prevention Plan (SWPPP) requirements.
2. The goal and standard for new construction sites is to totally retain the 90th percentile storm on site and then ensure there is minor system conveyance for the 25-year, 1-hour Farmer-Fletcher storm to an approved off-site location for disposal. This philosophy and retention standard is similar to LID & MS4 requirements and gives proper attention to preserving groundwater quality and avoiding discharge of pollutants into the ground.
3. A limited number of exceptions for conveyance may be approved by the City Engineer where regional facilities are planned but not yet available.
4. Numerous methods of on-site retention are appropriate and may be approved including, but not limited to those listed or referenced in Section 9 of this manual.
5. Part of this philosophy is to reduce the scope and magnitude of large systems of drainage and pipe networks for collection, conveyance, and off-site storm water disposal.
6. Stormwater discharge after proper detention from a specific construction or development site will be allowed to flow into a natural drainage channel provided it does not have an adverse downstream impact or except in limited cases as approved by the City Engineer.
7. On site or on-lot retention methods and LID techniques for storm water from roofs, drives, patios, and other impervious areas are highly encouraged so there is less runoff into the adjoining streets, thus reducing the required detention volume and 25-year conveyance requirement. If on-lot retention is part of the long-term permanent drainage plan, these methods may be a permanent condition of approval and recorded on the subdivision plat or other legally binding instrument.
8. Where infiltration rates are limited, less infiltration may be permitted by the City Engineer. Where access to regional conveyance channels is limited, the City may require retention of the 100-year runoff volume.
9. Storm drain retention ponds shall have specific standards for construction including depth, side slopes, bottom treatment, safety, fencing, side slope treatment, landscaping, etc. See Section 10 herein for site requirements.
10. Typical standard construction drawings are included in this manual. Where a specific City standard drawing may be absent, use the APWA standard drawings. If no typical drawing exists, the design engineer is required to submit a desired construction drawing for approval.
11. All construction plans, installations, and stormwater facilities need to be designed and stamped by a registered professional engineer and approved by the City Engineer.
12. For construction on each specific development site, a SWPPP is required to be approved and implemented. One key requirement is that the SWPPP must show not only the plan during construction, but for on-going post-construction water pollution prevention.
13. Retrofitting existing sites with the aforementioned facilities is encouraged and may be required at a future date. Payment responsibility for such installations is not yet finalized and will be approved by the City council or funded by storm drainage fees.

3. MUNICIPAL SEPARATE STORM SEWER SYSTEM (MS4) PERMIT

Municipal storm water systems such as cities, counties, state universities, state hospitals, etc. are covered by a General Permit for Discharges from Small MS4s which was issued on December 9, 2002 by the State of Utah. A general permit is a permit that is issued to cover a large number of facilities with similar discharges. Salem City was issued their general permit (UPDES Permit: UTR090064). This permit authorizes storm water discharges to Waters of the State of Utah under certain conditions.

Part of the requirements state that all permittees must develop, implement, and enforce a SWMP designed to reduce the discharge of pollutants from the MS4, protect water quality, and satisfy the appropriate water quality requirements of the Utah Water Quality Act. The City's SWMP must include the six minimum control measures described in Part 4.2 of this Permit. They are: 1) Public Education and Outreach, 2) Public Involvement/Participation, 3) Illicit Discharge Detection and Elimination, 4) Construction Site Storm Water Runoff Control, 5) Long-Term Storm Water Management in New Development and Redevelopment (Post- Construction Storm Water Management), 6) Pollution Prevention and Good Housekeeping for Municipal Operation.

To date, Salem has complied with the conditions of this permit and is in good standing with the State and intends to keep it that way. Accordingly, Salem City requires, as a condition of development, that a site-specific SWMP be submitted to the City prior to any development approval. Any techniques, construction measures, water quality features, stormwater control features, LID techniques, runoff calculations, SWPPP, etc. that the owner, developer, or engineer are planning to implement as part of the construction plans must be presented. The City Engineer is to review, and hopefully approve with required changes or improvements, said documented report. This report then becomes additional documentation for the City's compliance with the MS4 permit.

See the separate section in this document that addresses and sets for the requirements for the site-specific SWMP for new development or construction sites.

4. LOW IMPACT DEVELOPMENT (LID) REQUIREMENTS

Low Impact Development (LID) is an integral part of the Salem City Storm Water Management Plan (SWMP). LID techniques and the SWMP are required by the State of Utah as outlined in the Salem City MS4 (Municipal Separate Storm Sewer) permit. As part of the stormwater report to be submitted to the City prior to any development approval, LID techniques that the owner, developer, or engineer are planning to implement as part of the construction plans must be presented. These LID techniques become part of the required site-specific SWMP to be submitted to the City.

LID is an approach which mimics a site's predevelopment conditions, including techniques that infiltrate, filter, store, reuse, evaporate, transpire, and detain runoff close to its source. LID encourages preservation of natural systems, cluster development, minimization of impervious areas, green roofs, permeable paving, rainwater harvesting, bioretention, other techniques, and stormwater BMPs.

These LID techniques generally require a philosophy change in the way stormwater is managed. Previous strategies generally were to collect and dispose of stormwater quickly using engineered systems. The current LID strategy includes: 1) Avoid and reduce impacts of development, 2) Manage stormwater at its source through LID, 3) Emulate functions of natural systems, and 4) Store and integrate rainfall into the water cycle rather than disposing of it as a waste product.

There are numerous publications that describe at least one hundred LID techniques that will not be detailed herein. The developer or engineer is required to select those that will be applied and implemented on this specific site.

The State of Utah, Division of Water Quality lists the following resources that should be considered and included in the design process for any new or existing development site.

A GUIDE TO LOW IMPACT DEVELOPMENT IN UTAH MANUAL ISSUED BY DEQ.
https://documents.deq.utah.gov/water-quality/stormwater/updes/DWQ-2019-000161.pdf
The guidance provided in this manual is intended for all projects where the long-term management of storm water is required. New development and redevelopment projects within a permitted MS4 that disturb one acre or more, including projects less than one acre that are part of a larger common plan of development or sale, have specific LID requirements that must be met as part of DWQ's storm water program. All projects are encouraged to consider LID practices.

Other resources include, but are not limited to the following:
https://deq.utah.gov/water-quality/low-impact-development
https://deq.utah.gov/legacy/permits/water-quality/utah-pollutant-discharge-elimination-system/docs/2016/development-of-utahs-small-ms4-storm-water-retention-standard.pdf
Division of Water Quality Low Impact Development Center. http://www.lowimpactdevelopment.org
LID Urban Design Tools Website. http://www.lid-stormwater.net/
US EPA LID and GI in Semi-Arid SW. https://www.epa.gov/region8/green-infrastructure

5. STORM WATER POLLUTION PREVENTION PLANS

As part of the approval process for subdivisions or any new construction in Salem City, a Storm Water Pollution Prevention Plan (SWPPP) is required. In fact, a UPDES (Utah Pollution Discharge Elimination System) permit is required by the State for any construction site which disturbs one acre or more, or disturbs less than one acre of land if such activity is part of a larger common plan. As a condition of these permits, a SWPPP is required. This SWPPP becomes part of the site-specific or development SWMP (Storm Water Management Plan), which is more inclusive. The SWPPP is required to accurately describe the potential for soil erosion and controls, sedimentation, toxic wastes, nutrient control, oil, grease, & fuel, miscellaneous waste, toxic chemicals, increased runoff, waterway protection, or any other potential water pollution occurrence.

A Notice of Intent (NOI) is required to be filed with the State of Utah and issued under the general NPDES permit for each SWPPP. Go to the State of Utah Department of Water Quality website (https://secure.utah.gov/swp/client). A SWPP example can be found by going to the State of Utah Department of Water Quality website http://waterquality.utah.gov/UPDES/stormwatercon.htm.

As a minimum, the SWPPP in Salem City is required to contain the following information and must be prepared and approved before construction commences (this may be used as an outline or checklist for preparing the SWPPP):

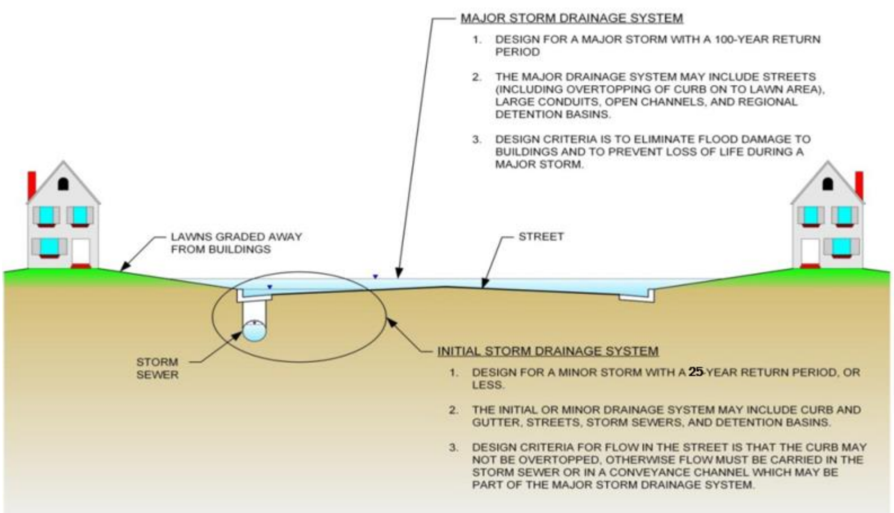
1. Location of the site and name of development.
2. Owner, developer, & Engineer – contact information - phone, address, email.
3. Dates of anticipated construction or disturbance.
4. Map of existing conditions – including a topographic map, drainage channels, hazardous conditions, potential mud flows or debris flows, stream channels, wetlands, etc.
5. Soils information from NRCS for the site.
6. Name of nearest downstream receiving water.
7. Identification of nature, types, and volumes of storm water pollutants expected.
8. Methods for waterway protection and a statement about the necessity (or not) of obtaining a Stream Channel Alteration Permit (SCAP) from the State Division of Water Rights.
9. The City requires a wetland delineation for areas within 300' of the forested shrub and freshwater emergent wetlands as mapped by USFWS. Areas outside this zone will need to provide a statement about the necessity (or not) of obtaining a USACOE wetlands permit.
10. Site plan for finished site – cuts, fills, roadways, channels, pipes, stabilization, buildings, stormwater control features.
11. List and examples of all BMP's (Best Management Practices) to be implemented (there are dozens to choose from). Among dozens of sources , two excellent resources are:
    https://deq.utah.gov/legacy/businesses/business-assistance/construction/index.htm
    https://slco.org/uploadedFiles/depot/publicWorks/engineering/final_bmp_constructi.pdf
12. Description of how and why certain BMP's were selected.
13. Monitoring, inspection, record-keeping, materials control, and maintenance plan.
14. Description of a long-term (10+years) plan to maintain storm water quality and legal instrument to accomplish this.
15. Method of revising the SWPP to include unanticipated changes.
16. Statement of understanding that a permit is required from the DWQ before construction starts and that a Notice of Termination (NOT) is required to be filed.

6. REQUIRED SWMP FOR DEVELOPMENT SITES

Each development site in Salem, be it new construction, residential sites, commercial sites, individual lots, etc. is required to present a Storm Water Management Plan (SWMP) to the City Engineer for his review and approval before construction begins. Contents of that plan are scattered throughout this manual, but are summarized here in a checklist format. Details are outlined in other chapters of this document.

CONTENTS OF THE SWMP FOR EACH INDIVIDUAL DEVELOPMENT SITE

1. Name and location of development.
2. Owner, developer, and Engineer of record (phone, address, email).
3. Dates of anticipated construction or disturbance.
4. Detailed site map showing critical site features such as: a) topography, b) wetlands, c) stream channels, d) sensitive lands, e) soils types, f) potential mud flows or debris flows, g) soils information from NRCS for the site.
5. Copy of the SWPPP and BMP's to be used.
6. Copy of the stormwater model HEC-HMS used and the inputs and outputs from said model. The HMS model is used to size conveyance pipes from the development. Include documentation of inputs and assumptions.
7. List and examples of LID techniques to be used to limit storm runoff and pollutants from the overall site.
8. List and examples of LID techniques to be used on individual lots to reduce runoff.
9. Name of nearest downstream receiving water.
10. Rainfall data and Curve Number calculation.
11. Map and calculations showing off-site conveyance location, path, nearest disposal site, and conveyance through and downstream of development for 25 and 100-year events. The cross-section with the least amount of street and overbank conveyance shall be shown in elevation view with the 100-year water surface elevation to ensure 100-year protection of the homes and/or structures.
12. Site plan for finished site – cuts, fills, roadways, channels, pipes, stabilization, buildings, stormwater control features, detention basin details, areas to receive revegetation, etc.
13. Engineering construction plans for all drainage features



7. DESIGN STANDARDS

Engineering design standards vary between jurisdictions. Salem's design standards are tuned to match the stormwater management philosophy and should not be compared or equated to other jurisdictions with different philosophies or policies. The design standards for new development or existing site are:

RETENTION ON SITE

At a minimum, retain on-site stormwater runoff volume from the 90th percentile storm which for Salem is a total depth of 0.7 inches. The runoff from that storm is dependent on the percent impervious of the development, therefore the amount that a development is required to retain is proportional to their total percent impervious (see table below). The depth to retain, found in the table below, is multiplied by the area of the site to acquire a required LID retention volume.

Percent Impervious	**10%**	**20%**	**30%**	**40%**	**50%**	**60%**	**70%**	**80%**	**90%**	**100%**
Depth to retain (in)	0.1	0.1	0.15	0.21	0.27	0.33	0.39	0.46	0.52	0.59

Numerous methods of retention and associated infiltration are acceptable and some are outlined later in this document. Where the soil capacity is unable to retain the volume as specified above, the City Engineer may approve conveying the amount that cannot be retained. Where conveyance facilities do not exist downstream, the required retention is 100 percent of the 100-year runoff volume.

RETENTION ON LOTS

Using LID techniques, methods, and designs, the developer or engineer may choose to retain storm runoff on the individual lots. This retention will count toward the on-site retention required and stormwater runoff for the entire development. Methods are at the option of the developer, but when implemented, they must be permanent and subject to permanent status by recordation on the plat or some other legal instrument.

CONVEYANCE OFF-SITE

Using the approved hydrologic model, show that there is a conveyance channel (pipes, gutters, ditches, roadways, surface channels, etc.) for the 25-year design storm to a City stormwater management facility. The resultant 25-year flow shall be used to size conveyance to Master Plan drainageways.

CONVEYANCE FOR 100-YEAR DESIGN STORM

Using the approved hydrologic model, show that there is a conveyance channel (pipes, gutters, ditches, roadways, surface channels, etc.) for the 100-year peak flows to a City stormwater management facility. This includes providing 100-year peak flow capacity into all retention/detention facilities. The stormwater retained on-site may be modeled to reduce these peak flows. The resultant 100-year flow shall be used to show protection of structures with 1 foot of freeboard to the finished floor elevation by providing the lowest capacity cross section and calculating the depth of flow using Manning's equation.

REPORT

Present all these methods, models, documents, plans, and calculations in a site-specific Stormwater Management Plan report (SWMP) for the specific development. Be sure to include all appropriate LID techniques, BMP's, and a SWPPP. This will be reviewed by the City Engineer or his designated representative. The developer shall consider all improvements, corrections, and suggestions rendered and then present a final report for approval by the City Engineer.

8. HYDROLOGIC CALCULATIONS

When developing in Salem, the engineer or developer SHALL use the following data sources and methodologies to obtain peak stormwater discharge and required volumes. The results of these calculations SHALL be presented in a Storm Water Management Plan (SWMP) for the development.

Rainfall data source: NOAA Atlas 14 Point Precipitation Frequency Estimates (https://hdsc.nws.noaa.gov/hdsc/pfds/pfds_map_cont.html)

Zoom in to the development area and double-click. Scroll down and click print page to print the documentation to submit with plans and calculations. Note the precipitation values for the following events: 25 and 100-year 1-hour (for developments smaller than 50 acres) or 3-hour (for developments greater than 50 acres). To get the precipitation time series for your development, multiply those depths by the appropriate dimensionless Farmer-Fletcher distribution. Pipe capacities shall be sized for the 25-year event and detention facilities shall be sized for the 100-year event (detention volume calculation shall be based on 3-hour storm).

If a place to discharge exists, the amount of LID retention volume that shall be required on-site is specified in Chapter 7. If no place to discharge exists, the retention required shall be the 100-year 24-hour runoff volume.

Peak flows for the 25-year and 100-year storm runoff SHALL be modeled using the publicly available HEC-HMS software using the Curve Number methodology. Curve Numbers (CNs) describe average conditions which are useful for design purposes. A site-specific CN may be calculated as follows:

- Obtain soils data from City or from Web Soil Survey for the development area (https://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx)
- Overlay proposed land use on soils data
- Use Table 2-2a to calculate a composite CN

For example, if a development has 40% soil type B and 60% soil type C and the proposed cover is 85% ¼ acre lots with 15% open space with all the open space falling in soil type C, its curve number would be: 0.40*75 (CN for soil type B and ¼ acre lots) + 0.15*74 (open space in good condition) + 0.45*83 (CN for soil type C and ¼ acre lots) = 78.5.

*For developments with many different soil types and land covers, the CN analysis may be completed more easily using a GIS software.

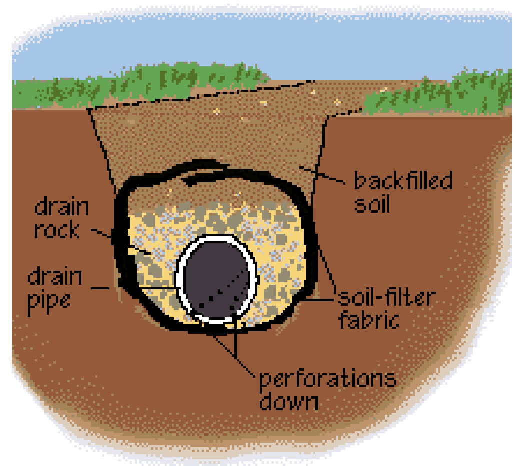
The lag time is calculated using methodology for determining time of concentration as described in the Natural Resources Conservation Service publication TR-55 “Urban Hydrology Manual”. The inputs for the model are development area, curve number, initial abstraction, and lag time. Lag time is calculated as $L= 0.6T_C$. Initial abstraction shall be accounted for by leaving the field blank.

All surface retention or detention facilities or areas shall drain within 72 hours. Typical infiltration rates (in inches/hour) for the hydrologic soil groups will be assumed to be as seen in the table below unless proven otherwise using a double ring infiltrometer test adhering to ASTM 3385.

Infiltration Rates (in/hr) for the Hydrologic Soil Groups			
A	B	C	D
0.4	0.25	0.1	0.05

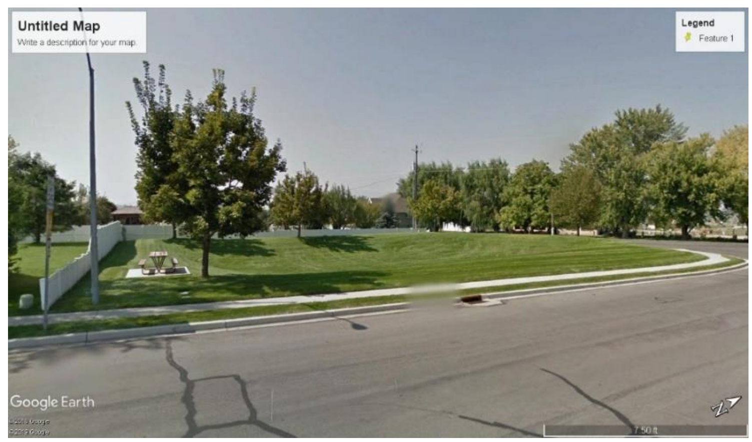
Time (in minutes) for a 1-hour distribution	Time (in minutes) for a 3-hour distribution	Cumulative proportion of rainfall
0	0	0
2	6	0
4	12	0.004
6	18	0.008
8	24	0.012
10	30	0.018
12	36	0.027
14	42	0.044
16	48	0.066
18	54	0.103
20	60	0.156
22	66	0.223
24	72	0.296
26	78	0.38
28	84	0.486
30	90	0.594
32	96	0.691
34	102	0.766
36	108	0.818
38	114	0.856
40	120	0.886
42	126	0.909
44	132	0.928
46	138	0.945
48	144	0.957
50	150	0.967
52	156	0.977
54	162	0.985
56	168	0.992
58	174	0.997
60	180	1

9. METHODS OF RETENTION & DETENTION



Salem City has selected and approved a high level of storm water retention for new construction for residential and commercial developments. Many areas in the City have a soil type that is well-drained and relatively permeable which lends itself to systems of small underground infiltration areas. Infiltrating the 90th percentile runoff volume on-site complies with the MS4 and LID requirements.

This sheet shows several examples of typical solutions for this stormwater disposal, detention, or retention. <u>In all cases, an overflow to a surface conveyance must be provided</u>. They are from top right to bottom right:



LID French drains or infiltration galleries that could be constructed in the planter strip between the curb and the sidewalk. See also the standard construction detail for park strip linear sumps.

Open retention or detention storm drain ponds, appropriately designed and landscaped where water mostly infiltrates or evaporates.

R-Tank underground storage tanks or basins where water is stored temporarily before infiltration in to the ground.

ADS StormTech underground storage basins where water is stored temporarily before infiltration in to the ground.

There are likely numerous other techniques that may be cost-effective and function properly in the City. These may include but are not limited to sumps (see standard detail), Contech CMP, ConSpan, or Duromax detention and infiltration facilities, Stormbrixx, Stormtank Pack, or precast concrete sections. Engineering design creativity and responsible applications of various methods will assist in achieving this discharge goal.

10. STORM DRAIN RETENTION AND DETENTION PONDS

Storm drainage retention and/or detention ponds are encouraged as one solution to on-site storm water containment. Sumps, infiltration galleries, R-tanks, French drains, ADS StormTech basins, LID, and other approved containment devices are also encouraged. The design engineer for a specific development or project is responsible to suggest and design the appropriate facilities, and submit to the City for approval as part of the site-specific SWMP.

Where an open retention or detention basin is proposed, it must meet, at a minimum, the following standards.

Maximum water depth without fencing = 3 feet
Freeboard above MWD = 1.0 feet
Maximum side slopes = 3:1 (slopes must be mowable)
Side slope and bottom treatment = grass turf
Landscaping with trees, shrubs, rockscapes, etc. must be provided
Sprinkling irrigation system for turf areas = required
Pond bottom slope = minimum grade of 0.33% toward the low point or outlet
Grated inlet protection for high velocity inlets = required
Grated inlet sump at low point of pond bottom to eliminate nuisance ponding = required
Overflow outlet or spillway to surface conveyance facilities = required
Controlled release rate generally by orifice plate or spillway
The 90th percentile event must be captured and stored below the outlet and/or spillway
If adjacent to a public street, curb, gutter and sidewalk is required
Maximum depth with fencing = as approved by City Engineer
If there are other utilities on the surface such as power, phone, or CATV, they must be mounted above the high-water line.

11. SPECIAL CONSIDERATIONS

There are several areas of interest, design, and special needs in the Salem City Storm Drainage Plan Area that may need special consideration, attention, or temporary revised standards. Some of these areas of special interest or concern include, but are not limited to the following topics:

1. Possible debris flows from adjacent canyons, especially after a fire with burn conditions.
2. Wetlands areas where special investigations or jurisdictional and non-jurisdictional mapping needs to be further investigated or studied.
3. Areas in the older portions of the City where these standards did not apply during construction, but still some level of detention is necessary to prevent on-site or downstream flooding.
4. City-wide or Regional storm drainage facilities planned but not yet constructed.
5. Emergency flood control or mitigation measures.
6. Revising design standards in limited, temporary situations where costs, health and safety considerations, hazardous condition mitigation, or acts of God demand a higher or lower level of service.
7. Special design considerations in areas of high groundwater where LID or MS4 requirements may not be practical.
8. Areas where the local off-site conveyance of storm water may be feasible rather than meeting the high level of on-site retention.
9. Areas where City storm drainage fees could likely be used to address the above issues.
10. Areas where land acquisition by the City is necessary but is not yet complete.

In these cases listed above, the Salem City Council has adopted by resolution, included in this storm drain manual, and granted authority to the Salem City Engineer to consider these issues, make recommendations, require additional studies, or recommend granting or withholding approvals of projects. The City Council specifically reserves the right for commitment of funding for any of these efforts.

12. STANDARD DRAWINGS

Several Standard Drawings are included herein. The developer shall use all the information above and the Salem City Standard Drawings in completing the stormwater portion of his construction plans. Where a specific City standard drawing may be absent, use the APWA standard drawings. If no typical drawing exists, the design engineer is required to submit a desired construction drawing for approval.

Street detail for 66’ right-of-way

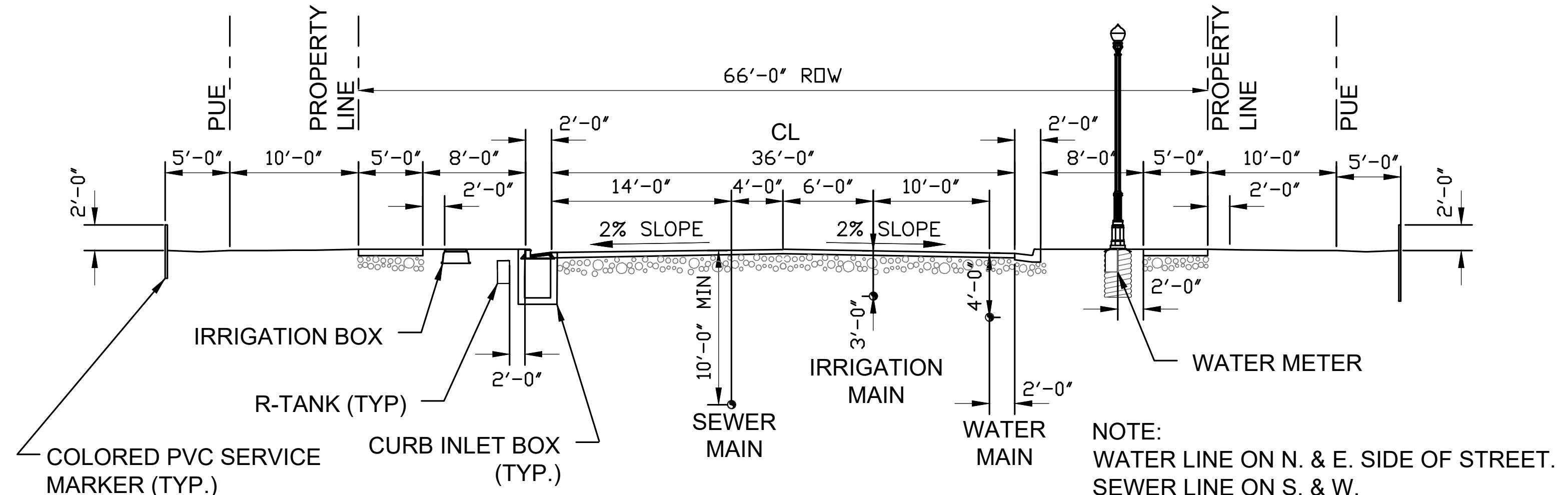
Storm Drain Curb Inlet Assembly

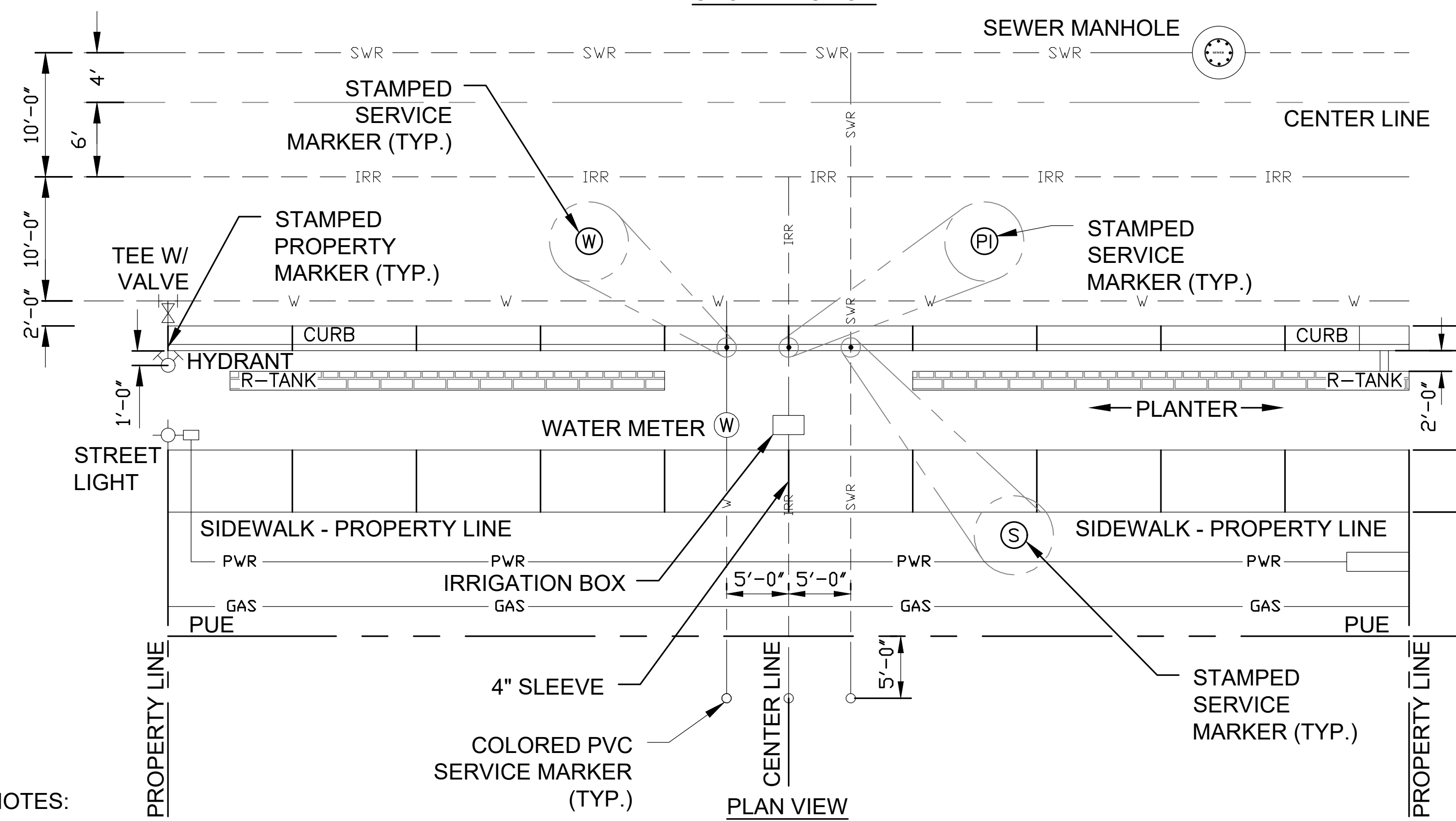
Storm Drain Manhole Sump

R-tank inlet and tank placement

Park Strip linear sump

TYPICAL 66' STREET RIGHT OF WAY





NOTES:

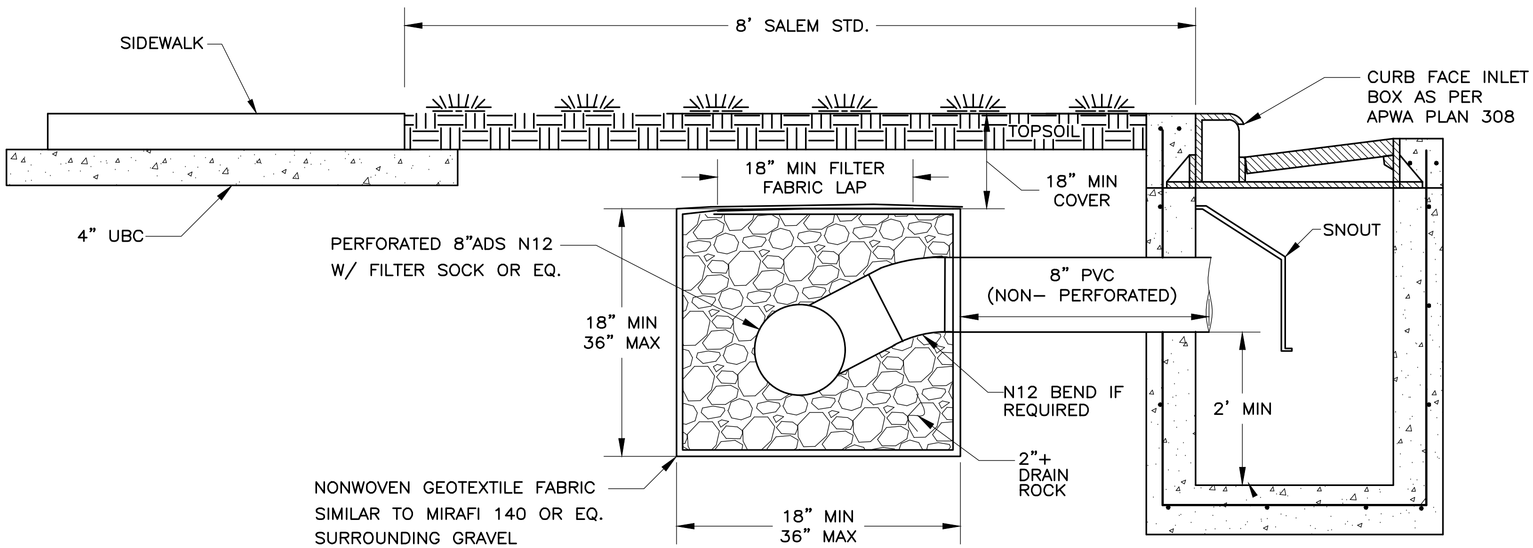
1. THE CONTRACTOR SHALL PROVIDE, INSTALL, AND MAINTAIN ALL ROAD CONSTRUCTION, BARRICADES, CHANNELING DEVICES, AND CONSTRUCTION SIGNS IN ACCORDANCE WITH THE MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES (MUTCD) FOR ROAD CONSTRUCTION ACTIVITIES.
2. TRAFFIC ACCESS SHALL BE MAINTAINED FOR LOCAL RESIDENTS TO PROPERTIES ALONG CONSTRUCTION BOUNDARIES.
3. WORK PERFORMED WITHIN THE STATE HIGHWAY RIGHTS-OF-WAY SHALL CONFORM TO THE STATE OF UTAH SPECIFICATIONS FOR EXCAVATION ON STATE HIGHWAY PREPARED BY THE DEPARTMENT OF TRANSPORTATION.
4. THE CONTRACTOR SHALL PROVIDE MAILBOXES AND POSTS ACCORDING TO U.S. POSTAL SERVICE STANDARDS AND SHALL PLACE THEM IN THE PLANTER STRIPS AT LOCATIONS DESIGNATED BY THE CITY.
5. PI BOX SHALL BE INSTALLED IN THE CENTER OF LOT. WATER METER SHALL BE INSTALLED 5 FEET FROM CENTER TO THE HIGHER ELEVATION SIDE OF THE PI BOX. SEWER LATERAL SHALL BE INSTALLED 5 FEET FROM CENTER TO THE LOWER ELEVATION SIDE OF LOT.
6. ALL SIDEWALKS, CURBS AND GUTTERS SHALL BE CONSTRUCTED USING 6.5 BAG MIX BASED ON APWA STANDARDS FOR CLASS 4000 CONCRETE.

City of SALEM

SALEM CITY CONSTRUCTION STANDARDS

STREET DETAILS
TYP. 66' RIGHT OF WAY
SCALE: NONE
DATE: 1-9-18
SECTION: 1.1
REV DATE: 7-30-19

PARK STRIP LINEAR SUMP
L.I.D. DETAIL



NOTES:

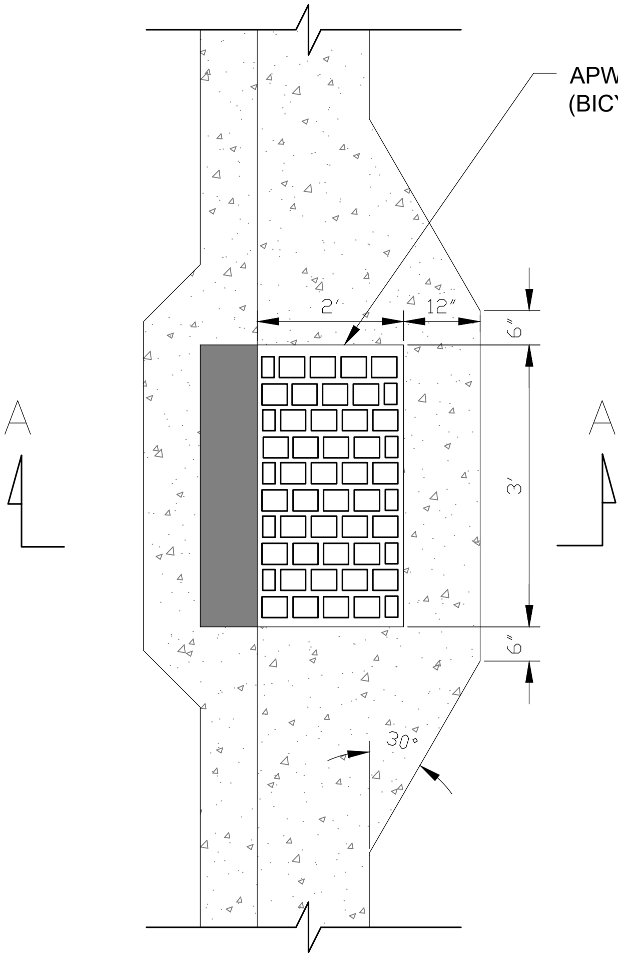
1. MAX DRAIN/SUMP LENGTH = 400'
2. LINEAR SUMP PREFERABLY TO BE LEVEL =0% SLOPE, AS THIS MAXIMIZES VOLUME WITHOUT PRESSURIZING END
3. WIDTH, HEIGHT, AND LENGTH OF LINEAR DRAIN TO BE DETERMINED BY PROJECT ENGINEER AND CALCULATIONS SUBMITTED TO AND APPROVED BY SALEM CITY ENGINEER
4. ALL LANDSCAPED AREA BETWEEN CURB AND WALK TO CONSIST OF PERVIOUS MATERIALS (EXCEPT FOR DRIVES AND WALKS)
5. VOLUME ALLOWED = L*W*H*%VOIDS IN ROCK

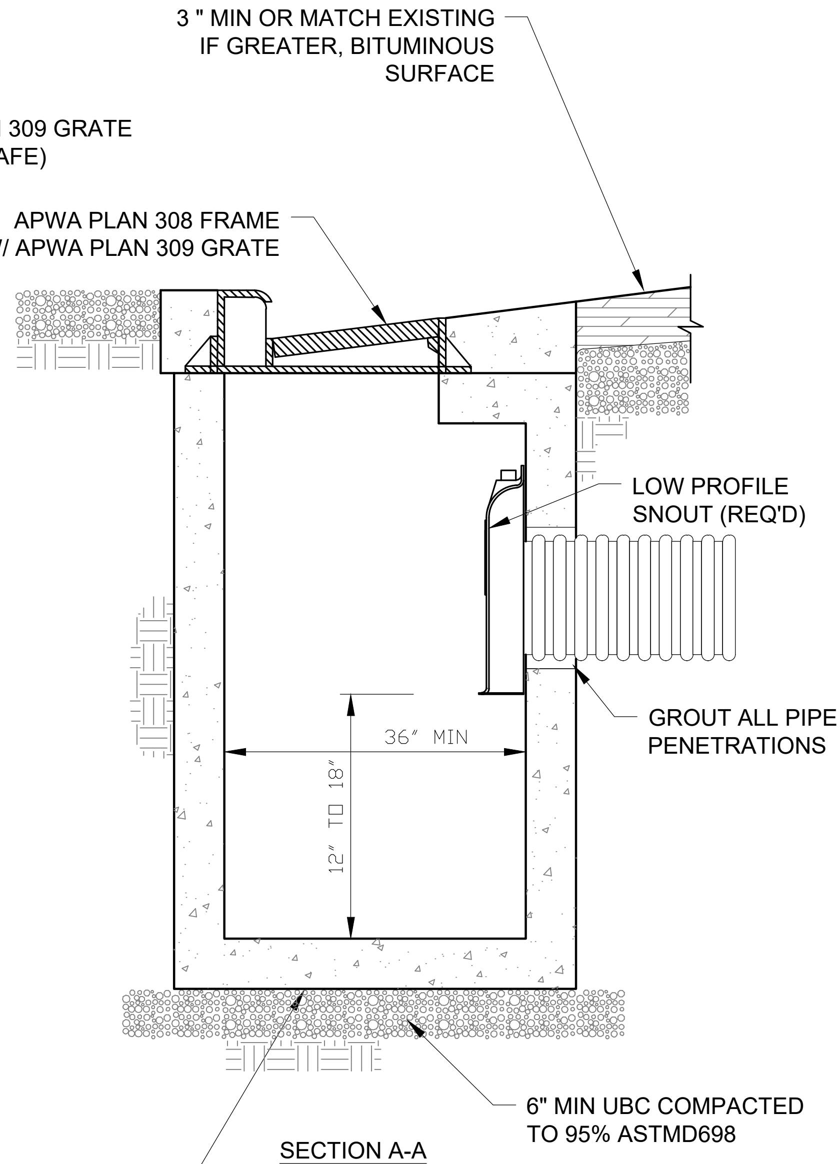
City of SALEM

SALEM CITY CONSTRUCTION STANDARDS

STREET DETAILS
PARK STRIP LINEAR SUMP
SCALE: NONE
DATE: 1-9-18
SECTION: 1.3
REV DATE: 7-30-19

CURB INLET BOX ASSEMBLY





3' X 3' X 4' (MIN. SIZE - INTERIOR DIMENSION) PRECAST BOX THAT MEETS H-20 LOADING AND ASTM SPECIFICATION C-858 FOR UNDERGROUND UTILITY STRUCTURES

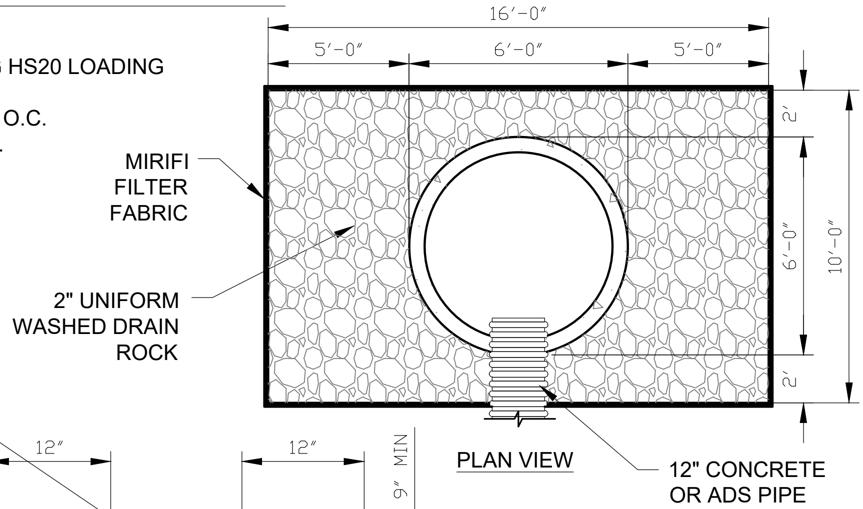
SALEM CITY CONSTRUCTION STANDARDS

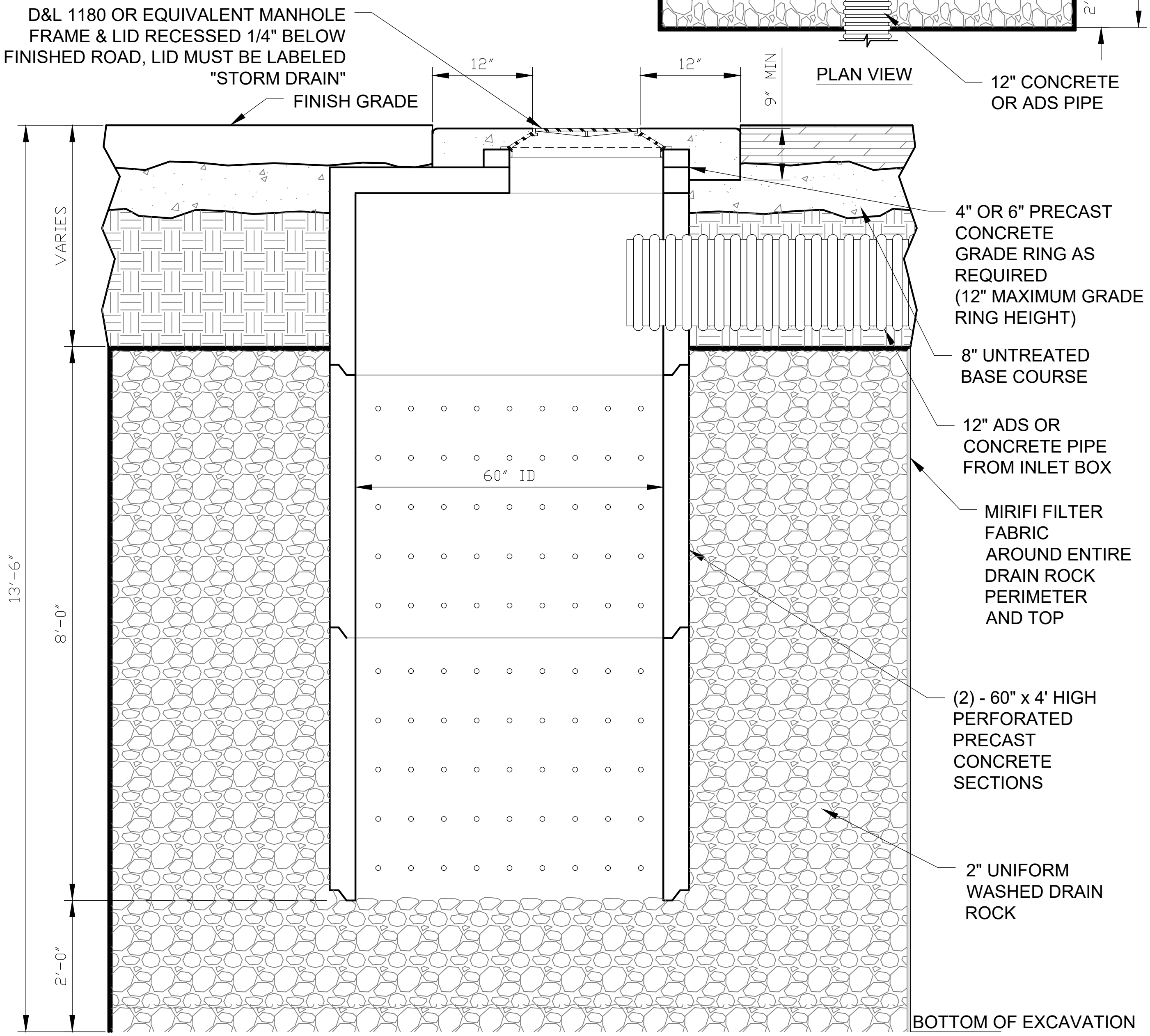
STORM DRAIN COLLECTION
CURB INLET BOX ASSEMBLY
SCALE: NONE
DATE: 1-9-18
SECTION: 2.1
REV DATE: 7-30-19

MANHOLE SUMP

NOTES:
1. ALL SUMPS SHALL BE PRE-CAST CONCRETE MEETING HS20 LOADING REQUIREMENTS.
2. PERFORATED SECTIONS SHALL HAVE 1" HOLES @ 12" O.C.
3. NO FLUSH MOUNT RING & COVERS WILL BE ALLOWED.

NOTE:
MINIMUM DIMENSIONS MAY BE MODIFIED

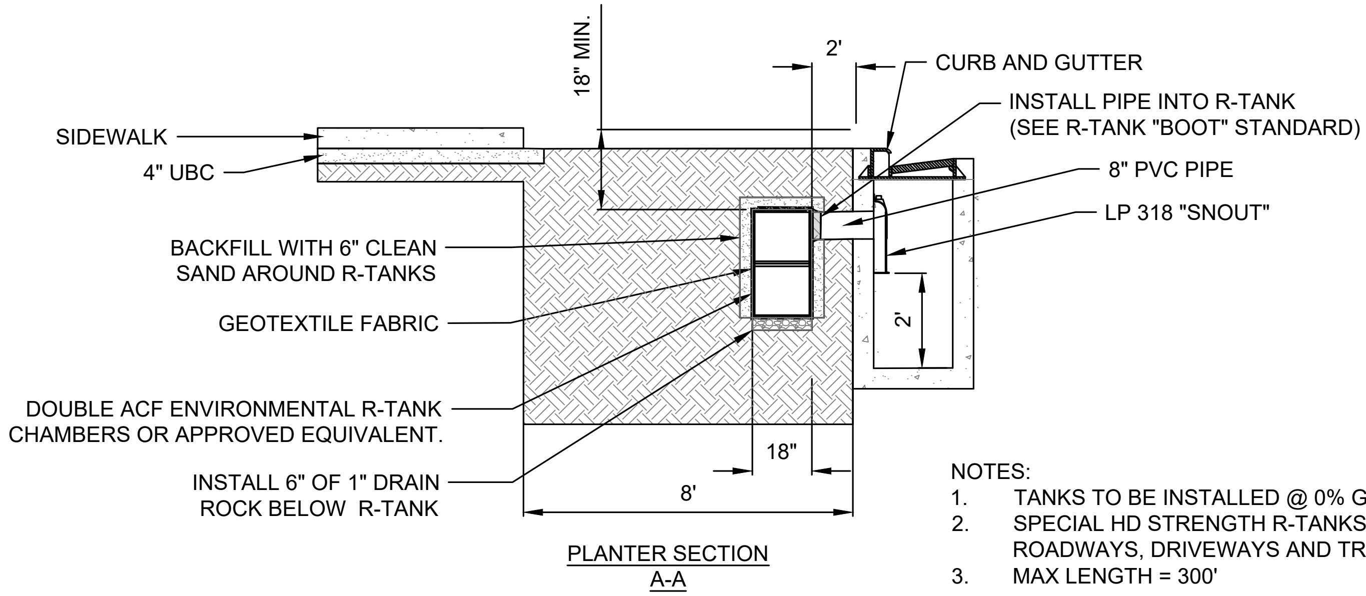




SALEM CITY
CONSTRUCTION
STANDARDS

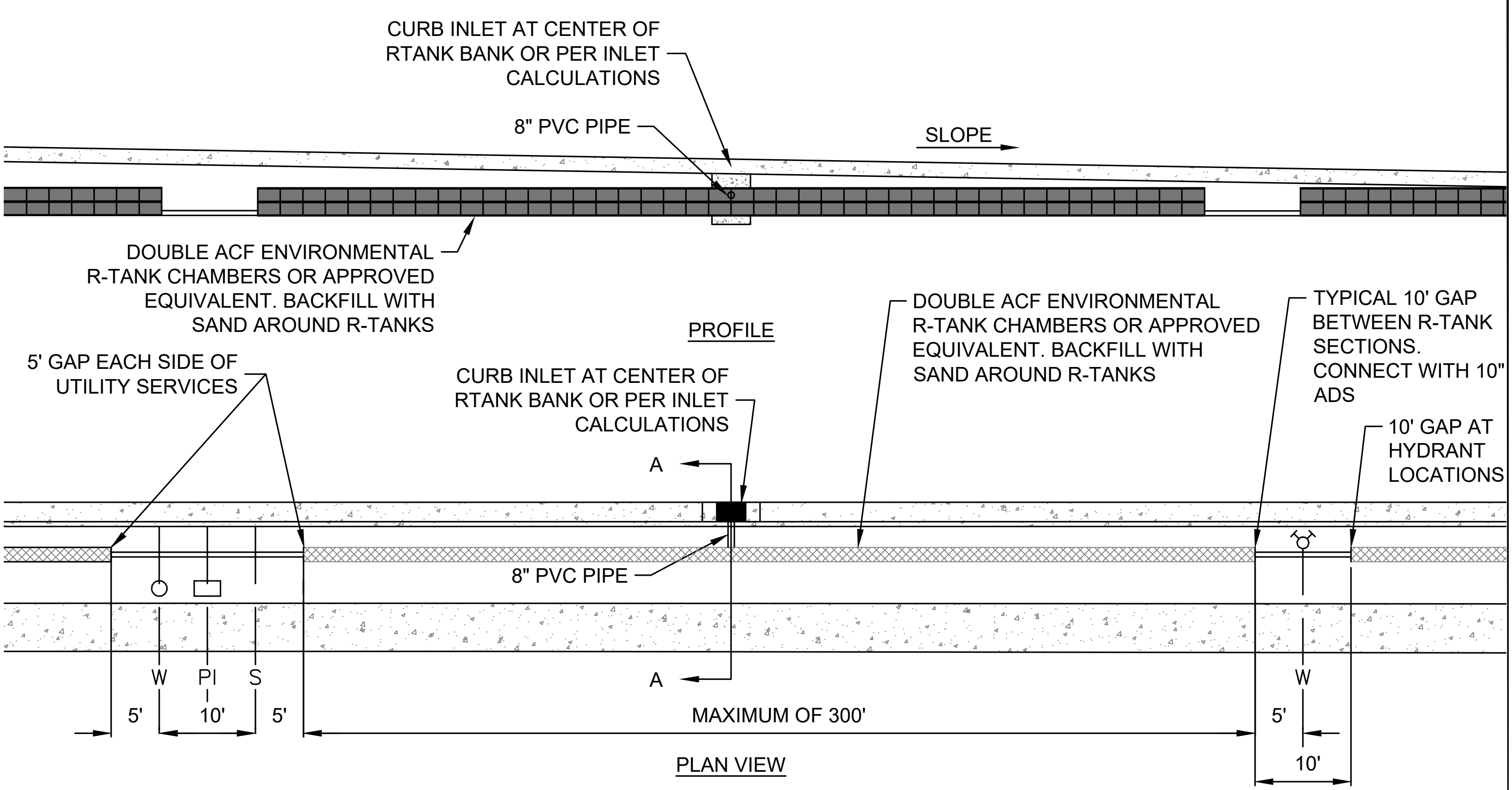
STORM DRAIN COLLECTION
MANHOLE SUMP
SCALE: NONE
DATE: 1-9-18
SECTION: 2.2
REV DATE: 7-30-19

R-TANK STREET PROFILE



PLANTER SECTION
A-A

NOTES:
1. TANKS TO BE INSTALLED @ 0% GRADE (LEVEL)
2. SPECIAL HD STRENGTH R-TANKS FOR ROADWAYS, DRIVEWAYS AND TRAFFIC LOADING
3. MAX LENGTH = 300'

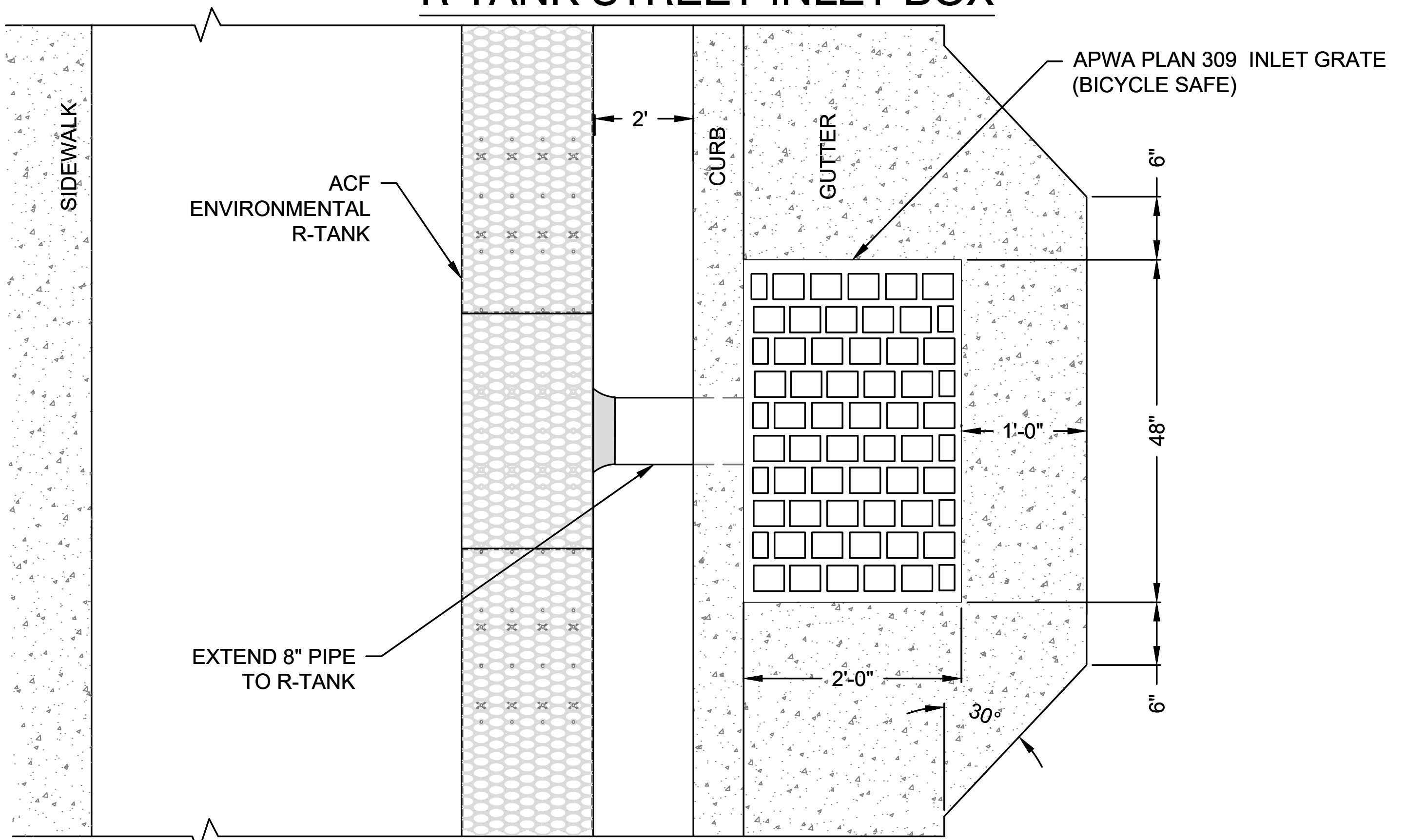


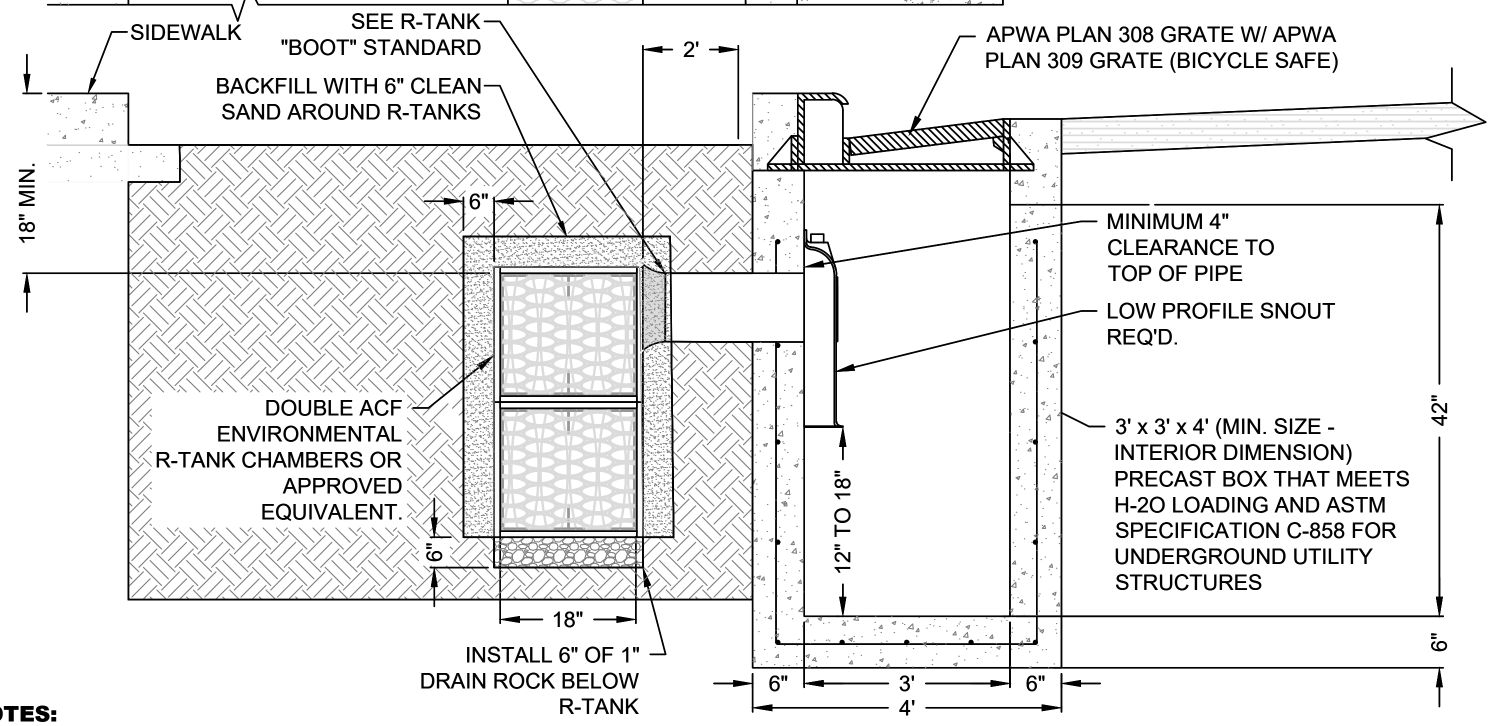
PLAN VIEW

NOTES:
1. THE TOP OF ALL R-TANK CHAMBERS ALONG A CONTINUOUS SECTION OF CHAMBERS SHALL BE DESIGNED TO BE A MINIMUM OF 3" BELOW THE GUTTER FLOWLINE AT THE INLET.
2. ALL PLANTER AREAS BETWEEN THE CURB AND SIDEWALK SHALL BE LANDSCAPED WITH PERVIOUS MATERIALS UNLESS OTHERWISE APPROVED BY THE CITY ENGINEER OR DESIGNEE.

SALEM CITY CONSTRUCTION STANDARDS	STORM DRAIN COLLECTION
	R-TANK STREET PROFILE
	SCALE: NONE
	DATE: 1-9-18
	SECTION: 2.4
	REV DATE: 7-30-19

R-TANK STREET INLET BOX





NOTES:

1. DETAILED ENGINEERING SHALL BE SUBMITTED TO THE CITY FOR APPROVAL ON ALL CAST IN PLACE BOXES.
2. "SNOUT" OIL-WATER-DEBRIS SEPARATOR SHALL BE INSTALLED TO MANUFACTURER'S SPECIFICATIONS.
3. ALL PLANTER AREAS BETWEEN THE CURB AND SIDEWALK SHALL BE LANDSCAPED WITH PERVIOUS MATERIALS UNLESS OTHERWISE APPROVED BY THE CITY ENGINEER OR DESIGNEE.
4. NO TREES SHALL BE ALLOWED IN PLANTER STRIPS WITH R-TANKS UNLESS THE PLANTER IS 10 FEET WIDE OR GREATER.
5. STORM BRICKS ARE AN ACCEPTABLE ALTERNATIVE TO R-TANKS.
6. BOTTOM OF R-TANKS TO INSTALLE FLAT. (O% GRADE)

SALEM CITY CONSTRUCTION STANDARDS

STORM DRAIN COLLECTION	
R-TANK STREET INLET BOX	
SCALE: NONE	
DATE: 1-9-18	
SECTION: 2.3	
REV DATE: 7-30-19	