Santa Clara City
Stormwater IFFP & IFA

SANTA CLARA CITY

STORMWATER IMPACT FEE FACILITIES PLAN AND IMPACT FEE ANALYSIS

MARCH 2025

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PREFACE

Santa Clara (City) has contracted with Sunrise Engineering, Inc. to prepare this update to the City's Storm Water Master Plan (Plan). The original plan was completed by Sunrise Engineering in 1997 with updates to the plan completed in 2001 and 2004. The most recent plan was completed in 2015. Many of the recommendations provided in the prior plans have been implemented by the City. In addition, there have been numerous other changes to storm water runoff patterns due to ongoing growth and development. This plan will help the City plan for and implement storm water control facilities and infrastructure. General requirements for sizing, maintenance, and configuration of a storm water system will be provided.

INTRODUCTION

This Storm Water Master Plan has been prepared for Santa Clara City, Utah located northwest of St. George in Washington County along old Highway 91. An Area Map has been included in Appendix A as Map 0.

Santa Clara City has experienced significant growth over the past 30 years. As this growth has occurred, the construction of homes, roads and other improvements typical of developed communities has altered the natural terrain upon which the community was built. These alterations have resulted in an increase in storm water runoff generated by storm events and have changed the routes by which storm runoff is directed through the City.

A flood irrigation system, built by early settlers in the area, historically served to collect, route and disperse storm water runoff generated in the area. Continued development in Santa Clara City and changes in irrigation methods have resulted in general abandonment and discontinued use of the flood irrigation system.

The current drainage system in Santa Clara includes many subterranean storm drain lines, particularly in the “Valley” area. Much of this infrastructure was installed during the Santa Clara Streetscape project completed in 2007. The “Heights” area drainage system consists mainly of streets with curb & gutter, although runoff is directed to natural drainage facilities surrounding the area using typical storm drain improvements.

Title 16 of the Santa Clara City Code governs the storm drainage requirements for new developments. New developments are typically required to install storm drain improvements consistent with the Santa Clara City Construction Design Standards and in accordance with the current Master Plan.

It is intended that this 2025 Stormwater Master Plan will help the City of Santa Clara manage current and future stormwater routing scenarios.

The Plan includes general requirements for the sizing, maintenance, and configuration of a stormwater management system in Santa Clara and makes recommendations for addressing specific problem areas in the City. In addition, this Plan provides operation and maintenance recommendations for existing and future stormwater improvements.

SECTION 1 | BASIN DESCRIPTION & DATA COLLECTION

1.1 FIELD INVESTIGATION

Santa Clara City is located northeast of St. George along old Highway 91 in Washington County, Utah. The original City of Santa Clara was established in the Santa Clara River valley just upstream from the confluence of the Snow Canyon drainage and the Santa Clara River. In the 1970's, the City expanded into the Santa Clara bench area known as Santa Clara Heights. Subsequent annexations have increased the area within the City boundaries to approximately 3,882 acres.

The community can be classified as rural and suburban due to varied land uses within the City. These land uses range from pasture and farmland to moderate and high-density residential housing and light commercial use. Development in the City has had a direct impact on the natural drainage patterns and native ground cover historically found in the area. These changes in ground cover and drainage patterns are a key contributor to exacerbated storm water problems and potential flooding in the City.

To assist with preparation of this Plan, Sunrise Engineering's staff conducted a detailed field investigation of the City. The overall purpose of the field investigation was to collect information regarding existing drainage improvements, drainage patterns, and existing problematic areas in the study area. This process resulted in a current understanding of the system which was used as a basis for evaluating and modeling the system.

The field investigation was further supplemented by maps obtained from the City and other entities regarding soil types, land uses, zoning, and elevations. The gathered information was then used in a hydrologic analysis of the study area to determine the amount of runoff generated by specific precipitation events and to evaluate the ability for existing infrastructure to convey the runoff flows.

1.2 EXISTING DRAINAGE FACILITIES

1.2.1 ROADWAY CONVEYANCE

Excess storm water generated by a given rainfall event typically sheet flows to the curb and gutter system lining the streets in a drainage area. Where necessary, valley gutters are located at the street intersections to route storm water across the intersections. Curb inlet boxes are installed in certain locations within the gutter systems to collect water from the streets and direct it into available storm drain pipes or natural drainage channels. On streets where curb and gutter systems are absent, shoulder swales often serve as drainage barriers which route storm water runoff to the nearest drainage facility or local depression.

1.2.2 STORM DRAIN PIPE SYSTEM

Storm drain pipe systems are located in certain portions of the City, and were constructed to drain specific regions. These systems include catch basins, cleanout boxes, pipe segments, and outfall structures which discharge storm-water to natural drainage features including several washes, and ultimately the Santa Clara River. A large portion of Santa Clara does not include complete storm drain pipe systems and consists of mainly roadway conveyance which routes flow to the nearest storm drain collection system or natural drainage feature. There are also several locations which do have curb and gutter, but lack effective routing of storm water to the nearest drainage channel. A map of the existing storm drainage improvements is included as Map 1 in Appendix A.

1.2.3 FLOOD IRRIGATION SYSTEM

Remaining portions of a flood irrigation system exist within the city which historically diverted water from the Santa Clara River and conveyed it to the fields throughout the City by means of old canals and ditches. The system not only served irrigation purposes but was also effective in collecting and routing storm water runoff to discharge points along the Santa Clara River. Due to ongoing development in the “Valley” area and the implementation of a pressurized irrigation system, only a few portions of the old canal and flood irrigation system remain. Those remaining portions are generally in a state of disrepair. It is the assumption of this Plan that these facilities are not included in the existing storm drain system.

1.2.4 DETENTION FACILITIES

The Laub Pond Flood Retention Embankment Structure is located on the east border of Santa Clara adjacent to Snow Canyon Middle School. The structure detains storm runoff flow from Laub Wash which includes the combined flows from Lava Flow Wash and Tuacahn Wash. The storage volume of the basin is approximately 78 acre-feet. The retention structure includes a 24-inch diameter lower level outlet that meters flow to the City’s down-stream storm drain system consisting of a 36-inch trunk line.

On September 11, 2012, following an estimated 100 year+ flood event, the old Laub Pond Retention Embankment failed, flooding numerous downstream homes and businesses and causing millions of dollars in damage. The City worked with the Federal Emergency Management Agency (FEMA) and the Washington County Flood Control Authority to obtain funding to reconstruct the embankment. The new embankment was finished in August of 2013, and was designed and constructed in accordance with current Utah Dam Safety Requirements. The new structure is much improved over the previous structure and is expected to provide the needed protection following major precipitation events.

1.2.5 DRAINAGE CHANNELS

There are 3 primary natural drainage channels that are located within the Santa Clara City watershed. These drainage channels are described below:

- <u>Laub Wash</u>: Laub Wash transects the study area from northwest to southeast in the northern half of Santa Clara City. The wash begins near Pioneer Parkway and runs adjacent to the area known as the South Black Rocks. This wash collects most of the runoff from the northern portion of Santa Clara including runoff from Lava Flow Wash and Tuacahn Wash and routes it to Laub Pond on the east side of the City. The wash has a considerably lower elevation than most of the developed area that it drains. Laub Pond, as previously mentioned, drains through a subterranean pipe system to the Santa Clara River.
- <u>Santa Clara River</u>: The Santa Clara River transects Santa Clara City from west to southeast near the midsection of the City. The river historically received discharge from Laub Wash to the north and currently receives metered discharge from Laub Pond. The area of Santa Clara City south of the Laub Wash Barrier drains directly to the Santa Clara River. This river is a major drainage feature for a significant portion of Washington County.
- <u>Cove Wash</u>: Cove Wash transects Santa Clara City from west to southeast in the southern portion of the City known as the “South Hills”. It was previously believed that a large portion of future growth in the City would occur in this area. The area, which is under the control of the Bureau of Land Management (BLM), had been identified in a land bill as an area of potential disposal. However, due to change in politics and the discovery of threatened/endangered plants in the South Hill area, it is no longer anticipated that the BLM will be disposing of this land any time soon.

A secondary drainage channel important to Santa Clara City is the Sand Hollow Wash which lies along the eastern border of Santa Clara. Sand Hollow Wash is a naturally occurring drainage channel to which some of the runoff generated in the southeastern portion of the City is routed.

1.3 WATERSHED INFORMATION

Work performed during the data collection and field investigation phase of this study included a detailed review of how storm water runoff within the City of Santa Clara is routed to the primary drainage channels and pipe systems previously described. The direction of storm water flow was established for local developments and existing storm water conveyance facilities were reviewed to understand how they route storm water to the major drainage channels. After these patterns were determined, watershed drainage basins and sub-basins were delineated.

A drainage basin is a portion of a greater watershed area that has specific, well-defined boundaries and produces runoff at a downstream point location. A sub-basin is a sub-area within a drainage basin that is characterized by drainage features and land use and contributes runoff to the larger drainage basin. Dividing larger watershed areas into individual drainage basins and sub-basins allows more detailed and accurate analyses of the individual areas. These individual analyses can then be combined to generate data for the large basins and the watershed as a whole. This process was followed for this Plan. An exhibit showing the drainage sub-basins as analyzed has been included as Map 2 in Appendix A.

1.4 SOIL TYPE INFORMATION

The soil type within a watershed area has a significant impact on how much excess storm water is available for runoff because the soil type determines the precipitation infiltration rate. This infiltration rate is the rate at which water moves from the ground surface into subsurface soil layers. If the infiltration rate is very high, storm water runoff generated by precipitation events is lower because a greater volume of moisture is absorbed by the soil. Conversely, if the infiltration rate is low, higher volumes of runoff are generated because minimal absorption occurs in the subsurface soil layers. The Soil Conservation Service (SCS) has studied soil types throughout the United States and has grouped soils according to their type and infiltration rates. These groups are described in the list below:

- Group A: These soils have a high infiltration rate. They are chiefly deep, well drained sands or gravel, deep loess, or aggregated silts. They have low runoff potential.
- Group B: These soils have a moderate infiltration rate when thoroughly wet. They are moderately deep and well drained and of moderately fine to moderately coarse texture. Examples are shallow loess and sand loam.
- Group C: These soils have a slow infiltration rate when wet. They are soils with a layer that impedes downward movement of water and typically have moderately fine to fine texture. Examples are clay loams or shallow sandy loams. These soils are typically low in organic content and high in clay content.
- Group D: These soils have a very slow infiltration rate. They are chiefly clay soils with high swelling potential. A high water table is often permanent. Clay pan is often found at or near the surface. A shallow layer of soil may cover a nearly impervious material. Examples include heavy plastic clays and certain saline soils. They have high runoff potential.

The United States Department of Agriculture, National Resource Conservation Service (NRCS) has performed several studies of soils throughout the United States including those in Santa Clara and the surrounding area. These studies reveal that the soil types located in the study area are primarily of groups B, C, and D. Soil data used for the study area consisted primarily of data from the SSURGO database which was obtained from the NRCS Web Soil Survey website. The data collected was used in the watershed analysis described by this Plan.

1.5 LAND USE PATTERNS

The type of land use in a given watershed area is a factor that significantly affects the magnitude of storm water flow and runoff volume generated by precipitation events. Land uses that have relatively higher percentages of impervious surfaces such as parking lots, shopping areas, storage yards and high-density residential housing tracts generate more storm water runoff than areas with lower percentages of impervious surfaces such as parks and grasslands.

A review of national land cover database (NLCD), current aerial photographs, and information collected during the field investigation were used to determine the current land use categories used in this Plan. These land uses include the following:

- Developed
    - Developed, Open Space: Areas with a mixture of some constructed materials, but mostly vegetation in the form of lawn grasses. Impervious surfaces account for less than 20% of total cover. These areas most commonly include large-lot single-family housing units, parks, golf courses, and vegetation planted in developed settings for recreation, erosion control, or aesthetic purposes.
    - Developed, Low Intensity: areas with a mixture of constructed materials and vegetation. Impervious surfaces account for 20% to 49% percent of total cover. These areas most commonly include single-family housing units.
    - Developed, Medium Intensity: areas with a mixture of constructed materials and vegetation. Impervious surfaces account for 50% to 79% of the total cover. These areas most commonly include single-family housing units.
    - Developed, High Intensity: highly developed areas where people reside or work in high numbers. Examples include apartment complexes, row houses and commercial/industrial. Impervious surfaces account for 80% to 100% of the total cover.
- Barren
    - Barren Land (Rock/Sand/Clay): areas of bedrock, desert pavement, scarps, talus, slides, volcanic material, glacial debris, sand dunes, strip mines, gravel pits and other accumulations of earthen material. Generally, vegetation accounts for less than 15% of total cover.
- Forest
    - Deciduous Forest: areas dominated by trees generally greater than 5 meters tall, and greater than 20% of total vegetation cover. More than 75% of the tree species shed foliage simultaneously in response to seasonal change.
    - Evergreen Forest: areas dominated by trees generally greater than 5 meters tall, and greater than 20% of total vegetation cover. More than 75% of the tree species maintain their leaves all year. Canopy is never without green foliage.

  - Mixed Forest: areas dominated by trees generally greater than 5 meters tall, and greater than 20% of total vegetation cover. Neither deciduous nor evergreen species are greater than 75% of total tree cover.

- Shrubland
  - Shrub/Scrub: areas dominated by shrubs; less than 5 meters tall with shrub canopy typically greater than 20% of total vegetation. This class includes true shrubs, young trees in an early successional stage or trees stunted from environmental conditions.

- Herbaceous
  - Grassland/Herbaceous: areas dominated by graminoid or herbaceous vegetation, generally greater than 80% of total vegetation. These areas are not subject to intensive management such as tilling but can be utilized for grazing.

- Planted/Cultivated
  - Pasture/Hay: areas of grasses, legumes, or grass-legume mixtures planted for livestock grazing or the production of seed or hay crops, typically on a perennial cycle. Pasture/hay vegetation accounts for greater than 20% of total vegetation.
  - Cultivated Crops: areas used for the production of annual crops, such as corn, soybeans, vegetables, tobacco, and cotton, and also perennial woody crops such as orchards and vineyards. Crop vegetation accounts for greater than 20% of total vegetation. This class also includes all land being actively tilled.

- Wetlands
  - Woody Wetlands: areas where forest or shrubland vegetation accounts for greater than 20% of vegetative cover and the soil or substrate is periodically saturated with or covered with water.
  - Emergent Herbaceous Wetlands: Areas where perennial herbaceous vegetation accounts for greater than 80% of vegetative cover and the soil or substrate is periodically saturated with or covered with water.

A map showing the current land uses used in this study has been included as Map 4 in Appendix A.

Development in the City has been governed by and has generally followed guidelines established by adopted zoning ordinances. It was assumed, for the purposes of this study and for predicting future land use patterns within the City, that development and land use will follow the Santa City Zoning Map. In addition, because portions of the drainage basins studied lie within the Ivins City municipal boundary, the Ivins City Zoning Map was also assumed to represent future land use patterns within those portions of the drainage basin falling within Ivins City boundaries. The portion of Ivins runoff that is received by Santa Clara is minimized by the stormwater infrastructure in Ivins City that directs flow through the storm drain mainline in Old Highway 91. The zoning maps for both cities have been included as Map 5 in Appendix A.

1.6 HISTORY OF FLOODING & COMPLAINTS

The data collection and field investigation process completed for this study included coordination with the City to identify existing storm water related problem areas within the City. A summary of the problem areas identified has been included below:

- Detention Basin on Santa Clara Drive near cemetery: City staff have noted this basin overtopping frequently.
- Flooding above roadway conveyance capacity has been noted by City staff in the following roadways:
    - Dutchman Drive/Red Mountain Drive
    - El Vista Drive/Little League Drive
    - Santa Clara Drive near Arrowhead Trail
    - Country Lane
- Truman Drive: Complete curb and gutter does not exist in this area to convey stormwater runoff.

Historically, extensive and high runoff flows are generated from even small rainfall events. Through past improvement projects and ongoing maintenance, the City has corrected numerous prior problem areas identified in past plans and studies. It is expected that the City will be able to eliminate the additional problem areas identified by following the recommendations contained within this Plan.

SECTION 2 | HYDROLOGIC ANALYSIS

2.1 INTRODUCTION

After the field investigation and data collection process was performed, a hydrologic analysis of the drainage basins was created for Santa Clara City.

EPA SWMM® was used in this analysis to determine peak and total volume flows generated in the drainage basins and sub-basins. The main purpose of this analysis is to provide a hydraulic model that accurately represents the current storm drain system and will be used for future development. The main purpose of the analysis is to provide reference information for future analyses, basic data for future designs, and to ensure that no current systems within Santa Clara City are largely undersized or under designed.

Certain assumptions and modeling parameters that mathematically describe precipitation and runoff characteristics of the study area were required for development of the computer model. These parameters include:

- Method of Analysis
- Sub-basin Delineation
- Rainfall Data
- Design Storm
- Soil Type and Land Use Characteristics
- Impervious Area (%)
- Basin Equivalent Width

A discussion of these input parameters and the process of creating the hydrologic model is given in Section 2.2. Results generated by the computer model are discussed in Section 3.1.

2.2 HYDROLOGIC MODEL

2.2.1 METHOD OF ANALYSIS

Numerous methods have been developed for performing hydrologic analyses for given watersheds. Each of the methods has its strengths and weaknesses; therefore, particular methods are better suited to specific watershed characteristics and configurations. The EPA SWMM model will use slope & Froude for normal flowing pipes, and Hazen Williams for pressurized pipe. The EPA SWMM model also will use the SCS method to calculate infiltration. Data required for input includes rainfall intensities, predominant soil types, land use patterns, basin width for individual basins, and infiltration curve numbers (CN) for individual basins. Output results are runoff hydrographs from which peak flows and volumes can be determined.

Typically, storms have different intensities and will rain harder at certain times during a storm event. These patterns have been analyzed throughout the US and a few standard patterns otherwise known as storm distributions have been developed. The model will use two standard storm distributions 1) SCS Type II distribution and 2) Farmer Fletcher Curve.

In the Unit Hydrograph Method, input data is used to create an output hydrograph. Different design storms for Santa Clara City will be used for the analysis (i.e. 10-year 3-hour, 100-year 3-hour, and 100-year 24-hour) based on the theory that individual hydrographs resulting from successive increments of rainfall excess that occur throughout a storm period will be proportional in discharge throughout their length. The EPA SWMM® software package has the ability to run a dynamic model method to generate stormwater discharge hydrographs based on the required input data. Hence, this package was appropriately suited for analysis of the Santa Clara City watershed.

2.2.2 SUB-BASIN DELINEATION

As given in Section 1.3, in order to effectively model precipitation and runoff scenarios for the Santa Clara City watershed, the study area was divided into drainage subbasins. These subbasins were delineated on a block-by-block basis within the City to more accurately analyze the total runoff flow within the City. These subbasins were delineated using a manual analysis of LiDAR data and represent the current storm runoff configuration for the City. Map 2 included in Appendix A illustrates the subbasin delineations.

2.2.3 RAINFALL DATA

Rainfall data necessary for input into the computer model was taken from the National Oceanic Atmospheric Administration (NOAA) website ATLAS 14. Information regarding design storm depth-duration-frequency (DDF) of rainfall depths is provided in Table II.B.1 in Appendix B. The precipitation data given in a DDF table can be used to create a DDF curve which is a relationship between the depth, duration, and frequency or return period of a given storm event. This, in turn, can be used to produce a storm temporal distribution. This distribution is a relationship between the percentage of rain produced and the amount of time that has elapsed. These distributions are related to the design storm duration and the distributions used in this study can be found in Table II.B.2 in Appendix B.

2.2.4 DESIGN STORM

The design storm for a hydrologic analysis is normally chosen based upon data observations that reveal the type of precipitation event that produces the highest peak flows and volumes for a given watershed under realistic rainfall event conditions. In the western United States and especially arid areas, storms that generally produce the highest levels of runoff are thunderstorms. Historically, the rainfall event frequency used to size storm drain pipes in southern Utah has been the 10-year 3-hour storm, 100-year 3-hour storm, and 100-year 24-hour storms. The existing drainage system should be designed so that a 10-year 3-hour storm will be conveyed within the drainage network. The existing drainage system including roadway flow should be designed to convey the 100-year 3-hour storm. The 100-year 24-hour storm has generally been used to size detention facilities. These design storms are consistent with local standards and have consequently been selected for use by this Plan.

2.2.5 SOIL TYPE & LAND USE CHARACTERISTICS

One factor that significantly affects the amount of runoff generated by a particular watershed is the soil type within the watershed. Different soils have different infiltration rates, or rates at which water can move through the surface to subsurface layers and thus be held from flowing off the watershed via surface drainage. If the infiltration rate is high, the runoff generated from storms is decreased. If the infiltration rate is comparatively low, precipitation will flow off the watershed rather than being absorbed.

Another important factor that affects the amount of runoff generated by a watershed is land use. Developed areas have a higher percentage of impervious surfaces like streets, driveways, parking lots and roofs while undeveloped areas are typified by pervious surfaces and plant features that are more efficient at absorbing precipitation, preventing it from leaving the watershed as runoff. The result is that higher rates are expected with increased development than are typically observed from a watershed in its natural condition.

The effect of soil types and land uses on watershed runoff flows and volumes is accounted for within the SCS Unit Hydrograph method for hydrologic analysis by the runoff curve number (CN). The Soil Conservation Service has calculated CN values for each soil group based on particular land uses. The CN is used to estimate infiltration (SWMM, Section 3.4.1). Representative curve numbers were calculated by the computer model according to soil maps and land use maps imported into the model under existing and build-out conditions. These soil type maps and land use maps are shown in Maps 3 & 4 in Appendix A. Each sub-basin was assigned by the model a composite CN value based on a weighted average of the different soil and land use types located within each sub-basin. In addition, the curve number values assigned to each of the sub-basins is shown in tabular form with other drainage basin parameters listed in the hydrologic model data, which is included in Table II.B.5 in Appendix B.

2.2.6 IMPERVIOUS AREA (%)

One factor that significantly affects the amount of runoff generated by a particular watershed is the amount of impervious area in the subbasin. This correlates directly to the amount of water able to infiltrate into the soil. This parameter is given as a percentage of water that is able to produce surface run off rather than infiltrate the soil, where 100% would indicate a fully impervious surface. LiDAR data and engineering judgement were used to determine the percent impervious for each subbasin. The different values used in the EPA SWMM model for each subbasin are given in Table II.B.3 in Appendix B. This data came from the impervious area shown in Map 6 in Appendix A.

2.2.7 BASIN WIDTH

The final input parameter required for the hydrologic model is the basin width (W) which is generally defined as the width of the overland flow path for sheet flow runoff. An initial estimate of the characteristic width is given by the subcatchment area divided by the average maximum overland flow length. The maximum overland flow length is the length of the flow path from the furthest drainage point of the subcatchment before the flow becomes channelized. Maximum lengths from several different possible flow paths should be averaged. These paths should reflect slow flow, such as over pervious surfaces, more than rapid flow over pavement, for example. Adjustments should be made to the width parameter to produce good fits to measured runoff hydrographs. The basin width used for each subbasin can be found in Table II.B.3 in Appendix B.

2.3 HYDROLOGIC MODEL RESULTS

Information regarding sub-basins, rainfall data, design storms, land uses, soil types and lag times were compiled. Following the compilation of the watershed and rainfall information, an analysis using EPA SWMM® storm water management modeling software was run which generated runoff hydrographs for each sub-basin in the watershed area. The runoff hydrographs provided values on peak flows and total runoff volumes for each sub-basin. The runoff volumes from the 100-year 24-hour storm were used to determine the sizing of detention basins. Peak flows from the 10-year 3-hour storm should be conveyed through the storm drain pipes only, where peak flows from the 100-year 3-hour storm should be conveyed through both the storm drain pipes and the roadway capacity by means of curb and gutter. However, due to the limited capacity of roadway conveyance, storm drain pipes were sized to convey most of the 100-year 3-hour storm flow. Peak flows and volumes resulting from the 100-year 3-hour storm event used to size storm drain piping are summarized in Table II.B.4 in Appendix B.

SECTION 3 | RECOMMENDED IMPROVEMENTS

3.1 INTRODUCTION

Based on the findings of the field investigation (including the known problem areas) and the results of the hydrologic and hydraulic analyses (see Appendix B) the following list of recommended improvements has been provided.

A map showing most of the recommended improvements has also been included as Map 7 in Appendix A.

3.2 SYSTEM IMPROVEMENTS – 0-10 YEAR PLANNING WINDOW

Multiple improvements are necessary to adequately manage the stormwater flow within Santa Clara. However, the cost to install all projects at once is not feasible and therefore should be spread over the length of the planning window. Through discussion with the City on financial feasibility and using engineering judgement, improvement projects were prioritized and split into 0 to 10-year and 10 to 20-year planning windows for installation. The full list of priority improvements is given in Appendix C. Maps of both the 0 to 10-year and 10 to 20-year planning window projects are shown as Map 7 in Appendix A.

This section will detail the recommended improvements by type for the 0 to 10-year planning window. A full Engineer's Opinion of Probable Cost for each improvement can be found in Appendix D. The total estimated cost of all recommended improvements for the 0 to 10 year planning window is $4,398,000.

3.2.1 DETENTION FACILITIES PROJECTS

1. Santa Clara Drive Basin Upsizing
    a. As stated in Section 1.6, City staff have noted this basin overtopping frequently. The hydrologic and hydraulic analysis confirmed this and have shown the need for upsizing the basin from approximately 6,722 cubic feet to 93,750 cubic feet. This includes rip rap and embankment improvements.

3.2.2 ROADWAY CONVEYANCE PROJECTS

2. Install curb and gutter:
    a. Install approximately half of the 17,180 LF of curb and gutter given in the map of recommended improvements in Appendix A.

3.2.3 STORM DRAIN PIPE SYSTEM PROJECTS

1. Project 4- Across Pioneer Parkway at Lava Flow
    a. Construction is beginning in 2025 to upsize the culverts under the parkway to 4 large box culverts. This project accounts for the cost of this ongoing project.

3.3 MAINTENANCE & MISCELLANEOUS IMPROVEMENTS

There are several improvements and practices that will enhance the ability for Santa Clara to manage storm water runoff. These improvements include both structural and non-structural items. They are:

- Reshape Existing Roads: Some of the roads in Santa Clara lack the ideal 2% cross slope. Without a proper crown in the roadway, the ability of the roadway to convey stormwater and drain properly is diminished. It is recommended that as roadways are resurfaced, care be taken to ensure that the proper cross slope is established.
- Install Curb and Gutter and Cross Gutters: Many of the streets in Santa Clara do not have complete curb and gutter systems which control runoff from the street. The City should pave these roads whenever possible and require curb and gutter and cross gutters on all future street improvements.
- Complete Regular Street Sweeping: A comprehensive street sweeping and cleanup program should be developed to remove sediment and trash from the streets and gutters so debris is not washed to downstream storm drain control facilities. It is anticipated that this simple maintenance procedure will greatly reduce future costs for maintenance of the storm drain system.
- Complete Regular Facility Cleaning: A comprehensive facility maintenance program should be established to clean inlet boxes, manholes, pipe systems, and any future pollution control structures. Regular maintenance will ensure the proper functionality of these structures, prolong life expectancy and reduce future maintenance costs.
- Ensure Proper Grate Orientation: Ensure that the catch basins in the Santa Clara storm drain system that are fitted with directional grates have the directional grates installed in the correct orientation to function at maximum efficiency. Maintenance of the storm drain system should include a procedure to ensure that the grates on every catch basin are oriented properly.
- Establish Standard Maintenance Program: It is recommended that the City continue their regular storm drain system maintenance program with proper tracking and record keeping. Using current computer technology including mapping and record keeping software makes this easy to accomplish. Following this system will allow the City to keep maintaining the storm drain system at the highest level of efficiency.
- Maintain a Current System Map: It is strongly recommended that Santa Clara City continue maintaining a thorough storm drain system map. Using modern computer technology makes this task relatively simple, significantly reducing storm drain system maintenance costs. Updates to the current map that the City maintains should include sizes, materials, and slopes of improvements.
- Update this IFFP: A Plan update should occur every five years or as growth dictates to maintain current impact fees and update the impact fee facilities plan.

3.4 WATER QUALITY IMPROVEMENT MEASURES

One of the primary goals of a storm water management plan is to enhance the quality of water discharged to downstream storm water conveyance facilities. Runoff generated from urban and suburban areas often contains pollutants such as sediments, road salts, oils, greases, solvents, pesticides, fertilizers, detergents, trash and many other forms of pollutants which may be discharged to downstream rivers and lakes. The Environmental Protection Agency (EPA) requires that these pollutants be controlled, mitigated and otherwise eliminated before they are discharged.

The first line of defense against pollution discharges are detention basin facilities installed near low segments of storm drain systems. Detention basins control peak flows that would otherwise be routed directly to receiving discharge facilities. As storm water runoff is held in the detention basin, flow velocity of the water is minimized and many of the suspended pollutants are able to settle out. Some of the pollutants are broken down organically while the physical debris, such as trash and sediment, can be manually cleaned from the detention basin and disposed of properly. This study recommends installation of local detention basin facilities in future developments in the City. These would be implemented by individual developers.

The second line of defense against pollution discharges are Best Management Practice (BMP) improvements such as oil and grease separation structures, vegetated outlet channels, and storm drain inlet filters. These improvements are designed to remove oils, grease, excess sediments, debris, and other similar materials from storm water before it is discharged to downstream receiving facilities. It is recommended that improvements of this type be installed on all future major storm drain lines to ensure that these pollutant types are removed from storm water before it is discharged from the storm drain system into the Virgin River. It should be noted that these facilities require regular maintenance. If not cleaned and maintained properly, these devices cease to function, and no pollutants are removed from the discharge flows.

3.5 COST ESTIMATES & PROJECT PRIORITY LIST

After establishing the list of recommended improvements, the City was consulted on the phasing for feasibly installing the projects. A priority list was created using this input, as well as considering necessary infrastructure to install the storm drain system from downstream to upstream. The 0-to-10-year priority improvements are estimated to cost $4,398,000.00 in 2024 dollars and are given in Table 1. The full list of 0-to-20-year priority projects can be found in Appendix C.

Table 1: 0-10 Year Priority Improvements

Project	Cost	Est. Year of Installation	Estimated Costs with 3% Inflation
Detention Facilities Projects			
2 SANTA CLARA DR BASIN UPSIZING	$111,300.00	2026	$119,000.00
Roadway Conveyance Projects			
3 CURB AND GUTTER PROJECTS - 0-10 Year	$1,648,600.00	2027	$1,802,000.00
Storm Drain Pipe System Projects			
4 ACROSS PIONEER PKWAY AT LAVA FLOW	$2,404,000.00	2025	$2,477,000.00
Total	$4,163,900.00		$4,398,000.00

3.6 FURTHER CONSIDERATIONS

Stormwater facilities include a wide assortment of constructed practices designed to manage and control the stormwater runoff from a certain area of land. The best stormwater management facility design cannot preclude the need for long term maintenance and repair of these facilities to keep the facility functioning as originally designed. The lack of proper operation and maintenance is often cited as the number one reason for failure of facilities or damage to property from flooding events. Routine maintenance addresses the expected activities required to keep the stormwater facilities in proper condition.

Routine maintenance may include mowing, vegetation maintenance, and removal of accumulated debris and sediment. The party responsible for the stormwater facilities shall keep accurate and complete records. Typical records include a log of all inspections, repairs and maintenance performed at the site, copies of inspection reports, invoices for work performed, photographs of the facilities, etc. These records, along with establishing an ongoing operation maintenance program, are the key to successful stormwater maintenance.

SECTION 4 | IMPACT FEE FACILITIES PLAN & IMPACT FEE ANALYSIS

4.1 IMPACT FEE FACILITIES PLAN

This report constitutes an Impact Fee Facilities Plan for the Santa Clara City Storm Water System. The recommended improvements were outlined in Section 3.2. An Engineer's Opinion of Probable Cost (EOPC) was prepared for each of the recommended improvements for the purpose of financial planning and calculation of the Storm Water Impact Fees. Copies of the EOPCs have been included in Appendix C.

It should be noted that these improvements constitute the System Improvements relating to the storm water system and that individual developments will be responsible for their individual Project Improvements.

4.2 GROWTH PROJECTIONS

The following information and projections were assumed in this plan:

- 2024 developed acres: 1,397
- 2033 developed acres: 1,647
- 2044 (Buildout) acres: 1,982

The source of this information is the 2023 Santa Clara City Water System Impact Fee Facilities Plan & Impact Fee Analysis as well as GIS information on developable acres within the current zoned boundary. The 2023 report indicated that projected buildout would be reached in the year 2044. This information was used in conjunction with the developable acres remaining within the current zoned boundary to estimate the acres that would be built by the end of the 10-year planning period of 2033. It was assumed that 50% of the remaining acres would be built out by 2033, with the remaining 50% of acreage being built out by 2044. This results in 250 buildable acres within the 10-year planning window.

4.3 IMPACT FEE ELIGIBILITY

The estimated 250 acres projected to be built out in 2033 were divided among 3 drainage subbasins within the City. This was done in order to assign impact fee eligibility to each project, so that developers are not unduly burdened by improvements that benefit existing system users but also pay their fair share. A map of these subbasins is given as Map 8 in Appendix A. The developable percentages for each subbasin are given in Table 2.

Table 2: Basin Developable Percentage

Subbasin	Developable Acres	Total Acres	Developable Percentage (%)
1	140.17	373.88	37.49%
2	425.44	1242.28	34.25%
3	19.48	365.78	5.33%

The impact fee eligibility of each project was determined based on the subbasin in which the majority of the project was encompassed. The developable percentage of that basin was considered to be equivalent to that project's impact fee eligibility.

4.4 IMPACT FEE ANALYSIS

It should be noted that it is the City's desire to assess impact fees which are consistent across the entire city rather than to incorporate different impact fees for separate areas of the City. The method of calculating the impact fee described herein is believed to be a fair and reasonable method of accomplishing this desire. The impact fee eligibility calculated in section 4, in conjunction with the developable acres in the next 10 years, was used to determine an impact fee per acre of *$9,408.62 per acre*. The impact fee eligibility by project and total impact fee eligible amount is given in Figure 1. Table 3 shows the anticipated impact fee per lot for select residential zones based on the minimum lot sizes given in the City zoning code. Where commercial zone lots tend to have more impervious area than residential zone lots, a factor representing the ratio of increased impervious area above the residential average was applied to the commercial zones to calculate the impact fee. The impact fee per acre for commercial zones is given in Table 4.

Projects	Current Costs	Year	Costs w/ Inflation*	Financed Cost (2.75%,30 yr)	Impact Fee Eligibility %	Impact Fee Eligible Amount
Detention Facilities Projects						
2 SANTA CLARA DR BASIN UPSIZING	$ 111,300.00	2026	$ 119,000.00	$ 176,303.00	34.25%	$ 60,384.00
		Sub total	$ 119,000.00	$ 176,303.00		
Roadway Conveyance Projects						
3 CURB AND GUTTER PROJECTS - 0-10 YEAR	$ 1,648,600.00	2027	$ 1,802,000.00	$ 2,669,722.00	34.25%	$ 914,380.00
		Sub total	$ 1,802,000.00	$ 2,669,722.00		
Storm Drain Pipe System Projects						
1 ACROSS PIONEER PKWAY AT LAVA FLOW	$ 2,404,000.00	2025	$ 2,477,000.00	$3,669,757.00	37.49%	$ 1,375,792.00
		Sub total	$2,477,000.00	$3,669,757.00		
		Total	$ 4,398,000.00	$ 6,515,782.00	Impact Fee Eligible Amount	$ 2,350,556.00
* Inflation is assumed at 3%					Developable Acres (10yrs)	249.83
					Impact Fee per Acre	**$9,408.62**

Figure 1: Impact Fee Analysis

Table 3: Residential Impact Fee Per Lot

Zone	Impact Fee Per Acre	Minimum Lot Size (acres)	Impact Fee per Lot*
RA - RESIDENTIAL AGRICULTURE ZONE	$9,408.62	0.5	$4,704.31
R-1-6 - SINGLE-FAMILY RESIDENTIAL ZONE		0.14	$1,317.21
R-1-10 - SINGLE-FAMILY RESIDENTIAL ZONE		0.23	$2,163.98
R-1-10/ML - MIXED LOT SIZE ZONE		0.23	$2,163.98
PDR - PLANNED DEVELOPMENT RESIDENTIAL ZONE		0.083	$780.92
*Impact fee is based on lot size per acre, not a fixed fee per lot. Impact fees given by minimum lot size are for example only.			

Table 4: Commercial Impact Fee Per Lot

Zone	Impact Fee Per Acre	ESU Factor**	Impact Fee per Lot
COMMERCIAL ZONE	$9,408.62*ESU Factor	Impervious Area (SF)/3,500 SF	ESU Factor*Lot Size (Acres)*$9,408.62
**ESU Factor is given by dividing the Impervious area by the average assumed residential impervious area of 3,500 SF (as given in City of Santa Clara Resolution No. 2004-06R). For an example lot size of 0.75 acres and 7,500 SF of impervious area, the impact fee for the lot would be 0.75 acres*7,500 SF/3,500 SF* $9,408.62/acre= $15,121.00			

4.5 IMPACT FEE RELATED ITEMS

In general, it is beneficial to update this impact fee facilities plan and impact fee analysis at least every five years, or more frequently if unexpected growth or changes affect the assumptions and data in this plan. It is assumed that this plan will be updated as recommended.

There are several items relating to impact fees that Santa Clara City should consider when planning for, collecting, and expending impact fees in accordance with Utah Code 11-36a. First, the City can only expend impact fees for system improvements that are identified in the impact fee facilities plan and that are for the specific facility type for which the fee was collected. Second, impact fees must be expended or encumbered for a permissible use within six years of their receipt unless 11-36a-602(2)(b) applies. Third, impact fees must be properly accounted for (collections and expenditures documented) in accordance with Utah Code 11-36a-601. The other provisions of Utah Code 11-36a also apply.

In accordance with Utah Code 11-36a-306, a certification of impact fee analysis is in Appendix D.

The impact fee ordinance adopted by Santa Clara City will be attached as Appendix E following enactment of an impact fee amount by the City Council.

APPENDIX A : MASTER PLAN FIGURES

Appendix A - Map 0 Santa Clara Locator

Legend

Municipal Boundary

0 4.5 9 Miles

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Appendix A - Map 1.1: Existing Stormwater Pipe Map

Legend

Existing Pipe

- 6" PIPE
- 8" PIPE
- 10" PIPE
- 11" PIPE
- 12" PIPE
- 14" PIPE
- 15" PIPE
- 16" PIPE
- 18" PIPE
- 24" PIPE
- 30" PIPE
- 36" PIPE
- 42" PIPE
- 48" PIPE
- 72" PIPE
- Municipal Boundary

0 0.33 0.66 Miles

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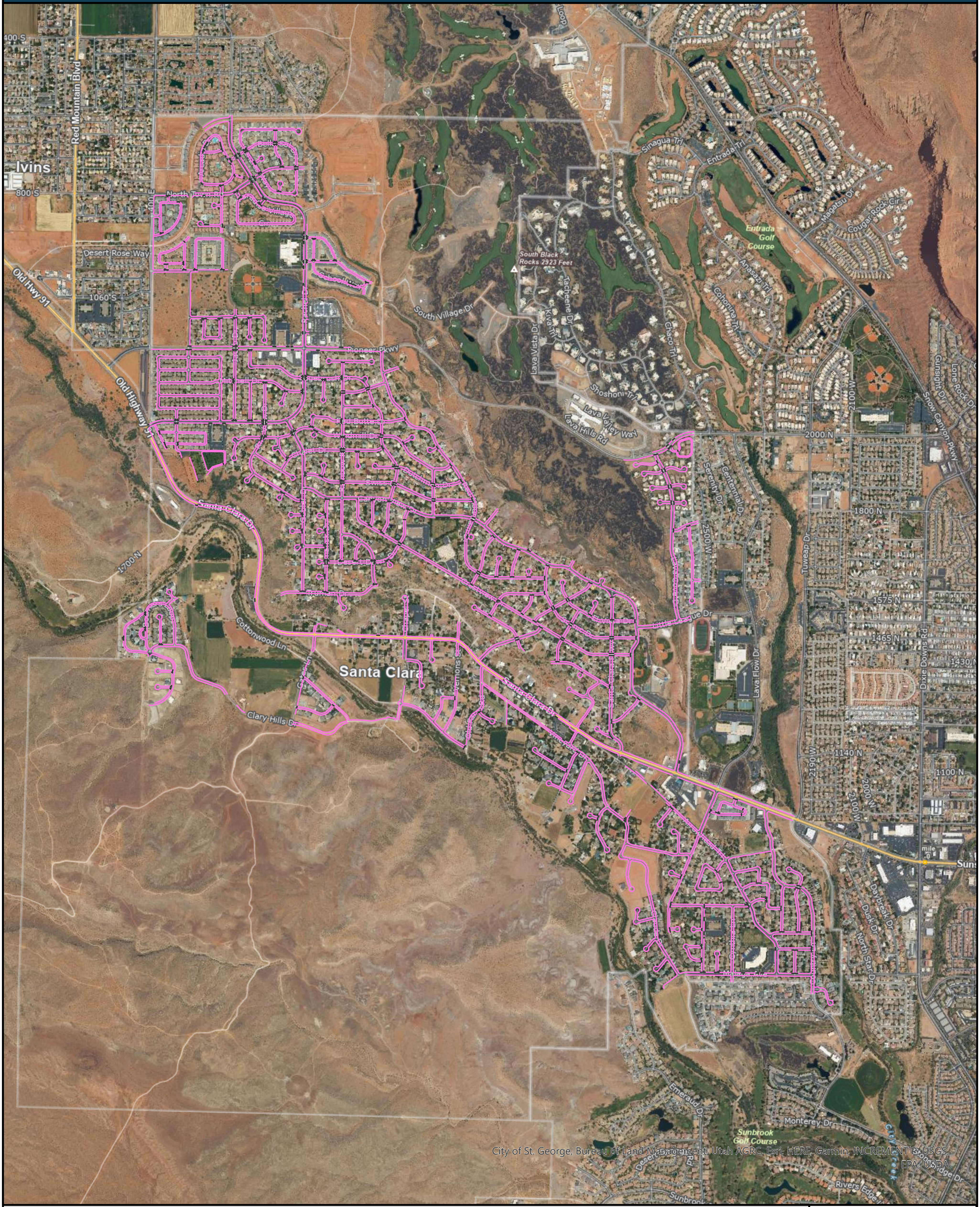
Appendix A - Map 1.2: Existing Curb and Gutter



Legend

Gutter System

- C&G
- CROSS GUTTER

0 0.3 0.6 Miles

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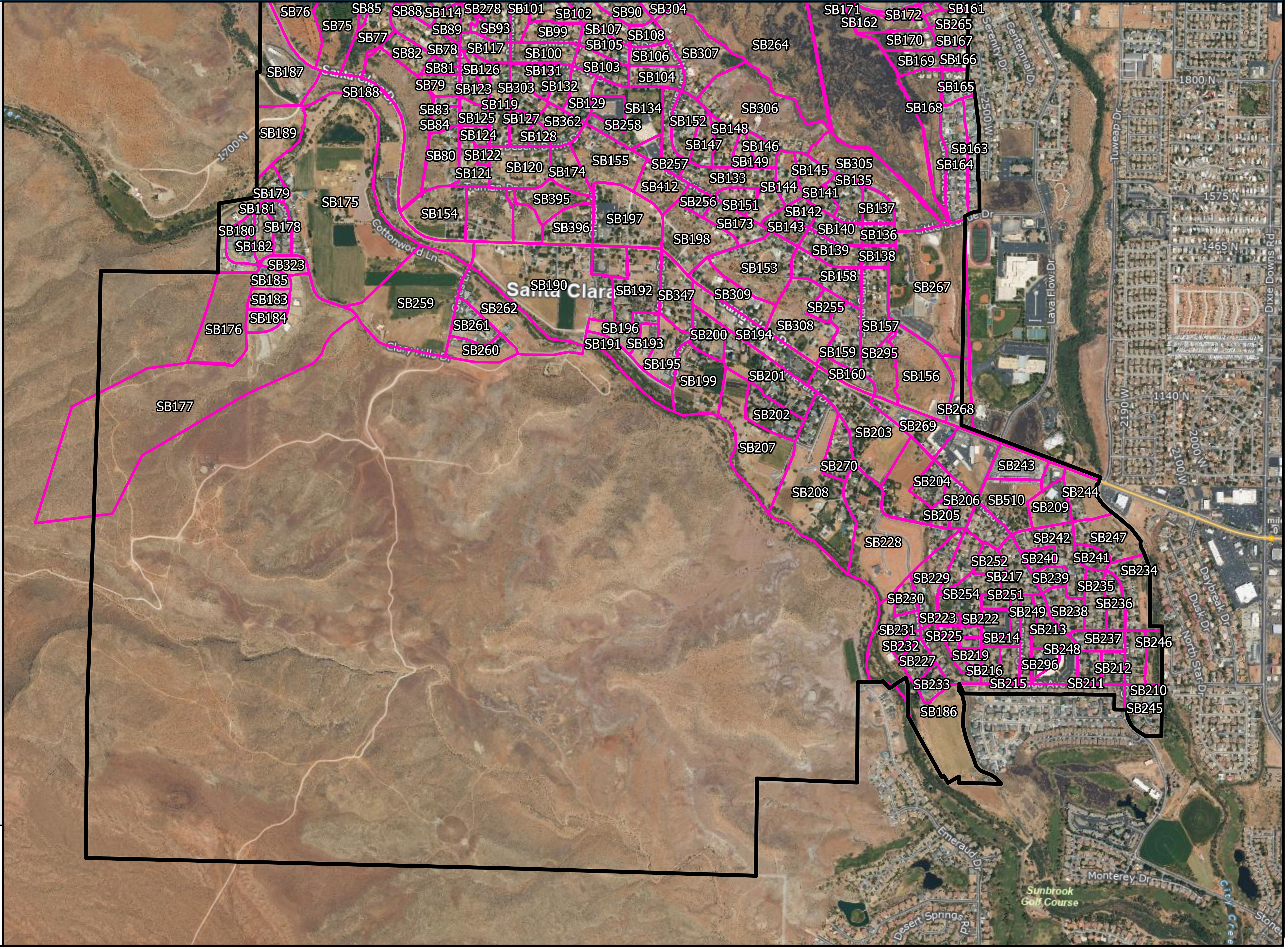
Appendix A - Map 2.1: Stormwater Subbasins



Legend

- Municipal Boundary
- Stormwater Subbasins

0 | 1,250 | 2,500 US Feet

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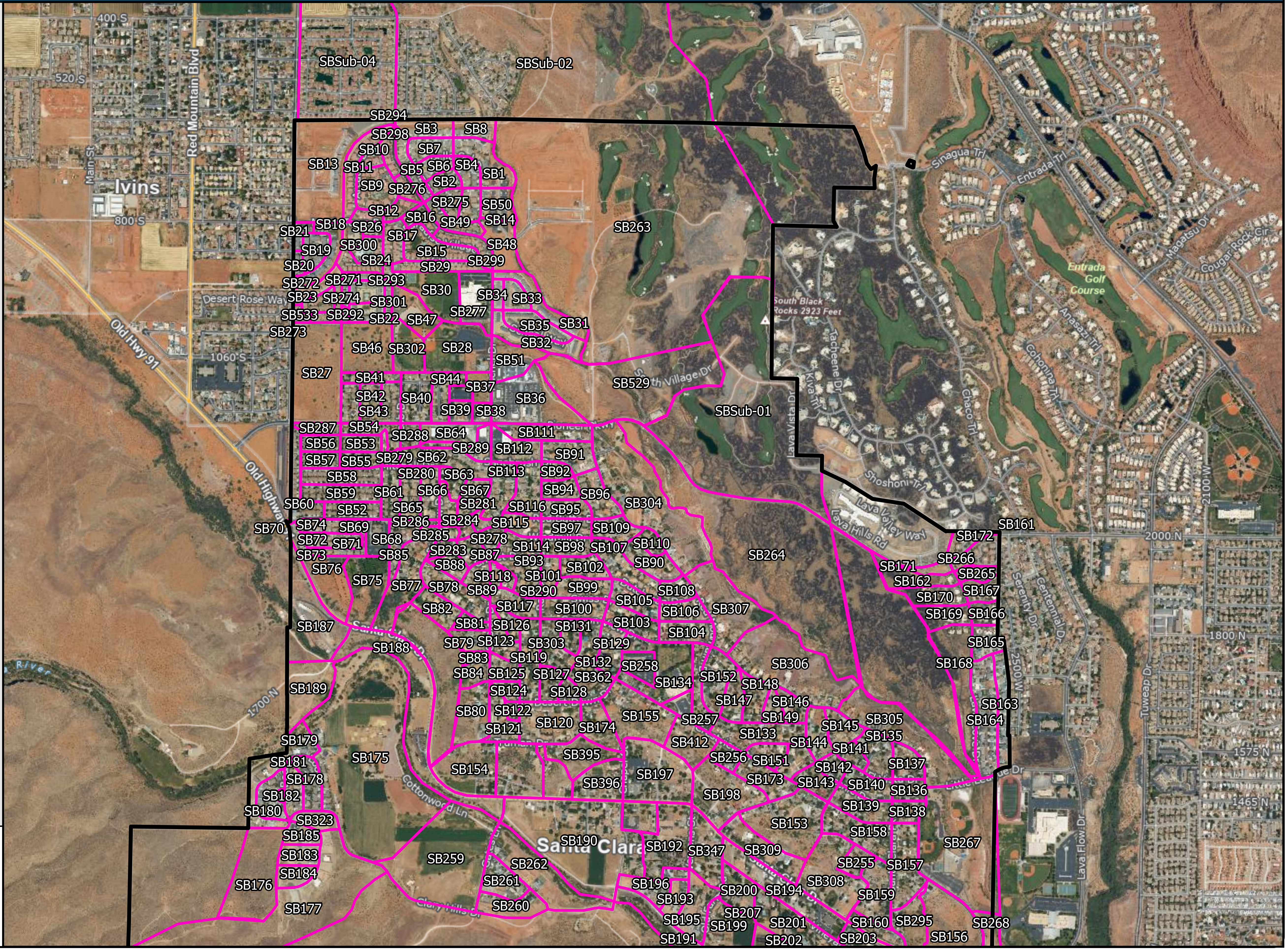
Appendix A - Map 2.2: Stormwater Subbasins

Legend

- Municipal Boundary
- Stormwater Subbasins

0 1,250 2,500 US Feet



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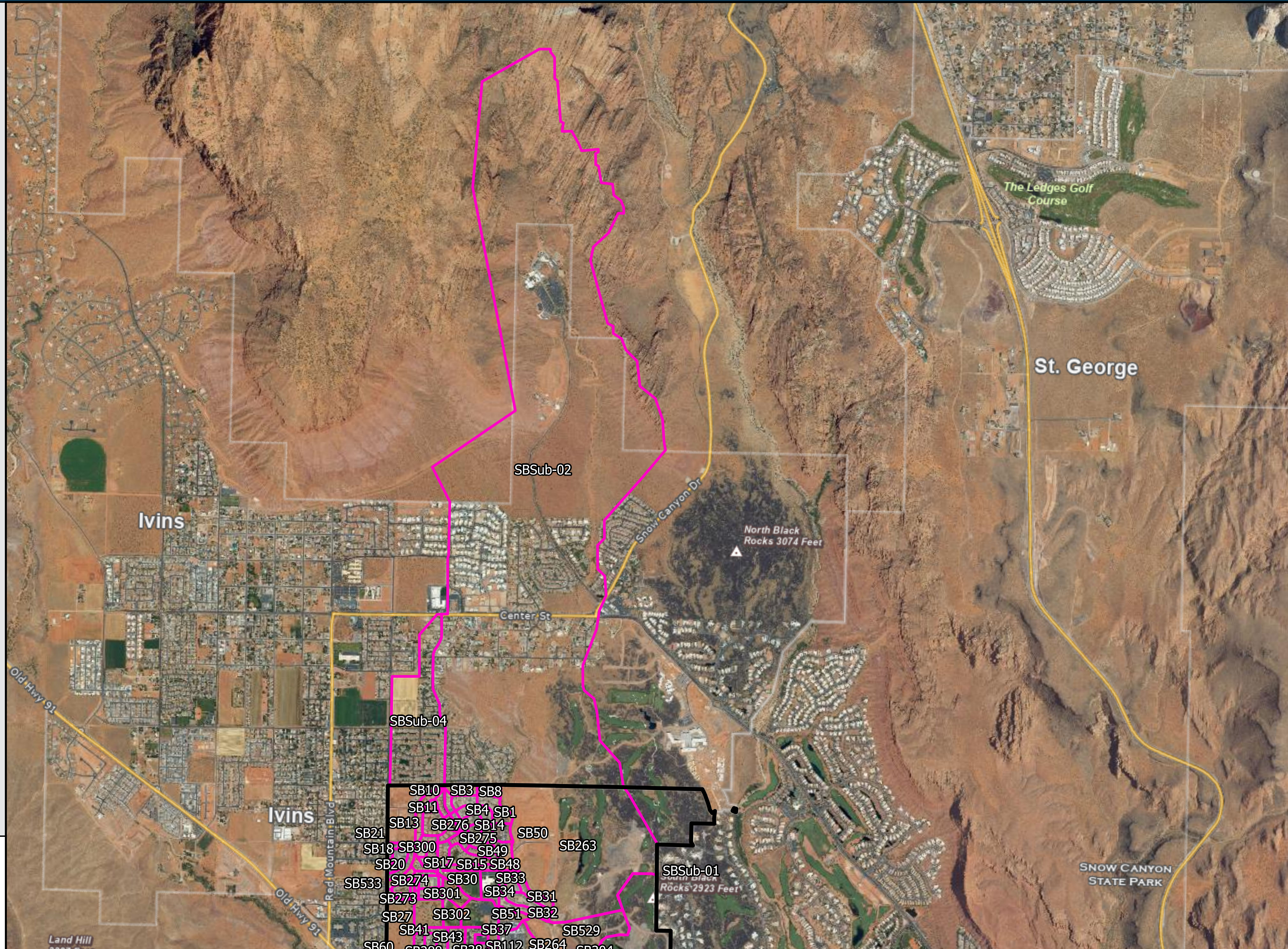
Appendix A - Map 2.3: Stormwater Subbasins



Legend

- Municipal Boundary
- Stormwater Subbasins

0 — 2,250 — 4,500 US Feet

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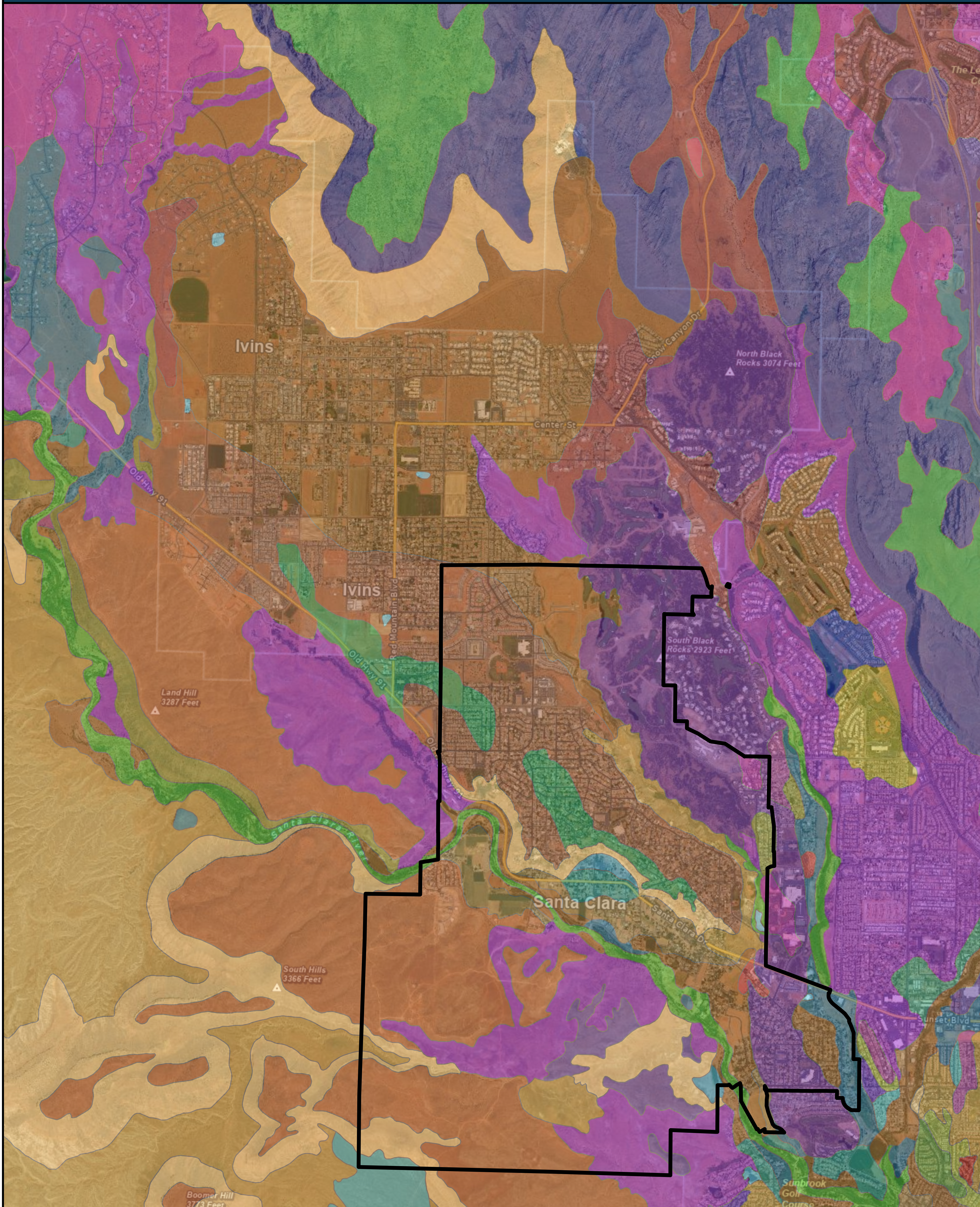
Appendix A - Map 3: Soil Types



Legend

Map Unit Name

- Badland
- Badland, very steep
- Bermesa fine sandy loam
- Dune land
- Eroded land-Shalet complex, warm
- Fluvaquents and torrifluvents, sandy
- Gravel pits
- Gullied land
- Hantz silty clay loam
- Harrisburg fine sandy loam
- Isom cobbly sandy loam
- Ivins loamy fine sand
- Ivins loamy fine sand, hummocky
- Junction fine sandy loam
- Lava flows
- Laverkin fine sandy loam
- Leeds silty clay loam
- Nikey sandy loam
- Nikey sandy loam
- Pintura loamy fine sand
- Pintura loamy fine sand, hummocky
- Pintura-Toquerville complex
- Renbac-Rock land association
- Riverwash
- Rock land
- Rock land, stony
- Rock outcrop
- St. George silt loam
- St. George silt loam, strongly saline
- Stony colluvial land
- Tobler fine sandy loam
- Tobler silty clay loam
- Water
- Winkel gravelly fine sandy loam
- Municipal Boundary

0 0.5 1 Miles

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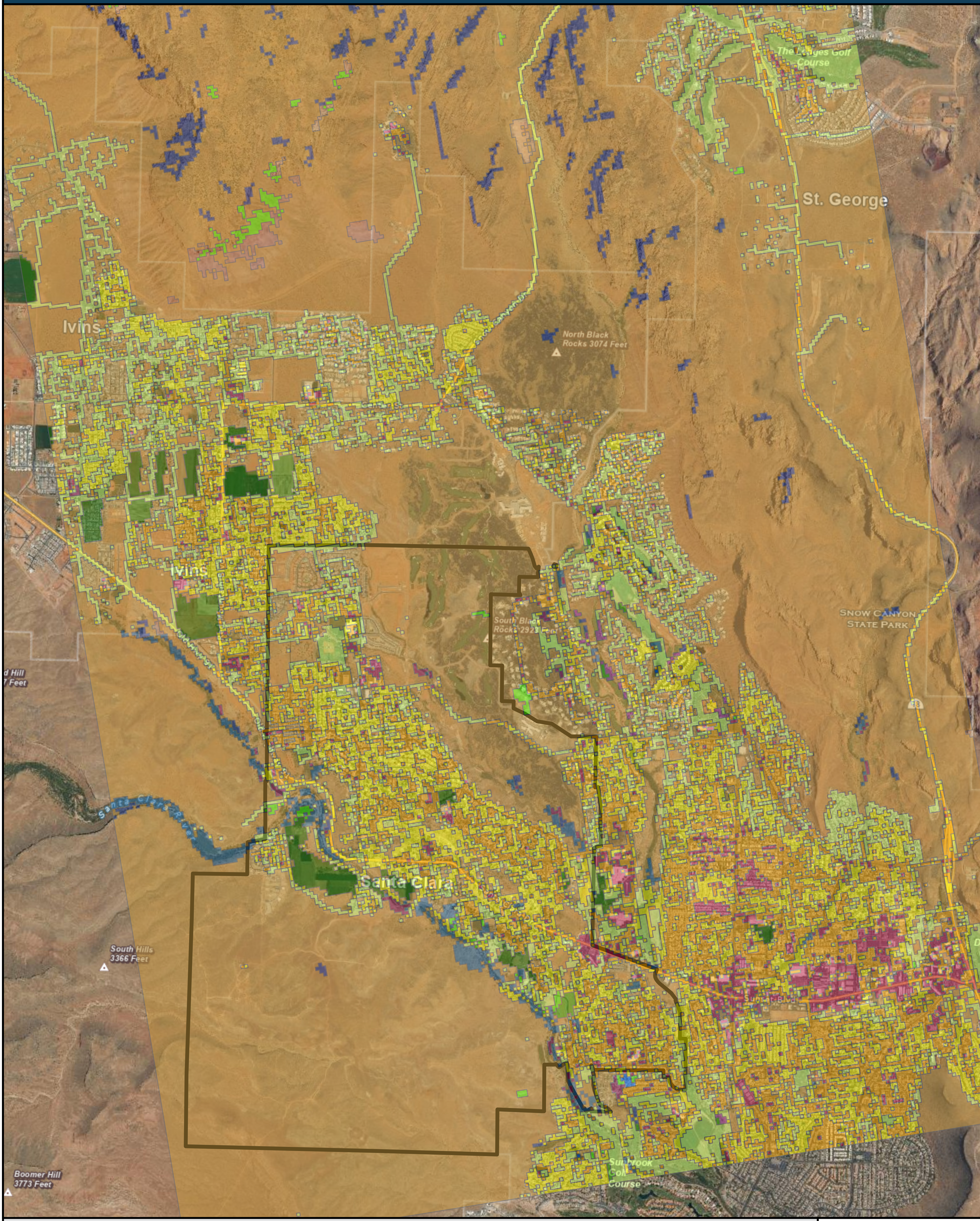
Appendix A - Map 4: NLCD Land Use



Legend

- Open Water
- Developed, Open Space
- Developed, Low Intensity
- Developed, Medium Intensity
- Developed High Intensity
- Evergreen Forest
- Mixed Forest
- Shrub/Scrub
- Grassland/ Herbaceous
- Pasture/Hay
- Cultivated Crops
- Woody Wetlands
- Emergent Herbaceous Wetlands
- Municipal Boundary

0 0.5 1 Miles

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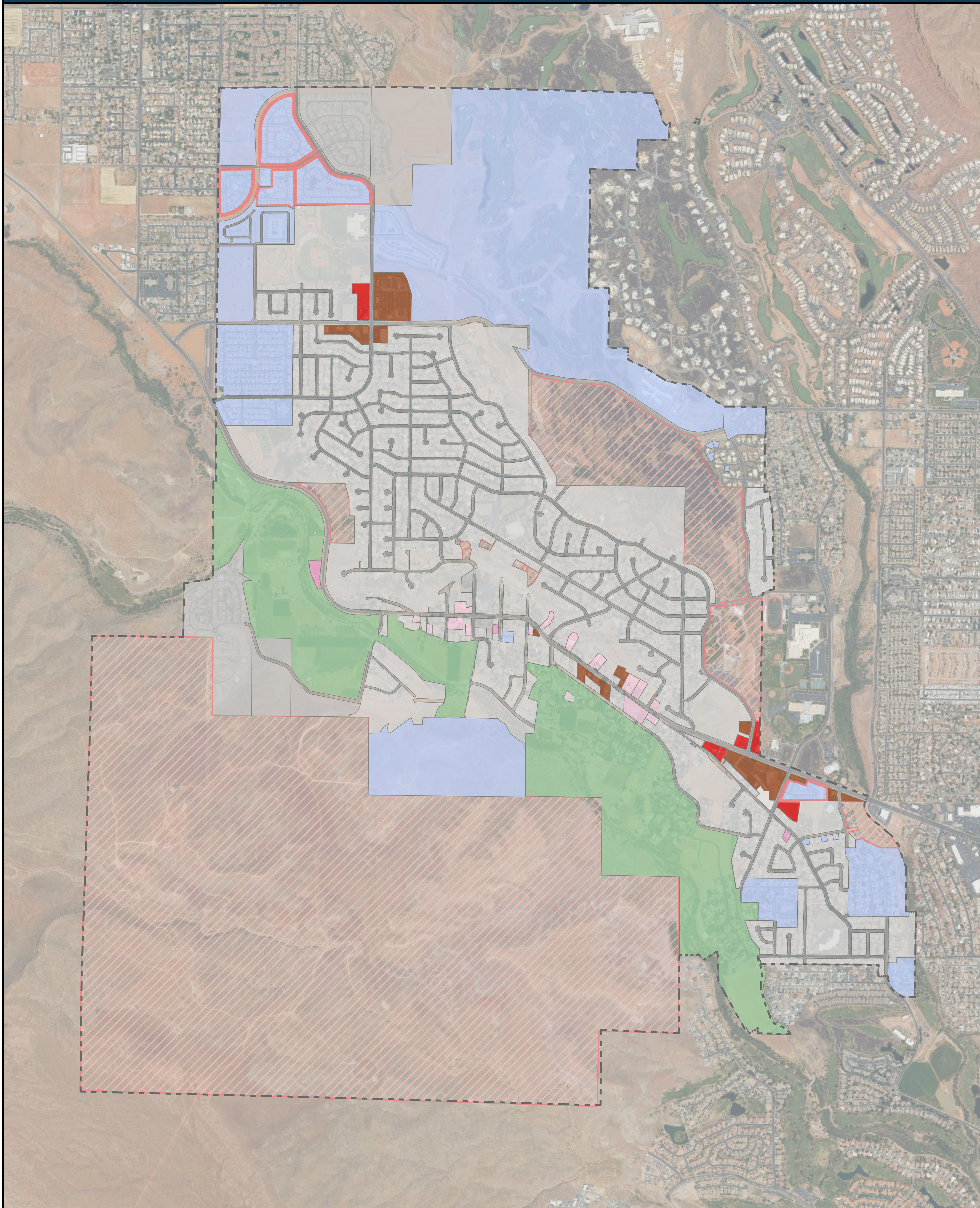
Appendix A - Map 5: Zoning Map



Legend

Zoning District

- OS - OPEN SPACE ZONE
- C - COMMERCIAL ZONE
- PDR - PLANNED DEVELOPMENT RESIDENTIAL ZONE (Multi Family)
- HDMU - HISTORIC DISTRICT/MIXED USE
- PDC - PLANNED DEVELOPMENT COMMERCIAL ZONE
- PDR - PLANNED DEVELOPMENT RESIDENTIAL ZONE
- PDR - PLANNED DEVELOPMENT RESIDENTIAL ZONE (Short Term Rental)
- RA - RESIDENTIAL AGRICULTURE ZONE
- R-1-6 - SINGLE-FAMILY RESIDENTIAL ZONE
- R-1-10 - SINGLE-FAMILY RESIDENTIAL ZONE
- R-1-10/ML - MIXED LOT SIZE ZONE
- PDO - PLANNED OFFICE AND INSTITUTIONAL DEVELOPMENT ZONE
- PDI - PLANNED INDUSTRIAL DEVELOPMENT ZONE
- Municipal Boundary

0 0.3 0.6 Miles

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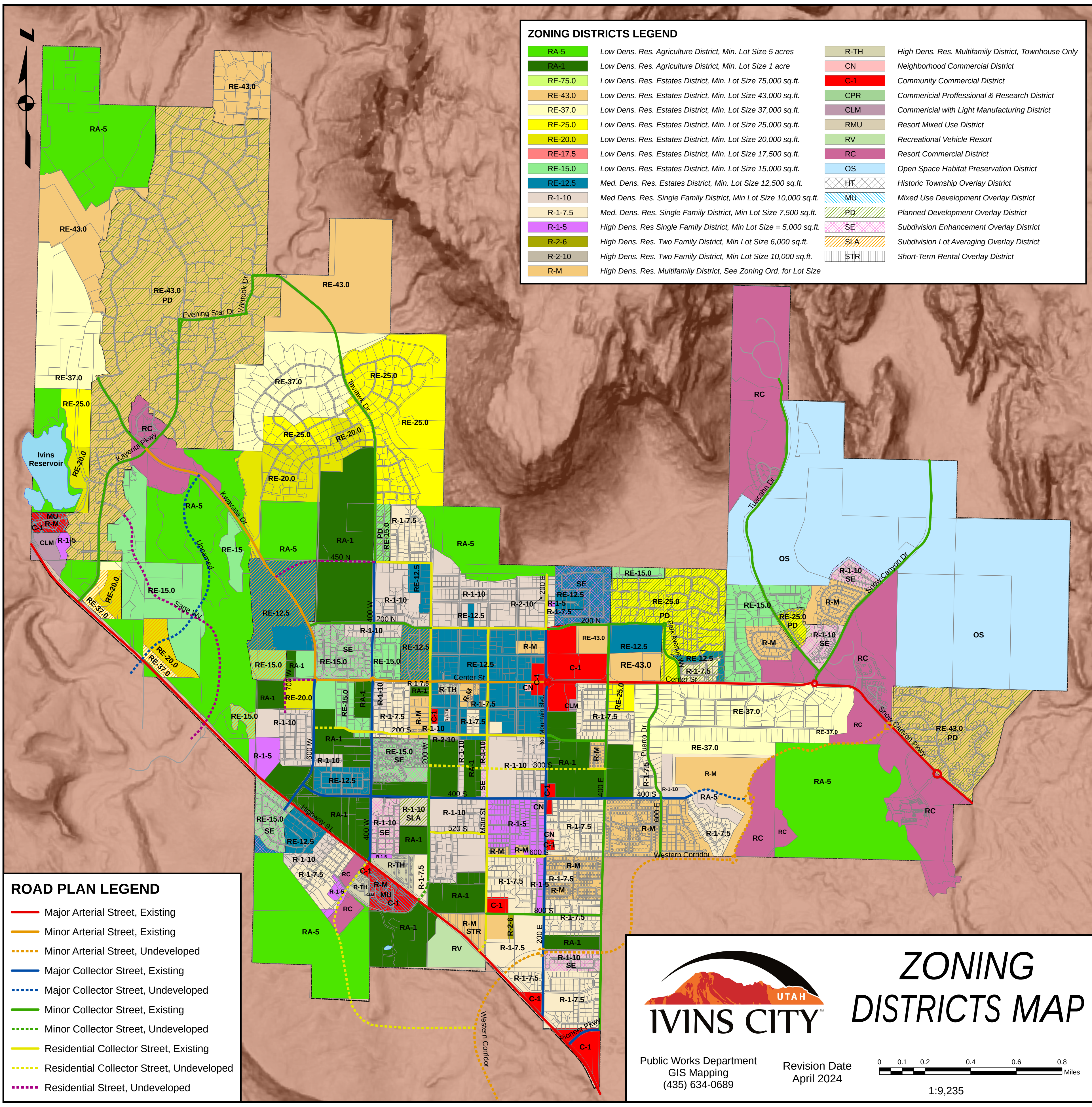
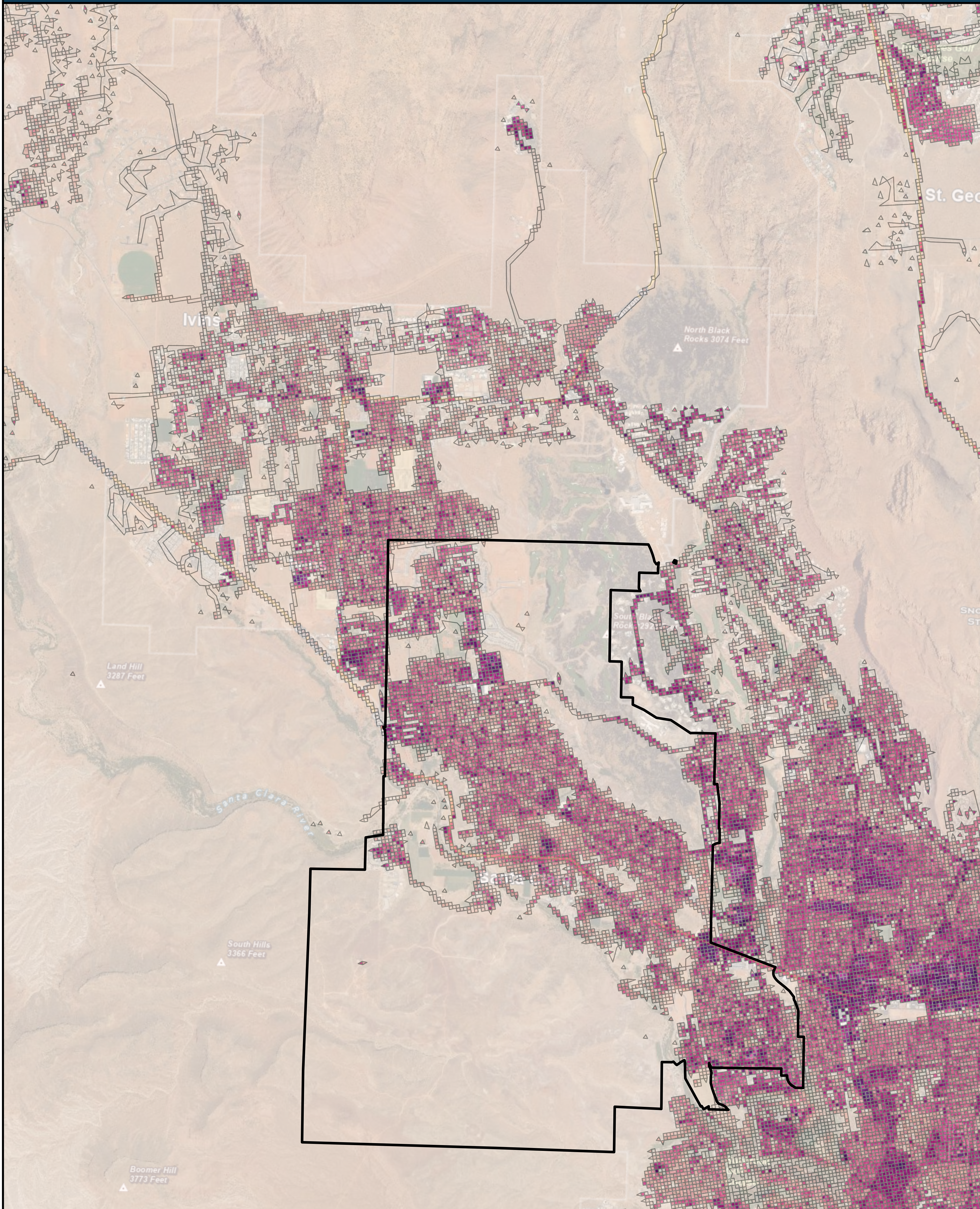

ZONING DISTRICTS LEGEND
RA-5 Low Dens. Res. Agriculture District, Min. Lot Size 5 acres
RA-1 Low Dens. Res. Agriculture District, Min. Lot Size 1 acre
RE-75.0 Low Dens. Res. Estates District, Min. Lot Size 75,000 sq.ft.
RE-43.0 Low Dens. Res. Estates District, Min. Lot Size 43,000 sq.ft.
RE-37.0 Low Dens. Res. Estates District, Min. Lot Size 37,000 sq.ft.
RE-25.0 Low Dens. Res. Estates District, Min. Lot Size 25,000 sq.ft.
RE-20.0 Low Dens. Res. Estates District, Min. Lot Size 20,000 sq.ft.
RE-17.5 Low Dens. Res. Estates District, Min. Lot Size 17,500 sq.ft.
RE-15.0 Low Dens. Res. Estates District, Min. Lot Size 15,000 sq.ft.
RE-12.5 Med. Dens. Res. Estates District, Min. Lot Size 12,500 sq.ft.
R-1-10 Med Dens. Res. Single Family District, Min Lot Size 10,000 sq.ft.
R-1-7.5 Med. Dens. Res. Single Family District, Min Lot Size 7,500 sq.ft.
R-1-5 High Dens. Res Single Family District, Min Lot Size = 5,000 sq.ft.
R-2-6 High Dens. Res. Two Family District, Min Lot Size 6,000 sq.ft.
R-2-10 High Dens. Res. Two Family District, Min Lot Size 10,000 sq.ft.
R-M High Dens. Res. Multifamily District, See Zoning Ord. for Lot Size
R-TH High Dens. Res. Multifamily District, Townhouse Only
CN Neighborhood Commercial District
C-1 Community Commercial District
CPR Commericial Proffessional & Research District
CLM Commericial with Light Manufacturing District
RMU Resort Mixed Use District
RV Recreational Vehicle Resort
RC Resort Commercial District
OS Open Space Habitat Preservation District
HT Historic Township Overlay District
MU Mixed Use Development Overlay District
PD Planned Development Overlay District
SE Subdivision Enhancement Overlay District
SLA Subdivision Lot Averaging Overlay District
STR Short-Term Rental Overlay District
ROAD PLAN LEGEND
Major Arterial Street, Existing
Minor Arterial Street, Existing
Minor Arterial Street, Undeveloped
Major Collector Street, Existing
Major Collector Street, Undeveloped
Minor Collector Street, Existing
Minor Collector Street, Undeveloped
Residential Collector Street, Existing
Residential Collector Street, Undeveloped
Residential Street, Undeveloped
Ivins Reservoir
Evening Star Dr
Kayenta Pkwy
Kwavasa Dr
Tuweep Dr
Center St
Highway 91
Snow Canyon Pkwy
Tuacahn Dr
Western Corridor
Main St
Pioneer Pkwy
UTAH
IVINS CITY
ZONING
DISTRICTS MAP
Public Works Department
GIS Mapping
(435) 634-0689
Revision Date
April 2024
0 0.1 0.2 0.4 0.6 0.8 Miles
1:9,235

Appendix A - Map 6: Impervious Area Map



Legend

Municipal Boundary

% Impervious

0

100

0 0.5 1 Miles

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Appendix A - Map 7.1: 0-10 Year Proposed Stormwater Improvements Map

Legend

- Proposed Pipe
- Municipal Boundary
- Upsized Detention Pond
- Updated Proposed Pipe 3_18_25

0 0.2 0.4 Miles

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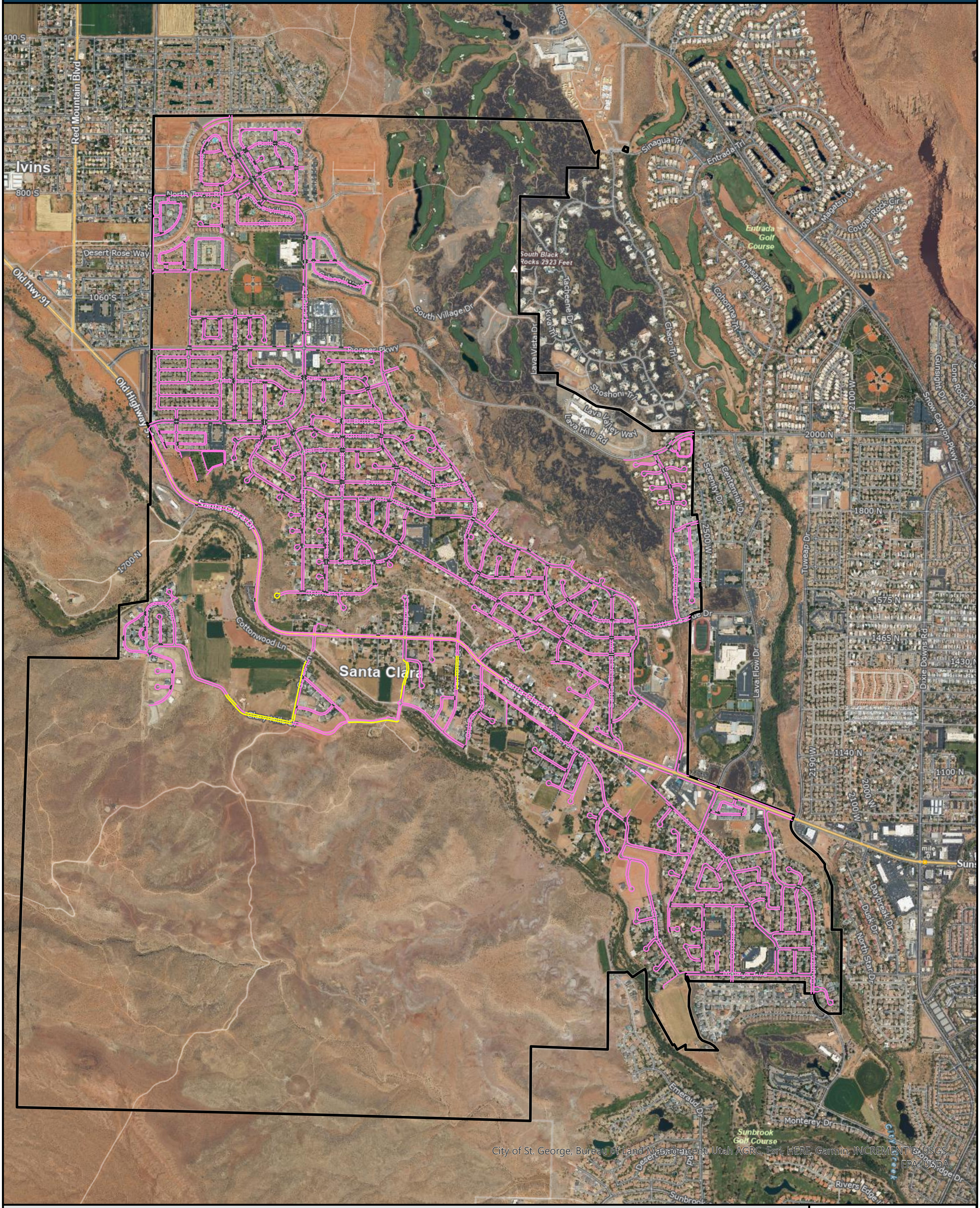
Appendix A - Map 7.2: 0-10 Year Curb and Gutter Improvements



Legend

Gutter System

- C&G
- CROSS GUTTER
- Proposed C&G
- Municipal Boundary

0 0.3 0.6 Miles

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Appendix A - Map 7.3: 10-20 Year Proposed Stormwater Improvements Map

Legend

Municipal Boundary

Municipal Boundary

Proposed Pipe

- 30" Pipe
- 36" Pipe
- Dual 36" Pipe
- 60" Pipe

0 — 0.33 — 0.66 Miles

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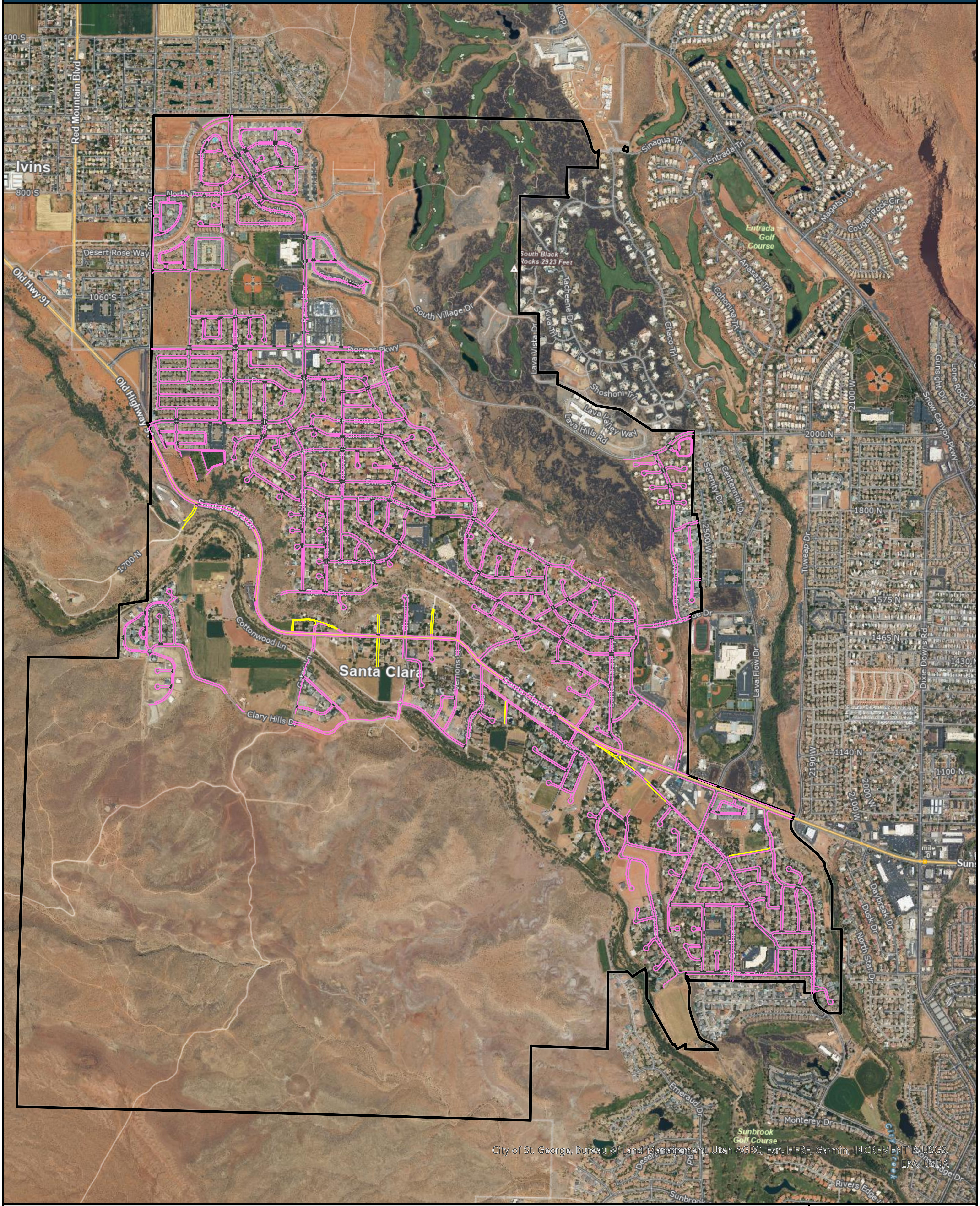
Appendix A - Map 7.4: 10-20 Year Curb and Gutter Improvements



Legend

Gutter System

- C&G
- CROSS GUTTER
- Proposed C&G
- Municipal Boundary

0 0.3 0.6 Miles

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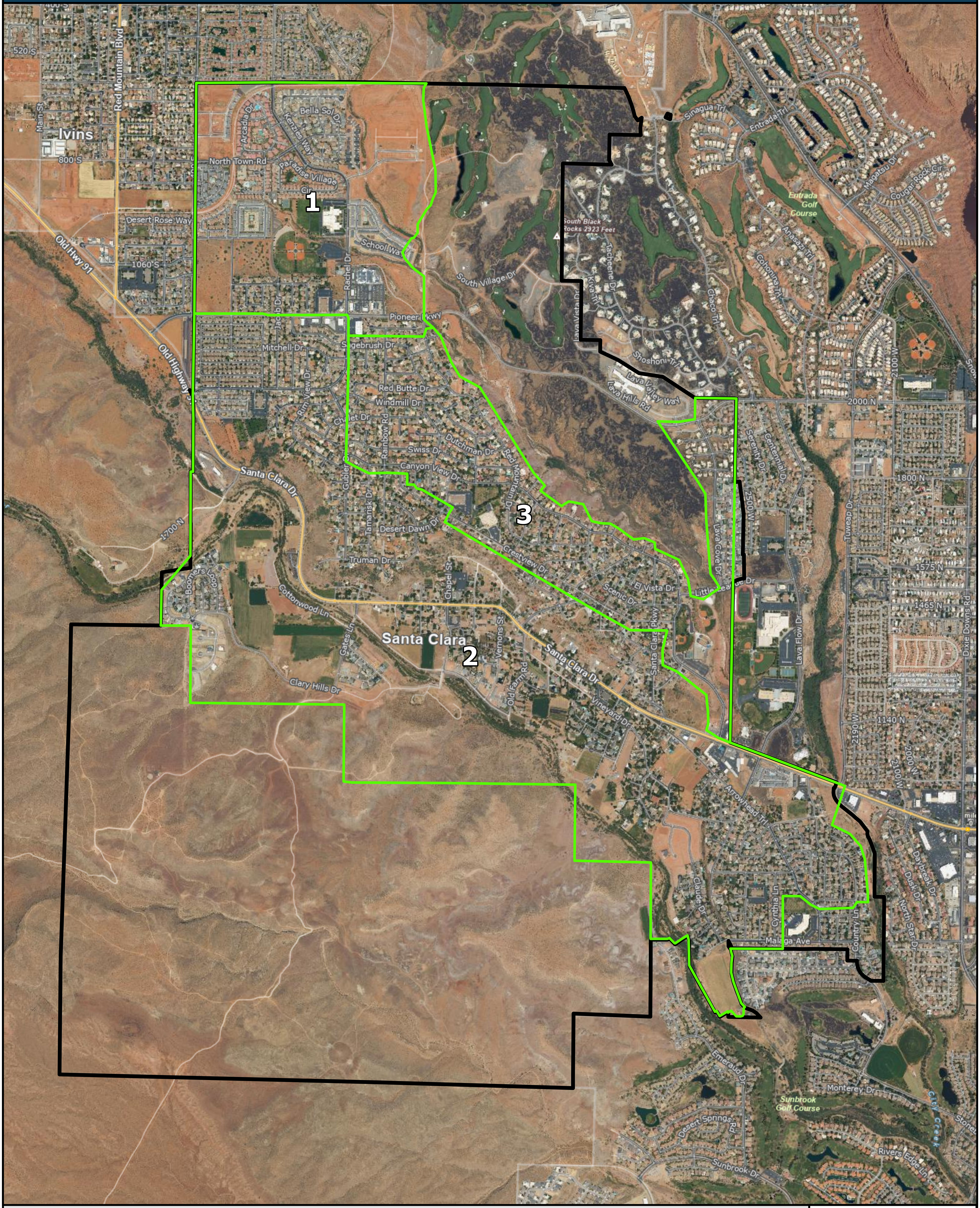
Appendix A - Map 8: Large Basins



Legend

- Basins
- Municipal Boundary

0 0.3 0.6 Miles

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APPENDIX B : MASTER PLAN TABLES

Table II.B.1 - NOAA DDF Data

NOAA Atlas 14, Volume 1, Version 5
Location name: Ivins, Utah, USA*
Latitude: 37.1667°, Longitude: -113.6625°
Elevation: 3029 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	0.135 (0.115-0.159)	0.173 (0.149-0.206)	0.235 (0.200-0.279)	0.289 (0.244-0.345)	0.372 (0.310-0.442)	0.444 (0.364-0.528)	0.526 (0.422-0.629)	0.620 (0.484-0.746)	0.764 (0.574-0.934)	0.890 (0.649-1.10)
10-min	0.205 (0.176-0.242)	0.263 (0.227-0.314)	0.357 (0.304-0.424)	0.439 (0.372-0.524)	0.566 (0.471-0.673)	0.675 (0.554-0.803)	0.801 (0.643-0.958)	0.943 (0.737-1.14)	1.16 (0.873-1.42)	1.35 (0.987-1.67)
15-min	0.254 (0.217-0.301)	0.326 (0.281-0.389)	0.443 (0.377-0.526)	0.544 (0.461-0.650)	0.701 (0.584-0.834)	0.837 (0.686-0.996)	0.993 (0.797-1.19)	1.17 (0.913-1.41)	1.44 (1.08-1.76)	1.68 (1.22-2.07)
30-min	0.342 (0.293-0.405)	0.440 (0.378-0.524)	0.596 (0.508-0.708)	0.733 (0.621-0.875)	0.944 (0.787-1.12)	1.13 (0.924-1.34)	1.34 (1.07-1.60)	1.58 (1.23-1.89)	1.94 (1.46-2.37)	2.26 (1.65-2.79)
60-min	0.424 (0.362-0.501)	0.544 (0.468-0.648)	0.738 (0.629-0.876)	0.907 (0.768-1.08)	1.17 (0.974-1.39)	1.40 (1.14-1.66)	1.66 (1.33-1.98)	1.95 (1.52-2.34)	2.40 (1.80-2.94)	2.80 (2.04-3.45)
2-hr	0.514 (0.448-0.596)	0.644 (0.563-0.749)	0.846 (0.737-0.980)	1.02 (0.886-1.19)	1.30 (1.10-1.50)	1.53 (1.28-1.77)	1.79 (1.47-2.08)	2.08 (1.67-2.45)	2.53 (1.96-3.02)	2.92 (2.20-3.52)
3-hr	0.571 (0.506-0.654)	0.715 (0.634-0.820)	0.921 (0.815-1.06)	1.10 (0.965-1.25)	1.36 (1.18-1.56)	1.58 (1.35-1.81)	1.83 (1.54-2.11)	2.11 (1.73-2.45)	2.54 (2.03-3.05)	2.92 (2.28-3.55)
6-hr	0.710 (0.633-0.807)	0.889 (0.797-1.01)	1.13 (1.01-1.28)	1.33 (1.18-1.52)	1.62 (1.42-1.84)	1.86 (1.61-2.12)	2.12 (1.81-2.44)	2.41 (2.02-2.79)	2.86 (2.33-3.36)	3.24 (2.58-3.85)
12-hr	0.869 (0.781-0.974)	1.09 (0.978-1.22)	1.37 (1.23-1.54)	1.60 (1.43-1.80)	1.91 (1.69-2.15)	2.16 (1.89-2.44)	2.41 (2.08-2.74)	2.68 (2.29-3.06)	3.06 (2.56-3.54)	3.40 (2.80-3.98)
24-hr	1.02 (0.950-1.10)	1.28 (1.19-1.38)	1.60 (1.48-1.72)	1.85 (1.72-1.99)	2.19 (2.03-2.36)	2.46 (2.27-2.65)	2.74 (2.50-2.94)	3.02 (2.74-3.25)	3.39 (3.05-3.66)	3.68 (3.29-4.00)
2-day	1.13 (1.06-1.22)	1.42 (1.32-1.52)	1.76 (1.65-1.89)	2.04 (1.91-2.19)	2.42 (2.25-2.60)	2.72 (2.52-2.91)	3.02 (2.78-3.24)	3.33 (3.06-3.58)	3.75 (3.40-4.04)	4.07 (3.67-4.41)
3-day	1.22 (1.14-1.31)	1.52 (1.43-1.64)	1.90 (1.78-2.04)	2.20 (2.06-2.35)	2.61 (2.43-2.78)	2.93 (2.72-3.12)	3.25 (3.00-3.48)	3.58 (3.29-3.84)	4.02 (3.66-4.33)	4.36 (3.94-4.72)
4-day	1.31 (1.23-1.40)	1.63 (1.53-1.75)	2.04 (1.91-2.18)	2.36 (2.21-2.51)	2.79 (2.61-2.97)	3.13 (2.91-3.34)	3.48 (3.22-3.71)	3.82 (3.52-4.10)	4.30 (3.91-4.62)	4.66 (4.21-5.04)
7-day	1.52 (1.42-1.63)	1.90 (1.77-2.04)	2.36 (2.20-2.53)	2.73 (2.54-2.92)	3.22 (2.99-3.44)	3.59 (3.32-3.84)	3.96 (3.65-4.25)	4.34 (3.97-4.66)	4.83 (4.39-5.22)	5.20 (4.70-5.64)
10-day	1.68 (1.56-1.81)	2.11 (1.96-2.27)	2.64 (2.45-2.83)	3.04 (2.83-3.26)	3.58 (3.32-3.83)	3.98 (3.69-4.27)	4.39 (4.04-4.72)	4.80 (4.40-5.17)	5.33 (4.85-5.76)	5.72 (5.18-6.23)
20-day	2.13 (1.98-2.29)	2.67 (2.48-2.87)	3.29 (3.06-3.54)	3.75 (3.49-4.02)	4.33 (4.02-4.64)	4.74 (4.39-5.09)	5.14 (4.74-5.52)	5.52 (5.07-5.94)	5.98 (5.48-6.46)	6.30 (5.75-6.82)
30-day	2.54 (2.36-2.75)	3.19 (2.96-3.44)	3.95 (3.66-4.25)	4.51 (4.18-4.86)	5.22 (4.84-5.62)	5.74 (5.30-6.18)	6.24 (5.75-6.73)	6.72 (6.16-7.26)	7.31 (6.68-7.93)	7.74 (7.03-8.42)
45-day	3.04 (2.80-3.30)	3.81 (3.51-4.14)	4.75 (4.37-5.15)	5.44 (5.01-5.89)	6.33 (5.82-6.84)	6.97 (6.39-7.53)	7.59 (6.94-8.21)	8.18 (7.46-8.87)	8.92 (8.10-9.70)	9.43 (8.54-10.3)
60-day	3.47 (3.18-3.78)	4.36 (4.00-4.74)	5.42 (4.98-5.89)	6.20 (5.69-6.73)	7.20 (6.59-7.81)	7.92 (7.22-8.59)	8.60 (7.84-9.36)	9.26 (8.40-10.1)	10.1 (9.09-11.0)	10.6 (9.56-11.7)

[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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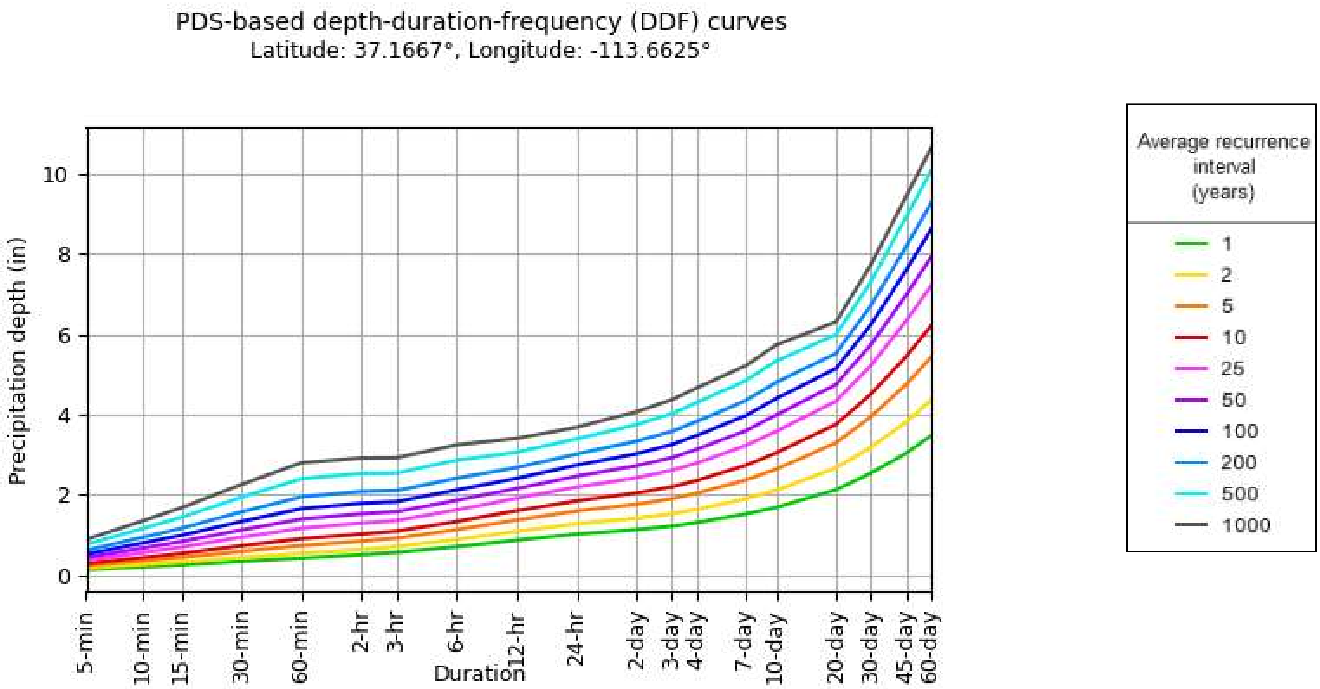
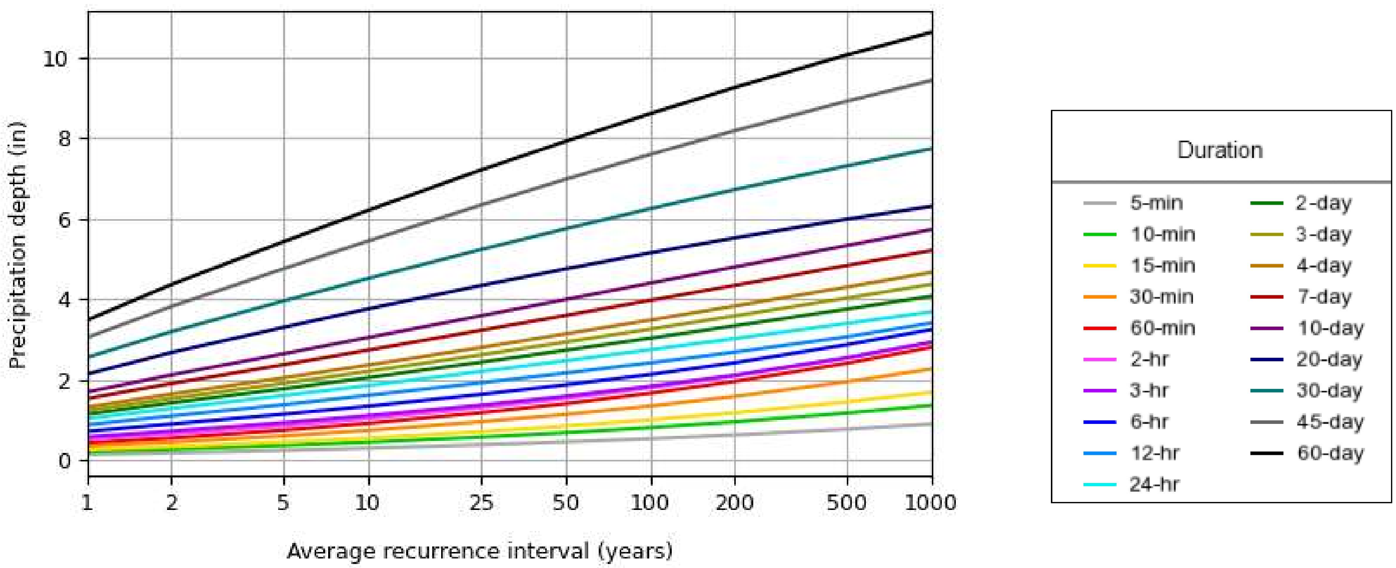
PF graphical





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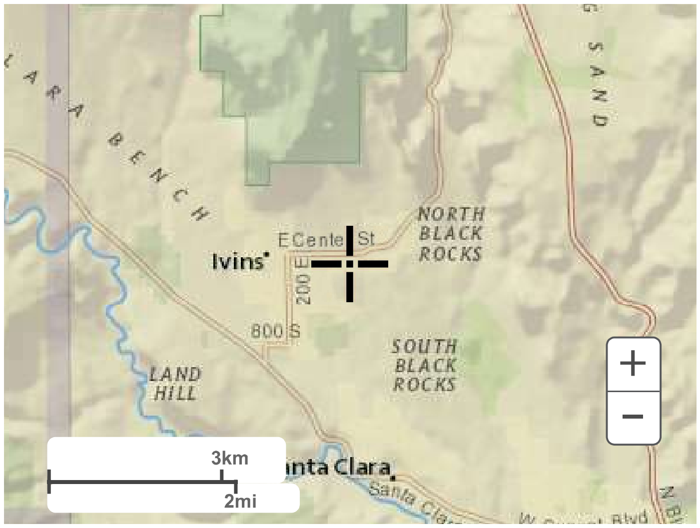
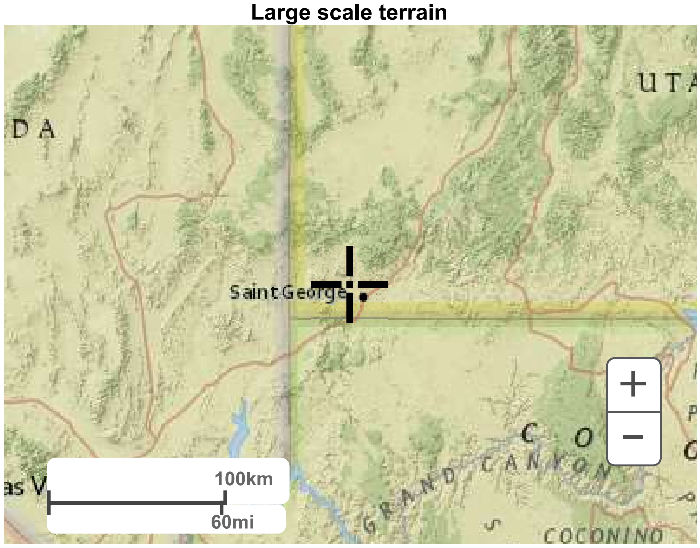
Maps & aerials

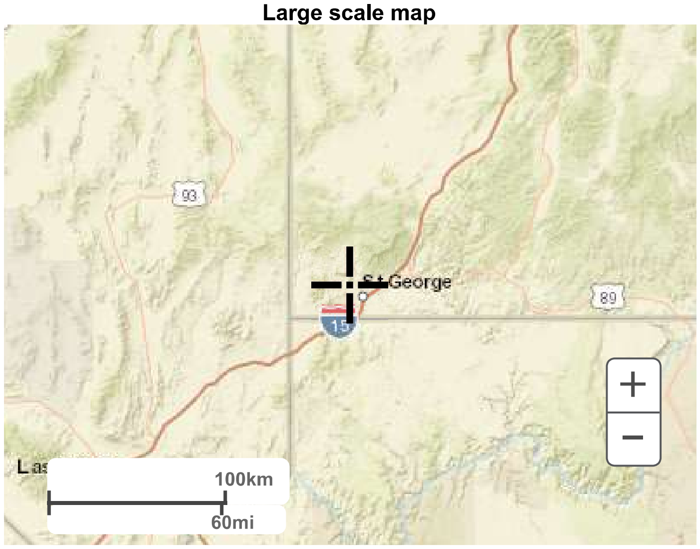
Small scale terrain



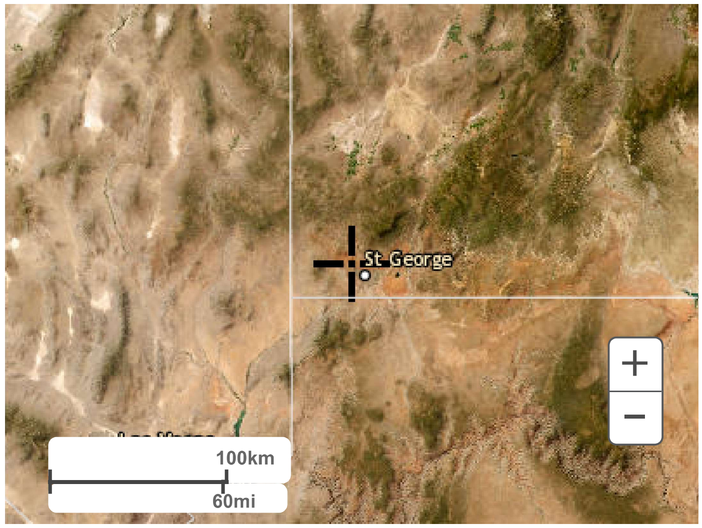
Large scale terrain



Large scale map



Large scale aerial



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National Weather Service
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Table II.B.2.a
Rainfall Distribution - 3Hr 10 Year

H:M	Time (min)	Precipitation (inches)	Paste Values	Cumulative	Storm	Total Depth (inches)
0:00	0	0.000000	0.000000	0.000000	1 - Hr	0.907
0:05	5	0.008042	0.008042	0.008042	3 - Hr	1.100
0:10	10	0.008042	0.008042	0.016083		
0:15	15	0.008042	0.008042	0.024125		
0:20	20	0.008042	0.008042	0.032167		
0:25	25	0.008042	0.008042	0.040208		
0:30	30	0.008042	0.008042	0.048250		
0:35	35	0.258495	0.258495	0.306745		
0:40	40	0.204075	0.204075	0.510820		
0:45	45	0.142399	0.142399	0.653219		
0:50	50	0.090700	0.090700	0.743919		
0:55	55	0.054420	0.054420	0.798339		
1:00	60	0.041722	0.041722	0.840061		
1:05	65	0.030838	0.030838	0.870899		
1:10	70	0.023582	0.023582	0.894481		
1:15	75	0.018140	0.018140	0.912621		
1:20	80	0.016326	0.016326	0.928947		
1:25	85	0.014512	0.014512	0.943459		
1:30	90	0.011791	0.011791	0.955250		
1:35	95	0.008042	0.008042	0.963292		
1:40	100	0.008042	0.008042	0.971333		
1:45	105	0.008042	0.008042	0.979375		
1:50	110	0.008042	0.008042	0.987417		
1:55	115	0.008042	0.008042	0.995458		
2:00	120	0.008042	0.008042	1.003500		
2:05	125	0.008042	0.008042	1.011542		
2:10	130	0.008042	0.008042	1.019583		
2:15	135	0.008042	0.008042	1.027625		
2:20	140	0.008042	0.008042	1.035667		
2:25	145	0.008042	0.008042	1.043708		
2:30	150	0.008042	0.008042	1.051750		
2:35	155	0.008042	0.008042	1.059792		
2:40	160	0.008042	0.008042	1.067833		
2:45	165	0.008042	0.008042	1.075875		
2:50	170	0.008042	0.008042	1.083917		
2:55	175	0.008042	0.008042	1.091958		
3:00	180	0.008042	0.008042	1.100000		

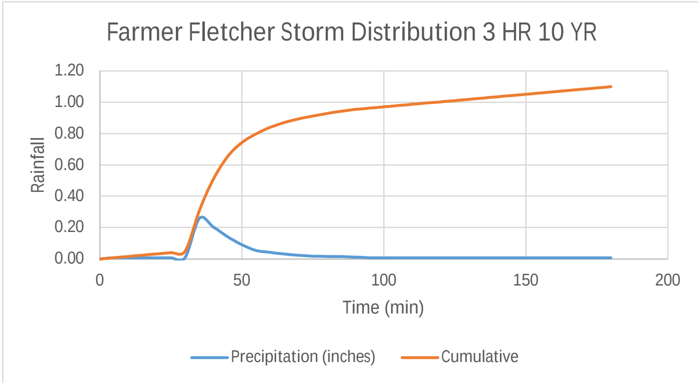

Table II.B.2.b
Rainfall Distribution - 3Hr 100 Year

H:M	Time	Inches (incremental)	* Inches (cumulative)	Difference	Distributed	Cumulative	Percentage
0:00	0	0.0000	0.000	0.000	0.000	**0.000**	0.00
0:15	15	0.0662	0.993	0.993	0.010	**0.010**	0.55
0:30	30	0.0447	1.340	0.347	0.010	**0.020**	1.09
0:45	45	0.0333	1.500	0.160	0.033	**0.053**	2.87
1:00	60	0.0277	1.660	0.160	0.033	**0.085**	4.64
1:15	75	0.0226	1.693	0.033	0.160	**0.245**	13.39
1:30	90	0.0192	1.725	0.033	0.993	**1.238**	67.65
1:45	105	0.0167	1.758	0.033	0.347	**1.585**	86.61
2:00	120	0.0149	1.790	0.033	0.160	**1.745**	95.36
2:15	135	0.0133	1.800	0.010	0.033	**1.778**	97.13
2:30	150	0.0121	1.810	0.010	0.033	**1.810**	98.91
2:45	165	0.0110	1.820	0.010	0.010	**1.820**	99.45
3:00	180	0.0102	1.830	0.010	0.010	**1.830**	100.00

* Taken from the NOAA Atlas 14 data and interpolated for unknown points.

Actual data from Atlas 14
Interpolated data from Atlas 14

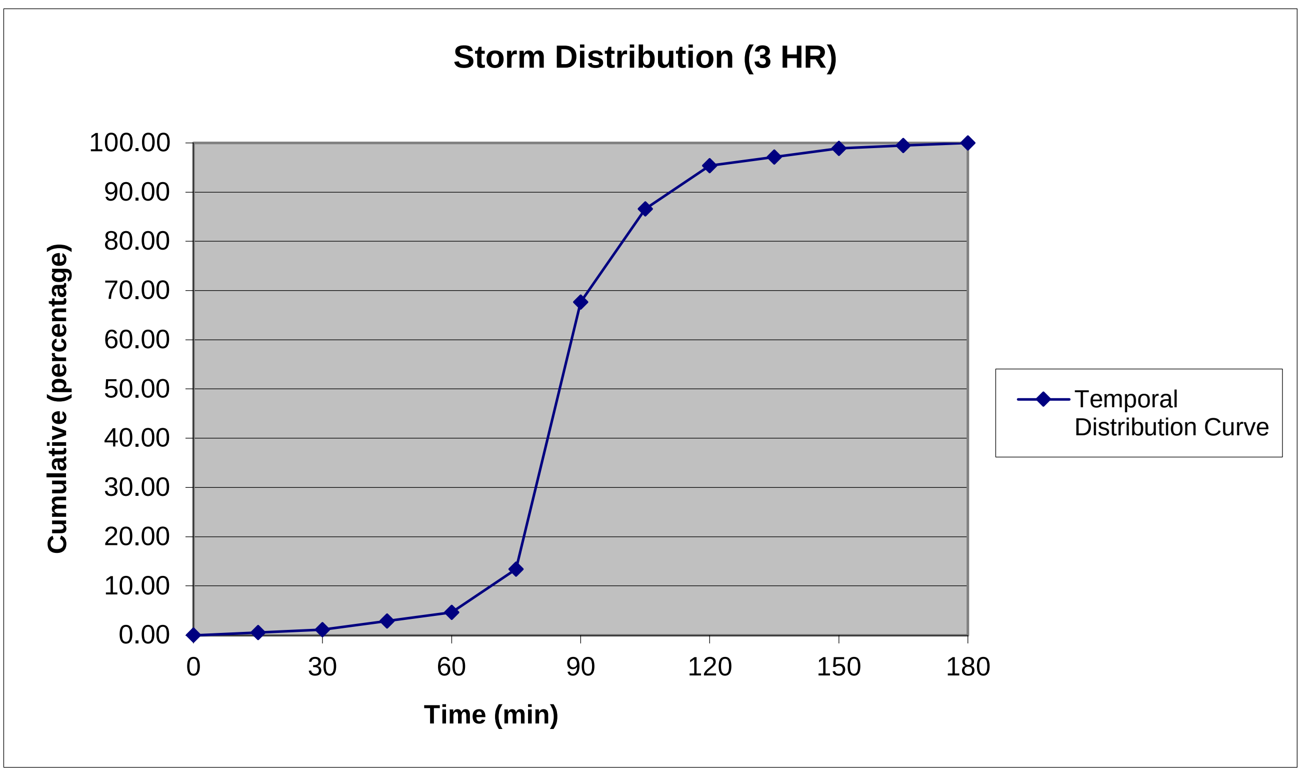

Table II.B.2.c
Rainfall Distribution - 24 Hr 100 Year

	Time	Inches (incremental)	* Inches (cumulative)	Difference	Distributed	Cumulative	Percentage
0	0	0.0000	0.000	0.000	0.000	**0.000**	0%
1	60	0.0277	1.660	1.660	0.027	**0.027**	1%
2	120	0.0149	1.790	0.130	0.040	**0.067**	2%
3	180	0.0102	1.830	0.040	0.028	**0.095**	3%
4	240	0.0080	1.927	0.097	0.027	**0.123**	4%
5	300	0.0067	2.023	0.097	0.027	**0.150**	5%
6	360	0.0059	2.120	0.097	0.028	**0.178**	6%
7	420	0.0052	2.168	0.048	0.048	**0.226**	8%
8	480	0.0046	2.217	0.048	0.048	**0.274**	10%
9	540	0.0042	2.265	0.048	0.048	**0.323**	12%
10	600	0.0039	2.313	0.048	0.048	**0.371**	14%
11	660	0.0036	2.362	0.048	0.048	**0.419**	15%
12	720	0.003	2.410	0.048	1.660	**2.079**	76%
13	780	0.0031	2.438	0.027	0.130	**2.209**	81%
14	840	0.0029	2.465	0.028	0.097	**2.306**	84%
15	900	0.0028	2.493	0.027	0.097	**2.403**	88%
16	960	0.0026	2.520	0.027	0.097	**2.499**	91%
17	1020	0.0025	2.548	0.028	0.048	**2.548**	93%
18	1080	0.0024	2.575	0.027	0.027	**2.575**	94%
19	1140	0.0023	2.603	0.027	0.027	**2.603**	95%
20	1200	0.0022	2.630	0.028	0.028	**2.630**	96%
21	1260	0.0021	2.658	0.027	0.027	**2.658**	97%
22	1320	0.0020	2.685	0.027	0.027	**2.685**	98%
23	1380	0.0020	2.713	0.028	0.028	**2.713**	99%
24	1440	0.0019	2.740	0.027	0.027	**2.740**	100%

* Taken from the NOAA Atlas 14 data and interpolated for unknown points.

Actual data from Atlas 14
Interpolated data from Atlas 14

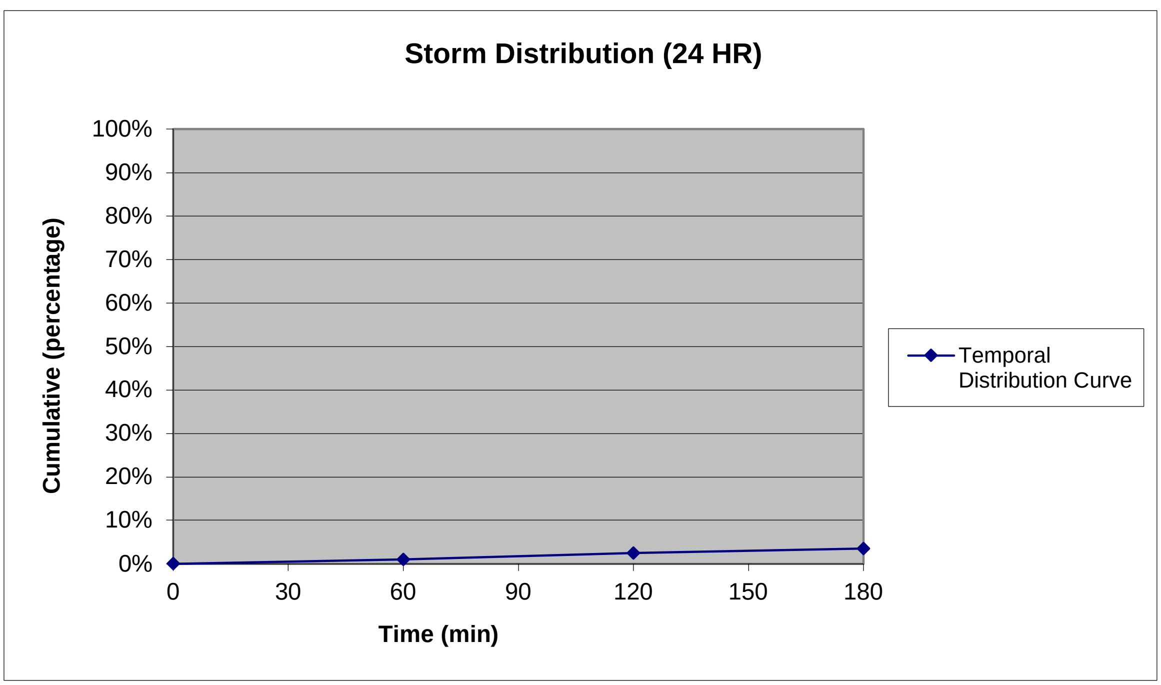

Table II.B.3

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Subcatchment Summary

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Name	Area	%Imperv	Width	%Slope
1	6.87	61.98	260.48	9.58
2	2.36	47.45	194.85	8.62
3	3.96	65.64	218.76	9.15
4	2.71	49.73	203.01	5.52
5	1.68	51.80	153.82	7.38
6	2.51	55.52	265.57	8.46
7	3.7	62.58	206.13	8.53
8	3.32	65.62	193.00	9.08
9	6.44	50.21	475.75	4.89
10	1.62	74.75	225.15	4.72
11	5.66	58.26	261.59	6.74
12	2.01	48.29	263.92	6.16
13	23.54	0.92	586.20	5.89
14	2.7	51.52	649.06	5.84
15	6.8	48.56	495.88	6.34
16	2.39	55.63	179.34	4.87
17	3.6	59.43	190.38	6.17
18	4.85	63.70	213.49	6.40
19	3.45	53.33	293.45	4.38
20	1	38.75	274.24	4.05
21	1.56	53.52	202.00	6.99
22	2.78	58.22	240.56	4.53
23	2.94	71.19	185.78	4.95
24	2.82	56.81	246.69	6.61
25	2.56	60.19	173.28	6.90
26	1.2	58.62	350.95	4.81
27	19.69	4.40	2218.30	9.10
28	12.37	32.08	525.81	6.94
29	3.83	64.65	116.76	5.45
30	9.71	13.08	529.71	5.54
31	5.98	64.22	160.70	11.31
32	6.15	61.05	197.29	12.92
33	2.74	25.53	211.02	4.86
34	1.36	45.06	136.69	2.59
35	4.82	74.60	214.24	8.02
36	14.45	67.35	543.51	8.17
37	2.62	9.69	329.71	5.02
38	1.54	61.88	619.69	4.71
39	2.12	66.05	235.53	4.49
40	6.26	51.15	260.16	5.96

Table II.B.3

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Subcatchment Summary

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Name	Area	%Imperv	Width	%Slope
41	2.42	49.30	149.23	5.50
42	2.25	53.03	466.45	5.67
43	4.42	52.98	535.50	5.39
44	4.48	45.17	419.31	5.98
46	10.31	7.11	594.37	5.94
47	5.74	24.07	533.18	7.72
48	6.06	66.60	259.84	8.20
49	3.4	52.30	328.17	6.11
50	4.17	56.60	560.85	9.72
51	6.25	56.23	404.56	11.06
52	3.99	57.31	228.12	4.76
53	2.8	55.55	247.67	4.70
54	3.59	55.66	1014.87	6.97
55	2.66	57.84	202.78	5.61
56	2.64	57.88	257.59	5.32
57	2.63	57.41	271.23	5.72
58	5.43	55.52	522.88	4.81
59	5.54	53.79	472.39	4.87
60	5.43	55.75	254.29	5.91
61	3.98	53.25	248.29	5.32
62	7.15	45.64	313.22	6.82
63	2.32	39.92	335.13	5.67
64	4.7	23.39	309.93	8.28
65	4.4	49.97	267.71	5.29
66	4.04	49.79	312.67	4.78
67	2.37	48.47	419.37	5.44
68	3.46	55.46	441.61	4.40
69	3.91	56.15	685.70	6.54
70	1.5	63.44	168.34	13.12
71	2.25	58.35	213.91	5.41
72	1.21	56.83	235.82	7.92
73	0.47	47.60	197.24	11.41
74	1.42	58.92	260.43	8.58
75	10.06	9.56	468.86	22.87
76	8.66	15.14	937.75	18.90
77	9.94	30.09	1561.15	22.45
78	7.16	45.57	925.91	5.68
79	3.14	23.21	1132.23	20.84
80	7.48	16.41	1337.83	28.18
81	1.74	51.05	366.35	6.27

Table II.B.3

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Subcatchment Summary

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Name	Area	%Imperv	Width	%Slope
82	4.56	20.15	1984.95	24.11
83	1.19	19.66	788.29	25.00
84	2.56	22.18	1423.52	25.59
85	3.65	49.19	764.29	6.07
86	0.95	49.28	255.58	4.83
87	2.74	49.31	538.07	4.83
88	2.53	52.49	680.00	4.97
89	2.96	49.11	342.58	5.21
90	5.13	50.37	250.12	5.13
91	5.5	52.12	391.80	8.29
92	2.06	33.75	315.10	6.99
93	5.28	45.63	583.88	6.31
94	3.06	51.85	281.13	6.40
95	3.72	52.58	248.29	6.16
96	5.18	49.44	933.20	6.34
97	3.8	49.46	248.09	5.95
98	3.9	48.65	365.43	6.98
99	4.65	45.44	230.32	6.83
100	5.56	41.59	288.28	6.51
101	2.8	45.05	247.26	6.31
102	3.96	40.34	336.66	7.08
103	4.91	44.38	266.09	7.53
104	4.74	45.21	269.23	4.53
105	4.45	47.52	254.49	6.18
106	3.92	48.82	724.15	5.10
107	6.75	46.65	246.18	4.77
108	2.94	46.58	614.78	5.15
109	4	52.46	369.06	5.05
110	1.99	38.88	301.61	5.73
111	5.83	49.33	528.05	8.82
112	5.26	54.35	250.38	4.87
113	5.6	44.02	286.54	8.46
114	3.66	54.11	246.26	5.98
115	3.06	50.62	245.50	5.92
116	6.03	49.35	579.41	7.03
117	4.25	49.10	392.28	5.48
118	1.27	50.46	470.36	4.76
119	6.72	43.61	246.92	5.34
120	10.15	41.61	726.09	10.14
121	4.72	45.10	247.82	6.90

Table II.B.3

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Subcatchment Summary

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Name	Area	%Imperv	Width	%Slope
122	0.99	43.07	251.91	6.69
123	3.74	45.65	434.14	5.84
124	1.72	44.40	262.72	4.52
125	2.84	51.40	359.86	15.00
126	2	46.08	220.35	5.92
127	2.83	45.44	277.84	4.66
128	1.74	44.81	288.90	4.58
129	4.7	46.42	416.09	7.50
131	2.58	44.10	291.91	5.35
132	3.38	44.36	370.90	6.28
133	8.33	38.56	801.29	4.40
134	12.23	31.78	806.05	5.54
135	5.32	45.12	508.99	5.22
136	2.89	33.86	341.61	4.51
137	3.86	45.24	396.91	4.95
138	2.69	47.52	304.01	4.98
139	5.57	40.84	411.34	5.04
140	4.57	38.89	307.10	3.96
141	2.16	43.37	320.09	4.95
142	2.35	42.41	406.94	3.93
143	3.73	33.97	638.72	5.04
144	4.38	44.36	274.13	4.59
145	3.96	46.79	282.54	5.14
146	2.94	44.49	258.77	4.73
147	3.57	44.59	224.82	3.98
148	4.15	40.91	317.21	4.82
149	2.19	50.70	207.71	4.50
150	3.36	47.18	379.76	4.31
151	3.12	46.05	248.74	3.75
152	6.22	45.17	305.70	5.36
153	14.96	56.23	1407.74	17.29
154	11.3	18.50	1657.50	26.07
155	11.98	19.43	1232.50	24.55
156	15.99	13.24	746.95	11.60
157	9.28	38.22	601.77	9.68
158	8.36	40.04	559.42	8.20
159	7.09	39.09	342.76	15.84
160	3.56	35.67	1043.33	12.31
161	3.42	47.12	573.29	10.08
162	5.55	59.99	754.08	17.38

Table II.B.3

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Subcatchment Summary

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Name	Area	%Imperv	Width	%Slope
163	5.46	55.09	1575.94	17.31
164	10.67	58.13	726.41	17.01
165	3.62	53.20	648.47	5.55
166	2.56	56.35	1141.12	7.27
167	3.07	35.99	1114.70	8.85
168	12.44	51.92	1062.87	17.20
169	4.39	60.35	516.03	16.85
170	4.79	54.59	669.12	12.25
171	1.59	72.90	970.51	13.13
172	2.75	63.97	503.26	11.72
173	5.69	41.26	358.45	5.46
174	5.31	17.64	297.50	20.49
175	72.33	6.70	1729.02	9.24
176	16.06	0.74	850.00	24.20
177	90.02	0.75	631.00	34.52
178	4.29	55.13	651.00	12.30
179	9.32	43.72	1555.84	20.38
180	4.38	61.08	790.42	10.57
181	3.52	60.64	393.14	10.95
182	0.35	40.40	126.33	7.07
183	3.37	74.64	703.44	29.55
184	3.11	74.86	564.03	31.29
185	2.72	74.85	505.22	20.22
186	29.62	8.40	1033.88	8.51
187	15.59	11.63	1551.45	23.55
188	22.61	15.47	888.08	16.34
189	9.68	0.74	834.83	18.13
190	38.08	38.97	1630.23	7.97
191	7.34	25.43	2636.16	16.15
192	11.58	25.84	624.64	4.99
193	2.94	47.80	224.54	5.14
194	12.13	52.15	607.78	5.00
195	6.81	21.92	606.96	5.35
196	5.02	34.10	363.94	5.61
197	15.35	25.95	914.46	5.25
198	12.43	26.33	720.49	21.96
199	12.01	27.23	429.71	7.59
200	5.17	22.85	253.83	4.36
201	13.17	21.34	783.45	5.78
202	6.95	18.08	888.19	5.90

Table II.B.3

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Subcatchment Summary

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Name	Area	%Imperv	Width	%Slope
203	18.89	19.82	691.03	5.28
204	4.25	37.00	753.40	8.19
205	1.83	36.15	606.31	11.45
206	4.25	47.11	376.05	8.22
207	19.14	3.70	664.28	7.63
208	29.96	9.29	565.16	6.92
209	5.91	45.47	447.72	7.60
210	7.32	59.62	290.67	8.28
211	3.16	49.55	483.07	9.16
212	3.12	47.96	437.73	6.06
213	5.35	22.74	410.29	5.40
214	3.32	50.06	476.26	5.86
215	2.99	51.47	691.05	4.26
216	2.81	54.22	236.84	5.90
217	5.98	51.92	820.49	6.16
218	4.81	42.75	344.50	4.85
219	1.21	47.96	350.29	5.59
220	3.48	28.87	422.21	4.06
221	2.05	50.40	257.90	5.73
222	1	41.99	177.33	3.94
223	1.06	23.93	559.36	6.26
224	1.02	45.39	174.34	3.77
225	0.98	44.36	172.23	4.82
226	0.97	51.91	365.04	4.59
227	3.57	0.50	541.69	5.84
228	27.52	14.33	1079.04	8.28
229	8.51	38.00	597.41	18.25
230	2.55	46.74	1655.10	5.87
231	5.37	44.04	860.80	25.92
232	1.34	0.23	558.33	4.88
233	2.97	42.80	374.38	5.26
234	8.88	39.73	395.37	8.28
235	5.01	49.22	292.76	5.14
236	4.05	44.09	446.17	9.66
237	4.26	50.16	364.21	8.99
238	5.33	41.60	425.34	6.00
239	2.6	55.56	275.78	6.04
240	2.42	54.29	272.99	7.47
241	2.66	51.13	396.90	6.62
242	9.25	48.74	985.02	9.21

Table II.B.3

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Subcatchment Summary

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Name	Area	%Imperv	Width	%Slope
243	6.05	73.64	1028.44	12.21
244	6.21	34.16	715.09	11.59
245	6.85	38.86	667.01	7.88
246	3.49	22.93	389.02	9.41
247	8.68	18.73	445.35	9.37
248	4.01	61.52	496.26	5.02
249	4.43	48.80	302.28	7.61
250	3.04	59.83	532.86	3.92
251	1.68	42.95	460.86	4.96
252	2.81	55.04	307.27	5.72
254	3.8	48.67	726.04	5.58
255	2.75	31.21	405.71	19.78
256	2.64	43.61	283.82	5.17
257	4.79	42.86	737.14	7.03
258	3.52	71.48	356.67	4.91
259	31.76	2.81	915.78	9.96
260	5.58	65.68	284.47	12.79
261	5.27	34.01	329.91	10.50
262	14.79	10.85	724.01	17.05
263	199.06	0.70	4051.95	21.60
264	127.82	6.28	1383.00	27.77
265	2.26	38.63	391.86	8.63
266	0.87	40.55	460.94	13.01
267	35.68	26.59	2154.36	14.02
268	7.94	45.55	956.52	13.14
269	7.85	55.02	441.53	7.51
270	5.24	31.00	727.95	8.51
271	2.11	55.93	95.81	5.56
272	2.36	33.02	228.62	4.47
273	0.98	72.59	167.54	5.74
274	1.23	61.61	102.90	6.85
275	2.35	50.44	256.58	5.98
276	1.85	56.38	175.04	6.26
277	7.25	53.58	360.42	6.27
278	2.08	52.36	526.69	5.79
279	1.6	54.91	193.15	4.25
280	2.04	49.74	663.77	5.74
281	1.34	55.73	269.92	4.36
282	1.57	57.00	231.13	6.11
283	1.09	49.01	163.12	4.73

Table II.B.3

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Subcatchment Summary

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Name	Area	%Imperv	Width	%Slope
284	0.72	55.40	198.39	4.64
285	0.96	53.96	232.91	4.75
286	1.21	63.24	244.56	4.06
287	2.03	59.17	298.99	4.66
288	1.9	50.39	239.28	6.89
289	3.61	55.80	201.76	6.41
290	0.89	53.37	300.84	4.75
291	3.15	53.98	262.73	3.89
292	0.47	57.63	157.81	5.05
293	0.67	46.39	123.39	5.09
294	1.89	67.50	139.94	7.59
295	6.31	18.96	334.76	10.70
296	2.53	62.89	372.40	3.87
297	1.63	58.26	85.00	3.87
298	2.5	69.81	140.84	5.41
299	3.74	57.71	159.94	6.76
300	2.01	48.11	321.33	6.88
301	0.61	46.91	95.98	4.74
302	5.9	20.51	503.83	3.64
303	5.24	38.72	590.31	5.62
304	29.01	19.91	2806.70	15.80
305	17.36	33.92	2748.05	18.39
306	23.79	13.49	3070.20	16.68
307	14.46	16.65	3715.35	16.29
308	13.77	19.05	1407.74	6.76
309	8.26	56.23	1407.74	6.76
323	2.91	74.81	425.00	6.76
331	1.41	67.50	235.45	6.76
340	3.03	52.98	255.00	6.76
341	19.14	18.75	425.00	6.76
Sub-01	86.38	7.38	1445.00	6.76
Sub-02	1283.74	18.75	2909.55	2.40
Sub-04	81.824934	0.92	1018.30	2.20
347	8.05	25.84	340.00	4.99
355	1.59	52.43	340.00	0.50
361	9.97	18.75	1657.50	0.50
362	4.88	38.72	590.31	5.62
377	4.5	17.64	297.50	0.50
395	6.75	17.64	425.00	20.49
396	7.03	17.64	552.50	2.60

Table II.B.3

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Subcatchment Summary

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Name	Area	%Imperv	Width	%Slope
412	6.49	19.43	552.50	0.50
423	4.24	25.84	340.00	4.99
438	25.98	69.75	620.50	6.76
444	10.41	55.02	340.00	7.51
445	10.87	19.82	425.00	5.28
471	4.55	47.96	340.00	6.06
504	1.58	45.47	178.00	7.60
510	9.46	45.47	600.00	7.60
516	4.49	42.75	391.00	4.85
529	37.35	0.70	1291.00	21.00
533	1	71.19	185.78	0.50
539	2.13	71.40	250.00	0.50
541	5	6.28	500.00	27.77

Table II.B.4

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Subcatchment Runoff Summary

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Subcatchment	Total Precip in	Total Runon in	Total Evap in	Total Infil in	Imperv Runoff in	Perv Runoff in	Total Runoff in	Total Runoff 10^6 gal	Peak Runoff CFS	Runoff Coeff
1	1.83	0	0	0.65	1.02	0	1.02	0.19	16.71	0.559
2	1.83	0	0	0.78	0.78	0.09	0.87	0.06	4.48	0.477
3	1.83	0	0	0.55	1.09	0.02	1.11	0.12	10.33	0.606
4	1.83	0	0	0.79	0.82	0.04	0.86	0.06	5.39	0.471
5	1.83	0	0	0.48	0.86	0.3	1.16	0.05	3.8	0.631
6	1.83	0	0	0.7	0.92	0.04	0.96	0.07	5.58	0.522
7	1.83	0	0	0.62	1.03	0.01	1.05	0.11	9.2	0.571
8	1.83	0	0	0.58	1.08	0	1.09	0.1	8.67	0.593
9	1.83	0	0	0.67	0.83	0.14	0.97	0.17	13.02	0.531
10	1.83	0	0	0.34	1.24	0.08	1.32	0.06	4.89	0.721
11	1.83	0	0	0.56	0.96	0.11	1.07	0.16	13.06	0.586
12	1.83	0	0	0.64	0.8	0.2	1	0.05	4.04	0.547
13	1.83	0	0	1.27	0.02	0.2	0.21	0.14	1.9	0.117
14	1.83	0	0	0.76	0.85	0.06	0.9	0.07	5.57	0.494
15	1.83	0	0	0.48	0.8	0.35	1.15	0.21	14.47	0.63
16	1.83	0	0	0.4	0.92	0.31	1.23	0.08	5.72	0.672
17	1.83	0	0	0.33	0.98	0.32	1.3	0.13	9.12	0.71
18	1.83	0	0	0.47	1.05	0.11	1.17	0.15	12.15	0.637
19	1.83	0	0	0.59	0.88	0.16	1.05	0.1	7.47	0.572
20	1.83	0	0	0.71	0.64	0.3	0.94	0.03	1.76	0.513
21	1.83	0	0	0.49	0.88	0.27	1.15	0.05	3.66	0.629
22	1.83	0	0	0.37	0.96	0.31	1.27	0.1	7.04	0.694
23	1.83	0	0	0.32	1.18	0.15	1.33	0.11	8.45	0.726
24	1.83	0	0	0.35	0.94	0.35	1.29	0.1	7.25	0.704
25	1.83	0	0	0.39	1	0.25	1.25	0.09	6.52	0.683
26	1.83	0	0	0.39	0.97	0.29	1.26	0.04	3.37	0.687
27	1.83	0	0	1.24	0.07	0.31	0.39	0.21	5.61	0.211
28	1.83	0	0	0.69	0.53	0.36	0.89	0.3	16.92	0.487
29	1.83	0	0	0.29	1.06	0.26	1.32	0.14	9.54	0.721
30	1.83	0	0	1.02	0.22	0.33	0.55	0.15	5.58	0.301
31	1.83	0	0	0.62	1.06	0	1.06	0.17	14.7	0.578
32	1.83	0	0	0.56	1.01	0.07	1.08	0.18	14.74	0.591
33	1.83	0	0	1.19	0.42	0.04	0.46	0.03	2.8	0.25
34	1.83	0	0	0.64	0.75	0.25	0.99	0.04	2.54	0.542
35	1.83	0	0	0.4	1.23	0.03	1.26	0.16	14	0.686
36	1.83	0	0	0.31	1.11	0.22	1.33	0.52	39.26	0.726
37	1.83	0	0	1.14	0.16	0.32	0.48	0.03	1.17	0.26
38	1.83	0	0	0.44	1.02	0.2	1.22	0.05	4.26	0.664
39	1.83	0	0	0.26	1.09	0.29	1.38	0.08	6.29	0.757
40	1.83	0	0	0.41	0.84	0.35	1.2	0.2	13.46	0.654
41	1.83	0	0	0.5	0.82	0.31	1.12	0.07	5.05	0.612
42	1.83	0	0	0.41	0.87	0.36	1.24	0.08	5.89	0.678
43	1.83	0	0	0.4	0.88	0.37	1.24	0.15	10.87	0.68
44	1.83	0	0	0.49	0.75	0.4	1.15	0.14	9.26	0.626

Table II.B.4

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Subcatchment Runoff Summary

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Subcatchment	Total Precip in	Total Runon in	Total Evap in	Total Infil in	Imperv Runoff in	Perv Runoff in	Total Runoff in	Total Runoff 10^6 gal	Peak Runoff CFS	Runoff Coeff
46	1.83	0	0	1.22	0.12	0.24	0.36	0.1	3.13	0.195
47	1.83	0	0	0.85	0.4	0.37	0.77	0.12	6.26	0.42
48	1.83	0	0	0.58	1.1	0	1.1	0.18	15.81	0.601
49	1.83	0	0	0.49	0.87	0.28	1.15	0.11	7.67	0.626
50	1.83	0	0	0.74	0.93	0	0.94	0.11	9.45	0.511
51	1.83	0	0	0.46	0.93	0.25	1.18	0.2	14.88	0.643
52	1.83	0	0	0.4	0.95	0.28	1.23	0.13	9.54	0.672
53	1.83	0	0	0.33	0.92	0.39	1.3	0.1	7.08	0.713
54	1.83	0	0	0.37	0.92	0.36	1.27	0.12	10.38	0.696
55	1.83	0	0	0.32	0.96	0.36	1.31	0.09	6.88	0.718
56	1.83	0	0	0.32	0.96	0.36	1.32	0.09	7.01	0.722
57	1.83	0	0	0.32	0.95	0.37	1.32	0.09	7.01	0.721
58	1.83	0	0	0.33	0.92	0.39	1.3	0.19	13.86	0.713
59	1.83	0	0	0.43	0.89	0.32	1.21	0.18	12.94	0.659
60	1.83	0	0	0.43	0.92	0.27	1.19	0.18	12.48	0.652
61	1.83	0	0	0.41	0.88	0.34	1.22	0.13	9.13	0.667
62	1.83	0	0	0.52	0.75	0.34	1.09	0.21	13.75	0.596
63	1.83	0	0	0.55	0.66	0.42	1.08	0.07	4.48	0.59
64	1.83	0	0	0.85	0.39	0.37	0.76	0.1	4.88	0.415
65	1.83	0	0	0.44	0.83	0.35	1.18	0.14	9.48	0.645
66	1.83	0	0	0.41	0.82	0.39	1.22	0.13	8.98	0.664
67	1.83	0	0	0.5	0.8	0.34	1.14	0.07	5.38	0.625
68	1.83	0	0	0.31	0.92	0.42	1.33	0.13	9.27	0.729
69	1.83	0	0	0.41	0.93	0.3	1.23	0.13	10.21	0.673
70	1.83	0	0	0.29	1.05	0.31	1.36	0.06	4.52	0.743
71	1.83	0	0	0.39	0.97	0.29	1.25	0.08	5.73	0.685
72	1.83	0	0	0.36	0.94	0.35	1.28	0.04	3.41	0.701
73	1.83	0	0	0.54	0.78	0.33	1.11	0.01	1.2	0.607
74	1.83	0	0	0.31	0.97	0.36	1.33	0.05	4.23	0.728
75	1.83	0	0	1.02	0.16	0.42	0.58	0.16	4.93	0.316
76	1.83	0	0	1.01	0.25	0.38	0.63	0.15	6.63	0.342
77	1.83	0	0	0.74	0.49	0.41	0.9	0.24	16.02	0.492
78	1.83	0	0	0.43	0.75	0.46	1.21	0.24	16.17	0.661
79	1.83	0	0	0.96	0.38	0.32	0.7	0.06	3.98	0.385
80	1.83	0	0	1	0.27	0.38	0.65	0.13	6.98	0.352
81	1.83	0	0	0.41	0.84	0.39	1.24	0.06	4.53	0.675
82	1.83	0	0	0.93	0.33	0.4	0.73	0.09	6.61	0.401
83	1.83	0	0	1.04	0.32	0.31	0.63	0.02	1.43	0.344
84	1.83	0	0	0.89	0.36	0.41	0.77	0.05	4.33	0.421
85	1.83	0	0	0.44	0.81	0.39	1.2	0.12	9.05	0.656
86	1.83	0	0	0.42	0.81	0.41	1.22	0.03	2.46	0.667
87	1.83	0	0	0.44	0.81	0.39	1.21	0.09	6.66	0.659
88	1.83	0	0	0.38	0.86	0.4	1.26	0.09	6.96	0.691
89	1.83	0	0	0.43	0.81	0.39	1.2	0.1	6.75	0.657

Table II.B.4

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Subcatchment Runoff Summary

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Subcatchment	Total Precip in	Total Runon in	Total Evap in	Total Infil in	Imperv Runoff in	Perv Runoff in	Total Runoff in	Total Runoff 10^6 gal	Peak Runoff CFS	Runoff Coeff
90	1.83	0	0	0.42	0.83	0.36	1.2	0.17	10.99	0.654
91	1.83	0	0	0.44	0.86	0.33	1.19	0.18	12.59	0.652
92	1.83	0	0	0.59	0.56	0.49	1.05	0.06	3.67	0.572
93	1.83	0	0	0.46	0.75	0.43	1.18	0.17	11.48	0.644
94	1.83	0	0	0.41	0.86	0.37	1.23	0.1	7.22	0.671
95	1.83	0	0	0.44	0.87	0.32	1.19	0.12	8.44	0.653
96	1.83	0	0	0.44	0.82	0.39	1.21	0.17	12.69	0.659
97	1.83	0	0	0.43	0.82	0.37	1.19	0.12	8.26	0.651
98	1.83	0	0	0.42	0.8	0.41	1.21	0.13	8.87	0.663
99	1.83	0	0	0.49	0.75	0.37	1.12	0.14	9.1	0.613
100	1.83	0	0	0.52	0.69	0.4	1.09	0.16	10.11	0.596
101	1.83	0	0	0.49	0.75	0.39	1.14	0.09	5.73	0.621
102	1.83	0	0	0.53	0.67	0.43	1.1	0.12	7.4	0.599
103	1.83	0	0	0.49	0.73	0.39	1.13	0.15	9.57	0.615
104	1.83	0	0	0.48	0.75	0.38	1.13	0.15	9.22	0.616
105	1.83	0	0	0.44	0.79	0.39	1.18	0.14	9.29	0.645
106	1.83	0	0	0.42	0.81	0.41	1.22	0.13	9.56	0.666
107	1.83	0	0	0.45	0.77	0.37	1.14	0.21	13.01	0.621
108	1.83	0	0	0.37	0.77	0.5	1.27	0.1	7.61	0.695
109	1.83	0	0	0.38	0.87	0.38	1.25	0.14	9.53	0.683
110	1.83	0	0	0.54	0.64	0.45	1.09	0.06	3.86	0.596
111	1.83	0	0	0.49	0.82	0.33	1.14	0.18	12.81	0.625
112	1.83	0	0	0.47	0.9	0.25	1.15	0.16	11.63	0.627
113	1.83	0	0	0.49	0.73	0.39	1.12	0.17	10.84	0.613
114	1.83	0	0	0.36	0.89	0.37	1.27	0.13	8.78	0.692
115	1.83	0	0	0.49	0.84	0.3	1.14	0.09	6.67	0.624
116	1.83	0	0	0.43	0.82	0.39	1.21	0.2	13.77	0.659
117	1.83	0	0	0.4	0.81	0.42	1.23	0.14	9.66	0.671
118	1.83	0	0	0.41	0.83	0.4	1.23	0.04	3.5	0.673
119	1.83	0	0	0.46	0.72	0.4	1.12	0.2	12.36	0.613
120	1.83	0	0	0.51	0.69	0.43	1.12	0.31	19.68	0.613
121	1.83	0	0	0.47	0.75	0.4	1.15	0.15	9.34	0.627
122	1.83	0	0	0.47	0.71	0.46	1.17	0.03	2.39	0.641
123	1.83	0	0	0.47	0.75	0.41	1.16	0.12	8.04	0.636
124	1.83	0	0	0.51	0.73	0.4	1.13	0.05	3.62	0.618
125	1.83	0	0	0.41	0.85	0.39	1.24	0.1	7.34	0.676
126	1.83	0	0	0.47	0.76	0.41	1.17	0.06	4.31	0.638
127	1.83	0	0	0.37	0.75	0.5	1.25	0.1	6.28	0.685
128	1.83	0	0	0.43	0.74	0.47	1.21	0.06	3.98	0.661
129	1.83	0	0	0.44	0.77	0.42	1.19	0.15	10.23	0.651
131	1.83	0	0	0.44	0.73	0.47	1.19	0.08	5.54	0.653
132	1.83	0	0	0.45	0.73	0.45	1.18	0.11	7.26	0.647
133	1.83	0	0	0.51	0.64	0.48	1.11	0.25	15.17	0.609
134	1.83	0	0	0.62	0.53	0.46	0.98	0.33	17.66	0.536

Table II.B.4

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Subcatchment Runoff Summary

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Subcatchment	Total Precip in	Total Runon in	Total Evap in	Total Infil in	Imperv Runoff in	Perv Runoff in	Total Runoff in	Total Runoff 10^6 gal	Peak Runoff CFS	Runoff Coeff
135	1.83	0	0	0.44	0.75	0.44	1.19	0.17	11.27	0.65
136	1.83	0	0	0.47	0.56	0.59	1.15	0.09	5.2	0.627
137	1.83	0	0	0.43	0.75	0.45	1.2	0.13	8.29	0.656
138	1.83	0	0	0.37	0.79	0.48	1.27	0.09	6.31	0.692
139	1.83	0	0	0.47	0.68	0.47	1.15	0.17	10.49	0.626
140	1.83	0	0	0.48	0.64	0.48	1.12	0.14	8.06	0.612
141	1.83	0	0	0.39	0.72	0.53	1.24	0.07	4.98	0.68
142	1.83	0	0	0.47	0.7	0.46	1.16	0.07	5.02	0.637
143	1.83	0	0	0.54	0.56	0.54	1.09	0.11	6.93	0.598
144	1.83	0	0	0.44	0.73	0.44	1.17	0.14	8.66	0.64
145	1.83	0	0	0.42	0.77	0.42	1.2	0.13	8.36	0.655
146	1.83	0	0	0.5	0.74	0.39	1.13	0.09	5.87	0.618
147	1.83	0	0	0.43	0.74	0.44	1.18	0.11	7.08	0.646
148	1.83	0	0	0.49	0.68	0.45	1.13	0.13	7.75	0.616
149	1.83	0	0	0.37	0.84	0.42	1.26	0.07	5.13	0.687
150	1.83	0	0	0.41	0.78	0.44	1.22	0.11	7.49	0.665
151	1.83	0	0	0.39	0.76	0.47	1.23	0.1	6.61	0.672
152	1.83	0	0	0.45	0.75	0.41	1.16	0.2	12.2	0.633
153	1.83	0	0	0.44	0.93	0.28	1.21	0.49	37.84	0.661
154	1.83	0	0	0.86	0.3	0.48	0.78	0.24	13.29	0.427
155	1.83	0	0	0.78	0.32	0.53	0.85	0.28	14.38	0.465
156	1.83	0	0	1.07	0.22	0.3	0.52	0.23	9.16	0.284
157	1.83	0	0	0.49	0.63	0.5	1.13	0.28	16.99	0.617
158	1.83	0	0	0.51	0.66	0.45	1.11	0.25	15.44	0.606
159	1.83	0	0	0.46	0.65	0.51	1.15	0.22	13.3	0.631
160	1.83	0	0	0.46	0.59	0.6	1.18	0.11	9.3	0.647
161	1.83	0	0	0.65	0.78	0.22	1	0.09	6.9	0.546
162	1.83	0	0	0.58	0.99	0.09	1.08	0.16	13.38	0.591
163	1.83	0	0	0.41	0.91	0.33	1.24	0.18	16.04	0.677
164	1.83	0	0	0.37	0.96	0.31	1.27	0.37	27.95	0.695
165	1.83	0	0	0.44	0.88	0.33	1.21	0.12	9.01	0.659
166	1.83	0	0	0.41	0.93	0.32	1.24	0.09	7.55	0.679
167	1.83	0	0	0.9	0.59	0.17	0.77	0.06	4.57	0.419
168	1.83	0	0	0.65	0.87	0.15	1.01	0.34	26.31	0.554
169	1.83	0	0	0.45	1	0.2	1.2	0.14	11.42	0.654
170	1.83	0	0	0.63	0.9	0.13	1.03	0.13	10.6	0.561
171	1.83	0	0	0.41	1.2	0.05	1.25	0.05	4.64	0.682
172	1.83	0	0	0.54	1.05	0.07	1.12	0.08	7.04	0.613
173	1.83	0	0	0.45	0.68	0.48	1.16	0.18	10.77	0.635
174	1.83	0	0	0.74	0.29	0.58	0.87	0.13	5.27	0.474
175	1.83	0	0	1.27	0.11	0.16	0.27	0.53	19.84	0.147
176	1.83	0	0	1.17	0.01	0.42	0.43	0.19	5.05	0.235
177	1.83	0	0	1.13	0.01	0.25	0.26	0.63	8.1	0.142
178	1.83	0	0	0.34	0.91	0.39	1.3	0.15	12.21	0.712

Table II.B.4

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Subcatchment Runoff Summary

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Subcatchment	Total Precip in	Total Runon in	Total Evap in	Total Infil in	Imperv Runoff in	Perv Runoff in	Total Runoff in	Total Runoff 10^6 gal	Peak Runoff CFS	Runoff Coeff
179	1.83	0	0	0.7	0.72	0.23	0.95	0.24	17.81	0.519
180	1.83	0	0	0.38	1.01	0.26	1.27	0.15	12.43	0.694
181	1.83	0	0	0.32	1	0.33	1.33	0.13	10.07	0.726
182	1.83	0	0	0.45	0.66	0.54	1.2	0.01	0.93	0.655
183	1.83	0	0	0.3	1.23	0.13	1.35	0.12	10.96	0.74
184	1.83	0	0	0.3	1.23	0.12	1.36	0.11	10.09	0.741
185	1.83	0	0	0.29	1.23	0.13	1.36	0.1	8.79	0.744
186	1.83	0	0	1.43	0.14	0.05	0.18	0.15	9.96	0.1
187	1.83	0	0	1.05	0.19	0.4	0.59	0.25	9.87	0.321
188	1.83	0	0	1.34	0.25	0.04	0.3	0.18	14	0.162
189	1.83	0	0	1.44	0.01	0.18	0.2	0.05	1.45	0.107
190	1.83	0	0	0.76	0.64	0.2	0.85	0.88	60.28	0.464
191	1.83	0	0	1.22	0.42	0.04	0.46	0.09	7.47	0.252
192	1.83	0	0	0.73	0.43	0.42	0.85	0.27	13.21	0.463
193	1.83	0	0	0.74	0.79	0.11	0.9	0.07	5.63	0.49
194	1.83	0	0	0.39	0.86	0.37	1.23	0.4	27	0.672
195	1.83	0	0	0.99	0.36	0.26	0.62	0.11	6.26	0.34
196	1.83	0	0	1.01	0.56	0.07	0.63	0.09	6.85	0.346
197	1.83	0	0	0.59	0.43	0.56	0.99	0.41	19.2	0.54
198	1.83	0	0	0.69	0.43	0.5	0.93	0.31	16.46	0.51
199	1.83	0	0	1.06	0.45	0.1	0.55	0.18	13.08	0.299
200	1.83	0	0	0.67	0.38	0.5	0.88	0.12	5.42	0.481
201	1.83	0	0	0.73	0.35	0.49	0.84	0.3	13.22	0.461
202	1.83	0	0	1.1	0.3	0.23	0.53	0.1	5.24	0.289
203	1.83	0	0	1.15	0.33	0.11	0.44	0.22	15.01	0.239
204	1.83	0	0	0.74	0.61	0.3	0.9	0.1	7.06	0.494
205	1.83	0	0	0.68	0.59	0.38	0.97	0.05	3.65	0.53
206	1.83	0	0	0.56	0.78	0.3	1.08	0.12	8.7	0.59
207	1.83	0	0	1.48	0.06	0.06	0.12	0.06	2.83	0.068
208	1.83	0	0	1.31	0.15	0.08	0.23	0.19	11.16	0.128
209	1.83	0	0	0.78	0.75	0.11	0.86	0.14	10.78	0.47
210	1.83	0	0	0.38	0.98	0.26	1.24	0.25	17.94	0.68
211	1.83	0	0	0.57	0.82	0.26	1.08	0.09	6.9	0.588
212	1.83	0	0	0.62	0.79	0.23	1.02	0.09	6.34	0.559
213	1.83	0	0	0.86	0.38	0.37	0.75	0.11	5.38	0.407
214	1.83	0	0	0.41	0.83	0.41	1.23	0.11	8.08	0.674
215	1.83	0	0	0.52	0.85	0.28	1.12	0.09	6.92	0.615
216	1.83	0	0	0.46	0.9	0.28	1.18	0.09	6.54	0.645
217	1.83	0	0	0.52	0.86	0.27	1.13	0.18	13.56	0.615
218	1.83	0	0	0.66	0.71	0.26	0.96	0.13	8.54	0.527
219	1.83	0	0	0.55	0.79	0.31	1.1	0.04	2.78	0.602
220	1.83	0	0	0.74	0.48	0.41	0.88	0.08	4.62	0.482
221	1.83	0	0	0.58	0.83	0.23	1.06	0.06	4.36	0.58
222	1.83	0	0	0.6	0.69	0.34	1.03	0.03	1.91	0.565

Table II.B.4

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Subcatchment Runoff Summary

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Subcatchment	Total Precip in	Total Runon in	Total Evap in	Total Infil in	Imperv Runoff in	Perv Runoff in	Total Runoff in	Total Runoff 10^6 gal	Peak Runoff CFS	Runoff Coeff
223	1.83	0	0	0.88	0.39	0.38	0.77	0.02	1.48	0.421
224	1.83	0	0	0.65	0.75	0.24	0.99	0.03	1.97	0.543
225	1.83	0	0	0.72	0.73	0.2	0.93	0.02	1.8	0.507
226	1.83	0	0	0.43	0.85	0.37	1.22	0.03	2.65	0.668
227	1.83	0	0	1.2	0.01	0.41	0.41	0.04	1.22	0.226
228	1.83	0	0	1.3	0.24	0.07	0.31	0.23	15.8	0.17
229	1.83	0	0	0.84	0.63	0.17	0.8	0.19	13.17	0.438
230	1.83	0	0	0.84	0.77	0.06	0.83	0.06	4.77	0.453
231	1.83	0	0	0.62	0.72	0.3	1.03	0.15	11.36	0.562
232	1.83	0	0	1.26	0	0.38	0.39	0.01	0.63	0.211
233	1.83	0	0	0.64	0.71	0.29	0.99	0.08	5.49	0.542
234	1.83	0	0	0.89	0.66	0.09	0.74	0.18	14.09	0.406
235	1.83	0	0	0.57	0.81	0.24	1.06	0.14	10.15	0.578
236	1.83	0	0	0.74	0.73	0.18	0.91	0.1	7.32	0.495
237	1.83	0	0	0.65	0.83	0.16	0.99	0.11	8.71	0.543
238	1.83	0	0	0.81	0.69	0.14	0.83	0.12	8.94	0.454
239	1.83	0	0	0.62	0.92	0.11	1.03	0.07	5.81	0.562
240	1.83	0	0	0.52	0.9	0.23	1.13	0.07	5.59	0.616
241	1.83	0	0	0.57	0.84	0.23	1.08	0.08	5.83	0.59
242	1.83	0	0	0.72	0.81	0.12	0.93	0.23	18.18	0.508
243	1.83	0	0	0.35	1.22	0.09	1.31	0.22	18.27	0.715
244	1.83	0	0	1.07	0.56	0.03	0.6	0.1	8.5	0.325
245	1.83	0	0	0.79	0.64	0.2	0.85	0.16	10.96	0.462
246	1.83	0	0	1.09	0.38	0.17	0.55	0.05	3.24	0.299
247	1.83	0	0	1.33	0.31	0.02	0.33	0.08	6.51	0.178
248	1.83	0	0	0.3	1.02	0.32	1.34	0.15	11.33	0.733
249	1.83	0	0	0.46	0.81	0.36	1.17	0.14	9.57	0.64
250	1.83	0	0	0.32	0.99	0.34	1.33	0.11	8.59	0.725
251	1.83	0	0	0.53	0.71	0.41	1.12	0.05	3.76	0.611
252	1.83	0	0	0.45	0.91	0.28	1.19	0.09	6.74	0.651
254	1.83	0	0	0.55	0.8	0.29	1.09	0.11	8.34	0.598
255	1.83	0	0	0.55	0.51	0.58	1.09	0.08	5.61	0.597
256	1.83	0	0	0.5	0.72	0.41	1.13	0.08	5.32	0.616
257	1.83	0	0	0.45	0.71	0.48	1.19	0.15	10.84	0.651
258	1.83	0	0	0.18	1.18	0.28	1.47	0.14	11.43	0.801
259	1.83	0	0	1.19	0.05	0.28	0.33	0.28	4.71	0.18
260	1.83	0	0	0.33	1.09	0.23	1.31	0.2	15.47	0.717
261	1.83	0	0	0.58	0.56	0.47	1.03	0.15	8.44	0.565
262	1.83	0	0	1.37	0.18	0.08	0.26	0.11	6.43	0.143
263	1.83	0	0	1.26	0.01	0.25	0.26	1.42	23.51	0.143
264	1.83	0	0	1.41	0.1	0.06	0.16	0.56	32.12	0.088
265	1.83	0	0	0.83	0.64	0.19	0.82	0.05	3.6	0.449
266	1.83	0	0	0.77	0.67	0.23	0.89	0.02	1.64	0.488
267	1.83	0	0	0.83	0.44	0.35	0.79	0.76	41.76	0.43

Table II.B.4

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Subcatchment Runoff Summary

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Subcatchment	Total Precip in	Total Runon in	Total Evap in	Total Infil in	Imperv Runoff in	Perv Runoff in	Total Runoff in	Total Runoff 10^6 gal	Peak Runoff CFS	Runoff Coeff
268	1.83	0	0	0.61	0.75	0.28	1.03	0.22	16.06	0.565
269	1.83	0	0	0.46	0.91	0.26	1.17	0.25	18.1	0.642
270	1.83	0	0	1.05	0.51	0.09	0.6	0.09	6.5	0.328
271	1.83	0	0	0.33	0.92	0.37	1.29	0.07	5.02	0.705
272	1.83	0	0	0.74	0.55	0.34	0.88	0.06	3.38	0.483
273	1.83	0	0	0.29	1.2	0.16	1.36	0.04	3.05	0.744
274	1.83	0	0	0.37	1.02	0.26	1.28	0.04	3.26	0.697
275	1.83	0	0	0.62	0.83	0.19	1.02	0.07	4.89	0.56
276	1.83	0	0	0.53	0.93	0.19	1.12	0.06	4.31	0.612
277	1.83	0	0	0.4	0.89	0.34	1.23	0.24	16.55	0.669
278	1.83	0	0	0.36	0.86	0.42	1.29	0.07	5.87	0.703
279	1.83	0	0	0.37	0.91	0.36	1.27	0.06	4.04	0.696
280	1.83	0	0	0.48	0.82	0.35	1.16	0.06	5.16	0.636
281	1.83	0	0	0.42	0.92	0.3	1.22	0.04	3.44	0.668
282	1.83	0	0	0.35	0.94	0.35	1.29	0.06	4.25	0.705
283	1.83	0	0	0.38	0.81	0.45	1.26	0.04	2.66	0.687
284	1.83	0	0	0.37	0.91	0.36	1.28	0.02	2.03	0.698
285	1.83	0	0	0.3	0.89	0.45	1.34	0.03	2.82	0.733
286	1.83	0	0	0.26	1.05	0.34	1.38	0.05	3.73	0.756
287	1.83	0	0	0.32	0.98	0.34	1.32	0.07	5.64	0.723
288	1.83	0	0	0.45	0.83	0.36	1.19	0.06	4.46	0.652
289	1.83	0	0	0.49	0.92	0.22	1.15	0.11	8.28	0.626
290	1.83	0	0	0.4	0.88	0.37	1.25	0.03	2.48	0.682
291	1.83	0	0	0.38	0.89	0.36	1.25	0.11	7.48	0.684
292	1.83	0	0	0.31	0.95	0.38	1.33	0.02	1.46	0.729
293	1.83	0	0	0.4	0.77	0.47	1.24	0.02	1.64	0.677
294	1.83	0	0	0.47	1.12	0.06	1.18	0.06	5.09	0.645
295	1.83	0	0	0.73	0.31	0.54	0.85	0.15	6.03	0.467
296	1.83	0	0	0.31	1.04	0.29	1.34	0.09	7.21	0.73
297	1.83	0	0	0.54	0.96	0.19	1.15	0.05	3.83	0.629
298	1.83	0	0	0.4	1.15	0.09	1.24	0.08	6.88	0.68
299	1.83	0	0	0.42	0.95	0.25	1.21	0.12	8.83	0.659
300	1.83	0	0	0.48	0.79	0.37	1.16	0.06	4.63	0.634
301	1.83	0	0	0.42	0.77	0.44	1.21	0.02	1.42	0.663
302	1.83	0	0	0.91	0.34	0.35	0.69	0.11	5.28	0.376
303	1.83	0	0	0.51	0.64	0.48	1.11	0.16	9.91	0.609
304	1.83	0	0	0.93	0.33	0.37	0.7	0.55	27.52	0.383
305	1.83	0	0	0.73	0.56	0.35	0.91	0.43	28.95	0.498
306	1.83	0	0	0.94	0.22	0.47	0.69	0.45	19.58	0.377
307	1.83	0	0	0.91	0.27	0.47	0.74	0.29	16.9	0.405
308	1.83	0	0	1.05	0.31	0.38	0.69	0.26	13.06	0.379
309	1.83	0	0	0.56	0.93	0.22	1.15	0.26	20.71	0.629
323	1.83	0	0	0.28	1.24	0.17	1.4	0.11	9.53	0.768
331	1.83	0	0	0.25	1.12	0.33	1.45	0.06	4.71	0.791

Table II.B.4

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Subcatchment Runoff Summary

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Subcatchment	Total Precip in	Total Runon in	Total Evap in	Total Infil in	Imperv Runoff in	Perv Runoff in	Total Runoff in	Total Runoff 10^6 gal	Peak Runoff CFS	Runoff Coeff
340	1.83	0	0	0.41	0.88	0.42	1.3	0.11	7.68	0.711
341	1.83	0	0	0.98	0.31	0.33	0.64	0.33	15.45	0.347
Sub-01	1.83	0	0	1.49	0.12	0.01	0.14	0.32	25.53	0.074
Sub-02	1.83	0	0	1.05	0.3	0.02	0.32	10.99	408.87	0.172
Sub-04	1.83	0	0	1.28	0.02	0.09	0.1	0.22	3.27	0.055
347	1.83	0	0	0.73	0.43	0.51	0.93	0.2	9.66	0.51
355	1.83	0	0	0.85	0.87	0	0.87	0.04	3.32	0.474
361	1.83	0	0	1.46	0.34	0	0.34	0.09	7.49	0.184
362	1.83	0	0	0.51	0.64	0.48	1.12	0.15	9.33	0.61
377	1.83	0	0	0.74	0.29	0.4	0.69	0.08	3.41	0.376
395	1.83	0	0	0.74	0.29	0.58	0.87	0.16	6.91	0.477
396	1.83	0	0	0.74	0.29	0.53	0.82	0.16	6.02	0.448
412	1.83	0	0	0.78	0.32	0.38	0.7	0.12	5.4	0.383
423	1.83	0	0	0.73	0.43	0.45	0.87	0.1	5.05	0.477
438	1.83	0	0	0.49	1.14	0.01	1.16	0.82	64.31	0.632
444	1.83	0	0	0.46	0.91	0.25	1.16	0.33	22.95	0.631
445	1.83	0	0	1.15	0.33	0.11	0.44	0.13	8.64	0.24
471	1.83	0	0	0.62	0.86	0.3	1.16	0.14	9.52	0.632
504	1.83	0	0	0.78	0.75	0.12	0.87	0.04	2.89	0.474
510	1.83	0	0	0.78	0.75	0.1	0.86	0.22	17.23	0.468
516	1.83	0	0	0.66	0.71	0.26	0.97	0.12	8.04	0.53
529	1.83	0	0	1.26	0.01	0.3	0.31	0.31	6.53	0.168
533	1.83	0	0	0.32	1.17	0.15	1.33	0.04	2.86	0.725
539	1.83	0	0	0.19	1.17	0.27	1.44	0.08	6.04	0.787
541	1.83	0	0	1.41	0.1	0.14	0.24	0.03	1.26	0.131

Table II.B.4

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Subcatchment Infiltration Data Summary

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Subcatchment	Curve Number	Conductivity	Drying Time
1	40.38	0.15	7
2	61.87	0.15	7
3	53.1	0.15	7
4	54.76	0.15	7
5	82.82	0.15	7
6	53.7	0.15	7
7	48.05	0.15	7
8	42.72	0.15	7
9	70	0.15	7
10	70	0.15	7
11	69.28	0.15	7
12	74.25	0.15	7
13	72.6	0.15	7
14	55.36	0.15	7
15	84.95	0.15	7
16	85.39	0.15	7
17	87.68	0.15	7
18	71.87	0.15	7
19	73.18	0.15	7
20	77.92	0.15	7
21	81.01	0.15	7
22	86.19	0.15	7
23	79.98	0.15	7
24	87.8	0.15	7
25	83.56	0.15	7
26	84.44	0.15	7
27	72.14	0.15	7
28	82.31	0.15	7
29	87.28	0.15	7
30	77.32	0.15	7
31	37.39	0.15	7
32	64.58	0.15	7
33	52.49	0.15	7
34	77.77	0.15	7
35	55.82	0.15	7
36	84.75	0.15	7
37	73.51	0.15	7
38	78.21	0.15	7
39	88.75	0.15	7
40	87.04	0.15	7

Table II.B.4

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Subcatchment Infiltration Data Summary

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Subcatchment	Curve Number	Conductivity	Drying Time
41	83.14	0.15	7
42	86.58	0.15	7
43	87.07	0.15	7
44	86.03	0.15	7
46	71.09	0.15	7
47	79.08	0.15	7
48	38.74	0.15	7
49	81.87	0.15	7
50	41.22	0.15	7
51	81.06	0.15	7
52	84.84	0.15	7
53	89.28	0.15	7
54	87.09	0.15	7
55	88.86	0.15	7
56	88.99	0.15	7
57	89.02	0.15	7
58	89.19	0.15	7
59	84.94	0.15	7
60	83.7	0.15	7
61	86.41	0.15	7
62	84.28	0.15	7
63	85.04	0.15	7
64	79.62	0.15	7
65	86.1	0.15	7
66	87.62	0.15	7
67	83.86	0.15	7
68	90.44	0.15	7
69	84.44	0.15	7
70	88.35	0.15	7
71	84.89	0.15	7
72	87.1	0.15	7
73	81.88	0.15	7
74	88.81	0.15	7
75	78.88	0.15	7
76	76.61	0.15	7
77	80.95	0.15	7
78	88.44	0.15	7
79	74.21	0.15	7
80	76.02	0.15	7
81	87.21	0.15	7

Table II.B.4

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Subcatchment Infiltration Data Summary

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Subcatchment	Curve Number	Conductivity	Drying Time
82	77.63	0.15	7
83	71.85	0.15	7
84	78.18	0.15	7
85	86.37	0.15	7
86	87.27	0.15	7
87	86.61	0.15	7
88	88.03	0.15	7
89	86.82	0.15	7
90	87.18	0.15	7
91	85.01	0.15	7
92	85.99	0.15	7
93	87.18	0.15	7
94	86.96	0.15	7
95	85.15	0.15	7
96	86.53	0.15	7
97	86.65	0.15	7
98	87.58	0.15	7
99	85.66	0.15	7
100	86.07	0.15	7
101	85.72	0.15	7
102	85.93	0.15	7
103	86.11	0.15	7
104	86.21	0.15	7
105	87.22	0.15	7
106	87.41	0.15	7
107	87.04	0.15	7
108	90.35	0.15	7
109	87.81	0.15	7
110	85.88	0.15	7
111	83.62	0.15	7
112	81.91	0.15	7
113	86.11	0.15	7
114	88.21	0.15	7
115	83.04	0.15	7
116	86.87	0.15	7
117	88.16	0.15	7
118	87.2	0.15	7
119	87.64	0.15	7
120	86.49	0.15	7
121	86.85	0.15	7

Table II.B.4

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Subcatchment Infiltration Data Summary

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Subcatchment	Curve Number	Conductivity	Drying Time
122	87.45	0.15	7
123	86.47	0.15	7
124	85.38	0.15	7
125	87.15	0.15	7
126	86.48	0.15	7
127	90.48	0.15	7
128	88.61	0.15	7
129	87.5	0.15	7
131	88.43	0.15	7
132	87.89	0.15	7
133	87.52	0.15	7
134	85.43	0.15	7
135	88.06	0.15	7
136	89.88	0.15	7
137	88.38	0.15	7
138	90.21	0.15	7
139	88.18	0.15	7
140	88.29	0.15	7
141	90.38	0.15	7
142	87.65	0.15	7
143	87.75	0.15	7
144	88.3	0.15	7
145	88.16	0.15	7
146	85.84	0.15	7
147	88.75	0.15	7
148	87.4	0.15	7
149	88.9	0.15	7
150	88.35	0.15	7
151	89.74	0.15	7
152	87.72	0.15	7
153	82.96	0.15	7
154	81.27	0.15	7
155	83.83	0.15	7
156	74.86	0.15	7
157	88.22	0.15	7
158	86.84	0.15	7
159	88.89	0.15	7
160	89.84	0.15	7
161	74.87	0.15	7
162	64.03	0.15	7

Table II.B.4

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Subcatchment Infiltration Data Summary

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Subcatchment	Curve Number	Conductivity	Drying Time
163	85.22	0.15	7
164	85.98	0.15	7
165	84.67	0.15	7
166	84.67	0.15	7
167	66.69	0.15	7
168	69.7	0.15	7
169	78.13	0.15	7
170	67.46	0.15	7
171	59.82	0.15	7
172	60.79	0.15	7
173	88.88	0.15	7
174	85.76	0.15	7
175	68.96	0.15	7
176	77	0.15	7
177	78.38	0.15	7
178	88.88	0.15	7
179	74.04	0.15	7
180	83.64	0.15	7
181	87.85	0.15	7
182	89.17	0.15	7
183	77	0.15	7
184	77	0.15	7
185	77.72	0.15	7
186	55.2	0.15	7
187	76.79	0.15	7
188	53.18	0.15	7
189	63.62	0.15	7
190	74	0.15	7
191	49.03	0.15	7
192	83.44	0.15	7
193	65.15	0.15	7
194	87.91	0.15	7
195	73.07	0.15	7
196	58.14	0.15	7
197	88.12	0.15	7
198	84.84	0.15	7
199	62.98	0.15	7
200	86.49	0.15	7
201	84.83	0.15	7
202	69.59	0.15	7

Table II.B.4

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Subcatchment Infiltration Data Summary

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Subcatchment	Curve Number	Conductivity	Drying Time
203	64.54	0.15	7
204	77.16	0.15	7
205	80.94	0.15	7
206	81.31	0.15	7
207	57.87	0.15	7
208	63.74	0.15	7
209	64.47	0.15	7
210	84.4	0.15	7
211	78.73	0.15	7
212	76.28	0.15	7
213	79.52	0.15	7
214	87.66	0.15	7
215	80.62	0.15	7
216	82.9	0.15	7
217	80.53	0.15	7
218	77.93	0.15	7
219	81.4	0.15	7
220	81.84	0.15	7
221	77.17	0.15	7
222	81.65	0.15	7
223	77.63	0.15	7
224	76.6	0.15	7
225	72.13	0.15	7
226	86.02	0.15	7
227	75.69	0.15	7
228	58.96	0.15	7
229	69.03	0.15	7
230	54.19	0.15	7
231	79.48	0.15	7
232	73.3	0.15	7
233	78.82	0.15	7
234	62.09	0.15	7
235	79.28	0.15	7
236	70.57	0.15	7
237	71.45	0.15	7
238	67.6	0.15	7
239	66.6	0.15	7
240	78.61	0.15	7
241	77.61	0.15	7
242	66.3	0.15	7

Table II.B.4

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Subcatchment Infiltration Data Summary

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Subcatchment	Curve Number	Conductivity	Drying Time
243	70.93	0.15	7
244	50.12	0.15	7
245	71.92	0.15	7
246	65.53	0.15	7
247	48.79	0.15	7
248	88.26	0.15	7
249	85.8	0.15	7
250	88.2	0.15	7
251	85.08	0.15	7
252	82.87	0.15	7
254	80.67	0.15	7
255	88.18	0.15	7
256	85.82	0.15	7
257	88.47	0.15	7
258	91.42	0.15	7
259	75.17	0.15	7
260	83.97	0.15	7
261	86.16	0.15	7
262	57.66	0.15	7
263	73	0.15	7
264	59.66	0.15	7
265	69.22	0.15	7
266	72.08	0.15	7
267	78.71	0.15	7
268	79.07	0.15	7
269	82.41	0.15	7
270	58.17	0.15	7
271	89.24	0.15	7
272	79.82	0.15	7
273	80.92	0.15	7
274	84.12	0.15	7
275	73.98	0.15	7
276	75.95	0.15	7
277	86.78	0.15	7
278	89.11	0.15	7
279	87.75	0.15	7
280	84.01	0.15	7
281	84.18	0.15	7
282	87.49	0.15	7
283	89.16	0.15	7

Table II.B.4

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Subcatchment Infiltration Data Summary

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Subcatchment	Curve Number	Conductivity	Drying Time
284	87.4	0.15	7
285	91.02	0.15	7
286	89.81	0.15	7
287	88.34	0.15	7
288	85.62	0.15	7
289	79.77	0.15	7
290	86.74	0.15	7
291	87.48	0.15	7
292	89.36	0.15	7
293	89.15	0.15	7
294	63.25	0.15	7
295	85.59	0.15	7
296	87.18	0.15	7
297	72	0.5	7
298	70.41	0.15	7
299	83.24	0.15	7
300	84.92	0.15	7
301	88.03	0.15	7
302	78.38	0.15	7
303	87.18	0.15	7
304	77.66	0.15	7
305	79.4	0.15	7
306	80.14	0.15	7
307	80.17	0.15	7
308	72	0.5	7
309	72	0.5	7
323	78.38	0.5	4
331	88.75	0.5	4
340	86.58	0.5	4
341	76.02	0.5	4
Sub-01	51.59	0.15	7
Sub-02	72	0.5	7
Sub-04	72	0.5	7
347	83.44	0.5	4
355	3	0.5	4
361	3	0.5	4
362	87.18	0.5	4
377	85.76	0.5	4
395	85.76	0.5	4
396	85.76	0.5	4

Table II.B.4

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Subcatchment Infiltration Data Summary

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Subcatchment	Curve Number	Conductivity	Drying Time
412	83.82	0.5	4
423	83.44	0.5	4
438	51.59	0.5	4
444	82.41	0.5	4
445	64.54	0.5	4
471	76.28	0.5	4
504	64.47	0.5	4
510	64.47	0.5	4
516	77.93	0.5	4
529	73	0.5	4
533	79.98	0.5	4
539	91	0.5	4
541	59.66	0.5	4

APPENDIX C : FINANCIAL TABLES & CALCULATIONS

SUNRISE ENGINEERING

11 North 300 West, Washington Utah 84780
Tel 435.652.8450 | FAX 435.652.8416

Engineer's Opinion of Probable Cost

Proposed Stormwater Improvements
Santa Clara City

NO.	DESCRIPTION	EST. QTY	UNIT	UNIT PRICE	AMOUNT
1 ACROSS PIONEER PKWAY AT LAVA FLOW					
			ROUNDED TOTAL PROJECT COST		**$ 2,404,000.00**
2 SANTA CLARA DR BASIN UPSIZING					
1	GENERAL CONSTRUCTION (MOBILIZATION TRAFFIC CONTROL, ETC)	1	LS	$ 6,900.00	$ 6,900.00
2	EXCAVATION	2500	CY	$ 5.00	$ 12,500.00
3	IMPORT EMBANKMENT	1000	CY	$ 25.00	$ 25,000.00
4	RESEEDING	4200	SF	$ 2.00	$ 8,400.00
5	RIP RAP ARMORING	4200	SF	$ 4.50	$ 18,900.00
				CONSTRUCTION SUBTOTAL	$ 71,700.00
			CONTINGENCY	**20%**	$ 14,300.00
				CONSTRUCTION TOTAL	**$ 86,000.00**
1	ENGINEERING		9.3%	$ 10,300.00	$ 10,300.00
2	FUNDING		4.5%	$ 5,000.00	$ 5,000.00
3	BIDDING AND NEGOTIATING		9.0%	$ 10,000.00	$ 10,000.00
				INCENDENTAL TOTAL	**$ 25,300.00**
				ROUNDED TOTAL PROJECT COST	**$ 111,300.00**
3 CURB AND GUTTER PROJECTS - 0-10 YEAR					
1	GENERAL CONSTRUCTION (MOBILIZATION TRAFFIC CONTROL, ETC)	1	LS	$ 47,100.00	$ 47,100.00
2	SAWCUT EXISTING ASPHALT	8260	LF	$ 2.50	$ 20,650.00
3	CURB AND GUTTER	8260	LF	$ 26.00	$ 214,760.00
4	REPLACE EXISTING ASPHALT	99200	SF	$ 11.00	$ 1,091,200.00
				CONSTRUCTION SUBTOTAL	$ 1,373,710.00
			CONTINGENCY	**20%**	$ 274,800.00
				ROUNDED TOTAL PROJECT COST	**$ 1,648,600.00**
4 WINDMILL TO RED MOUNTAIN DR					
1	GENERAL CONSTRUCTION (MOBILIZATION TRAFFIC CONTROL, ETC)	1	LS	$ 232,000.00	$ 232,000.00
2	36" HDPE	2,600	LF	$ 450.00	$ 1,170,000.00
3	36" BOX	10	EA	$ 15,500.00	$ 155,000.00
4	CURB INLET	10	EA	$ 15,000.00	$ 150,000.00
5	ASPHALT WITH BASE	14,300	SF	$ 5.00	$ 71,500.00
				CONSTRUCTION SUBTOTAL	$ 1,778,500.00
			CONTINGENCY	**20%**	$ 355,700.00
				CONSTRUCTION TOTAL	**$ 2,134,200.00**
1	ENGINEERING		6.3%	$ 144,600.00	$ 144,600.00
2	FUNDING		0.2%	$ 5,000.00	$ 5,000.00
3	BIDDING AND NEGOTIATING		0.4%	$ 10,000.00	$ 10,000.00
				INCENDENTAL TOTAL	**$ 159,600.00**
				ROUNDED TOTAL PROJECT COST	**$ 2,293,800.00**

SUNRISE ENGINEERING

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5 RED MOUNTAIN - PARK VIEW - SCENIC - WASH						
1	GENERAL CONSTRUCTION (MOBILIZATION TRAFFIC CONTROL, ETC)	1	LS	$ 188,300.00	$	188,300.00
3	30" HDPE	2,850	LF	$ 310.00	$	883,500.00
4	30" BOX	10	EA	$ 15,000.00	$	150,000.00
5	CURB INLET	10	EA	$ 15,000.00	$	150,000.00
6	ASPHALT WITH BASE	14,300	SF	$ 5.00	$	71,500.00
				CONSTRUCTION SUBTOTAL	$	1,443,300.00
			CONTINGENCY	20%	$	288,700.00
				CONSTRUCTION TOTAL	**$**	**1,732,000.00**
1	ENGINEERING		6.5%	$ 121,200.00	$	121,200.00
2	FUNDING		0.3%	$ 5,000.00	$	5,000.00
3	BIDDING AND NEGOTIATING		0.5%	$ 10,000.00	$	10,000.00
				INCENDENTAL TOTAL	**$**	**136,200.00**
				ROUNDED TOTAL PROJECT COST	**$**	**1,868,200.00**
6 ACROSS LITTLE LEAGUE DR						
1	GENERAL CONSTRUCTION (MOBILIZATION TRAFFIC CONTROL, ETC)	1	LS	$ 65,500.00	$	65,500.00
2	4' X 5' RCP BOX CULVERT	80	LF	$ 475.00	$	38,000.00
3	CULVERT INLET	1	EA	$ 45,000.00	$	45,000.00
4	CULVERT OUTLET	1	EA	$ 45,000.00	$	45,000.00
5	ASPHALT WITH BASE	600	SF	$ 5.00	$	3,000.00
				CONSTRUCTION SUBTOTAL	$	196,500.00
			CONTINGENCY	20%	$	39,300.00
				CONSTRUCTION TOTAL	**$**	**235,800.00**
1	ENGINEERING		8.6%	$ 23,500.00	$	23,500.00
2	FUNDING		1.8%	$ 5,000.00	$	5,000.00
3	BIDDING AND NEGOTIATING		3.6%	$ 10,000.00	$	10,000.00
				INCENDENTAL TOTAL	**$**	**38,500.00**
				ROUNDED TOTAL PROJECT COST	**$**	**274,300.00**
7 SANTA CLARA DRIVE						
1	GENERAL CONSTRUCTION (MOBILIZATION TRAFFIC CONTROL, ETC)	1	LS	$ 216,800.00	$	216,800.00
2	30" HDPE	450	LF	$ 310.00	$	139,500.00
3	36" HDPE	2,280	LF	$ 450.00	$	1,026,000.00
4	30" BOX	2	EA	$ 15,000.00	$	30,000.00
5	36" BOX	5	EA	$ 15,500.00	$	77,500.00
6	CURB INLET	7	EA	$ 15,000.00	$	105,000.00
7	ASPHALT WITH BASE	13,425	SF	$ 5.00	$	67,125.00
				CONSTRUCTION SUBTOTAL	$	1,661,925.00
			CONTINGENCY	20%	$	332,385.00
				CONSTRUCTION TOTAL	**$**	**1,994,310.00**
1	ENGINEERING		6.3%	$ 135,700.00	$	135,700.00
2	FUNDING		0.2%	$ 5,000.00	$	5,000.00
3	BIDDING AND NEGOTIATING		0.5%	$ 10,000.00	$	10,000.00
				INCENDENTAL TOTAL	**$**	**150,700.00**
				ROUNDED TOTAL PROJECT COST	**$**	**2,145,100.00**

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8 PEARL ROSE LN								
1	GENERAL CONSTRUCTION (MOBILIZATION TRAFFIC CONTROL, ETC)	1	LS	$	39,100.00	$	39,100.00
2	30" HDPE	510	LF	$	310.00	$	158,100.00
3	30" BOX	3	EA	$	15,000.00	$	45,000.00
4	CURB INLET	3	EA	$	15,000.00	$	45,000.00
5	ASPHALT WITH BASE	2,550	SF	$	5.00	$	12,750.00
					CONSTRUCTION SUBTOTAL	$	299,950.00
				CONTINGENCY	**20%**	$	59,990.00
					CONSTRUCTION TOTAL	**$**	**359,940.00**
1	ENGINEERING		8.1%	$	32,900.00	$	32,900.00
2	FUNDING		1.2%	$	5,000.00	$	5,000.00
3	BIDDING AND NEGOTIATING		2.5%	$	10,000.00	$	10,000.00
					INCENDENTAL TOTAL	**$**	**47,900.00**
					ROUNDED TOTAL PROJECT COST	**$**	**407,900.00**
9 ACROSS COUNTRY LN							
1	GENERAL CONSTRUCTION (MOBILIZATION TRAFFIC CONTROL, ETC)	1	LS	$	76,000.00	$	76,000.00
2	30" HDPE	70	LF	$	310.00	$	21,700.00
3	36" HDPE	760	LF	$	450.00	$	342,000.00
4	30" BOX	1	EA	$	15,000.00	$	15,000.00
5	36" BOX	3	EA	$	15,500.00	$	46,500.00
6	SURFACE RESTORATION	1	LS	$	10,000.00	$	10,000.00
7	CURB INLET	4	EA	$	15,000.00	$	60,000.00
8	ASPHALT WITH BASE	2,300	SF	$	5.00	$	11,500.00
					CONSTRUCTION SUBTOTAL	$	582,700.00
				CONTINGENCY	**20%**	$	116,540.00
					CONSTRUCTION TOTAL	**$**	**699,240.00**
1	ENGINEERING		7.3%	$	56,000.00	$	56,000.00
2	FUNDING		0.6%	$	5,000.00	$	5,000.00
3	BIDDING AND NEGOTIATING		1.3%	$	10,000.00	$	10,000.00
					INCENDENTAL TOTAL	**$**	**71,000.00**
					ROUNDED TOTAL PROJECT COST	**$**	**770,300.00**
10 CURB AND GUTTER PROJECTS - 10-20 YEAR							
1	GENERAL CONSTRUCTION (MOBILIZATION TRAFFIC CONTROL, ETC)	1	LS	$	50,800.00	$	50,800.00
2	SAWCUT EXISTING ASPHALT	8920	LF	$	2.50	$	22,300.00
3	CURB AND GUTTER	8920	LF	$	26.00	$	231,920.00
4	REPLACE EXISTING ASPHALT	107100	SF	$	11.00	$	1,178,100.00
					CONSTRUCTION SUBTOTAL	$	1,483,120.00
				CONTINGENCY	**20%**	$	296,700.00
					ROUNDED TOTAL PROJECT COST	**$**	**1,779,900.00**
	TOTAL COST OF IMPROVEMENTS					**$**	**13,703,400.00**

Project	Cost Estimate (Today's $)	Est. Year of Installation	Estimated Costs with Inflation
0 To 10 Year Improvements			
Detention Facilities Projects			
2 SANTA CLARA DR BASIN UPSIZING	$ 111,300.00	2026	$ 119,000.00
Roadway Conveyance Projects			
3 CURB AND GUTTER PROJECTS - 0-10 YEAR	$ 1,648,600.00	2027	$ 1,802,000.00
Storm Drain Pipe System Projects			
1 ACROSS PIONEER PKWAY AT LAVA FLOW	$ 2,404,000.00	2025	$ 2,477,000.00
Total Costs for 0 to 10 Year Improvements	**$ 4,163,900.00**		**$ 4,398,000.00**
10 To 20 Year Improvements			
Storm Drain Pipe System Projects			
5 RED MOUNTAIN - PARK VIEW - SCENIC - WASH	$ 1,868,200.00	2033	$ 2,438,000.00
6 ACROSS LITTLE LEAGUE DR	$ 274,300.00	2034	$ 369,000.00
4 WINDMILL TO RED MOUNTAIN DR	$ 2,293,800.00	2035	$ 3,176,000.00
8 PEARL ROSE LN	$ 407,900.00	2038	$ 617,000.00
9 ACROSS COUNTRY LN	$ 770,300.00	2039	$ 1,201,000.00
10 CURB AND GUTTER PROJECTS - 10-20 YEAR	$ 1,779,900.00	2041	$ 2,942,000.00
7 SANTA CLARA DRIVE	$ 2,145,100.00	2043	$ 3,762,000.00
Total Costs for 10 to 20 Year Improvements	$ 9,539,500.00		$ 14,505,000.00
Total Costs for All Improvements	**$ 13,703,400.00**		**$ 18,903,000.00**

Projects	Current Costs	Year	Costs w/ Inflation*	Financed Cost (2.75%,30 yr)	Impact Fee Eligibility %	Impact Fee Eligible Amount
Detention Facilities Projects						
2 SANTA CLARA DR BASIN UPSIZING	$ 111,300.00	2026	$ 119,000.00	$ 176,303.00	34.25%	$ 60,384.00
		Sub total	$ 119,000.00	$ 176,303.00		
Roadway Conveyance Projects						
3 CURB AND GUTTER PROJECTS - 0-10 YEAR	$ 1,648,600.00	2027	$ 1,802,000.00	$ 2,669,722.00	34.25%	$ 914,380.00
		Sub total	$ 1,802,000.00	$ 2,669,722.00		
Storm Drain Pipe System Projects						
1 ACROSS PIONEER PKWAY AT LAVA FLOW	$ 2,404,000.00	2025	$ 2,477,000.00	$3,669,757.00	37.49%	$ 1,375,792.00
		Sub total	$2,477,000.00	$3,669,757.00		
		Total	$ 4,398,000.00	$ 6,515,782.00	Impact Fee Eligible Amount	$ 2,350,556.00
					Developable Acres (10yrs)	249.83
					Impact Fee per Acre	**$9,408.62**

* Inflation is assumed at 3%

Example Impact Fees Per Lot			
Residential			
Zone	Impact Fee Per Acre	Minimum Lot Size (acres)	Impact Fee per Lot*
RA - RESIDENTIAL AGRICULTURE ZONE	$9,408.62	0.5	$4,704.31
R-1-6 - SINGLE-FAMILY RESIDENTIAL ZONE		0.14	$1,317.21
R-1-10 - SINGLE-FAMILY RESIDENTIAL ZONE		0.23	$2,163.98
R-1-10/ML - MIXED LOT SIZE ZONE		0.23	$2,163.98
PDR - PLANNED DEVELOPMENT RESIDENTIAL ZONE		0.083	$780.92

Commercial			
Zone	Impact Fee Per Acre	ESU Factor**	Impact Fee per Lot
COMMERCIAL ZONE	$9,408.62*ESU Factor	Impervious Area (SF)/3,500 SF	ESU Factor*Lot Size (Acres)*$9,408.62

*Impact fee is based on lot size per acre, not a fixed fee per lot. Impact fees given by minimum lot size are for example only.
**ESU Factor is given by dividing the Impervious area by the average assumed residential impervious area of 3,500 SF (as given in City of Santa Clara Resolution No. 2004-06R). For an example lot size of 0.75 acres and 7,500 SF of impervious area, the impact fee for the lot would be 0.75 acres*7,500 SF/3,500 SF*$9,408.62/acre = $15,121.00

	Buildout	2024	2033
Total Acres	1981.94	1396.85	1646.68
Delta	585.09	0.00	249.83

	Basin 1	Basin 2	Basin 3	Total
2024 (current)acres	233.71	816.84	346.30	1396.85
2033 (10-year) acres	284.96	995.95	365.78	1646.68
Delta	51.25	179.11	19.48	249.83

Basin	Developable Acres	Total Acres	%
1	140.17	373.88	37.49%
2	425.44	1242.28	34.25%
3	19.48	365.78	5.33%

APPENDIX D : IMPACT FEE CERTIFICATION

CERTIFICATION OF IMPACT FEE ANALYSIS BY CONSULTANT

In accordance with Utah Code Annotated § 11-36a-306, Nathan Wallentine, P.E., on behalf of Sunrise Engineering, LLC, make the following certification:

I certify that the attached Impact Fee Facilities Plan and Impact Fee Analysis:

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

Nathan Wallentine, P.E., makes this certification with the following qualifications:

1. All of the recommendations for implementation of the Impact Fee Facilities Plan ("IFFP") made in the IFFP documents or in the Impact Fee Analysis documents are followed in their entirety by the Santa Clara City, Utah, staff, and elected officials.
2. If all or a portion of the IFFP or Impact Fee Analyses are modified or amended, this certification is no longer valid.
3. All information provided to Sunrise Engineering, Inc., its contractors or suppliers, is assumed to be correct, complete and accurate. This includes information provided by Santa Clara City, Utah, and outside sources.

4. The undersigned is trained and licensed as a professional engineer and has not been trained or licensed as a lawyer. Nothing in the foregoing certification shall be deemed an opinion of law or an opinion of compliance with law which under applicable professional licensing laws or regulations or other laws or regulations must be rendered by a lawyer licensed in the State of Utah.

5. The foregoing Certification is an expression of professional opinion based on the undersigned's best knowledge, information and belief and shall not be construed as a warranty or guaranty of any fact or circumstance.

6. The foregoing certification is made only to Santa Clara City, Utah, and may not be used or relied upon by any other person or entity without the expressed written authorization of the undersigned.

Sunrise Engineering, LLC.

By: ___________________________

Dated: ________________________