

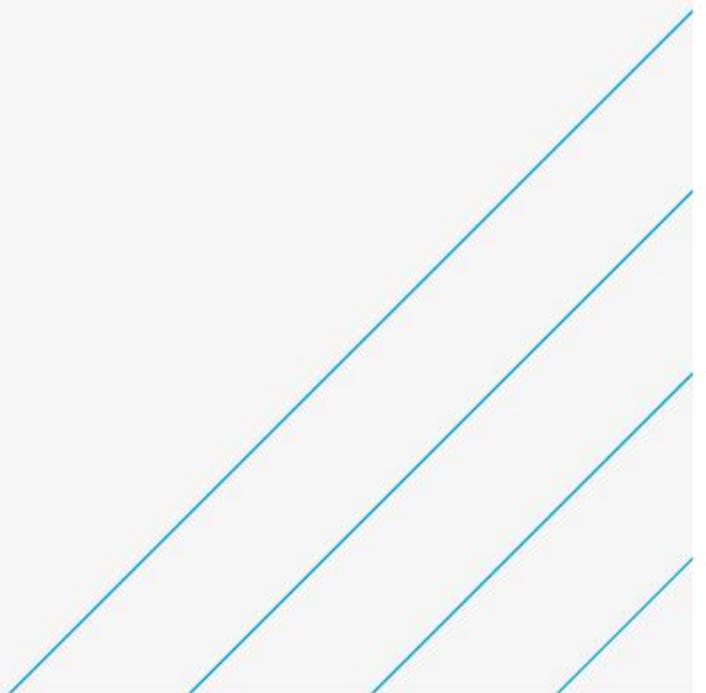


# Wastewater Collection System

Planning Study Report - Phase II and III

Hi Desert Water District

September 4 2018



# Notice

This document and its contents have been prepared and are intended solely as information for Hi Desert Water District and use in relation to planning for the wastewater collection system

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## Abbreviations and Definitions

B	Barron Basin
CEQA	California Environmental Quality Act
Deferred	A parcel that will not connect to the initial collection system
District	Hi Desert Water District
FM	Force main
FT	Feet
IS/EIR	Initial Study / Environmental Impact Report
K	Kickapoo Basin
LAFCO	Local Agency Formation Commission
LF	Linear Feet
MND	Mitigated Negative Declaration
MWH	Montgomery Watson Harza
NEPA	National Environmental Protection Agency
Non-assessed	A parcel that was not assessed and never planned to connect to the sewer system
P	Paxton Basin
Planned Parcels	All parcels not listed as deferred or non-assessed
PS	Pump Station
RD	Recommend to Defer
S	Sunnyslope Basin
Town	Town of Yucca Valley
USGS	United States Geological Survey
WWTP	Wastewater Treatment Plant

# Executive Summary

In 2007, the California State Water Resources Control Board adopted a resolution identifying the Town of Yucca Valley as a top priority for eliminating the use of septic systems. In 2011, the Colorado River Basin Regional Water Quality Control Board (Board) amended their Basin Plan to prohibit discharge from septic systems in Yucca Valley. Because of these measures, Hi Desert Water District (District) is implementing the Wastewater Reclamation Project and will become the local sewer agency. The Wastewater Reclamation Project is a program to design, construct, and operate a wastewater collection and treatment system.

The District will own and operate the proposed wastewater collection and treatment system. The District contracted Montgomery Watson Harza (MWH) to prepare a wastewater master plan (Master Plan) for the Town of Yucca Valley, which was adopted in 2009. The design and construction of the system is separated into three phases. Phase I, designed by Atkins, is currently under construction and is scheduled for completion during the first quarter of 2021. The District has also contracted Atkins to perform initial design services for Phases II and III, which are scheduled to complete construction in 2022 and 2025 respectively.

The purpose of this Planning Study is to formalize proposed sewer alignments that will provide service to all parcels within the Phase II and III boundaries. Select parcels identified as *deferred* or *non-assessed* in the Assessment District Engineer’s Report, compiled by Albert A. Webb Associates, will not receive service as part of the three phases, at present, and are not considered for this study. Deferred parcels are properties within the phase boundaries that are either vacant or in a low development area that will not meet the design flow metrics and will be hooked into the system at a later date. Non-assessed parcels are parcels that are dedicated for open space, habitat conservation, public rights-of-way, utility easements, parking lots or other uses that will not involve development of the parcel. Parcels within the phase boundaries that are not listed as deferred or non-assessed will be called *planned parcels*.

Backbone trunk sewer and force main alignments as well as the three major pump stations are included in the Phase I system. Sewer mains within the Phase II and III systems will ultimately flow into the Phase I alignments then to the Wastewater Treatment Plant (WWTP). For the initial Phase II and III design, Atkins utilized aerial imagery and topographical data gathered for the Phase I system, supplemented by new survey data gathered by Psomas. The Phase II and III wastewater collection system consists of gravity flow sewer mains and short force main alignments.

The collection system proposed in this study is an extension of the Phase I system to ensure every planned parcel is serviced. The collection system is optimized to minimize pipe lengths and system depth while ensuring sufficient gravity flow. Cost and ease of construction are improved by reducing the need for private easements and reducing the number of sewer lines crossing Caltrans right-of-way (SR 247 and SR 62). This Planning Study is a preliminary assessment of proposed alignments and is subject to further refinement based on final design and easement acquisitions.

The Phase II and III system is divided into the same four basins identified in Phase I. Each basin is defined by topographical constraints and comprised of several sub-basins which are defined by a network of sewer mains that feed into a branch of the backbone collection system.

The proposed system to service every planned parcel within the Phase II and III boundaries is summarized below:

- 334,900 feet of gravity sewer collection line
- 3,585 feet of force main
- 3,780 total lots serviced
  - 2,984 developed lots serviced
  - 796 vacant lots serviced

Construction of the Phase II and III system is projected to range from a low-end cost of \$83,337,270 to a high-end cost of \$88,337,506. This cost does not include associated soft costs, or any professional services.

# 1. Introduction

The Hi Desert Water District (District) has provided drinking water service for the Town of Yucca Valley (Town) and portions of the unincorporated area of San Bernardino County since 1962. The Town is located at the intersection of State Route 62 and State Route 247 between Morongo Valley and Twentynine Palms, California.



**Figure 1 - Vicinity Map**

Septic systems are currently used within the District’s entire service area to dispose of wastewater. The District’s primary water source is groundwater from the Warren sub-basin of the Morongo Groundwater Basin. The District collaborates with the United States Geological Survey (USGS) in a cooperative water resources monitoring program to monitor the water quality and groundwater surface elevations in the groundwater basin.

In 2007, the California Regional Water Quality Control Board (Regional Board) adopted a resolution identifying the Town as a top priority for eliminating the use of septic systems. The goal of eliminating septic systems was to improve the water quality in the groundwater basin, which has tested high for nitrates. On February 17, 2010, the Local Agency Formation Commission (LAFCO) granted the Hi Desert Water District the authority to construct, operate, and maintain a wastewater collection and treatment system. Additionally, in 2011, Colorado River Basin Regional Water Quality Control Board amended their Basin Plan to prohibit discharge from new and existing septic systems within the Town. In response to the Regional Board’s resolution, the District is implementing the Wastewater Reclamation Project, and will become the local sewer agency.

The project is separated into three phases, as shown in Figure 1 of Appendix A. All referenced Figures are in Appendix A unless otherwise stated. The design and construction of the collection and treatment system for the central portion of Yucca Valley (Phase I), is currently under construction and scheduled to be complete in the first quarter of 2021. The Phase I area septic system discharge prohibition begins June 30, 2021, while the Phase II and III prohibition begins December 31, 2025. The District has now begun to look at the expansion of the system to incorporate the Phase II and III areas. The additional facilities necessary to efficiently incorporate the Phase II and III areas is the focus of this planning study.

The District contracted MWH to prepare a Sewer Master Plan which was adopted by the Board in January of 2009. The Master Plan defined planning criteria to calculate flow projections, created a hydraulic model based on the projections, and determined initial estimates for the Phase I collection system pipe sizes. Atkins updated the hydraulic model in 2013 and used it to set the final pipe diameter sizes for the Phase I system.

To satisfy the Federal requirements of the National Environmental Policy Act (NEPA) and the State requirements of the California Environmental Quality Act (CEQA), the environmental consulting firm Tom Dodson and Associates was selected by the District to prepare an Initial Study/ Environmental Assessment Report (IS/EAR). Based on the IS/EAR, a Mitigated Negative Declaration (MND) for the Project was finalized on October 7, 2009.

In March 2016, the Regional Board adopted a Basin Plan Amendment, to revise the prohibition dates and phase boundaries governing the wastewater collection system in Yucca Valley. This Basin Plan removed areas from the initial plan that would produce little benefit to the system (low flow), extended the prohibition dates for all three phases, and allowed for the simultaneous design and construction of Phases II and III. The prohibition dates reflected in this planning study match the revised dates from the Basin Plan amendment, and not the original dates set in 2007.

As a product of the 2016 Basin Plan Amendment, Atkins was provided with a list of all Assessor's Parcel Numbers (APN) within the complete phase boundaries, and a corresponding parcel status. The parcel status identified several parcels as either deferred or non-assessed. Deferred parcels are exempt from the requirement to connect into the Phase I, II and III systems, and will be connected at a future date, once specific flow and/or development metrics are met. Deferred parcels still carry a small assessment fee, which is much lower than the typical fee for non-deferred parcels. Non-assessed parcels carry no assessment fee and are planned to never connect to the collection system. These non-assessed parcels are comprised of properties that will never need a sewer connection, such as parcels dedicated for open space, habitat conservation, public rights-of-way, utility easements, parking lots, or other uses that will not involve development of the parcel. As both deferred parcels and non-assessed parcels are not planned to connect into this phase of the collection system, they were not included in the layout of the system.

## 1.1. Purpose

One of the first tasks associated with the design of the sewer collection system for the Phase II and III areas was to perform a horizontal alignment study. The purpose of the Alignment Study was to provide initial sewer alignments to service all parcels that are not listed as deferred or non-assessed and fall within the Phase II and III boundaries. The alignment study was completed in June of 2018, and it laid out recommendations for changes to the overall Phase II and III areas that could improve the overall efficiency of the system.

The purpose of this planning study is to formalize final alignments for the Phase II and III areas and identify system components that will be a part of the system for final design. This planning study will use these final alignments and expand upon their provided information to include final lengths and number of manholes. The alignments will also be used to identify the anticipated number of easements needed, identify areas needing environmental study, and outline the anticipated costs associated with the design and construction of the Phase II and III system. In addition, alignments to service deferred parcels were laid out, and an associated deferred cost is presented in Section 3.2. The deferred cost will be used for future planning purposes upon build out of the deferred areas.

## 1.2. Methodology

The design team utilized the aerial imagery and topographical data collected for the Phase I system supplemented by new data for the Phase II and III areas gathered by Psomas, to develop a wastewater collection system consisting of gravity flow sewers and short force main alignments connecting into the existing Phase I system. The collection system proposed in this study builds upon the existing Phase I system to ensure every planned parcel within the Phase II and III boundaries is serviced. The collection system is designed to minimize pipe length and depth while ensuring gravity flow, reduce the need for

private easements, and reduce the number of sewer lines crossing sensitive right-of-way such as Caltrans (SR 247 and Highway 62) and San Bernardino County Flood Control District.

The collection system expansion into the Phase II and III areas will also conform to all criteria set forth in the Phase I Preliminary Design Report, including minimum pipe diameter, minimum pipe slopes, minimum depth, and minimum velocity requirements. This Planning Study Report is a preliminary assessment of proposed alignments, depths and costs; it is subject to further refinement due to vertical alignment continuity, easement acquisitions, and alignment revisions as the project progresses through the final design stage.

## 2. Collection System Analysis

### 2.1. Sewer Basins

The Phase I system was divided into four major basins, Barron, Sunnyslope, Paxton, and Kickapoo, which are shown in Figure 2 of Appendix A. Each basin is defined by topographical characteristics, has one terminating low point, and is comprised of sub-basins. A sub-basin is defined by a network of sewer mains that feed a branch of the trunk sewer.

For the Phase II and III areas, these basins will be extended by adding additional area to the existing sub-basins, as shown in Appendix A. The new areas added to each sub-basin will be split into regions. Each region corresponds to a single connection point into the Phase I or Phase II system. To maintain continuity with the labelling scheme and basin designations of the Phase I system, the new regions for the Phase II and III areas will adopt a similar naming convention.

Regions in the Phase II and III areas will be named in the following format: PD2A, PD2B, PD3A, etc. The first two-letter designation represents the Phase I sub-basin that the new region will connect into. Therefore, the PD2A region will connect into the PD sub-basin in the Phase I system. Second, the number indicates the phase; for example, the “2” in the PD2A region indicates that this region is part of the Phase II area. Similarly, a “3” designation in a region, such as PD3A, indicates that the region is part of the Phase III area. Finally, the last letter in the region designation accounts for the position of the region within the overall basin and project area. For example, the PD2A region is the first region in the Phase II area that will connect into the PD sub-basin from Phase I. PD2B will be the second region in the Phase II area that will connect into the PD sub-basin from Phase I, and so on. These position indicators are assigned moving from east to west, so the earlier the letter, the further east the region is located.

There are certain regions within the Phase II and III area that include serviced parcels, but no new sewer pipe. In this instance, the listed parcels are serviced by pipe that is part of a different region or Phase. Such parcels shall be called dependent parcels. Where a new region is comprised of only dependent parcels, it shall be called a dependent region.

In addition to construction of sewer mains in the Phase II and III areas, the scope of the Phase II and III construction will include the addition of a new sewer within the Phase I boundary. The new sewer within the Phase I limits will be in the Paxton basin south down Kickapoo Trail, from Santa Fe to Mountain View Trail. This pipe is needed to allow for connections from the Phase III areas. Construction of this line will allow several parcels along the east side of Kickapoo Trail, which were previously deferred under Phase I, to connect into the system.

Overall, the total length of gravity pipe including all four basins under the condition of providing service to every planned parcel within the Phase II boundary is 160,225 feet and within the Phase III boundary is 174,675 feet. The total length of force main to service every planned parcel within the Phase II boundary is 700 feet and within the Phase III boundary is 2,885 feet. This length of pipe is used to service 1,969 lots within Phase II and 1,811 lots within Phase III. Within Phase II, 1,656 of those lots, or 84%, are developed, and within Phase III, 1,328 of those lots, or 73% are developed.

## 2.2. Barron Basin

The Barron Basin is located within the eastern portion of Yucca Valley, north and south of Highway 62. The Barron Basin contains both Phase I and Phase III areas, as shown in Figure 3 of Appendix A. Within the Barron Basin, there is only one sub-basin, BA, while the Phase III area of the Barron Basin is comprised of only one planned region, as shown in Figure 4 of Appendix A.

Sewer mains within the Barron Basin flow via gravity to the Barron Pump Station, located at the northwest corner of Barron Drive and Yucca Mesa Road, as shown in Appendix B. Flow is then conveyed south via the Barron Force Main, to the Barron Trunk, and finally to the Sunnyslope Trunk. The Sunnyslope Trunk ultimately flows via gravity to the proposed Wastewater Treatment Plant (WWTP), shown in Appendix B. Within the Phase III area of the Barron Basin, the total length of pipe is 8,830 feet, which is used to service 80 lots, of which 47, or 59%, are developed. Summarized in Table 1 below is the proposed region information.

**Table 1 - Barron Basin Regions**

Region	Phase	Length (ft)	Parcels Serviced	No. Manholes (4' Diameter)	No. Manholes (5' Diameter)
BA3A	3	8,830	80	28	3
Total		8,830	80	28	3

## 2.3. Sunnyslope Basin

The Sunnyslope Basin is located within the eastern portion of Yucca Valley, south of the proposed WWTP. The Sunnyslope Basin contains both Phase I, II, and III areas, as shown in Figure 5 of Appendix A. Within the Sunnyslope Basin, there are two sub-basins, SA and SB, as shown in Figure 6 of Appendix A. Finally, the Phase II and III areas of the Sunnyslope Basin are broken up into three regions, as shown in Figure 7 of Appendix A.

Sewer mains within the Sunnyslope Basin flow via gravity to the Sunnyslope Trunk sewer, ultimately discharging to the proposed WWTP. Within the Phase II and III areas of the Sunnyslope Basin, the total length of gravity pipe is 107,155 feet, which is used to service 1,145 lots, of which 943, or 82%, are developed. Summarized in Table 2 below is the proposed region information.

**Table 2 - Sunnyslope Basin Regions**

Region	Phase	Length (ft)	Parcels Serviced	No. Manholes (4' Diameter)	No. Manholes (5' Diameter)
SB2A	2	34,580	438	103	11
SB3A	3	35,935	268	121	13
SB3B	3	36,640	439	117	13
Total		107,155	1,145	341	37

## 2.4. Paxton Basin

Paxton Basin is the largest of the four basins encompassing the central portion of Yucca Valley on both sides of Highway 62. The basin is mostly east of Kickapoo Trail and west of Avalon Avenue. The Paxton Basin contains both Phase I, II, and III areas, as shown in Figure 8 of Appendix A. Within the Paxton Basin, there are 25 sub-basins, PA through PZ, excluding PY, as shown in Figure 9 of Appendix A. Finally, the Phase II and III areas of the Paxton Basin are broken up into thirty regions, as shown in Figure 10 of Appendix A.

Sewer mains within the Paxton Basin flow via gravity to the Paxton Trunk then to the Paxton Pump Station, located at the southwest corner of Paxton Road and Balsa Avenue, shown in Appendix B. Flow is then conveyed south then east via the Paxton Force Main to the Sunnyslope Trunk. As previously stated, the Sunnyslope Trunk sewer ultimately flows via gravity to the proposed WWTP. All the sub-basins except for PB and PE were represented in Phase I. Phase II contains 18 regions and Phase III contains 12 regions of the Paxton Basin. Within the Phase II and III areas of the Paxton Basin, the total

length of gravity pipe is 180,055 feet which is used to service 2,076 lots of which 1,636, or 79%, are developed. Summarized in Table 3 below is the proposed alignment information.

**Table 3 - Paxton Basin Regions**

Region	Phase	Length (ft)	Parcels Served	No. Manholes (4' Diameter)	No. Manholes (5' Diameter)
PD2D	2	0	2 <sup>1</sup>	0	0
PD2E	2	1,890	11	8	0
PD2F	2	5,975	41	21	0
PD2G	2	1,025	14	4	0
PD2H	2	2,920	44	10	0
PD2I	2	2,890	34	8	0
PD2J	2	11,970	132	34	4
PI2A	2	19,865	250	70	8
PI2B	2	17,610	253	49	5
PK2A	2	5,875	132	24	0
PK2B	2	15,120	153	49	6
PO2A	2	1,375	12	7	0
PQ2A	2	1,355	13	4	0
PR2A	2	1,355	12	4	0
PS2A	2	1,740	15	9	0
PT2A	2	1,945	17	6	0
PU2A	2	3,445	38	12	0
PW2A	2	1,990	15	6	0
PB3A	3	2,400	10	8	0
PC3A	3	5,395	53	26	3
PC3B	3	5,420	70	25	3
PD3A	3	16,210	235	62	7
PD3B	3	5,730	89	23	3
PE3A	3	10,555	74	33	4
PE3B	3	25,570	250	112	13
PH3A	3	715	5	3	0
PI3A	3	4,555	78	22	0
PJ3A	3	2,650	20	8	0
PJ3B	3	0	1 <sup>1</sup>	0	0
PX3A	3	2,510	3	9	0
Total		180,055	2,076	656	56

<sup>1</sup> Parcels in regions with zero length are serviced by pipe in other regions or phases. These are named *dependent parcels*.

## 2.5. Kickapoo Basin

The Kickapoo Basin is located within the western portion of Yucca Valley, on both sides of Highway 62. The Kickapoo Basin contains both Phase I, II, and III areas, as shown in Figure 11 of Appendix A. Within the Kickapoo Basin, there are two sub-basins, KA and KB, as shown in Figure 12 of Appendix A. Finally, the Phase II and III areas of the Kickapoo Basin are broken up into six regions, as shown in Figure 13 of Appendix A.

Sewer mains in the Kickapoo Basin flow via gravity to the Kickapoo Pump Station, located on the south side of Benicia Trail, east of Kickapoo Trail, as shown in Appendix B. Flow is then pumped south to the Paxton Trunk and directed east to the Paxton Pump Station, where it is pumped to the Sunnyslope Trunk, and ultimately into the WWTP via gravity. Within the Phase II and III areas of the Kickapoo Basin, the total length of gravity pipe is 38,860 feet which is used to service 479 lots of which 358 or 79% are developed. Summarized in Table 4 below are the Phase II and III alignments.

**Table 4 - Kickapoo Basin Alignments**

Region	Phase	Length (ft)	Parcels Serviced	No. Manholes (4' Diameter)	No. Manholes (5' Diameter)
KA2A	2	27,300	343	103	11
KA3B <sup>1</sup>	3	0	1 <sup>1</sup>	0	0
KA3C	3	3,170	46	11	0
KA3D <sup>1</sup>	3	0	3 <sup>1</sup>	0	0
KA3E	3	7,035	79	25	3
KB3E	3	1,355	7	5	0
Total		38,860	479	144	14

<sup>1</sup> Parcels in regions with zero length are serviced by pipe in other regions or phases. These are named *dependent parcels*.

## 2.6. Force Mains

Due to grades and site constraints, three separate regions within the Paxton and Sunnyslope basins require force mains. The force mains will allow for construction to take place within maintained roads, avoiding construction through easements and parcels thick with Joshua trees, dense rocks, and other obstructions impacting construction. Pumps for the force mains will be located in a sump manhole. Summarized in Table 5 below is the proposed force main alignment information.

**Table 5 - Force Main Alignments**

Region	Phase	Length (ft)	Proposed Diameter (in)	Parcels Benefitted
PK2B	2	700	6	34
PC3A	3	2,535	6	53
SB3A	3	350	6	56
Total		3,585	-	143

## 2.7. Deferred Regions

As discussed in the Alignment Study, alignments were laid out to service every planned parcel. This was necessary to accurately design and plan the expansion of the collection system into the Phase II and III areas. These alignments were then optimized to eliminate service to areas that did not meet the metrics presented in the Alignment Study. Service was deferred to areas that would only serve vacant parcels, areas where the District does not provide water service, and areas that contain low flow parcels. The deferred parcels will require service once the areas meet one of the three metrics, and

their construction could take place on a rolling timeline. For the purposes of this report, deferred regions are quantified collectively. The total length of deferred sewer line is 105,184 feet, or 19.9 miles.

## 2.8. Environmental

The MND approved for the project on October 7, 2009 was based on the sewer alignments proposed in the Sewer Master Plan. This Planning Study proposes new alignment locations to study compared to the alignments presented in the Master Plan such that an amendment to the MND will be required. Shown in Appendix C are proposed alignments and deferred alignments that both were and were not included in the Master Plan. Summarized in Table 6 below is the proposed alignment information for each Phase.

**Table 6 - Summary of Alignments Not a Part of Sewer Master Plan**

Phase	Alignment Length Previously Studied (ft)	Alignment Length for Future Study (ft)
Phase II Planned	133,926	29,045
Phase II Deferred	7,270	24,350
Phase III Planned	140,020	35,220
Phase III Deferred	22,740	50,830
Phase II & III Planned	273,946	64,265
Phase II & III Deferred	30,010	75,180
Total Phase II & III	303,956	139,445

## 2.9. Easements

Many areas within the Phase I boundary are not dedicated right of way and required easements to construct the sewer. This situation is also present in Phase II and III. In areas that do not have dedicated right of way, the District will need to obtain easements in order to construct and operate the new sewer system. Parcels that will require new easements are shown in Appendix D. Table 7 below summarizes the parcels that will require easements.

**Table 7 - Proposed Sewer Requiring Easements**

Phase	Number of Parcels
Phase II Planned	90
Phase II Deferred	54
Phase III Planned	111
Phase III Deferred	152
Total Phase II & III Planned	201
Total Phase II & III Deferred	206
Total Phase II & III	407

## 2.10. Hydraulic Analysis

In order to appropriately size the new sewer mains planned for the Phase II and III areas, Atkins updated and expanded the existing Phase I hydraulic model of the collection system. The hydraulic model uses the estimated pipe slopes, materials, and projected flows, to simulate the volume of wastewater in the system at any given time of day. This volume is used to size the pipe diameter to conform with the design criteria depth to diameter (d/D) ratio, as well as to produce a velocity as close to the desired velocity of 2 feet per second, which is generally considered to be a “self-cleaning” velocity.

To generate projected wastewater flows, Atkins used the same process followed for the Phase I system design. This process included obtaining water meter flow data for each property in the Phase II and III areas, which was then tied back to a specific parcel through the APN. A return to sewer (RTS) rate of 90% was used, meaning that 90% of the water meter flow was modeled to return to the sewer system as wastewater.

Pairing this flow data with the system layout in this study yielded potential flow rates in each pipe segment of the Phase II and III areas. Each pipe was initially set to a minimum diameter of 8-inches, and the model was used to highlight pipes that were over capacity and needed to increase in diameter. Shown in Table 8 below are the pipes in the Phase II and III system that are projected to be larger than 8-inches in diameter.

**Table 8 - Pipes Larger Than 8 Inches**

Region	Initial Pipe size	Required Pipe Size	Length (ft)
PD2F	8"	10"	5,770
SB2A	8"	10"	9,530
Total Phase II and III	--	--	15,300

## 3. Estimated Costs

### 3.1. Construction Costs

To generate projected construction costs for the Phase II and III systems two methods were applied. The first method used as bid prices for the sewer infrastructure in Phase I as a baseline. Those prices were then combined with the anticipated system metrics of the Phase II and III areas to generate a probable cost of construction.

The system metrics used from the Phase II and III areas include the length of pipe by diameter, number of manholes by diameter, anticipated paving areas, and other like items from Phase I. For lump sum bid items, percentages of each value from the corresponding Phase I package were generated and applied to the Phase II and III estimate.

The second method applied to generate construction costs used a general approach of taking the average cost per mile of construction. The average price per mile of construction was derived from the three Phase I bid packages and multiplied by the anticipated length of the Phase II and III system.

The price determined using as bid prices from Phase I is \$83,337,270. A line item breakdown of this method is available in Appendix E. The price determined using the average cost per mile is \$75,068,612. A line item breakdown of the cost per mile method is available in Appendix F.

For the purposes of this report, the price using method one will be used carried forward as the low-end estimate. To accommodate potential increases in construction materials and general construction pricing, a high-end price will be developed by escalating the prices 6% from the low-end price. Together, the low and high-end prices will create the anticipated range for construction costs.

### 3.2. Construction Costs – Deferred Regions

For planning purposes, it is important to look not only at the recommend lines presented in this Planning Study, but also at the deferred lines. The deferred lines will be a critical cost component as the District builds out the completion of the system over time. An estimated cost for the construction of these lines can be made using the average construction cost per mile developed in Appendix F. Using this method, the anticipated cost to construct the deferred portions of the Phase II and III system is \$23,366,527.

### 3.3. Anticipated Soft Costs

In addition to the estimated construction cost, the overall cost of the system will include several soft costs including design, construction management, survey, environmental monitoring, testing, and District staff labor hours. Each of these items will add to the total overall price of the project and should be included in the total budget. Recommendations for each of the soft cost is outlined below and are based on a percentage of the construction cost.

Item	Cost (Low-End)	Cost (High-End)
Construction Cost:	\$83,337,270	\$88,337,506
Engineering Design and Construction Support: 7%	\$5,833,608	\$6,183,625
Construction Management: 9%	\$7,500,354	\$7,950,375
Environmental Monitoring: 0.8%	\$666,698	\$706,700
Surveying and Testing: 1%	\$833,372	\$883,375
Geotechnical: 0.2%	\$166,675	\$176,675
Assessment District Engineer: 0.5%	\$416,686	\$441,687
District Labor: 3%	\$2,500,118	\$2,650,125
Easement Acquisition 0.5%	\$416,686	\$441,687
Enhanced Septic (\$25,000 each)	\$500,000	\$525,000
Total	\$102,171,467	\$108,296,755

## 4. Recommendation

The purpose of the Planning Study is to formalize proposed sewer alignments that will provide service to all planned parcels within the Phase II and III boundaries. The proposed alignments take into consideration the existing topography, right-of-way corridors, existing utilities, and preferred connection points into the Phase I sewer system. Based on this study, an estimate of the length of pipe, number of parcels serviced, and potential easement requirements were quantified.

The collection system is designed to minimize pipe lengths and system depth while ensuring gravity flow, reduce the need for private easements, and reduce sewer lines crossing Caltrans right-of-way (SR 247 and Highway 62). The collection system expansion into the Phase II and III areas will also conform to all criteria set forth in the Phase I Preliminary Design Report, including minimum pipe diameter, slopes, depth, and velocity requirements.

The proposed Phase II and III system is divided into four major basins matching the Phase I system. Table 9 below summarizes the proposed system for each major basin servicing every planned parcel within the Phase II and III boundaries. Table 10 below summarizes the proposed system by Phase.

**Table 9 - Phase II and III System Summary Table - By Basin**

Basin	Pipe Length (ft)	Parcels Serviced		No. Manholes (4' Diameter)	No. Manholes (5' Diameter)
		Total	Developed		
Barron	8,830	80	47	28	3
Sunnyslope <sup>1</sup>	107,505	1,145	943	341	37
Paxton <sup>1</sup>	183,290	2,076	1,636	656	56
Kickapoo	38,860	479	358	144	14
Total	338,485	3,780	2,984	1,169	110

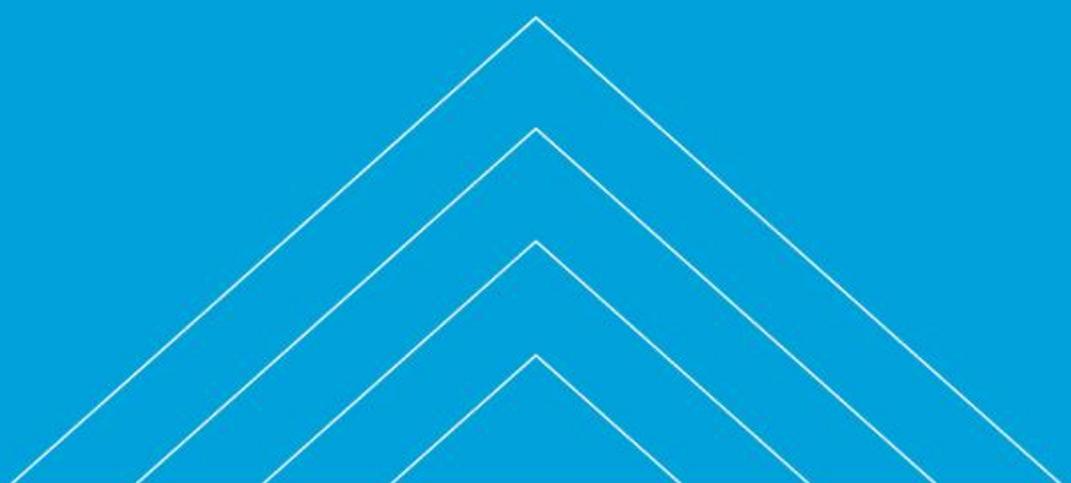
<sup>1</sup> This basin includes both gravity and force main lengths.

**Table 10 - Phase II and III System Summary Table - By Phase**

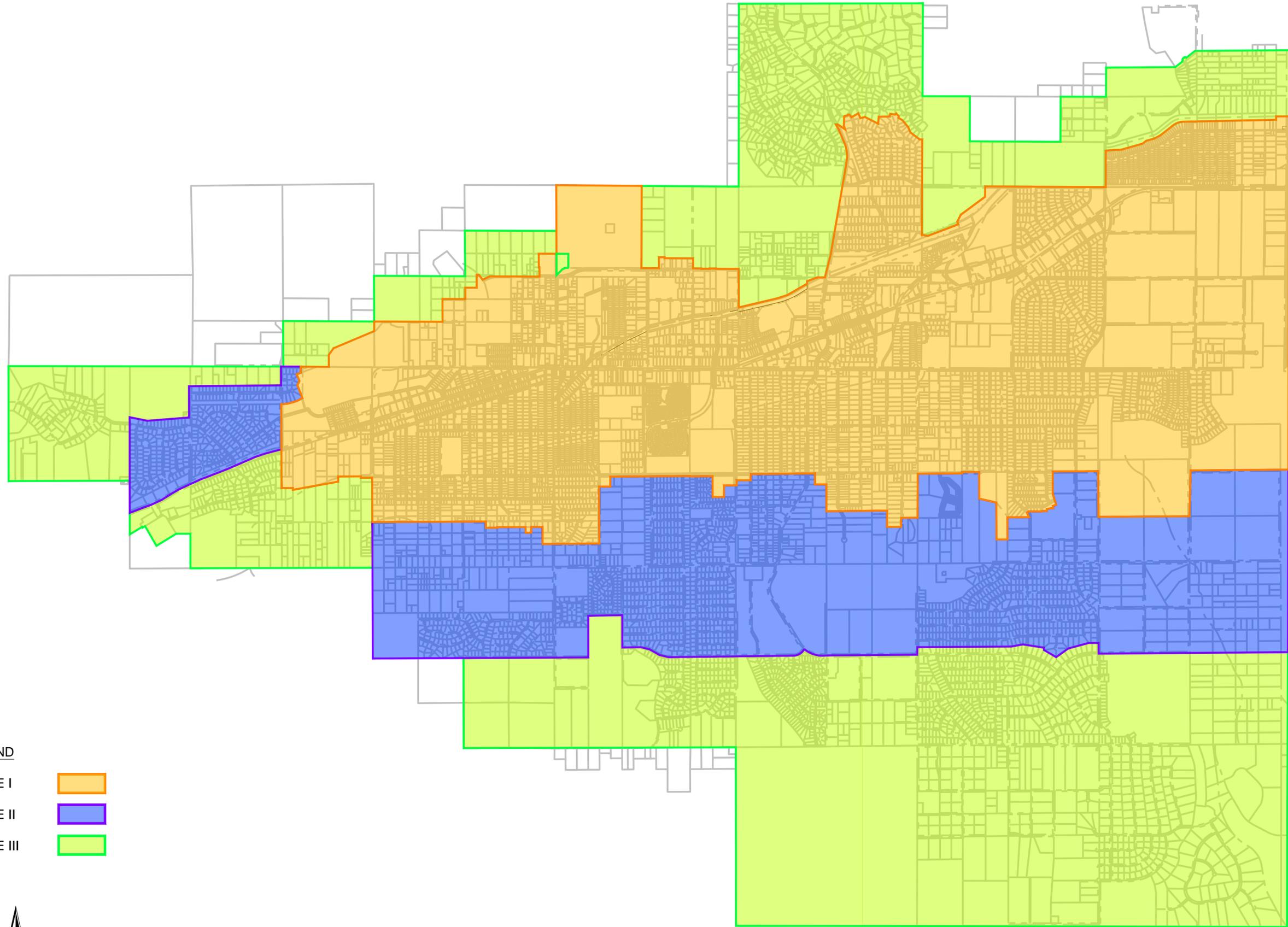
Phase	Pipe Length (ft)	Parcels Serviced		No. Manholes (4' Diameter)	No. Manholes (5' Diameter)
		Total	Developed		
Phase II <sup>1</sup>	160,925	1,969	1,656	531	45
Phase III <sup>1</sup>	177,560	1,811	1,328	638	65
Phase II & III	338,485	3,780	2,984	1,169	110

<sup>1</sup> This Phase includes both gravity and force main lengths.

# Appendices



# Appendix A. Figures



LEGEND

- PHASE I
- PHASE II
- PHASE III

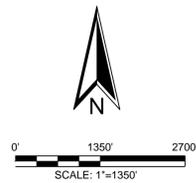
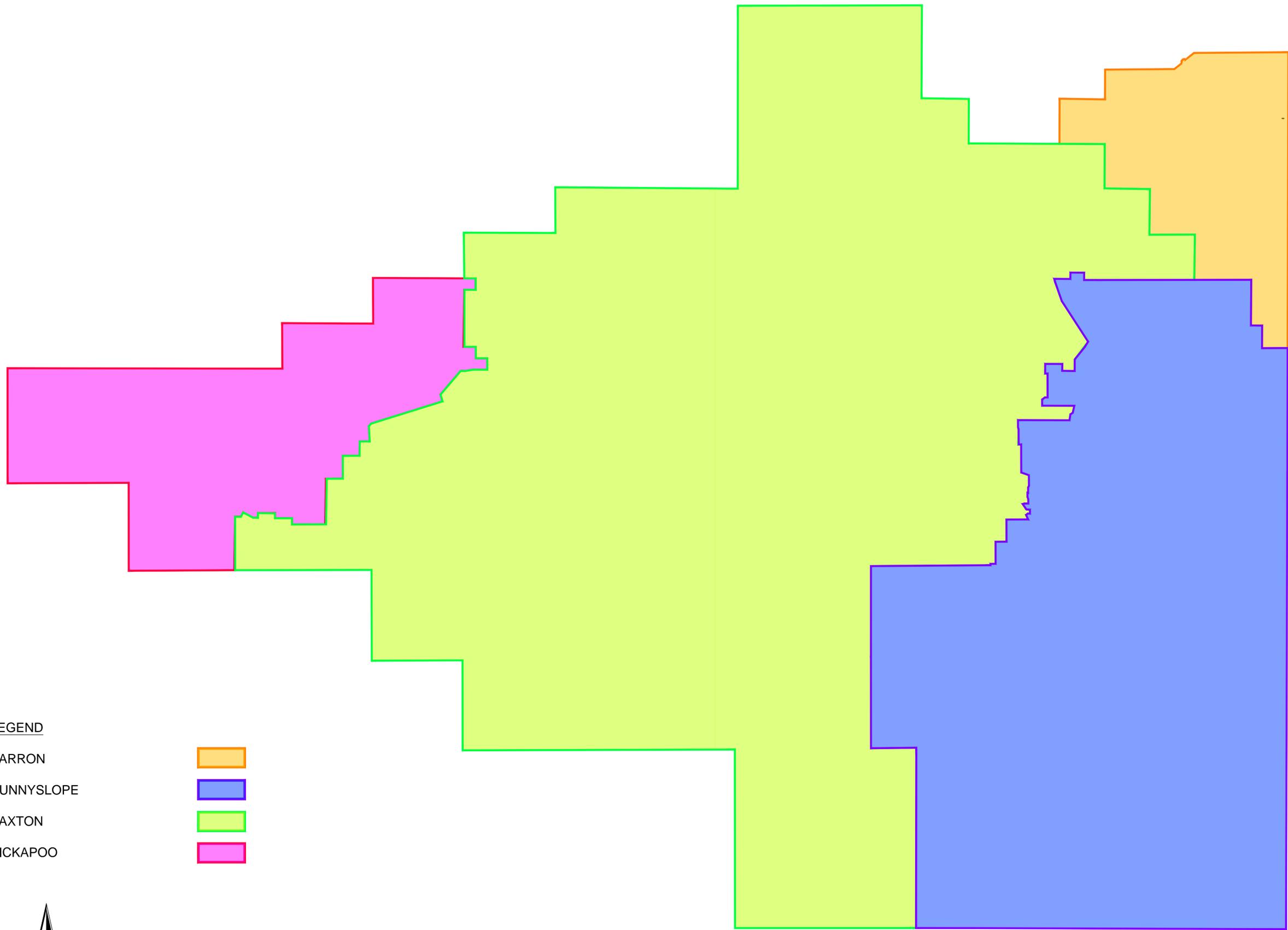


FIGURE 1 - PHASE MAP



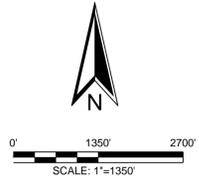
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**LEGEND**

- BARRON
- SUNNYSLOPE
- PAXTON
- KICKAPOO

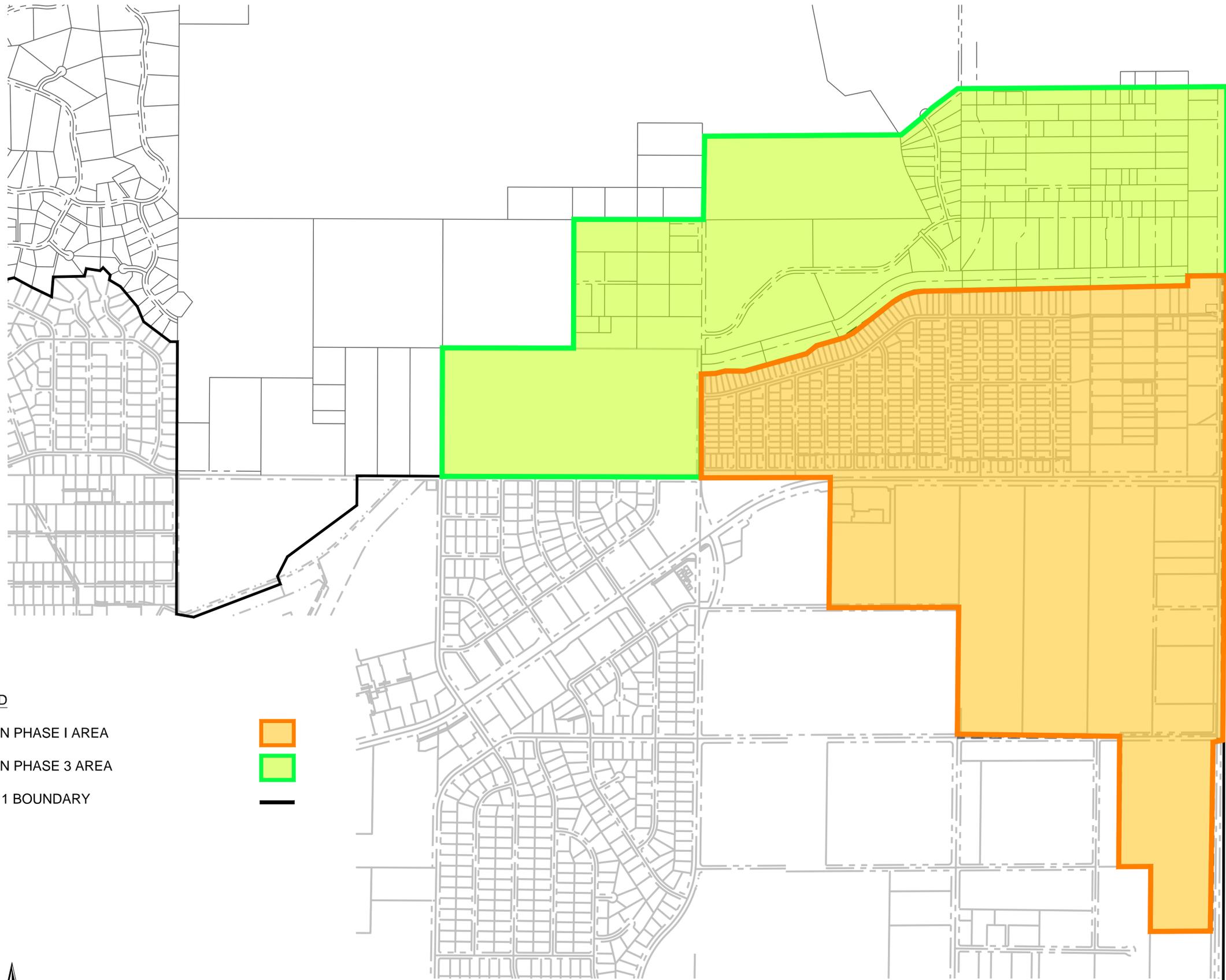


**FIGURE 2 - BASIN MAP**



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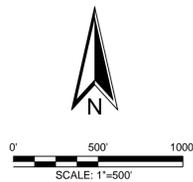


**LEGEND**

BARRON PHASE I AREA

BARRON PHASE 3 AREA

PHASE 1 BOUNDARY

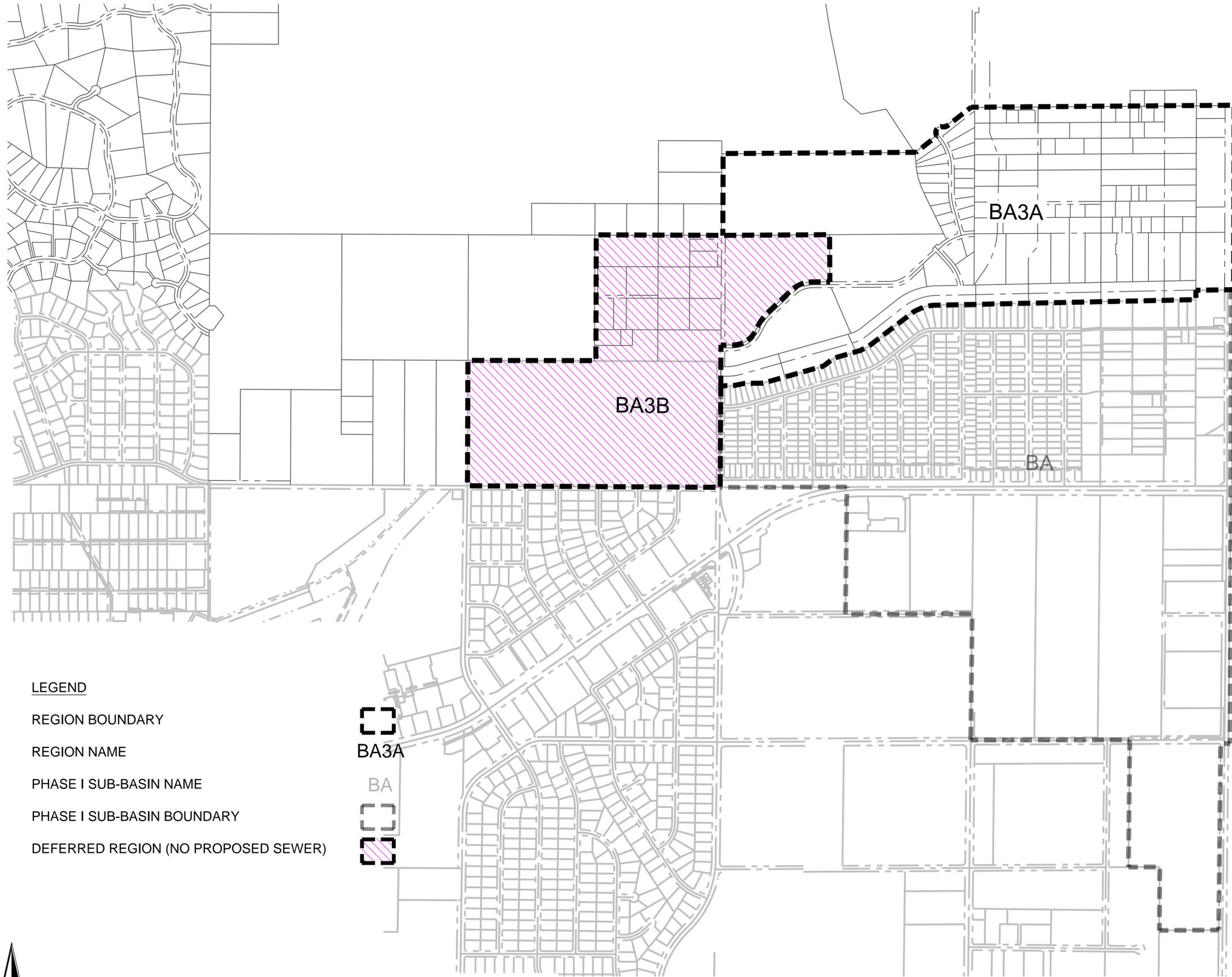


**FIGURE 3 - BARRON PHASES**

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**LEGEND**

REGION BOUNDARY

REGION NAME

PHASE I SUB-BASIN NAME

PHASE I SUB-BASIN BOUNDARY

DEFERRED REGION (NO PROPOSED SEWER)

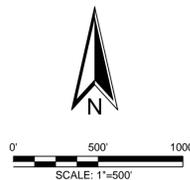


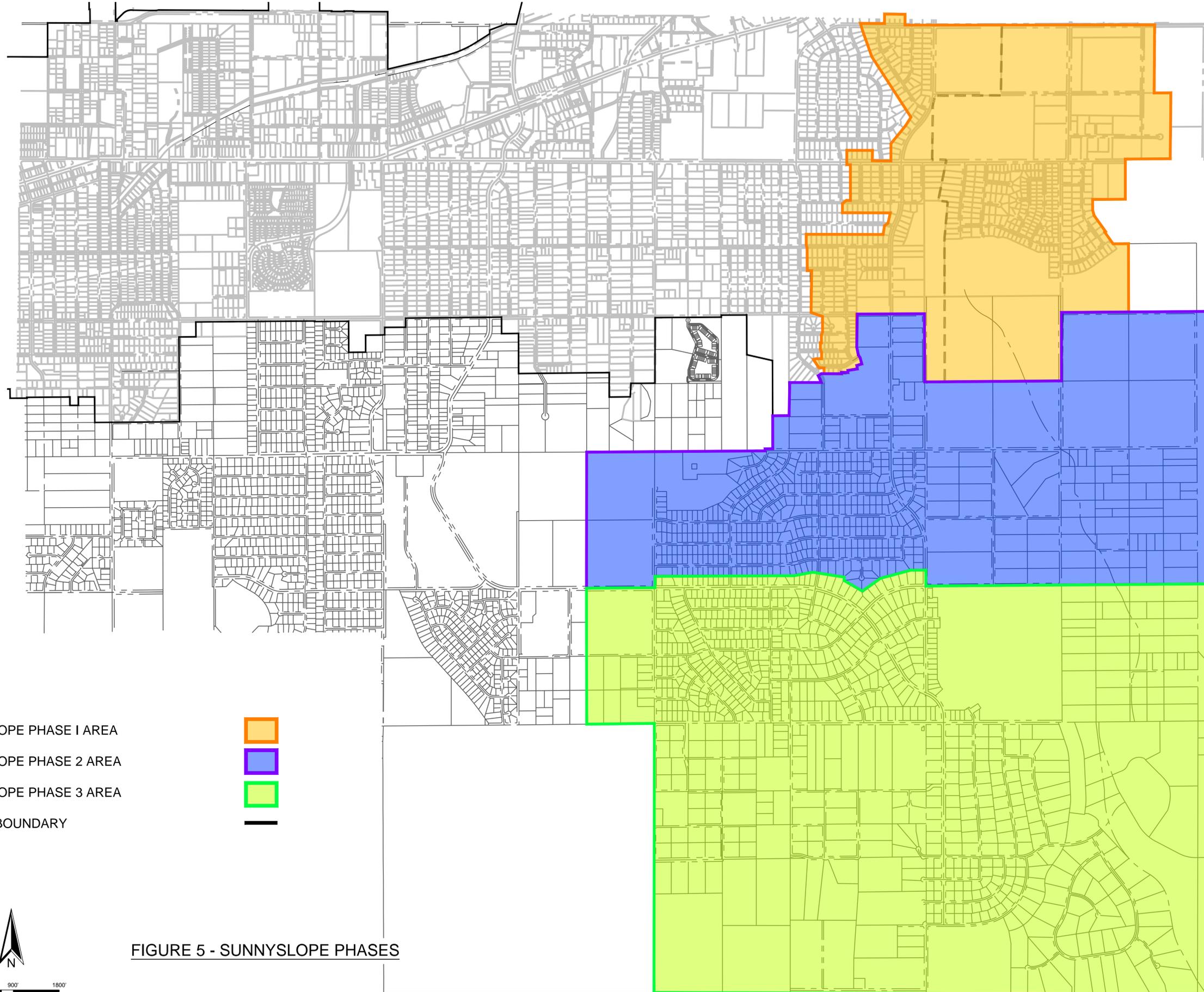
BA3A

BA



**FIGURE 4 - BARRON SUB-BASINS/REGIONS**





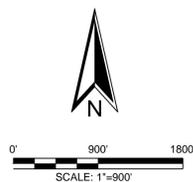
**LEGEND**

SUNNYSLOPE PHASE 1 AREA

SUNNYSLOPE PHASE 2 AREA

SUNNYSLOPE PHASE 3 AREA

PHASE 1 BOUNDARY

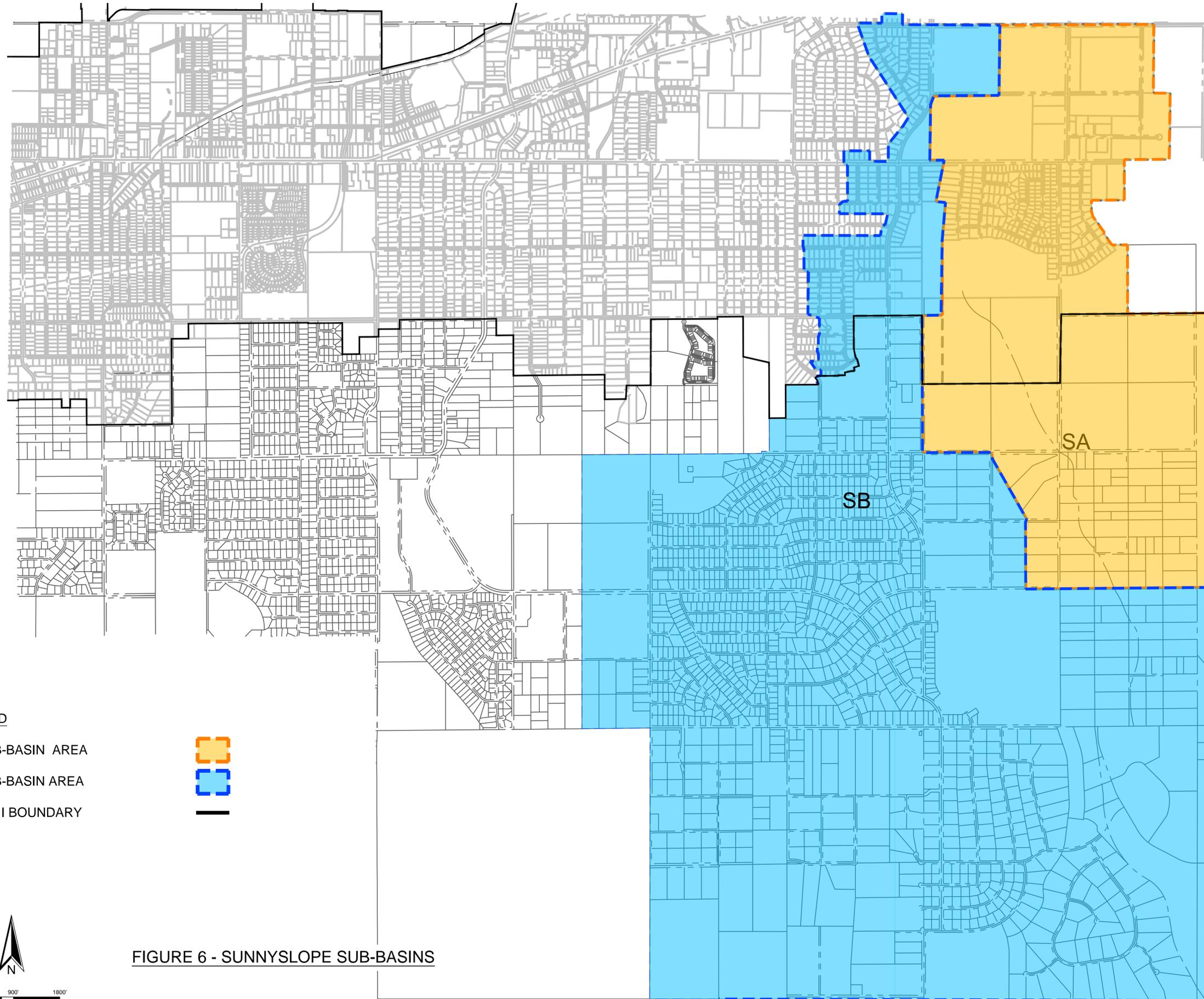


**FIGURE 5 - SUNNYSLOPE PHASES**

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**LEGEND**

SA SUB-BASIN AREA



SB SUB-BASIN AREA



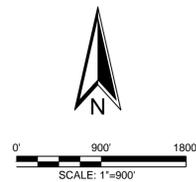
PHASE I BOUNDARY



SB

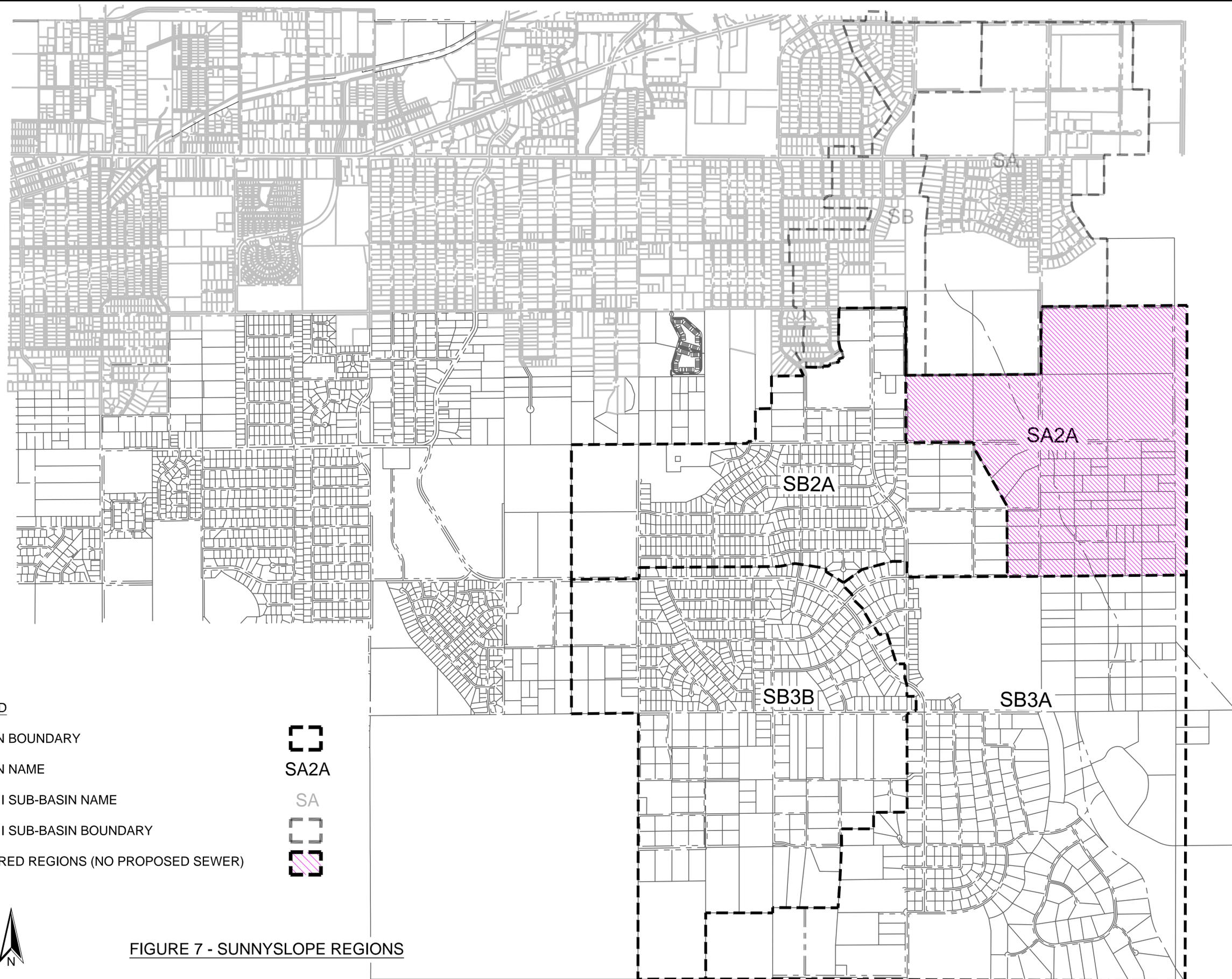
SA

**FIGURE 6 - SUNNYSLOPE SUB-BASINS**



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**LEGEND**

REGION BOUNDARY



REGION NAME

SA2A

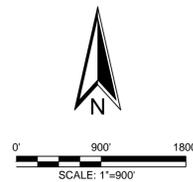
PHASE I SUB-BASIN NAME

SA

PHASE I SUB-BASIN BOUNDARY



DEFERRED REGIONS (NO PROPOSED SEWER)



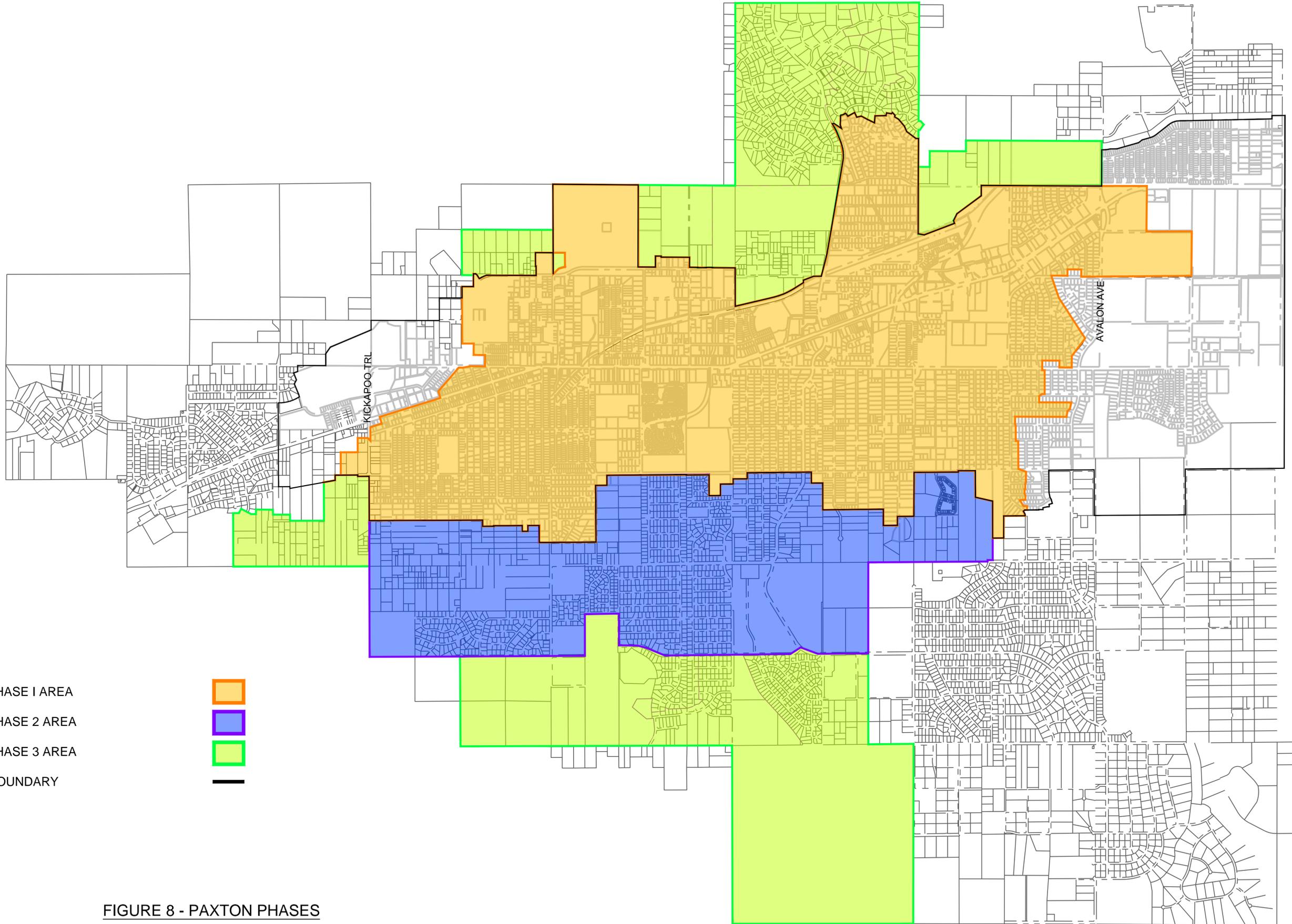
**FIGURE 7 - SUNNYSLOPE REGIONS**



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**LEGEND**

PAXTON PHASE 1 AREA

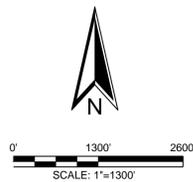
PAXTON PHASE 2 AREA

PAXTON PHASE 3 AREA

PHASE 1 BOUNDARY



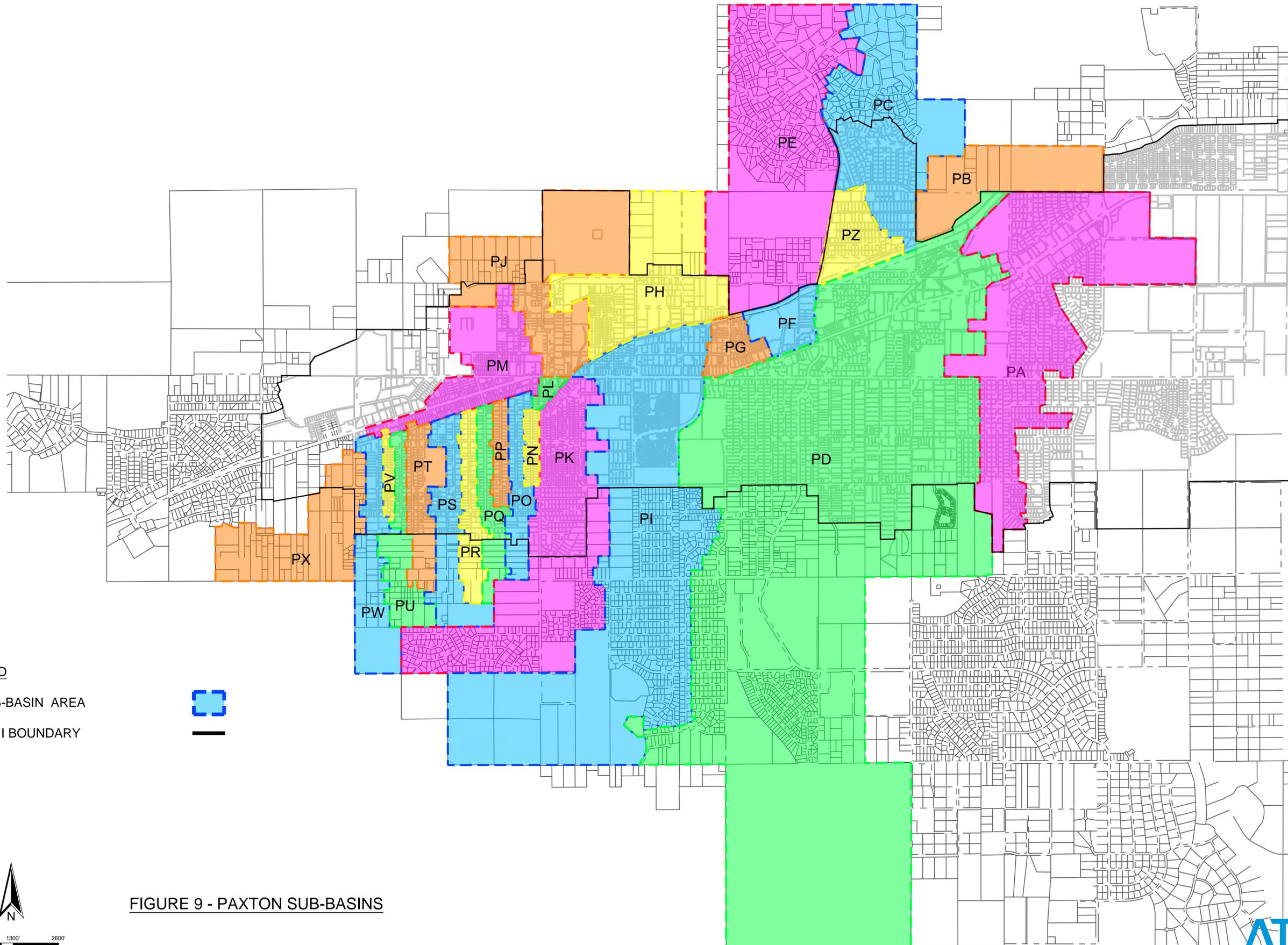
**FIGURE 8 - PAXTON PHASES**



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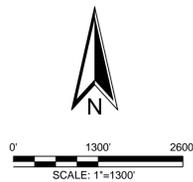
**LEGEND**

PA SUB-BASIN AREA

PHASE I BOUNDARY

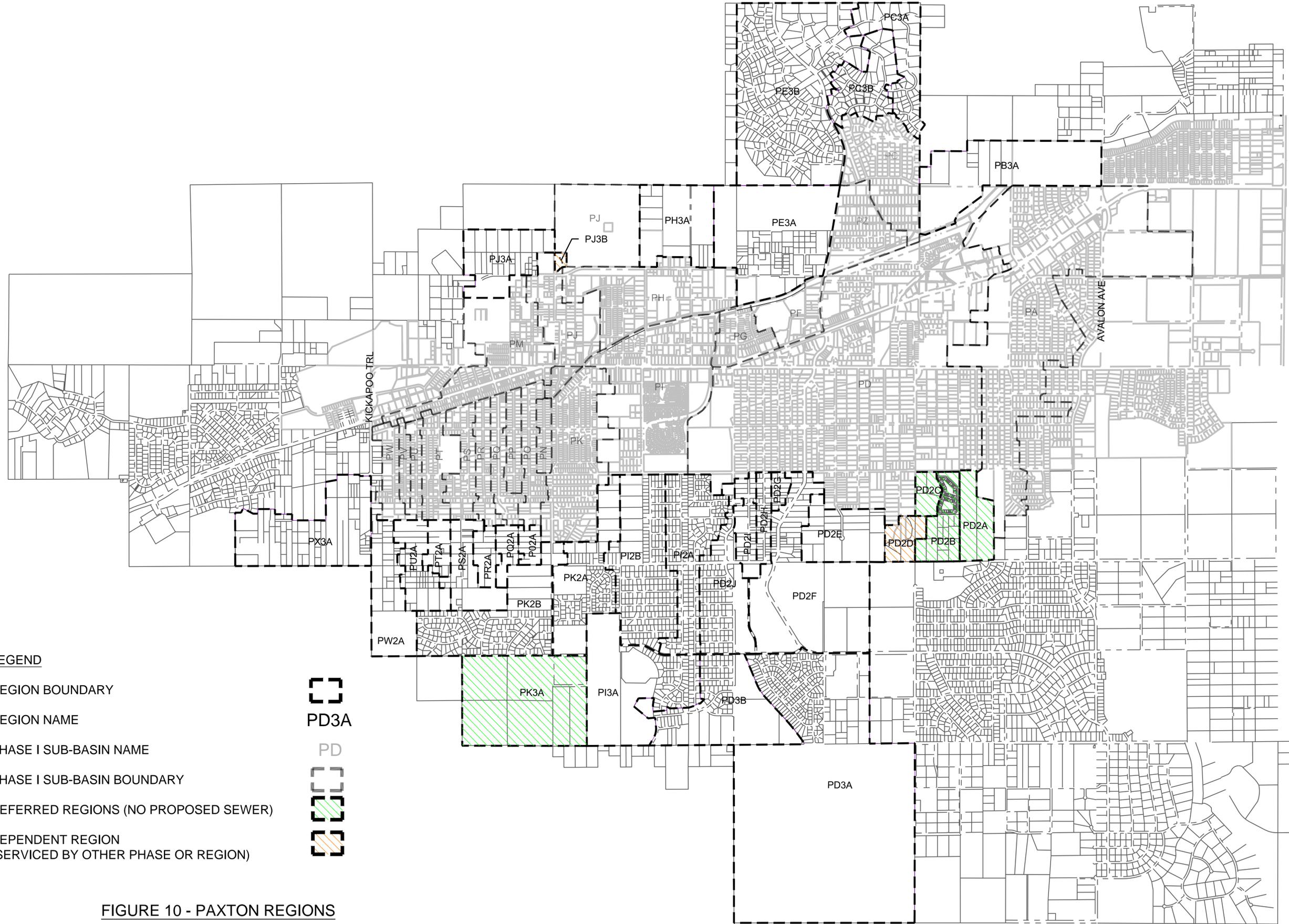


**FIGURE 9 - PAXTON SUB-BASINS**



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**LEGEND**

REGION BOUNDARY

REGION NAME

PHASE I SUB-BASIN NAME

PHASE I SUB-BASIN BOUNDARY

DEFERRED REGIONS (NO PROPOSED SEWER)

DEPENDENT REGION  
(SERVICED BY OTHER PHASE OR REGION)



PD3A

PD



0' 1300' 2600'  
SCALE: 1"=1300'

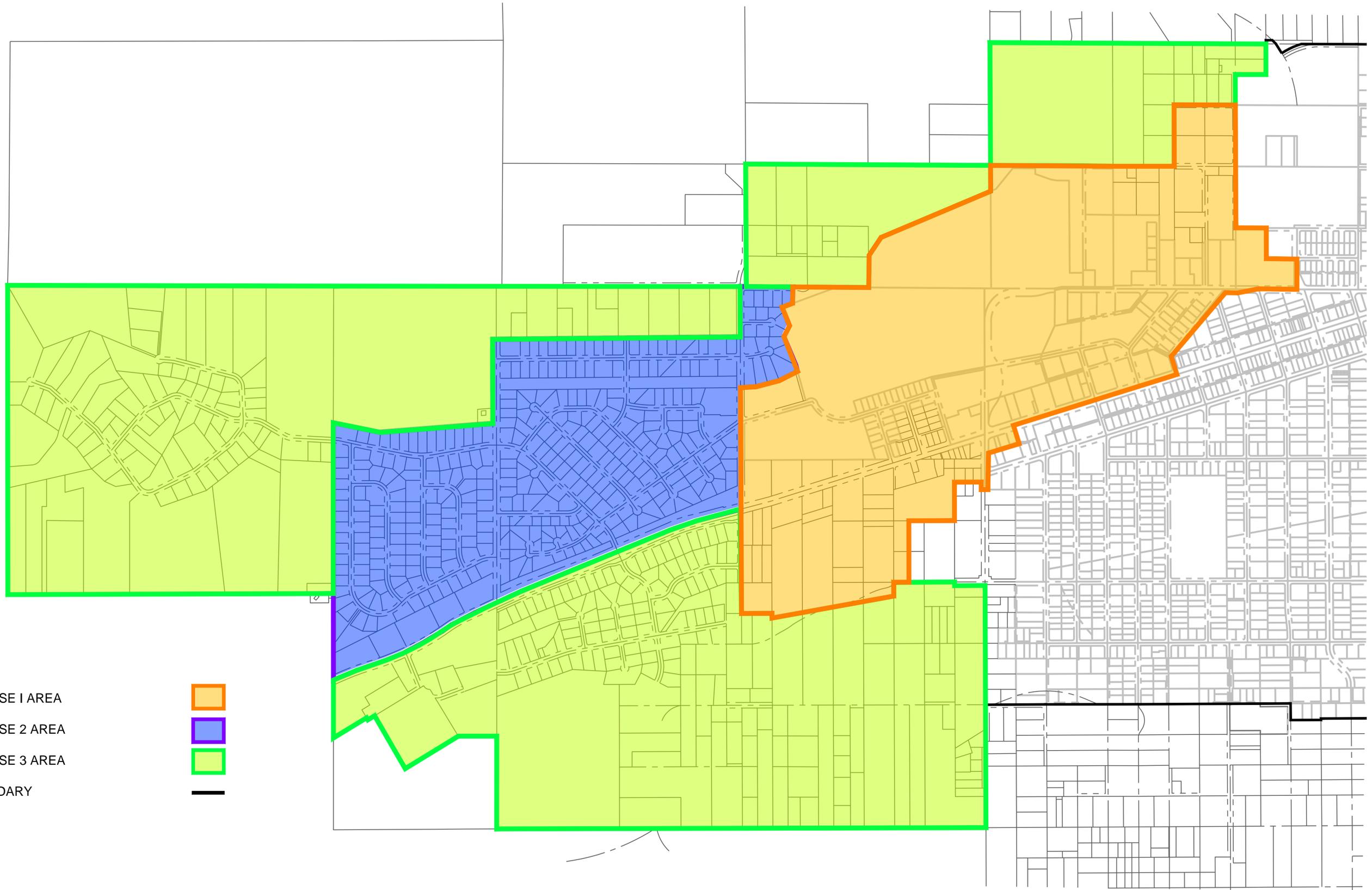
**FIGURE 10 - PAXTON REGIONS**

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**LEGEND**

KICKAPOO PHASE I AREA

KICKAPOO PHASE 2 AREA

KICKAPOO PHASE 3 AREA

PHASE 1 BOUNDARY



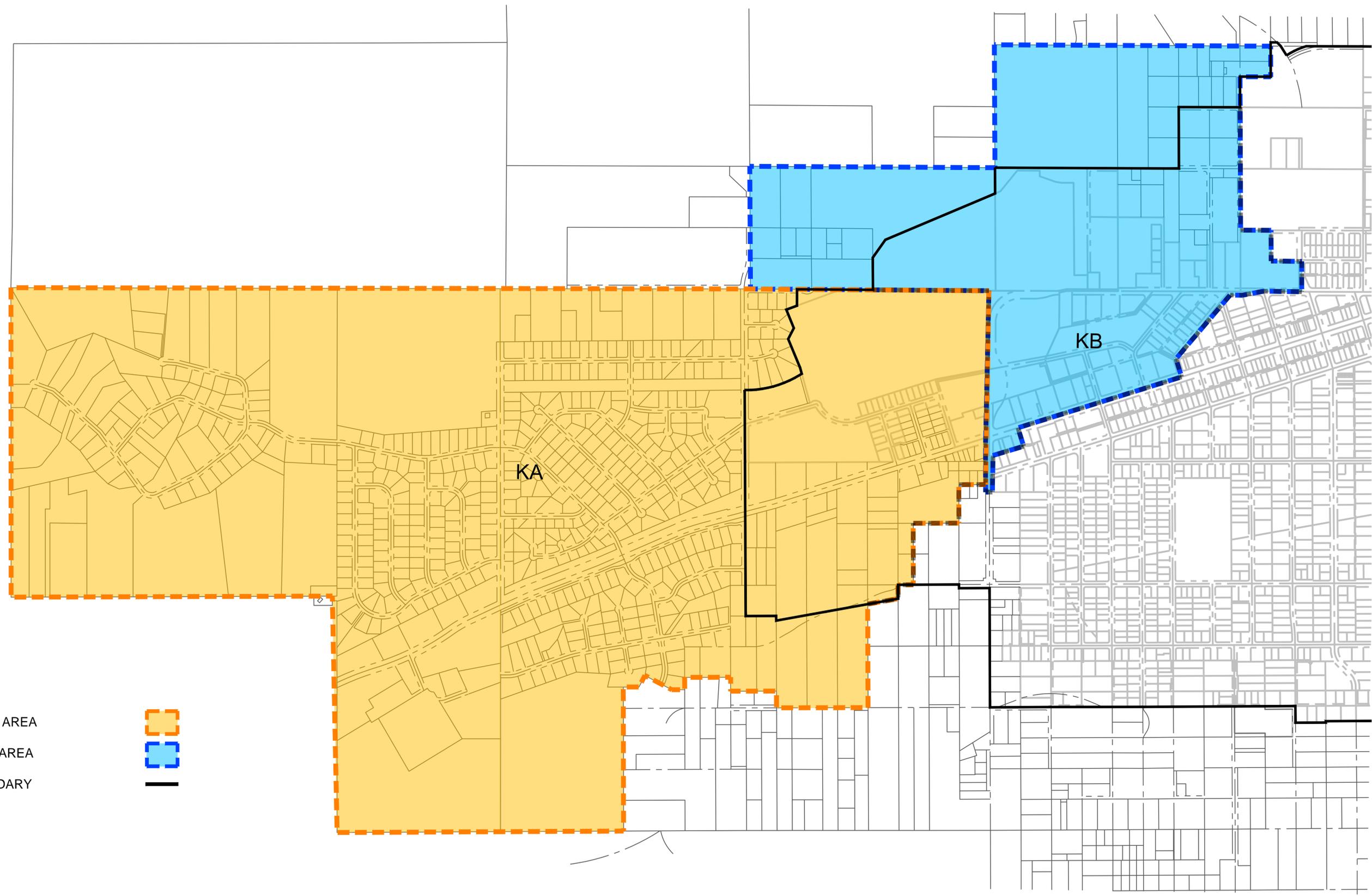
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**FIGURE 11 - KICKAPOO PHASES**

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**LEGEND**

KA SUB-BASIN AREA

KB SUB-BASIN AREA

PHASE I BOUNDARY



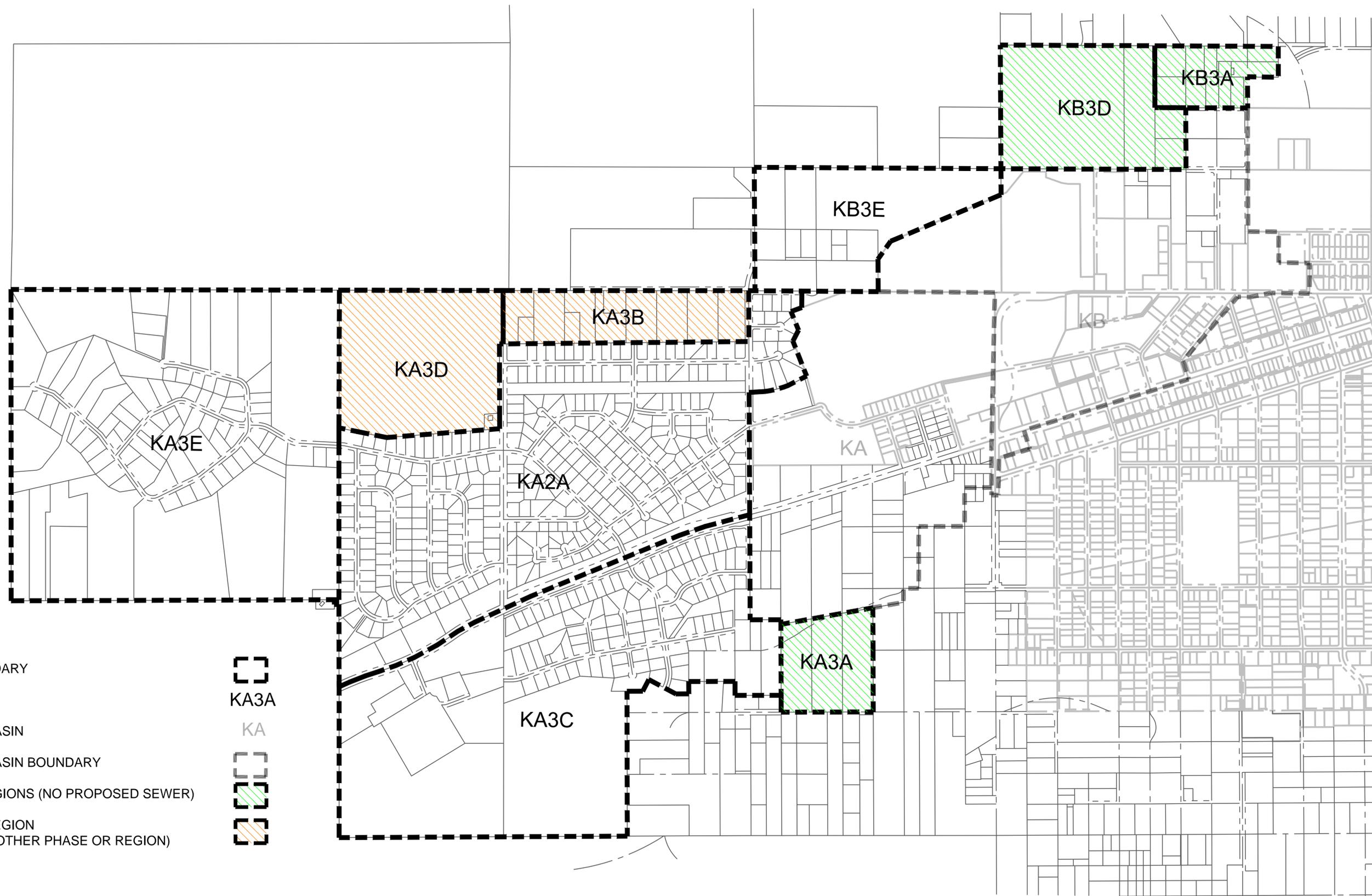
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**FIGURE 12 - KICKAPOO SUB-BASINS**



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LEGEND

REGION BOUNDARY

REGION NAME

PHASE I SUB BASIN

PHASE I SUB BASIN BOUNDARY

DEFERRED REGIONS (NO PROPOSED SEWER)

DEPENDENT REGION  
(SERVICED BY OTHER PHASE OR REGION)



0' 1350' 2700'  
SCALE: 1"=1350'

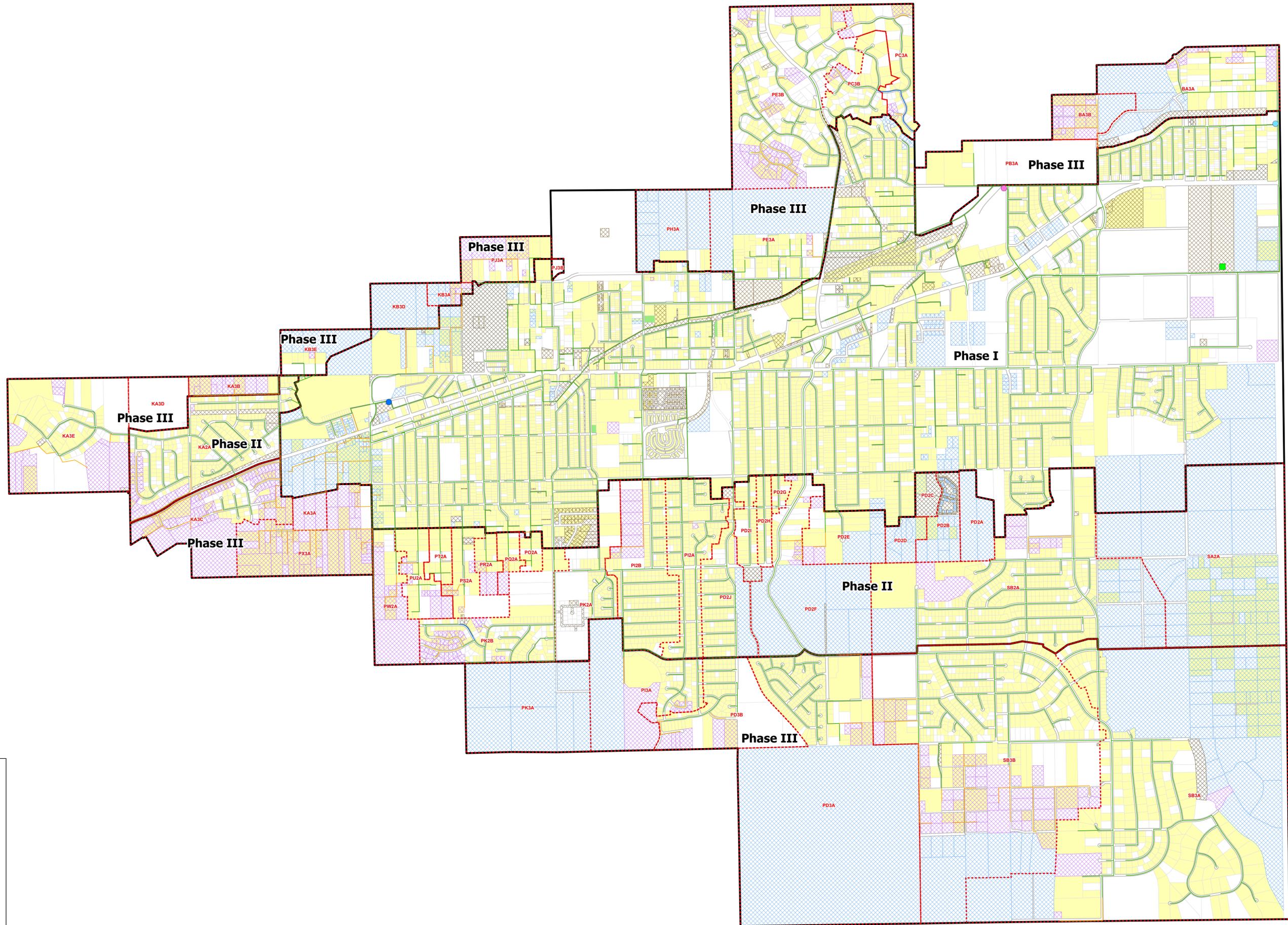
FIGURE 13 - KICKAPOO REGIONS

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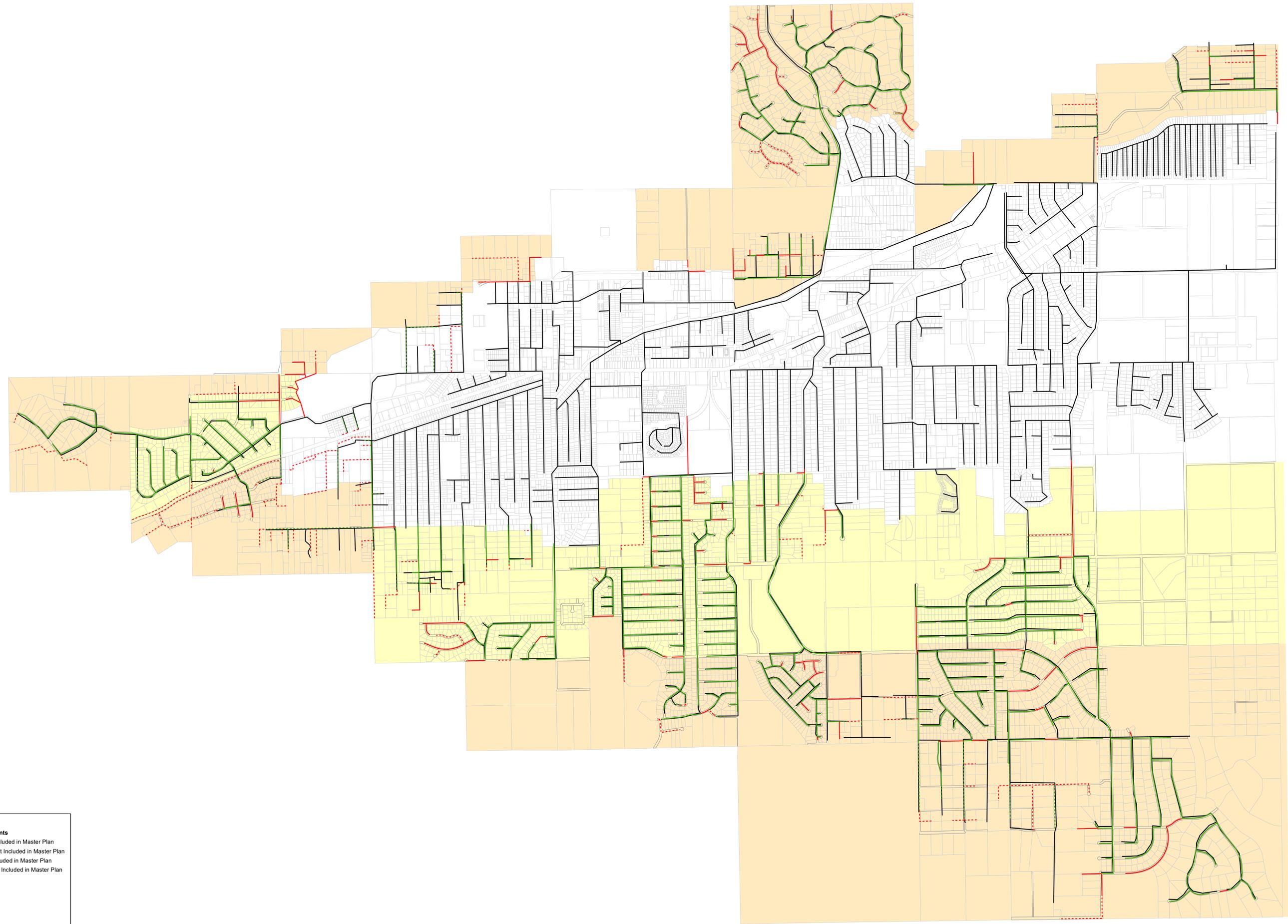
# Appendix B. Phase II and III System Layout



■ Wastewater Treatment Plant  
**Pump Station**  
● Barron  
● Kickapoo  
● Paxton  
**Sewer Alignments**  
— Proposed Gravity Main  
— Proposed Force Main  
- - - Deferred Gravity Main  
- - - Regions  
 Phases  
 ROW  
 Atkins Non-Assessed Parcels  
 Atkins Deferred Parcels  
 Non-Assessed Parcels  
 Deferred Parcels  
 Developed Parcels  
 Undeveloped Parcels



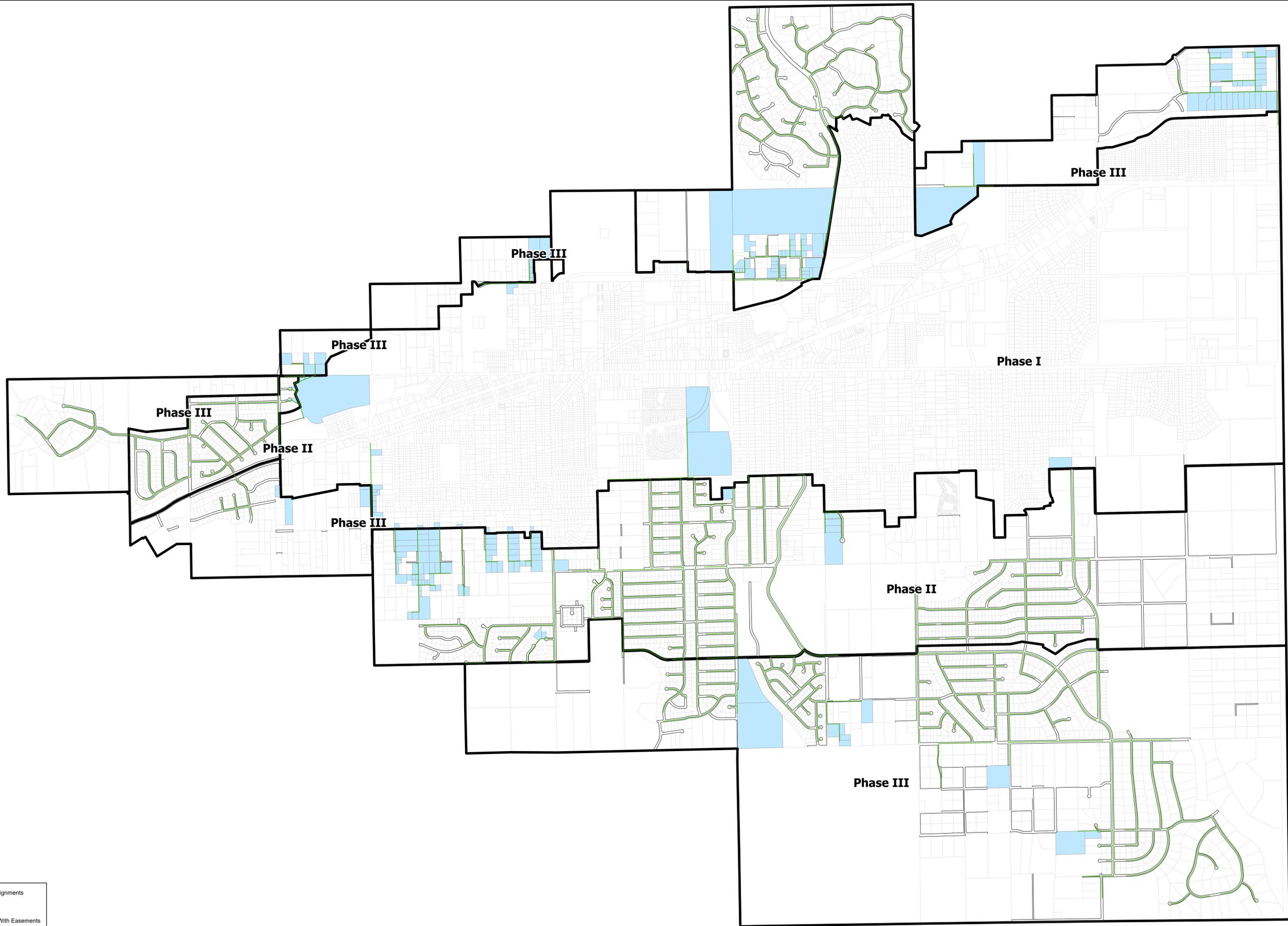
# Appendix C. Alignments Not a Part of Environmental Study



— Master Plan Alignments  
**Current Phase II & III Alignments**  
 — Proposed Alignments Included in Master Plan  
 — Proposed Alignments Not Included in Master Plan  
 - - - Deferred Alignments Included in Master Plan  
 - - - Deferred Alignments Not Included in Master Plan  
 — ROW  
 □ Parcels  
**Phase**  
 II  
 III



# Appendix D. Alignments Requiring Easements



- Sewer Alignments
- ROW
- Phases
- Parcels With Easements
- Parcels



# Appendix E. Estimate of Probable Construction Costs Using as Bid Prices

**HDWD Sewer Conversion Project - Phase 2/3 - Engineers Opinion of Probable Construction Costs**

<i>Item No.</i>	<i>Item Description</i>	<i>Quantity</i>	<i>Unit of Measure</i>	<i>Unit Cost</i>	<i>Item Total</i>
1	MOBILIZATION & DEMOBILIZATION	1	LS	\$ 4,500,000.00	\$ 4,500,000
2	VIDEO RECORDING OF PRE-EXISTING SURFACE CONDITIONS	1	LS	\$ 15,000.00	\$ 15,000
3	TRAFFIC CONTROL	1	LS	\$ 1,500,000.00	\$ 1,500,000
4	SHEETING/SHORING AND BRACING	1	LS	\$ 2,400,000.00	\$ 2,400,000
5	MILLING OF EXISTING ROADWAY	11,827,200	SF	\$ 0.20	\$ 2,365,440
6	8-INCH SEWER MAIN	319,600	LF	\$ 55.00	\$ 17,578,000
7	10-INCH PVC SEWER MAIN	15,300	LF	\$ 65.00	\$ 994,500
8	6-INCH PVC FORCE MAIN	3,585	LF	\$ 65.00	\$ 233,025
9	4' DIAMETER POLYMER MANHOLES	1,169	EA	\$ 10,500.00	\$ 12,274,500
10	5' DIAMETER POLYMER MANHOLES	110	EA	\$ 18,500.00	\$ 2,035,000
11	SEWER LATERAL PIPING AND CLEANOUT - 4-INCH	3,754	EA	\$ 215.00	\$ 807,110
12	SEWER LATERAL PIPING AND CLEANOUT - 6-INCH	26	EA	\$ 260.00	\$ 6,760
13	VIDEO INSPECTION OF PIPELINES FOR ACCEPTANCE	338,485	LF	\$ 1.00	\$ 338,485
14	REPAVE EXISTING PAVED ROADWAY SURFACE 4" over native	1,314,133	SY	\$ 1.50	\$ 1,971,200
15	REPLACE BERMS	475,200	LF	\$ 5.00	\$ 2,376,000
16	WATER POLLUTION CONTROL PROGRAM DEVELOPMENT	1	LS	\$ 10,000.00	\$ 10,000
17	WATER POLLUTION CONTROL PROGRAM IMPLEMENTATION	1	LS	\$ 200,000.00	\$ 200,000
18	PERMITTING Caltrans Encroachment Inspections	1	LS	\$ 2,500.00	\$ 2,500
19	JACK AND BORE 8-INCH PVC IN 20-INCH CASING	1	EA	\$ 450,000.00	\$ 450,000
20	MITIGATION AND MONITORING	1	LS	\$ 600,000.00	\$ 600,000
21	NATIVE PLANT RELOCATION	1	LS	\$ 33,000.00	\$ 33,000
22	ASPHALT MATERIAL	258,720	TON	\$ 72.50	\$ 18,757,200
SUB-TOTAL					\$ 69,447,720
Contingency 20.0%					\$ 13,889,544
<b>TOTAL =</b>					<b>\$ 83,337,264</b>

<b>TOTAL ENGINEER'S ESTIMATED PROBABLE CONSTRUCTION COST</b>	<b>\$ 83,337,270</b>
--	----------------------

# Appendix F. Estimate of Probable Construction Costs Using Average Cost Per Mile

Appendix F

Hi-Desert Water District Collection System Phase II/III Design  
Hi-Desert Water District

Phase I Data (For Reference)	A	C	D	
Length of Phase I (miles)	24.74	24.1	28.9	77.74
Design cost				\$ 4,736,730
Construction cost (at bid)	\$ 30,285,998	\$ 28,739,867	\$ 32,159,039	\$ 91,184,904
Design as percent of construction				5.19%
Construction cost per mile				\$ 1,172,947.06
Construction cost per foot				\$ 222
Cost per mile for design				\$ 60,930.41
Cost per foot for design				\$ 11.54
<hr/>				
Phase II/III Data				
Length of Phase II/III (miles)				64
Anticipated construction value				\$75,068,612
General design fee (5.19%)				\$3,896,061
Cost per mile for design				\$ 60,875.95
Cost per foot for design				\$ 11.53

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