

EXHIBIT

“A”

2017

Pima County
Multi-Jurisdictional Hazard
Mitigation Plan

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TABLE OF CONTENTS

SECTION 1: INTRODUCTION 1

1.1 Purpose..... 1

1.2 Background and Scope 1

1.3 Tribal Assurance 2

1.4 Plan Organization 2

SECTION 2: COMMUNITY DESCRIPTIONS..... 5

2.1 County Overview..... 5

2.2 Jurisdictional Overviews 13

 2.2.1 Town of Marana..... 13

 2.2.2 Town of Oro Valley 16

 2.2.3 Pascua Yaqui Tribe 18

 2.2.4 Town of Sahuarita..... 21

 2.2.5 City of South Tucson 25

 2.2.6 City of Tucson..... 27

SECTION 3: PLANNING PROCESS 30

3.1 Planning Process..... 30

3.2 Planning Activities and Teams..... 30

3.3 Public and Stakeholder Involvement..... 35

3.4 Reference Documents and Resources 37

SECTION 4: RISK ASSESSMENT 40

4.1 Section Changes..... 40

4.2 Hazard Identification..... 40

4.3 Vulnerability Analysis Methodology 43

4.4 Hazard Risk Profiles 45

 4.4.1 Drought..... 46

 4.4.2 Earthquake 56

 4.4.3 Extreme Cold 64

 4.4.4 Extreme Heat 68

 4.4.5 Flood 74

 4.4.6 Landslide..... 92

 4.4.7 Severe Wind..... 96

 4.4.8 Wildfire..... 100

SECTION 5: MITIGATION STRATEGY..... 106

5.2 Hazard Mitigation Goal and Objectives.....106

5.3 Capability Assessment106

5.4 Mitigation Actions/Projects.....122

SECTION 6: PLAN MAINTENANCE PROCEDURES 142

6.1 Monitoring, Evaluating and Updating142

6.3 Incorporation into Other Planning Mechanisms.....143

APPENDIX A: ACRONYMS 148

APPENDIX B: RESOLUTIONS OF ADOPTION 150

PIMA COUNTY..... 151

TOWN OF MARANA 152

TOWN OF ORO VALLEY.....	153
PASCUA YAQUI TRIBE	154
TOWN OF SAHUARITA	155
CITY OF TUCSON.....	156
APPENDIX C: PLANNING PROCESS DOCUMENTATION.....	158
APPENDIX D: ASSESSMENT OF PREVIOUS ACTION ITEMS.....	198
APPENDIX E: PUBLIC INVOLVEMENT.....	221
PIMA COUNTY	221
TOWN OF MARANA	224
TOWN OF ORO VALLEY.....	226
PASCUA YAQUI TRIBE	227
TOWN OF SAHUARITA	229
CITY OF TUCSON.....	230

LIST OF FIGURES

FIGURE 2-1: VICINITY 6

FIGURE 2-2: ECOREGIONS 8

FIGURE 2-3: COMMUNITY LOCATION AND LAND OWNERSHIP 9

FIGURE 2-4: GENERAL LOCATION AND TRANSPORTATION 11

FIGURE 2-5: TOWN OF MARANA LAND USE 15

FIGURE 2-6: TOWN OF ORO VALLEY LAND USE 17

FIGURE 2-7: PASCUA LOCATION 20

FIGURE 2-8: TOWN OF SAHUARITA GENERAL PLAN LAND USE 24

FIGURE 2-9: CITY OF SOUTH TUCSON LAND OWNERSHIP AND LOCATION 26

FIGURE 2-10: CITY OF TUCSON GENERALIZED DISTRIBUTION OF LAND USE & FUTURE GROWTH.. 29

FIGURE 4-1: TUCSON AVERAGE PRECIPITATION VARIANCES BASED ON 1990-2015 TREND 47

FIGURE 4-2: U.S. DROUGHT MONITOR FOR MAY 2017 48

FIGURE 4-3: U.S. SEASONAL DROUGHT OUTLOOK, APRIL TO JULY 2017 48

FIGURE 4-4: ARIZONA SHORT TERM DROUGHT STATUS FOR MAY 2017..... 51

FIGURE 4-5: ARIZONA LONG TERM DROUGHT STATUS FOR APRIL 2017 52

FIGURE 4-6 SOUTHEASTERN ARIZONA EARTHQUAKE FAULT SYSTEMS..... 58

FIGURE 4-7: USGS SIMPLIFIED 2014 EARTHQUAKE HAZARD MAP 59

FIGURE 4-8: PGA FOR A 2% CHANCE IN 50 YEARS' RECURRENCE 60

FIGURE 4-9: NATIONAL WEATHER SERVICE HEAT INDEX CHART 70

FIGURE 4-10: PIMA COUNTY FLOOD HAZARDS 79

FIGURE 4-11: EASTERN PIMA COUNTY FLOOD HAZARDS DETAIL..... 80

FIGURE 4-12: LOCAL FLOOD HAZARD AREAS PIMA COUNTY 81

FIGURE 4-13: LOCAL FLOOD HAZARD AREAS EASTERN PIMA COUNTY DETAIL 82

FIGURE 4-14: WILDFIRE HAZARD POTENTIAL PIMA COUNTY 104

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LIST OF TABLES

TABLE 2-1: CLIMATE STATISTICS FOR STATIONS IN PIMA COUNTY 10

TABLE 2-2: POPULATION ESTIMATES 12

TABLE 2-3: PASCUA YAQUI TRIBAL ENROLLMENT DEMOGRAPHICS 18

TABLE 2-4 POPULATION AND HOUSING 21

TABLE 2-5: TOWN OF SAHUARITA POPULATION GROWTH..... 22

TABLE 2-6: TOWN OF SAHUARITA MEDIUM INCOME 23

TABLE 2-7: TOWN OF SAHUARITA EDUCATION 23

TABLE 3-1: PLANNING TEAM PARTICIPANTS 31

TABLE 3-2: LOCAL PLANNING TEAM AND CONTENT RESOURCES 32

TABLE 3-3: PAST PUBLIC AND STAKEHOLDER INVOLVEMENT 35

TABLE 3-4: RESOURCE DOCUMENTS REVIEWED AND INCORPORATED IN THIS PLAN..... 38

TABLE 4-1: COMPARISON OF PLAN HAZARDS..... 40

TABLE 4-2: PIMA COUNTY DECLARED DISASTER COSTS (1991 – 2016)..... 42

TABLE 4-3: CALCULATED PRIORITY RISK INDEX CATEGORIES AND RISK LEVELS 43

TABLE 4-4: HAZARDS TO BE MITIGATED BY EACH JURISDICTION 2017 44

TABLE 4-5: CPRI RESULTS FOR DROUGHT FOR 2017 49

TABLE 4-6: CPRI RESULTS FOR EARTHQUAKE FOR 2017 61

TABLE 4-7: CPRI RESULTS FOR EXTREME COLD 2017..... 65

TABLE 4-8: CPRI RESULTS FOR EXTREME HEAT FOR 2017 70

TABLE 4-9: CPRI RESULTS FOR FLOOD 2017 77

TABLE 4-10: PIMA COUNTY EXPOSURE AND LOSS ESTIMATES DUE TO FLOODING 87

**TABLE 4-11: PIMA COUNTY EXPOSURE AND LOSS ESTIMATES DUE TO FLOODING IN LOCAL FLOOD
HAZARD AREAS 89**

TABLE 4-12: NFIP STATISTICS AS OF JULY 31, 2016 91

TABLE 4-13: REPETITIVE LOSS PROPERTY STATISTICS BY JURISDICTION 91

TABLE 4-14: CPRI RESULTS FOR LANDSLIDE..... 93

TABLE 4-15: CPRI RESULTS FOR SEVERE WIND FOR 2017 98

TABLE 4-16: CPRI RESULTS FOR WILDFIRE FOR 2017 102

TABLE 5-1: PIMA COUNTY LEGAL AND REGULATORY CAPABILITIES 107

TABLE 5-2: PIMA COUNTY TECHNICAL STAFF AND PERSONNEL CAPABILITIES..... 108

TABLE 5-3: PIMA COUNTY FISCAL CAPABILITIES 108

TABLE 5-4: MARANA LEGAL AND REGULATORY CAPABILITIES	109
TABLE 5-5: MARANA TECHNICAL STAFF AND PERSONNEL CAPABILITIES.....	110
TABLE 5-6: MARANA FISCAL CAPABILITIES	110
TABLE 5-7: ORO VALLEY LEGAL AND REGULATORY CAPABILITIES.....	111
TABLE 5-8: ORO VALLEY TECHNICAL STAFF AND PERSONNEL CAPABILITIES	112
TABLE 5-9: ORO VALLEY FISCAL CAPABILITIES.....	112
TABLE 5-10: PASCUA YAQUI TRIBE LEGAL AND REGULATORY CAPABILITIES	113
TABLE 5-11: PASCUA YAQUI TRIBE TECHNICAL STAFF AND PERSONNEL CAPABILITIES	113
TABLE 5-12: PASCUA YAQUI TRIBE FISCAL CAPABILITIES	114
TABLE 5-13: MITIGATION RESPONSIBILITIES FOR THE PASCUA YAQUI TRIBE	115
TABLE 5-14: SAHUARITA LEGAL AND REGULATORY CAPABILITIES.....	117
TABLE 5-15: SAHUARITA TECHNICAL STAFF AND PERSONNEL CAPABILITIES	117
TABLE 5-16: SAHUARITA FISCAL CAPABILITIES.....	118
TABLE 5-17: TUCSON LEGAL AND REGULATORY CAPABILITIES.....	118
TABLE 5-18: TUCSON TECHNICAL STAFF AND PERSONNEL CAPABILITIES	119
TABLE 5-19: TUCSON FISCAL CAPABILITIES.....	120
TABLE 5-20: 2017 MITIGATION MEASURES FOR UNINCORPORATED PIMA COUNTY.....	124
TABLE 5-21: 2017 MITIGATION MEASURES FOR MARANA	126
TABLE 5-22: 2017 MITIGATION MEASURES FOR ORO VALLEY	129
TABLE 5-23: 2017 MITIGATION MEASURES FOR PASCUA YAQUI TRIBE.....	132
TABLE 5-24: 2017 MITIGATION MEASURES FOR SAHUARITA	133
TABLE 5-25: 2017 MITIGATION MEASURES FOR TUCSON.....	135
TABLE 6-1: CONTINUED PUBLIC AND STAKEHOLDER INVOLVEMENT	147
TABLE D-1: 2012 MITIGATION MEASURES FOR PIMA COUNTY.....	198
TABLE D-2: 2012 MITIGATION MEASURES FOR MARANA.....	200
TABLE D-3: 2012 MITIGATION MEASURES FOR ORO VALLEY	203
TABLE D-3: 2012 MITIGATION MEASURES FOR PASCUA YAQUI TRIBE.....	208
TABLE D-4: 2012 MITIGATION MEASURES FOR SAHUARITA	213
TABLE D-5: 2012 MITIGATION MEASURES FOR TUCSON	218

SECTION 1: INTRODUCTION

1.1 Purpose

The purpose of the Plan is to identify natural hazards that impact the various jurisdictions located within Pima County, assess the vulnerability and risk posed by those hazards to community-wide human and structural assets, develop strategies for mitigation of those identified hazards, present future maintenance procedures for the plan, and document the planning process.

Pima County and all of the Cities and Towns are political subdivisions of the State of Arizona and are organized under Title 9 (cities/towns) and Title 11 (counties) of the Arizona Revised Statutes (ARS). This Pima County Multi-Jurisdictional Hazard Mitigation Plan was prepared by the Pima County Office of Emergency Management (PCOEM) and the listed participating jurisdictions, along with interested public, appointed representatives and elected officials of these jurisdictions. Accordingly, each of the participating jurisdictions is empowered to formally plan and adopt the Plan on behalf of their respective jurisdictions.

1.2 Background and Scope

Each year in the United States, disasters take the lives of hundreds of people and injure thousands more. Nationwide, taxpayers pay billions of dollars annually to help communities, organizations, businesses, and individuals recover from disasters. These monies only partially reflect the true cost of disasters, because additional expenses to insurance companies and nongovernmental organizations are not reimbursed by tax dollars. Many disasters are predictable, and much of the damage caused by these events can be alleviated or even eliminated.

Hazard mitigation is defined by FEMA as “any sustained action taken to reduce or eliminate long-term risk to human life and property from a hazard event. The goal of risk reduction is to reduce the risk to life and property, which includes existing structures and future construction, in the pre and post-disaster environments. This is achieved through regulations, local ordinances, land use, and building practices and mitigation projects that reduce or eliminate long-term risk from hazards and their effects.”

Another way to understand hazard mitigation is in relation to the emergency management cycle in the whole community. FEMA encourages the Whole Community approach to mitigation, prevention, protection, response and recovery activities. This means that, in addition to federal, state and local emergency management entities, academia, nongovernmental organizations, community members and the private sector need to be engaged in all phases of emergency management including mitigation.

The results of a three-year congressionally mandated independent study to assess future savings from mitigation activities provides states that on average, each dollar spent on mitigation saves society an average of \$4 in avoided future losses to society including saving lives and preventing injuries (National Institute of Building Science Multi-Hazard Mitigation Council, 2005).¹ This study is currently being updated.

Hazard mitigation planning is the process through which natural hazards that threaten communities are identified, likely impacts of those hazards are determined, mitigation goals are set, and appropriate strategies to lessen impacts are determined, prioritized, and implemented. This Plan documents the planning process employed by the Planning Team for Pima County’s Multi-Jurisdictional Hazard Mitigation Plan (MJHMP). The Plan identifies relevant hazards and risks, and identifies the strategy that will be used to decrease vulnerability and increase resiliency and sustainability.

Examples of hazard mitigation strategies include, but are not limited to the following:

- Development of mitigation standards, regulations, policies, and programs;
- Land use/zoning policies;

¹ National Institute of Building Science Multi-Hazard Mitigation Council, 2016: http://www.nibs.org/?page=mmc_projects#nhms

- Strong building code and floodplain management regulations;
- Dam safety program, seawalls, and levee systems;
- Acquisition of flood prone and environmentally sensitive lands; or
- Retrofitting/hardening/elevating structures and critical facilities.
- Relocation of structures, infrastructure, and facilities out of vulnerable areas
- Public awareness/education campaigns
- Improvement of warning and evacuation systems

This Plan was prepared pursuant to the requirements of the Disaster Mitigation Action of 2000 and the implementing regulations set forth in the Federal Register (hereafter, these requirements will be referred to collectively as the DMA2K). The Federal Disaster Mitigation Act of 2000 requires that a community have an approved hazard mitigation plan in order to qualify for federal funding from the following grant programs. Some of the grant programs available include:

- Pre-Disaster Mitigation Competitive (PDM-C)
- Hazard Mitigation Grant Program (HMGP)
- Flood Mitigation Assistance (FMA)

Information in this Plan will be used to help guide and coordinate mitigation activities and decisions for future land use. Proactive mitigation planning will help reduce the cost of disaster response and recovery to the community and its property owners by protecting structures, reducing exposure and minimizing overall community impacts and disruption. The community has been affected by hazards in the past and is thus committed to reducing future disaster impacts and maintaining eligibility for Federal funding. In the future, climate variability could affect the outcome of hazards by either reducing or increasing disaster impacts. This plan will attempt to address potential variables in each of the hazards addressed.

This is a multi-jurisdictional plan that geographically covers the participating communities within the Pima County boundaries (hereinafter referred to as the planning area). The following jurisdictions participated in the planning process:

- Pima County (Unincorporated)
- Town of Marana
- Town of Oro Valley
- Town of Sahuarita
- City of Tucson
- Pascua Yaqui Tribe

1.3 Tribal Assurance

The Pascua Yaqui Tribe is a federally recognized tribe, organized and established as a sovereign nation pursuant to the provisions of the Indian Reorganization Act of June 18, 1934. The Pascua Yaqui Tribe achieved federal recognition as an established tribe on September 18, 1978, and became recognized as a historic tribe in 1994.

The Pascua Yaqui Tribe will comply with all applicable Federal Statutes and regulations during the periods for which it receives grant funding, in compliance with DMA 2000 requirement §201.7(c)(6), and will amend its plan whenever necessary to reflect changes in tribal or Federal laws and statutes as required.

1.4 Plan Organization

This Plan is organized as follows:

- Section 1: Introduction
- Section 2: Community Profile
- Section 3: Planning Process
- Section 4: Hazard Identification & Risk Assessment
- Section 5: Mitigation Strategies and Action Items
- Section 6: Plan Maintenance

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SECTION 2: COMMUNITY DESCRIPTIONS

2.1 County Overview

History

Pima County is unique for being one of the oldest continuously inhabited areas of the United States. Native Americans have lived in this region from prehistoric times to the present, with the Tohono O’odham reservation being the second largest in the nation. Originally named for the Native American tribe inhabiting the area, evidence of the human settlement of Pima County dates back over 9,000 years. The Hohokam inhabited the area until the 1500s when they mysteriously disappeared. The Tohono O’odham were the next to settle the region and concentrated along the Santa Cruz and Gila Rivers. The arrival of the Spanish in the 1690s marked the first European peoples to establish settlements in the area. Missionary and explorer Father Eusebio Francisco Kino established the San Xavier del Bac mission. Throughout the 1700s, the Spanish continued to settle throughout southern Arizona. In 1775, the Tucson presidio was built to protect settlers from raiding tribes of Apaches. Residents of the fort began to refer to it as the “Old Pueblo”, which remains today as a nickname for Tucson.

Pima County was created in 1864, and included all of southern Arizona acquired from Mexico by the Gadsden Purchase. It is the second largest of the four original counties. Over time, portions of Pima County were carved off to create Maricopa, Pinal, Cochise, and Graham Counties.

Development began to flourish around the middle of the 18th century when silver and gold were discovered in the geographical area and the arrival of prospectors from Mexico. With the expansion of mining and ranching in the late 1800s, Pima County continued to witness increasing populations as new residents migrated to the Tucson region settling in proximity to major transportation corridors. Slowly, development moved eastward from Tucson until abutting with federally owned land resulting in a trend reversal with new growth occurring to the northwest. In the 1960’s the county flourished due to the copper industry, and by the 1970s, the industry was responsible for the employment of almost 9,000 people.

According to recent 2016 data, Pima County now has a population of around 1,010,025, with a projected population increase to 1.4 million by 2041. Pima County is multi-culturally diverse and unique in the sense that it is a very urbanized county, with more than one-third of the population living outside of any incorporated cities or towns. The county seat of Pima County is Tucson, where most of the population is located. Tucson is a major commercial and academic hub, and is home to the University of Arizona, Pima Air & Space Museum and the Arizona-Sonora Desert Museum².

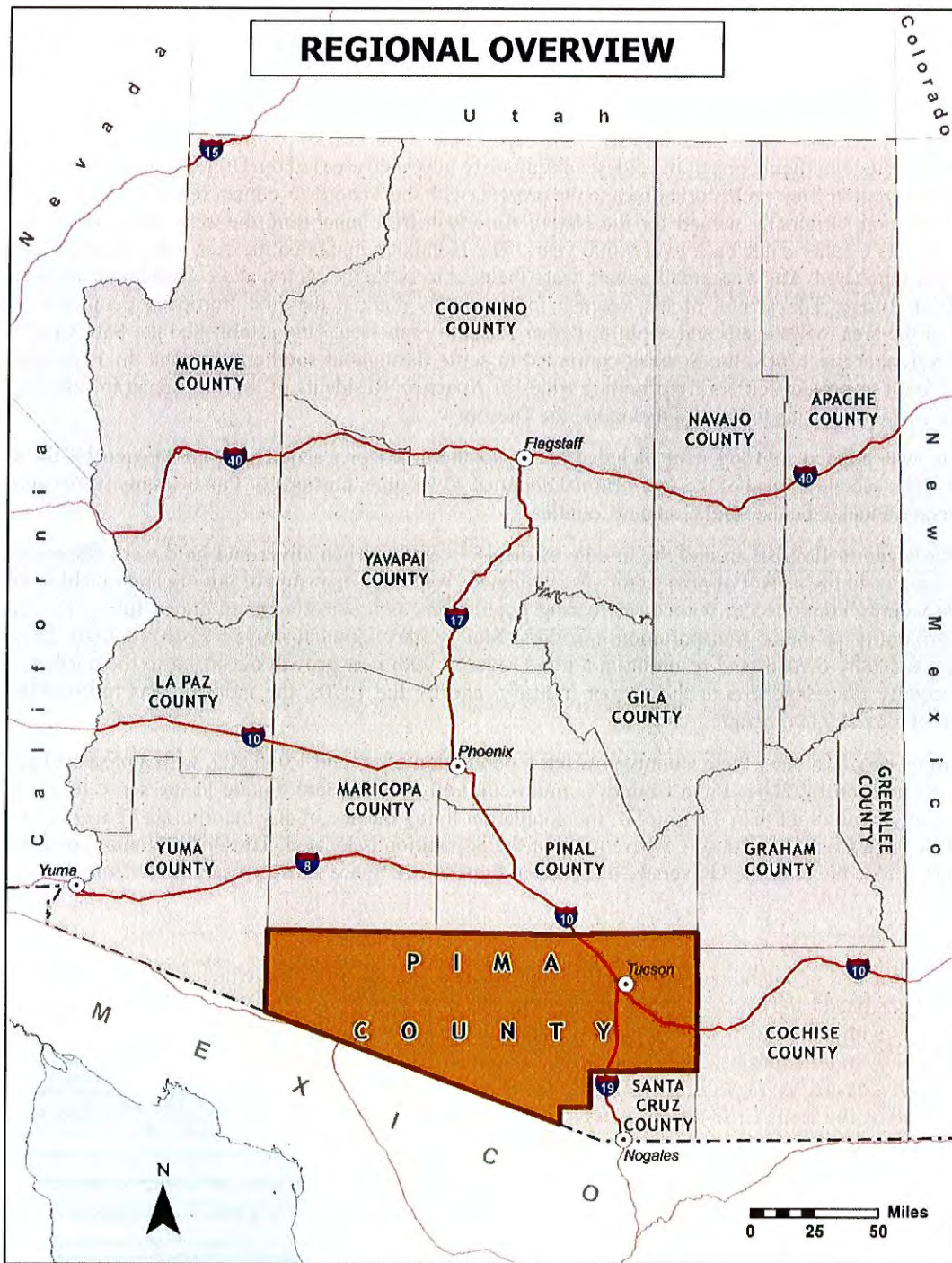
Geography

Pima County is located in southern Arizona and encompasses 9,184 square miles, which is roughly equal in area to the states of Rhode Island and Connecticut combined. Pima County shares a 120-mile border in common with Mexico. Pima County lies within the Basin and Range Physiographic Province, characterized by northwest-trending mountain ranges separated by alluvial basins. Separated by the Tucson and Sierrita Mountains, a large portion of Pima County lies in two alluvial basins: Avra Valley to the west and the Tucson basin in the east. The regional drainage network, primarily formed by the Santa Cruz River and its tributaries, is dry for a majority of the year except during the spring runoff or from heavy storms.

Varying in elevation from desert valleys at roughly 1,200 feet to the 9,185-foot peak of Mount Lemmon, the county is home to diverse plant and animal communities. Numerous mountain ranges ring the Tucson basin, including the Santa Catalina, Rincon, Empire, Santa Rita, Sierrita, and Tucson mountains. Two cactus forests traverse the county – Saguaro National Park to the northeast and Organ Pipe Cactus National Monument in the southwestern portion. In addition, the County is home to the Cabeza Prieta National Wildlife Refuge nestled along the western boundary of the

² Source: http://webcms.pima.gov/government/about_pima_county/, 2016

county and the Coronado National Forest in the eastern portion of the county within the Santa Catalina Mountains.



Source: Pima County Geographical Information Systems, 2016

Figure 2-1: Vicinity

The geographical characteristics of Pima County have been mapped into the following three terrestrial ecoregions:

- **Chihuahuan Desert** – this ecoregion is typical of the high altitude deserts and foothills and is found in much of the southeastern portion of Arizona. Elevations in this zone varies between 3,000-4,500 feet. The average temperatures for the Chihuahuan Desert tends to be cooler than the Sonoran Desert due to the elevation differences. However, like its lower elevation cousin, the summers are hot and dry with mild to cool, relatively dry winters.
- **Sierra Madre Occidental Pine-Oak Forest** – this ecoregion is predominant to mountainous regions in southeast Arizona with elevations generally above 5,000 feet. The average temperatures tend to be cool during the summer and cold in winter.
- **Sonoran Desert** – this ecoregion is an arid environment that covers much of southwestern Arizona. The elevation varies in this zone from approximately sea level to 3,000 feet. Vegetation in this zone is comprised mainly of Sonoran Desert Scrub and is one of the few locations in the world where saguaro cactus can be found. The climate is typically hot and wet during the summer and mild during the winter with a very dry spring and fall.

Land ownership within Pima County is divided between Indian Reservation (42%), Private (12%), U.S. Forest Service and Bureau of Land Management (12%), State Trust Land (15%), and other public lands (19%)³.

Government

The governmental and administrative affairs of the unincorporated areas of Pima County are directed by a five-member Board of Supervisors with each member elected from a designated district. Because of Arizona's constitutional provisions and the requirements promulgated by Arizona Revised Statutes, the government of Pima County is organized to have a direct and indirect relationship with the Board of Supervisors. The Board of Supervisors has direct control over the County's general government functions including community services; indigent defense; medical, health, and welfare services; and public works functions. These broad functions include the County's internal governmental administrative/ management activities; maintenance and construction of the County's sewerage and sanitation infrastructures; County streets, roads, and bridges which comprise the County's transportation infrastructure; natural resources, parks, community centers, recreational facilities and libraries (in cooperation with the city of Tucson); and numerous clinics. Indirect relationships are maintained with the elected officials. The Board of Supervisors appoints a County Administrator to be responsible for the general direction, supervision, administration, and coordination of all affairs of the county.

Each of the five municipalities in the county (Town of Marana, Town of Oro Valley, Town of Sahuarita, City of South Tucson, and City of Tucson) are governed by council-manager form of government. An elected tribal council governs the Pascua Yaqui Tribe. Each of the municipalities and the tribal community are described in more detail in Section 2.3 below.

³ Source: Pima County Geographic Information Systems, 2016

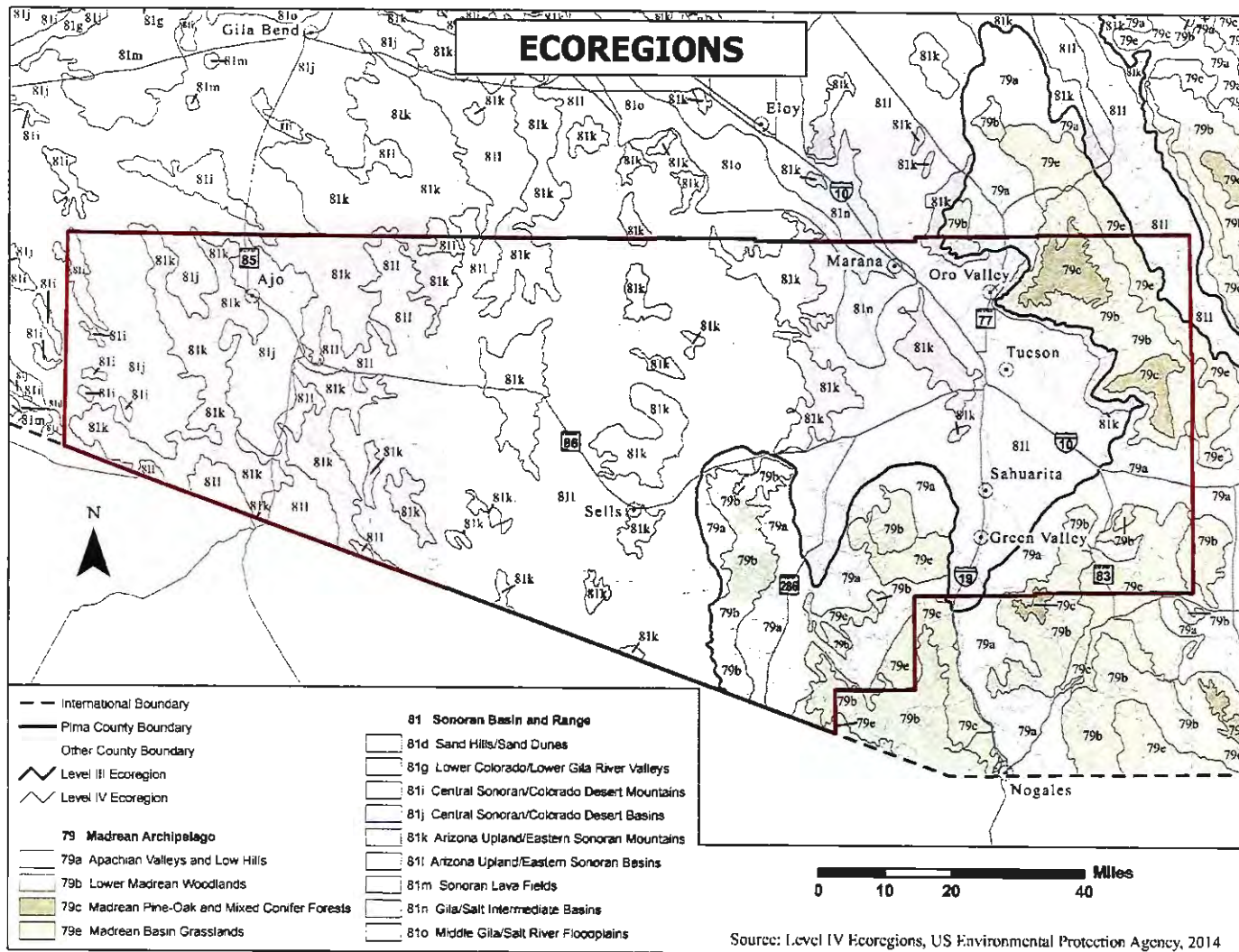


Figure 2-2: Ecoregions

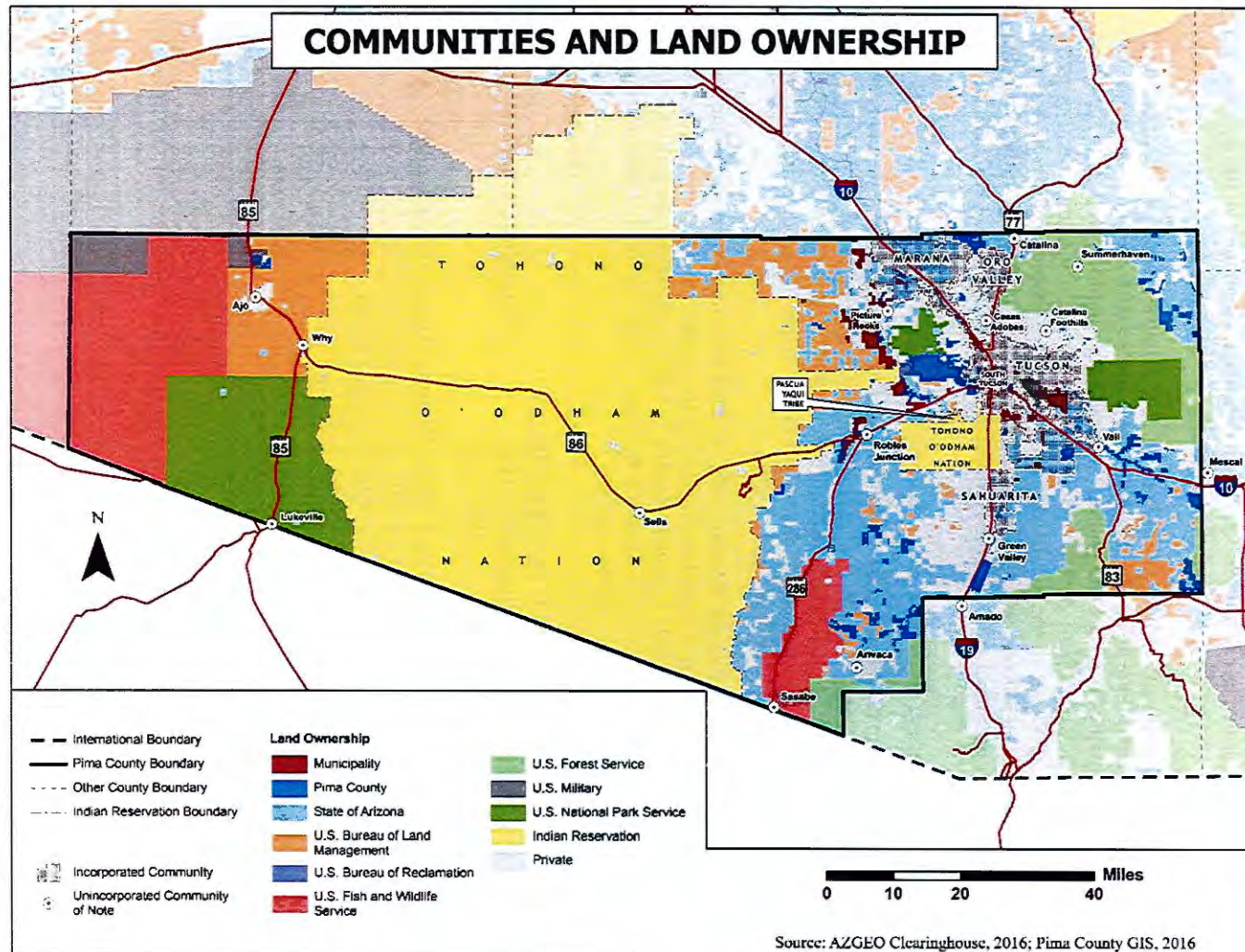


Figure 2-3: Community Location and Land Ownership

Geology

Pima County is comprised of a complex geology reflective of a history of faulting and folding of the earth’s crust. The mountains include sedimentary, metamorphic volcanic, or intrusive igneous rock, or a combination of the three. The alluvial basins consist of well-consolidated sediments eroded from the surrounding mountain ranges with caliche, or hardpan, underneath. Caliche is formed as calcium carbonate and deposited within the soil through water seepage.

Transportation

As shown in Figure 2-4, several major roadways support both local and transportation needs. Interstate 10 provides connectivity with the Phoenix metropolitan area to the north and Interstate 19 with Mexico to the south. Several other State and US highways, most notably Arizona State Highways 85 and 86, coupled with key Indian Routes provide local and regional access throughout southern Arizona. Pima County is host to four municipal airports providing commercial and general aviation service to the region. In addition, the county is home to the Davis-Monthan Air Force Base in Tucson. Davis-Monthan Air Force Base has approximately 6,500 Active Duty military personnel, 1,000 Reserve and Air National Guard personnel, 3,000 civilian employees, and nearly 19,000 military retirees that reside in the Tucson area.⁴

Climate

For the majority of Pima County, the climate is typical to the Sonoran Desert areas of the state and is characterized by abundant sunshine, a long summer, mild winter, low average annual precipitation, relatively low humidity, and generally light winds. In the relatively small areas of the county above 4,000 feet mean sea level, the climate tends to be more moderate. Climatic statistics for weather stations within Pima County are produced by the Western Region Climate Center⁵ and span records dating back to the early 1900’s.

Table 2-1 lists some partial climate statistics for several of the weather stations located within the county. Average temperatures within Pima County range from near freezing during the winter months to over 100°F during the hot summer months. The severity of temperatures in either extreme is highly dependent upon the location, and more importantly the altitude, within the county. For instance, temperature extremes in the foothill communities will generally be about 10° less than those in valley communities.

Table 2-1: Climate Statistics for Stations in Pima County

Location	Average Temperature (F)				Precipitation (inches)		
	January		July		Wettest Month	Driest Month	Total Annual Average
	Min	Max	Min	Max			
Ajo	41.6	64.2	77.8	103	1.90 (August)	0.07 (May)	8.37
Cascabel	30.0	64.8	65.3	99.2	2.59 (August)	0.31 (May)	13.33
Kitt Peak	33.0	49.6	60.8	80.4	4.53 (August)	0.44 (May)	23.16
Sabino Canyon	37.1	66.4	72.4	101.9	2.41 (August)	0.19 (May)	12.73
Green Valley/Sahuarita	37.0	67.7	73.6	98.8	3.23 (July)	0.21 (May)	13.42
Sells	36.9	66.0	72.1	101.1	2.58 (July)	0.15 (May)	11.77
Tucson Magnetic Observatory	34.2	64.8	71.3	100.5	2.25 (August)	0.24 (May)	12.62
Tucson, University of Arizona	38.7	64.9	74.0	99.4	2.36 (August)	0.22 (May)	11.4

Note: Period of record varies by station but generally spans from the early 1900’s to 2010. Sabino Canyon 1941-2002. Green Valley 1988-2016 is near Sahuarita.
Source: Western Regional Climate Center, 2016.

⁴ Davis-Monthan & 355th Fighter Wing Fact Sheet, 2015

⁵ Most of the data provided and summarized here taken from the WRCC website beginning at the following URL:
<http://www.wrcc.dri.edu/CLIMATEDATA.html>, 2016

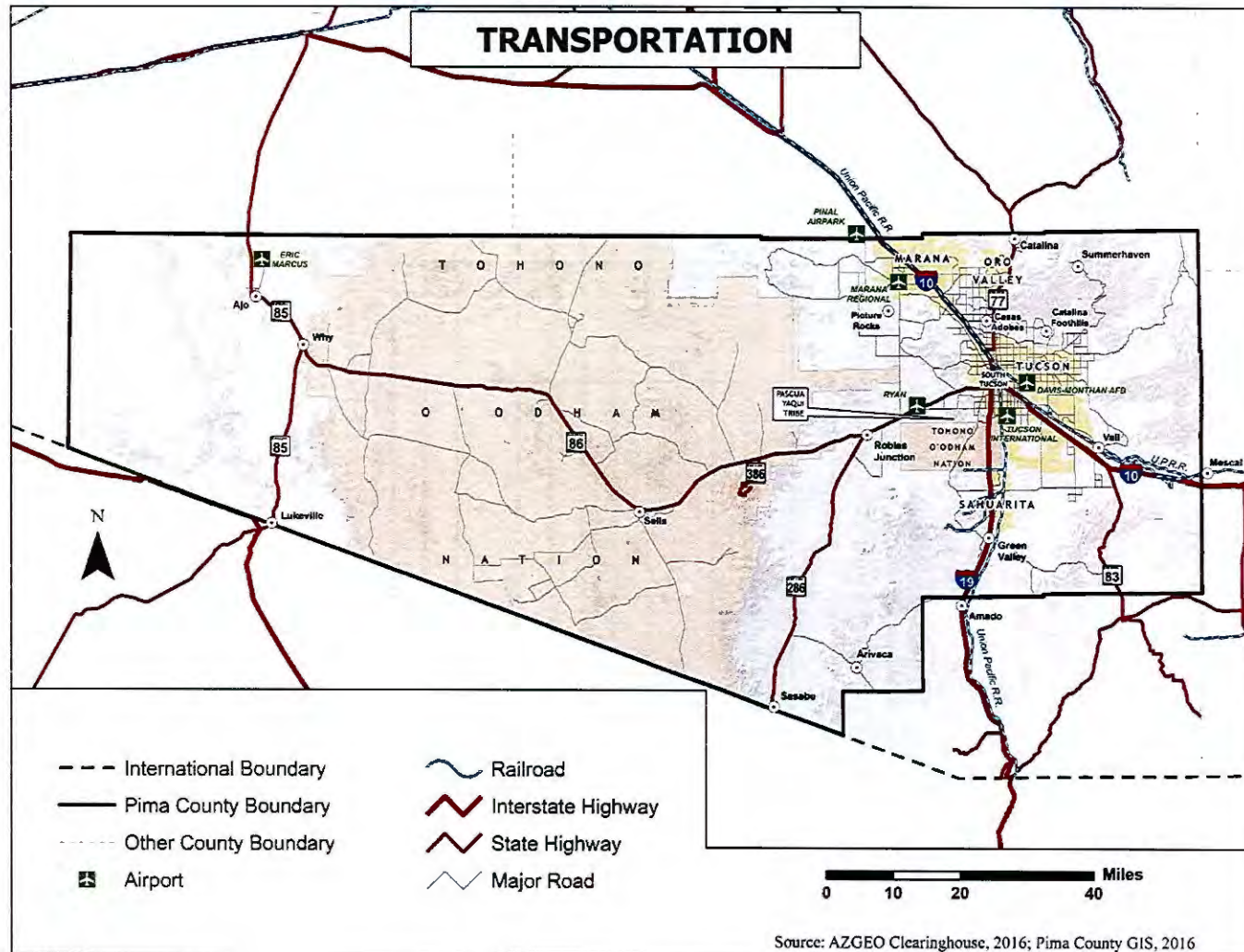


Figure 2-4: General Location and Transportation

Precipitation throughout Pima County is governed largely by elevation and season of the year. From November through March, storm systems from the Pacific Ocean cross the state as broad winter storms producing mild precipitation events and snowstorms at the higher elevations. Summer rainfall begins early in July and usually lasts until mid-September. Moisture-bearing winds move into Arizona at the surface from the southwest (Gulf of California) and aloft from the southeast (Gulf of Mexico). The shift in wind direction, termed the North American Monsoon, produces summer rains in the form of thunderstorms that result largely from excessive heating of the land surface and the subsequent lifting of moisture-laden air, especially along the primary mountain ranges. Thus, the strongest thunderstorms are usually found in the mountainous regions of the central southeastern portions of Arizona. These thunderstorms are often accompanied by strong winds, blowing dust, and infrequent hailstorms.⁶

Average wind speeds are similar across Arizona, averaging approximately 6 to 9 miles per hour annually. Pima County generally experiences average wind speeds at approximately 8 miles per hour. However, significant variations can exist throughout the year, as evidenced by Tucson’s statewide record of 76 miles per hour maximum-recorded wind gust. The surrounding mountains and topography of the region influence wind velocities and directions in the Tucson basin.

Population

As of July 2016, 1,009,371 residents call Pima County home⁷. The majority of the citizens still live in the incorporated communities or reservation portion of Pima County. The largest community is the City of Tucson. The two incorporated cities and three towns are geographically located in the eastern portion of Pima County.

Jurisdiction	2010	2015
Pima County	981,168	1,009,371
Town of Marana*	35,051	41,655
Town of Oro Valley	40,984	43,499
Pascua Yaqui Tribe (Pascua Pueblo Reservation)	3,745	8,831**
Town of Sahuarita	25,259	27,637
City of South Tucson	5,672	5,712
Tohono O’odham Nation	9,051	Not reported
City of Tucson	520,795	529,845
Unincorporated County	353,319	361,023

2010 Pascua Yaqui Tribe and Tohono O’odham Nation estimates from 2010 Census Block data
 2010 and 2015 data from AZDOA: <https://population.az.gov/population-estimates>
 *A portion of Marana is in Pinal County
 ** Provided by Pascua Yaqui Tribe and current as of September 2016

Economy

The metropolitan Tucson area is the center of economic activity for the County. As of July 2016, the countywide labor force was estimated at 470,100 with an unemployment rate of 5.8%.⁸ A majority of workers in Pima County are employed in the educational services, healthcare, and social assistance sector of the economy, followed by arts and entertainment, and then professional, scientific and management. The labor force is reflective of the influence of tourism, academia, and the retirement population in the Tucson metropolitan area.

⁶ Office of the State Climatologist for AZ, 2004. <http://geography.asu.edu/azclimate/narrative.htm>

⁷ U.S. Census Bureau, Quick Facts, 2016. <http://www.census.gov/quickfacts/table/PST045216/00>

⁸ AZ Department of Administration Employment and Population Statistics, August 2016. <https://laborstats.az.gov/sites/default/files/Emp-Report.pdf>

2.2 Jurisdictional Overviews

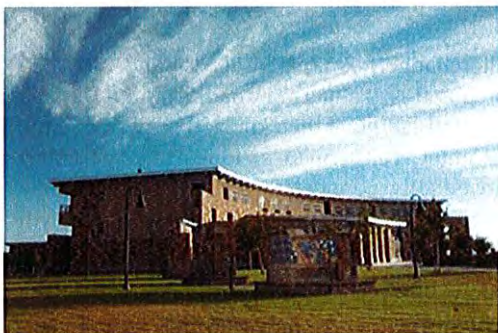
2.2.1 Town of Marana

Nestled along Interstate 10 approximately one mile northwest of Tucson, the Town of Marana has experienced dramatic growth in the past decade because of aggressive annexation policies and the development of master-planned communities. Founded in 1881, in conjunction with the development of rail transportation, Marana solidified itself as a destination with its appearance on Southern Pacific Railroad maps in 1890. Although ranching and the railroad dominated the community prior to World War I, the post-war years brought significant change to the region with the implementation of extensive agricultural irrigation systems and the development of cotton farming. Other substantial factors in Marana's development were the location of Marana Army Air Field (now Pinal Airpark and Evergreen Air Center) and the removal of the downtown business district due to the widening of Interstate 10 in the early 1960's.

In March of 1977, the Town of Marana incorporated with an area roughly 10 square miles. Governed by a seven-member Town Council consisting of a Mayor and six council members elected for four-year terms, the Town utilizes a Council-Manager form of government. The Town Council appoints a Town Manager responsible for the daily operation of town services and the orderly administration of affairs.

Although a majority of Marana's topography is flat, much of the area is designated as floodplain. In addition, the existing Town boundaries include portions of the Tortolita and Tucson Mountain foothills that are dominated by slopes exceeding 15%. The development constraints posed by these environmentally sensitive lands provide the potential for natural open space and habitat conservation areas to balance with the urban development occurring. Several riparian features, including major wash crossing in the Tortolita Fan and the Santa Cruz River provide natural wildlife habitat for diverse species native to the Sonoran Desert.

Although witnessing substantial urban growth during the past decade, Marana continues to hold onto its agricultural and ranching roots and serves as the main trade and transportation center for the surrounding rural periphery for the eastern portion of Pima County. As illustrated in Table 2-2, the 2015 Census population of Marana is 41,655. On



average between the years of 2010-2014, the civilian labor force was 64.5% of the town's population. In 2012, when data was last recorded by the U.S. Census Bureau, there was approximately \$23,436 worth of retail sales per capita in the town. New building permits issued in 2015 were 622.⁹

Marana's General Plan, adopted on December 7, 2010, reflects a community preparing for unprecedented future growth. Marana's Land Use Map (Figure 2-5) defines a pattern of growth sensitive to the natural environment and reflective of the Town's goal to preserve and protect natural habitats. The Marana General Plan designates a majority of northeast Marana as environmentally sensitive, best suited for less intense uses such as low-density residential development or open space. Low and medium density residential in proximity to environmentally sensitive areas provide a transition to more intensive commercial and industrial uses located in proximity to major transportation corridors including Interstate 10 and the Marana Northwest Regional Airport.

The Town's reputation for a business-friendly environment with no city property taxes has led to substantial recent investment in economic development activities. Although agriculture remains a major force in Marana's economy, a recent influx of residential and commercial development has occurred due to its location between Phoenix and Tucson along I-10 and the Union Pacific Railroad, a business-friendly government and no town property taxes. To the south, adjacent to Tucson, is a new commercial business district. Continental Ranch/Peppertree Ranch Industrial Park has several new tenants and new industrial properties will soon be available at Marana Northwest Regional Airport. Marana's major private employers include Arizona Portland Cement, Costco, Home Depot, Wal-Mart, Lowes, Sargent

⁹ U.S. Census Bureau, QuickFacts, 2016. <http://www.census.gov/quickfacts/>

Controls & Aerospace, and Tucson Ready Mix. Major public employers include the Marana Unified School District and the Town of Marana. Marana's planning area encompasses approximately 228 square miles in Pima and Pinal Counties. Existing land uses include natural undisturbed desert, improved drainage areas, agriculture, recreational lands, and residential, commercial, and industrial development. A majority of the Planning Area beyond the Town boundaries is undeveloped.

Marana's Town limits reflect the many changes and transitions that have occurred since its incorporation. Marana's rural heritage is reflected in traditional family farms and agricultural activities that continue on many acres of land historically used for agriculture. Older, low-density residential and commercial development was located west of Interstate 10 (I-10), in and near the traditional Town area where many Marana pioneer families settled. This northwest part of Marana began a transition to a more densely populated area in early 2000. At that time, the Cactus Ferruginous Pygmy-owl was listed as an endangered species, which limited development in much of the area east of I-10. This shifted the development focus to the farm fields in northwest Marana. The extension of bank protection along the Santa Cruz River to Sanders Road took many of the farm fields out of the floodplain and opened them up to development opportunities. The extension of close to six miles of sewer lines in 2003 brought urban services to the northwest area. By 2010, there were more than 4,000 new lots platted in this developing part of the Town and close to half of those lots had constructed homes. The new growth brought approximately 5,000 new residents to this once rural area. The northwest area is the number one growth area for Marana, with more than 17,000 additional lots entitled in this area.

Marana's planning area includes natural areas, such as the Tortolita Mountain Alluvial Fan in the northeast, which provide physical constraints that limit development. Characterized by steep slopes, natural drainage ways, native vegetation and floodplains, this area provides natural undisturbed open space and habitat for a multitude of plant and animal species. The Town has proactively moved to direct new growth and development away from the fan to other more appropriate areas.

The Town of Marana 2010 General Plan indicates that residential development is the predominant land use, occupying more than 50% of the total land area. The residential categories provide a range of densities within each designation. However, the maximum density cannot always be achieved because of land use policies or physical constraints. Commercial and industrial uses may potentially accommodate a wide range of uses.

The new Twin Peaks Road extension and Twin Peaks/I-10 freeway interchange has created access and provided infrastructure to new areas previously unavailable for development. Related to this, Tangerine Road, from La Canada Drive to I-10, is currently in design for the expansion of up to six lanes that will facilitate the expected growth in three activity centers in the region including the Tangerine Road/I-10 Activity Center; Tangerine Corridor Activity Center; and Dove Mountain Activity Center. The new Tangerine Road will eventually connect to a fully planned, new Tangerine/I-10 freeway interchange. These roadway projects will allow for the capacity necessary for future growth in the area as well as provide better circulation and connectivity in the community including access to the Town of Oro Valley.

At the Marana Regional Airport, a future focal point of the town's local economy, continual upgrading and expansion of the facility has benefit to the airport and to the Town's ability to attract commerce. The recent addition of road and utility infrastructure in the I-10 area directly east of the airport will attract new businesses to the Town while others will be attracted to the airport because of its business-class jet capabilities, convenient location and access for business or pleasure.

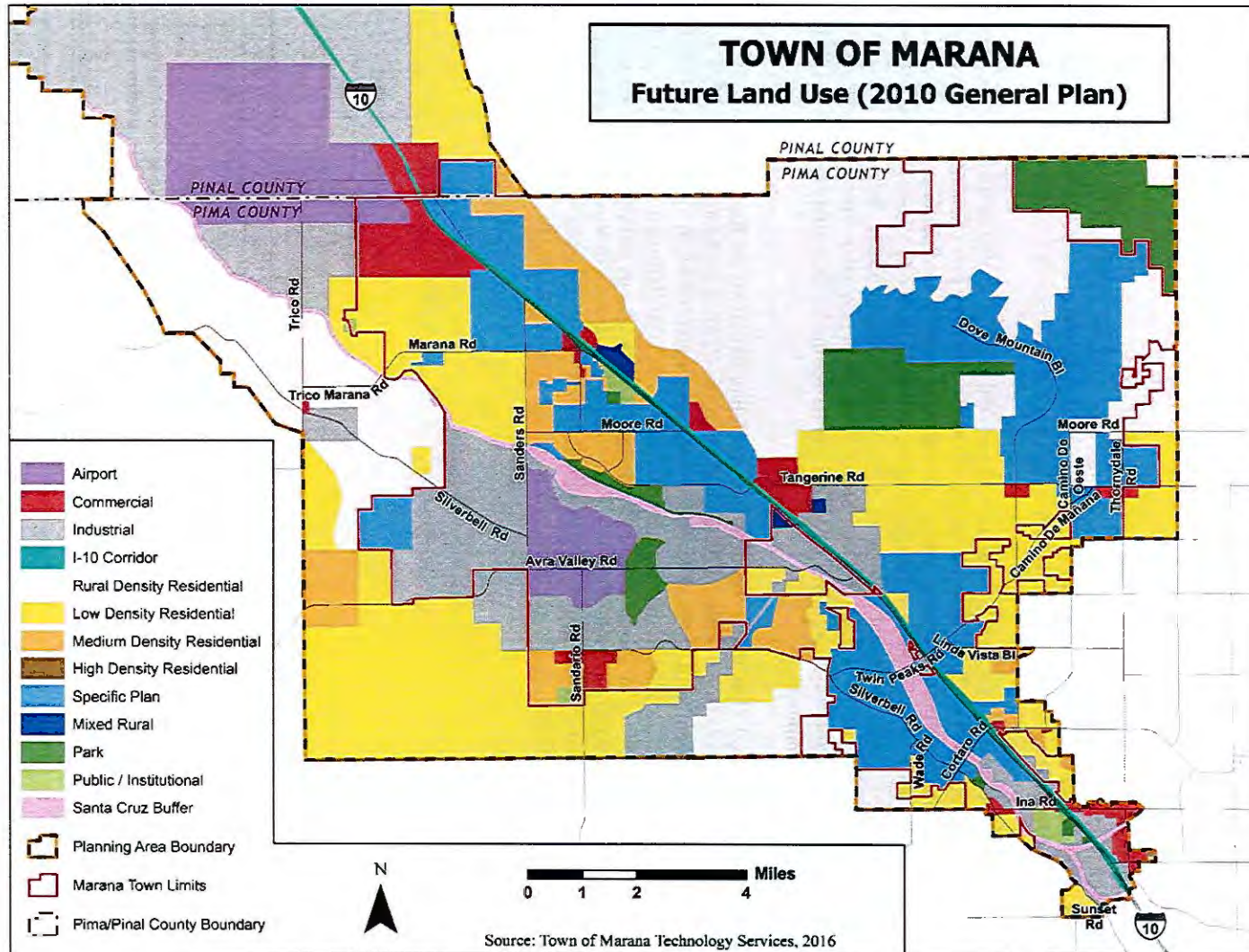


Figure 2-5: Town of Marana Land Use

2.2.2 *Town of Oro Valley*

Located between the Santa Catalina Mountains to the east and the Tortolita Mountains to the northwest, Oro Valley is located six miles northwest of the Tucson city limits. Other nearby communities include the Town of Marana to the west and the unincorporated community of Catalina to the north. Oro Valley serves as a gateway to regional parks, sharing its eastern border with Catalina State Park and the Coronado National Forest. These areas provide vast recreational and natural open space opportunities for the community and are integral to the Town's identity as a community known for its integration of residential uses within the natural Sonoran Desert and as a resort area. Major access to Oro Valley is via Interstate 10, located approximately 12 miles to the west, and State Route 77, or Oracle Road, which runs north-south through the Town, and is the original transportation corridor linking Tucson with the Phoenix metropolitan area to the north. The Town incorporated in April of 1974 and operates under a Council-Manager form of government, which includes a mayor and six council members elected at large. The Mayor is directly elected while the Vice Mayor is selected by the Council from among the six Council members.

Oro Valley is a growing community. The 2015 population of Oro Valley is estimated at 43,500. This population is forecasted to grow to around 50,000 by 2030. Residential growth has been a large part of economic activity in the past and will remain important into the future. In recent years, more diverse employment opportunities have become part of the community. Oro Valley's large employers include Ventana Medical Systems, a member of the Roche Group, Honeywell Aerospace, Oro Valley Hospital, Town of Oro Valley, Amphitheater School District, Hilton El Conquistador Golf & Tennis Resort, Fry's Food & Drug Store, Walmart Supercenter, Splendido at Rancho Vistoso and Meggitt Securaplane. Oro Valley is emerging as a regional center for the biotech industry, with Innovation Park, featuring medical and biotech campuses.

The Town of Oro Valley's General Plan guides the character and future directions for the community over a 10-year period. The *Your Voice, Our Future* General Plan was adopted by Town Council on September 21, 2016 and ratified by the Oro Valley voters on November 8, 2016. The Plan supports the potential of an evolving community, with a focus on family-friendly features, economic development and amenities contributing to a "complete community". This is balanced with long-held values for the natural environment and lower density development. Future commercial growth will likely be concentrated in designated growth areas, primarily the Oracle Road corridor and secondarily smaller neighborhood commercial clusters dispersed throughout the Town. Residential growth will likely occur in both smaller infill projects as well as a few larger tracts of land on the western portion of Town.

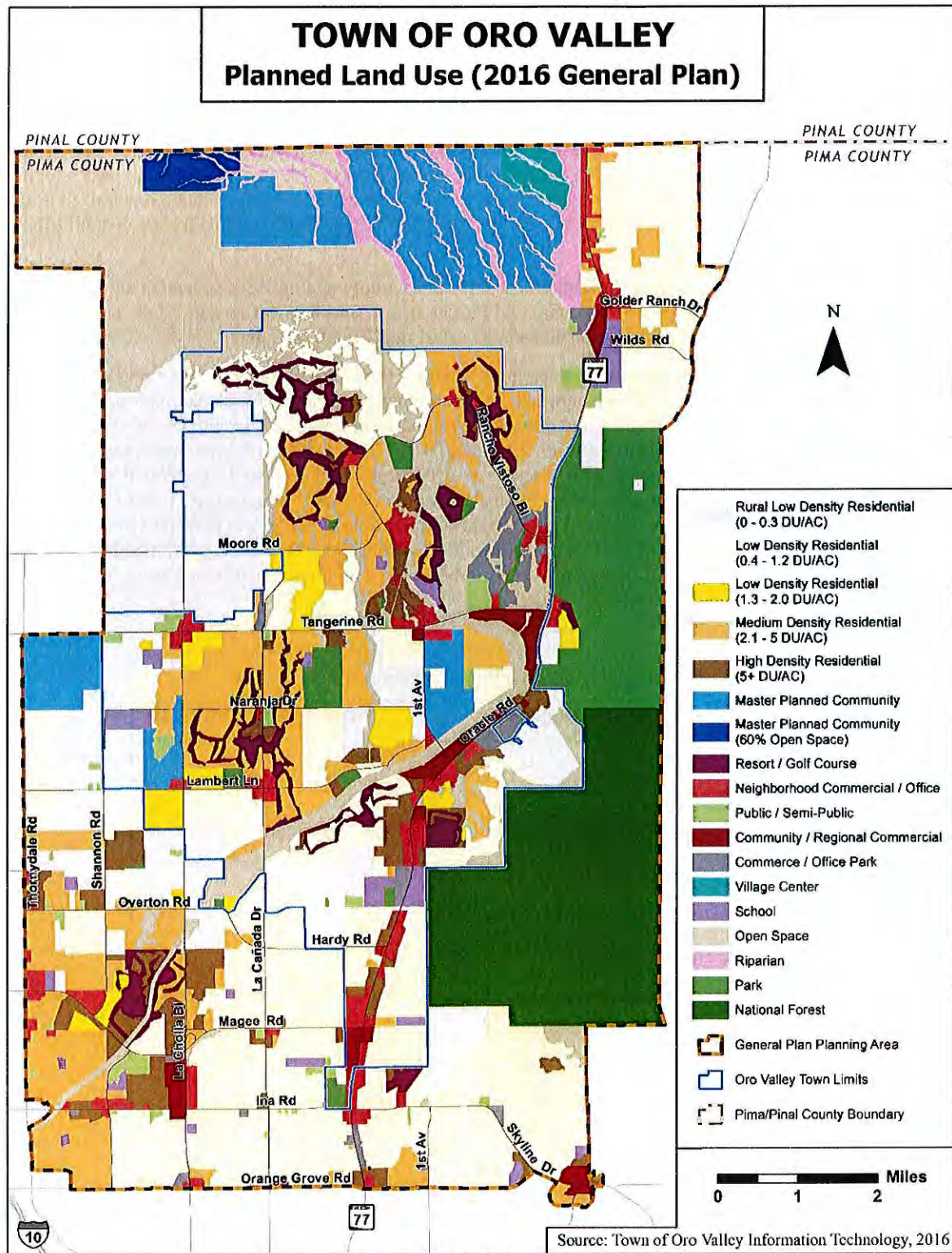


Figure 2-6: Town of Oro Valley Land Use

2.2.3 Pascua Yaqui Tribe

The lands of the Pascua Yaqui became part of the United States in the 1870s. Calling themselves the Yaquis, the first modern settlements of these descendants from the ancient Uto-Azteca people, were near Nogales and South Tucson. Over time, the Yaquis spread out, settling north of Tucson in an area they named Pascua Village and in Guadalupe near Tempe. Retaining their religious and cultural ways of life, the Yaquis began calling themselves the Pascua Yaqui Tribe and accepted political integration into American society during the 1950s. In 1952, the Pascua Yaqui Tribe was annexed by the City of Tucson. In 1964, Congress transferred 202 acres of desert land southwest of Tucson to the Pascua Yaquis who were looking for an area to preserve their tribal identity. Members of the Pascua Yaqui Tribe relocating to the reservation struggled to secure federal recognition for the tribe until finally being recognized in 1978. The Tribe acquired an additional 690 acres in 1988. In 1994, the tribe’s status was changed from a created tribe to a historic tribe.

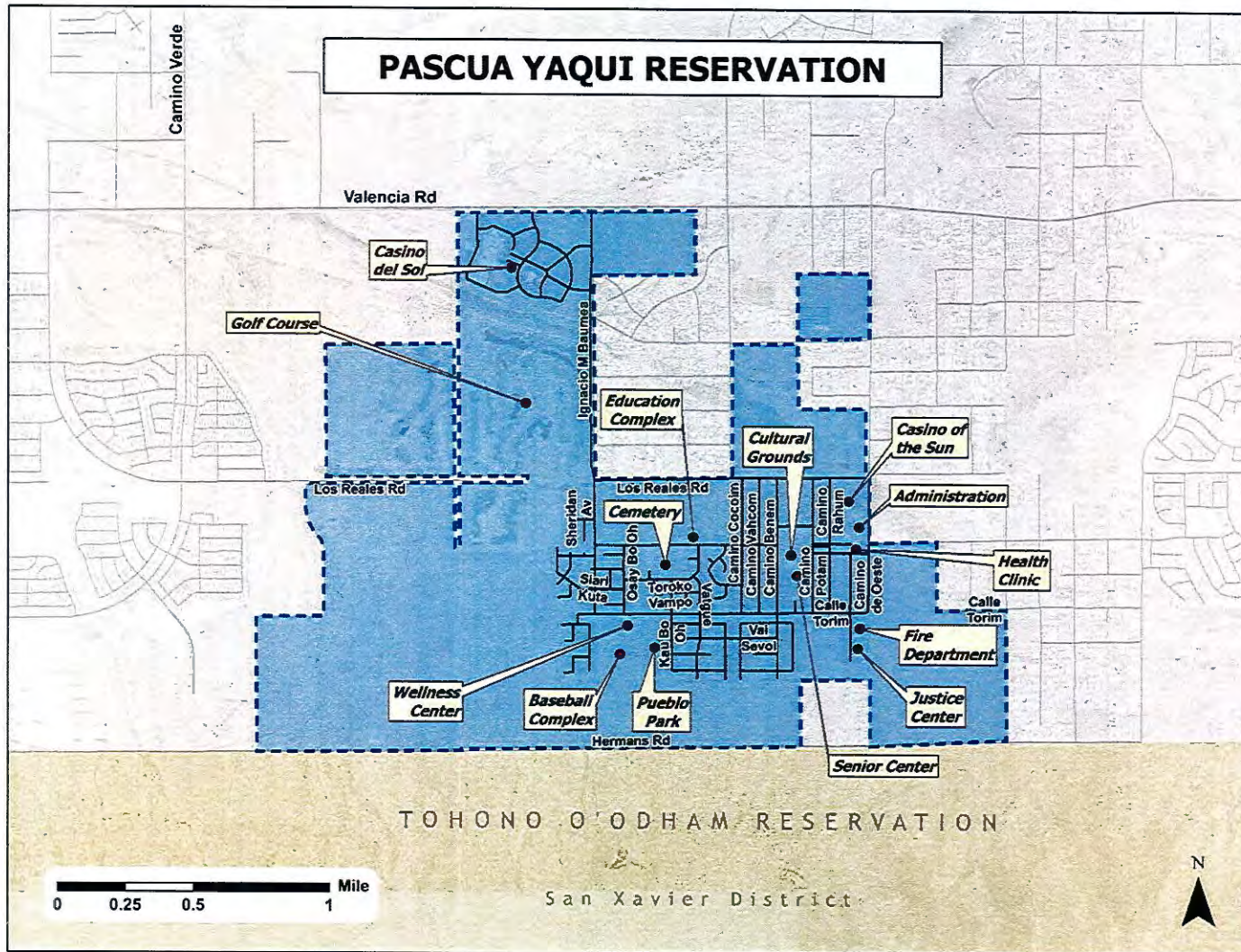
Today, the Pascua Yaqui Tribe is scattered throughout eastern Pima County and includes several small communities. These communities include Yoem Pueblo in Marana, Old Pascua in Tucson, Barrio Libre in South Tucson, and the Pascua Pueblo, a 1.87-square mile reservation located southwest of the City of Tucson.

According to Tribal sources, the population as of September 2016 for the Pascua Yaqui Tribe within Pima County communities was 8,831. Table 2-3 summarizes enrolled Tribal membership by the various Pascua Yaqui communities located both within Pima County and outside. Enrollment demographics for the Pascua Yaqui Tribe have increased due to housing development. Between 2013 and 2015, Housing Urban Development Grants were obtained to build housing for tribal members. The Pascua Yaqui Tribe also had proposed amendments to its constitutions effecting the tribe’s base enrollment to its tribal members. The amendments were passed by the federal government that gave the authority to the Pascua Yaqui Tribal Council to have the power to enact ordinances, subject to the approval of the Secretary of the Interior, governing future membership and loss of membership. This rise in enrolment is reflected in Table 2-3 demographics with the Yaqui Communities of New Pascua and Marana falling under the tribes and included in the Plan.

Table 2-3: Pascua Yaqui Tribal Enrollment Demographics	
Pascua Yaqui Communities	No. of Enrolled Members
<ul style="list-style-type: none"> • New Pascua • Old Pascua • Barrio Libre (South Tucson) • Yoem Pueblo (Marana) • Guadalupe (Maricopa County) • High Town (Chandler) • Penjamo Pueblo (Scottsdale) • Eloy/Coolidge (Pinal County) 	<ul style="list-style-type: none"> • 5,086 • 775 • 741 • 123 • 3,537 • 113 • 250 • 247
Community Total	10,872
<ul style="list-style-type: none"> • Other Arizona Cities • Outside the State of AZ 	<ul style="list-style-type: none"> • 6,446 • 2,011
Total Active Membership	19,329

Source: Pascua Yaqui Tribe, September 2016

The Pascua Yaqui Tribe operates two casinos within Pima County, the 40,000 square foot Casino of the Sun and the 75,000 square foot Casino del Sol. Other tribal enterprises include the brand new Sol Casino Hotel and Convention Center, which includes 215 rooms and a 20,000 square foot ballroom, the Anselmo Valencia Amphitheater 4,470 seat open-air concert venue, and the Del Sol Marketplace. The Sewailo Golf Course opened in 2013 measures 7,400 yards from the championship tees, with 5 different tee boxes on each hole to allow for players of all abilities. It is known as one of the finest golf courses in Tucson and the state of Arizona.



Source: Pima County Geographical Information Systems, 2016

Figure 2-7: Pascua Location

2.2.4 Town of Sahuarita

The Town of Sahuarita, incorporated in 1994, now encompasses a little over 31 square miles. Land uses within the incorporated boundaries of the Town include primarily residential and agricultural uses and vacant land. The next largest land use in the town is institutional, which includes schools, public uses, and utilities. In addition to these, there is commercial and light industrial land and recreational/open space uses.

The 2010 census found 10,615 dwelling units and 9,020 occupied households with a population of 25,259 (see Table 1). The Town has seen significant growth, with a 679% increase in population from 2000 to 2010. The Town’s population in the year 2015 was at 27,637. As of 2013 a lower 13.2% vacancy rate was reported in the 2011-2013 American Community Survey 3 Year Estimate.

Table 2-4 Population and Housing							
	2015 Total Census Population	Total Units 2010	Total Occupied 2010	Total Vacant 2010	Group Quarters Population 2010	Owner Occupied 2010	Renter Occupied
Sahuarita	27,637	10,615	9,020	1,595	63	7,615	1,405

Source: U.S. Census Bureau; 2015 and 2010 Census

Using the 2010 Census average household size and average family size of 2.79 and 3.14, respectively, the Town calculates future population projections using 2.89 persons per unit. The 2010 Census found an almost equal male/female ratio within the study area. The Town does not currently have a large group quarters facility.

Within Sahuarita are five age-restricted communities: Quail Creek, a fully age-restricted master planned community; Rancho Resort and Sonora within Rancho Sahuarita; La Jolla Verde, which lies southeast of I-19, and Duval Mine Road; and the Green Valley RV Resort that lies west of I-19 and north of Duval Mine Road. The Town shows a more traditional mix of population by age category not indicative of being skewed to the senior age groups. The Town of Sahuarita prides itself in being open to families with children as well as other household types.

Nearly 85% of the 9,020 occupied housing stock within the Town was owner-occupied in 2010. Based on this demographic holding in the future, the Town should plan either on ensuring that there is an adequate supply of single-family housing or assume that a significant part of its housing stock will likely be owner-occupied units. National trends, however, show a shift towards smaller household sizes and an increase in renting vs homeownership. It is unclear if this trend will affect Sahuarita, but it may be prudent to plan for a variety of housing types to best position the Town for the future.

Sahuarita represents five predominant land use themes today. First are the existing, older residential areas, primarily on larger lots, located in the western portion of the town, and interspersed by undeveloped properties.

Secondly, there is the rise of the master planned community from Rancho Sahuarita to the northwest and Madera Highlands and age-restricted Quail Creek to the southeast. Most of the growth anticipated in the Town during the life of the 2015 general plan will occur within master planned communities. Each is unique and caters to its individual market, but differs from more rural Sahuarita.

Third are the developing commercial and potentially mixed-use centers in the southern portion of the Town around the intersection of I-19 and Duval Mine Road. These centers provide regional services to Green Valley and much of the Upper Santa Cruz Valley in addition to Town residents.

Fourth are the production agriculture orchards and ranches in the eastern portion of the Town. Some of this land lies within the 100-year floodplain, but some of it lies outside and is imminently developable. Agricultural employment, in particular the pecan orchards owned and operated by FICO, provides a source of employment in the community that brings in revenues from outside the Town and helps the local economy. It is expected that over time, FICO holdings will likely convert to more urban scale development, completely or in part. The Sahuarita Farms Specific Plan and River Master Plan reflect the type of transition anticipated in this area.

Lastly, the Santa Cruz River and its large floodplain, which bisect the Town, provide both a constraint and an opportunity. Most of the river’s floodplain within the Town is not in a natural condition today; indeed, there are a number of structural uses, particularly around the historic Sahuarita townsite as well as irrigated agriculture and

institutional uses. Currently, there are no flood control measures planned for the Santa Cruz River within the Town of Sahuarita; however, consideration of such measures in the future may occur, pursuant to pre-existing agreements and the recently approved Sahuarita and Continental Farms River Master Plans.

Major employers in the area include Freeport-McMoRan and Asarco; Caterpillar Proving Grounds; FICO; Wal-Mart; Fry's; Safeway; Desert Diamond Casino, an Enterprise of the Tohono O'odham Nation; the Sahuarita School District; and the Town of Sahuarita itself.

Size and Location

Currently 31 square miles in area, Sahuarita is located just 15 minutes south of Tucson and approximately 40 minutes north of the Mexican border. Tucson International Airport is within a 20-minute drive.

Located along I-19, 40 minutes north of the U.S./Mexico border and 18 miles south of downtown Tucson, Sahuarita is uniquely positioned to capture 24 million annual visitors from Mexico. Sahuarita is overflowing with retail opportunities, executive living and a viable center for companies and employers to conduct business with Mexico.

Each day, on average, more than 65,000 Mexican residents come to Arizona to work, visit friends and relatives, recreate, shop, and spend over \$7,350,000. This contributes substantially to Arizona's export trade with Mexico. Familial ties, long-term friendships, work opportunities, leisure activities and shopping experiences not yet available in Mexico continue to support strong cross-border interactions between Arizona and its neighbor, Sonora.

Town Government

The Town of Sahuarita operates under the council-manager form of government. The Sahuarita Town Council is responsible for the policy matters of the town, and the town manager oversees staff and carries out the day-to-day functions of the town. Sahuarita is administered by the seven-member town council, which includes a Mayor and Vice Mayor. The Mayor and Vice Mayor are not elected into those positions, but are instead chosen among elected council members. The Town Council oversees all issues pertaining to Sahuarita, including residential and commercial development and natural preservation.

Population

As one of Arizona's fastest-growing communities, the Town of Sahuarita is the newest jurisdiction in Pima County, incorporated in 1994. The Town of Sahuarita's population increased nearly 700 percent during the period from the 2000 Census to the Census of 2010.

Year	Population	% Increase
2010	25,259	11.5%
2011	25,722	1.8%
2012	26,244	2.0%
2013	26,772	2.0%
2014	27,232	1.7%

Source: U.S. Census Bureau: 2015 Census: Sahuarita Economic Development Quick Facts

Income

The Town of Sahuarita saw a 13.1 percent growth in the working-age population between 2008 and 2012, and households earned a median income of \$69,425. Additionally, Sahuarita has an unemployment rate of 5.8 percent.

Town/Municipality	Median Household Income
Sahuarita	\$69,425
Pima County	\$46,433
State of Arizona	\$50,256

Source: U.S. Census Bureau; 2010 Census; Sahuarita Economic Development Quick Facts

Housing

From a quality of life perspective, Sahuarita has it all: safe, quiet streets; affordable housing; modern schools; landscaped trails and parks; scenic beauty; neighborhood shopping; easy access to interstates and the airport. The Town of Sahuarita has three master planned communities and eleven small neighborhoods for its residents to call home.

Education

The Town of Sahuarita Workforce Assessment by the University of Arizona Eller College of Management Economic and Business Research Center concluded that Sahuarita’s employed workforce displays higher levels of educational attainment overall than Pima County and Arizona as a whole. Sahuarita’s employed labor force has concentrations significantly greater than those in Southern Arizona do in higher paying occupational categories and in important ‘high-tech’ occupations.

Town/Municipality	Population 25 years and over with a Bachelor’s Degree
Sahuarita	21.7%
Pima County	17.4%
State of Arizona	16.0%

Source: U.S. Census Bureau; 2010 Census; Sahuarita Economic Development Quick Facts

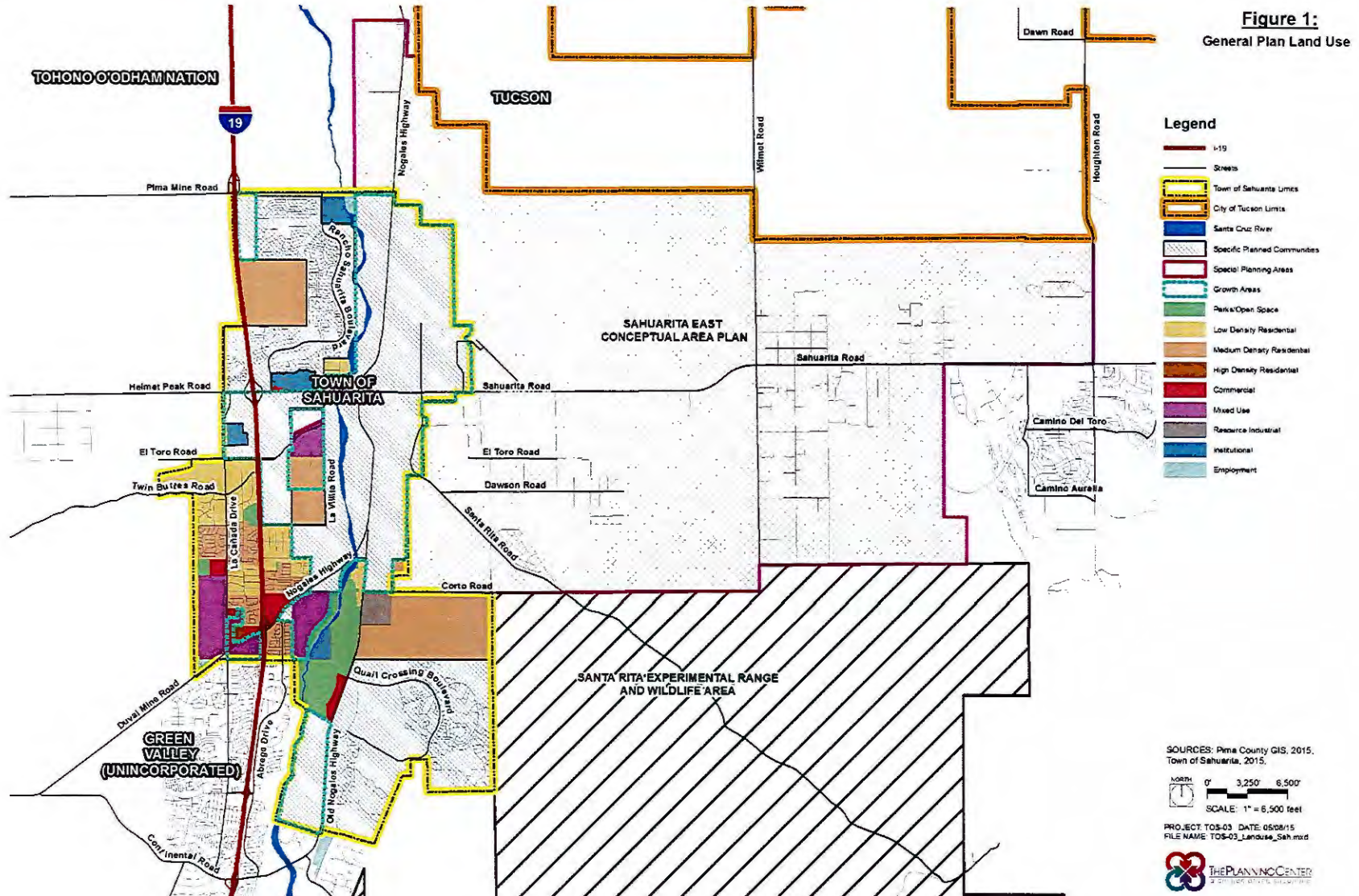


Figure 2-8: Town of Sahuarita General Plan Land Use

2.2.5 City of South Tucson

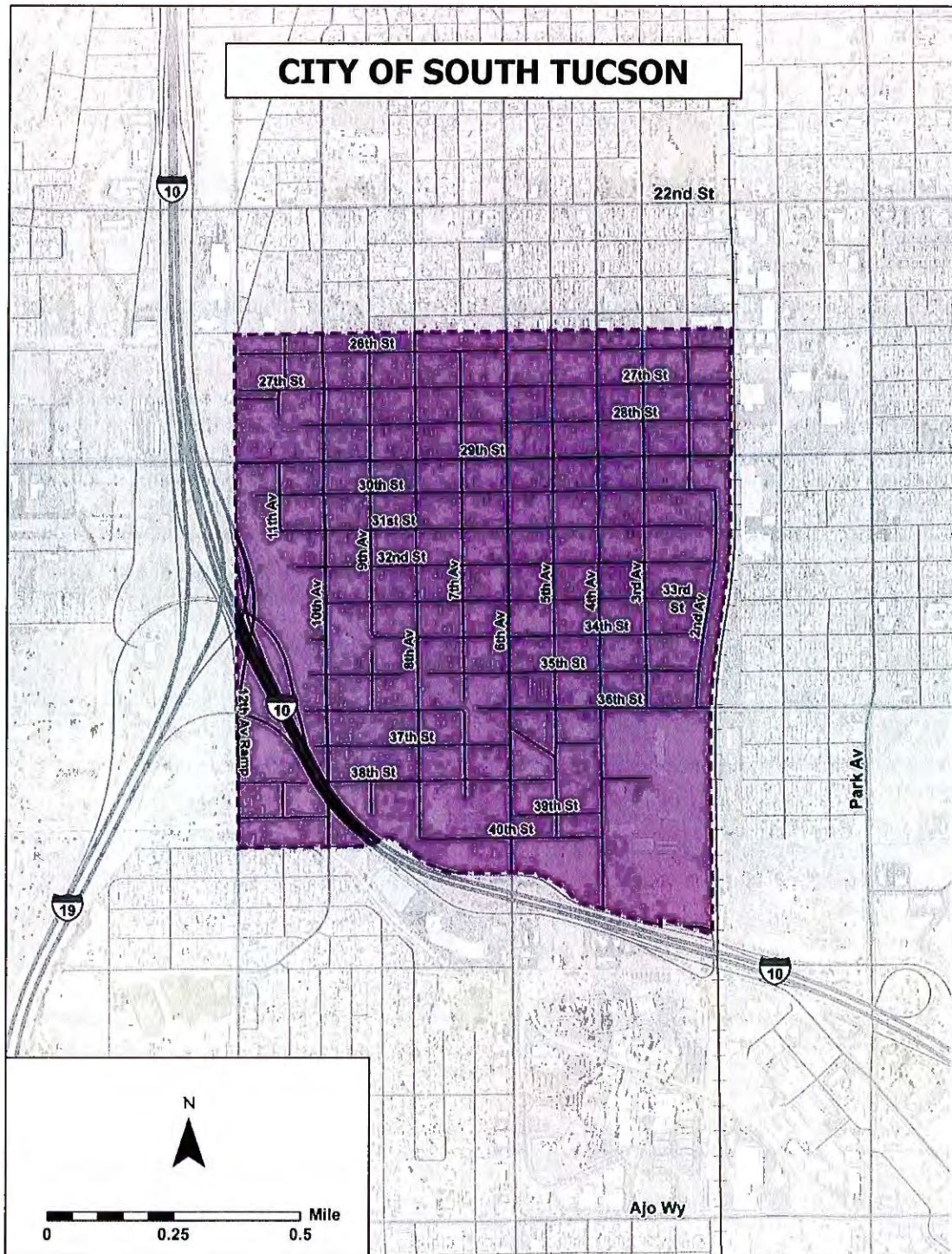
Surrounded by the City of Tucson, the City of South Tucson is a one square mile community just south of historical downtown Tucson nestled between the junction of Interstates 10 and 19. Rich in ethnic heritage, this small community services a population of which 83% are Mexican-American and 10% are Native American. Developed as a suburban community to Tucson, South Tucson enjoyed a colorful history after being incorporated in 1936, unincorporated in 1938, and reincorporated in 1940.

The City of South Tucson is located within a U.S. Department of Housing and Urban Development (HUD)–designated Empowerment Zone and Tucson Pima Enterprise Zone, both of which are dedicated to revitalizing dilapidated areas in the greater Tucson metropolitan area. The City of South Tucson has also been designated a rural ‘Colonia’ by the United States Department of Agriculture.

A Mayor, Six Council Members, and a City Manager govern the City of South Tucson. The local police and fire department have both full-time and volunteer personnel.

In 2000, the population of South Tucson was 5,490. Relatively small growth (0.42% through 2020) is projected for the future. South Tucson will continue to provide a declining percent of Pima County’s overall resident population. This pattern is reflective of the strong growth throughout eastern Pima County and the City’s inability to gain in available land mass. Similarly, South Tucson’s small labor force is forecasted to parallel the Town’s population growth by comprising a smaller share of the region’s employment opportunities. The City of South Tucson updated their General Plan in 2002. Although not mandated to contain Growing Smarter elements due to their small size, this information was incorporated into the 2002 revision to provide consistency with other municipalities in the region.

South Tucson was invited to participate in the 2017 plan revision, but did not participate due to limited resources. They were invited to all meetings and minutes of each planning meeting were shared with the jurisdictional contact available at the time.



Sour

Source: Pima County Geographical Information Systems, 2016

Figure 2-9: City of South Tucson Land Ownership and Location

2.2.6 City of Tucson

The human history of the area on which the City of Tucson sits goes back as far as 10,000 B.C. with intermittent habitation by migratory Paleoindian and archaic hunters and gatherers. There is evidence of agricultural settlement as early as 1,000 B.C. The Hohokam people thrived in the area from 200 B.C. until the 1450's. The Pima and Tohono O'odham peoples are the descendants of that advanced civilization and have lived in the area ever since. Spanish explorers traveled through the area in 1540, starting a long history of Spanish colonization including the founding, in 1699, and construction of the Mission San Xavier del Bac completed in 1791. The modern day City of Tucson was founded in 1775 with the establishment of the Tucson Presidio. Over the next century, the City would become part of Sonora, Mexico during that country's fight for independence, then a part of the United States following the Gadsden Purchase. This period led to a decade in which the City of Tucson was capital of the Arizona Territory. The City was incorporated in 1877. In 1880, the Southern Pacific railroad reached Tucson and the population grew to 8,000. In 1912 Arizona joined the Union as the 48th state and Tucson continued to grow reaching a population of 120,000 by 1950, doubling to 220,000 by 1960, and reaching 400,000 by 1990.

Today the City of Tucson is Arizona's second largest city and serves as the seat for Pima County. It is the focal point for political, economic, and cultural activity in Southern Arizona. The 2010 census put the population of the City at 520,116 making it the 33rd largest city in the United States, and as of 2015, the estimated population was 531,641. The City of Tucson shares a border with the Town of Marana and the San Xavier district of the Tohono O'odham Nation, as well as several Census Designated Places such as Vail. Otherwise, the majority of its borders are surrounded by unincorporated Pima County. South Tucson, a one square mile enclave, lies within the City of Tucson. The neighboring towns of Oro Valley and Sahuarita have close economic, social and governmental ties to the City. Altogether, the City and the surrounding towns and communities make up the Tucson Metropolitan Statistical Area with a total 2010 census population of 1,010,025.

Tucson follows the council-manager form of local government. The six-member city council holds legislative authority and shares executive authority with the mayor, who is elected by the voters independently of the council. An appointed city manager is responsible for the day-to-day operations of the city.

The City encompasses an area of 236 square miles. It sits at an elevation of 2,634 feet above sea level, measured at the Tucson International Airport. It is situated on top of an alluvial plain, a flat area of land created over millennia by sediment washing down from the surrounding mountain ranges that include the Santa Catalina and Tortolita Mountains to the North, the Santa Rita mountains to the South, the Rincon Mountains to the East, and the Tucson Mountains to the West. The City is located along the Santa Cruz River, which was formerly a perennial river but now is a dry river that floods during seasonal rains. Tucson's natural environment is characteristic of the Sonoran Desert within which it resides with diverse habitats and conditions ranging from low land deserts to the highlands of the Santa Catalina and Rincon Mountains.

Tucson is located 118 miles from Phoenix, AZ, the state's capital city, and 60 miles from the U.S./Mexico international border. Two major transportation corridors serve Tucson. The first is Interstate 10, which passes through the City from the Northwest to the Southeast, connecting it to Phoenix, AZ via Westbound I-10 and to Las Cruces, NM and El Paso, TX via Eastbound I-10. The second is Interstate 19, which begins at its intersection with I-10 at the southern edge of Tucson connecting the City with Mexico through the town of Nogales, AZ. Tucson International Airport, the second busiest airport in the State of Arizona, sits just outside of the City's limits and approximately six miles from the City center. Tucson is also a hub for the Union Pacific Railroad, connecting the Los Angeles ports with the South/Southeast regions of the U.S. In addition to freight traffic, passenger rail service is provided by Amtrak with a station in downtown Tucson connecting the City to Los Angeles, New Orleans, and Chicago via various rail lines.

The University of Arizona calls the City of Tucson home, as does the Davis-Monthan Air Force Base. Both have large economic influence, as the second and third largest employers respectively, as well as cultural influence on the City. The presence of the University and Air Force base draw high-tech industries to Tucson including Raytheon Missile Systems, the largest employer in the City, as well as Texas Instruments, IBM, Intuit, and Honeywell Aerospace leading to Tucson being recognized as a national leader in optics, astronomy, medical industries and aerospace and defense. Other large employers outside of the technology and defense industries include Walmart, Pima County's government, the Tucson Unified School District, U.S. Customs and Border Protection and the City of Tucson government. As of April 2016, Tucson had a civilian labor force of 477,600 with an unemployment rate of 5.0%.

Future Growth Scenario Map

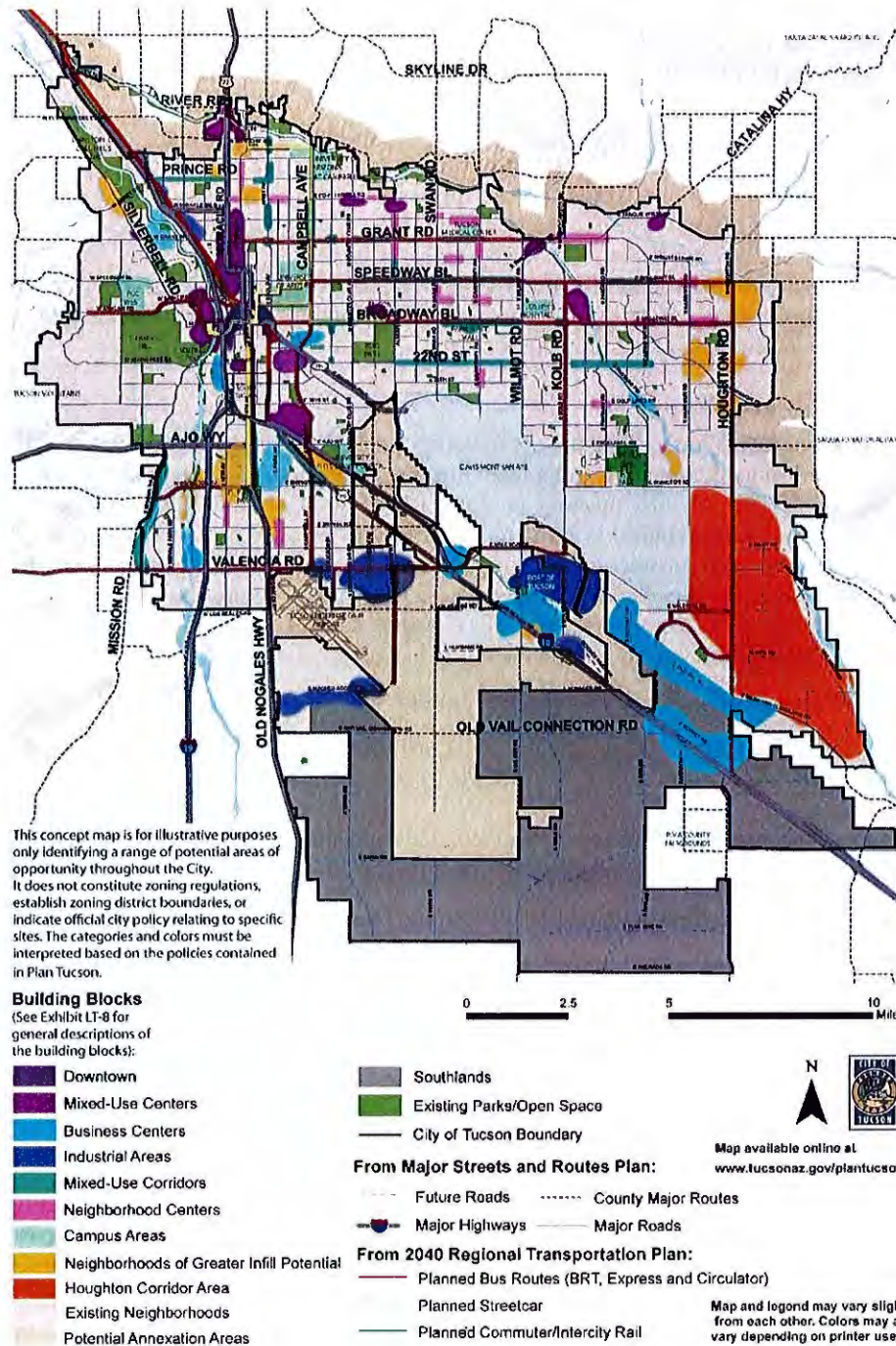


Figure 2-10: City of Tucson Generalized Distribution of Land Use & Future Growth

SECTION 3: PLANNING PROCESS

3.1 Planning Process

The 2017 update to the Plan was a countywide effort that included a revision and update of the previous plan, the integration of new components to the plan, and incorporation of new participants into the planning process. A multi-jurisdictional Planning Team was assembled to conduct the review of the 2012 plan, evaluate its efficacy over the last five years, and propose revisions for the 2017 plan. PCOEM served as the lead planning agency for the process, with support from the Arizona Department of Emergency and Military Affairs (ADEMA). The planning team elected not to use a consultant given that the 2012 plan would serve as the basis for revisions. PCOEM took the lead in recruiting participants, conducting Planning Team meetings, tracking progress, editing documents, and keeping the project on schedule. Jurisdictional Local Planning Teams were responsible for evaluating and updating the sections of the plan for their respective jurisdictions and supporting Pima County in the completion of the plan as a whole. Details regarding key contact information and promulgation authorities, the planning team selection, participation, activities, and public involvement are discussed in the following sections.

3.2 Planning Activities and Teams

The role of the Planning Team was to facilitate the coordination, research, and planning element activities to update the 2012 Plan. Four (4) multi-jurisdictional planning team meetings were conducted over the period of May through October of 2016, beginning with the first meeting on May 12, 2016. A separate meeting was held with multi-jurisdictional planners and their Geographical Information System (GIS) representatives to work exclusively on maps and data. Representatives from each jurisdiction were required to participate in all Planning Team meetings, as the meetings were structured to take the jurisdictions through a systematic planning process. At each meeting, next-steps and procedures were presented and discussed, progress was reported, and action items assigned. Subsequent meetings built on the information discussed previously and on the individual assignments completed between meetings.

The Planning Team took on the following primary responsibilities:

- Conveying information and assignments to the jurisdictional Local Planning Teams (LPTs) of which several jurisdictions organized for specific plan parts or for mitigation ideas and members are noted below,
- Ensuring all requested assignments were completed fully and returned on a timely basis, and
- Arranging for review and official adoption of the final Plan.

To support the Planning Team, the Jurisdictional Local Planning Teams were tasked with:

- Convening meetings as needed to work through assignments from the Planning Team,
- Providing support and data,
- Developing and refining mitigation strategies,
- Assisting with the prioritization of hazards and plan objectives,
- Assisting the Planning Team representatives with assignments,
- Making planning decisions regarding Plan components, and
- Reviewing the Plan draft documents.

The planning process for Pima County's Multi-Jurisdictional Hazard Mitigation Plan followed FEMA's 4-phase Disaster Mitigation Act (DMA) planning process:

1. Organize Resources
2. Assess Risks
3. Develop the Mitigation Plan
4. Implement the Plan and Monitor Progress

Cultivating a well-rounded, representative Planning Team was the responsibility of the PCOEM. Using the list of Planning Team Participants from the 2012 Plan as a guide, the PCOEM identified a list of potential participants and contributors to the 2017 Update Planning Team. PCOEM initiated contact with and extended invitations to participate

to jurisdictional representatives and agencies from all incorporated communities within Pima County, the Pascua Yaqui Tribe and the Tohono O’odham Nation.

The participating members of the Planning Team are summarized in Table 3-1. Copies of invited individuals and attendance sheets are in Appendix C Planning Process Documents.

Table 3-1: Planning Team Participants (participants in bold returning members)		
Name	Jurisdiction / Organization	Planning Team Role
Ackerman, Char	Town of Oro Valley Police Department Emergency Management	Planning Team Member, Jurisdictional Point of Contact, Local Planning Team Lead
Austin, Susan (Wood)	AZ Department of Emergency and Military Affairs	State Planning Manager, Management level support for planning effort, Mitigation strategy development
Bear, Courtney	Pima County Office of Emergency Management	Lead Planner
Bowen, Sheila	Town of Sahuarita Public Works Director	Planning Team member, Jurisdictional Point of Contact and Local Planning Team Lead
Carbajal, Manny	Town of Marana	Planning Team member, Jurisdictional Point of Contact, Local Planning Team Lead
Espinoza, Sandra	Arizona Department of Emergency and Military Affairs	DEMA representative for Southern Arizona, Planning Team member
Glenn, Erik	Pima County Information Technology	Planning Team Member, GIS Lead for the County
Groseclose, Sgt. Brian	Sahuarita Police Department	Planning Team member, Jurisdictional Point of Contact
Horton, Jeff	Tucson Airport Authority	Planning Team member, Tucson Airport Authority representative
Johnson, Sgt. Steven	Marana Police Department	Planning Team Member, Jurisdictional Point of Contact
Matus, Andre	Pascua Yaqui Tribe / Pascua Pueblo Fire Department	Planning Team Member, Lead Jurisdictional Point of Contact, Local Planning Team Lead
McGlone, Sgt. Matt	Sahuarita Police Department	Jurisdictional Point of Contact and Lead Planner for Sahuarita
Moya-Flores, Griselda	Pima County Office of Emergency Management	Planning Team member, Administrative
Nicolas Siemsen	City of Tucson / Office of Emergency Management	Jurisdictional Point of Contact and Lead Planner for City of Tucson
Rodriguez, Bernice	Pascua Pueblo Fire Dept.	Planning Team Member, Local Planning Team Administration for Pascua Yaqui Tribe

An integral part of the planning process was working with other agencies and organizations, both within and outside of the participating jurisdiction’s governance, to obtain specialized information and data for inclusion into the Plan or

to provide more public exposure to the planning process. In addition to the adopting jurisdictions, several agencies and organizations that operate within, or have jurisdiction over small and large areas of Pima County were invited to participate in the planning process. Some were invited to the first Planning Team meeting, while others were brought in as the Planning Team discovered a need for their assistance. Copies of the various meeting invitations are provided in Appendix B.

Those others agencies and organizations who assisted by providing data or otherwise contributing to this Plan are listed in Table 3-2. The specific jurisdiction with whom they collaborated is noted.

Table 3-2: Local Planning Team and Content Resources (participants in bold returning members)		
Name	Agency/Dept./Division	Role/Contribution
Abdelrasoul, Abdo	Town of Oro Valley	Local Planning Team Member GIS Support
Bender, Cheryl	American Red Cross	Sheltering and Community Organizations Active in Disaster
Bonser, Colby	Pima County Office of Sustainability and Conservation	Climate resource
Boyce, Karn	Town of Oro Valley Water Utility	Local Planning Team Member Buffelgrass Program
Boyer, Chuck	Town of Oro Valley IT Director	Local Planning Team Member
Brandhuber	Golder Ranch Fire Department	Local Planning Team Member for Oro Valley for wildfire expertise
Bradshaw, Gary	City of Tucson Fire Department	City of Tucson Representative
Canale, Brett	Marana GIS	Local Planning Team member
Casertano, Paul	Pima Association of Governments	Community description, Transportation and traffic
Chalmers, Seth	Pima County DOT	Local Planning Team member, Traffic and transportation for Pima County
Chavez, Kathy	Pima County Office of Sustainability	Local Planning Team Member
D'Entremont, Andy	Pima County Office of Emergency Management	Local Planning Team member
Drozd, Ken	NOAA	Climate and weather expert
Faas, Jim	Pima County Finance and Risk Management	Pima County finance information
Fontes, Antonio	Pascua Yaqui Tribe	Local Planning Team member, GIS representative for Pascua Yaqui Tribe
Geitner, Ian	Pascua Land Use	Land use planning for Pascua Yaqui Tribe
Groseclose, Sgt. Brian	Sahuarita Police Department	Planning Team member, Jurisdictional Point of Contact
Hamblin, Elisa	Town of Oro Valley Community Development and Public Works	Local Planning Team Member Long-range Principal Planner

Table 3-2: Local Planning Team and Content Resources (participants in bold returning members)		
Name	Agency/Dept./Division	Role/Contribution
Hammarstrom, Cptn. Mike	City of Tucson Police Dept.	Local Planning Team member, City of Tucson representative
Helfrich, Thomas	Pima County Flood Control District	Local Planning Team, Flood control
Hoppe, Jamie	Town of Oro Valley Community Development and Public Works	Local Planning Team Member Adopt-a-Wash Program
Horton, Jeff	Tucson Airport Authority	Planning Team member, Tucson Airport Authority representative
Huelle, Cheryl	Town of Oro Valley Community Development and Public Works	Local Planning Team Member Hazard Mitigation Project identification
Jacobs, Amanda	Town of Oro Valley Town Manager's Office	Local Planning Team Member Community Description
Jamarta, Julie	Pima Association of Governments	Population data and community description assistance
Karazs, Sarah	Arizona DOT	Environmental planning resource
Karlik, Jay	Rural/Metro Fire District / Fire Dept.	Local Planning Resource
Khawam, Yves	Pima County Development Services	Local Planning Team member, Code and enforcement resource
King, Chuck	Town of Oro Valley Community Development and Public Works Building Manager	Local Planning Team Member Ordinances, laws and codes
Kosiorowski, Joey	Green Valley Fire District	Local Planning Team member
Ladd, Keith	University of Arizona	Climate resource
Langdale, Paul	Arizona DOT	Environmental Planning
Lauber, Brian	Arizona Division of Forestry	Wildland fire information
Lee Muscarella, Lee	Golder Ranch Fire District Battalion Chief	Local Planning Team resource for Oro Valley
Lynn, Judy	Pima County Office of Emergency Management	Local Planning Team Member, Community Outreach, Public Information assistance
Mercer, Rita	Pima County Regional Wastewater Reclamation	Local Planning Team member, Wastewater, AZWARN
Miranda, Richard	Pima County Regional Wastewater Reclamation	Local Planning Team member, Wastewater, AZWARN
Moore, Mark	Town of Oro Valley Water Utility	Local Planning Team Member Water authority input on hazards and mitigation actions

Table 3-2: Local Planning Team and Content Resources (participants in bold returning members)		
Name	Agency/Dept./Division	Role/Contribution
Nassi, Richard	Pima Association of Governments- Transportation	Community description, Transportation and traffic
Orchard, Lynn	Pima County Regional Flood Control	Advisory information for flood hazard and notifications
Padilla, Robert	Pima County Natural Resources/Parks & Rec	Local Planning Team member, Parks and Rec information
Porter, Scott	Pima County Environmental Quality	Local Planning Team member, environmental resource
Ramsey, Aimee	Town of Oro Valley Community Development and Public Works Assistant Director	Local Planning Team Member General support
Riley, Kara	Oro Valley Police Department	Local Planning Team Member Public information and notice
Robinson, Julie	Pima County Office of Sustainability	Local Planning Team member, Climate resource
Rodriguez, Jose	Town of Oro Valley Community Development and Public Works Managing Engineer	Local Planning Team Member Hazard mitigation actions and projects development
Rutherford, Tony	Mountain Vista Fire District	Local Planning Team Member, wildfire hazard and mitigation projects
Saxe, Greg	Pima County Regional Flood Control	Local Planning Team member, Flood Hazard lead
Selover, Nancy	Arizona State University- Arizona State Climate Office	Climate expert
Shepp, Eric	Pima County Regional Flood Control	Local Planning Team member for Pima County, Flood information source
Smith, Allen	City of Tucson Police Dept.	City of Tucson representative
Thum, Gabe	Pima Association of Governments- Transportation Safety	Planning and demographics
Todnem, Mike	Oro Valley	Local Planning Team member
Valenzuela, Louis	Pima County Health Dept.	Local Planning Team, Health Department representative
West, Gary	Northwest Fire Department	Local Planning Team member
Wittenberg, Dan	Kinder Morgan	Industry representative
Youberg, Ann	State of Arizona- AZ Geological Survey	Geological expertise, Landslide specialist

3.3 Public and Stakeholder Involvement

Public involvement and input to the planning process was encouraged cooperatively among all of the participating jurisdictions using several venues throughout the course of the revision planning cycle. This Plan will remain on the County and individual jurisdictional websites on a continual basis once approved and adopted by each jurisdiction. Stakeholders are assumed jurisdictional representatives, technical and subject matter experts and others not considered members of the public who have an interest in the development or use of the plan.

The pre-draft public involvement strategy for the Plan development included press releases, and public web notices. The 2012 Plan was posted to the County website and made available for public review and comment. The local jurisdictions placed announcements on their websites linking the reader to the Plan on the County website. The post-draft strategy included posting the draft plan to the County website, with website links from local jurisdictions, and requesting public comment. Documentation of the outreach can be found in this Plan’s appendices.

The Pima County Office of Emergency Management also reached out to surrounding counties during plan revision at regional meetings held by the Arizona Department of Emergency and Military Affairs. AZDEMA also encouraged information sharing amongst Pima County’s surrounding counties of Santa Cruz, Pinal, Yuma and Cochise.

Tribal Definition of “Public”

The Pascua Yaqui Tribe has formulated the following statement to define “public” for the purposes of this planning effort to satisfy the Tribal Planning requirements:

“All residents of the Pascua Yaqui Reservation, as its boundaries may be revised from time to time.”

Table 3-3: Past Public and Stakeholder Involvement	
Jurisdiction	Activity or Opportunity
Pima County	<ul style="list-style-type: none"> • Maintained the county website that included the current Plan and provided contact information for continued comment and input. • Sought and managed a mitigation grant for Buffelgrass reduction. • Developed brochures regarding local threats in conjunction with the PCOEM website. • Attended community events and engage with the public on mitigation and preparation activities. • Conducted Emergency Management meetings with local emergency management professionals on a quarterly basis, and discussed hazard mitigation events. • Worked with Pima Regional Flood Control on Community Rating System requirements such as planning and exercising. • Maintained social media presence and focus on mitigation measures that citizens can take before monsoon and fire seasons.

Table 3-3: Past Public and Stakeholder Involvement	
Jurisdiction	Activity or Opportunity
City of Tucson	<ul style="list-style-type: none"> • City of Tucson Office of Emergency Management webpage was dedicated to preparedness and mitigation topics. • Performed annual “Operation Splash” outreach efforts to raise awareness of the dangers of driving through flooded washes and roadways. • Performed annual “Operation Freeze” outreach efforts to raise awareness of the dangers of cold and freezing weather. • Used the “Don’t Get Swept Away, Find a Safer Place to Play” campaign to encourage people to avoid flooded washes and other storm water infrastructure during the monsoon season. • The Tucson Office of Emergency Management regularly used social media sites to share preparedness and mitigation information to the public. • Declaration signed by the Mayor and Council of September Preparedness Month, with public preparedness outreach at public events, via social media, on television, etc. • Regular water conservation outreach efforts from Tucson Water Department via bill inserts, social media, television, etc. • Weekly preparedness and safety tips via the Tucson Fire Department posted online and aired on television. • Provided preparedness and mitigation brochures and pamphlets to each of the six City Council ward offices for their constituents, along with an orientation for Council staff on the mission of emergency management including mitigation efforts.
Town of Oro Valley	<ul style="list-style-type: none"> • Provided Water Conservation Messaging in Quarterly Town Newsletter. • Developed Media Release regarding pipe safety during cold weather. • Banned fireworks during dry months. • Signed a Town Proclamation in recognition of Beat Back Buffelgrass Day. • News release recognizing the Town of Oro Valley as having a NOAA Stormready designation. • Offered SKYWARN Weather Spotter Training in the Town of Oro Valley. • Signed a Town Proclamation declaring September National Preparedness Month. • Town of Oro Valley webpage was dedicated to water information and tips. • Provided hazard awareness information to residents through newsletters, social media, PSAs, website, brochures, neighborhood meetings, community events, and other. • Conducted presentations to the public about hazards and disaster preparedness. • Provided floodplain related information to targeted properties in high-risk areas. • Provided staff support and technical guidance to homeowners, businesses, and HOAs about flood mitigation projects on private property. • Expanded public participation in the Adopt a Street/Wash program.

Table 3-3: Past Public and Stakeholder Involvement	
Jurisdiction	Activity or Opportunity
Town of Marana	<ul style="list-style-type: none"> • Provided information to the public, business and first responders by participating in the Local Emergency Planning Committee (LEPC) for hazardous materials preparedness. • Provided floodplain related hazard and mitigation information to targeted properties in high-risk areas. • Provided flood hazard outreach to residents of the Town of Marana, located within the flood plain. • Created brochures for building within the flood plain. • Created a Town-wide Spill Control Plan, with flow chart to help Town employees and residents follow a simple plan for hazardous material spills. • Acquired a Small Quantity Generator (SQG) designation from the City of Tucson - Household Hazardous Waste (HHW) Facility for proper disposal of small quantities of hazardous waste. • Implemented Mandatory Storm Water Management Awareness Training for all Town employees, as mandated by (Small MS4 Permit) - (Marana SWMP) 6.3.6 Employee Training • Provided a library of pamphlets in the Marana Municipal Complex (MMC) Lobby area for all interested parties to peruse and take for reference. • During the 2016 General Plan meeting, the Town Emergency Management Coordinator distributed brochures on hazard mitigation and individual preparedness as part of public outreach.
Pascua Yaqui	<ul style="list-style-type: none"> • Continued mitigation activities in correlation to the Pascua Yaqui Tribe Improvement Projects program. • Referenced the plan on the Pascua Yaqui Intranet/Intranet and on Yaqui Radio Station PSAs. • The Pascua Yaqui Tribe continued to use the plan for reference for profiling of cultural sites for economic development. • The Pascua Yaqui Department of Public Safety, who oversees mitigation planning, has supported the plan by referencing the plan with other tribal departments for grants and infrastructure improvement opportunities. In 2016, the plan was referenced in the development of accreditation for the Tribal Health Department. • During Tribal Recognition Days, an information booth was set up to promote mitigation opportunities and hazard reduction.
Town of Sahuarita	<ul style="list-style-type: none"> • The Sahuarita Strategic Plan for Emergency Preparedness and the Sahuarita Emergency Operations Plan were posted on the website. • “Be Prepared” brochures were available at Town Hall to interested constituents. • Copies of Strategic Plan for Emergency Preparedness and Sahuarita Emergency Operations Plan maintained on town website.

Table 6-1 summarizes opportunities for continued public engagement and dissemination of information each jurisdiction plans to pursue when relevant and appropriate.

3.4 Reference Documents and Resources

Additional reference material, such as other plans, studies, reports, and technical information, was obtained during the planning process and reviewed for incorporation or reference in the updated plan. The majority of the additional reference material pertained specifically to the risk assessment and the capabilities assessment. To a lesser extent, the community descriptions and mitigation strategy also benefitted from additional document and technical information research. Table 3-4 provides a reference listing of the primary resource documents and technical resources reviewed

and used in the Plan. Detailed bibliographic references for the risk assessment are provided in each hazard risk profile in Section 4 as footnotes.

Table 3-4: Resource documents reviewed and incorporated in this plan	
Resource	Description of Reference and Its Use
AZ Department of Commerce	Reference for demographic and economic data for the county. Used for community descriptions
AZ Department of Administration	Reference for demographic and employment data for the county used in the community descriptions.
AZ Department of Emergency and Military Affairs	Resource for state and federal disaster declaration information for Arizona. Also a resource for hazard mitigation planning guidance and documents.
AZ Department of Water Resources	Resource for data on drought conditions, statewide drought management, and land subsidence all used in risk assessment.
AZ Geological Survey	Resource for earthquake, fissure, landslide/mudslide, subsidence, and other geological hazards. Used in the risk assessment.
AZ Model Local Hazard Mitigation Plan	Guidance document for preparing and formatting hazard mitigation plans for Arizona.
AZ State Department of Forestry and Fire Management	Source for statewide GIS coverage (ALRIS) and statewide wildfire hazard profile information. Used in the risk assessment for wildland fire.
AZ Drought Monitoring Technical Committee	Source for statewide drought information including monthly drought monitor reports.
AZ Wildland Urban Interface Assessment (2004)	Source of wildfire hazard profile data and urban interface at-risk communities. Used in the risk assessment.
Bureau Net (2017)	Source for NFIP statistics for Arizona.
Census Bureau	Source for 2010 and 2015 Census demographics
Federal Emergency Management Agency	Guidance (How-To series) for floodplain and flooding related NFIP data (mapping, repetitive loss, NFIP statistics), and historic hazard incidents. Used in the risk assessment and mitigation strategy.
HAZUS-MH	Based data sets within the program were used in the vulnerability analysis.
National Climatic Data Center	Online resource for weather related data and historic hazard event data. Used in the risk assessment.
National Weather Service	Source for hazard information, data sets, and historic event records. Used in the risk assessment.
National Wildfire Coordination Group	Source for historic wildfire hazard information. Used in the risk assessment.
Pima County Hazard Mitigation Plan (2012)	FEMA approved hazard mitigation plan that is the subject of the plan update process.
Arizona State Climatologist	Reference for weather characteristics for the county. Used for community descriptions and risk assessment.
National Fire Protection Association NFPA 1600: Standard on Disaster/ Emergency Management and Business Continuity Programs (2016)	Used to establish the classification and definitions for the asset inventory. Used in the risk assessment.
State of Arizona Hazard Mitigation Plan (2013)	The state plan was used a source of hazard information and the state identified hazards were used as a starting point in the development of the risk assessment.
USACE Flood Damage Report (1978)	Source of historic flood damages for 1978 flood. Used in the risk assessment.

Resource	Description of Reference and Its Use
USACE Flood Damage Report (1994)	Source of historic flood damages for 1993 flood. Used in the risk assessment.
US Forest Service	Source for local wildfire data. Used in the risk assessment.
US Geological Survey	Source for geological hazard data and incident data. Used in the risk assessment.
Western Regional Climate Center	Online resource for climate data used in climate discussion

SECTION 4: RISK ASSESSMENT

4.1 Section Changes

For the 2017 revision, the Planning Team spent considerable time discussing hazards and the distinction between human-caused and natural hazards. Because of these discussions and upon consideration of the hazards in the sphere of mitigation of natural hazards, several significant changes have been made to the Hazard Risk Profiles. Table 4-1 compares the hazards of previous plans to those chosen by the current Planning Team for 2017. In general, human-caused hazards have been removed from the 2017 plan.

One of the key elements to the hazard mitigation planning process is the risk assessment. In performing a risk assessment, a community determines “what” can occur, “when” (how often) it is likely to occur, and “how bad” the effects are, are generally categorized into the following measures:

Hazard Identification and Screening

Hazard Profiling

Assessing Vulnerability to Hazards

The risk assessment for Pima County and participating jurisdictions was performed using a countywide, multi-jurisdictional perspective, with much of the information gathering and development being accomplished by the Planning Team. This integrated approach was employed because many hazard events are likely to affect numerous jurisdictions within the County and are not often relegated to a single jurisdictional boundary. The vulnerability analysis was performed in a way such that the results reflect vulnerability at an individual jurisdictional level and at a countywide level. For the majority of the hazards, quantitative vulnerability was removed and a qualitative vulnerability created by each of the jurisdictions for the hazards that they identified as priorities in their area.

4.2 Hazard Identification

Hazard identification is the process of answering the question; “*What hazards can and do occur in my community or jurisdiction?*” For this Plan, the list of hazards identified in the 2012 Plan were reviewed by the Planning Team with the goal of refining the list to reflect the hazards that pose the greatest risk to the jurisdictions represented by this Plan.

Table 4-1: Comparison of Plan Hazards		
2007 Hazards for Plan	2012 Hazards for Plan	2017 Hazards for Plan
<ul style="list-style-type: none"> • Dam Failure • Disease • Drought • Extreme Heat • Flood • Hail • HAZMAT • Lightning • Subsidence • Thunderstorm • Tornado • Tropical Cyclone • Wildfire • Winter Storm 	<ul style="list-style-type: none"> • Disease • Drought • Earthquake • Extreme Heat • Flood • HAZMAT • Levee Failure • Severe Wind • Subsidence • Wildfire • Winter Storms 	<ul style="list-style-type: none"> • Drought • Earthquake • Extreme Cold • Extreme Heat • Flood • Landslide • Severe Wind • Wildfire

The review included an initial screening process to evaluate each of the listed hazards based on the following considerations:

- Experiential knowledge on behalf of the Planning Team with regard to the relative risk associated with the hazard;
- Documented historic context for damages and losses associated with past events (especially events that have occurred during the last plan cycle);
- The ability/desire of Planning Team to develop effective mitigation for the hazard under current DMA 2000 criteria;
- Compatibility with the state hazard mitigation plan hazards; and
- Duplication of effects attributed to each hazard.

Each jurisdiction evaluated and rated the hazards using the Calculated Priority Risk Index (CPRI) and met to discuss results amongst the jurisdictions after they had chosen hazards for their jurisdiction to address. Because of planning discussions, four hazards were deleted and one hazard was added as seen in Table 4-1. Additionally, Winter Storm was updated and revised to Extreme Cold. Below is a summary of those decisions for adding or removing a particular hazard by the main Planning Team:

- Disease was removed as a hazard in 2017 because the mitigation actions chosen during the last planning cycle were all planning or response actions. A lengthy discussion on whether or not disease is natural or human-caused also factored in the decision. Ultimately, since the Pima County Health Department has plans for disease outbreaks that include prevention and mitigation actions, it would be duplicative effort to keep Disease in this Plan.
- Hazards Materials were removed because it is normally a human-caused disaster and there are other plans, procedures and guidelines for hazardous materials in Pima County. The Pima County Local Emergency Planning Committee handles mitigation, prevention, preparedness, response and recovery with participants from local government agencies, business and academia.
- Levee failure was removed because none of the jurisdictions chose it as a priority hazard and most of the actions were taken due to following established rules and regulations. To describe flood issues in Pima County accurately, the Levee hazard was removed and pertinent information moved to the Flood hazard.
- Subsidence was removed because none of the Planning Team representatives felt that this was something that could be mitigated separately from the Drought hazard. In addition, the Arizona Department of Water Resources has found that land subsidence rates within the Phoenix and Tucson areas have decreased between 25% and 90% compared to the 1990s¹. This reduction is credited to increased management including reduced groundwater pumping, increased recharge.
- Landslide was added as a hazard after discussions with the Arizona Geological Survey and the Pima County Department of Transportation in one of the first planning meetings. Unincorporated Pima County felt that landslides are a hazard that can be addressed locally through mitigation actions.
- Winter Storm was revised to become Extreme Cold. There were several discussions at planning meetings about the confusion between Winter Storm, Extreme Cold, Severe Wind and Flooding. Initially it was decided that Winter Storm would stay in, but only the City of Tucson rated it as a hazard worth addressing. Upon looking at their mitigation action, it was clear it was an action for Extreme Cold. The decision was made that jurisdictions could run the CPRI for Extreme Cold and decide if they would like to address it as a priority hazard.

Individual jurisdictions also prioritized hazards and removed some from their chosen focus. They did this at the Local Planning Team level or individually by consulting with knowledgeable individuals in their jurisdictions. Below is a summary of changes for the 2017 Plan:

¹ AZ Department of Water Resources, Land Subsidence Report #3, 2017:
http://www.azwater.gov/AzDWR/Hydrology/Geophysics/documents/ADWRLandSubsidenceMonitoringReport_Number3_Final.pdf

- When reviewing their hazards, the Town of Oro Valley has identified that current resource allocation for winter storm hazards are focused primarily on preparedness or response type activities that are part of routine and annual operations.
- The Pascua Yaqui Tribe removed Drought as a hazard for being no longer necessary as their Tribal Land Department and the Bureau of Indian Affairs resources determined that they do not have sustainable water resources and at this time, resources can be focused on a more addressable hazard. They also removed Earthquake as they felt it was covered by the Arizona Geological Survey and Pima County as a whole. They removed Severe Wind as building codes are enforced by their Tribal Buildings Inspections group and as a result improved construction techniques that have reduced their vulnerability to the hazard.
- Sahuarita removed Wildfire as it did not rank high on the hazard and risk analysis and they are a part of the Pima County Community Wildfire Protection Plan (PCCWPP). They felt that latter was sufficient for addressing the hazard in their community.

The table below summarizes federal and state disaster declarations that included Pima County. If a hazard is not listed, that means there were no events reported for that hazard.

INCIDENT TYPE	DISASTER AREA	DECLARATION DATE		STATE DECLARATION	STATE	FEDERAL
		STATE	FEDERAL	TERMINATED	EXPENDITURES	EXPENDITURES
Flooding	Statewide Flood All Counties except La Paz, Mohave	08-Jan-93		15-Nov-02	\$ 30,072,157.03	\$ 104,069,362.11
Flooding	Pima County Flash Flood Emergency Pima County	16-Aug-99		23-Feb-00	\$ -	
Severe Wind, Flooding	Gila Bend/Ajo Storm Emergency Maricopa & Pima County	17-Aug-01		19-Feb-02	\$ 14,237.94	
Wildfire	Aspen Fire Pima & Pinal County	19-Jun-03	14-Jul-03	09-Jun-11	\$ 675,568.52	\$ 5,363,459.27
	Mediterranean Fruit Fly Emergency La Paz, Pima, Santa Cruz & Yuma	23-Sep-04		16-Sep-05	\$ 197,421.08	
	Border Security Emergency Cochise, Pima, Santa Cruz & Yuma	15-Aug-05		19-May-09	\$ 1,492,758.44	
Flooding	Flash Flood Emergency Pima County	16-Sep-05		07-Feb-08	\$ 256,948.47	
	Glassy-Winged Sharpshooter Inf. Cochise, Yuma, Pima, Pinal, Maricopa & Santa Cruz	23-Jun-06		19-May-09	\$ 567,257.48	
Severe Wind, Flooding	Monsoons & Flooding Pinal, Pima, Gila, Graham, Greenlee, Navajo	08-Aug-06	07-Sep-06		Est. \$ 2,409,278.00	\$ 12,141,752.40
Flooding	January 2008 Severe Precipitation Emergency - Pima County	19-Feb-08		28-Jan-11	\$ 231,798.65	
Winter Storm	January 2010 Severe Winter Storm				Est.	Est.
	Apache, Coconino, Gila, Greenlee La Paz, Maricopa, Mohave, Navajo, Pima, Pinal, Yavapai, City of Yuma	21-Jan-10	18-Mar-10		\$ 4,497,895.00	\$ 14,210,904.00
Totals					\$ 40,415,320.61	\$ 135,785,477.78

Source: AZDEMA Emergency Declarations 1966 to Present, 2017 <https://dema.az.gov/emergency-management/operationscoordination/recovery-branch/infrastructure>

4.3 Vulnerability Analysis Methodology

General

The following sections summarize the methodologies used to perform the vulnerability analysis portion of the risk assessment. For the 2017 plan revision, the entire vulnerability analysis was either revised or updated to reflect new hazard categories, the availability of new data, or differing loss estimation methodology. Individual jurisdictions discuss their vulnerability to chosen hazards in the appropriate section.

Calculated Priority Risk Index (CPRI) Evaluation

The first step in the vulnerability analysis (VA) is to assess the perceived overall risk for each of the plan hazards using the Calculated Priority Risk Index (CPRI). The CPRI value is obtained by assigning varying degrees of risk to four categories for each hazard, and then calculating an index value based on a weighting scheme. Table 4-3 summarizes the CPRI risk categories and provides guidance regarding the assignment of values and weighting factors for each category. Table 4-4 summarizes the CPRI results for each jurisdiction and unincorporated Pima County. Jurisdictions each worked under their Lead Planner to complete their own CPRI scores and then the Planning Team met to review all scored hazards for consistency. In addition to Table 4-4, each hazard section has a CPRI table where the jurisdictions in bold have chosen that hazard for the 2017 Plan.

Table 4-3: Calculated Priority Risk Index Categories and Risk Levels				
CPRI Category	Degree of Risk			Assigned Weighting Factor
	Level ID	Description	Index Value	
Probability	Unlikely	<ul style="list-style-type: none"> ▪ Extremely rare with no documented history of occurrences or events. ▪ Annual probability of less than 0.001. 	1	45%
	Possibly	<ul style="list-style-type: none"> ▪ Rare occurrences with at least one documented or anecdotal historic event. ▪ Annual probability that is between 0.01 and 0.001. 	2	
	Likely	<ul style="list-style-type: none"> ▪ Occasional occurrences with at least two or more documented historic events. ▪ Annual probability that is between 0.1 and 0.01. 	3	
	Highly Likely	<ul style="list-style-type: none"> ▪ Frequent events with a well-documented history of occurrence. ▪ Annual probability that is greater than 0.1. 	4	
Magnitude/Severity	Negligible	<ul style="list-style-type: none"> ▪ Negligible property damages (less than 5% of critical and non-critical facilities and infrastructure). ▪ Injuries or illnesses are treatable with first aid and there are no deaths. ▪ Negligible quality of life lost. ▪ Shut down of critical facilities for less than 24 hours. 	1	30%
	Limited	<ul style="list-style-type: none"> ▪ Slight property damages (greater than 5% and less than 25% of critical and non-critical facilities and infrastructure). ▪ Injuries or illnesses do not result in permanent disability and there are no deaths. ▪ Moderate quality of life lost. ▪ Shut down of critical facilities for more than 1 day and less than 1 week. 	2	
	Critical	<ul style="list-style-type: none"> ▪ Moderate property damages (greater than 25% and less than 50% of critical and non-critical facilities and infrastructure). 	3	

		<ul style="list-style-type: none"> ■ Injuries or illnesses result in permanent disability and at least one death. ■ Shut down of critical facilities for more than 1 week and less than 1 month. 		
	Catastrophic	<ul style="list-style-type: none"> ■ Severe property damages (greater than 50% of critical and non-critical facilities and infrastructure). ■ Injuries or illnesses result in permanent disability and multiple deaths. ■ Shut down of critical facilities for more than 1 month. 	4	
Warning Time	Less than 6 hours	Self-explanatory.	4	15%
	6 to 12 hours	Self-explanatory.	3	
	12 to 24 hours	Self-explanatory.	2	
	More than 24 hours	Self-explanatory.	1	
Duration	Less than 6 hours	Self-explanatory.	1	10%
	Less than 24 hours	Self-explanatory.	2	
	Less than one week	Self-explanatory.	3	
	More than one week	Self-explanatory.	4	

Jurisdiction	Drought	Earthquake	Extreme Cold	Extreme Heat	Flood	Landslide	Severe Wind	Wildfire
Unincorporated Pima County	x			x	x	x	x	x
Marana					x			x
Oro Valley	x			x	x			x
Pascua Yaqui Tribe				x	x			x
Sahuarita	x			x	x			
South Tucson	No data provided							
Tucson	x	x	x	x	x		x	

Asset Inventory

A detailed asset inventory was performed for the 2012 Plan to establish an accurate baseline data set for assessing the vulnerability of each jurisdiction's assets to the hazards previously identified. The Planning Team did not feel it was value added to update the inventory from the 2012 version, as the resource of a full time intern or a consultant to work on the data was no longer available. Pima County OEM obtained the critical infrastructure dataset from the Department

of Homeland Security, but was unable to use the data in HAZUS. The Pima County Geographical Information System team member was unable to integrate the data in a meaningful way. The only hazard that contains this information is the Flood Hazard Section 4.4.5 and a detailed explanation of the data is there.

Loss Estimations

The hazards profiled in this Plan revision may not include quantitative exposure and loss estimates. The vulnerability of people and assets associated with some hazards are nearly impossible to evaluate given the uncertainty associated with where these hazards will occur as well as the relatively limited focus and extent of damage. Instead, a qualitative review of vulnerability will be discussed to provide insight to the nature of losses that are associated with the hazard. For subsequent updates of this Plan, the data needed to evaluate these unpredictable hazards may become refined such that comprehensive vulnerability statements and thorough loss estimates can be made. Loss estimations for Flood to meet National Flood Insurance Program requirements are updated in the 2017 revision.

Development Trend Analysis

The updated analysis will focus on the potential risk associated with projected growth patterns and their intersection with the Plan identified hazards.

Specifically for the Pascua Yaqui Tribe, a new subdivision of 30 homes is in development. As this is a HUD project, the new homes will have safe zones around them for the wildfire urban interface. They are also working with their Land and Development, Facilities Management, and Housing Department to make sure the development has adequate drainage and infrastructure to reduce flood hazards. The Housing Department has increased the standard for windows and insulation and other construction materials to reduce the exposure to extreme temperatures with energy efficient design and construction.

Cultural and sacred sites are of high priority to the Pascua Yaqui Tribe and special attention is needed when considering hazard mitigation of these areas. Because of their cultural importance, these sites require special attention and protection. Normally, the Tribe does not share the location of these sites and areas. For this reason, these sites and areas will not be included in this Plan. The Pascua Yaqui Tribe will ensure within its internal planning efforts that these sites and areas are included in their mitigation activities. Cultural and Sacred sites are protected but are available for tribal use. Information on sites can be requested through the Land Department which is located at 7474 S. Camino Del Oeste. The Land Office Director can be reached at 520-879-5288. A separate appendix will be provided as an appendix to this plan for tribal use upon adoption with approximate areas but not exact locations of cultural and sacred sites.

4.4 Hazard Risk Profiles

The following sections summarize the risk profiles for each of the Plan hazards identified in Section 4.1. For each hazard, the following elements are addressed to present the overall risk profile:

- **Description**
- **History**
- **Probability and Magnitude**
- **Vulnerability**
 - **CPRI Results**
 - **Loss Estimations**
 - **Development Trends**

Much of the 2017 Plan data has been updated, incorporated and revised to reflect current conditions and Planning Team changes. Discussions for each hazard are limited to state and county impacts; however, jurisdictions may discuss historical events in their vulnerability statements.

The Environmental Risk and Vulnerability tables were an Emergency Management Accreditation Program (EMAP) requirement, so it has been removed from each section since they are not perceived as particularly beneficial to the Plan as well as the County not seeking EMAP accreditation at this time.

4.4.1 Drought

Description

Drought is a deficiency in precipitation over an extended period, usually a season or more, resulting in a water shortage causing adverse impacts on vegetation, animals, and people. It is a normal, recurrent feature of climate that occurs in virtually all climate zones, from very wet to very dry. Drought is a temporary aberration from normal climatic conditions, thus it can vary significantly from one region to another. Drought is different from aridity, which is a permanent feature of climate in regions where low precipitation is the norm, as in a desert.¹

Drought is a complex natural hazard on which human factors, such as water demand and water management, can exacerbate the impact. The following are three commonly used definitions¹:

- Meteorological drought is usually defined based on the degree of dryness, as compared to some “normal” or average, and the duration of the dry period.
- Hydrological drought usually occurs following periods of extended precipitation shortfalls that affect water supplies such as stream flows, reservoir and lake levels or groundwater.
- Agricultural drought links various characteristics of meteorological drought to agricultural impacts, focusing on precipitation shortages, soil water deficits, reduced ground water or reservoir levels needed for irrigation, and so forth.

The effects of drought increase with duration as more moisture-related activities are impacted. Non-irrigated croplands are most susceptible to precipitation shortages. Rangeland and irrigated agricultural crops may not respond to moisture shortage as rapidly, but yields during periods of drought can be substantially affected. During periods of severe drought, lower moisture in plant and forest fuels create an increased potential for devastating wildfires. In addition, lakes, reservoirs, and rivers can be subject to water shortages that affect recreational opportunities, irrigated crops, and availability of water supplies for activities such as fire suppression and human consumption, and natural habitats of animals. Socioeconomic effects include higher unemployment and lower land values. Insect infestation can also be particularly damaging impact from severe drought conditions.

History

Arizona has been in a state of long-term drought for approximately 21 years according to the Arizona Department of Water Resources 2015 Arizona Drought Preparedness Annual Report². Figure 4-1 depicts the most recent precipitation data from NCDC regarding average statewide precipitation variances from normal.

¹ National Weather Service. (2008, May). *Drought Public Fact Sheet*. Retrieved 2016, from <http://www.nws.noaa.gov/os/brochures/climate/DroughtPublic2.pdf>

² ADWR's 2015 Arizona Drought Preparedness Annual Report, <http://www.azwater.gov/AzDWR/StatewidePlanning/Drought/documents/2015ADPReport.pdf>