

# ESTRELLA AND LAVEEN DRAINAGE STRUCTURE COST ANALYSIS

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*Prepared for:*



**City of Phoenix**

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## SECTION 1: INTRODUCTION

### 1.1 General

JE Fuller/ Hydrology and Geomorphology, Inc. (JE Fuller) has been retained by the City of Phoenix to conduct a drainage facility cost analysis for the Estrella and Laveen Infrastructure Financing Plan (IFP) areas (EL Area). The City of Phoenix assesses impact fees to fund construction of drainage facilities along arterial roadways and to also fund large regional drainage systems. To more accurately anticipate the public costs of such facilities, the City requires an evaluation of the natural drainage system that identifies major drainage corridors, expected peak discharge rates, drainage structure type and size, and drainage maintenance issues.

The purpose of the analysis for each of the two IFP areas was to:

- Identify future drainage structure and storm drain requirements in planned and existing arterial streets within each IFP area.
- Assess and incorporate past and future costs associated with regional drainage systems and detention basins that serve the IFP area drainage needs, but that are not located specifically along an arterial roadway alignment.
- Provide comments or suggestions related to drainage facility construction or maintenance issues that might arise from the on-site investigations or review of technical documents and models.

The City of Phoenix will use the information in this study to summarize drainage facility costs for the purposes of calculating impact fees for each IFP area. This information may also assist in the preparation of future capital improvement plans and preliminary street design efforts.

### 1.2 Location

*The EL Area is generally situated in southern Phoenix. The Estrella area is roughly bounded by 43rd Ave on the east, Interstate 10 on the north, 107th Ave on the west, and the Salt River on the south. The Laveen area is roughly bounded by 27th Ave on the east, South Mountain Park on the south, the Gila River Indian Community on the west, and the Salt River on the north. There are several, small Unincorporated Maricopa County islands within the study area.*

Figure 1 indicates the EL Area respective to the City of Phoenix corporate boundaries. Figure 2 details the individual limits of the Estrella and Laveen IFP Areas and indicates the existing and proposed arterial roadways and current FEMA delineated 100-year floodplains.

### 1.3 Study Scope

Eight general tasks define the scope of work for this project. The goal for this analysis is to update the previous ELA Drainage Structure Cost Analysis (JE Fuller, 2003) (less the Ahwatukee study area) by collecting up-to-date data through coordination with agencies including the City of Phoenix, FCDMC, ADOT, MCDOT and others (Task 1). This study will also include crafting an updated existing drainage and infrastructure framework (Task 2), updating (where applicable) drainage structure discharges (Task 3),

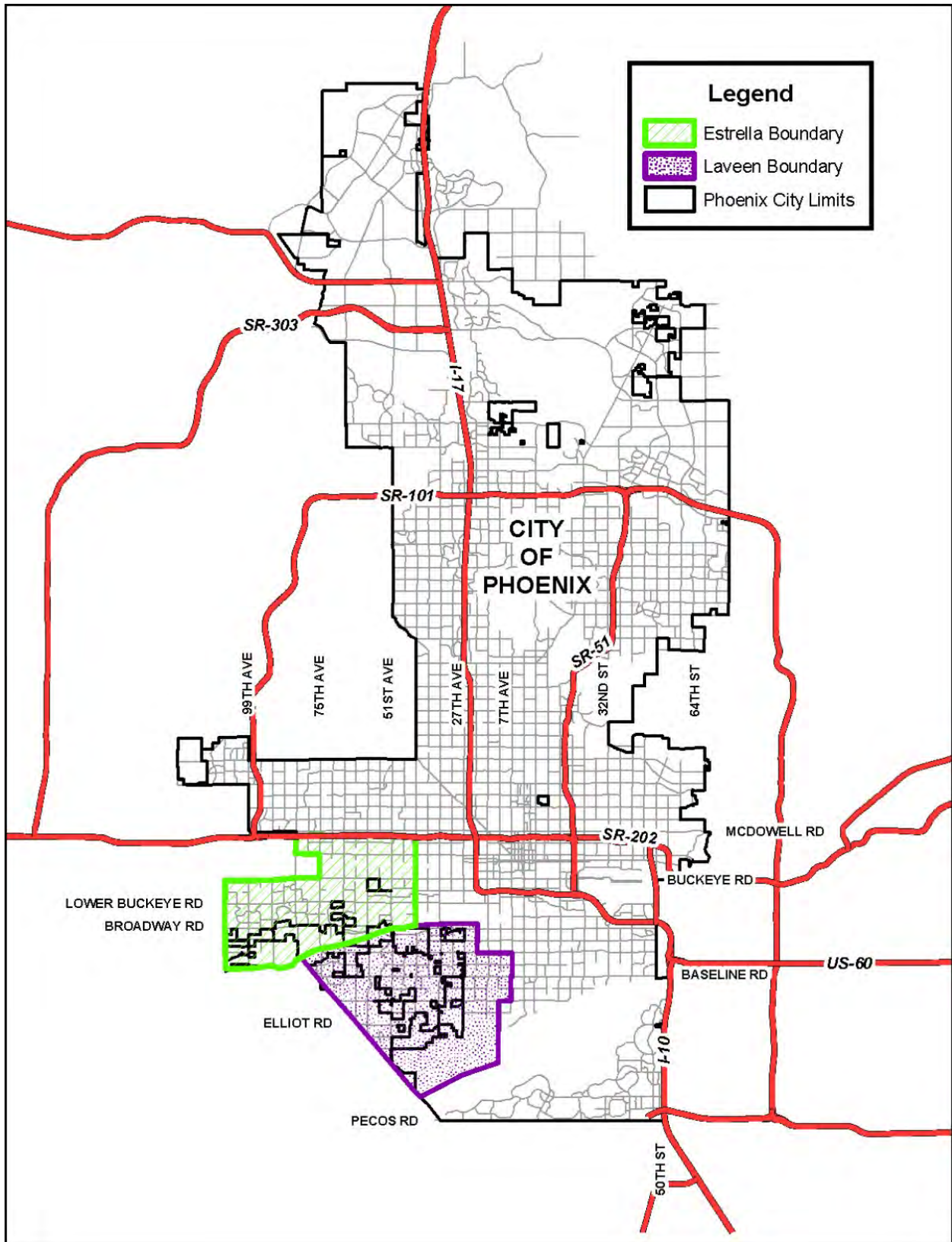


Figure 1. EL Area Vicinity Map

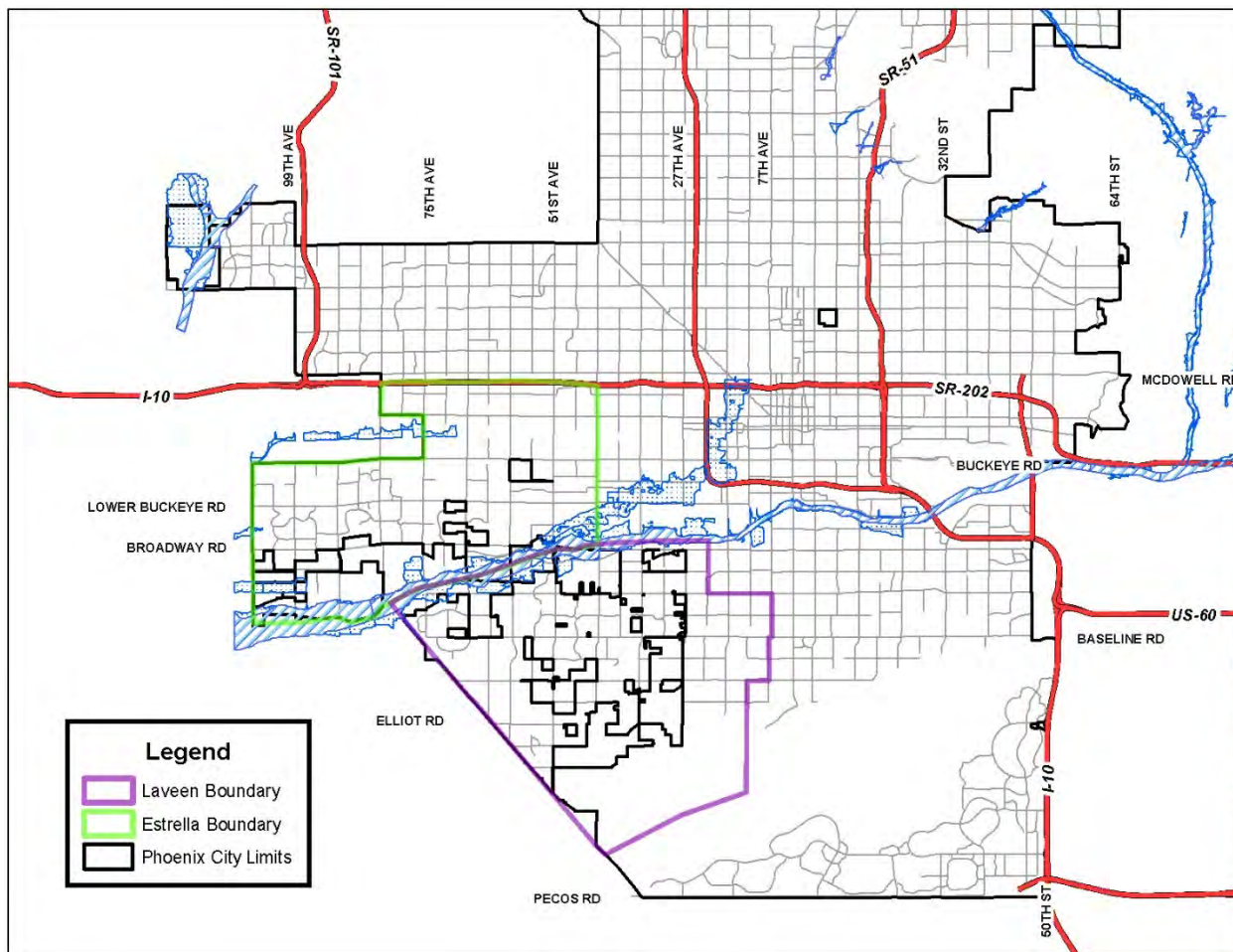


Figure 2. EL Area roadways and floodplain map

updating the drainage crossing structures inventory and their costs (Task 4) as well as updating the arterial storm drain and irrigation tiling facilities inventory inclusive of cost estimates (Task 5). The remaining tasks include compiling a regional drainage facilities inventory and organizing any available cost-share data (Task 6), providing an updated drainage structure cost analysis report (Task 7).

## 1.4 IFP Area Characteristics

### 1.4.1 Estrella

The Estrella IFP Area is characterized by relatively flat topography that generally drains to the Salt River in a southwesterly direction. Most of the area was once predominantly agricultural with field grading that is typical for row or border-strip type irrigation applications. Irrigation delivery and tailwater ditches are numerous, and often become the primary watercourse alignments. The roadways are laid out in typical east-west, north-south grid patterns and significantly impact the drainage patterns for the area. The Interstate 10 corridor forms a drainage barrier to flows from the north. The Union Pacific Railroad runs east-west through the study area along the half-mile alignment between Van Buren Street and Buckeye Road, forming a barrier that concentrates and ponds runoff along the upstream (northern) side. The one-

mile corridor centered along the railroad is comprised of primarily light to heavy industrial development. South of Buckeye Road, many new subdivisions are either under construction or being platted. The rest of the area remains agricultural.

#### *1.4.2 Laveen*

The Laveen IFP Area is characterized by relatively flat topography that generally drains to the Salt River in a northwesterly direction. The southern limits of the Laveen area extend into South Mountain Regional Park, hence many of the arterial streets end south of the Dobbins and Elliot Road alignments. Except for the foothills, most of the area was once predominantly agricultural with field grading that is typical for row or border-strip type irrigation applications. Irrigation delivery and tailwater ditches are numerous and significantly impact drainage patterns. Central to the Laveen area is a major tailwater drainage corridor called the Maricopa Drain, which is a regional low point that drains westerly and parallel to the Salt River. This drain ultimately confluences with the Salt River at about the 83<sup>rd</sup> Avenue alignment near the confluence with the Gila River. The roadways are laid out in typical east-west, north-south grid patterns and significantly impact the drainage patterns for the area. Residential and commercial development is rapidly occurring in this area and is often outpacing the construction of regional drainage improvements.

### **1.5 Report Format**

Sections 2 through 8 of this report are organized to discuss and present the results for each of the contract scope of work Tasks 1 through 7, respectively.

The entire report is provided as a PDF file on the enclosed CD at the back.



## SECTION 2: DATA COLLECTION

### 2.1 General

A comprehensive search of relevant documents or studies was made with each of the following agencies:

- City of Phoenix
- Flood Control District of Maricopa County
- Arizona State Land Department
- Arizona Department of Transportation
- Salt River Project

### 2.2 Paper and Digital Files

Data collection efforts included the acquisition or research of the following available information in paper and/or digital format, from the above listed sources:

- Topographic mapping (2-foot contour interval mapping, various production years)
- Recent bid-tabulations from multiple agencies
- Intergovernmental agreements (IGAs) for drainage projects that involved two or more participating agencies
- Final drainage reports
- GIS shapefiles
- City of Phoenix Street Classification Mapping
- National Flood Hazard Layer Data (NFHL)
- Digital Terrain Model data (DTM)

### 2.3 Data Collection Results

The EL Area has been hydrologically analyzed or studied as a part of master drainage plans for large, master planned communities, regional flood control projects, area drainage master plans, watercourse master planning studies, and regional roadway drainage design studies. A comprehensive bibliography of the data sources obtained or reviewed is provided in Appendix A. Discharge estimates from existing studies were used to size future drainage structures and storm drains where appropriate.

## SECTION 3: IDENTIFICATION OF MAJOR STREAM CORRIDORS

### 3.1 Major Watercourse Identification

The identification of major watercourses is important to the EL Area analyses in that the delineated watercourses are assumed to require a drainage structure at each arterial roadway crossing. Accordingly, each watercourse delineated will directly correlate to the cost of existing and/or potential drainage structures, with significant impacts to the IFP fees for the area.

Major watercourses within the EL Area can be classified into one of two categories:

1. Natural local washes
2. Regional watercourses
3. Irrigation Canals and Laterals

Natural local washes are those washes that occur naturally and generally originate within or closely to, the immediate study boundaries. For example, there is a local wash that emanates from South Mountain and crosses 35<sup>th</sup> Avenue south of Elliot Road in the Hidden Valley portion of the Laveen Area.

Regional watercourses are conveyance corridors (natural or manmade) that either originate a significant distance offsite to, and extend beyond the boundaries of the study area, or that traverse a significant portion of the study area length. Regional watercourses can be natural, man-made, existing or proposed.

There are several irrigation canals and laterals located within the EL Area that require either culverts or small bridges at the locations where they intersect the arterial streets.

Table 1 summarizes the regional watercourses and irrigation canals identified for the EL Area. The major watercourses identified by this analysis are depicted on Plates 1 and 2, which are included at the back of this report.

Federal Emergency Management Agency (FEMA), 100-year Special Flood Hazard Areas (SFHA) are delineated for the Salt River and some of the ponding areas upstream of the Union Pacific Railroad (UPRR). Each of these delineations are indicated on Figure 2.

Future drainage infrastructure associate with the Arizona Department of Transportation (ADOT) Loop 202 South freeway will also influence drainage patterns along the freeway's alignment. The ADOT improvements are considered in the drainage structure evaluations presented herein.

*Table 1. Summary of major watercourses identified for the EL Area*

<b>Watercourse Name</b>	<b>IFP Area(s) Impacted</b>	<b>Natural or Man-Made</b>	<b>Existing or Proposed</b>	<b>Comments</b>
Salt River	Estrella and Laveen	Both	Existing	Large watercourse that requires full bridge crossings.
Roosevelt Irrigation District Canal	Estrella	Man-Made	Existing	Irrigation lateral that extends across most of the Estrella Area from east to west. Will require widening of bridge crossings with arterial improvements.
Buckeye Feeder Canal	Estrella	Man-Made	Existing	Large tailwater ditch that becomes a delivery lateral near 107th Avenue.
Durango Regional Conveyance Channel	Estrella	Man-Made	Existing and Proposed	Recommended alternative from the Durango ADMP. System is comprised of channels, culverts and detention basins. DRCC Ph. 1 has been completed inclusive of two detention basins and large storm drain that outlets into the Salt River.
Sunland Avenue Channel	Estrella	Man-Made	Proposed	Recommended alternative from the Durango ADMP. System is comprised of channels, culverts and detention basins.
47th Avenue Channel	Estrella	Man-Made	Proposed	Recommended alternative from the Durango ADMP. System is comprised of channels, culverts and detention basins.
Maricopa Drain	Laveen	Both	Existing	SRP regional tailwater ditch.
Laveen Area Conveyance Channel	Laveen	Man-Made	Existing	Channel system that replaced and enlarged the Maricopa Drain west of 43 <sup>rd</sup> Avenue to provide a regional drainage system. Completed in 2009.
Western Canal	Laveen	Man-Made	Existing	Irrigation delivery canal and laterals.

## SECTION 4: IDENTIFICATION OF ROAD ALIGNMENTS

### 4.1 General

Base roadway alignments and category classifications were provided by the City of Phoenix Street Transportation Department in a GIS file coverage for the entire City. That data is based on the currently adopted Street Classification Map (SCM)<sup>1</sup>. The analyses presented herein are focused primarily on arterial roadways and their improvement status as presented on the adopted SCM, which are generally described as:

1. *Typical Design Cross Section* – Standard ultimate planned right-of-way and pavement width.
2. *“X” Cross Sections* – Typically an existing roadway built to a modified section (most built before 1992).
3. *“Z” Cross Sections* – Future or incomplete arterials streets with modified cross sections.

Each identified arterial roadway was visually inspected using current 2017-2018 aerial photography to determine which lengths of roadway are likely to require future drainage infrastructure. Typically, fully improved existing arterials are assumed to have been constructed with full drainage improvements and are not anticipated to require additional drainage infrastructure.

### 4.2 Results

The final alignments used to identify drainage impacts are indicated on Plates 1 and 2. Table 2 summarizes the various standard characteristics of each roadway category.

*Table 2. Summary of arterial roadway categories and characteristics*

<b>Roadway Category</b>	<b>Planned Right of Way Width (ft)</b>	<b>Planned Pavement Width (ft)</b>
A	140	104 <sup>1</sup>
B	130	94 <sup>1</sup>
C	110	74
CM	110	74 <sup>1</sup>
D	100	64

<sup>1</sup> This value includes a raised center median.

<sup>1</sup> City of Phoenix *Street Classification Map*, Resolution # 21208, dated March 19<sup>th</sup>, 2014.

## SECTION 5: DRAINAGE STRUCTURE DISCHARGE ESTIMATES

### 5.1 General

A key element to the drainage structure and storm drain analyses is the estimation of peak discharges at critical locations for each type of structure. For arterial road crossings (culverts or bridges), the City of Phoenix has generally established a policy that stipulates new major arterial drainage crossing structures be designed to convey a 100-year flood without overtopping the roadway. Accordingly, 100-year peak discharge estimates are the primary focus of all culvert and bridge analyses. The City policy for storm drain design is to intercept and convey 100 percent of the 2-year storm generated within the right-of-way. Peak discharges for the EL Area are established by adopting previously estimated values from existing drainage studies and reports. Where needed, simple rational method calculations were conducted to determine peak discharges.

### 5.2 Previously Established Discharges

The primary sources<sup>2</sup> for existing peak discharge estimates come from the hydrologic analyses provided within the following drainage design reports and/or area drainage master plans:

- Durango Area Drainage Master Plan [Dibble, 2001] (Estrella Area)
- Design Hydrology for the Laveen Area Conveyance Channel [FCDMC, 2002] (Laveen Area)
- FLO-2D Modeling for the Laveen Area Drainage Master Plan Update [JE Fuller, 2017] (Laveen Area)

### 5.3 Storm Drain Discharge Estimates

For the purposes of this analysis, new or proposed storm drain segments not previously sized by area drainage master plans or other detailed studies, are classified as either laterals or main lines. Storm drains are also divided into approximately one-mile sections (usually with multiple segments) as the Arterial and Major Arterial roadways are laid out in 1-mile squares. Laterals are defined as a single extension from the main line. The main line is defined as a segment of storm drain that drains one or more laterals. Only laterals and mains that are, or will be, located within an arterial roadway are considered.

Discharges were calculated for each arterial section lacking drainage conveyance and assumed a fully developed right-of-way. Storm drains were sized (see Appendix D) to convey the discharge generated by that roadway section plus any flow from laterals contributing to the system. Proposed storm drain systems are assumed to discharge at regional outfalls or large detention basins, or at the project boundary. Due to the nature of this project, timing of flow peaks were not considered when sizing the storm drain systems. Segment flows were the result of an additive tabulation as storm water was introduced at each segment or lateral tie-in location (see Appendix D).

Roadway discharges were calculated using the Rational Method with simplifying assumptions (assumptions listed in Section 7.2.1). Factors affecting discharge and roadway capacity include roadway cross section width/contributing area, Manning's n-value/run-off coefficient and longitudinal slope at that

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<sup>2</sup>See Bibliography in Appendix A for a complete reference listing.

location. Normal depth calculations were performed to determine a maximum flow that can be conveyed in the half-street before exceeding the City of Phoenix roadway spread criteria for a 2-year event. Once the maximum discharge was identified, the rational method was used to back-calculate a contributing area that would result in the flow limitation. After identifying the roadway cross-section geometry at each stretch, JE Fuller was able to calculate a roadway length that equates to the maximum allowable contributing area.

Following the steps above, a contributing flow was identified, and storm drains were then sized to convey the accumulated flows. Manning's equation for conduits was used to identify an appropriately dimensioned storm drain that can pass that flow at the respective HGL slope.

For this planning level analysis, the cost estimates and hydrologic calculations are considered reasonable for the ultimate purpose of calculating impact fees. The discharges estimated for each segment of storm drain are summarized in Appendix D.

#### **5.4 Application of Discharges**

It is noted that the discharges presented herein are concept level *estimates* and should not be construed to be accurate for preliminary or final drainage design purposes. A detailed hydrologic analysis should be performed to identify the many complicating characteristics that could alter these discharge estimates such as flow splits, new development, new roadways, higher resolution topography, and the effects of retention/detention basins. The discharges presented herein are solely used for conceptually estimating drainage structure sizes and costs for impact fee analysis of the EL Area.

## SECTION 6: DRAINAGE CROSSING STRUCTURES

### 6.1 Drainage Structure Selection Criteria and Guidelines

#### 6.1.1 General

Proposed drainage crossing structures for the EL Area are either estimated by JE Fuller using the guidelines and criteria outlined below, or are obtained from the preferred alternative drainage plan provided in either the Durango Area Drainage Master Plan [Dibble, 2002] or the Laveen Area Drainage Master Study/Plan Update [JE Fuller, 2017]. Additional crossing structures are also estimated by JE Fuller for the major canal crossings within both the Estrella and Laveen study areas. For the purposes of this analysis, only the non-area drainage master plan (ADMP) structures will be summarized in this section. All the ADMP identified crossing structures will be discussed and summarized in Section 8 of this report.

Washes within the study area typically exhibit bank-full capacities that range between a 2-year and 10-year flood. Flows exceeding the bank capacities continue down gradient either within the watercourse over-banks or as avulsions or split flows to adjacent watercourses. Changes in topography/geology cause washes to lose definition and the conveyance mechanism transitions from concentrated wash flow to predominantly overland sheet flow. Given these complex characteristics, elements to consider in evaluating conveyance and constructability include:

- Estimation of design discharges,
- Watercourse geometry and slope,
- Sediment transport capacity of washes and culverts,
- Watercourse sediment continuity,
- Residential and commercial development,
- Roadway profiles with respect to existing watercourse alignments and bed elevations,
- Culvert profiles and cover depths,
- Available headwater depths,
- Inlet and outlet headwall selection and geometry,
- Erosion and scour protection,
- Upstream and downstream channel stability,
- Maintenance access and equipment requirements,
- Culvert materials and geometry,
- Available rights-of-way,
- Soils conditions, and
- Construction accessibility.

Combinations and variations of all these elements can significantly impact design complexity and construction costs. It is also noted that drainage structures sized solely to reduce construction costs often end up as major long-term maintenance items and/or candidates for replacement.

#### 6.1.2 Structure Types

For this impact fee analysis, drainage crossing structures are classified into two primary categories of either culverts or bridges. In general, culverts are typically single or multiple barrel conveyance tubes with

geometric configurations that can be varied to fit the hydraulic and physical constraints of a drainage crossing. Bridges are typically used when span width or clear opening requirements exceed the reasonable limits of standard culvert combinations.

**Culverts** – Culverts are generally used to convey drainage from local watersheds under the roadway. Culvert geometries and composition materials vary depending upon the application, size, environment, design discharge, and hydraulic requirements. Typical culvert geometry types include:

- Circular
- Rectangular
- Arch
- Oval
- Compound Arches

Typical material types include:

- Concrete (reinforced, non-reinforced, pre-cast, and cast-in-place)
- Corrugated Metal (steel and aluminum)
- High Density Poly-Ethylene (HDPE)

For the EL Area, the following list of criteria was developed for the conceptual sizing of cross drainage culverts on arterial roadways that are not a part of an area drainage master plan. These criteria are based on discussions with City of Phoenix staff, observations of existing culverts in the area, and previous design experience.

- All culverts shall be sized to convey the 100-year event with no overtopping of the roadway.
- All culverts shall have a geometry that will permit maintenance, with a minimum width of 4-feet and a minimum height of six-feet. These dimensions are the minimums dictated by maintenance machinery requirements of the City of Phoenix.
- Culvert inverts may be sacrificially buried to accommodate low head or shallow wash crossings as long as the total (buried plus open) opening satisfies the minimum six-foot height standard.
- Culverts shall be designed to convey the bank-full discharge in the wash with minimal head loss in order to maintain sediment transport continuity on the watercourse.
- Culverts shall not be used when the 100-year peak discharge estimate is greater than 4,000 cfs.

For this analysis, a simplifying assumption is made that most culverts will function under inlet control hydraulics. The Federal Highway Administration (FHWA, 2012) has published inlet control design nomographs for various culvert shapes, sizes, materials, and inlet geometries that can be used to size culverts based on available headwater and design discharge parameters. For estimating the drainage impact fees, all non-bridge drainage structures in the EL Area are considered to be reinforced concrete box (RCB) culverts with inlet and outlet headwalls and a concrete outlet apron. The available headwater depth is assumed to be equal to the height of the culvert with a minimum of 4-feet. and all RCB culverts are assumed to be six-feet in height<sup>3</sup>. Using the appropriate FHWA nomograph and an assumed available

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<sup>3</sup> For RCBs, a 4-foot available headwater depth assumes 2-feet of the culvert is sacrificially buried.



headwater depth of four feet, a unit discharge capacity of 23 cubic feet per second (cfs) per sq. foot of opening is calculated. This unit discharge will be used to establish the culvert widths at each proposed crossing. Table C-1 in Appendix C summarizes the culverts sized for each of the arterial road crossings.

**Bridges** – Bridges are typically used for crossing large, regional watercourses or other drainages where a span width is required that is greater than what can be typically accommodated by a culvert. Bridges are also typically used at roadway crossings of major irrigation canals to avoid impacting the canal hydraulics.

When design discharges reach a certain magnitude or when the required minimum span widths exceed 20-feet individually and 100 feet collectively, it becomes more economical to build a bridge rather than multiple barrel culverts. Bridges can also be constructed with little or no encroachment onto the main low-flow channel of a watercourse.

Concept design guidelines for selecting and sizing structures of these types was previously provided by JE Fuller in the impact fee analysis report for the Desert View Planning Area<sup>4</sup>, which is herein referred to as the Desert View Report. Those same guidelines are applicable to structure design and selection in the EL Area.

### 6.1.3 Summary and Conclusions

**Culverts** – There was only one non-ADMP culvert identified for the EL Area. The width of box for the new culvert structure is based on the unit discharge capacity of 23 cfs per foot, as determined using the FHWA inlet control nomographs. A summary of the culvert sized for the crossing indicated on Plate 2, is provided in Table C-1 in Appendix C.

**Bridges** – The only potentially new bridges in the EL Area are the Salt River crossings at 67<sup>th</sup> and 75<sup>th</sup> Avenue and the proposed Avenida Rio Salado. There were no other crossings identified that required or were likely going to construct a bridge. The proposed Salt River bridges are assumed to be the same span length as the existing bridge at 51<sup>st</sup> Avenue. The widths are assumed to be compatible with the planned roadway cross section.

**Canal Crossing Structures** – There were no canal crossings identified for future widening at arterial roadway crossings in the EL Area.

## 6.2 Summary of Unit Costs

Recent bid-tabulations and as-built plans were used to develop representative unit costs for crossing structures. Total item costs were taken from multiple recent COP, ADOT and FCDMC bid-tabulations, and structure geometries were verified by reviewing the corresponding as-built documents. With these resources, JE Fuller developed a method for preliminarily estimating the structure cost using the proposed geometry. For culverts, a unit dollar cost per square foot of opening per linear foot of box was developed and included the attendant wingwalls and outlet aprons. Bridges are estimated using a unit dollar cost per square foot of bridge deck. Recent bid tabulations for RCB culverts and attendant wingwalls and outlet aprons, were calculated to range from \$17 to \$29 per square foot of opening per linear foot of box.

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<sup>4</sup> JE Fuller/ Hydrology & Geomorphology, Inc., 2002, *Desert View Arterial Street Drainage Structure Analysis*

A fourth estimate using RSMMeans yielded a cost of approximately \$22 per square foot of opening per linear foot of box. Based on these results, the unit cost recommended for RCB culverts is assumed to be \$25 per square foot of opening per linear foot of box. The unit cost for bridges is recommended to be \$130 per square foot of bridge deck. Table 3 summarizes a typical application of the culvert and bridge unit costs for various structures found within the EL Area.

*Table 3. Example calculations of proposed structure costs*

<b>Structure Type</b>	<b>Size Description</b>	<b>Construction Cost Calculation</b>	<b>Comments</b>
RCBC Culvert	Span = 10 feet Height = 6 feet No. of Barrels = 1 Culvert Length = 100 feet	= (10' x 6' x 100') x \$25/sf/lf = \$150,000	1
RCBC Culvert	Span = 8 feet Height = 6 feet No. of Barrels = 3 Culvert Length = 120 feet	= (8' x 6' x 3 x 120') x \$25/sf/lf = \$432,00	1
Bridge	Span Length = 120 feet Bridge Deck Width = 110 feet	= (110' x 120') x \$130/sf of deck =\$1,716,000	2
Comments: 1. RCBCs priced \$25/sf of opening /lf of the box. 2. Use Bridge unit price of \$130 per sf of deck.			

### 6.3 Total Drainage Facility Costs

Line item construction costs for each new arterial non-ADMP drainage and canal crossing are summarized in Table C-1 of Appendix C. Table 4 summarizes the total drainage crossing structure costs for the EL Area. The reported costs are presented by individual IFP area (Estrella and Laveen) with a stand-alone column summarizing the three Salt River bridge costs. The bridges are summarized separately as the bridges (and hence their costs) are related to multiple IFP areas.

*Table 4. List of EL Area major arterial crossing structure costs not associated with an ADMP*

<b>Cost Estimate Category</b>	<b>ESTRELLA</b>	<b>LAVEEN</b>	<b>SALT RIVER BRIDGES</b>
Number of Structures	0	1	3
Construction Cost Estimate	\$0	\$360,000	\$48,750,000
8.58% Engineering Design Fees	\$0	\$30,088	\$4,182,750
30.49% Administrative Overhead	\$0	\$109,764	\$14,863,875
<b>Total Costs:</b>	<b>\$0</b>	<b>\$499,852</b>	<b>\$67,796,625</b>

In summary, the overall costs presented in this analysis are a good estimate of the drainage crossing structure cost impacts in these regions that are not included in any proposed ADMP regional solutions. The projected costs for drainage crossing structures are small when compared to the potential costs associated with construction of any of the Salt River bridges. The three Salt River bridges are a low priority for the City of Phoenix and none are included in the 2018-2023 Capital Improvement Program (CIP) list of projects.

## SECTION 7: ARTERIAL STORM DRAIN AND IRRIGATION TILING

### 7.1 General

Storm drains and irrigation tiling will ultimately be required for many of the EL Area arterial roadways once they are fully developed or significantly improved. It is anticipated that most development adjacent to the roadways will ultimately be constructed with onsite retention per current City of Phoenix requirements. In some cases, however, the storm drain will precede the development and require enough capacity to convey the two-year runoff from the adjacent properties.

Irrigation delivery laterals and tailwater ditches maintained by the Salt River Valley Water Users Association (SRVWUA) are numerous in the Estrella and Laveen IFP Areas. Typically, when arterial roadway improvements encroach upon one of these ditches, the City is required to “tile” the ditch by converting the canal to underground pipes. This can be an expensive part of arterial roadway improvements, and therefore is being included in the impact fee program.

### 7.2 Arterial Storm Drains

#### 7.2.1 Design Guidelines

The City of Phoenix criteria for storm drain sizing and design in arterial streets is established in the City of Phoenix Drainage Manual<sup>5</sup>. The following is a list of the key criteria used in this analysis:

- Design storm is a 2-year event
- Minimum pipe size of 18 inches
- For a 2-year event, maintain a single dry lane (12 feet wide) in both directions
- Maximum catch basin spacing of 660 feet
- Maximum distance between manholes is 500 feet

In typical storm drain design, the size and location of storm drains are dictated by hydrology, street capacity and available hydraulic gradient. The street and storm drain capacities are directly related to the natural ground slope and the hydrology is based on the tributary area land use and conveyance characteristics. The estimation of the design hydrology for the storm drain analysis is summarized in Section 5.

The following assumptions were made regarding the street capacity:

- Maximum spread width from face of gutter is 18 feet
- Maximum depth in gutter is 0.46 feet (pavement cross slope of 2 percent, and standard MAG gutter)
- Manning’s equation normal depth hydraulics
- Manning’s n-value is 0.015
- Street slope is equal to natural ground slope

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<sup>5</sup> City of Phoenix, December 2013, (Draft), *City of Phoenix Storm Water Policies and Standards*

The following assumptions were made regarding the storm drain capacity:

- Full flow capacity is calculated using Manning’s Equation
- Manning’s n-value is 0.013
- Minimum full flow velocity is greater than 3 feet per second
- Hydraulic grade line slope is equal to 70 percent of ground slope<sup>6</sup>

### 7.2.2 Unit Cost Estimates

Storm drain costs are estimated in two components. The first is the pipe cost of the lateral or main line. The second is a comprehensive unit cost for all the ancillary storm drain structures including catch basins, manholes, connector pipes, and fittings. All unit costs are based on data found in recent bid-tabulations collected as a part of this project. Table 5 summarizes the unit prices used for each size of storm drain pipe. Table 6 summarizes the development of the average unit cost per foot of storm drain, for all the ancillary storm drain structures. The estimated storm drain construction costs per segment of arterial roadway are summarized in Appendix D.

*Table 5. Summary of storm drain pipe unit costs*

<b>Storm Sewer Pipe Size (inches)</b>	<b>Unit Type</b>	<b>City of Phoenix Bid Tabulation Item No.</b>	<b>Unit Cost from Bid Tabulations (per LF)</b>
18	LF	M6180018	\$85
24	LF	M6180024	\$100
30	LF	M6180030	\$120
36	LF	M6180036	\$166
42	LF	M6180042	\$211
48	LF	M6180048	\$305
54	LF	M6180054	\$320
60	LF	M6180060	\$360
66	LF	M6180066	\$385
72	LF	M6180072	\$410
78	LF	M6180078	\$435
84	LF	M6180084	\$460
90	LF	M6180090	\$485
96	LF	M6180096	\$510
102	LF	M6180102	\$535
108	LF	M6180108	\$560

<sup>6</sup> This assumption allows for inherent losses in the pipe system (junctions, manholes, etc.) and for flattening of pipe slopes to discharge storm drain to natural outfalls.

Table 6. Average unit cost calculations for ancillary storm drain structures

<i>Item Description</i>	<i>Unit Type</i>	<i>No. of Units</i>	<i>Unit Cost</i>	<i>Total</i>
<b>Catch Basins</b> - Assume one every 500 ft	Each	22	\$2,875	\$63,250
<b>Manholes</b> - Assume one every 500 ft	Each	10	\$5,750	\$57,500
<b>Prefab Tees</b>	Each	22	\$500	\$11,000
<b>15" Connector Pipes</b> - Assume 50 ft per CB	LF	1100	\$80	\$88,000
<b>Total Cost per Mile of Street</b>				\$219,750
<b>Unit Cost of Items per Foot of Street</b>				\$42

### 7.2.3 Concept Design Results and Costs

Typical street and storm drain capacities for given slopes and street classifications are summarized in the data provided in Appendix D. The proposed arterial storm locations are shown on Plates 1 and 2. Proposed pipe sizes and lengths for each IFP area are summarized in Appendix D. Each length of storm drain is typically based on a one-mile reach and is subdivided into up-to 4 segments that are sized using the estimated 2-year discharge and hydraulic grade line slope.

### 7.3 Irrigation Tiling Requirements

The tiling of irrigation delivery laterals and tailwater ditches is usually required when arterial roadway widening or intersections cross existing irrigation delivery or tailwater ditches. Most of the irrigation facilities owned by the SRVWUA are typically located along sectional property boundaries, which usually are coincident with arterial roadway alignments. Occasionally, the irrigation work will also require relocating pumps, irrigation turnouts, junction boxes, and other items that can significantly add to the cost.

Identification of candidate irrigation facilities that may require tiling was accomplished using the 2018 SRVWUA Zanjero Area Maps [SRP, 2018] which are included in Appendix E for reference. Each delivery and tailwater ditch segment identified as open (un-tiled) on the maps was checked against the 2016 aerial photography and potential tiling lengths were developed for specified segments of arterial roadways. The results of that analysis are provided in Table E-1 in Appendix E. No attempt was made to size the irrigation tiles. Instead, the average figure of \$100 per foot (\$528K per mile) used in the 2003 ELA study (JE Fuller, 2003) was adjusted to reflect 2018 dollars, resulting in a new unit cost of \$165 per foot.

## 7.4 Total Storm Drain and Irrigation Tiling Costs

Table 7 summarizes the total storm drain and irrigation tiling costs for each of the individual IFP areas within the EL Area.

*Table 7. EL Area future storm drain and irrigation tiling costs for arterial street improvements*

<b>Cost Estimate Category</b>	<b>ESTRELLA</b>	<b>LAVEEN</b>
Storm Drain Construction Cost <i>(Approximate Length of Pipe in feet)</i>	\$8,361,449 <i>(32,982)</i>	\$9,166,247 <i>(36,100)</i>
Irrigation Tiling Construction Cost <i>(Approximate Tiling Length in feet)</i>	\$9,044,100 <i>(54,807)</i>	\$13,562,900 <i>(82,193)</i>
Subtotal of Construction Costs	\$17,405,549	\$22,729,147
8.58% Engineering Design Fees	\$1,493,396	\$1,950,161
30.49% Administrative Overhead	\$5,306,952	\$6,930,117
<b>TOTAL Storm Drain and Irrigation Tiling Cost</b>	<b>\$24,205,897</b>	<b>\$31,609,425</b>

## SECTION 8: REGIONAL DRAINAGE FACILITIES

### 8.1 General

For this analysis, regional drainage facilities are defined as those facilities that are designed and constructed to improve drainage conditions for a large geographical area. In relatively flat topography such as that found throughout much of the Estrella and Laveen IFP Areas, significant flooding and ponding can occur in low lying areas where floodwaters are concentrated. These areas tend to coincide with primary roadways, canals, irrigation delivery and drainage ditches, and regional drains. The conspicuous absence of historic watercourses and washes exacerbates the drainage problems. Regional drainage facilities are usually proposed to remedy the drainage concerns and tend to be relatively large structures that intercept and divert floodwaters using a combination of channels, culverts, storm drains, and detention basins. Ultimately the intercepted floodwaters are conveyed to a regional watercourse such as the Salt River. Due to the diversionary nature of these drainage facilities, they are usually sized to convey a regulatory storm such as the 100-year event to preclude unintended consequences of shifting the flooding problem to another location. The design and formulation of this type of facility is usually the result of master drainage planning and analysis of watershed areas that are regional in nature.

There are three primary area drainage master plans impacting the EL Area that have been performed by the Flood Control District of Maricopa County (FCDMC) with participation from the City of Phoenix. Each of the ADMPs have identified and proposed drainage design alternatives and several of those improvements have already been constructed. The Estrella IFP Area is principally covered by the Durango ADMP [Dibble, 2002] and various follow-on studies. The Laveen IFP Area is covered by both the South Phoenix/Laveen ADMP [HDR, 1997 and 2001] and the Laveen ADMSPU [JE Fuller, 2017]. The Laveen Area Conveyance Channel [FCDMC, 2003] is also the result of master drainage planning and design but is considered a separate project from the other ADMPs.

### 8.2 Existing ADMP Regional Drainage Facilities

#### 8.2.1 Estrella IFP

The primary elements of the original Durango ADMP proposed for the Estrella IFP Area were the Durango Regional Conveyance Channel (DRRC), the Sunland Channel and the 47<sup>th</sup> Avenue Channel. Of these, the DRRC (as modified) is substantially completed within the City of Phoenix. The Sunland Channel and 47<sup>th</sup> Avenue Channel are still proposed, but there are currently no plans to construct either facility within the next five years.

The DRRC system has been altered from the original Durango ADMP configuration within the Estrella IFP Area, and was completed in two general projects. The first project was completed in 2009 and included drainage facilities east of 75<sup>th</sup> Avenue including two detention basins, channel, culverts and a large trunk line storm drain in 75<sup>th</sup> Avenue that extends from a half-mile north of Buckeye Road, south to the Salt River. The second project of DRRC construction included three basins, channels, and culvert facilities between 75<sup>th</sup> Avenue and 107<sup>th</sup> Avenue and is currently under construction with completion anticipated

in 2019. Schematics of the constructed DRCC facilities are included on Plate 1 and costs are provided in Appendix B.

### 8.2.2 *Laveen IFP*

The ADMP identified regional facilities constructed in the Laveen IFP Area date back to 1998 and include:

- 35<sup>th</sup> Avenue and Dobbins Road Basin and Storm Drain (completed in 1998)
- 43<sup>rd</sup> Avenue Storm Drain from Baseline Road to the Salt River (completed in 2000)
- Baseline Road Storm Drain (completed in 2000)
- LACC and 43<sup>rd</sup> Avenue and Southern Avenue Detention Basin (completed in 2005)
- 23<sup>rd</sup> Avenue and Roeser Detention Basin and 27<sup>th</sup> Avenue/Roeser Storm Drain (completed in 2010)
- 43<sup>rd</sup> Avenue and Baseline Road Detention Basin (completed in 2014)
- 27<sup>th</sup> Avenue and South Mountain Road Basin (completed in 2015)

The LACC is the largest and most costly of the facilities and includes channels, culverts and storm drain connections. Details of the project costs are provided in Appendix B.

It is noted that several facilities previously identified by the South Phoenix/Laveen ADMP (HDR, 1997 and 2001) were subsequently re-designed or removed from further consideration with the more recent Laveen ADMSPU (JE Fuller, 2017). These actions were primarily attributed to the availability of more accurate two-dimensional hydrology and hydraulic modeling data and newer, higher resolution topographic mapping. Accordingly, there are several facilities that were included in the 2003 ELA Study (JE Fuller, 2003) that are no longer valid.

### 8.2.3 *Summary of Existing ADMP Facility Costs*

Table 8 summarizes the project costs expended to construct each of the ADMP identified regional drainage facilities discussed above. Sources for the costs included IGA documents, bid tabulations and other documents available in the records.

## 8.3 **Proposed ADMP Regional Drainage Facilities**

### 8.3.1 *Estrella*

The only remaining ADMP facilities being proposed for the Estrella IFP area are the 47<sup>th</sup> Avenue System (47<sup>th</sup> Avenue Channel and 47<sup>th</sup> Avenue Basin and Lateral) and the Sunland Channel. The 47<sup>th</sup> Avenue System is completely located with the Estrella IFP area and is generally located along the 47<sup>th</sup> Avenue alignment from approximately one-half mile north of Buckeye Road to the Salt River and includes channels, culverts and a single detention basin. The Sunland Channel is generally located a quarter-mile north of and parallel to Southern Avenue, between 99<sup>th</sup> Avenue and the proposed confluence with the DRCC at approximately 120<sup>th</sup> Avenue. The full Sunland Channel system originates in Phoenix (99<sup>th</sup> to 107<sup>th</sup>) and extends into Avondale (107<sup>th</sup> to DRCC confluence). The original Durango ADMP allocates all the Sunland Channel system cost to FCDMC and the City of Phoenix.



Table 8. Summary of existing ADMP regional facilities construction costs

IFP Planning Area	Project Name	Original Total Project Cost	Year Built	Original Agency Cost-Share			Cost Index	Inflation Adjusted Phoenix Cost Share
				FCDMC	Phoenix	Other (MCDOT, Private, etc.)		
Estrella	75th Ave Storm Drain and Durango Regional Conveyance Channel	\$32,000,000	2006-2009	\$20,650,000	\$11,350,000	\$0	1.35	\$15,322,500
Estrella	DRCC 75th Ave to 107th Ave - Phases 1 and 2 Land Acquisition	\$4,250,000	2017	\$2,125,000	\$2,125,000	\$0	1.01	\$2,146,250
Estrella	DRCC 75th Ave to 107th Ave - Phases 1 and 2 Design	\$1,100,000	2016	\$550,000	\$550,000	\$0	1.02	\$561,000
Estrella	DRCC 75th Ave to 107th Ave - Phases 1 and 2 Construction	\$14,200,000	2018-2019	\$8,700,000	\$5,500,000	\$0	1.00	\$5,500,000
Laveen	23rd and Roeser Basin and SD	\$9,000,000	2010	\$4,500,000	\$4,500,000	\$0	1.16	\$5,220,000
Laveen	35th and Dobbins Basin and SD	\$8,263,750	1998	\$1,763,750	\$6,500,000	\$0	1.82	\$11,830,000
Laveen	43rd Ave Storm Drain - Baseline Rd to Salt River	\$11,266,000	2000	\$7,436,000	\$0	\$3,830,000	1.74	\$0
Laveen	43rd Ave and Baseline & 27th and South Mtn. Basins Aka - "Two Basins"	\$7,000,000	2014-2015	\$4,900,000	\$2,100,000	\$0	1.03	\$2,163,000
Laveen	Laveen Area Conveyance Channel (LACC) and 43rd Ave and Southern Ave Detention Basin	\$21,000,000	2005	\$7,000,000	\$13,000,000	\$1,000,000	1.45	\$18,850,000
Laveen	Baseline Storm Drain	\$7,215,000	2000	\$4,762,000	\$0	\$2,453,000	1.74	\$0
<b>ESTRELLA IFP AREA TOTALS:</b>		<b>\$51,550,000</b>		<b>\$32,025,000</b>	<b>\$19,525,000</b>	<b>\$0</b>		<b>\$23,529,750</b>
<b>LAVEEN IFP AREA TOTALS:</b>		<b>\$63,744,750</b>		<b>\$30,361,750</b>	<b>\$26,100,000</b>	<b>\$13,283,000</b>		<b>\$38,063,000</b>

It is noted that the Durango ADMP estimated landscape costs at double what FCDMC would normally fund, to allow for “enhanced landscaping” of the Sunland Channel. This resulted in a City share equal to 75% of the total “enhanced” landscape costs. Also, the Durango ADMP assumed that 60% of the land would be donated by private developers and 40% would be funded by FCDMC. The 60% private share is allocated to Phoenix for this calculation. Excerpts from the Durango ADMP Report showing the details of the cost share allocations are provided in Appendix F. In summary, cost-share information for the Sunland Channel is only divided between FCDMC and Phoenix, even though over half the facility will be located within Avondale.

According to officials at FCDMC<sup>7</sup>, the remaining portion of DRCC will be constructed and cost-shared between FCDMC and the City of Avondale, and no additional cost share is expected to be allocated to Phoenix. There are no other regional facilities currently planned for the Estrella IFP Area. Details of the Sunland Channel (within the Estrella IFP area limits) are shown on Plate 1 and listed in Appendix F, Table F-1

### *8.3.2 Laveen*

All proposed ADMP facilities recommended for implementation in the Laveen IFP Area are presented in the Laveen ADMSPU (JE Fuller, 2017). As previously noted, any unconstructed remnant facilities proposed with prior ADMPs have been voided or removed from further consideration by the Laveen ADMSPU. The Laveen ADMSPU proposed facilities are grouped into Areas of Mitigation Interest, or AoMIs. There are five AoMIs developed for the Laveen area and proposed facilities include combinations of culverts, channels, storm drains and detention basins. Detailed components for each AoMI are shown on Plate 2 and listed with costs in Appendix F, Table F-2. All of the proposed AoMI costs are assumed to be split equally between FCDMC and the City of Phoenix.

### *8.3.3 Summary of Costs*

Table 9 summarizes the proposed ADMP drainage facility costs for the Estrella and Laveen IFP Areas. More detailed line item summaries of the proposed regional drainage system costs reported in each ADMP for the Estrella and Laveen IFP Areas, are provided in Tables F-1 and F-2 in Appendix F. Tables F-1 and F-2 include breakdowns of the land acquisition, construction, and cost share. It should be noted that these costs do not reflect the typical City of Phoenix engineering design and administrative overhead mark-ups for two reasons. First, the costs reported in the ADMP reports already include similar allowances for these items. Second, the design and construction administration of these facilities may or may not be performed by the City.

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<sup>7</sup> Phone conversations with Ms. Bobbie Ohler, FCDMC Project Manager and Mr. Tim Murphy, FCDMC Project Management Branch Supervisor.

Table 9. Summary of proposed ADMP regional project costs

IFP Planning Area	Proposed ADMP Project Name	ADMP / Source	Total Land Cost	Planned Total Project Cost	Phoenix Cost Share	ADMP Cost Year	Cost Index	Inflation Adjusted Phoenix Cost Share
Estrella	47th Ave Channel	Durango Area Drainage Master Plan	\$1,689,932	\$9,174,515	\$5,524,402	2001	1.70	\$9,391,484
Estrella	47th Ave Basin and Inlet	Durango Area Drainage Master Plan	\$2,089,886	\$9,904,133	\$6,111,003	2001	1.70	\$10,388,705
Estrella	Sunland Channel	Durango Area Drainage Master Plan	\$1,859,630	\$8,148,276	\$5,105,387	2001	1.70	\$8,679,158
Laveen	AoMI No. 1	Laveen Area Drainage Master Study/Plan Update	\$3,512,000	\$8,260,000	\$4,130,000	2017	1.01	\$4,171,300
Laveen	AoMI No. 2	Laveen Area Drainage Master Study/Plan Update	\$1,418,000	\$5,568,000	\$2,784,000	2017	1.01	\$2,811,840
Laveen	AoMI No. 3	Laveen Area Drainage Master Study/Plan Update	\$33,000	\$1,013,000	\$506,500	2017	1.01	\$511,565
Laveen	AoMI No. 4	Laveen Area Drainage Master Study/Plan Update	\$867,000	\$6,267,000	\$3,133,500	2017	1.01	\$3,164,835
Laveen	AoMI No. 5	Laveen Area Drainage Master Study/Plan Update	\$794,100	\$7,242,000	\$3,621,000	2017	1.01	\$3,657,210
<b>ESTRELLA IFP AREA TOTALS:</b>			<b>\$5,639,448</b>	<b>\$27,226,924</b>	<b>\$17,436,911</b>			<b>\$28,459,347</b>
<b>LAVEEN IFP AREA TOTALS:</b>			<b>\$6,622,000</b>	<b>\$28,350,000</b>	<b>\$14,175,000</b>			<b>\$14,316,750</b>

# APPENDIX A

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# **APPENDIX B**

## **Existing Regional Projects Cost-Share**

Appendix - B1  
Existing Regional Projects

Project Name	Study Area	IGA No(s)	Total Project Cost	Year Built	Project Identifier		Agency Responsibility (%)			Agency Share (\$)			
					FCDMC	City of Phoenix	FCDMC	City of Phoenix	Other	FCDMC	City of Phoenix	Other Agency Share (\$)	Agency
23rd and Roeser Basin and SD	Laveen	2003A004 2003A004A	\$ 9,000,000	2010	Unavailable	ST83120034	50	50	N/A	\$ 4,500,000	\$ 4,500,000	\$ -	N/A
35th and Dobbins Basin and SD	Laveen	FCD 97001	\$ 8,263,750	1998	Unavailable	PA752000022	21.3	78.7	N/A	\$ 1,763,750	\$ 6,500,000	\$ -	N/A
43rd Avenue Storm Drain - Baseline Road to Salt River	Laveen	FCD 98046	\$ 11,266,000	2000			66	N/A	34	\$ 7,436,000	\$ -	\$ 3,830,000	MCDOT
43rd Ave and Baseline & 27th and South Mtn. Basins Aka - "Two Basins"	Laveen	2011A002 2011A002A	\$ 7,000,000	2014-2015	FCD2012C027	ST83120047-1	70	30	N/A	\$ 4,900,000	\$ 2,100,000	\$ -	N/A
Laveen Area Conveyance Channel (LACC) and 43rd Avenue and Southern Avenue Detention Basin	Laveen	2000A021 2000A021A 2000A021B	\$ 21,000,000	2005	Basin - FCD2001C008 LACC - 1170831 Basin - 1170230	N/A	33.33	33.33	33.33	\$ 7,000,000	\$ 7,000,000	\$ 7,000,000	MCDOT Private Land Owners (see Note B)
Baseline Storm Drain	Laveen	FCD 98046	\$ 7,215,000	2000	Unavailable	ST85100042	66.7		33.3	\$ 4,762,000	\$ -	\$ 2,453,000	MCDOT
75th Ave Storm Drain and Durango Regional Conveyance Channel	Estrella	FCD2003A014 and A (Final) 2002A015 and A	\$ 32,000,000	2006-2009	75th Ave Basin - 2005C017	67th Ave RCBC - 83120039  Santa Maria Basin- 83120038  75th Ave Storm Drain (and connection?)- 83110051	65	35	N/A	\$ 20,650,000	\$ 11,350,000	\$ -	
DRCC 75th Ave to 107th Ave - Phases 1 and 2 Land Acquisition	Estrella	FCD2008A010	\$ 4,250,000	2017	N/A	N/A	50	50	N/A	\$ 2,125,000	\$ 2,125,000	\$ -	
DRCC 75th Ave to 107th Ave - Phases 1 and 2 Design	Estrella	FCD2009A007	\$ 1,100,000	2016	FCD 2010C033	N/A	50	50	N/A	\$ 550,000	\$ 550,000	\$ -	
DRCC 75th Ave to 107th Ave - Phases 1 and 2 Construction	Estrella	FCD2010A029 and A	\$ 14,200,000	2018-2019	180069-DBB	N/A	See Note A	See Note A	N/A	\$ 8,700,000	\$ 5,500,000	\$ -	
NOTE A: The IGA reports a cost share percentage of 43% FCDMC and 57% Phoenix but these numbers do not match to other places in the IGA that split the costs as \$8.7M FCDMC and \$5.5M Phoenix. NOTE B: MCDOT = \$1,000,000 and Private Land Donations = \$6,000,000. For the IFP, the \$6,000,000 is allocated to the City of Phoenix since the City credited developer impact fees for the donated land.													



# APPENDIX C

## Non-ADMP Crossing Structures Design and Cost Data

Table C-1  
Detailed summary of major arterial crossing structures and costs

Crossing Structure ID	City of Phoenix Planning Village	Design Source	Q100	Structure Type	Watercourse Name	Arterial Roadway Name	Roadway Classification	Culvert					Bridge		Structure		Structure Comments
								Length	Span	Height	Diameter	Barrels	Span Length	Width	Cost	Status	
			cfs					feet	feet	feet	feet		feet	feet			
C-109	Laveen	JEF	471	RCB	Unnamed	35th Ave	D	120	10	6	---	2	---	---	\$ 360,000	Proposed	Q100 from <i>Design Hydrology for the Laveen Area Conveyance Channel</i>
B-101	Laveen/Estrella	JEF	164,000	Bridge	Salt River	67th Ave	D	---	---	---	---	---	1500	80	\$ 15,600,000	Proposed	Bridge span length assumed to equal 51st Avenue bridge, Q100 is from FEMA
B-102	Laveen/Estrella	JEF	164,000	Bridge	Salt River	75th Ave	D	---	---	---	---	---	1500	80	\$ 15,600,000	Proposed	Bridge span length assumed to equal 51st Avenue bridge, Q100 is from FEMA
B-103	Laveen	JEF	164,000	Bridge	Salt River	Avenida Rio Salado	ZB	---	---	---	---	---	1500	90	\$ 17,550,000	Proposed	Bridge span length assumed to equal 51st Avenue bridge, Q100 is fro
<b>TOTAL \$ 49,110,000</b>																	
<b>Total Non-ADMP Crossing Structure Costs for ESTRELLA Planning Area: \$ -</b>																	
<b>Total Non-ADMP Crossing Structure Costs for LAVEEN Planning Area: \$ 360,000</b>																	
<b>Total Cost for Salt River Bridges: \$ 48,750,000</b>																	

# APPENDIX D

## 2-Year Non-ADMP Storm Drain Design and Cost

Table D-1  
Assumption and Constants

Assumptions	
1	Tc = 10 Minutes; Intensity = 2.34 in/hr
2	Average Rational C = 0.8
3	Average MH Spacing 500 feet
4	Max CB Spacing 660 Feet
5	Max depth at curb to maintain 1 dry lane = 0.46 feet (18 ft spread with standard gutter and 2% road cross slope)
6	50% of the flow is collected at each set of CBs
7	Street Types in the region are B, C, CM, and D. All of which can fall in the X or Z category (pre-1992 and future or incomplete roads respectively).
8	HGL is 70% of prevailing street slope.

Half-Street Width (ft) per Street Classification	
A	70
B	65
C	55
CM	55
D	50

Summary of Average Unit Cost Calculations for Ancillary Storm Drain Structures				
Item Description	Unit Type	No. of Units	Unit Cost	Total
Catch Basins - Assume one every 500 ft	Each	22	\$ 2,875	\$ 63,250
Manholes - Assume one every 500 ft	Each	10	\$ 5,750	\$ 57,500
Prefab Tees	Each	22	\$ 500	\$ 11,000
15" Connector Pipes - Assume 50 ft per CB	LF	1100	\$ 80	\$ 88,000
Total Cost per Mile of Street				\$ 219,750
Unit Cost of Items per Foot of Street				\$ 42

\*See Table 5 for Storm Drain Costs

Full Street Length (ft)	Street Type B		Street Type C		Street Type CM		Street Type D	
	Basin Area (acres)	Discharge (cfs)	Basin Area (acres)	Discharge (cfs)	Basin Area (acres)	Discharge (cfs)	Basin Area (acres)	Discharge (cfs)
500	1.49	2.8	1.26	2.4	1.26	2.4	1.15	2.1
1000	2.98	5.6	2.53	4.7	2.53	4.7	2.30	4.3
1500	4.48	8.4	3.79	7.1	3.79	7.1	3.44	6.4
2000	5.97	11.2	5.05	9.5	5.05	9.5	4.59	8.6
2500	7.46	14.0	6.31	11.8	6.31	11.8	5.74	10.7
3000	8.95	16.8	7.58	14.2	7.58	14.2	6.89	12.9
3500	10.45	19.6	8.84	16.5	8.84	16.5	8.03	15.0
4000	11.94	22.3	10.10	18.9	10.10	18.9	9.18	17.2
4500	13.43	25.1	11.36	21.3	11.36	21.3	10.33	19.3
5000	14.92	27.9	12.63	23.6	12.63	23.6	11.48	21.5
5500	16.41	30.7	13.89	26.0	13.89	26.0	12.63	23.6
6000	17.91	33.5	15.15	28.4	15.15	28.4	13.77	25.8
6500	19.40	36.3	16.41	30.7	16.41	30.7	14.92	27.9
7000	20.89	39.1	17.68	33.1	17.68	33.1	16.07	30.1

\*Note: These calculations show the discharge for the entire street per length shown. NOT the half-street.

Table D-2  
Spread and Capacity Calcs

Street Slope (ft/ft)	Half-Street Capacity (cfs)	Whole Street Capacity (cfs)	Drainage Area (Acre)	Max Length (ft) of Half Street Drainage to CB				
				A	B	C	CM	D
0.0005	2.6	5.2	1.39	864	931	1100	1100	1210
0.001	3.6	7.2	1.9	1197	1289	1523	1523	1675
0.002	5.2	10.4	2.8	1729	1862	2200	2200	2420
0.003	6.3	12.6	3.4	2094	2255	2665	2665	2932
0.004	7.3	14.6	3.9	2427	2613	3088	3088	3397
0.005	8.1	16.2	4.3	2693	2900	3427	3427	3770
0.006	8.9	17.8	4.8	2959	3186	3765	3765	4142
0.007	9.6	19.2	5.1	3191	3437	4062	4062	4468
0.008	10.3	20.6	5.5	3424	3687	4358	4358	4793
0.009	10.9	21.8	5.8	3623	3902	4612	4612	5073
0.01	11.5	23	6.1	3823	4117	4865	4865	5352

Table D-3  
Storm Drain Capacity Table

Pipe Slope (ft/ft)	Pipe Capacity (cfs)	Pipe Size (inches)	Flow Velocity (ft/s)
0.0005	2.3	18	1.3
0.0005	5.1	24	1.6
0.0005	9.2	30	1.9
0.0005	14.9	36	2.1
0.0005	22.5	42	2.3
0.0005	32.1	48	2.6
0.0005	44.0	54	2.8
0.0005	58.2	60	3.0
0.0005	75.1	66	3.2
0.0005	94.7	72	3.3
0.0005	117.2	78	3.5
0.0005	142.8	84	3.7
0.0005	171.7	90	3.9
0.0005	203.9	96	4.1
0.0005	239.7	102	4.2
0.0005	279.2	108	4.4
0.001	3.3	18	1.9
0.001	7.2	24	2.3
0.001	13.0	30	2.6
0.001	21.1	36	3.0
0.001	31.8	42	3.3
0.001	45.4	48	3.6
0.001	62.2	54	3.9
0.001	82.4	60	4.2
0.001	106.2	66	4.5
0.001	133.9	72	4.7
0.001	165.8	78	5.0
0.001	202.0	84	5.2
0.001	242.8	90	5.5
0.001	288.4	96	5.7
0.001	339.0	102	6.0
0.001	394.9	108	6.2
0.002	4.7	18	2.7
0.002	10.1	24	3.2
0.002	18.3	30	3.7
0.002	29.8	36	4.2
0.002	45.0	42	4.7
0.002	64.2	48	5.1
0.002	87.9	54	5.5
0.002	116.5	60	5.9
0.002	150.2	66	6.3
0.002	189.4	72	6.7
0.002	234.5	78	7.1
0.002	285.7	84	7.4
0.002	343.4	90	7.8
0.002	407.9	96	8.1
0.002	479.5	102	8.4
0.002	558.4	108	8.8
0.003	5.8	18	3.3
0.003	12.4	24	3.9
0.003	22.5	30	4.6
0.003	36.5	36	5.2
0.003	55.1	42	5.7
0.003	78.7	48	6.3
0.003	107.7	54	6.8
0.003	142.7	60	7.3
0.003	183.9	66	7.7
0.003	232.0	72	8.2
0.003	287.2	78	8.7
0.003	349.9	84	9.1
0.003	420.6	90	9.5
0.003	499.6	96	9.9
0.003	587.2	102	10.3
0.003	683.9	108	10.8

Table D-3  
Storm Drain Capacity Table

Pipe Slope (ft/ft)	Pipe Capacity (cfs)	Pipe Size (inches)	Flow Velocity (ft/s)
0.004	6.6	18	3.8
0.004	14.3	24	4.6
0.004	25.9	30	5.3
0.004	42.2	36	6.0
0.004	63.6	42	6.6
0.004	90.8	48	7.2
0.004	124.4	54	7.8
0.004	164.7	60	8.4
0.004	212.4	66	8.9
0.004	267.8	72	9.5
0.004	331.6	78	10.0
0.004	404.0	84	10.5
0.004	485.6	90	11.0
0.004	576.8	96	11.5
0.004	678.1	102	11.9
0.004	789.7	108	12.4
0.005	7.4	18	4.2
0.005	16.0	24	5.1
0.005	29.0	30	5.9
0.005	47.2	36	6.7
0.005	71.1	42	7.4
0.005	101.6	48	8.1
0.005	139.1	54	8.7
0.005	184.2	60	9.4
0.005	237.5	66	10.0
0.005	299.5	72	10.6
0.005	370.7	78	11.2
0.005	451.7	84	11.7
0.005	543.0	90	12.3
0.005	644.9	96	12.8
0.005	758.1	102	13.4
0.005	882.9	108	13.9
0.006	8.1	18	4.6
0.006	17.5	24	5.6
0.006	31.8	30	6.5
0.006	51.7	36	7.3
0.006	77.9	42	8.1
0.006	111.3	48	8.9
0.006	152.3	54	9.6
0.006	201.7	60	10.3
0.006	260.1	66	10.9
0.006	328.0	72	11.6
0.006	406.1	78	12.2
0.006	494.8	84	12.9
0.006	594.8	90	13.5
0.006	706.5	96	14.1
0.006	830.5	102	14.6
0.006	967.2	108	15.2

Table D-3  
Storm Drain Capacity Table

Pipe Slope (ft/ft)	Pipe Capacity (cfs)	Pipe Size (inches)	Flow Velocity (ft/s)
0.007	8.8	18	5.0
0.007	18.9	24	6.0
0.007	34.3	30	7.0
0.007	55.8	36	7.9
0.007	84.2	42	8.7
0.007	120.2	48	9.6
0.007	164.5	54	10.3
0.007	217.9	60	11.1
0.007	281.0	66	11.8
0.007	354.3	72	12.5
0.007	438.6	78	13.2
0.007	534.5	84	13.9
0.007	642.4	90	14.5
0.007	763.1	96	15.2
0.007	897.0	102	15.8
0.007	1044.7	108	16.4
0.008	9.4	18	5.3
0.008	20.2	24	6.4
0.008	36.7	30	7.5
0.008	59.7	36	8.4
0.008	90.0	42	9.4
0.008	128.5	48	10.2
0.008	175.9	54	11.1
0.008	232.9	60	11.9
0.008	300.4	66	12.6
0.008	378.8	72	13.4
0.008	468.9	78	14.1
0.008	571.4	84	14.8
0.008	686.8	90	15.5
0.008	815.8	96	16.2
0.008	958.9	102	16.9
0.008	1116.8	108	17.6
0.009	10.0	18	5.6
0.009	21.5	24	6.8
0.009	38.9	30	7.9
0.009	63.3	36	9.0
0.009	95.4	42	9.9
0.009	136.3	48	10.8
0.009	186.6	54	11.7
0.009	247.1	60	12.6
0.009	318.6	66	13.4
0.009	401.8	72	14.2
0.009	497.4	78	15.0
0.009	606.0	84	15.7
0.009	728.5	90	16.5
0.009	865.3	96	17.2
0.009	1017.1	102	17.9
0.009	1184.6	108	18.6
0.01	10.5	18	5.9
0.01	22.6	24	7.2
0.01	41.0	30	8.4
0.01	66.7	36	9.4
0.01	100.6	42	10.5
0.01	143.6	48	11.4
0.01	196.6	54	12.4
0.01	260.4	60	13.3
0.01	335.8	66	14.1
0.01	423.5	72	15.0
0.01	524.3	78	15.8
0.01	638.8	84	16.6
0.01	767.9	90	17.4
0.01	912.1	96	18.1
0.01	1072.1	102	18.9
0.01	1248.6	108	19.6



Proposed Future Storm Drains - Estrella Study Area																
Location	Class	Storm Drain ID	Segment ID	Roadway Cross Section	Roadway Cross Section - 2	Contributing Street Length (ft)	Pipe Length (ft)	Half-Street Width (ft)	Whole-Street Width (ft)	Total Segment Contributing Area (acres)	Segment Q (cfs)	Road Slope (ft/ft)	Pipe HGL (ft/ft)	System Q (cfs)	Required Pipe Size (inches)	Notes
Southern Ave - 99th Ave to 107th Ave	Main	300	1	CM		1925	1925	55	110	4.9	9.1	0.0016	0.0011	33.4	48	Flows into Seg 2
Southern Ave - 99th Ave to 107th Ave	Main	300	2	CM		1925	1925	55	110	4.9	9.1	0.0016	0.0011	42.5	48	Flows into Seg 3
Southern Ave - 99th Ave to 107th Ave	Lateral	300	3	CM		1250	1250	55	110	3.2	5.9	0.0016	0.0011	48.4	54	SD 305 and SD 300; Outfall at study boundary
Broadway Rd - 99th Ave to 107th Ave	Main	301	1	CM		2385	2385	55	110	6.0	11.3	0.0024	0.0017	20.7	36	Flows into Seg 2
Broadway Rd - 99th Ave to 107th Ave	Main	301	2	CM		2385	2385	55	110	6.0	11.3	0.0024	0.0017	32.0	42	Flows into Seg 3
Broadway Rd - 99th Ave to 107th Ave	Lateral	301	3	CM		375	375	55	110	0.9	1.8	0.0024	0.0017	33.8	42	SD 324 and SD 301; Outfall at study boundary
99th Ave - Broadway Rd to Southern Ave	Lateral	305	1	CM		5134	779	55	110	13.0	24.3	0.008	0.0056	24.3	30	Flows into SD-300 Seg 1
91st Ave - Broadway to Salt River	Lateral	306	1	CM		3427	3427	55	110	8.7	16.2	0.005	0.0035	55.8	42	Flows into Seg 2
91st Ave - Broadway to Salt River	Main	306	1	CM		3223	3223	55	110	8.1	15.2	0.005	0.0035	71.0	48	Outfalls at Salt River
Lower Buckeye Rd - 59th Ave to 67th Ave	Main	310	1	CM		980	980	55	110	2.5	4.6	0.0025	0.0018	26.7	36	Terminates at anticipated L202 infrastructure
83rd Ave - Broadway Rd to Salt River	Lateral	314	1	CM		3850	1925	55	110	9.7	18.2	0.0016	0.0011	18.2	36	Flows into Seg 2
83rd Ave - Broadway Rd to Salt River	Lateral	314	2	CM		1925	1925	55	110	4.9	9.1	0.0016	0.0011	27.3	42	Flows into Seg 3
83rd Ave - Broadway Rd to Salt River	Lateral	314	3	CM		180	180	55	110	0.5	0.9	0.0016	0.0011	28.2	42	Flows into Salt River
59th Ave - Buckeye Rd to Lower Buckeye Rd	Lateral	315	1	D		5140	2365	50	100	11.8	22.1	0.0027	0.0019	22.1	36	Flows into SD-310 Seg 1
59th Ave - Lower Buckeye Rd to Broadway Rd	Main	316	1	CM		5633	2343	55	110	14.2	26.6	0.0046	0.0032	26.6	36	Outfall at Salt River
Broadway Rd - 91st Ave toward 99th Ave	Lateral	324	1	CM		1995	895	55	110	5.0	9.4	0.0005	0.0004	9.4	36	Flows into SD-301
Broadway Rd - 99th Ave toward 91st Ave	Lateral	324A	1	CM		2200	1100	55	110	5.6	10.4	0.0005	0.0004	10.4	36	Flows into Seg 2
Broadway Rd - 99th Ave toward 91st Ave	Lateral	324A	2	CM		885	885	55	110	2.2	4.2	0.0005	0.0004	14.6	36	Flows into SD-306 Seg 1
Broadway Rd - 83rd Ave to 91st Ave	Lateral	325	1	CM		5160	2580	55	110	13.0	24.4	0.0029	0.0020	24.4	36	Flows into Seg 2
Broadway Rd - 83rd Ave to 91st Ave	Main	325	2	CM		130	130	55	110	0.3	0.6	0.0029	0.0020	25.0	36	Flows into SD-306 Seg 1

Appendix D-5  
Future SD Costs - Estrella

<b>Estrella - Proposed Storm Drain Costs</b>			
<i>Storm Drain Size (inches)</i>	<i>Quantity (lf)</i>	<i>Unit Cost (per lf)</i>	<i>Total Cost Storm Drain</i>
18	-	\$ 85	\$ -
24	-	\$ 100	\$ -
30	779	\$ 121	\$ 94,259
36	15,588	\$ 166	\$ 2,587,621
42	8,292	\$ 211	\$ 1,749,612
48	7,073	\$ 305	\$ 2,157,265
54	1,250	\$ 320	\$ 400,000
60	-	\$ 360	\$ -
66	-	\$ 385	\$ -
72	-	\$ 410	\$ -
78	-	\$ 435	\$ -
84	-	\$ 460	\$ -
90	-	\$ 485	\$ -
96	-	\$ 510	\$ -
102	-	\$ 535	\$ -
108	-	\$ 560	\$ -
<b>Storm Drain Total</b>			<b>\$ 6,988,757</b>
<i>Total Street Improvement Length (ft)</i>	<i>Manhole, Catch Basin, Tee and Connector Pipe Cost per Mile (Table 7)</i>	<b>Manhole, Catch Basin, Tee and Connector Total Cost</b>	<b>\$ 1,372,692</b>
32,982	\$ 42		
<b>Total Storm Drain Cost For Area:</b>			<b>\$ 8,361,449</b>

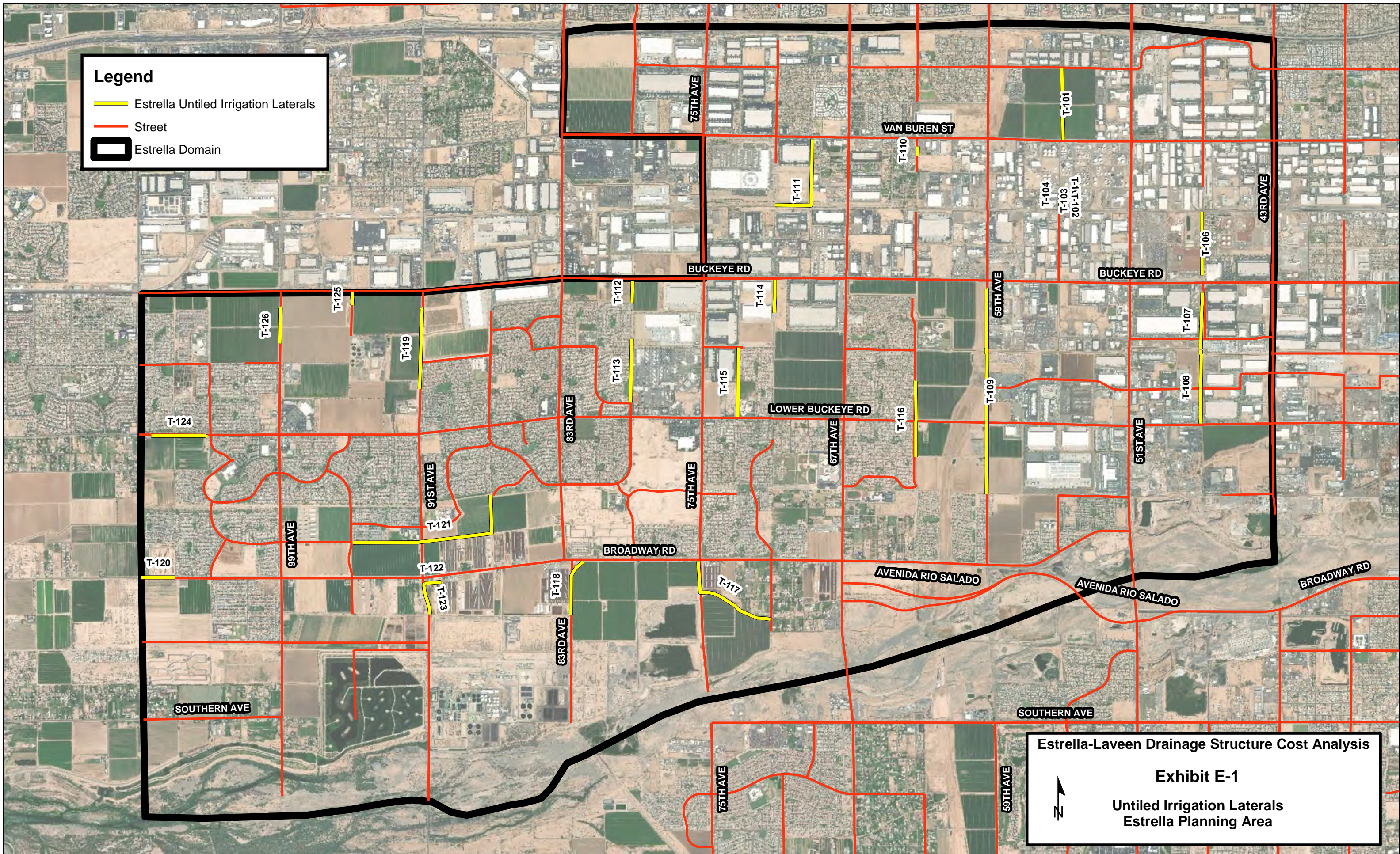
Proposed Future Storm Drains - Laveen Study Area																
Location	Class	Storm Drain ID	Segment ID	Roadway Cross Section	Roadway Cross Section - 2	Contributing Street Length (ft)	Pipe Length (ft)	Half-Street Width (ft)	Whole -Street Width (ft)	Total Segment Contributing Area (acres)	Segment Q (cfs)	Road Slope (ft/ft)	Pipe HGL (ft/ft)	System Q (cfs)	Required Pipe Size (inches)	Notes
Elliot Rd - 51st Ave to 59th Ave	Main	100	1	CM		2630	2572	55	110	6.6	12.4	0.0028	0.0020	35.6	42	Flows into Seg 2
Elliot Rd - 51st Ave to 59th Ave	Main	100	2	CM		2630	2572	55	110	6.6	12.4	0.0028	0.0020	48.0	48	Flows into Seg 3
Elliot Rd - 51st Ave to 59th Ave	Main	100	3	CM		2605	103	55	110	6.6	12.3	0.0028	0.0020	60.3	48	Flows into SD-101 Seg 1
Elliot Rd - 59th Ave to San Jaun Ave	Main	101	1	CM		2100	2100	55	110	5.3	9.9	0.0023	0.0016	82.3	54	SD-115 Seg 1+2; SD-100 Seg 1+2; SD-114 Seg 1+2; and SD 101
Dobbins Rd - 59th Ave to San Juan Ave	Main	103	1	C	Z	2340	2340	55	110	5.9	11.1	0.0023	0.0016	20.0	36	Flows into Seg 2
Dobbins Rd - 59th Ave to San Juan Ave	Main	103	2	C	Z	2340	2340	55	110	5.9	11.1	0.0023	0.0016	31.1	42	Flows into Seg 3
Dobbins Rd - 59th Ave to San Juan Ave	Main	103	3	C	Z	1950	1950	55	110	4.9	9.2	0.0023	0.0016	40.3	42	SD-102; SD-113; and SD 103 - Outfall
Southern Ave - 59th Ave to 67th Ave	Lateral	111	1	CM	Z	4260	2130	55	110	10.8	20.1	0.0019	0.0013	20.1	36	Flows into Seg 2
Southern Ave - 59th Ave to 67th Ave	Lateral	111	2	CM	Z	1000	1000	55	110	2.5	4.7	0.0019	0.0013	24.9	42	Flows into SD-112 Seg 1
Southern Ave - 67th Ave to 75th Ave	Lateral	112	1	CM	Z	2475	2475	55	110	6.3	11.7	0.0026	0.0018	58.9	48	Flows into Seg 2
Southern Ave - 67th Ave to 75th Ave	Lateral	112	2	CM	Z	2475	2475	55	110	6.3	11.7	0.0026	0.0018	70.6	54	Flows into Seg 3
Southern Ave - 67th Ave to 75th Ave	Lateral	112	3	CM	Z	275	275	55	110	0.7	1.3	0.0026	0.0018	71.9	54	Drains to Local Outfall
59th Ave - McNeil St to Dobbins Rd	Lateral	113	1	CM		1900	430	55	110	4.8	9.0	0.00094	0.0007	9.0	30	Flows into SD-103 - Seg 1
59th Ave - Olney Dr to Elliot Rd	Lateral	114	2	CM		2535	675	55	110	6.4	12.0	0.0015	0.0011	12.0	30	Flows into SD-101 - Seg 1
51st Ave - Estrella Dr to Elliot Rd	Lateral	115	1	CM		4900	2110	55	110	12.4	23.2	0.0033	0.0023	23.2	36	Flows into SD-100 - Seg 1
51st Ave - Estrella Dr toward Dusty Ln	Lateral	116	2	CM		2265	475	55	110	5.7	10.7	0.0014	0.0010	10.7	30	Drains to graded ditch near boundary
51st Ave - Mirada Dr to Olney Ave	Lateral	118	1	CM		2629	1039	55	110	6.6	12.4	0.0011	0.0008	12.4	30	Outfalls into Laveen ADMPU Proposed System
59th Ave - Southern Ave to Baseline Rd	Lateral	120	1	CM		3180	1590	55	110	8.0	15.0	0.0011	0.0008	15.0	36	Flows into Seg 2
59th Ave - Southern Ave to Baseline Rd	Lateral	120	2	CM		1590	1590	55	110	4.0	7.5	0.0011	0.0008	22.5	42	Flows into Seg 3
59th Ave - Southern Ave to Baseline Rd	Lateral	120	3	CM		497	497	55	110	1.3	2.3	0.0011	0.0008	24.9	42	Outfalls at LACC
75th Ave - St Charles Ave toward Southern Ave	Lateral	123	1	D		2210	350	50	100	5.1	9.5	0.0015	0.0011	9.5	30	Drains to local outfall
35th Ave - Carver Rd to Dobbins Rd	Lateral	128	1	CM		5145	370	55	110	13.0	24.3	0.012	0.0084	24.3	30	Drains to Laveen ADMPU Proposed Culvert
67th Ave - Vineyard Rd to Southern Ave	Lateral	133	1	D		4210	2664	50	100	9.7	18.1	0.001	0.0007	18.1	36	Drains to Local Outfall
Southern Ave - 19th Ave to 27th Ave	Lateral	134	1	D		5189	1978	50	100	11.9	22.3	0.0036	0.0025	22.3	30	Flows into SD-112 Seg 1

Appendix D-7  
Future SD Costs - Laveen

<b>Laveen - Proposed Storm Drain Costs</b>			
<i>Storm Drain Size (inches)</i>	<i>Quantity (lf)</i>	<i>Unit Cost (per lf)</i>	<i>Total Cost Storm Drain</i>
18	-	\$ 85	\$ -
24	-	\$ 100	\$ -
30	5,317	\$ 121	\$ 643,357
36	10,834	\$ 166	\$ 1,798,444
42	9,949	\$ 211	\$ 2,099,239
48	5,150	\$ 305	\$ 1,570,750
54	4,850	\$ 320	\$ 1,552,000
60	-	\$ 360	\$ -
66	-	\$ 385	\$ -
72	-	\$ 410	\$ -
78	-	\$ 435	\$ -
84	-	\$ 460	\$ -
90	-	\$ 485	\$ -
96	-	\$ 510	\$ -
102	-	\$ 535	\$ -
108	-	\$ 560	\$ -
<b>Storm Drain Total</b>			<b>\$ 7,663,790</b>
<i>Total Street Improvement Length (ft)</i>	<i>Manhole, Catch Basin, Tee and Connector Pipe Cost per Mile (Table 7)</i>	<b>Manhole, Catch Basin, Tee and Connector Total Cost</b>	<b>\$ 1,502,457</b>
36,100	\$ 42		
<b>Total Storm Drain Cost For Area:</b>			<b>\$ 9,166,247</b>

# APPENDIX E

## Irrigation Tiling and Cost Data



**Legend**

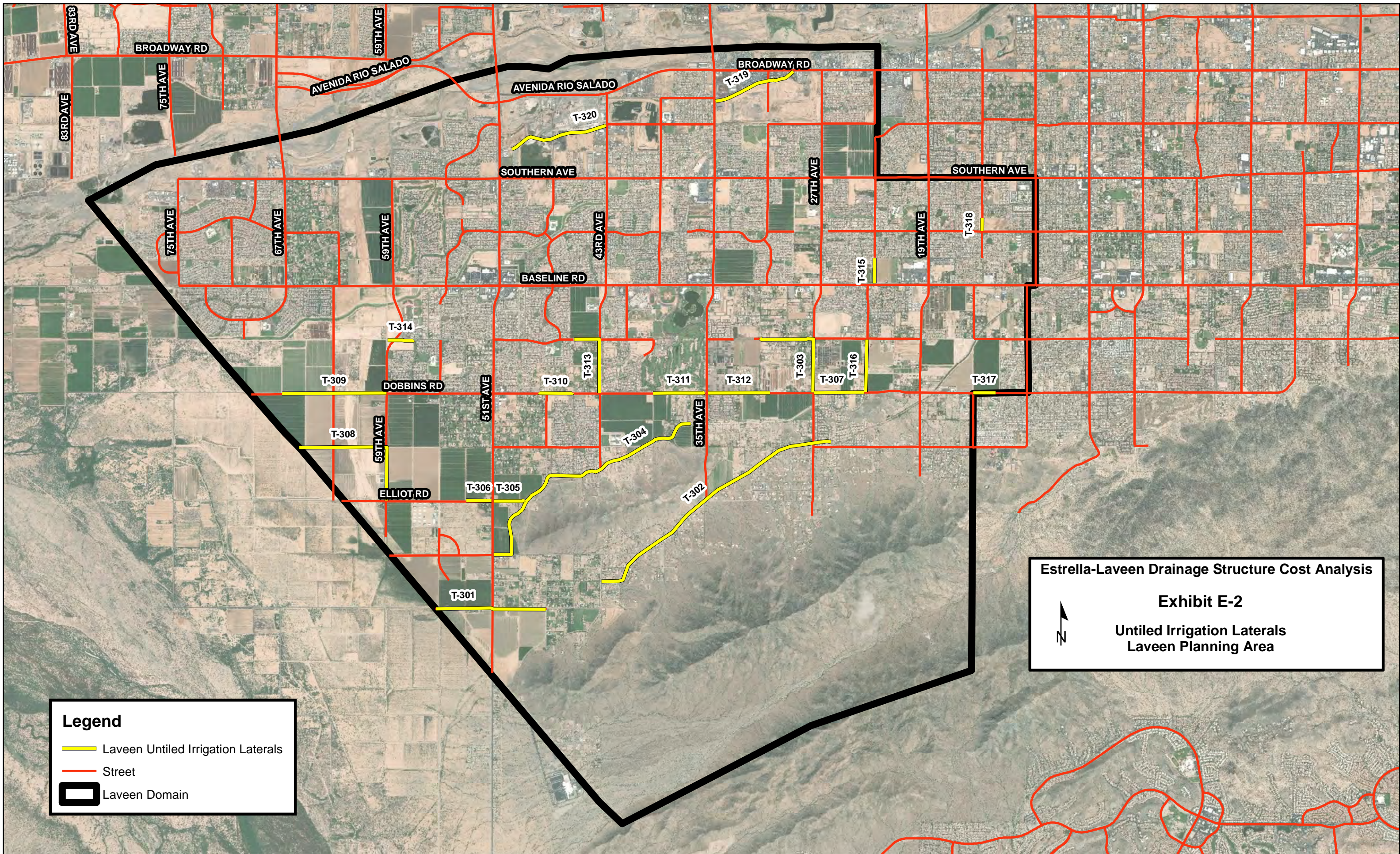
- Estrella Untiled Irrigation Laterals
- Street
- Estrella Domain

**Estrella-Laveen Drainage Structure Cost Analysis**

**Exhibit E-1**

**Untiled Irrigation Laterals  
Estrella Planning Area**

N



**Legend**

- Laveen Untiled Irrigation Laterals
- Street
- Laveen Domain

**Estrella-Laveen Drainage Structure Cost Analysis**

**Exhibit E-2**

**Untiled Irrigation Laterals  
Laveen Planning Area**



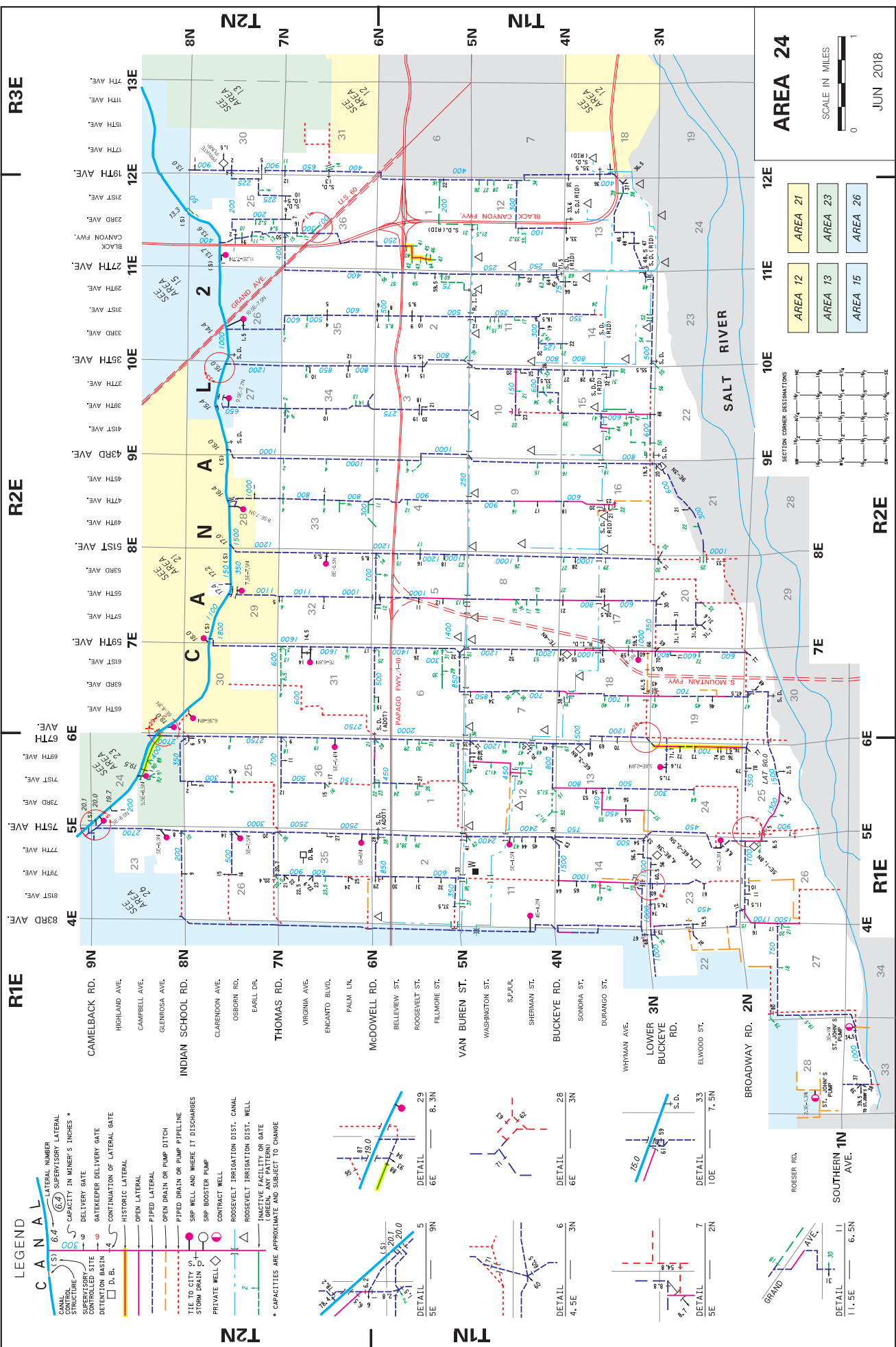
Table E-1  
Irrigation Tiling Costs

<b>Estrella Planning Area</b>			
Tiling ID	Zanjero Map	Length (ft)	Tiling Cost (\$)
T-101	24	2,655	\$ 438,100
T-102	24	210	\$ 34,600
T-103	24	151	\$ 24,900
T-104	24	242	\$ 40,000
T-105	24	38	\$ 6,300
T-106	24	2,345	\$ 387,000
T-107	24	2,072	\$ 341,900
T-108	24	2,728	\$ 450,100
T-109	24	7,641	\$ 1,260,800
T-110	24	331	\$ 54,600
T-111	24	3,772	\$ 622,400
T-112	24	816	\$ 134,700
T-113	24	2,367	\$ 390,500
T-114	24	1,214	\$ 200,400
T-115	24	2,567	\$ 423,600
T-116	24	2,839	\$ 468,500
T-117	24	4,030	\$ 665,000
T-118	24	2,157	\$ 356,000
T-119	26	3,035	\$ 500,800
T-120	26	1,260	\$ 207,900
T-121	26	6,596	\$ 1,088,500
T-122	26	627	\$ 103,500
T-123	26	1,187	\$ 195,900
T-124	26	2,084	\$ 343,900
T-125	26	483	\$ 79,800
T-126	26	1,360	\$ 224,400
<b>Estrella Planning Area Totals:</b>		<b>54,807</b>	<b>\$ 9,044,100</b>



Table E-2  
Irrigation Tiling Costs

Laveen Planning Area			
Tiling ID	Zanjero Map	Length (ft)	Tiling Cost (\$)
T-301	40	5,410	\$ 892,800
T-302	40	13,791	\$ 2,275,600
T-303	40	5,286	\$ 872,300
T-304	40	13,409	\$ 2,212,500
T-305	40	1,516	\$ 250,100
T-306	40	1,234	\$ 203,700
T-307	40	2,476	\$ 408,600
T-308	40	6,920	\$ 1,141,900
T-309	40	5,122	\$ 845,200
T-310	40	1,670	\$ 275,600
T-311	40	2,536	\$ 418,500
T-312	40	3,066	\$ 505,900
T-313	40	3,846	\$ 634,700
T-314	40	1,295	\$ 213,700
T-315	40	1,232	\$ 203,300
T-316	39	2,567	\$ 423,600
T-317	39	1,094	\$ 180,500
T-318	39	642	\$ 106,100
T-319	39	4,149	\$ 684,600
T-320	39	4,931	\$ 813,700
Laveen Planning Area Totals:		82,193	\$ 13,562,900



## AREA 24

### LEGEND

**CANAL**

- (3) LATERAL NUMBER
- (6.4) SUPERVISORY LATERAL
- (20.0) CAPACITY IN MINER'S INCHES \*
- (S) SUPERVISORY CONTROLLED SITE
- (G) DELIVERY GATE
- (G) GATEKEEPER DELIVERY GATE
- (D.B.) D.B.
- (C) CONTINUATION OF LATERAL GATE
- (H) HISTORIC LATERAL
- (O) OPEN LATERAL
- (P) PIPED LATERAL
- (D) OPEN DRAIN OR PUMP DITCH
- (P) PIPED DRAIN OR PUMP PIPELINE
- (C) TIE TO CITY
- (S) STORM DRAIN
- (P) SRP WELL AND WHERE IT DISCHARGES
- (P) PRIVATE WELL
- (C) CONTRACT WELL
- (R) ROOSEVELT IRRIGATION DIST. CANAL
- (R) ROOSEVELT IRRIGATION DIST. WELL
- (I) INACTIVE FACILITY OR GATE (GREEN, ANY PATTERN)

\* CAPACITIES ARE APPROXIMATE AND SUBJECT TO CHANGE

DETAIL 5 9N

DETAIL 6 3N

DETAIL 7 2N

DETAIL 8 3N

DETAIL 9 10E

DETAIL 10 7.5N

DETAIL 11 5E

DETAIL 12 3N

DETAIL 13 6E

DETAIL 14 2N

DETAIL 15 3N

DETAIL 16 6E

DETAIL 17 10E

DETAIL 18 7.5N

DETAIL 19 3N

DETAIL 20 6E

DETAIL 21 2N

DETAIL 22 3N

DETAIL 23 6E

DETAIL 24 2N

DETAIL 25 3N

DETAIL 26 6E

DETAIL 27 2N

DETAIL 28 3N

DETAIL 29 6E

SECTION CORNER DESIGNATIONS

3N	4E	5E	6E	7E	8E	9E	10E	11E	12E
4E	5E	6E	7E	8E	9E	10E	11E	12E	13E

SCALE IN MILES

0 1

JUN 2018

AREA 21

AREA 23

AREA 26

AREA 12

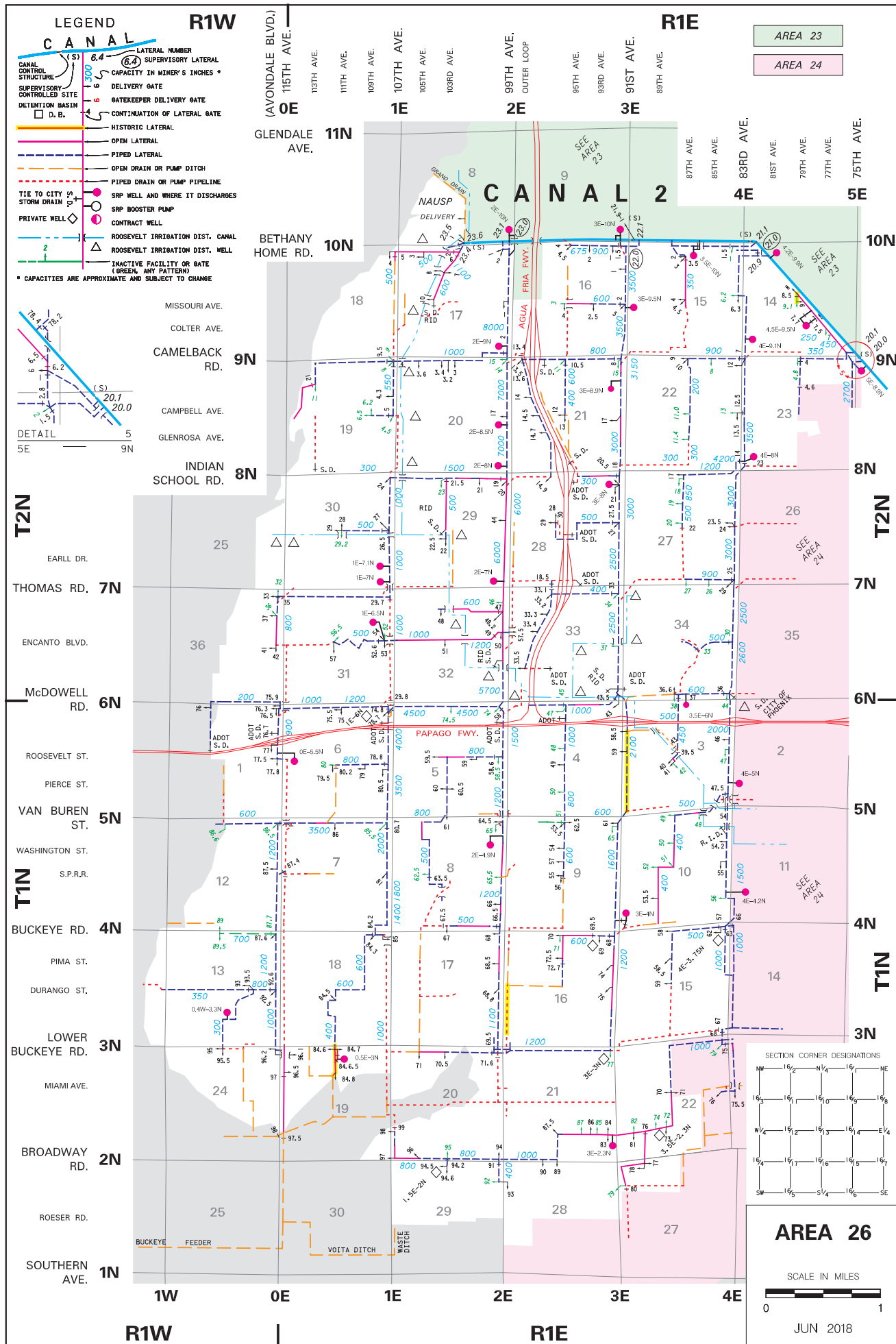
AREA 13

AREA 15

AREA 22

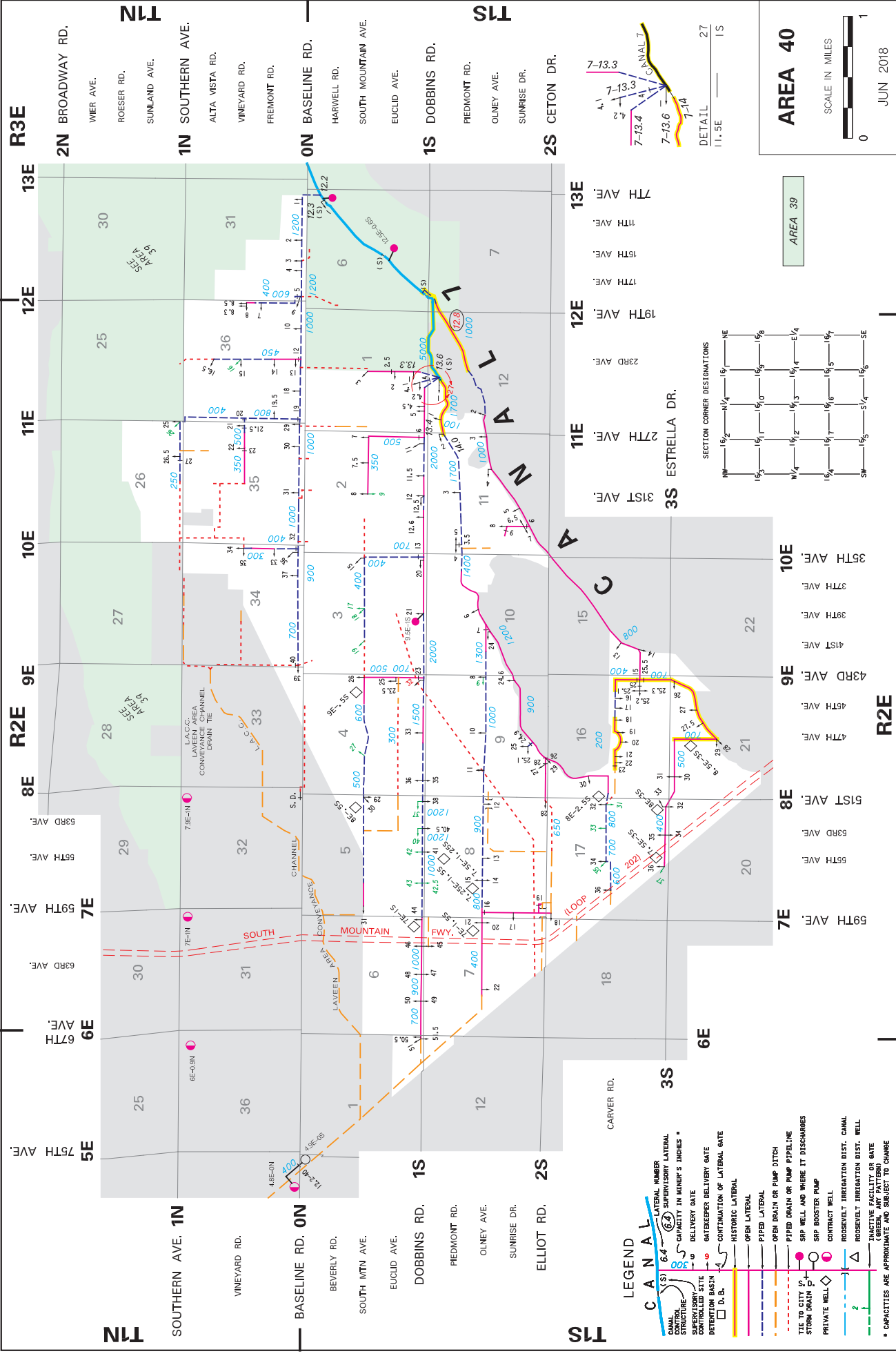
AREA 24

# AREA 26





# AREA 40



### LEGEND

**CANAL**

- CANAL CONTROL STRUCTURE
- 6.4 SUPERVISORY LATERAL
- 6.2 CAPACITY IN MINER'S INCHES \*
- DELIVERY GATE
- DEFINITION BASIN
- D.B.
- GATEKEEPER DELIVERY GATE
- CONTINUATION OF LATERAL GATE
- HISTORIC LATERAL
- OPEN LATERAL
- PIPED LATERAL
- OPEN DRAIN OR PUMP DITCH
- PIPED DRAIN OR PUMP PIPELINE
- SRP WELL AND WHERE IT DISCHARGES
- SRP BOOSTER PUMP
- CONTRACT WELL
- ROSEVELT IRRIGATION DIST. CANAL
- ROSEVELT IRRIGATION DIST. WELL
- TRANSVERSE FACILITY AS GATE (GREEN, ANY PATTERN)

\* CAPACITIES ARE APPROXIMATE AND SUBJECT TO CHANGE

### SECTION CORNER DESIGNATIONS

NW	16 1/2	16 1/4	16	15 3/4	15 1/2	15 1/4	15	14 3/4	14 1/2	14 1/4	14	13 3/4	13 1/2	13 1/4	13	12 3/4	12 1/2	12 1/4	12	11 3/4	11 1/2	11 1/4	11	10 3/4	10 1/2	10 1/4	10	9 3/4	9 1/2	9 1/4	9	8 3/4	8 1/2	8 1/4	8	7 3/4	7 1/2	7 1/4	7	6 3/4	6 1/2	6 1/4	6	5 3/4	5 1/2	5 1/4	5	4 3/4	4 1/2	4 1/4	4	3 3/4	3 1/2	3 1/4	3	2 3/4	2 1/2	2 1/4	2	1 3/4	1 1/2	1 1/4	1	3/4	1/2	1/4	0
NE	16	15 3/4	15 1/2	15 1/4	15	14 3/4	14 1/2	14 1/4	14	13 3/4	13 1/2	13 1/4	13	12 3/4	12 1/2	12 1/4	12	11 3/4	11 1/2	11 1/4	11	10 3/4	10 1/2	10 1/4	10	9 3/4	9 1/2	9 1/4	9	8 3/4	8 1/2	8 1/4	8	7 3/4	7 1/2	7 1/4	7	6 3/4	6 1/2	6 1/4	6	5 3/4	5 1/2	5 1/4	5	4 3/4	4 1/2	4 1/4	4	3 3/4	3 1/2	3 1/4	3	2 3/4	2 1/2	2 1/4	2	1 3/4	1 1/2	1 1/4	1	3/4	1/2	1/4	0		
SE	16	15 3/4	15 1/2	15 1/4	15	14 3/4	14 1/2	14 1/4	14	13 3/4	13 1/2	13 1/4	13	12 3/4	12 1/2	12 1/4	12	11 3/4	11 1/2	11 1/4	11	10 3/4	10 1/2	10 1/4	10	9 3/4	9 1/2	9 1/4	9	8 3/4	8 1/2	8 1/4	8	7 3/4	7 1/2	7 1/4	7	6 3/4	6 1/2	6 1/4	6	5 3/4	5 1/2	5 1/4	5	4 3/4	4 1/2	4 1/4	4	3 3/4	3 1/2	3 1/4	3	2 3/4	2 1/2	2 1/4	2	1 3/4	1 1/2	1 1/4	1	3/4	1/2	1/4	0		
SW	16	15 3/4	15 1/2	15 1/4	15	14 3/4	14 1/2	14 1/4	14	13 3/4	13 1/2	13 1/4	13	12 3/4	12 1/2	12 1/4	12	11 3/4	11 1/2	11 1/4	11	10 3/4	10 1/2	10 1/4	10	9 3/4	9 1/2	9 1/4	9	8 3/4	8 1/2	8 1/4	8	7 3/4	7 1/2	7 1/4	7	6 3/4	6 1/2	6 1/4	6	5 3/4	5 1/2	5 1/4	5	4 3/4	4 1/2	4 1/4	4	3 3/4	3 1/2	3 1/4	3	2 3/4	2 1/2	2 1/4	2	1 3/4	1 1/2	1 1/4	1	3/4	1/2	1/4	0		

### AREA 40

SCALE IN MILES

JUN 2018

### DETAIL

11.5E 27 1S

# APPENDIX F

## ADMP Proposed Regional Facilities and Costs

Appendix F-1  
ADMP Cost Summaries\_Estrella

EL Area Study ID	FCDMC ID	ADMP / Source	Facility Type	ADMP Cost Year	Inflation Adjustment Factor	Land Acquisition Area (acres)	Land Acquisition Cost		Total ADMP Facility Cost		Phoenix Cost Share Amount (See Note D)
							Original ADMP	Inflation Adjusted (See Note A)	Original (See Note B)	Inflation Adjusted (See Note A)	
<b>ESTRELLA PLANNING AREA</b>											
CH-20	47CH01a	Durango Area Drainage Master Plan	Channel	2001	1.70	7.2	\$309,403	\$525,985	\$1,120,056	\$1,904,095	\$1,243,730
CH-19	47CH01b	Durango Area Drainage Master Plan	Channel	2001	1.70	13.9	\$600,605	\$1,021,029	\$2,236,952	\$3,802,818	\$2,467,616
CH-18	47CH02	Durango Area Drainage Master Plan	Channel	2001	1.70	11.9	\$514,802	\$875,163	\$1,890,280	\$3,213,476	\$2,092,056
CH-17	47CH03	Durango Area Drainage Master Plan	Channel	2001	1.70	6.1	\$265,122	\$450,707	\$2,441,620	\$4,150,754	\$2,325,315
CH-16	47CH04	Durango Area Drainage Master Plan	Channel	2001	1.70	4.6	\$197,803	\$336,265	\$871,843	\$1,482,133	\$927,541
C-22	47CH-C1	Durango Area Drainage Master Plan	RCB Culvert	2001	1.70	---	\$0	\$0	\$559,813	\$951,682	\$475,841
C-21	47CH-C2	Durango Area Drainage Master Plan	RCB Culvert	2001	1.70	---	\$0	\$0	\$404,885	\$688,305	\$344,152
C-20	47CH-C3	Durango Area Drainage Master Plan	RCB Culvert	2001	1.70	---	\$0	\$0	\$520,910	\$885,547	\$442,774
C-19	47CH-C4	Durango Area Drainage Master Plan	RCB Culvert	2001	1.70	---	\$0	\$0	\$1,188,720	\$2,020,824	\$1,010,412
C-18	47CH-C5	Durango Area Drainage Master Plan	RCB Culvert	2001	1.70	---	\$0	\$0	\$1,006,134	\$1,710,428	\$855,214
DB-19	47TH AVE	Durango Area Drainage Master Plan	Basin	2001	1.70	43.9	\$1,892,083	\$3,216,541	\$6,837,435	\$11,623,640	\$7,595,538
(See Note C)	SUN-C1	Durango Area Drainage Master Plan	RCB Culvert	2001	1.70	---	\$0	\$0	\$244,075	\$414,928	\$207,464
C-23	SUN-C2	Durango Area Drainage Master Plan	RCB Culvert	2001	1.70	---	\$0	\$0	\$190,450	\$323,765	\$161,883
C-24	SUN-C3	Durango Area Drainage Master Plan	RCB Culvert	2001	1.70	---	\$0	\$0	\$169,000	\$287,300	\$143,650
C-25	SUN-C4	Durango Area Drainage Master Plan	RCB Culvert	2001	1.70	---	\$0	\$0	\$133,250	\$226,525	\$113,263
(See Note C)	SUN-O1	Durango Area Drainage Master Plan	Channel	2001	1.70	12.5	\$539,483	\$917,121	\$2,094,518	\$3,560,681	\$2,288,926
(See Note C)	SUN-O2A	Durango Area Drainage Master Plan	Channel	2001	1.70	1.9	\$82,477	\$140,211	\$720,869	\$1,225,477	\$690,492
(See Note C)	SUN-O2B	Durango Area Drainage Master Plan	Channel	2001	1.70	4.1	\$178,675	\$303,748	\$670,258	\$1,139,439	\$738,161
(See Note C)	SUN-O2C	Durango Area Drainage Master Plan	Channel	2001	1.70	8.6	\$372,884	\$633,903	\$1,398,784	\$2,377,933	\$1,540,494
CH-39	SUN-O3A	Durango Area Drainage Master Plan	Channel	2001	1.70	7.9	\$342,300	\$581,910	\$1,260,754	\$2,143,282	\$1,394,337
CH-40	SUN-O3B	Durango Area Drainage Master Plan	Channel	2001	1.70	8.0	\$343,811	\$584,479	\$1,266,318	\$2,152,741	\$1,400,490
<b>TOTAL COSTS:</b>							\$5,639,448	\$9,587,062	\$27,226,924	\$46,285,771	\$28,459,347

SUN\*\*\* = Sunland Channel

47CH\*\*\* = 47th Avenue Basin and Channel

**Note A:** Costs from the ADMP are multiplied by 1.70 (derived from the RS Mean s Historical Cost Index) to reflect 2018 dollars.

**Note B:** Costs include land acquisition, full landscape, construction and contingencies

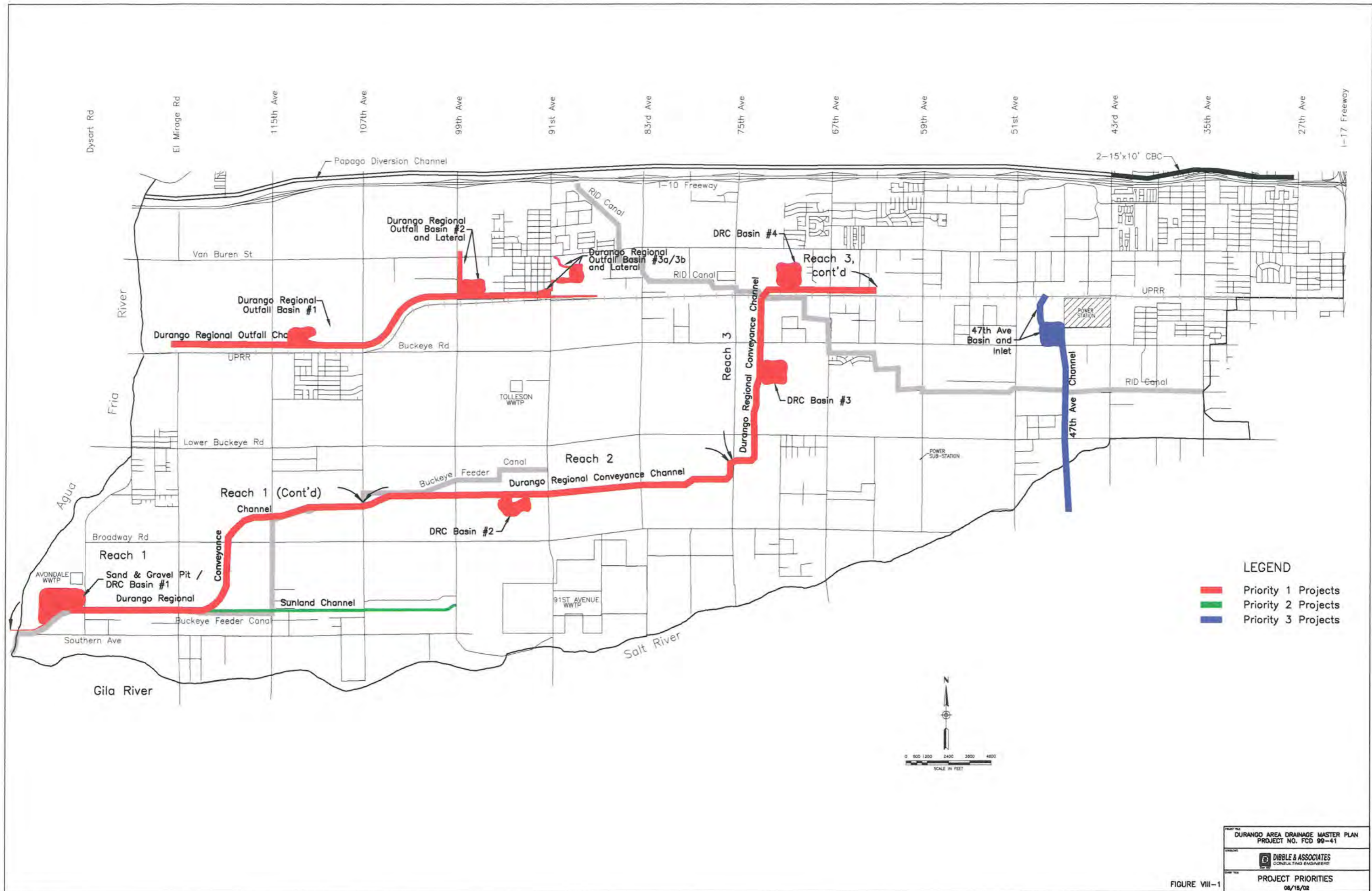
**Note C:** These Sunland Channel facilities are located within Avondale and are not located within the Estrella-Laveen IFP Areas. However, costs for the entire Sunland Channel system are only shared between Phoenix and FCDMC per the Durango ADMP report. Avondale is not a cost-share partner for this facility.

**Note D:** The Durango ADMP estimated landscape costs at double what FCDMC would normally fund, to allow for "enhanced landscaping". This will make the City share equal 75% of the total landscape costs. Also, the Durango ADMP assumed that 60% of the land would be donated by private developers and 40% would be funded by FCDMC. The 60% private share is allocated to Phoenix for this calculation. See the Durango ADMP Report for details of the cost share allocations

Appendix F-2  
ADMP Cost Summaries\_Laveen

EL Area Study ID	FCDMC ID	ADMP / Source	Facility Type	ADMP Cost Year	Inflation Adjustment Factor	Land Acquisition Area (acres)	Land Acquisition Cost		ADMP Facility Cost		Phoenix Cost Share Amount
							Original ADMP	Inflation Adjusted (See Note A)	Original	Inflation Adjusted (See Note A)	
<b>LAVEEN PLANNING AREA</b>											
C-33	AoMI 3	Laveen ADMSPU	RCB Culvert	2017	1.01	0.3	\$33,000	\$33,330	\$980,000	\$989,800	\$511,565
C-34	AoMI 1 - Carver Basin Channel	Laveen ADMSPU	Channel	2017	1.01	(See Note E)	(See Note E)	(See Note E)	(See Note E)	(See Note E)	(See Note E)
CH-53	AoMI 2 - Sunrise Basin Channel	Laveen ADMSPU	Channel	2017	1.01	(See Note F)	(See Note F)	(See Note F)	(See Note F)	(See Note F)	(See Note F)
CH-54	AoMI 1 Basin - Carver	Laveen ADMSPU	Detention Basin	2017	1.01	6.6	\$1,725,000	\$1,742,250	\$1,433,000	\$1,447,330	\$1,594,790
DB-21	AoMI 1 Basin - Highline	Laveen ADMSPU	Detention Basin	2017	1.01	5.33	\$1,394,000	\$1,407,940	\$831,000	\$839,310	\$1,123,625
DB-22	AoMI 2 - Sunrise Basin	Laveen ADMSPU	Detention Basin	2017	1.01	7.8	\$1,024,000	\$1,034,240	\$906,000	\$915,060	\$974,650
DB-23	AoMI 5 - Dobbins Basin	Laveen ADMSPU	Detention Basin	2017	1.01	6.0	\$785,000	\$792,850	\$1,340,000	\$1,353,400	\$1,073,125
DB-24	HMA Basins - AoMI 4	Laveen ADMSPU	Detention Basin	2017	1.01	5.0	\$500,000	\$505,000	\$1,000,000	\$1,010,000	\$757,500
DB-33, 34 and 35 (See Note B)	AoMI 1 - 30 inch to 36 inch RCPs	Laveen ADMSPU	Storm Drain	2017	1.01	1.5	\$393,000	\$396,930	\$2,484,000	\$2,508,840	\$1,452,885
SD-25	AoMI 2 - 24, 36, and 48 inch RCPs	Laveen ADMSPU	Storm Drain	2017	1.01	3.0	\$394,000	\$397,940	\$3,244,000	\$3,276,440	\$1,837,190
SD-26 and SD-27	AoMI 4 - 24, 48 and 72 inch RCP	Laveen ADMSPU	Storm Drain	2017	1.01	1.4	\$367,000	\$370,670	\$4,400,000	\$4,444,000	\$2,407,335
SD-28	AoMI 5 - 24, 48, 54, 66, and 72 inch RCPs	Laveen ADMSPU	Storm Drain	2017	1.01	0.05	\$7,000	\$7,070	\$5,110,000	\$5,161,100	\$2,584,085
<b>TOTAL COSTS:</b>							\$6,622,000	\$6,688,220	\$21,728,000	\$21,945,280	\$14,316,750
<p>AoMI - Area of Mitigation Interest</p> <p><b>Note A:</b> Costs are inflation adjusted using the RS Means Historical Cost Index to reflect 2018 dollars</p> <p><b>Note B:</b> Basins DB-33, 34 and 35 are part of the Laveen ADMSPU AoMI 4 and are referred to as the HMA basins.</p> <p><b>Note C:</b> None the ADMP proposed storm drain is located within an existing or future arterial street.</p> <p><b>Note D:</b> Length of storm drain located within an existing or future arterial street.</p> <p><b>Note E:</b> Carver Basin Channel land acquisition and construction cost details are included in the values for the Carver Basin.</p> <p><b>Note F:</b> Sunrise Basin Channel land acquisition and construction cost details are included in the values for the Sunrise Basin.</p>											





**LEGEND**

- █ Priority 1 Projects
- █ Priority 2 Projects
- █ Priority 3 Projects

DURANGO AREA DRAINAGE MASTER PLAN  
 PROJECT NO. FCD 99-41

**DIBBLE & ASSOCIATES**  
 CONSULTING ENGINEERS

PROJECT PRIORITIES  
 08/15/02

FIGURE VIII-1

Table 2 - Recommended Plan Estimated Costs

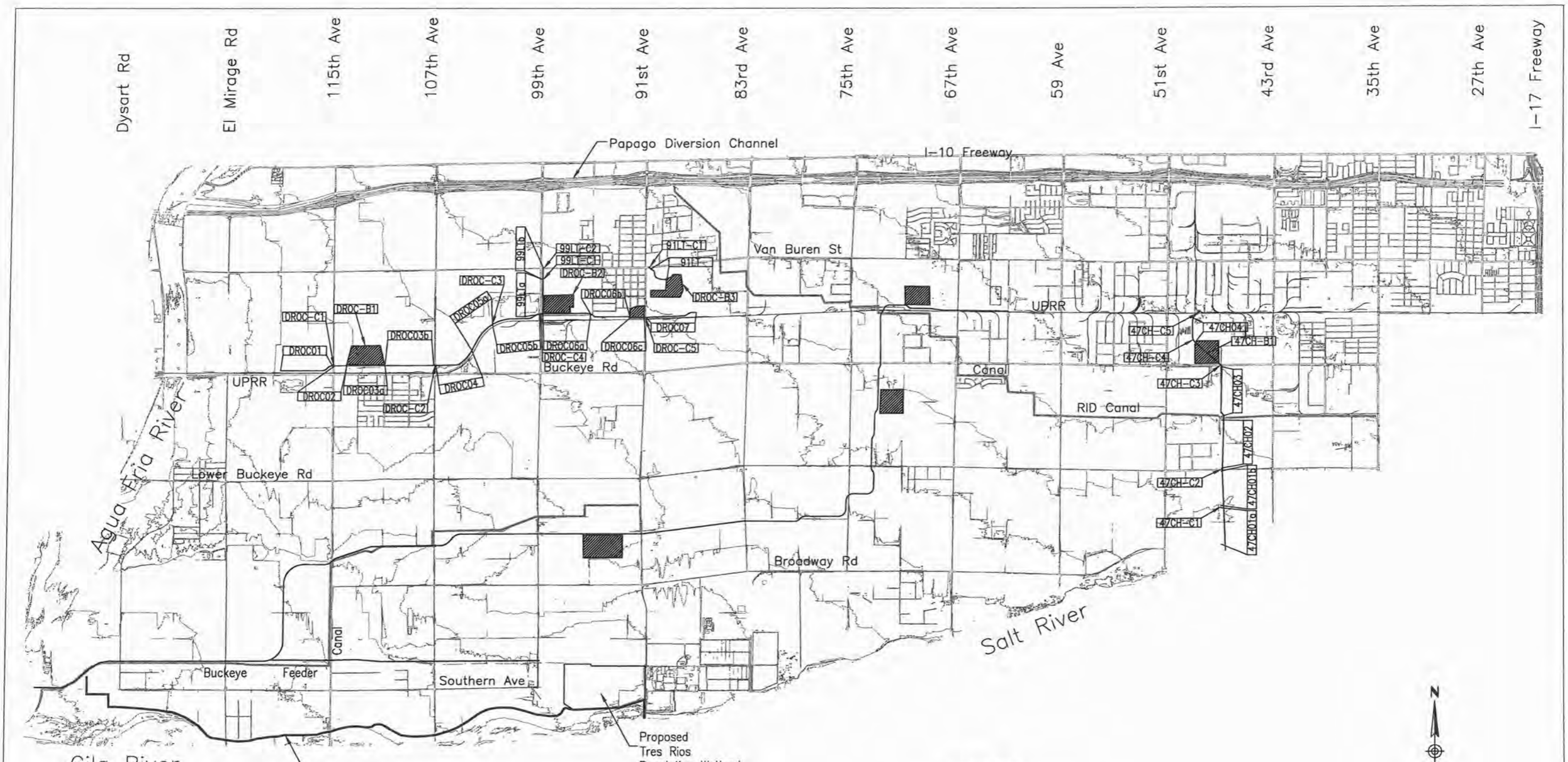
Project	Land Acquisition	Landscaping (FCD Policy)	Construction	Construction Contingency (15%)	Design & CM (15%)	Base Total	Landscaping Enhancements	Total w/ Landscaping Enhancements
Durango Regional Conveyance Channel	\$12,238,407	\$11,125,824	\$21,594,878	\$3,239,232	\$3,239,232	\$51,437,572	\$11,125,824	\$62,563,396
Durango Regional Conveyance Basin #1	\$6,468,660	\$5,880,600	\$1,305,459	\$195,819	\$195,819	\$14,046,357	\$5,880,600	\$19,926,957
Durango Regional Conveyance Basin #2	\$2,069,971	\$1,881,792	\$851,392	\$127,709	\$127,709	\$5,058,572	\$1,881,792	\$6,940,364
Durango Regional Conveyance Basin #3	\$712,846	\$648,042	\$356,826	\$53,524	\$53,524	\$1,824,762	\$648,042	\$2,472,804
Durango Regional Conveyance Basin #4	\$1,261,389	\$1,146,717	\$850,448	\$127,567	\$127,567	\$3,513,688	\$1,146,717	\$4,660,405
<b>DRCC System Total</b>						<b>\$75,880,951</b>		<b>\$96,563,926</b>
Durango Regional Outfall Channel	\$3,428,229	\$3,059,030	\$4,543,878	\$681,582	\$681,582	\$12,394,301	\$3,059,030	\$15,453,331
Durango Regional Outfall Basin #1	\$1,595,603	\$1,450,548	\$1,151,020	\$172,653	\$172,653	\$4,542,476	\$1,450,548	\$5,993,024
Durango Regional Outfall Basin #2 and Lateral	\$1,740,386	\$1,582,169	\$1,477,252	\$221,588	\$221,588	\$5,242,983	\$1,582,169	\$6,825,152
Durango Regional Outfall Basins #3a/3b and Lateral	\$1,522,929	\$1,384,481	\$1,542,010	\$231,301	\$231,301	\$4,912,022	\$1,384,481	\$6,296,503
<b>DROP System Total</b>						<b>\$27,091,782</b>		<b>\$34,568,010</b>
Sunland Avenue Channel	\$1,859,630	\$1,690,573	\$2,236,539	\$335,481	\$335,481	\$6,457,703	\$1,690,573	\$8,148,276
<b>Sunland Avenue System Total</b>						<b>\$6,457,703</b>		<b>\$8,148,276</b>
47th Ave Channel	\$1,689,932	\$1,536,302	\$3,393,831	\$509,075	\$509,075	\$7,638,214	\$1,536,302	\$9,174,515
47th Ave Basin and Inlet	\$2,089,886	\$1,899,896	\$3,088,042	\$463,206	\$463,206	\$8,004,237	\$1,899,896	\$9,904,133
<b>47th Avenue System Total</b>						<b>\$15,642,450</b>		<b>\$19,078,648</b>
<b>Base ADMP Total</b>						<b>\$125,072,887</b>		
<b>Total Landscape Enhancements</b>							<b>\$33,285,974</b>	
<b>ADMP Total w/ Landscape Enhancements</b>								<b>\$158,358,861</b>

Capital Expenditures	Cost	03-04	04-05	05-06	06-07	07-08	08-09	09-10	10-11	11-12	12-13
<b>DRCC - Reach 1</b>											
Land Acquisition	\$6,119,315		\$6,119,315								
Design	\$852,677		\$852,677								
Construction/Conting./C.M.	\$13,927,065			\$13,927,065							
FCD Policy Landscape	\$5,563,013				\$5,563,013						
Landscape Enhancements	\$5,563,013				\$5,563,013						
<b>DRCC - Reach 2</b>											
Land Acquisition	\$4,074,396	\$4,074,396									
Design	\$487,036				\$487,036						
Construction/Conting./C.M.	\$7,954,924					\$7,954,924					
FCD Policy Landscape	\$3,703,997						\$3,703,997				
Landscape Enhancements	\$3,703,997						\$3,703,997				
<b>DRCC - Reach 3</b>											
Land Acquisition	\$2,044,696		\$2,044,696								
Design	\$279,902			\$279,902							
Construction/Conting./C.M.	\$4,571,736				\$4,571,736						
FCD Policy Landscape	\$1,858,814					\$1,858,814					
Landscape Enhancements	\$1,858,814					\$1,858,814					
<b>DRC Basin 1</b>											
Land Acquisition	\$6,468,660	\$6,468,660									
Design	\$97,909	\$97,909									
Construction/Conting./C.M.	\$1,599,188		\$1,599,188								
FCD Policy Landscape	\$5,880,600					\$5,880,600					
Landscape Enhancements	\$5,880,600					\$5,880,600					
<b>DRC Basin 2</b>											
Land Acquisition	\$2,069,971	\$2,069,971									
Design	\$63,854					\$63,854					
Construction/Conting./C.M.	\$1,042,955						\$1,042,955				
FCD Policy Landscape	\$1,881,792							\$1,881,792			
Landscape Enhancements	\$1,881,792							\$1,881,792			
<b>DRC Basin 3</b>											
Land Acquisition	\$712,846	\$712,846									
Design	\$26,762		\$26,762								
Construction/Conting./C.M.	\$437,112			\$437,112							
FCD Policy Landscape	\$648,042					\$648,042					
Landscape Enhancements	\$648,042					\$648,042					
<b>DRC Basin 4</b>											
Land Acquisition	\$1,261,389	\$1,261,389									
Design	\$63,784		\$63,784								
Construction/Conting./C.M.	\$1,041,798			\$1,041,798							
FCD Policy Landscape	\$1,146,717					\$1,146,717					
Landscape Enhancements	\$1,146,717					\$1,146,717					
<b>DRC System Base Total</b>	<b>\$75,880,951</b>	<b>\$14,685,172</b>	<b>\$10,706,421</b>	<b>\$15,685,877</b>	<b>\$12,416,545</b>	<b>\$15,758,192</b>	<b>\$4,746,952</b>	<b>\$1,881,792</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>
Landscape Enhancements	\$20,682,975	\$0	\$0	\$0	\$7,357,773	\$7,739,414	\$3,703,997	\$1,881,792	\$0	\$0	\$0
<b>DRC System Total w/ LS Enhancements</b>	<b>\$96,563,926</b>	<b>\$14,685,172</b>	<b>\$10,706,421</b>	<b>\$15,685,877</b>	<b>\$19,774,317</b>	<b>\$23,497,606</b>	<b>\$8,450,948</b>	<b>\$3,763,584</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>
<b>DRO Channel - Reach 1</b>											
Land Acquisition	\$1,419,040	\$1,419,040									
Design	\$122,182	\$122,182									
Construction/Conting./C.M.	\$1,995,633		\$1,995,633								
FCD Policy Landscape	\$1,290,037			\$1,290,037							
Landscape Enhancements	\$1,290,037			\$1,290,037							
<b>DRO Channel - Reach 2</b>											
Land Acquisition	\$2,009,189		\$1,004,595	\$1,004,595							
Design	\$218,609	\$218,609									
Construction/Conting./C.M.	\$3,570,618			\$1,785,309	\$1,785,309						
FCD Policy Landscape	\$1,768,993				\$884,497	\$884,497					
Landscape Enhancements	\$1,768,993				\$884,497	\$884,497					
<b>DRO Basin 1</b>											
Land Acquisition	\$1,595,603	\$1,595,603									
Design	\$86,326	\$86,326									
Construction/Conting./C.M.	\$1,409,999		\$1,409,999								
FCD Policy Landscape	\$1,450,548		\$1,450,548								
Landscape Enhancements	\$1,450,548		\$1,450,548								
<b>DRO Basin 2 &amp; Lateral</b>											
Land Acquisition	\$1,740,386	\$1,740,386									
Design	\$110,794	\$110,794									
Construction/Conting./C.M.	\$1,809,633			\$1,809,633							
FCD Policy Landscape	\$1,582,169			\$1,582,169							
Landscape Enhancements	\$1,582,169			\$1,582,169							
<b>DRO Basin 3 &amp; Lateral</b>											
Land Acquisition	\$1,522,929	\$1,522,929									
Design	\$115,651	\$115,651									
Construction/Conting./C.M.	\$1,888,962				\$1,888,962						
FCD Policy Landscape	\$1,384,481				\$1,384,481						
Landscape Enhancements	\$1,384,481				\$1,384,481						
<b>DRO System Base Total</b>	<b>\$27,091,782</b>	<b>\$6,931,520</b>	<b>\$5,860,775</b>	<b>\$7,471,743</b>	<b>\$5,943,248</b>	<b>\$884,497</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>
Landscape Enhancements	\$7,476,228	\$0	\$1,450,548	\$2,872,206	\$2,268,977	\$884,497	\$0	\$0	\$0	\$0	\$0
<b>DRO System Total w/ LS Enhancements</b>	<b>\$34,568,010</b>	<b>\$6,931,520</b>	<b>\$7,311,323</b>	<b>\$10,343,949</b>	<b>\$8,212,226</b>	<b>\$1,768,993</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>
<b>Sunland Avenue Channel</b>											
Land Acquisition	\$1,859,630						\$1,859,630				
Design	\$167,740						\$167,740				
Construction/Conting./C.M.	\$2,739,760							\$2,739,760			
FCD Policy Landscape	\$1,690,573							\$1,690,573			
Landscape Enhancements	\$1,690,573							\$1,690,573			
<b>Sunland Avenue System Base Total</b>	<b>\$6,457,703</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$2,027,370</b>	<b>\$4,430,333</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>
Landscape Enhancements	\$1,690,573	\$0	\$0	\$0	\$0	\$0	\$0	\$1,690,573	\$0	\$0	\$0
<b>Sunland System Total w/ LS Enhancements</b>	<b>\$8,148,276</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$2,027,370</b>	<b>\$6,120,905</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>
<b>47th Ave Basin &amp; Lateral</b>											
Land Acquisition	\$2,089,886		\$2,089,886								
Design	\$231,603							\$231,603			
Construction/Conting./C.M.	\$3,782,851								\$3,782,851		
FCD Policy Landscape	\$1,899,896									\$1,899,896	
Landscape Enhancements	\$1,899,896									\$1,899,896	
<b>47th Ave Channel</b>											
Land Acquisition	\$1,689,932							\$1,689,932			
Design	\$254,537								\$254,537		
Construction/Conting./C.M.	\$4,157,442									\$4,157,442	
FCD Policy Landscape	\$1,536,302										\$1,536,302
Landscape Enhancements	\$1,536,302										\$1,536,302
<b>47th Avenue System Base Total</b>	<b>\$15,642,450</b>	<b>\$0</b>	<b>\$2,089,886</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$1,921,535</b>	<b>\$4,037,388</b>	<b>\$6,057,339</b>	<b>\$1,536,302</b>
Landscape Enhancements	\$3,436,198	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$1,899,896	\$1,536,302
<b>47th Ave System Total w/ LS Enhancements</b>	<b>\$19,078,648</b>	<b>\$0</b>	<b>\$2,089,886</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$1,921,535</b>	<b>\$4,037,388</b>	<b>\$7,957,235</b>	<b>\$3,072,604</b>
<b>TOTAL BASE EXPENDITURES</b>	<b>\$125,072,887</b>	<b>\$21,616,692</b>	<b>\$18,657,082</b>	<b>\$23,157,620</b>	<b>\$16,359,793</b>	<b>\$16,642,689</b>	<b>\$6,774,322</b>	<b>\$8,233,660</b>	<b>\$4,037,388</b>	<b>\$6,057,339</b>	<b>\$1,536,302</b>
<b>TOTAL LANDSCAPE ENHANCEMENTS</b>	<b>\$33,285,974</b>	<b>\$0</b>	<b>\$1,450,548</b>	<b>\$2,872,206</b>	<b>\$9,626,750</b>	<b>\$8,623,911</b>	<b>\$3,703,997</b>	<b>\$3,572,365</b>	<b>\$0</b>	<b>\$1,899,896</b>	<b>\$1,536,302</b>
<b>TOTAL ADMP w/ LANDSCAPE ENHANCEMENTS</b>	<b>\$158,358,861</b>	<b>\$21,616,692</b>	<b>\$20,107,630</b>	<b>\$26,029,826</b>	<b>\$27,986,543</b>	<b>\$25,266,599</b>	<b>\$10,478,319</b>	<b>\$11,806,024</b>	<b>\$4,037,388</b>	<b>\$7,957,235</b>	<b>\$3,072,604</b>

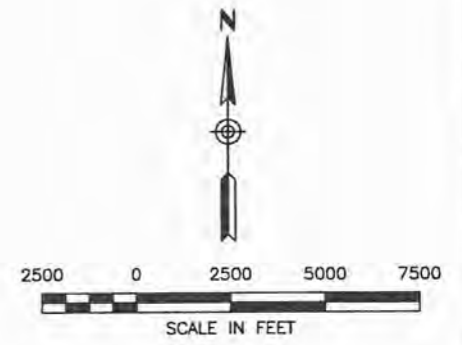


TABLE 5 - PROJECTED COST VS. REVENUE

COST VS. REVENUES		03-04	04-05	05-06	06-07	07-08	08-09	09-10	10-11	11-12	12-13	Total
City of Phoenix - Impact Fees	Project Cost	\$3,072,184	\$522,472	\$0	\$243,518	\$4,009,389	\$6,077,473	\$2,880,589	\$1,009,347	\$2,464,283	\$1,152,226	\$21,431,480
	Projected Revenues	\$620,000	\$682,000	\$750,200	\$825,220	\$907,742	\$998,516	\$1,098,368	\$1,208,205	\$1,329,025	\$1,461,928	\$9,881,203
	Fund Balance	(\$2,452,184)	(\$2,292,655)	(\$1,542,455)	(\$960,753)	(\$4,062,400)	(\$9,141,357)	(\$10,923,578)	(\$10,724,720)	(\$11,859,978)	(\$11,550,277)	(\$11,550,277)
City of Phoenix - CIP Budget	Project Cost	\$987,118	\$1,590,092	\$879,406	\$4,978,007	\$2,788,221	\$83,870	\$3,963,640	\$1,009,347	\$2,464,283	\$1,152,226	\$19,896,210
	Projected Revenues		\$700,000	\$11,000,000								\$11,700,000
	Fund Balance	(\$987,118)	(\$1,877,210)	\$8,243,384	\$3,265,378	\$477,157	\$393,286	(\$3,570,353)	(\$4,579,701)	(\$7,043,983)	(\$8,196,210)	(\$8,196,210)
City of Avondale	Project Cost	\$4,138,911	\$4,346,230	\$7,969,761	\$8,344,520	\$8,820,900	\$0	\$0	\$0	\$0	\$0	\$33,620,323
	Projected Revenues											\$0
	Fund Balance	(\$4,138,911)	(\$8,485,141)	(\$16,454,902)	(\$24,799,423)	(\$33,620,323)	(\$33,620,323)	(\$33,620,323)	(\$33,620,323)	(\$33,620,323)	(\$33,620,323)	(\$33,620,323)
City of Tolleson	Project Cost	\$1,854,185	\$0	\$4,170,725	\$5,240,602	\$1,326,745	\$0	\$0	\$0	\$0	\$0	\$12,592,256
	Projected Revenues											\$0
	Fund Balance	(\$1,854,185)	(\$1,854,185)	(\$6,024,910)	(\$11,265,511)	(\$12,592,256)	(\$12,592,256)	(\$12,592,256)	(\$12,592,256)	(\$12,592,256)	(\$12,592,256)	(\$12,592,256)
FCDMC	Project Cost	\$10,666,442	\$6,168,424	\$11,478,350	\$9,179,897	\$8,321,344	\$3,201,198	\$3,947,837	\$2,018,694	\$3,028,669	\$768,151	\$58,779,007
	Projected Revenues	\$1,075,000	\$2,350,000	\$4,100,000	\$3,450,000	\$2,000,000						\$12,975,000
	Fund Balance	(\$9,591,442)	(\$13,409,866)	(\$20,788,217)	(\$26,518,113)	(\$32,839,458)	(\$36,040,656)	(\$39,988,492)	(\$42,007,186)	(\$45,035,856)	(\$45,804,007)	(\$45,804,007)
MCDOT	Project Cost	\$12,218	\$199,563	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$211,781
	Projected Revenues											\$0
	Fund Balance	(\$12,218)	(\$211,781)	(\$211,781)	(\$211,781)	(\$211,781)	(\$211,781)	(\$211,781)	(\$211,781)	(\$211,781)	(\$211,781)	(\$211,781)
Tres Rios	Project Cost	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
	Projected Revenues											\$0
	Fund Balance	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
SRP	Project Cost	\$0	\$2,019,374	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$2,019,374
	Projected Revenues											\$0
	Fund Balance	\$0	(\$2,019,374)	(\$2,019,374)	(\$2,019,374)	(\$2,019,374)	(\$2,019,374)	(\$2,019,374)	(\$2,019,374)	(\$2,019,374)	(\$2,019,374)	(\$2,019,374)
Developers	Project Cost	\$885,635	\$5,261,475	\$1,531,583	\$0	\$0	\$1,115,778	\$1,013,959	\$0	\$0	\$0	\$9,808,430
	Projected Revenues											\$0
	Fund Balance	(\$885,635)	(\$6,147,110)	(\$7,678,693)	(\$7,678,693)	(\$7,678,693)	(\$8,794,471)	(\$9,808,430)	(\$9,808,430)	(\$9,808,430)	(\$9,808,430)	(\$9,808,430)
<b>TOTAL PROJECT COST</b>		\$21,616,692	\$20,107,630	\$26,029,826	\$27,986,543	\$25,266,599	\$10,478,319	\$11,806,024	\$4,037,388	\$7,957,235	\$3,072,604	\$158,358,861
<b>TOTAL PROJECTED REVENUES</b>		\$1,695,000	\$3,732,000	\$15,850,200	\$4,275,220	\$2,907,742	\$998,516	\$1,098,368	\$1,208,205	\$1,329,025	\$1,461,928	\$34,556,203
<b>NET FUND BALANCE</b>		(\$19,921,692)	(\$36,297,322)	(\$46,476,948)	(\$70,188,271)	(\$92,547,128)	(\$102,026,931)	(\$112,734,588)	(\$115,563,771)	(\$122,191,982)	(\$123,802,658)	(\$123,802,658)



- LEGEND**
- New Channel
  - XXX-# New Channel Reach Identifier
  - x New Culvert
  - XXX-C# New Culvert Identifier
  - ▨ New Detention Basin
  - XXX-B# New Detention Basin Identifier



PROJECT TITLE:  
DURANGO AREA DRAINAGE MASTER PLAN  
PROJECT NO. FCD 99-41

CONSULTANT:  
**DIBBLE & ASSOCIATES**  
CONSULTING ENGINEERS

DATE:  
**RECOMMENDED PLAN, SHEET 1**  
07/24/02

Recommended Plan, Sheet 1

ID	Excavated Volume (cy)	Unit Cost (\$/cy)	Excavation Cost	Concrete Volume (cy)	Unit Cost (\$/cy)	Concrete Cost	Utility Relocation Cost	Channel Length (ft)	Left Access Road Width (ft)	Right Access Road Width (ft)	E-ABC Access Road Unit Cost (\$/sf)	Access Road Cost	Total Corridor Width-Channel+Access Rd (ft)	Existing Right-of-Way Width (ft.)	New Right-of-Way Width Required (ft.)	Landscape Unit Cost (\$/sf)	Total Landscape Cost	Required Land Acquisition (Ac.)	Zoning	Land Acquisition Cost	Total Construction Cost	Channel Contingencies Cost	Total Construction, Land, Landscape, and Contingencies Costs
DROC01	58025	\$6	\$348,151	0	n/a	n/a	\$0	2689.7	16	16	\$0.65	\$55,946	164.6	0	190	\$1.80	\$919,877	11.7	Res / Ag	\$505,933	\$404,096	121,229	\$1,951,135
DROC02a	13170	\$6	\$79,017	0	n/a	n/a	\$45,000	920.5	16	16	\$0.65	\$19,146	136.3	0	150	\$1.80	\$248,535	3.2	Res / Ag	\$136,694	\$143,164	42,949	\$571,342
DROC02b	18794	\$6	\$112,762	0	n/a	n/a	\$0	1559.8	16	16	\$0.65	\$32,444	131.2	0	150	\$1.80	\$421,146	5.4	Res / Ag	\$231,630	\$145,206	43,562	\$841,544
DROC03	67699	\$6	\$406,195	0	n/a	n/a	\$0	2501.3	16	16	\$0.65	\$52,027	195.0	0	220	\$1.80	\$990,515	12.6	Res / Ag	\$544,783	\$458,222	137,467	\$2,130,987
DROC04	54819	\$6	\$328,913	0	n/a	n/a	\$4,000	2176.8	16	16	\$0.65	\$45,277	182.7	0	210	\$1.80	\$822,830	10.5	Res / Ag	\$452,557	\$378,190	113,457	\$1,767,035
DROC05a	15922	\$6	\$95,532	0	n/a	n/a	\$26,000	1166	16	16	\$0.65	\$24,253	129.3	0	150	\$1.80	\$314,820	4.0	Res / Ag	\$173,151	\$145,785	43,735	\$677,491
DROC05b	39016	\$4	\$156,063	0	n/a	n/a	\$22,000	2857.2	16	16	\$0.65	\$59,430	129.3	0	150	\$1.80	\$771,444	9.8	Res / Ag	\$424,294	\$237,493	71,248	\$1,504,479
DROC06a	44216	\$6	\$265,297	0	n/a	n/a	\$51,000	2558	16	16	\$0.65	\$53,206	147.0	0	170	\$1.80	\$782,748	10.0	Res / Ag	\$430,511	\$369,504	110,851	\$1,693,614
DROC06b	15243	\$4	\$60,973	2115	310	655692	\$53,000	2664	16	16	\$0.65	\$55,411	56.0	0	70	\$1.80	\$220,579	4.3	Res / Ag	\$184,615	\$825,076	247,523	\$1,477,793
DROC07	29980	\$6	\$179,879	0	n/a	n/a	\$33,000	2482.4	16	16	\$0.65	\$51,634	122.7	0	140	\$1.80	\$625,565	8.0	Res / Ag	\$344,061	\$264,512	79,354	\$1,313,492
99LTa	14863	\$6	\$89,177	0	n/a	n/a	\$0	1572.9	16	16	\$0.65	\$32,716	110.7	0	130	\$1.80	\$368,059	4.7	Res / Ag	\$202,432	\$121,893	36,568	\$728,952
99LTb	5266	\$4	\$21,064	0	n/a	n/a	\$9,000	557.3	16	16	\$0.65	\$11,592	110.7	0	130	\$1.80	\$130,408	1.7	Res / Ag	\$71,725	\$41,656	12,497	\$256,286
91LT	18114	\$6	\$108,686	0	n/a	n/a	\$16,000	1105.6	16	16	\$0.65	\$22,996	151.2	0	170	\$1.80	\$338,314	4.3	Res / Ag	\$186,072	\$147,882	44,305	\$716,373
47CH01a	40941	\$4	\$163,763	0	n/a	n/a	\$0	1302.2	16	16	\$0.65	\$27,086	212.2	0	240	\$1.80	\$562,550	7.2	Res / Ag	\$309,403	\$190,849	57,255	\$1,120,056
47CH01b	79473	\$4	\$317,893	0	n/a	n/a	\$48,250	2527.8	16	16	\$0.65	\$52,578	212.2	0	240	\$1.80	\$1,092,010	13.9	Res / Ag	\$600,605	\$418,721	125,616	\$2,236,952
47CH02	66919	\$4	\$267,677	0	n/a	n/a	\$18,875	2476.2	16	16	\$0.65	\$51,505	189.3	0	210	\$1.80	\$936,004	11.8	Res / Ag	\$514,802	\$338,057	101,417	\$1,890,280
47CH03	32163	\$4	\$128,651	3610	310	119076	\$0	2678	16	16	\$0.65	\$55,702	87.0	0	100	\$1.80	\$482,040	6.1	Res / Ag	\$265,122	\$1,303,429	391,029	\$2,441,620
47CH04	21850	\$4	\$87,399	0	n/a	n/a	\$130,000	1175.3	16	16	\$0.65	\$24,446	152.6	0	170	\$1.80	\$359,642	4.6	Res / Ag	\$197,803	\$241,845	72,553	\$871,843

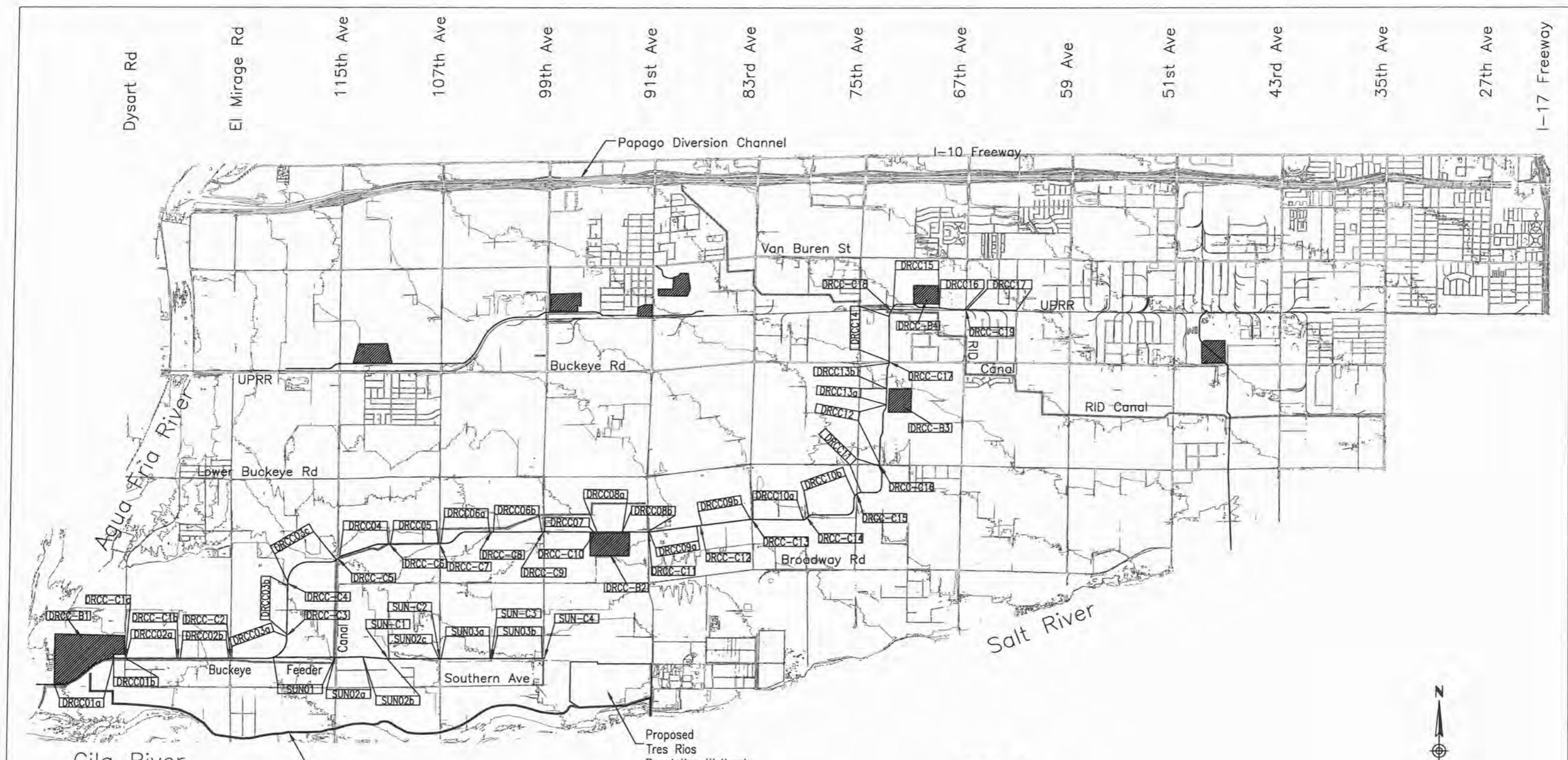
Culvert Cost

Location	ID	Length (ft.)	Number of Barrels	Culvert Dia./ Height	Unit	Width (ft)	Length of Pipe/ Box Culvert (ft.)	Unit Cost (\$/ft.)	Pipe/Box Culvert Cost	Inlet Headwall	Unit Cost (\$/Ea.)	Inlet Headwall Cost	Outlet Headwall	Unit Cost (\$/Ea.)	Outlet Headwall Cost	Required Land Acquisition (Ac.)	Zoning	Unit Cost (\$/sf)	Culvert Land Acquisition Cost	Culvert Materials Cost	Culvert Contingencies Cost	Total Land, Construction, and Contingencies Costs
DROC / 115th Ave	DROC-C1	130	4	5	ft.	10	130	\$2,100	\$273,000	1	\$5,700	\$5,700	1	\$9,900	\$9,900	0.0	N/A	\$0.00	\$0	\$288,600	\$86,580	\$375,180
DROC / 107th Ave	DROC-C2	110	3	5	ft.	10	110	\$1,575	\$173,250	1	\$6,050	\$6,050	1	\$10,500	\$10,500	0.0	N/A	\$0.00	\$0	\$189,800	\$56,940	\$246,740
DROC / 103rd Ave RR Spur	DROC-C3	242.4	3	5	ft.	10	242.4	\$1,575	\$381,780	1	\$4,800	\$4,800	1	\$8,300	\$8,300	0.0	N/A	\$0.00	\$0	\$394,880	\$118,464	\$513,344
DROC / 99th Ave	DROC-C4	110	2	5	ft.	10	110	\$1,050	\$115,500	1	\$4,950	\$4,950	1	\$8,600	\$8,600	0.0	N/A	\$0.00	\$0	\$129,050	\$38,715	\$167,765
DROC / 91st Ave	DROC-C5	150	2	5	ft.	10	150	\$1,050	\$157,500	1	\$4,700	\$4,700	1	\$8,100	\$8,100	0.0	N/A	\$0.00	\$0	\$170,300	\$51,090	\$221,390
99th Ave Lateral / 1/8 mile S. of Van Buren	99LT-C1	100	2	5	ft.	10	100	\$1,050	\$105,000	1	\$5,500	\$5,500	1	\$9,500	\$9,500	0.0	N/A	\$0.00	\$0	\$120,000	\$36,000	\$156,000
99th Ave Lateral / Van Buren St	99LT-C2	110	3	4	ft.	10	110	\$1,575	\$173,250	1	\$6,200	\$6,200	1	\$10,700	\$10,700	0.0	N/A	\$0.00	\$0	\$190,150	\$57,045	\$247,195
91st Ave Lateral / Van Buren St	91LT-C1	185	3	4	ft.	10	185	\$1,575	\$291,375	1	\$4,800	\$4,800	1	\$8,300	\$8,300	0.0	N/A	\$0.00	\$0	\$304,475	\$91,343	\$395,818
47th Ave Channel / 1/2 mile S. of Lower B.	47CH-C1	111	7	5	ft.	10	111	\$3,675	\$407,925	1	\$8,300	\$8,300	1	\$14,400	\$14,400	0.0	N/A	\$0.00	\$0	\$430,625	\$129,188	\$559,813
47th Ave Channel / Lower Buckeye Rd	47CH-C2	110	5	5	ft.	10	110	\$2,625	\$288,750	1	\$8,300	\$8,300	1	\$14,400	\$14,400	0.0	N/A	\$0.00	\$0	\$311,450	\$93,435	\$404,885
47th Ave Channel / Buckeye Rd	47CH-C3	323	3	5	ft.	8	323	\$1,200	\$387,600	1	\$4,800	\$4,800	1	\$8,300	\$8,300	0.0	N/A	\$0.00	\$0	\$400,700	\$120,210	\$520,910
47th Ave Channel / Del. Basin Entrance	47CH-C4	427	4	5	ft.	10	427	\$2,100	\$896,700	1	\$6,500	\$6,500	1	\$11,200	\$11,200	0.0	N/A	\$0.00	\$0	\$914,400	\$274,320	\$1,188,720

Retention/Detention Basin Cost

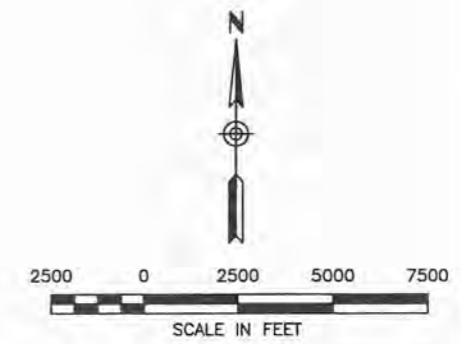
ID	Basin Excavation Volume (cy)	Unit Cost (\$/cy)	Detention Basin Excavation Cost	Length of Drain Pipe/ Box Culvert (ft.)	Unit Cost (\$/ft.)	Pipe/Box Culvert Cost	# Of Manholes	Manhole Unit Cost (\$)	Manhole Total Cost (\$)	Headwall	Unit Cost (\$/Ea.)	Headwall Cost	Inflow Spillway Area (ft*2)	Inflow Spillway Unit Cost (\$/sf)	Inflow Spillway Cost	Basin Top Area (ac)	Required Land Acquisition (Ac.)	Unit Cost (\$/sf)	Total Land Acquisition Cost	Landscape Restoration (sf)	Landscape Unit Cost (\$/sf)	Total Construction Cost	Total Landscape Cost	Detention Basin Contingencies Cost	Total Construction, Land, Landscape and Contingencies Costs
DRO Basin #1 - 111th Ave	279,897	\$4.00	\$1,119,588	156	\$55	\$8,580	1	\$4,500	\$4,500	1	\$1,100	\$1,100	3450.319	\$5	\$17,252	18	37	\$0.99	\$1,595,603	1611720	\$1.80	\$1,151,020	\$2,901,096	\$345,306	\$5,993,024
DRO Basin #2 - 99th Ave	231,400	\$4.00	\$925,600	155	\$55	\$8,525	1	\$4,500	\$4,500	1	\$1,100	\$1,100	8933.477	\$5	\$44,867	28	34	\$0.99	\$1,466,230	1481040	\$1.80	\$1,003,552	\$2,665,872	\$301,066	\$5,436,720
DRO Basin #3a - 91st Ave	184,000	\$4.00	\$736,000	2280	\$55	\$125,400	6	\$4,500	\$27,000	1	\$1,100	\$1,100	0	\$5	\$0	21	24	\$0.99	\$1,034,986	1045440	\$1.80	\$889,500	\$1,881,792	\$266,850	\$4,073,128
DRO Basin #3b - 91st Ave	39,800	\$4.00	\$159,200	91	\$55	\$5,005	1	\$4,500	\$4,500	2	\$1,100	\$2,200	5889.458	\$5	\$29,447	7	7	\$0.99	\$301,871	304920	\$1.80	\$200,352	\$548,856	\$60,106	\$1,111,185
47th Ave Basin	260,633	\$4.00	\$1,042,532	0	\$55	\$0	0	\$4,500	\$0	0	\$1,100	\$0	19153	\$5	\$95,767	35.1	43.875	\$0.99	\$1,892,083	1911195	\$1.80	\$1,157,847	\$3,440,151	\$347,354	\$6,837,435

\* Contingencies are based on 30% of total construction cost and include design and construction administration costs



**LEGEND**

- New Channel
- XXX-# New Channel Reach Identifier
- x New Culvert
- XXX-C# New Culvert Identifier
- ▨ New Detention Basin
- XXX-B# New Detention Basin Identifier



PROJECT TITLE:  
**DURANGO AREA DRAINAGE MASTER PLAN**  
 PROJECT NO. FCD 99-41

CONSULTANT:  
 **DIBBLE & ASSOCIATES**  
 CONSULTING ENGINEERS

DATE:  
**RECOMMENDED PLAN, SHEET 2**  
 10/08/02



Recommended Plan, Sheet 2

ID	Excavated Volume (cy)	Unit Cost (\$/cy)	Excavation Cost	Concrete Volume (cy)	Unit Cost (\$/cy)	Concrete Cost	Utility Relocation Cost	Channel Length (ft)	Left Access Road Width (ft)	Right Access Road Width (ft)	ABC Access Road Unit Cost (\$/ft)	Access Road Cost	Total Corridor Width-Channel+Access Rd (ft)	Existing Right-of-Way Width (ft)	New Right-of-Way Width Required (ft)	Landscape Unit Cost (\$/sf)	Total Landscape Cost	Required Land Acquisition (Ac.)	Zoning	Land Acquisition Cost	Total Construction Cost	Channel Contingencies Cost	Total Construction, Land, Landscape, and Contingencies Costs
DRCC01a	2581	\$6	\$15,546	1431	310	443611	\$0	4229.6	16	16	\$0.65	\$87,976	36.0	0	40	\$1.80	\$304,531	3.9	Res / Ag	\$167,492	\$547,133	164,140	\$1,183,296
DRCC01b	21989	\$6	\$131,934	0	n/a	n/a	\$0	500	16	16	\$0.65	\$10,400	268.1	0	300	\$1.80	\$270,000	3.4	Res / Ag	\$148,500	\$142,334	42,700	\$603,534
DRCC02a	110503	\$6	\$663,020	0	n/a	n/a	\$0	2512.7	16	16	\$0.65	\$52,264	268.1	0	300	\$1.80	\$1,356,858	17.3	Res / Ag	\$746,272	\$715,284	214,585	\$3,032,999
DRCC02b	110508	\$4	\$442,031	0	n/a	n/a	\$0	2512.8	16	16	\$0.65	\$52,266	268.1	0	300	\$1.80	\$1,356,912	17.3	Res / Ag	\$746,302	\$494,297	148,289	\$2,745,800
DRCC03a	138383	\$6	\$830,299	0	n/a	n/a	\$0	3376.8	16	16	\$0.65	\$70,237	253.5	0	280	\$1.80	\$1,701,907	21.7	Res / Ag	\$936,049	\$900,536	270,161	\$3,808,653
DRCC03b	103685	\$4	\$414,738	0	n/a	n/a	\$0	2530.1	16	16	\$0.65	\$52,826	253.5	0	280	\$1.80	\$1,275,170	16.3	Res / Ag	\$701,344	\$467,366	140,210	\$2,584,089
DRCC04	149479	\$6	\$896,871	0	n/a	n/a	\$401,200	2645.9	16	16	\$0.65	\$55,035	323.6	0	360	\$1.80	\$1,714,543	21.9	Res / Ag	\$942,999	\$1,353,106	405,932	\$4,416,579
DRCC05	140818	\$6	\$844,907	0	n/a	n/a	\$405,150	2492.6	16	16	\$0.65	\$51,846	323.6	0	360	\$1.80	\$1,615,205	20.6	Res / Ag	\$888,363	\$1,301,904	390,571	\$4,196,042
DRCC06a	53795	\$6	\$322,771	0	n/a	n/a	\$260,950	2724.6	16	16	\$0.65	\$56,672	157.8	0	180	\$1.80	\$882,770	11.3	Res / Ag	\$485,524	\$660,392	198,118	\$2,226,804
DRCC06b	47984	\$4	\$191,937	0	n/a	n/a	\$260,800	2430.3	16	16	\$0.65	\$50,560	157.8	0	180	\$1.80	\$787,417	10.0	Res / Ag	\$433,079	\$523,288	156,966	\$1,900,771
DRCC07	41224	\$6	\$247,341	0	n/a	n/a	\$2,000	2778.2	16	16	\$0.65	\$57,787	136.1	0	150	\$1.80	\$750,114	9.6	Res / Ag	\$412,563	\$307,128	92,138	\$1,561,943
DRCC08a	16588	\$6	\$99,537	0	n/a	n/a	\$0	1079.1	16	16	\$0.65	\$22,445	146.0	0	170	\$1.80	\$330,205	4.2	Res / Ag	\$181,613	\$121,982	36,595	\$670,394
DRCC08b	41229	\$6	\$247,376	0	n/a	n/a	\$0	1250.2	16	16	\$0.65	\$26,004	218.0	0	240	\$1.80	\$540,086	6.9	Res / Ag	\$297,048	\$273,380	82,014	\$1,192,528
DRCC09a	82977	\$6	\$497,860	0	n/a	n/a	\$2,000	2484.3	16	16	\$0.65	\$51,673	218.7	0	250	\$1.80	\$1,117,935	14.3	Res / Ag	\$614,864	\$551,534	165,460	\$2,449,793
DRCC09b	84617	\$4	\$338,467	0	n/a	n/a	\$20,000	2533.4	16	16	\$0.65	\$52,695	218.7	0	250	\$1.80	\$1,140,030	14.5	Res / Ag	\$627,017	\$411,162	123,348	\$2,301,556
DRCC10a	53924	\$6	\$323,545	0	n/a	n/a	\$0	2564.6	16	16	\$0.65	\$53,344	163.2	0	180	\$1.80	\$830,930	10.6	Res / Ag	\$457,012	\$376,888	113,067	\$1,777,897
DRCC10b	66746	\$4	\$266,984	0	n/a	n/a	\$41,250	3174.4	16	16	\$0.65	\$66,028	163.2	0	180	\$1.80	\$1,028,506	13.1	Res / Ag	\$565,678	\$374,261	112,278	\$2,080,723
DRCC11	39921	\$6	\$239,527	0	n/a	n/a	\$15,000	2417.2	16	16	\$0.65	\$50,278	142.9	0	160	\$1.80	\$696,154	8.9	Res / Ag	\$382,884	\$304,805	91,441	\$1,475,284
DRCC12	42113	\$6	\$252,678	0	n/a	n/a	\$12,500	3037.1	16	16	\$0.65	\$63,172	131.4	0	150	\$1.80	\$820,017	10.5	Res / Ag	\$451,009	\$328,349	96,505	\$1,697,881
DRCC13a	6581	\$6	\$30,488	0	n/a	n/a	\$0	815.3	16	16	\$0.65	\$18,858	104.4	0	120	\$1.80	\$176,105	2.2	Res / Ag	\$96,858	\$56,447	16,934	\$346,343
DRCC13b	12734	\$6	\$76,403	0	n/a	n/a	\$0	1287.7	16	16	\$0.65	\$26,784	112.7	0	130	\$1.80	\$301,322	3.8	Res / Ag	\$165,727	\$103,187	30,956	\$601,192
DRCC14	41250	\$6	\$247,501	0	n/a	n/a	\$46,000	2421.5	16	16	\$0.65	\$50,367	144.4	0	160	\$1.80	\$897,392	8.9	Res / Ag	\$383,566	\$343,868	103,161	\$1,527,986
DRCC15	18661	\$6	\$111,964	0	n/a	n/a	\$30,000	2441	16	16	\$0.65	\$50,773	102.5	0	120	\$1.80	\$527,256	6.7	Res / Ag	\$299,991	\$192,737	57,821	\$1,067,805
DRCC16	8488	\$6	\$50,931	1220	310	378105	\$0	1287	16	16	\$0.65	\$26,770	67.0	0	80	\$1.80	\$185,328	2.4	Res / Ag	\$101,930	\$486,693	146,008	\$919,969
DRCC17	14201	\$6	\$85,203	2135	310	661865	\$10,000	2492.5	16	16	\$0.65	\$51,844	62.0	0	70	\$1.80	\$314,055	4.0	Res / Ag	\$172,730	\$868,722	260,617	\$1,616,124
SUN01	63115	\$6	\$378,690	0	n/a	n/a	\$0	3027.4	16	16	\$0.65	\$62,970	182.8	0	180	\$1.80	\$980,878	12.5	Res / Ag	\$539,483	\$441,660	132,498	\$2,094,516
SUN02a	6493	\$6	\$38,956	993	310	307882	\$0	1388.5	16	16	\$0.65	\$28,881	52.0	0	60	\$1.80	\$149,958	1.9	Res / Ag	\$82,477	\$375,719	112,716	\$720,869
SUN02b	17203	\$6	\$103,218	0	n/a	n/a	\$0	1203.2	16	16	\$0.65	\$25,027	132.8	0	150	\$1.80	\$324,864	4.1	Res / Ag	\$178,675	\$128,245	38,474	\$670,258
SUN02c	35902	\$6	\$215,410	0	n/a	n/a	\$0	2511	16	16	\$0.65	\$52,229	132.6	0	150	\$1.80	\$677,970	8.6	Res / Ag	\$372,684	\$267,639	80,292	\$1,398,784
SUN03a	29398	\$6	\$176,391	0	n/a	n/a	\$0	2469.7	16	16	\$0.65	\$51,370	122.1	0	140	\$1.80	\$622,364	7.9	Res / Ag	\$342,300	\$227,761	68,326	\$1,260,754
SUN03b	29528	\$6	\$177,169	0	n/a	n/a	\$0	2480.8	16	16	\$0.65	\$51,596	122.1	0	140	\$1.80	\$625,111	8.0	Res / Ag	\$343,611	\$228,766	68,630	\$1,266,318

Culvert Cost

Location	ID	Length (ft)	Number of Baffles	Culvert Dia./Height	Unit	Width (ft)	Length of Pipe/Box Culvert (ft)	Unit Cost (\$/ft)	Pipe/Box Culvert Cost		Inlet Headwall		Outlet Headwall		Required Land Acquisition (Ac.)	Zoning	Unit Cost (\$/sf)	Culvert Land Acquisition Cost	Culvert Materials Cost	Culvert Contingencies Cost	Total Land, Construction, and Contingencies Costs
									Pipe/Box Culvert Cost	Inlet Headwall	Outlet Headwall										
DRCC / Dysart Rd	DRCC-C1a	110	9	5	ft	10	110	\$4,725	\$519,750	1	\$8,900	\$8,900	1	\$15,400	\$15,400	0.0	N/A	\$0.00	\$544,050	\$163,215	\$707,265
DRCC / 1/2 mile W. of El Mirage Rd	DRCC-C1b	110	9	5	ft	10	110	\$4,725	\$519,750	1	\$8,900	\$8,900	1	\$16,100	\$16,100	0.0	N/A	\$0.00	\$544,150	\$163,545	\$707,695
DRCC / 1/2 mile S. of Broadway Rd	DRCC-C3	110	9	5	ft	10	110	\$4,725	\$519,750	1	\$8,900	\$8,900	1	\$15,400	\$15,400	0.0	N/A	\$0.00	\$544,050	\$163,215	\$707,265
DRCC / Broadway Rd	DRCC-C4	110	9	5	ft	10	110	\$4,725	\$519,750	1	\$8,900	\$8,900	1	\$14,400	\$14,400	0.0	N/A	\$0.00	\$542,450	\$162,735	\$705,185
DRCC / 115th Ave	DRCC-C5	151	8	5	ft	10	151	\$4,200	\$634,200	1	\$6,300	\$6,300	1	\$14,400	\$14,400	0.0	N/A	\$0.00	\$656,900	\$197,070	\$853,970
DRCC / 111th Ave	DRCC-C6	110	8	5	ft	10	110	\$4,200	\$462,000	1	\$6,400	\$6,400	1	\$11,100	\$11,100	0.0	N/A	\$0.00	\$479,500	\$143,850	\$623,350
DRCC / 107th Ave	DRCC-C7	110	6	5	ft	10	110	\$3,150	\$346,500	1	\$6,400	\$6,400	1	\$11,100	\$11,100	0.0	N/A	\$0.00	\$364,000	\$109,200	\$473,200
DRCC / 103rd Ave	DRCC-C8	110	6	5	ft	10	110	\$3,150	\$346,500	1	\$6,700	\$6,700	1	\$11,600	\$11,600	0.0	N/A	\$0.00	\$364,800	\$109,440	\$474,240
DRCC / 99th Ave	DRCC-C9	110	4	5	ft	10	110	\$2,100	\$231,000	1	\$6,050	\$6,050	1	\$10,500	\$10,500	0.0	N/A	\$0.00	\$247,550	\$74,265	\$321,815
DRCC / 95th Ave	DRCC-C10	140	8	4	ft	10	140	\$4,200	\$588,000	1	\$6,200	\$6,200	1	\$10,700	\$10,700	0.0	N/A	\$0.00	\$604,900	\$181,470	\$786,370
DRCC / 91st Ave	DRCC-C11	110	5	5	ft	10	110	\$2,825	\$310,750	1	\$8,300	\$8,300	1	\$14,400	\$14,400	0.0	N/A	\$0.00	\$311,450	\$93,435	\$404,885
DRCC / 87th Ave	DRCC-C12	110.4	5	5	ft	10	110.4	\$2,825	\$312,800	1	\$8,300	\$8,300	1	\$14,400	\$14,400	0.0	N/A	\$0.00	\$312,500	\$93,750	\$406,250
DRCC / 83rd Ave	DRCC-C13	110.5	4	5	ft	10	110.5	\$2,100	\$232,050	1	\$6,500	\$6,500	1	\$11,200	\$11,200	0.0	N/A	\$0.00	\$249,750	\$74,925	\$324,675
DRCC / 79th Ave	DRCC-C14	220	4	5	ft	10	220	\$2,100	\$462,000	1	\$6,500	\$6,500	1	\$11,200	\$11,200	0.0	N/A	\$0.00	\$479,700	\$143,910	\$623,610
DRCC / 75th Ave	DRCC-C15	146	4	5	ft	10	146	\$2,100	\$306,600	1	\$6,050	\$6,050	1	\$10,500	\$10,500	0.0	N/A	\$0.00	\$323,150	\$96,845	\$420,095
DRCC / Lower Buckeye Rd	DRCC-C16	110.2	4	5	ft	8	110.2	\$1,600	\$176,320	1	\$4,800	\$4,800	1	\$6,300	\$6,300	0.0	N/A	\$0.00	\$189,420	\$56,826	\$246,246
DRCC / Buckeye Rd	DRCC-C17	110	3	5																	

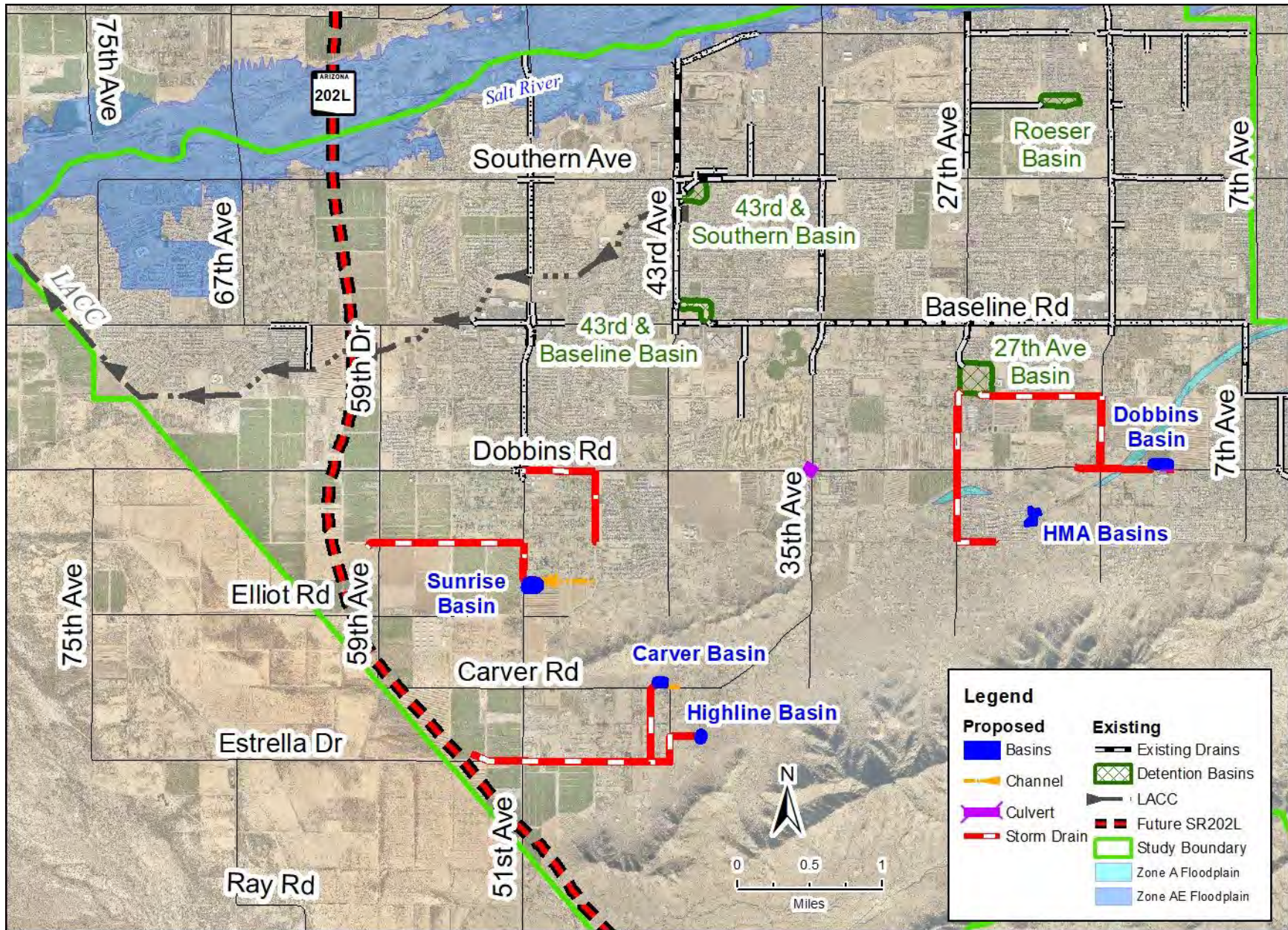


Figure 7. Recommended Alternatives Overview Map

**Laveen ADMSPU**  
**Table 1 - AoMI # 1 Recommended Alternative Cost Estimate**

<b>Estimated Storm Drain Construction Costs</b>					
Item No.	Description	Unit	Quantity	Unit Price	Cost
1	30" SD Carver Basin to Estrella / 45th Ave; Highline Basin to Estrella / 45th Ave	LF	5,590	\$100	\$559,000
2	36" SD from 45th Ave / Estrella to SR202L	LF	6,590	\$150	\$988,500
3	Storm drain manhole	EA	61	\$3,200	\$194,880
4	Landscaping	AC	2.4	\$5,000	\$12,000
<b>Estimated Carver Basin Construction Costs</b>					
5	Basin excavation	CY	48,700	\$10	\$487,000
6	Channel excavation	CY	2,000	\$8	\$16,000
7	1-1/4" minus DG basin sides	SY	10,000	\$6	\$60,000
8	Plain dumped riprap channel lining D50 = 4"	CY	481	\$60	\$28,860
9	Basin Spillway Erosion Protection	SY	3,400	\$25	\$85,000
10	Gabion Basket Basin Wall / Overflow Sill	LF	2,400	\$30	\$72,000
11	Reinf conc low-flow chanel - east, west and south	LF	575	\$140	\$80,500
12	Basin outlet	EA	1	\$25,000	\$25,000
13	6' Chain link fencing around basin (incl gates)	LF	1,850	\$20.00	\$37,000
14	Conc maint access ramp (basin)	SF	1,750	\$15.00	\$26,250
15	Stabelized DG maint access rd (10' wide)	SY	2,000	\$10.00	\$20,000
16	Landscaping	AC	4.4	\$5,000	\$22,000
17	Aesthetic treatment	LS	1	\$50,000	\$50,000
<b>Estimated Highline Basin Constrution Costs</b>					
18	Basin excavation	CY	28,000	\$10	\$280,000
19	1-1/4" minus DG basin sides	SY	8,000	\$6	\$48,000
20	Basin Spillway Erosion Protection	SY	1,235	\$25	\$30,875
21	Gabion Basket Basin Wall / Overflow Sill	LF	2,000	\$30	\$60,000
22	Reinf conc low-flow chanel - from inlet to outlet	LF	60	\$140	\$8,400
23	Basin outlet	EA	1	\$25,000	\$25,000
24	6' Chain link fencing around basin (incl gates)	LF	1,400	\$20.00	\$28,000
25	Conc maint access ramp (basin)	SF	1,590	\$15.00	\$23,850
26	Stabelized DG maint access rd (10' wide)	SY	1,765	\$10.00	\$17,650
27	Landscaping	AC	2.8	\$5,000	\$14,000
28	Aesthetic treatment	LS	1	\$50,000	\$50,000

<b>Subtotal Construction</b>		<b>\$3,350,000</b>
Construction Contingency	25%	\$837,500
Design	7%	\$293,125
Construction Admin	6%	\$251,250
<b>Total Construction Cost:</b>		<b>\$4,740,000</b>

<b>Estimated Storm Drain Right-of-Way Acquisition Costs</b>					
Purpose	Location	Area (AC)	Take	Cost per SF	Total Cost
Storm Drain	45th Ave from Carver Rd to Basin 2, Sunset Cove from Basin 3 to 43rd Ave, Estrella west of 51st Ave	1.5	Res	\$6	\$393,000
Basin parcel	Carver Basin - NW cor 43rd Ave / Carver Rd	6.6	Res	\$6	\$1,725,000
Basin parcel	Highline Basin - east end of Sunset Cove	5.0	Res	\$6	\$1,307,000
Access	Access to Highline Basin for maintenance	0.33	Res	\$6	\$87,000
<b>Total Estimated Right-of-Way &amp; Cost:</b>		<b>13.4</b>			<b>\$3,512,000</b>

<b>Recommended Alt. Total Cost:</b>	<b>\$8,260,000</b>
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**Notes:**

1. Estimate does not include costs associated with street improvements except as noted.
2. Estimate does not include right-of-way cost from SRP or any other utilities.

**Opinion of Cost:**

The opinions of cost shown, and any resulting conclusions on project financial or economic feasibility or funding requirements, have been prepared for guidance in project budgeting and implementation from the information available at the time the opinion was prepared. The final costs of the project will depend on actual labor and material costs, competitive market conditions, actual site conditions, implementation schedule, continuity of personnel and engineering, and other variable factors. As a result, the final project costs will vary from the opinions of cost presented herein. Project costs are presented in 2017 dollars.

**Laveen ADMSPU**

**Table 2 - AoMI # 2 Recommended Alternative Cost Estimate**

<b>Estimated Construction Costs</b>					
<b>Item No.</b>	<b>Description</b>	<b>Unit</b>	<b>Quantity</b>	<b>Unit Price</b>	<b>Cost</b>
1	Basin excavation	CY	28,000	\$5	\$140,000
2	Channel excavation	CY	9,000	\$5	\$45,000
3	1-1/4" minus DG basin sides	SY	9,700	\$6	\$58,200
4	Plain dumped riprap channel lining D50 = 4"	CY	2,120	\$60	\$127,200
5	Basin outlet	EA	1	\$25,000	\$25,000
6	6' Chain link fencing around basin (incl gates)	LF	2,100	\$20.00	\$42,000
7	Conc maint access ramp (basin)	SF	2,100	\$15.00	\$31,500
8	Stabelized DG maint access rd (10' wide)	SY	2,350	\$10.00	\$23,500
9	Basin Spillway Erosion Protection	SY	1,625	\$25	\$40,625
10	24" SD Lateral	LF	394	\$85.00	\$33,490
11	36" SD Olney to SR202 Basin	LF	7,288	\$150	\$1,093,200
12	48" SD Dobbins 47th Ave - 51st Ave	LF	2,642	\$200	\$528,400
13	36" SD 47th Ave McNeil - Dobbins	LF	2,630	\$150	\$394,500
14	Storm drain manhole	EA	63	\$3,200	\$200,960
15	Conc catch basin	EA	9	\$5,000	\$45,000
16	Landscaping	AC	11.5	\$5,000	\$57,500
17	Aesthetic treatment	LS	1	\$50,000	\$50,000

<b>Subtotal Construction</b>		<b>\$2,937,000</b>
Construction Contingency	25%	\$734,250
Design	7%	\$256,988
Construction Admin	6%	\$220,275
<b>Total Construction Costs:</b>		<b>\$4,150,000</b>

<b>Estimated Right-of-Way Acquisition Costs</b>					
<b>Purpose</b>	<b>Location</b>	<b>Area (AC)</b>	<b>Take</b>	<b>Cost per SF</b>	<b>Total Cost</b>
Basin/Channel	Southwest corner 51st Ave / Sunrise	7.8	Agri	\$3	\$1,024,000
Stormdrain	Olney Ave between 59th Ave and 55th Ave	3.0	Agri	\$3	\$394,000
<b>Total Estimated Right-of-Way &amp; Cost:</b>		<b>10.8</b>			<b>\$1,418,000</b>

<b>Recommended Alt. Total Cost:</b>	<b>\$5,568,000</b>
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**Notes:**

1. Estimate does not include costs associated with street improvements except as noted.
2. Estimate does not include right-of-way cost from SRP or any other utilities.

**Opinion of Cost:**

The opinions of cost shown, and any resulting conclusions on project financial or economic feasibility or funding requirements, have been prepared for guidance in project budgeting and implementation from the information available at the time the opinion was prepared. The final costs of the project will depend on actual labor and material costs, competitive market conditions, actual site conditions, implementation schedule, continuity of personnel and engineering, and other variable factors. As a result, the final project costs will vary from the opinions of cost presented herein. Project costs are presented in 2017 dollars.

**Laveen ADMSPU**

**Table 3 - AoMI # 3 Recommended Alternative Cost Estimate**

<b>Estimated Construction Costs</b>					
<b>Item No.</b>	<b>Description</b>	<b>Unit</b>	<b>Quantity</b>	<b>Unit Price</b>	<b>Cost</b>
1	Drop inlet headwall / trash rack / safety rail	EA	1	\$50,000	\$50,000
2	4-48" SD from channel to golf course (615 LF)	LF	2,460	\$200	\$492,000
3	Manhole / maint access	EA	1	\$50,000	\$50,000
4	Pipe outlet headwall / access barrier / safety rail	EA	1	\$50,000	\$50,000
5	Outlet energy diss / riprap	EA	1	\$25,000	\$25,000
6	Golf course grading	EA	1	\$10,000	\$10,000
7	Landscape mitigation	EA	1	\$10,000	\$10,000

<b>Subtotal Construction</b>		<b>\$687,000</b>
Construction Contingency	25%	\$171,750
Design	7%	\$60,113
Construction Admin	6%	\$51,525
<b>Total Construction Costs</b>		<b>\$980,000</b>

<b>Estimated Right-ofWay Acquisition Costs</b>					
<b>Purpose</b>	<b>Location</b>	<b>Area (AC)</b>	<b>Take</b>	<b>Cost per SF</b>	<b>Total Cost</b>
Inlet @ channel	Southeast corner Dobbins / 35th Ave	0.3	Subd tract	\$3	\$33,000

<b>Recommended Alt. Total Cost:</b>	<b>\$1,013,000</b>
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**Notes:**

1. Estimate does not include costs associated with street improvements except as noted.
2. Estimate does not include right-of-way cost from SRP or any other utilities.

**Opinion of Cost:**

The opinions of cost shown, and any resulting conclusions on project financial or economic feasibility or funding requirements, have been prepared for guidance in project budgeting and implementation from the information available at the time the opinion was prepared. The final costs of the project will depend on actual labor and material costs, competitive market conditions, actual site conditions, implementation schedule, continuity of personnel and engineering, and other variable factors. As a result, the final project costs will vary from the opinions of cost presented herein. Project costs are presented in 2017 dollars.

**Laveen ADMSPU**  
**Table 4 - AoMI # 4 Recommended Alternative Cost Estimate**

<b>Estimated Construction Costs for Storm Drains</b>					
<b>Item No.</b>	<b>Description</b>	<b>Unit</b>	<b>Quantity</b>	<b>Unit Price</b>	<b>Cost</b>
1	72" SD from Olney sump to 27th Ave to 27th Ave / S Mtn Ave Regional Basin	LF	6,990	\$350	\$2,387,000
2	48" SD from 72" SD in Olney to Southern Highlands Subd channel plus large grated drop inlet in channel	EA	1	\$30,000	\$30,000
3	48" SD from 72" SD in 27th Ave to Citrus Mtn Subd basin plus large grated drop inlet in basin	EA	1	\$30,000	\$30,000
4	72" SD outlet into existing 27th Ave Regional Basin	EA	1	\$30,000	\$30,000
5	24" SD Laterals	LF	604	\$85	\$51,340
6	Storm drain manhole	EA	35	\$3,200	\$112,000
7	Catch basins street drainage Olney, 27th Ave	EA	12	\$5,000	\$60,000
8	Large Inlets at Olney sump vicinity	EA	3	\$10,000	\$30,000
9	Misc removal / reconstruct / relocate: Olney pvmt removal, misc street, sidewalk, driveway, landscape, fencing, SRP irrig canal, COP water, utility and other existing improvements	EA	1	\$200,000	\$200,000
10	Vertical Curb & Gutter, H = 6"	LF	2,100	\$15	\$31,500
11	Aggregate Base Course, 6" Thick	Ton	1,525	\$17	\$25,925
12	Asphalt Concrete Pavement, 4" Thick	Ton	1,020	\$70	\$71,400
13	Concrete Sidewalk, MAG Det 230	SF	10,500	\$5	\$52,500

<b>Subtotal Construction:</b>		<b>\$3,112,000</b>
Misc constr, contingncy	25%	\$778,000
Design	7%	\$272,300
Construction admin	6%	\$233,400
<b>Total Construction Costs:</b>		<b>\$4,400,000</b>

<b>Estimated Right-of-Way Acquisition Costs for Storm Drains</b>					
	<b>Location</b>	<b>Area (AC)</b>	<b>Take</b>	<b>Cost per SF</b>	<b>Cost</b>
Inlets	At Olney sump vicinity	0.10	Res	\$6	\$27,000
Storm Drain	Along Olney Ave and 27th Ave	1.30	Res	\$6	\$340,000
<b>Total Estimated Right-of-Way &amp; Cost:</b>		<b>1.40</b>			<b>\$367,000</b>

<b>Recommended Alt. Total Cost:</b>	<b>\$4,767,000</b>
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**Notes:**

1. Estimate does not include costs associated with street improvements except as noted.
2. Estimate does not include R/W cost from SRP or any other utilities.

**Opinion of Cost:**

The opinions of cost shown, and any resulting conclusions on project financial or economic feasibility or funding requirements, have been prepared for guidance in project budgeting and implementation from the information available at the time the opinion was prepared. The final costs of the project will depend on actual labor and material costs, competitive market conditions, actual site conditions, implementation schedule, continuity of personnel and engineering, and other variable factors. As a result, the final project costs will vary from the opinions of cost presented herein. Project costs are presented in 2017 dollars.

<b>Estimated Costs for HMA Ret Basins 23rd Ave North of Olney (Refer to 2016 HMA Memorandum)</b>					
<b>Item No.</b>	<b>Description</b>	<b>Unit</b>	<b>Quantity</b>	<b>Unit Price</b>	<b>Cost</b>
1	Prepare Plans, Specifications and Cost Estimates	EA	1	\$118,160	\$118,160
2	Acquire All Easements and Property	EA	1	\$466,910	\$466,910
3	Acquire All Permits	EA	1	\$32,400	\$32,400
4	Bid Project For Construction	EA	1	\$13,200	\$13,200
5	Construct Project	EA	1	\$862,100	\$862,100
6	Perform Project Closeout	EA	1	\$6,600	\$6,600
<b>Total Estimated Cost Right-of-way and Construction:</b>					<b>\$1,500,000</b>

**Total Cost Storm Drains and Basins: \$6,267,000**

**Laveen ADMSPU**  
**Table 5 - AoMI # 5 Recommended Alternative Cost Estimate**

<b>Estimated Basin and Storm Drain Construction Costs</b>					
<b>Item No.</b>	<b>Description</b>	<b>Unit</b>	<b>Quantity</b>	<b>Unit Price</b>	<b>Cost</b>
1	Misc removals - pvmnt, sidewalk, landscape, ret wall, etc.	LS	1	\$100,000	\$100,000
2	Drainage excavation new basin	CY	51,200	\$5	\$256,000
3	1-1/4" - Minus DG basin side slopes	SY	16,500	\$6	\$99,000
4	6' Chain link fencing around new basin (incl gates)	LF	2,210	\$20	\$44,200
5	Conc maint access ramp in new basin	SF	1,905	\$15	\$28,575
6	Landscaping new basin	AC	5.3	\$15,000	\$79,500
7	Aesthetic treatment new basin	LS	1	\$25,000	\$25,000
8	Stabelized DG maint access rd (10' wide)	SY	2,150	\$10	\$21,500
9	Large grated inlet at Humane Society channel	EA	1	\$50,000	\$50,000
10	4-54" SD from Humane Soc channel to new basin	LF	800	\$250	\$200,000
11	Outlet structure in new basin from Humane Soc channel	EA	2	\$30,000	\$60,000
12	Reinf conc low-flow chanel along south toe of slope	LF	700	\$140	\$98,000
13	Basin Spillway Erosion Protection	SY	5,300	\$25	\$132,500
14	Outlet structure from new basin to new SD in Dobbins	EA	1	\$40,000	\$40,000
15	48" SD Dobbins	LF	150	\$200	\$30,000
16	54" SD Dobbins	LF	1,960	\$250	\$490,000
17	66" SD 19th Ave	LF	2,632	\$300	\$789,600
18	72" SD S Mtn Ave	LF	4,511	\$350	\$1,578,850
19	Manholes	EA	46	\$3,200	\$145,600
20	Catch basin	EA	15	\$5,000	\$75,000
21	24" SD Laterals	LF	1,500	\$85	\$127,500
22	Large catch basin	EA	8	\$7,500	\$60,000
23	Outlet from SD into exst 27th Ave / S Mtn Ave basin	EA	1	\$30,000	\$30,000

<b>Subtotal Construction</b>		<b>\$4,561,000</b>
Construction Contingency	25%	\$1,140,250
Design	7%	\$399,088
Construction Admin	6%	\$342,075
<b>Total Construction Costs</b>		<b>\$6,450,000</b>

<b>Estimated Basin and Storm Drain Right-of-Way Acquisition Costs</b>					
<b>Purpose</b>	<b>Location</b>	<b>Area (AC)</b>	<b>Take</b>	<b>Cost per SF</b>	<b>Total Cost</b>
Detention Basin	COP WS parcel east of fire station on Dobbins Rd	6.0	Part (vac)	\$3.00	\$785,000
Large SD inlet	Humane Society channel and frontage	0.05	Part	\$3.00	\$7,000
<b>Total Estimated Right-of-Way &amp; Cost:</b>		<b>6.1</b>			<b>\$792,000</b>

<b>Recommended Alt. Total Cost:</b>	<b>\$7,242,000</b>
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**Notes:**

1. Estimate does not include costs associated with street improvements, including common roadway drainage catch basins and laterals. Larger regional-size catch basin inlets / laterals are included at locations such as along Dobbins Rd from 15th Ave to 19th Ave and at intersection Dobbins / 19th Ave.

**Opinion of Cost:**

The opinions of cost shown, and any resulting conclusions on project financial or economic feasibility or funding requirements, have been prepared for guidance in project budgeting and implementation from the information available at the time the opinion was prepared. The final costs of the project will depend on actual labor and material costs, competitive market conditions, actual site conditions, implementation schedule, continuity of personnel and engineering, and other variable factors. As a result, the final project costs will vary from the opinions of cost presented herein. Project costs are presented in 2017 dollars.

## **PLATES**

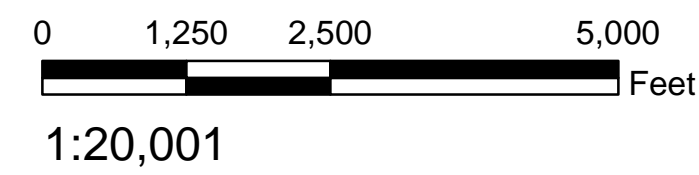
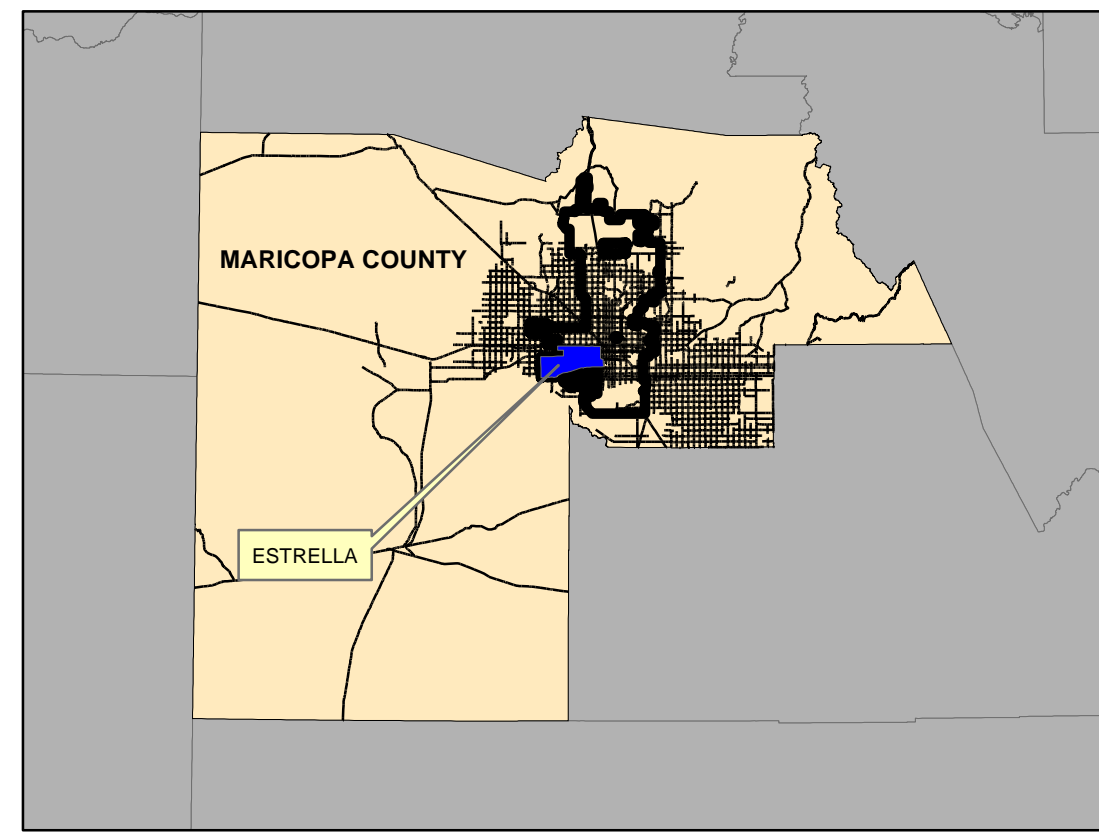
**Plate 1 - Arterial Street and Regional Drainage Structure Map for the Estrella Planning Area**

**Plate 2 - Arterial Street and Regional Drainage Structure Map for the Laveen Planning Area**



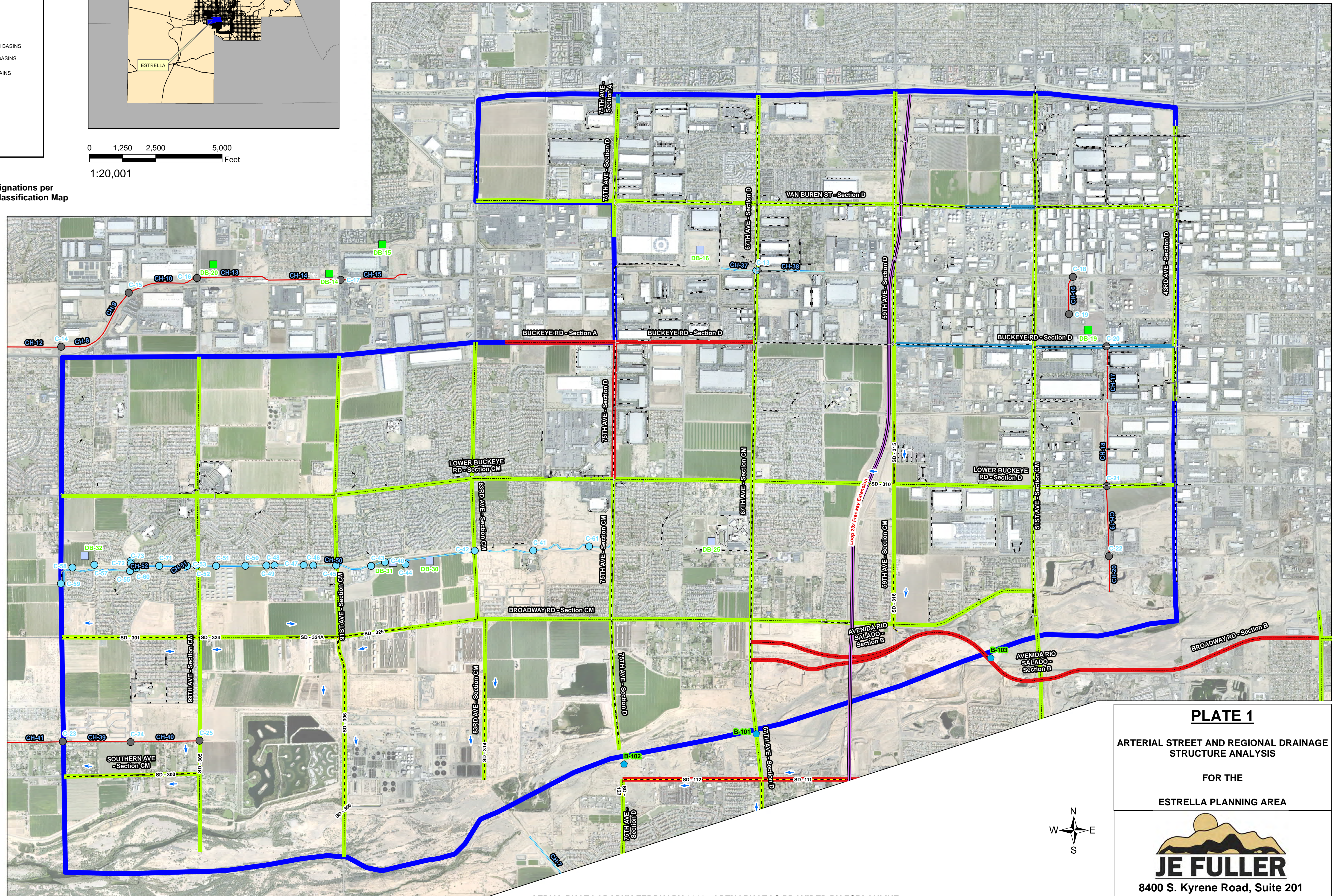
**Legend**

- SR202L Extension
- NON-ADMP PROPOSED STORM DRAINS
- PROPOSED STORM DRAIN FLOW DIRECTION
- EXISTING CITY STORM DRAINS
- PROPOSED BRIDGES
- PROPOSED ADMP CULVERTS
- EXISTING ADMP CULVERTS
- PROPOSED ADMP DETENTION BASINS
- EXISTING ADMP DETENTION BASINS
- PROPOSED ADMP STORM DRAINS
- PROPOSED ADMP CHANNELS
- EXISTING ADMP CHANNELS
- Standard Cross Section
- X Cross Section
- Z Cross Section
- ESTRELLA

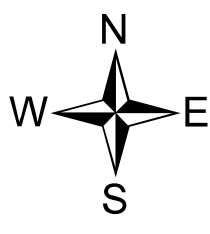


**NOTE:**

Street classification designations per City of Phoenix Street Classification Map dated March 19th, 2014.

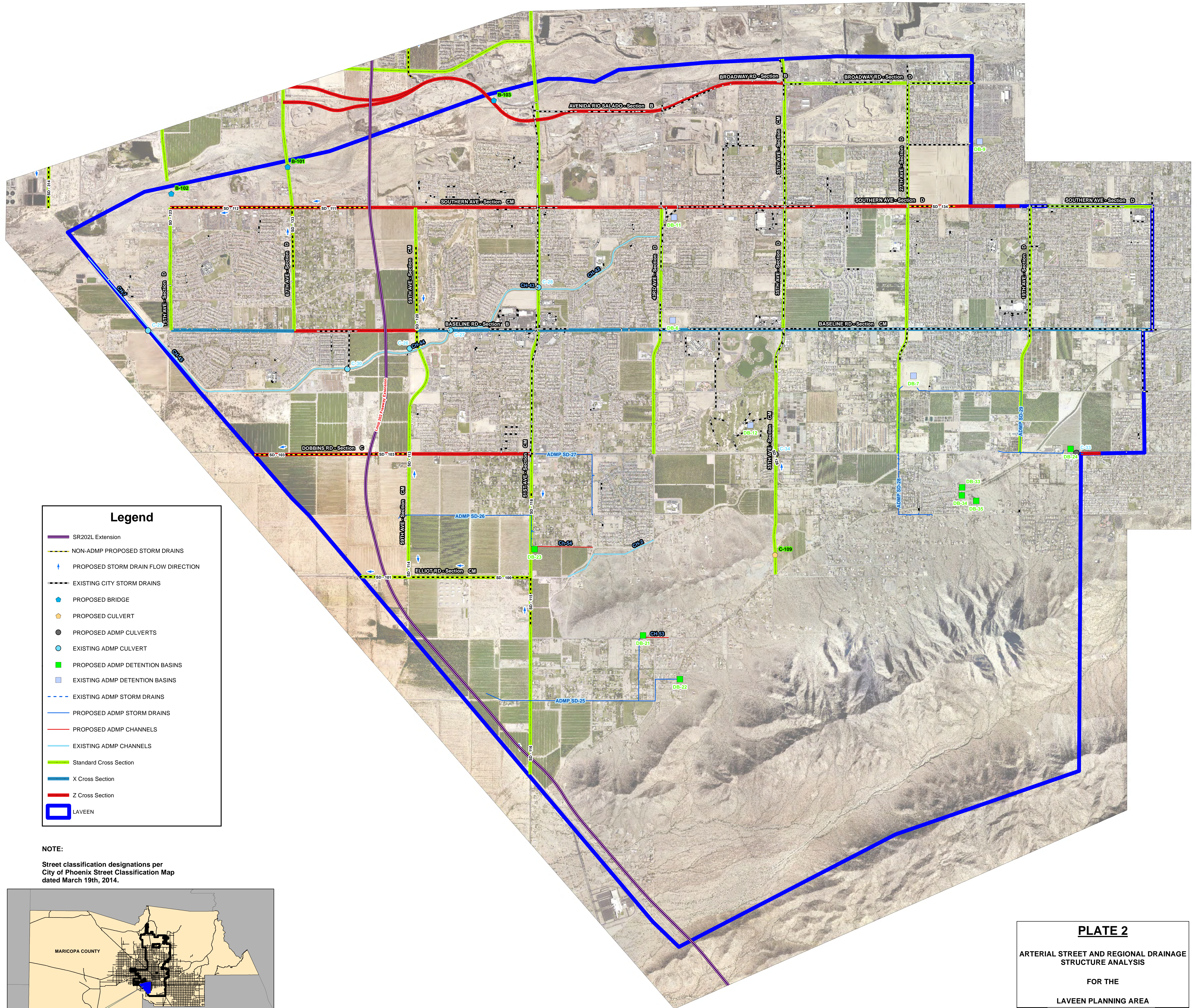


**PLATE 1**  
 ARTERIAL STREET AND REGIONAL DRAINAGE  
 STRUCTURE ANALYSIS  
 FOR THE  
 ESTRELLA PLANNING AREA



8400 S. Kyrene Road, Suite 201  
 Tempe, AZ 85284  
 Phone: 480.752.2124

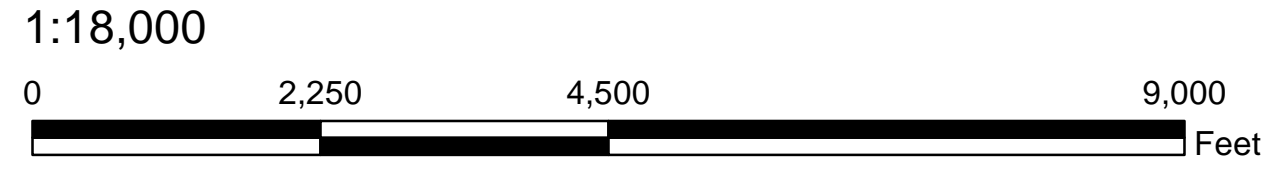
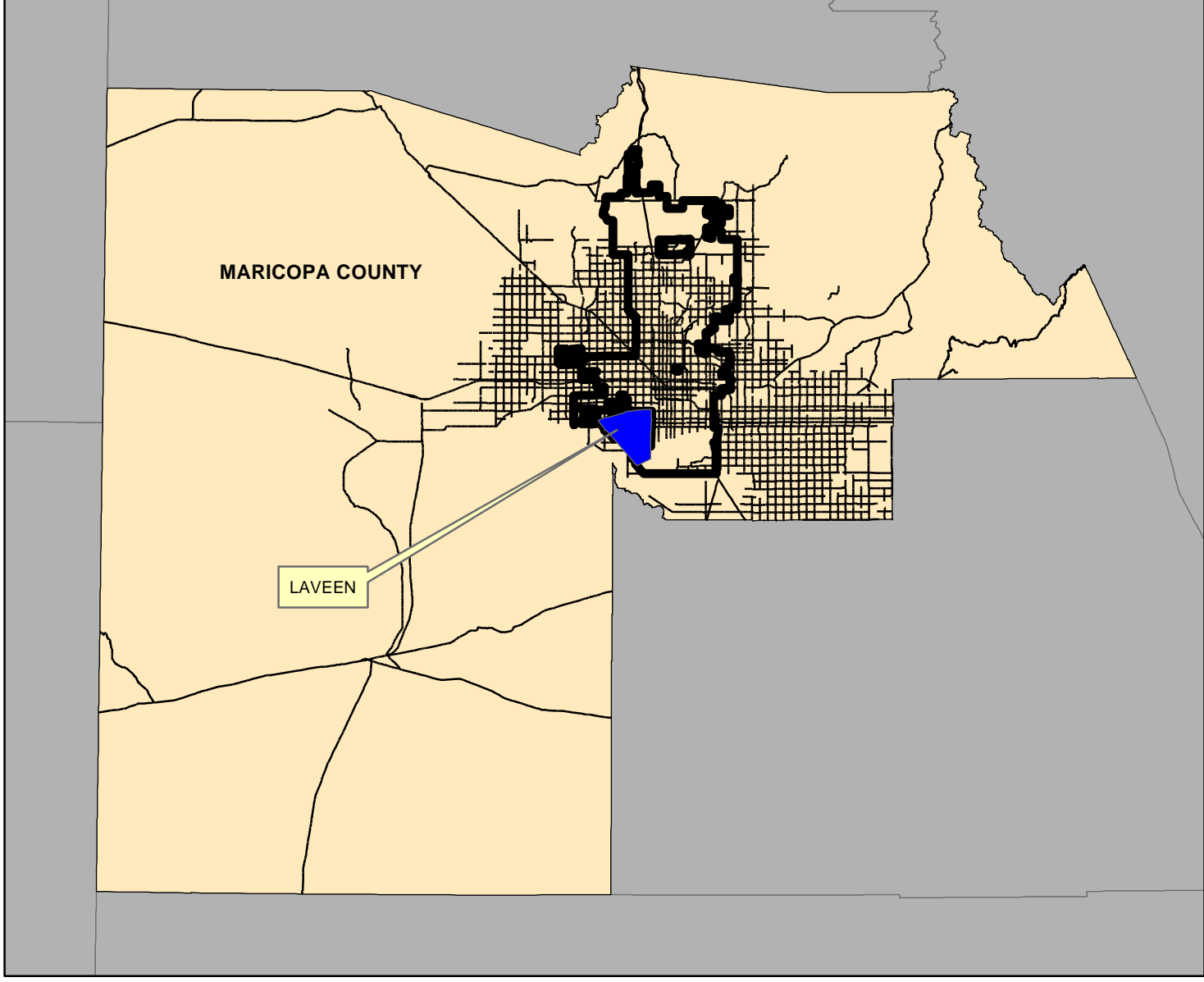
AERIAL PHOTOGRAPHY: FEBRUARY 2016, ORTHOPHOTOS PROVIDED BY ESRI ONLINE  
 TOPOGRAPHY, MAPPING: MARCH, 1999 to JULY, 2018 2 FT CI PROVIDED BY FLOOD CONTROL DISTRICT OF MARICOPA COUNTY



**Legend**

- SR202L Extension
- NON-ADMP PROPOSED STORM DRAINS
- PROPOSED STORM DRAIN FLOW DIRECTION
- EXISTING CITY STORM DRAINS
- PROPOSED BRIDGE
- PROPOSED CULVERT
- PROPOSED ADMP CULVERTS
- EXISTING ADMP CULVERT
- PROPOSED ADMP DETENTION BASINS
- EXISTING ADMP DETENTION BASINS
- EXISTING ADMP STORM DRAINS
- PROPOSED ADMP STORM DRAINS
- PROPOSED ADMP CHANNELS
- EXISTING ADMP CHANNELS
- Standard Cross Section
- X Cross Section
- Z Cross Section
- LAVEEN

**NOTE:**  
Street classification designations per City of Phoenix Street Classification Map dated March 19th, 2014.



AERIAL PHOTOGRAPHY: FEBRUARY 2016, ORTHOPHOTOS PROVIDED BY ESRI ONLINE  
TOPOGRAPHY, MAPPING: MARCH, 1999 to JULY, 2018 2 FT CI PROVIDED BY FLOOD CONTROL DISTRICT OF MARICOPA COUNTY