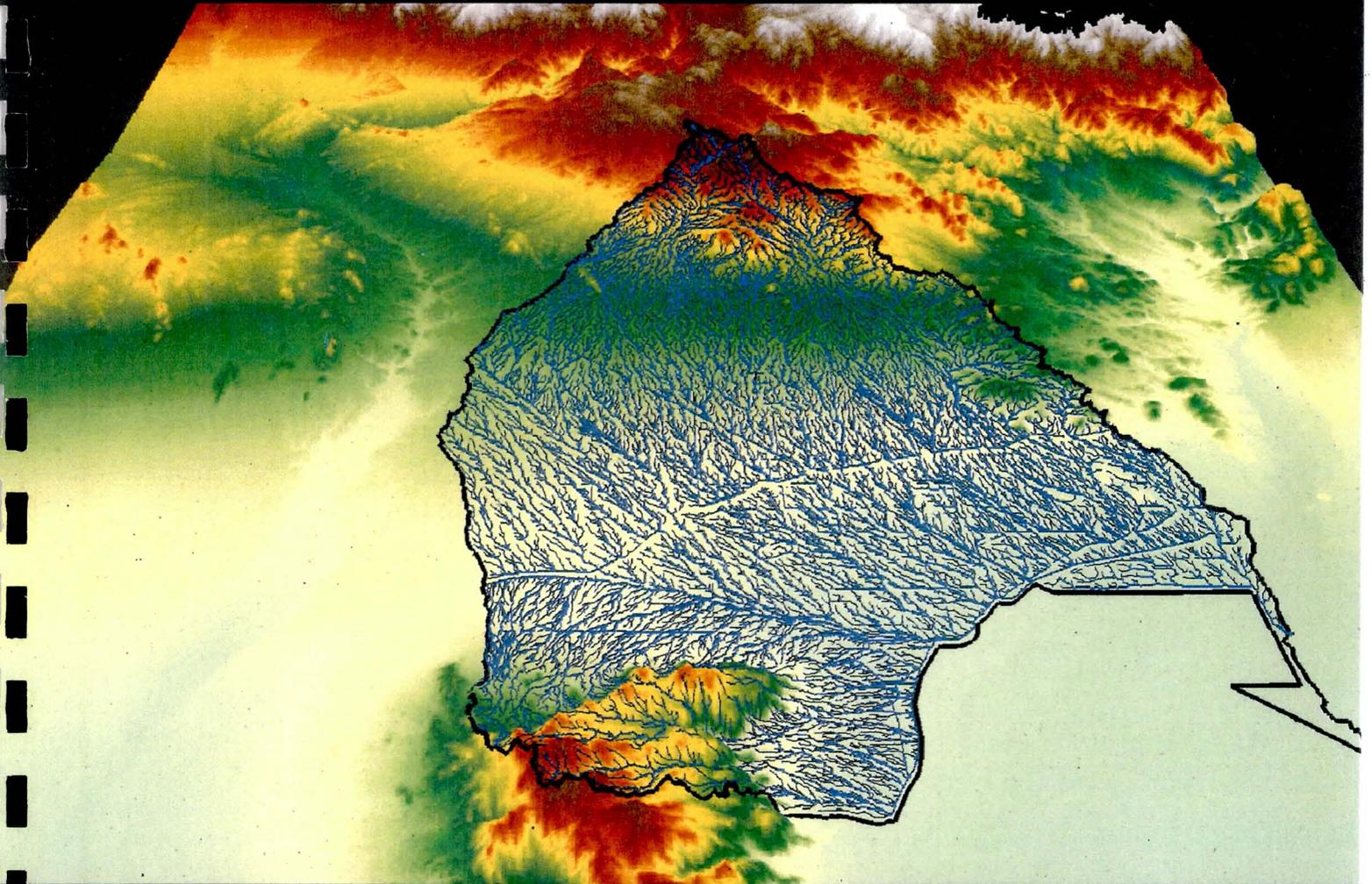


Wittmann Area Drainage Master Plan

Executive Summary - Volume ES



Prepared for the Flood Control District of Maricopa County

Contract FCD 2004C060



A344.204 Estellus™





**WITTMANN AREA DRAINAGE
MASTER PLAN**

**Executive
Summary
VOLUME ES**

Contract FCD 2004C060

July 2009

Prepared by:

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WITTMANN AREA DRAINAGE MASTER PLAN

CONTRACT FCD 2004C060

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WITTMANN AREA DRAINAGE MASTER PLAN

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EXECUTIVE SUMMARY

VOLUME ES

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WITTMANN AREA DRAINAGE MASTER PLAN

EXECUTIVE SUMMARY

VOLUME ES

SECTION ES-1:INTRODUCTION

The purpose of this report is to present and summarize the results of the Alternatives Analysis performed as part of the Wittmann Area Drainage Master Plan (ADMP). Contained herein is a summary of the information collected and generated during the ADMP and the final recommendation resulting from the alternatives analysis.

1.1 BACKGROUND AND PROJECT AREA

In April 2003, the Flood Control District of Maricopa County (District) began an Area Drainage Master Study Update (ADMSU) to update the 1989 Trilby Watershed Study (**Reference 165**). In 2005 the District took the ADMSU to the next level by beginning the Wittmann Area Drainage Master Plan (ADMP) to develop alternatives to resolve drainage problems identified during the ADMSU. This ADMP addresses the existing and future drainage hazards to serve as a guide for future development within the watershed.

The project area is bounded by the Hieroglyphic Mountains on the north and northeast, the White Tank Mountains and McMicken Dam and its outlet channel on the south, the Hassayampa River basin to the west, and the Agua Fria River and Beardsley Canal on the east. The area encompassed by the Wittmann ADMP is approximately 308 square miles of primarily undeveloped land, yet several master planned communities are currently in the construction or planning stages

1.2 PROJECT PURPOSE

The purpose of the Wittmann ADMP was to identify mitigation measures to solve existing and future drainage hazards that will guide future development to avoid adversely affecting the drainage in the study area.

1.2.1 Purpose and Goals

The District's mission is to provide regional flood hazard identification, regulation, remediation, and education to Maricopa County residents so that they can reduce their risks of injury, death, and property damage from flooding, while still enjoying the natural and beneficial values served by floodplains and the natural character of the desert environment. Thus, the Wittmann ADMP Alternatives Analysis has been conducted with these goals in mind.

1.2.2 Project Partners

ADMP project team consisted of members from the Flood Control District of Maricopa County (District), the City of Peoria, the City of Surprise, the Town of Buckeye, Entellus Inc., and its sub-consultants. Additional project partners may include the Maricopa County Department of Transportation (MCDOT), the Arizona Department of Transportation (ADOT), Burlington Northern and Santa Fe Railroad (BNSF), the Central Arizona Project (CAP), Arizona Game and Fish Department (AGFD), various conservation groups and societies, private developers, and citizens of the study area.

1.2.3 Plan Elements

The preferred alternative consists of a variety of drainage elements including:

- Constructed channels with multi-use opportunities.
- Drainage corridors with a recreation multi-use emphasis
- Drainage corridors with a scenic, wildlife multi-use emphasis
- Retention / detention basins with multi-use opportunities.
- Floodway preservation
- Floodplain preservation

1.3 IDENTIFIED FLOOD HAZARDS

Significant flood hazards have been identified in the study area. **Figure AA-2.2.1** summarizes the known drainage complain in the area. The majority of the drainage complaints from the area residents deal with roadway flooding and lack of access to their property during rainfall events. See the *Wittmann ADMP-Existing Conditions Report-Volume EC* for details.

The natural watershed drainage system in general has the capacity to store tremendous quantities of surface water and consists of poorly defined braided washes, sheet flow areas and highly erodible soils. When runoff does occur in the area, the majority is in the form of wide sheet flow through unconsolidated highly erodible soils. Roadways and developments tend to concentrate natural sheet flow, increasing the sediment-carrying capacity.

Under current conditions the roadway system is the main obstruction to the flow and even during minor storms the roadways, and in particular the wet crossings, are flooded by wide shallow flows. Many of the existing culverts observed along the major transportation corridors have become heavily sedimented and have lost a significant amount of their original carrying capacity.

The drainage system in the area also relies heavily on incidental storage and slow moving flows that reach wide shallow channels. Increasing pressure by development is changing this existing state. Master planned development channelizes the wide, shallow

flows into relatively small efficient channels. Additionally, the new generation of homeowners typically do not want to see water ponding in their yards or driveways (as occurs naturally in the watershed) and they do what they can ensure that this does not happen. Several areas were observed where residents had constructed channels, berms, walls or placed fill material to try to keep the flow off of their property. This, in many cases adversely impacts neighbors and most likely increases flows downstream. As development increases in the area more and more situations such as these are likely to occur, and current regulations do not adequately address the potential impacts of development in this type of terrain.

Hydrologic estimates revealed that the CAP Canal Embankment would be overtopped during a 100-year storm. The upstream CAP Canal embankment, which is over 20 feet high in some locations, can store a significant volume of water at various locations. Overtopping of the canal embankment would likely result in an embankment failure and potentially generate a large flood wave that could propagate downstream.

There are several alluvial fans within the watershed. The behavior of this land form is difficult to predict because its flow patterns can change drastically in a short period of time or even within a singular flow event. Drainage in these areas tends to be distributary and sediment transport plays an important role on the changing configuration of the drainage features.

In comparing the 100-year models (existing vs. future), in the portions of the watershed near areas identified as not having future retention, the future flows were higher than the existing flows. Some of these locations include developable areas north of the SR74 where the steep terrain limits the effectiveness of retention, along Padelford wash where significant single lot development has already occurred, as well as north of the CAP Canal and west of US60 where significant single lot development has occurred. In contrast, some of the large washes in the watershed have the highest modeled decreases in peak flow for future conditions. This is due to the cumulative affect of the 100-year, 2-hour retention occurring for all areas of future development, which is significant in this watershed. In particular Trilby, Iona and Wittmann Washes show a significant decrease in modeled peak discharge.

The study team is skeptical of the flows actually decreasing under future conditions. This is particularly true where existing sheet flow would be eliminated in the future for some sort of channelization as is typical of development. It was concluded that current methodology does not adequately model the sheet flow condition, which is typically slow moving flow and that increases infiltration and surface storage opportunities by trapping flow in small surface depressions. Therefore, the existing conditions models are probably overestimating the existing conditions flows by underestimating the infiltration and storage potential of the watershed. So even though the future conditions models depict a decrease in flow, it is probable that the future conditions flows will increase over the actual existing conditions flows.

1.4 RECOMMENDED ALTERNATIVES

The following section describes the process followed in the selection of the elements associated with the proposed plan. The final elements of the plan were selected with consideration to hydrologic, environmental, aesthetic, sustainability, property ownership, and other elements identified during the data collection and analysis process.

1.4.1 Alternatives Opportunities

During the course of the study several opportunities/constraints were identified throughout the watershed. The three most obvious features affecting the drainage in this watershed included the McMicken Dam, the CAP, and Grand Avenue. McMicken Dam is and its outlet channel is the outfall for the entire watershed (See **Figure EC-1**).

The CAP canal bisects the watershed about halfway. The canal system consists of an upstream embankment (12-25 feet high) the canal itself, a downstream embankment, and several cross drainage structures mostly overchutes. The Bureau of Reclamation owns a considerable amount of land upstream of the canal (ponding area use for environmental mitigation for the canal).

Grand Ave and the parallel BNSF Railroad are other main features in this watershed. They traverse the study area diagonally and many of the watercourse in the west side of the watershed cross the highway and the railroad or are diverted along the edge of their corridors. The BNSFRR is planning to add additional track (double tracking) and construct a large switching yard within the watershed.

Landscape architecture was integrated through all phases of the development of the Wittmann Area Drainage Master Plan that helped to ensure a comprehensive flood hazard mitigation solution that was sensitive to the goals and vision of the local community, municipal stakeholders, and incorporated multi-use opportunities that would provide multiple additional benefits to the citizens of Maricopa County (See **Figure 3.9**). Through the use of stakeholder and public meetings, landscape architectural goals were identified for the project. This included a high sensitivity in the community for preserving and protecting the natural character and functions provided by the large washes in the Wittmann area, the planning for future inclusion of passive and active recreation uses within the proposed channels and basins that were identified in local agency master plans, and working with state and local agencies to integrate project related open-spaces with regional biological resource goals.

There are several trail systems planned within the study area. *The Maricopa County Regional Trail System Plan* includes trails interconnecting regional and local recreational facilities. The cities of Surprise and Peoria both have additional trails, parks and open space plans within their corporate limits and planning areas (See **figure Parks & Trails Information Map**).

There are many master planned developments within the study area (see **Figure EC-2**). Gaining the support of the development community will facilitate the implementation of the plan. Therefore it was important that they were involved in the development of the plan.

The Arizona Game and Fish Department has preliminarily identified several wildlife corridors through out the state. Several of these planned corridors are within the Wittmann Study Area. There are two east-west corridors one along the CAP canal and the second along McMicken Dam and its outlet channel. Also there are several north-south corridors that roughly follow the alignment of the main washes though the study area (See **Figure Wildlife Linkage**).

1.4.2 Alternatives Selection Process

The first steps were to collect available information and develop a hydrologic model to identify drainage deficiencies for current and future conditions. During this process it became apparent that because of the nature of the watershed, sheet flow was the predominant flow conveyance throughout most of the watershed. All populated areas in the watershed appeared to have some drainage issues' judging by the distribution of drainage complains. The collected drainage complaints were mostly related to access issues resulting from a transportation system that did not consider the unique watershed characteristics. Based on this information the study team divided the study area into seven somewhat independent sub-watersheds, and with the help of the stakeholders, developed several alternatives to solve drainage problems for each of the watersheds.

This resulted in a very large number of overall alternative configurations that would result from the combination of these individual elements. To simplify the process the study team developed alternative themes that combined compatible elements from each of the sub-watersheds consistent with the given alternative theme.

The final step was for the study team and the stakeholders to select an alternative. The alternative was selected by choosing elements from each of the themes that would provide a balanced and adequate drainage system. This included channels and basins with varying configurations to serve distinct multi-use purposes. The preferred alternative was presented to the public, underwent a thorough Value Engineering workshop and stakeholder review before being finalized.

1.4.3 Recommended Alternatives Description

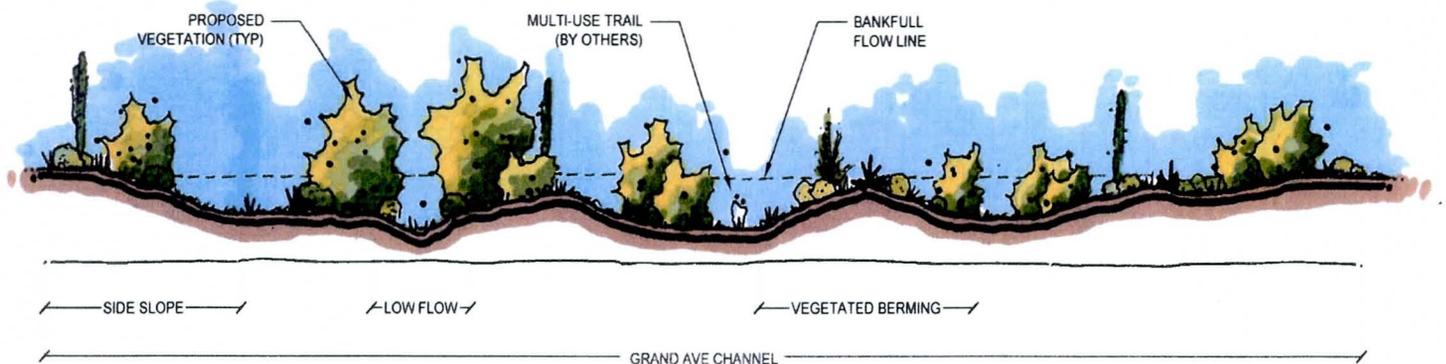
The recommended alternative consists of several elements. The first element is a watershed site specific Rules of Development to deal with the specific, unique drainage conditions in the watershed. The second element consists of the improvement of various drainage conveyance corridors that would provide the drainage system backbone for the entire watershed. The third element is the strategic placement of storage basins within

the watershed to slow and reduce peak flows downstream. A fourth element utilized in the final plan is the placement of sedimentation basins near the apices of alluvial fans to control and stabilize the fans. The final element is the preservation of existing floodplain

The recommended alternative conceptual plans are included at the end of this Executive Summary and are summarized in the following sections. Three basic configurations for the drainage corridor improvements were selected depending on location within the watershed and included constructed channels, natural channels, and recreational channels. Additionally the plan calls for the preservation of existing floodways and/or floodplains throughout the watershed. Retention/detention basins and sedimentation basins were also configured as either natural, semi-natural, or developed basins based on the areas context sensitivity.

1.4.3.1 Constructed Drainage Channels

Constructed channels are natural looking channels constructed primarily at location where no natural wash exist. With the exception of two small sections the preferred alternative recommends earthen channels with average side slopes of 4:1. The largest constructed channel is the US60 channel. All constructed channels include an 18 foot maintenance road on both sides and an appropriate set back on each side when possible.

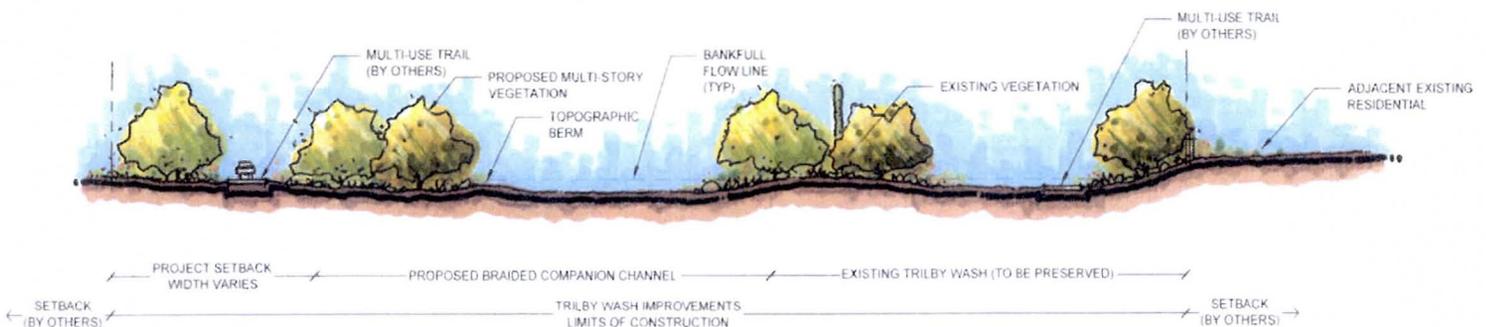


1.4.3.2 Drainage Corridors with a Recreation Multi-Use Emphasis

These are typically existing washes for which the proposed alternative modifies its cross section as needed to convey the expected flow in such away as to emphasize recreation multi-use opportunities. In these corridors the pristine riparian vegetation was left intact and improvements, when needed, were added outside these areas in the form of companion channels or bank stabilization. This proposed configuration closely mimics the natural drainage corridors typical of the area, which are braided natural channel systems with several low flow channels within a larger conveyance channel. The corridor configurations were designed with the expectation that the natural portion and the constructed portion will be reshaped and changed by runoff events and natural processes to reach some type of equilibrium resulting in a corridor with minimal maintenance requirements.

Typically these corridors resulted in a net reduction of the 100-year floodplain area along the corridor. Drainage corridors with recreation multi-use emphasis are proposed for:

- Picacho Wash North of the CAP Canal
- Picacho Wash South of the CAP Canal
- Trilby Wash North (North of US60)
- Trilby Wash Central (North of the CAP Canal)

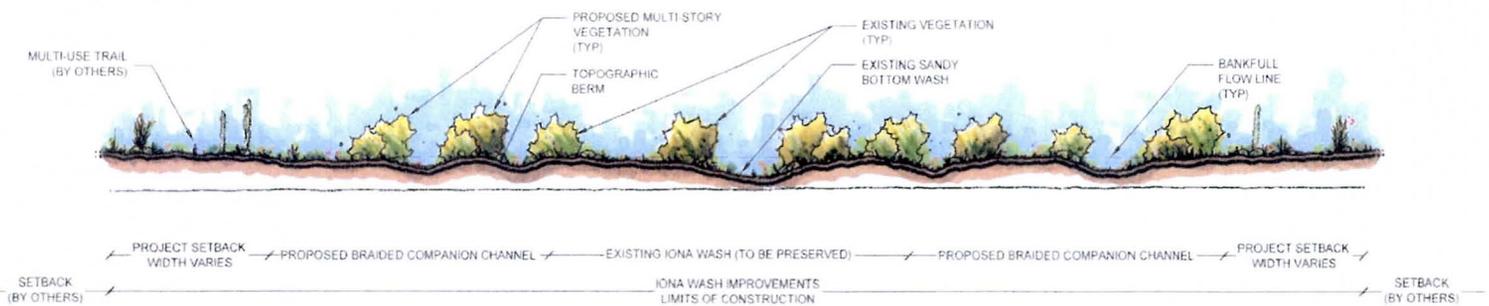


1.4.3.3 Drainage Corridors with a Scenic, Wildlife Multi-Use Emphasis

These are typically existing washes for which the proposed alternative modifies its cross section as needed to convey the expected flow in such away as to emphasize scenic, wildlife multi-use opportunities. In these corridors the pristine riparian vegetation was left intact and improvements, when needed, were added outside these areas in the form of companion channels or bank stabilization. This proposed configuration closely mimics the natural drainage corridors typical of the area, which are braided natural channel systems with several low flow channels within a larger conveyance channel. The corridor configurations were designed with the expectation that the natural portion and the constructed portion will be reshaped and changed by runoff events and natural processes to reach some type of equilibrium resulting in a corridor with minimum or no maintenance requirements.

Typically these corridors resulted in a net increase in the conveyance area utilized by the corridor (100-year floodplain versus proposed corridor area). Drainage corridors with scenic- wildlife multi-use emphasis are proposed for:

- Iona Wash North of the CAP Canal
- Trilby Wash South of the CAP Canal
- Padelford Wash North of the CAP Canal
- Padelford Wash South of the CAP Canal
- White Tanks Wash 1
- White Tanks Wash 2
- White Tanks Wash 3



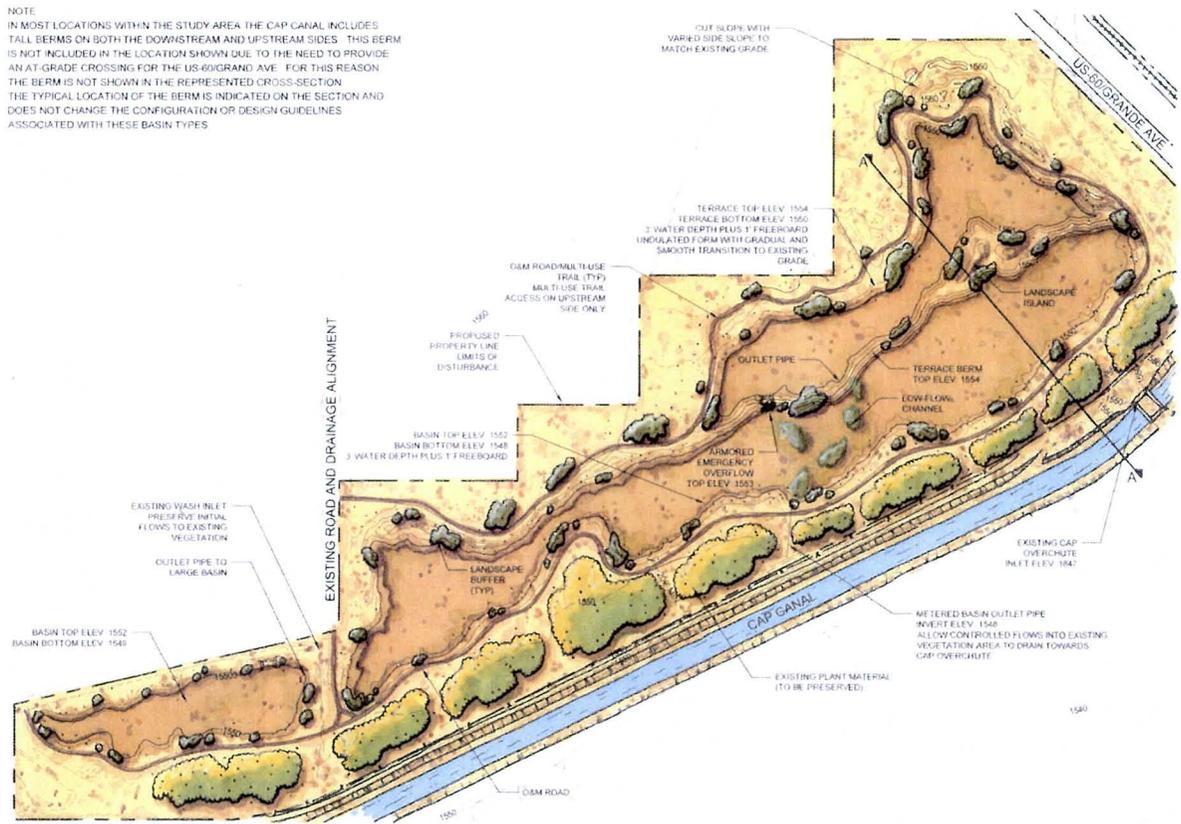
1.4.3.4 Retention / Detention Basins

Retention/Detention basins were placed throughout the study area in locations where it was both feasible and beneficial for peak flow reduction. Most of the basins were configured as off-line basins to maximize their efficiency in reducing the peak flows of large storms. Also the recommended alternative includes basins at the apices of several alluvial fans to control the sediment loads and stabilize the channels below through the fan.

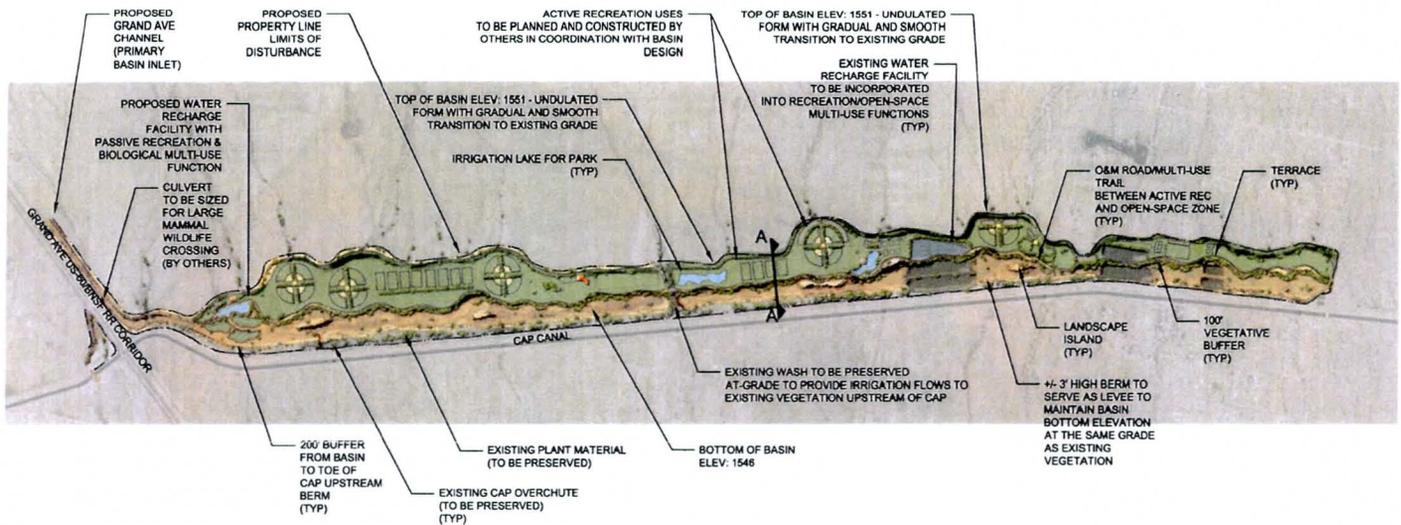
Similarly to the proposed channels, basins were also configured based on three basic themes: natural, semi-natural, or developed.

Natural basins were placed usually near or in areas associated with wildlife multi-use corridors. This theme, in addition to the main drainage function, usually includes biological and passive recreation multi-use functions.

NOTE
 IN MOST LOCATIONS WITHIN THE STUDY AREA THE CAP CANAL INCLUDES TALL BERMS ON BOTH THE DOWNSTREAM AND UPSTREAM SIDES. THIS BERM IS NOT INCLUDED IN THE LOCATION SHOWN DUE TO THE NEED TO PROVIDE AN AT-GRADE CROSSING FOR THE US-60 GRAND AVE. FOR THIS REASON THE BERM IS NOT SHOWN IN THE REPRESENTED CROSS-SECTION. THE TYPICAL LOCATION OF THE BERM IS INDICATED ON THE SECTION AND DOES NOT CHANGE THE CONFIGURATION OR DESIGN GUIDELINES ASSOCIATED WITH THESE BASIN TYPES



Semi-Natural themed basins are similar to Natural Themed Basins and are typically associated with either a biological or passive recreation multi-use function. These basins have either a greater emphasis on passive recreation than on biological function or are located in areas where the biological functions require greater planning considerations to ensure adequate buffering from adjacent development. O&M roads (14 feet wide with a 2-foot shoulder to each side) are planned to serve as a dual-use segment of multi-use trails and represent the only facilities typically planned within these basin types. Additional open space interpretative features, wildlife buffers, fencing, and trailheads may be incorporated as agreed to by the District and the cost-share partner with whom these multi-use functions are being developed.

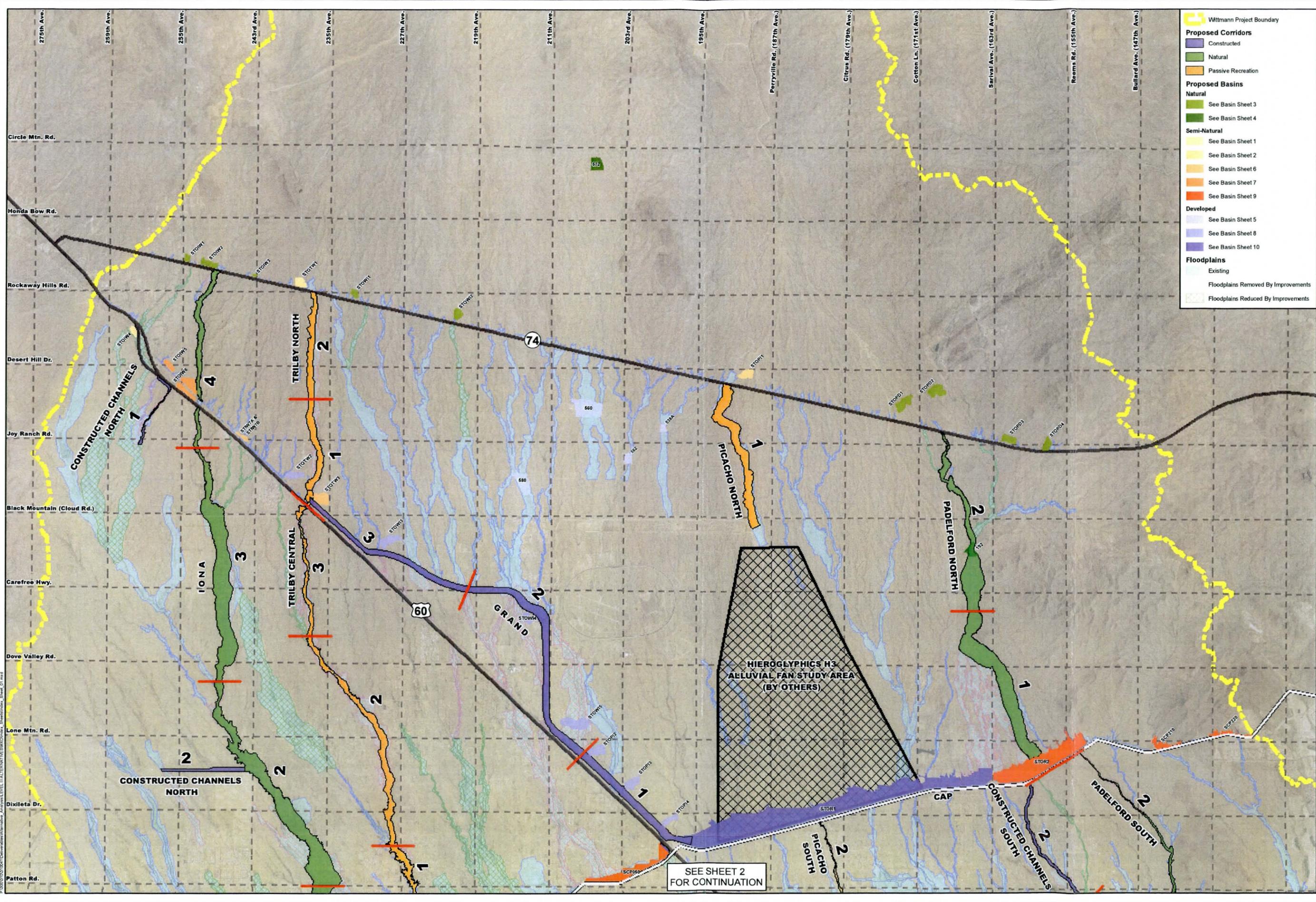


1.4.3.5 Floodplain/Floodway Preservation

The channels and basins described in the above sections form the drainage backbone for the study area. However, they are only a small portion of the entire drainage system, and in order for the entire system to function properly the local drainage elements need to be able to convey the flows to the backbone infrastructure. As part of the proposed alternatives, the study team recommends implementation of regulations to preserve the local existing floodplains in their natural state and to protect the drainage system and other beneficial functions associated with floodplains. In some cases this may not be practical to preserve the entire floodplain. In these cases the plan recommends preserving the floodway in its natural state and discourages channelization.

1.5 RECOMMENDED ALTERNATIVE CONCEPTUAL PLANS

The following pages contain the index sheets for the conceptual plans. For the full set of plans see the ADMP Alternatives Analysis Report.



Wittmann Project Boundary

Proposed Corridors

- Constructed
- Natural
- Passive Recreation

Proposed Basins

Natural

- See Basin Sheet 3
- See Basin Sheet 4

Semi-Natural

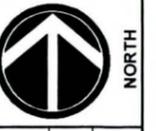
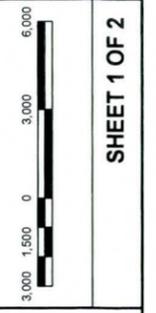
- See Basin Sheet 1
- See Basin Sheet 2
- See Basin Sheet 6
- See Basin Sheet 7
- See Basin Sheet 9

Developed

- See Basin Sheet 5
- See Basin Sheet 8
- See Basin Sheet 10

Floodplains

- Existing
- Floodplains Removed By Improvements
- Floodplains Reduced By Improvements



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 FLOOD CONTROL DISTRICT
 OF MARICOPA COUNTY

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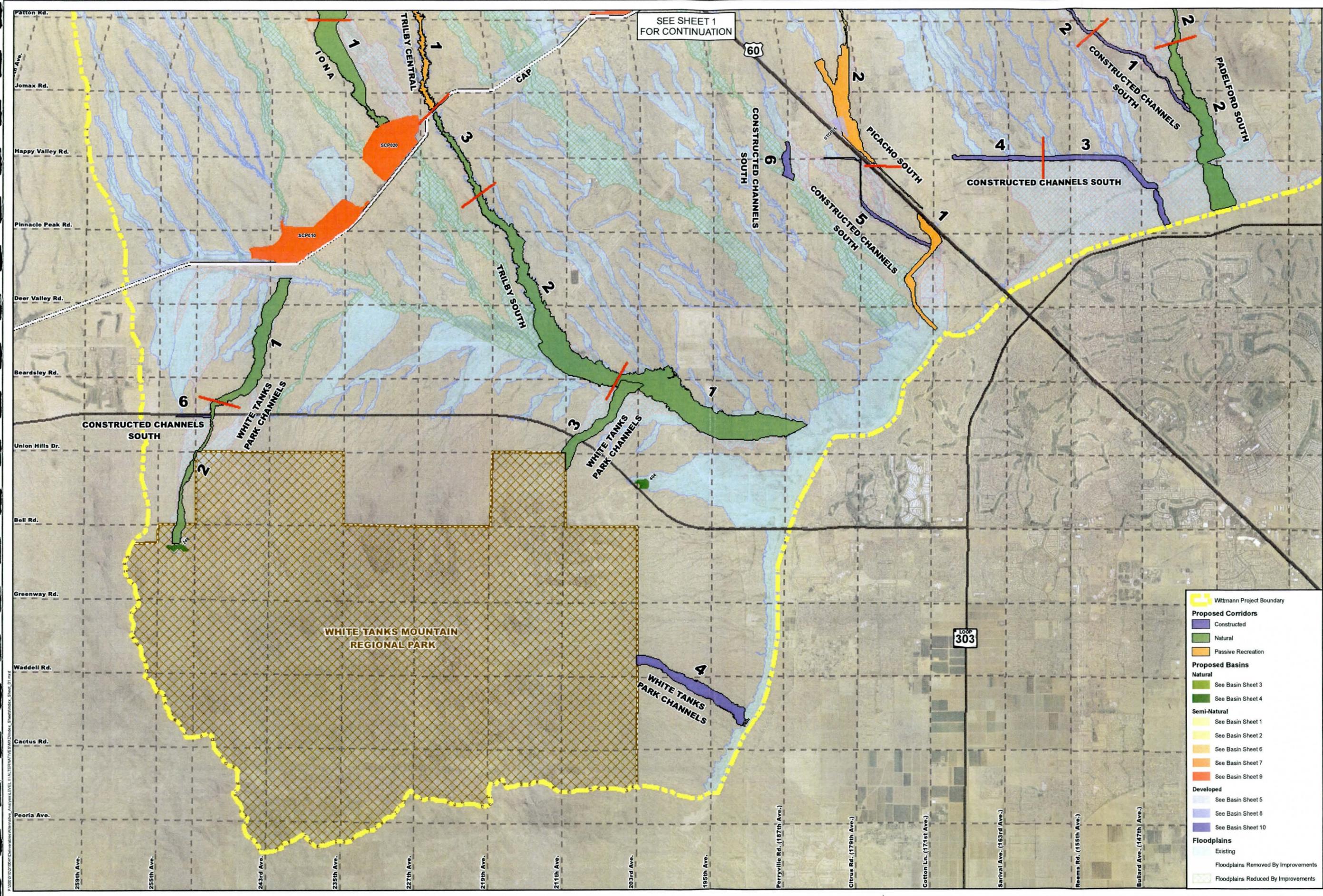


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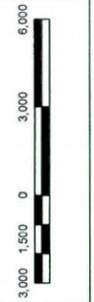
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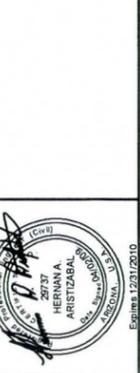


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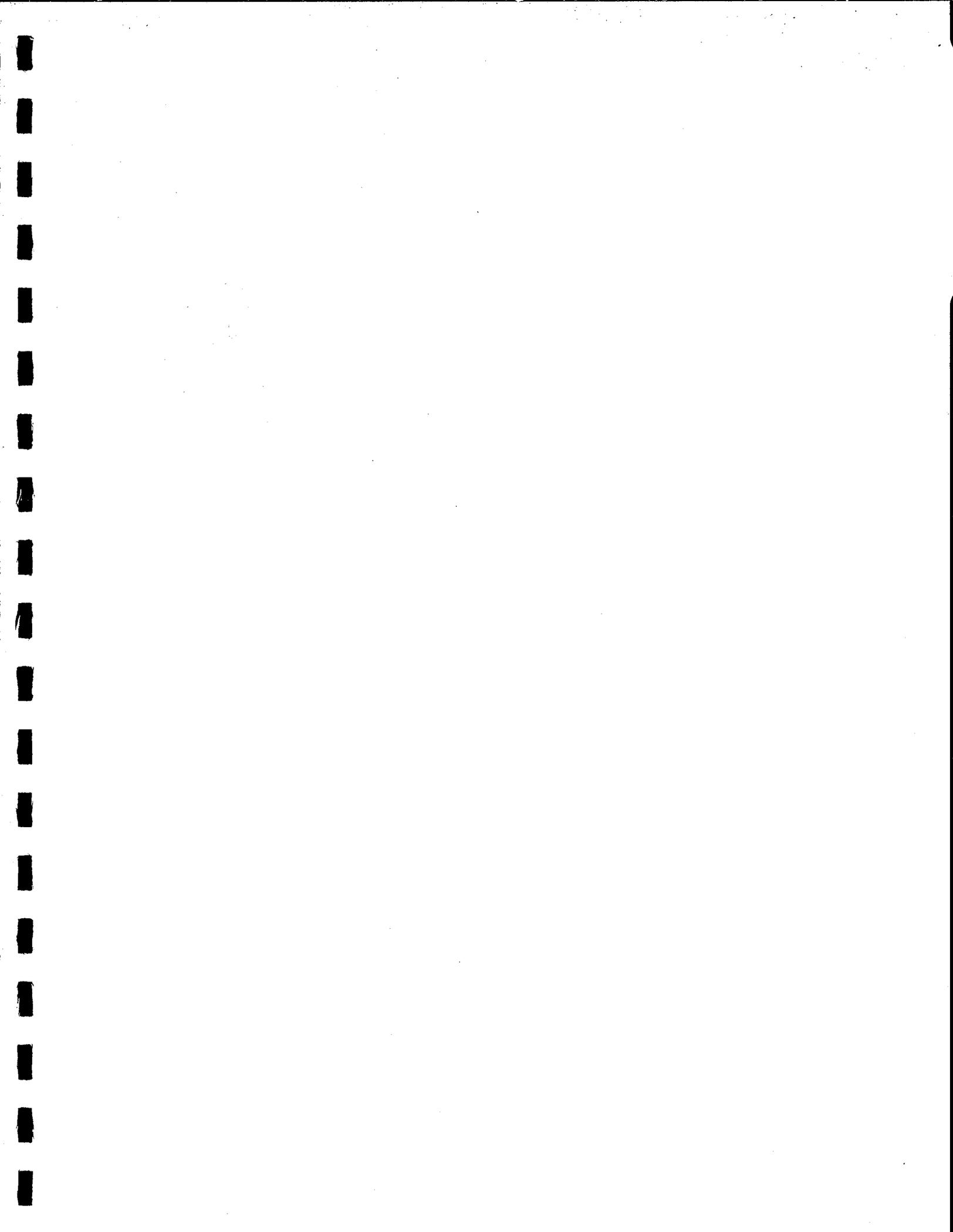
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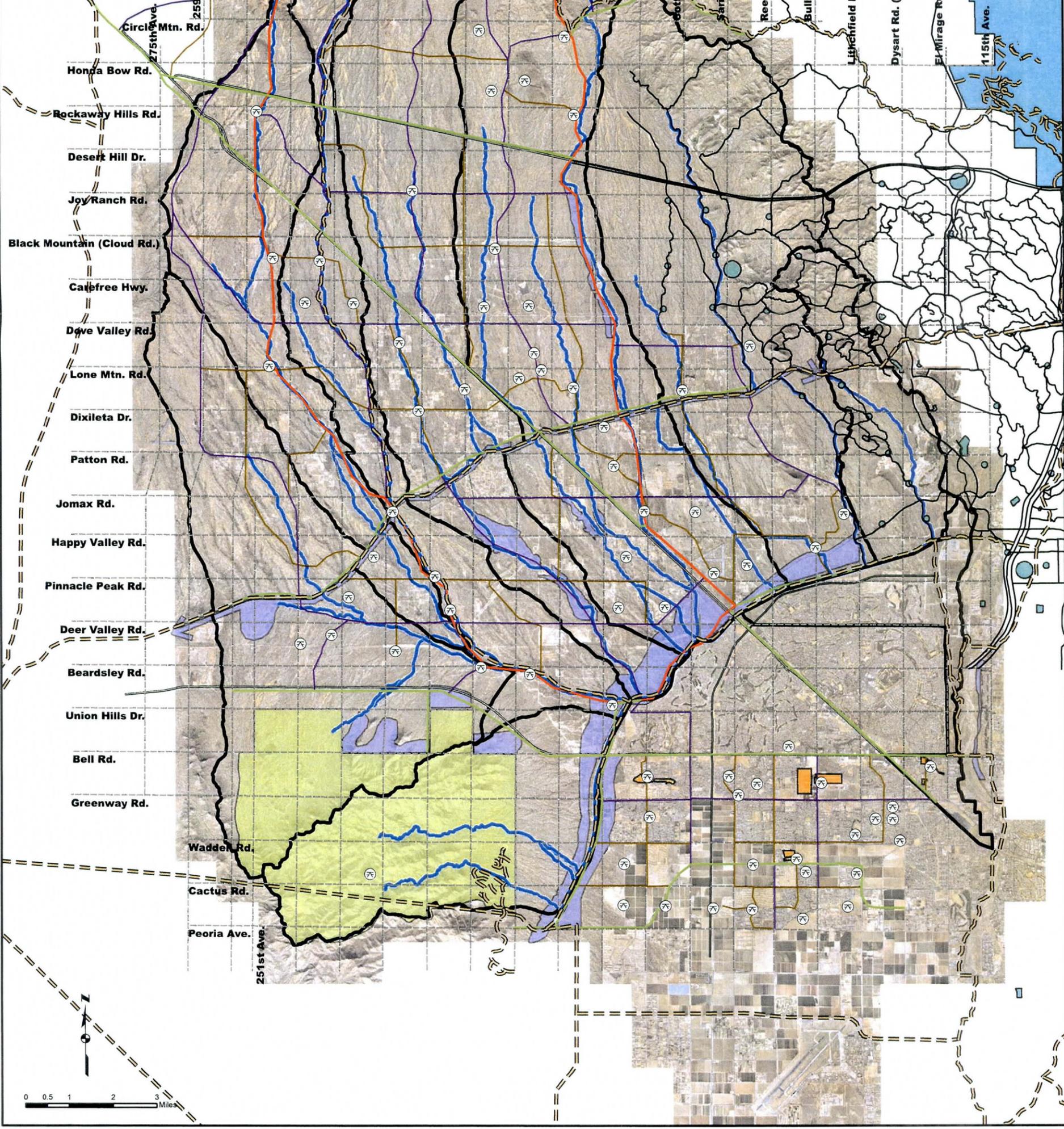
- Wittmann Project Boundary
- Proposed Corridors**
 - Constructed
 - Natural
 - Passive Recreation
- Proposed Basins**
 - Natural**
 - See Basin Sheet 3
 - See Basin Sheet 4
 - Semi-Natural**
 - See Basin Sheet 1
 - See Basin Sheet 2
 - See Basin Sheet 6
 - See Basin Sheet 7
 - See Basin Sheet 9
 - Developed**
 - See Basin Sheet 5
 - See Basin Sheet 8
 - See Basin Sheet 10
- Floodplains**
 - Existing
 - Floodplains Removed By Improvements
 - Floodplains Reduced By Improvements

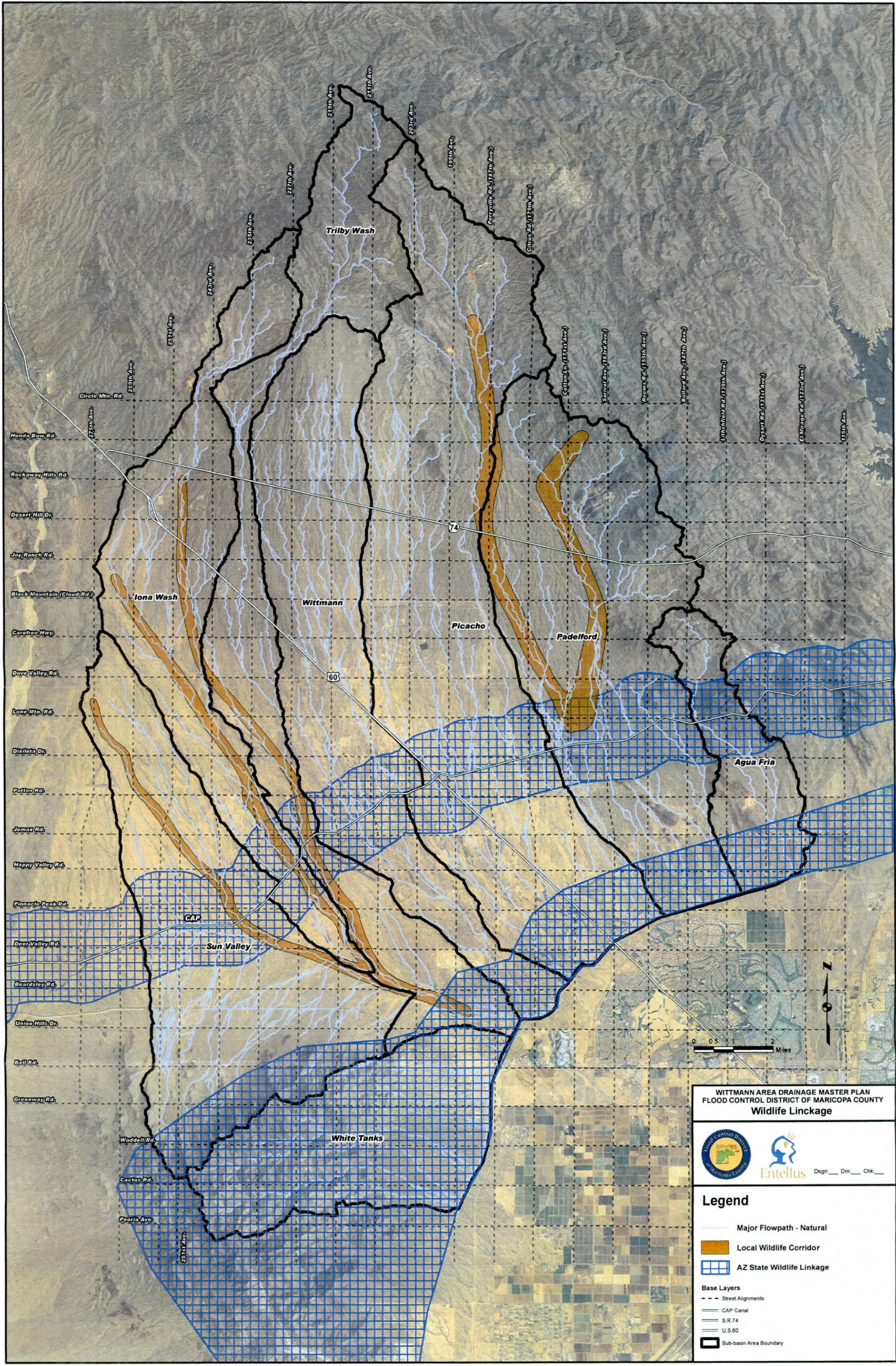


- Legend**
- Street Alignments
 - ▭ Watershed Boundary
 - Major Flow Path
 - Peoria Trails
 - Maricopa County Regional Trails
 - Surprise Trails**
 - Community trails
 - local trails
 - regional trail
 - signature trail
 - ⊗ Surprise Future Parks
 - ▭ Surprise Local Parks
 - ▭ Surprise Open Space
 - ▭ White Tank Mountain Regional Park
 - ▭ Peoria Regional, Existing Parks
 - ▭ Peoria Local Parks
 - ▭ Peoria Proposed Parks



WITTMANN AREA DRAINAGE MASTER PLAN
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
Parks & Trails Information Map





**WITTMANN AREA DRAINAGE MASTER PLAN
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
Wildlife Linkage**



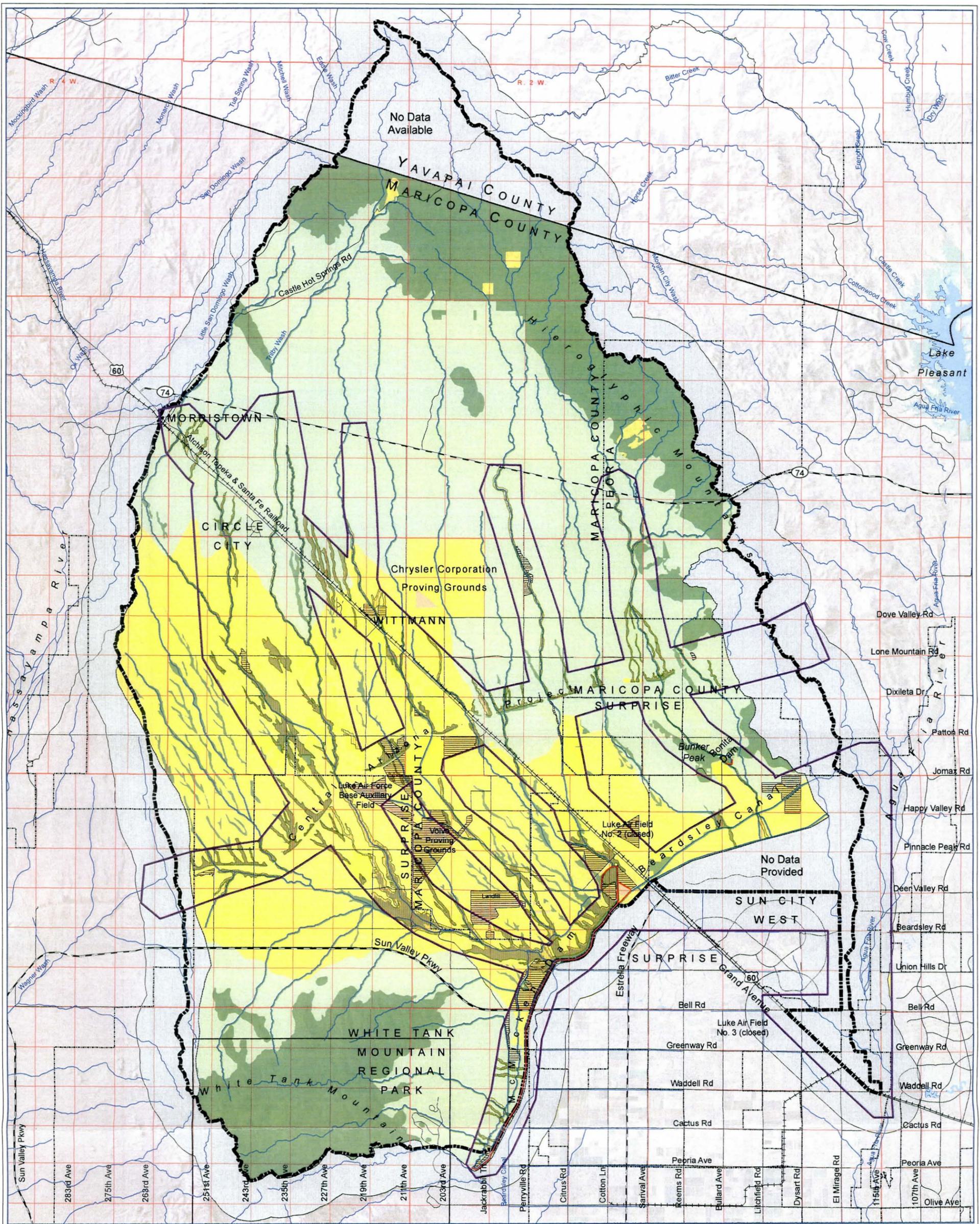
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Legend

- Major Flowpath - Natural
- Local Wildlife Corridor
- AZ State Wildlife Linkage

Base Layers

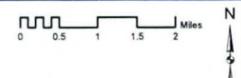
- Street Alignments
- CAP Canal
- S.R. 74
- U.S. 60
- Sub-basin Area Boundary



LEGEND

- EXISTING SCENIC RESOURCE COMPATIBILITY RATINGS**
- Compatibility Class 1
 - Compatibility Class 2
 - Compatibility Class 3
 - Compatibility Class 4
 - Compatibility Class 6
 - Unmapped
- SCENIC INTEGRITY**
- High
 - Low

Compatibility Class	Non-Structural	Structural	Sup	Sem-Sup	Hard or Aesthetic Treatment	Sem-Hard	Hard
Compatibility Class 1	Yes	No	No	No	No	No	No
Compatibility Class 2	Yes	No	Yes	Yes	Yes	Yes	Yes
Compatibility Class 3	Yes	No	Yes	Yes	Yes	Yes	Yes
Compatibility Class 4	Yes	No	Yes	Yes	Yes	Yes	Yes
Compatibility Class 5	Yes	No	Yes	Yes	Yes	Yes	Yes
Compatibility Class 6	Yes	No	Yes	Yes	Yes	Yes	Yes



- REFERENCE FEATURES**
- Site Study Boundary
 - Focus Area
 - Township & Range
 - Public Land Survey Sections
 - Dams
 - Lakes
 - Streams
 - Highway
 - Major Arterial Road
 - Railroads
 - County Boundary
 - Municipal Boundary
 - Previous Site Study Boundary

SOURCES:

This map was prepared as part of the overall assessment of the visual landscape character for the Wittmann ADMP for the Flood Control District of Maricopa County, under contract 2004C034 with EPG, Inc., Phoenix, Arizona. This map was prepared using Geographic Information Systems (GIS) software, GIS data supplied by the Flood Control District of Maricopa County, and field investigations conducted by EPG, Inc. For more information about this map, please contact the Flood Control District of Maricopa County, Landscape Architecture Branch at (602)506-1501, or write to us at 2801 W. Durango Street, Phoenix, AZ, 85009

EDAW | PREPARED BY: EDAW, INC. Date: Jan. 10, 2007

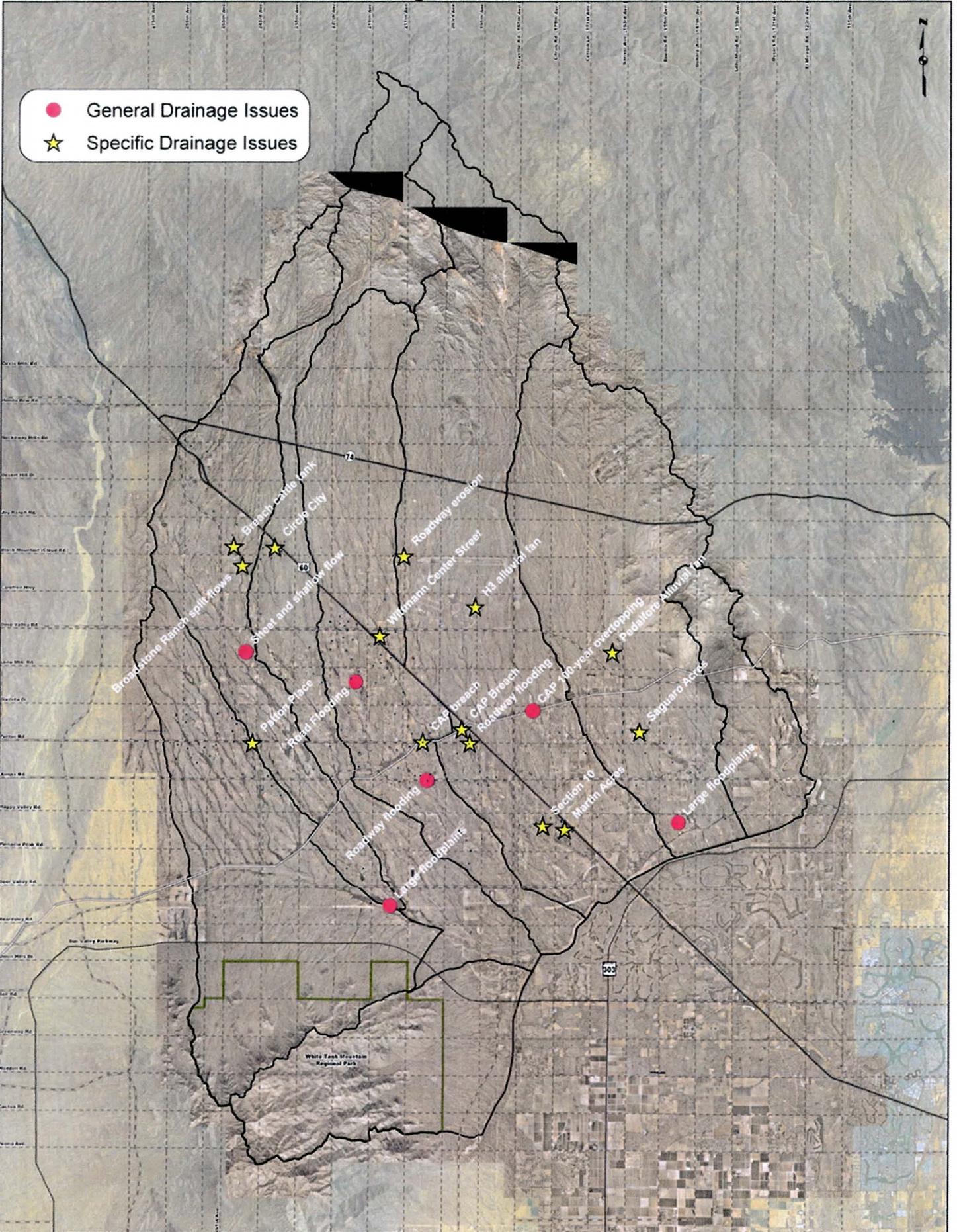
WITTMANN AREA DRAINAGE MASTER PLAN
Flood Control District of Maricopa County

Figure 3-9
Existing Scenic Resource Assessment Compatibility with Scenic Integrity



EXISTING DRAINAGE PROBLEMS

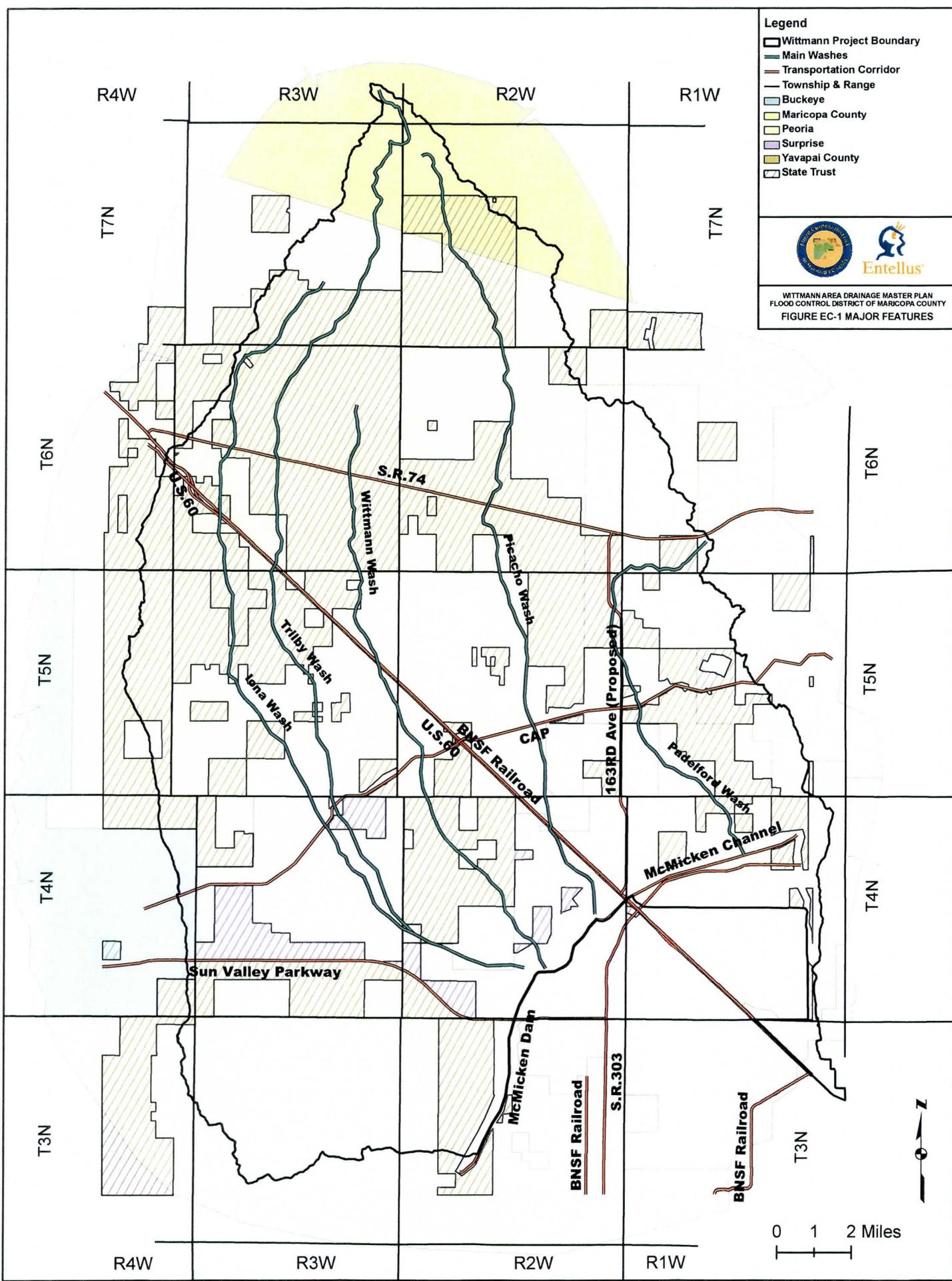
Figure AA-2.2.1



- Legend**
- Wittmann Project Boundary
 - Main Washes
 - Transportation Corridor
 - Township & Range
 - Buckeye
 - Maricopa County
 - Peoria
 - Surprise
 - Yavapai County
 - State Trust



WITTMANN AREA DRAINAGE MASTER PLAN
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
FIGURE EC-1 MAJOR FEATURES



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