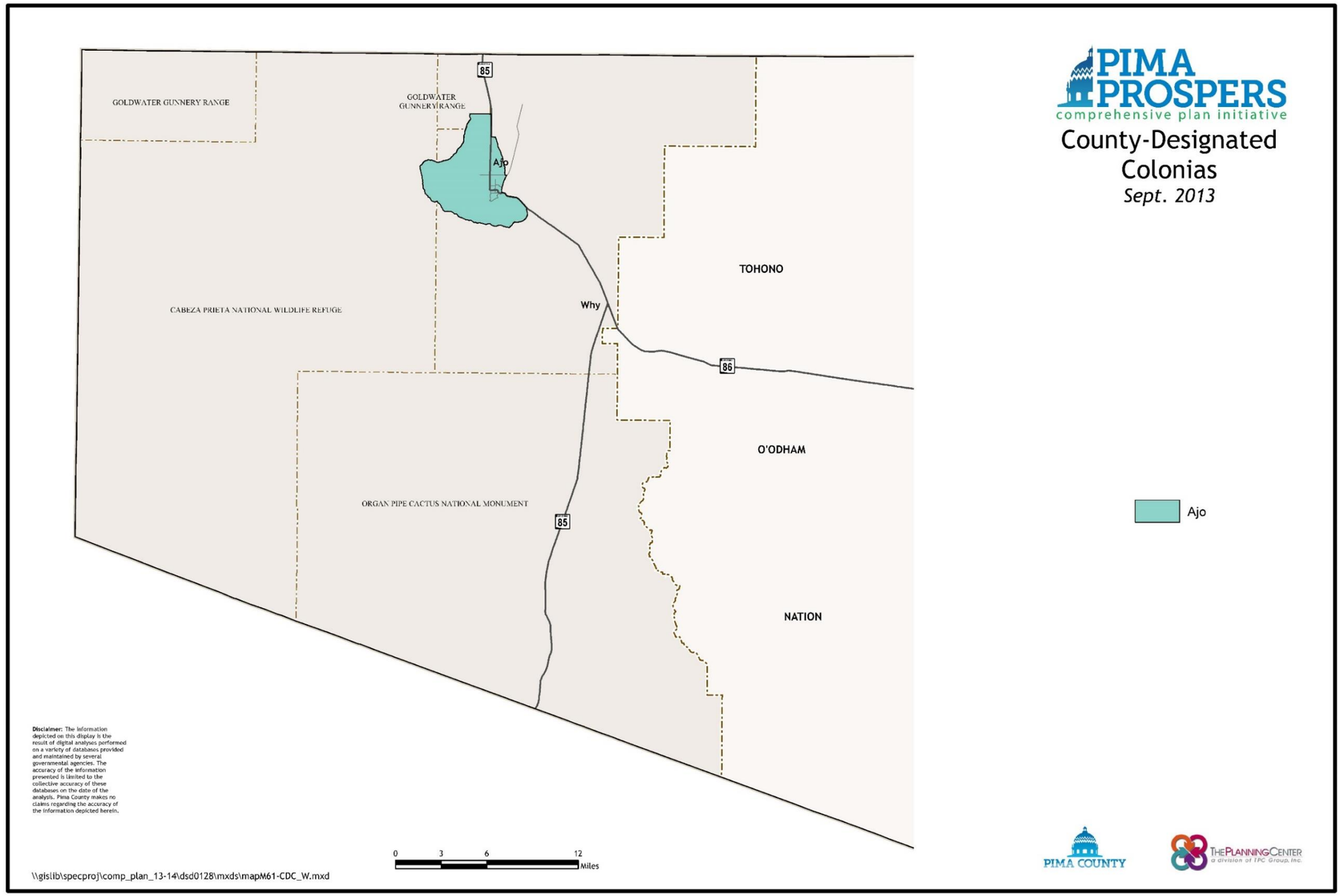
Exhibit 3.5.b: County-Designated Colonias



Physical Infrastructure Connectivity

Chapter 4: Physical Infrastructure Connectivity Background




Key Subjects

- ✓ Transportation
- ✓ Water Resources
- ✓ Energy
- ✓ Wastewater
- ✓ Environmental: Air Quality and Solid Waste
- ✓ Communications
- ✓ Public Buildings and Facilities
- ✓ Trails
- ✓ Flood Control/Drainage
- ✓ Infrastructure Concurrency

Important Notes:

1. At the time of the preparation of the infrastructure study that served as the core of this background document, the Tohono O'odham Nation was treated as a planning area for statistical purposes only. The Tohono O'odham Nation is a sovereign nation, and though the County recognizes the importance of the Nation to the region, the County has no jurisdiction over the Nation.

2. All Exhibits referenced in this chapter are included at the end of the chapter.

4.1 Transportation

The County transportation system includes roadways and bridges, railways, bus transit systems, airports, bikeways and pedestrian facilities. The following sections describe each type of facility or system followed by a section describing transportation-related issues. This background assessment leads to the development of goals and policies included in the Policy Document.

Facilities and Systems

Roadways

The public roadway system includes Interstates 10 and 19, state highways, arterial and collector streets, and local roadways and bridges. The county is responsible for building and maintaining only those public roadways in the unincorporated areas that are not controlled by the state. This includes approximately 1,800 miles of roadways from unpaved rural roads to 6-lane urban arterials.

Bus and Public Transit

Bus and public transit options for county residents are very limited outside the City of Tucson limits. Sun Shuttle operates nine routes that extend to various locations outside of Tucson including Green Valley and Sahuarita to the south and Marana and Oro Valley to the north. Dial-a-ride service is provided for individuals with disabilities and who live within eligible areas. Several SunTran routes - mostly the express routes - extend beyond the city limits to serve county residents. The lack of public transit makes mobility and access more difficult especially for those with lower incomes, the elderly and disabled. Public transit facilities also include bus stops, sidewalks, and bus pull-outs along the county roadway system.

Bicycle Facilities

Bicycle facilities include both the existing roadway network as well as separate shared-use paths. Drivers are required by State law to "share the road" and safely pass cyclists on any street, but many major roadways have five to six foot paved shoulders for bicycles. Local streets are also part of the bicycle network, whether signed as bike routes or not. Approximately three percent of all commuting trips are by bicycle, which ranks Tucson seventh in the nation[1]. Cyclists and other non-motorized users can use paved shared-use paths if they want to avoid riding on streets. The best example is The Loop which surrounds metro Tucson via the Rillito River Park, Santa Cruz River Park, Pantano River Park, Julian Wash Greenway, and Harrison Greenway. The county also provides education and encouragement programs including the Safe Routes to Schools Program to encourage more school children to bike and walk to school.

[1] The League of American Bicyclists, 2011

Pedestrian Facilities

Pedestrian facilities generally include sidewalks, crosswalks, traffic signals, paths and benches, bus stops, parking lots and the areas between vehicle parking areas and adjacent buildings. Crosswalk facilities include signalized intersections and specialized pedestrian-only traffic signals that stop traffic in one or both directions at a time to allow pedestrians to cross roadways in between intersections. Shared-use pathways such The Loop and the riverparks as well as walking and hiking trails are also a part of the county pedestrian system.

Aviation and Airports

Public airports in Pima County include Tucson International Airport (TIA), Ryan Airfield, the Marana Regional Airport and La Cholla Airpark in Oro Valley. Pima County owns and operates the Ajo Municipal Airport in Ajo, Arizona. While Pima County is not directly involved in airport planning and operations, the TIA as well as the Davis-Monthan Air Force Base strongly impact the regional economy and impact county airspace and adjacent land development by restricting building heights in airport zones.

Rail, Freight and Shipping

The Union Pacific Rail Line runs parallel to Interstate 10 and Interstate 19 to Mexico. Smaller rail spurs are associated with the Asarco Mine operations near Green Valley (along Pima Mine Road) and other locations. The intermodal Port of Tucson is located north of I-10 near Kolb Road along the main Union Pacific rail line. Planned expansion of the Port of Tucson will increase capacity for shipping more goods via rail. Increased trade with Mexico is anticipated which would increase trucking and potentially rail.

Transportation Issues

Several transportation related issues including roadway maintenance, safety and congestion have been raised at public meetings and expressed through public outreach efforts. These issues are discussed in this section and led to the development of transportation goals and policies which are part of the Policy Document of the comprehensive plan.

Deteriorating Roadway Conditions

County and city roads as a whole are not in great condition despite an aggressive capital improvement program which has widened and improved many arterial roadways since 1997. Approximately two-thirds of all roadways in the county are in poor or failing condition. Fixing these roads is a financial challenge, because many federal and regional (RTA) roadway funds can only be used to build new roads and cannot be spent on maintenance. State roadway funds have also declined. The county is currently spending approximately $23 million per year to fix the worst roadways, but total needs exceed $270 million. Alternative funding is needed to repair our roadways.

Improving Traffic Safety

Roadway and traffic safety is one of the highest priorities for Pima County, which collects and tabulates crash statistics for all roadways and intersections so that deficiencies can be identified and addressed. Roadways with the highest crash rates are prioritized for improvements which can include widening shoulders, reducing hills and curves, installing pedestrian-activitated crossing signals and other techniques. Many older roadways are not designed to accommodate flooding, so access and safety are problems during summer monsoon and winter rains. Driver education is an ongoing effort to encourage drivers to stay out of washes and avoid texting while driving for example.

Pima County has also been significantly involved in region-wide efforts to reduce wildlife/vehicle collisions. Either through the County's own project activities or in cooperation with other regional partners, startegies such as re-sizing culvert drainage features to facilitate passage of wildlife are being implemented on key roadways such as Silverbell and Tangerine Roads where wildlife mortality due to vehicle collisions is known to be a frequent occurrence. Pima County has also made financial contributions, as well as significant staff support, to the implementation of the first overpass crossing structure in southeast Arizona. This structure (along with other necessary amenities), has been made possible due primarily to funding allocations provided by the Regional Transportation Authority's Wildlife Linkage funds and this structure, as well as the other key wildlife features, have been incorporated into the Arizona Department of Transportation's SR 77 widening project. Incorporating the wildlife elements into the roadway project provided not only a great opportunity to maximize construction efficiencies, but also encompassed a critical wildlife connection between the Santa Catalina and Tortolita Mountains where wildlife mortality due to vehicle collision is significant, and would be expected to worsen due to the widened roadway.

Congestion and Capacity

Traffic congestion in Tucson is ranked 15th in the United States but this includes all the roadways within the city limits as well as those within the unincorporated areas[2]. The city, county and PAG all monitor traffic congestion in part by collecting traffic counts on all major and minor roadways. Traffic counts that exceed roadway capacities provide an indicator of congestion problems and suggest where limited funding may be spent. Following an aggressive capital improvement program funded by the 1997 bond issue and the 2006 RTA, many regional roadways and intersections have been widened to mitigate congestion problems. A review of 178 major roadways segments in the county indicates that only 12, or about seven percent, have volumes that exceed capacity. Some of these segments, such as Houghton Road, are being widened.

People are driving less now than in 2007. Similar state and national trends since 2006 have been explained by a number of factors, including the economic recession, increased gas prices, increased fuel

[2] Tom Tom Traffic Index, 2014

efficiency, and fewer younger drivers. Whether or not this trend continues will determine in part where and when future transportation investments should be made. The rate, location, and density of land use development will continue to determine transportation needs and limitations on roadway capacity will increasingly influence land use decisions.

Providing Transportation Choices

The County's built environment is characterized by low-density residential areas with commercial development located along major arterial roadways. Commercial development is often more concentrated at major intersections. As with many suburban and rural communities, many residential areas are not located close enough to commercial areas, employment, and other destinations to encourage walking versus driving. However, there is more interest in walking and bicycling as a means of healthy transport. Unfortunately, traditional zoning and street design discourages walking and instead promotes driving, even for relatively short trips. This is because zoning traditionally separates residential areas from non-residential areas and because subdivisions often do not connect to adjacent areas except via arterial streets. Subdivisions may have only one or two points of entry and exit and cul-de-sacs block off street connections to adjacent neighborhoods, shopping, and parks. A more open and connected street network supports walking and bicycling as convenient, safe, and healthy forms of transportation. Similarly, more flexible zoning allows residential areas to be located closer to shopping, work, and other destinations which make walking and bicycling a more viable means of personal transportation.

Improving Public Health

The linkage between transportation and public health has received an increasing amount of attention, as the nation searches to find more ways to address obesity and chronic disease. Americans spend more time in their vehicles, and school age children are walking and bicycling less than they did generations ago. This is the result of many factors such as suburbanization, cheaper housing located further away from city centers, longer driving distances, and safety concerns. Zoning laws historically separated housing areas from employment and commercial areas, resulting in people living further away from work, school, and shopping destinations. Transportation policies and investments historically focused on expanding roadway networks and traffic capacity with less focus on alternatives to driving.

Promoting Economic Development and Equity

Transportation investment and economic development go hand in hand. Investing in new roadways and improving existing facilities can stimulate economic development by providing the necessary infrastructure to support existing and growing businesses and attract new employers to the region. Regional access and mobility are important economic factors. Investments in public transit systems can also spur economic development along major transit routes as seen along the City's Streetcar Line. A balanced transportation system that serves all segments of the community can:

- Strengthen neighborhoods
- Engage historically under-represented communities
- Support distinctive places to live, work and play
- Provide people of all backgrounds with better access to opportunities
- Identify those areas that could benefit from Transit Oriented Development (TOD) and mixed use zoning and development

Transportation Planning and Design

Regional Transportation Planning

Transportation planning for the region begins with the long-range Regional Transportation Plan (RTP), administered by the Pima Association of Governments (PAG), which provides a vision for the region's transportation network over the next 30 years. The RTP includes all jurisdictions and all modes of travel, including auto, transit, bike and pedestrian. The PAG Transportation Improvement Plan (TIP) is a five-year schedule and budget of proposed transportation projects within eastern Pima County. Other plans contributing to transportation plans include the Short-Range Transit Plan, the Regional Plan for Bicycling, and other studies such as the Regionally Significant Corridors study.

Major Streets and Scenic Routes

The Pima County Major Streets and Scenic Routes Plan (MSSRP) is a map and an ordinance that 1) establishes adequate future street widths and setbacks along major streets, and 2) designates certain roads as "scenic" which places additional constraints on adjacent building development. Properties located adjacent to major and scenic routes are required to comply with specific setback and height requirements (scenic only). The current setback for major routes is 30 feet plus one-half the future right of way shown on the MSSRP, often 150 feet. The MSSRP is being updated to classify major routes according to size and function, modify right-of-way widths, and remove the 30 foot additional setback requirement for all major routes. This will provide additional land for private development while preserving an appropriate amount of right of way for future roadway conditions.

Exhibits 4.1.a and 4.1.b, included at the end of the chapter, show existing Major Streets and Scenic Routes.

Complete Streets

While roadways have historically been designed to move as much traffic as possible, current transportation trends are focusing more on building roadways that better accommodate all users of the roadway system, including transit vehicles, pedestrians and bicyclists. Smart Growth America defines complete streets as streets for everyone. They are designed and operated to enable safe access for all users, including pedestrians, bicyclists, motorists and transit riders of all ages and abilities. Complete

streets are easier to cross, walk to shops, and bicycle to work. They allow buses or other forms of public transit such as streetcars to run on time and make it safe for people to walk to and from transit stops. Pima County designs roadways to accommodate current and anticpated users of the roadway including buses, bicycles and pedestrians and even equestrians in specific locations. All new roadways include shoulders for bicycle use, and sidewalks are provided where walking is observed or planned.

Green Streets

Another new trend in roadway design and sustainability is the integration of stormwater management within the roadway right of way. Roadways that are designed to accommodate stormwater typically drain water off the roadway through channels and culverts. Rather than seeking to collect and remove all stormwater, berms and swales can be incorporated into the non-paved areas alongside roadways. This allows rainwater to be directed into basins to water trees and into landscaped areas that allow water to infiltrate rather than be carried away. These systems can reduce irrigiation needs for landscaping, encourage walking by providing shade trees alongside roadways, and reduce the amount of water that is directed away from communities.

TABLE 4.1.a: Roadways with Highest Volume to Capacity Ratios

Roadway	Limits	# of Lanes	Traffic Volume	Traffic Capacity	Over/ Under Capacity	Speed Limit	Transit	Bike	FHWA Classification	MS&SRP Classification	Vol/Cap Ratio
Cortaro Farms Rd	Stargrass Dr to Thornydale Rd	2	18,800	14,900	over	40	N	N	Urban Minor Arterial	Scenic Major	1.26
Houghton Rd	Escalante Rd to Corte Madera	2	24,500	14,900	over	45	N	Y/N	Rural Minor Arterial	Major Scenic	1.64
	Old Vail Connection Rd to Old Vail Rd	2	15,000	13,600	under	55	No	Yes	Rural Principal Arterial	Major Scenic Route	1.10
Ina Road	CDO Wash to La Cholla Blvd	4	35,400	33,000	over	45	Y	Y	Urban Principal Arterial	Scenic Major	1.07
	La Cholla Blvd to Skyline Dr	4	35,000	33,000	under	45	Y	Y	Urban Principal Arterial	Major Scenic	1.06
Orange Grove Rd	Orange Blossom Ln to Shannon Rd	2	24,100	14,900	over	45	Y	Y	Urban Principal Arterial	Major	1.62
	La Cholla Blvd to Oracle Rd	2	22,000	14,900	over	45	N	Y/N	Urban Principal Arterial	Major	1.47
	Oracle Rd to Skyline Dr	2	16,000	14,900	over	45	N	Y	Urban Principal Arterial	Major	1.07
River Road	Shannon Rd to Alvernon Way	4	36,000	33,000	under	45	Y	Y	Urban Principal Arterial	Major Scenic	1.09
Skyline Dr	Ina Rd to Sunrise Dr	4	34,000	33,000	under	45	N	Y	Urban Principal Arterial	Major Scenic	1.03
Sunrise Dr	Skyline Dr to Craycroft Rd	4	36,500	33,000	under	45	Y	Y	Urban Principal Arterial	Major Scenic	1.11
Thornydale Road	Cortaro Farms Rd to Camino del Norte	2	19,500	14,900	over	45	Y	N	Urban Minor Arterial	Scenic Major	1.31

Source: Pima County Department of Transportation, 2014.

4.2 Water Resources

Water, the most limiting factor in the Sonoran Desert, is a subject of focus throughout the Southwest, specifically in Arizona as increasing water demands are placed. When addressing growth and development in Pima County, the impacts for this natural resource must be considered.

Water Availability

Water supply sources available in Pima County include imported Colorado River water through the Central Arizona Project (CAP) canal, groundwater and reclaimed water produced at Tucson Water's reclaimed water facilities adjacent to the Agua Nueva Water Reclamation Facility (WRF). Underground Storage Facilities, of which there are six, store renewable water, either CAP water or reclaimed water, in an underground aquifer.[3] [4]

Arizona Department of Water Resources (ADWR) manages the State's Assured Water Supply Program which covers subdivisions within the Tucson Active Management Area (AMA). This program was created as part of the 1980 Groundwater Management Act to conserve groundwater. The assured water supply regulations require all new subdivisions to be served by a water provider with a designated assured water supply or to be certified as having an assured water supply.

The Central Arizona Groundwater Replenishment District (GRD) was created to allow subdivisions with no access to renewable water to continue to grow while meeting assured water supply rules. The GRD agrees to replenish the groundwater that will be pumped to serve the subdivision and the subdivision agrees to pay GRD's costs to acquire renewable water and replenish it on behalf of the subdivision.

Water Supply and Demand Management

The Bureau of Reclamation completed a study of the Colorado River Basin that supplies seven states, and the Central Arizona Project (CAP) with its share of 1.5 million acre feet delivered annually to Pima County as well as Pinal and Maricopa Counties. Basin-wide, shortfall between projected water supply and demand is likely; an estimated 3.2 million acre feet or more a year by 2060.

The Arizona Department of Water Resources (ADWR) reached a similar conclusion in the report, Arizona's Next Century: A Strategic Vision for Water Supply Sustainability. Some areas of the state are expected to experience constrained growth due to water shortage and new water supply acquisition or importation will be required.

Lake Mead, supply source for CAP water, is forecast to continually decline due to the recurring structural deficit of more water required by the Basin states than is naturally supplied to the reservoir. This deficit,

[3] http://www.azwater.gov/azdwr/WaterManagement/Recharge/TypesofRechargePermits.htm
[4] Knowledge Portals: Energy Management: Energy Efficiency and Pumping: FAQ's, Water Research Foundation, www.waterrf.org, 2013

although exasperated by drought, exists despite it. Water level at Mead serves as a trigger for mandatory reductions of CAP water. The increasing probability of lower water levels corresponds to the likelihood of less CAP water delivered to Pima County- although at first only impacting the agricultural sector.

The Bureau of Reclamation and the Arizona Department of Water Resources (ADWR) studies recommend using all water supplies as efficiently as possible and the expansion of reclaimed water use for non-potable purposes to ease potable demand. Effluent has and will continue to be a key water supply in the state's management plans and goal of safe yield, or hydrological balance. Yet both reports agree that no one strategy will solve future imbalance; augmentation will be required despite conservation and reuse efforts.

Exhibits 4.2, included at the end of the chapter, shows Water Service Areas servicing Pima County by planning area.

TABLE 4.2.a: Water Service Areas Total Acreage by Planning Area

Planning Area	Water Service Areas (Acres)
1) Avra Valley	15,849
2) Tucson Mountains	28,045
3) Southwest	27,701
4) Altar Valley	5,465
5) Upper Santa Cruz	16,697
6) Mountain View	0
7) Southeast	61,077
8) Central	69,591
9) Catalina Foothills	68,282
10) Rincon Valley	9,105
11) Tortolita	47,074
12) San Pedro	0
13) Ajo-Why	0
Total All Planning Areas:	**348,885**
Total County:	**348,885**

Source: Pima County Information Technology Department, Geographic Information Systems, 2013

Avra Valley Planning Area (1)

This planning area is one of the few areas that has experienced rising groundwater levels along the Santa Cruz River corridor primarily due to the presence of CAP recharge facilities and reclaimed water discharged, however, ground water levels in the vicinity of Brawley Wash and west of the Tucson Mountains have declined.[5]

No reclaimed water is delivered in this planning area; the reclaimed water infrastructure does not extend to this area. Much of the residential water service is provided by exempt wells that provide water to unregulated subdivisions.
The water providers are:

1) Marana Water (a municipal water utility) provides water service primarily within its limits.[6] Marana Water is taking its full CAP allocation;
2) Avra Valley Water Co-op provides water service to the Picture Rocks area. Avra Valley Water Co-op has a CAP allocation but does not take it;
3) Tucson Water is the largest municipal water provider in Pima County and has a CAP allocation.

In the Avra Valley planning area, Tucson Water only provides water service to three isolated service areas (i.e. eastern boundary of the Ironwood Forest, southwest of El Tiro Road and Anway Road, and near Silverbell Road at the western boundary of the Town of Marana). [7]

There are four Groundwater Replenishing District (GRD) subdivisions within the planning area. Marana Water and Tucson Water are both member service areas of the GRD. There are a number of recharge facilities in the planning area, so replenishment conducted by the GRD occurs relatively close to where the water is being withdrawn. Tucson Water has not used the GRD to replenish on its behalf, but could do so if the need arises. Marana has used the GRD to replenish.

Tucson Mountains Planning Area (2)

Tucson Water, Marana Water and Avra Valley Water Cooperative are all providers in this area and have CAP allocations. The smaller water providers are Avra Valley Water Cooperative, Lazy C Water Service and Logan Hills Water Company. Only Avra Valley Water Co-op has a CAP entitlement and none have a reclaimed water entitlement. There are no member GRD subdivisions in this planning area. Depth to groundwater varies widely in this planning area. Reclaimed water in the Tucson metropolitan area is produced at the Tucson Water's reclaimed water facilities adjacent to the Agua Nueva Water Reclamation Facility.

5 ADWR Water Atlas, Volume 8, Section 8.5 Tucson Active Management Area, page 380.
6 Town of Marana 2010 Potable Water Master Plan, Final Draft, Westland Resources, September 2010.
7 City of Tucson Water Service Area Policy, City of Tucson Resolution 21602, adopted August 4, 2010.

Southwest Planning Area (3)

Tucson Water and Metro Water are the major water providers in this area. Both water providers have CAP allocations. In 2012, Tucson Water began taking delivery of its entire 144,172 acre-feet entitlement of CAP water at its Clearwater Renewable Resource Facility located at the western portion of the Southwest Planning Area. CAP water is recharged in two recharge facilities, Central Avra Valley Storage and Recovery Project (CAVSARP) and South Avra Valley Storage and Recovery Project (SAVSARP) where it is blended with groundwater. The CAP/groundwater blend is recovered in water wells located around the recharge basins and delivered to Tucson Water customers throughout their service area. CAVSARP is permitted by ADWR to recharge up to 100,000 acre-feet of CAP water, while SAVSARP is permitted to recharge up to 60,000 acre-feet of CAP water.

Metro Water plans to enter into a CAP wheeling agreement in the future that will deliver CAP water from the Tucson Water recharge facilities to areas to be served by Metro Water. Some parcels in this planning area are within the City of Tucson non-expansion area, meaning no water service provider is designated to serve these parcels. Reclaimed water could be made available from the Avra Valley Water Reclamation Facility, but no reclaimed water delivery system is in place.

Altar Valley Planning Area (4)

The major source of water is groundwater. No major water providers are located in this planning area. Residential water service is provided by non-exempt wells. No reclaimed water is available to this area.

Upper Santa Cruz Planning area (5)

The major source of water is groundwater. Other water supply sources are CAP water, reclaimed water and mountain front recharge. The planning area is served by six major municipal water providers, several smaller providers and a number of privately-owned groundwater wells. The major municipal water providers are Farmers Water Company, Green Valley Domestic Water Improvement District, Community Water Company of Green Valley, Sahuarita Water Company, Las Quintas Water Company, and Quail Creek Water Company. The two water providers with CAP allocations are Community Water Company of Green Valley and the Green Valley Domestic Water Improvement District.

Replenishment facilities in the planning area include Pima Mine Road Recharge Project, Robson/Quail Creek, Town of Sahuarita Recharge Facility, and the FICO Groundwater Savings Facility (it has not stored water because of the lack of physical infrastructure to deliver either CAP or effluent). Reclaimed water from the Green Valley Water Reclamation Facility is fully committed to golf course irrigation. Effluent from the Arivaca Junction Water Reclamation Facility is delivered to a local ranch and is restricted to agricultural use.

Mountain View Planning Area (6)

The major source of water is groundwater. No major water providers are located in this planning area. Residential water service is provided by non-exempt wells. No reclaimed water is available to this area.

Southeast Planning Area (7)

Tucson Water is the primary water company providing potable service. This planning area receives a blend of CAP water and groundwater. For the City, groundwater will remain an important supply source to meet peak demand and provide a backup supply. Other water providers include the Vail Water Company and, to the south in the Sahuarita/Green Valley Area, the water providers include Farmers Water, Sahuarita Water, Community Water and Green Valley Water Company. There are also small individual water providers including Voyager RV which serves an RV campground and the Arizona State Prison as well as numerous exempt private wells.

Reclaimed water is available to an urbanized portion of this planning area and effluent is recharged through percolation ponds at the Green Valley and Corona de Tucson Water Reclamation Facilities.

Central Planning Area (8)

A majority of the planning area is within the incorporated area of the City of Tucson and receives most of its water supply from Tucson Water. Other water providers include Flowing Wells Irrigation District and the Vail Water Company. Davis-Monthan Air Force Base provides its water within the base boundaries and the University of Arizona provides about half of its water supply through groundwater wells and the remainder is provided by the city's water utility.

Reclaimed water treated by Pima County and delivered through Tucson Water's reclaimed water system serves municipal parks and golf courses. There are two major stormwater harvesting projects located in this planning area.

Catalina Foothills Planning Area (9)

This planning area has few GRD subdivisions. The major water providers are Metro Water and the Mt. Lemmon Water District, serving Summerhaven, which provides water service derived from mountain springs. Tucson Water provides municipal water service.

Groundwater is an important source and beginning in 2000, groundwater levels in the central area have increased due to Tucson Water's delivery of the CAP/groundwater blend. Tucson Water delivers reclaimed water within its service area. A comparatively smaller source of water, rainfall and snowmelt, replenish the aquifer as mountain front recharge[8] and a number of springs are located in this planning area (e.g. Agua Caliente, Bear Wallow and La Cebadilla).

[8] http://www.azwater.gov/azdwr/WaterManagement/AMAs/documents/ch2-tuc.pdf

Metro Water was created to serve a specific portion of unincorporated northwest Tucson but has added three service areas in unincorporated Pima County including the Hub, located in the Catalina Foothills Planning Area. Metro Water has a CAP allocation which is primarily recharged. Metro Water has a reclaimed water entitlement through an agreement with Tucson Water but currently has no plans to deliver reclaimed water directly to areas within this planning area.

Rincon Valley Planning Area (10)

Municipal water providers that serve this area include Vail Water Company, Spanish Trail Water Company and Saguaro Water Company. Tucson Water serves a small portion of the area.

Vail has a CAP allocation and had taken its full allocation and recharged it at facilities in the Marana area[9]. Vail Water Company has no share of reclaimed water. Spanish Trail has a CAP allocation and recharges at facilities in the Marana area.[10] Spanish Trail has a share of reclaimed water which is recharged. Although both Vail and Spanish Trail water companies have CAP allocations, their delivery systems do not access CAP water directly due to the lack of infrastructure. In 2013, Vail entered into a wheeling agreement with Tucson Water for the recharge and subsequent direct delivery of the utility's CAP allotment, a maximum of 1,857 acre-feet a year, thereby eliminating that volume of groundwater pumping in the Vail service area and the hydrological disconnection between recharge and recovery sources. Saguaro Water Company service area has a number of GRD subdivisions. Saguaro Water Company has no CAP allocation or reclaimed water. Tucson Water only provides water service to two small areas. Rural areas without service from these providers rely on private wells. A comparatively smaller source of water, rainfall and snowmelt, replenish the aquifer as mountain front recharge.[11]

Tortolita Planning Area (11)

Major municipal water providers that serve this area include the Town of Oro Valley, Town of Marana, Metro Water and Tucson Water. The service areas of Oro Valley and Metro Water are entirely within this planning area. Tucson Water serves isolated areas and the Town of Marana's water utility serves limited portions of the planning area. The Town of Oro Valley's water utility generally serves its incorporated area. Oro Valley has a CAP allocation. Oro Valley has an effluent entitlement through an agreement with Tucson Water. Several smaller water providers also provide residential water service. Rural areas that do not receive municipal water from these water providers rely on private wells for water service.

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9 ADWR Annual Status Report found at: http://www.azwater.gov/azdwr/WaterManagement/Recharge/PermittedFacilities.htm

10 ADWR Annual Status Report found at: http://www.azwater.gov/azdwr/WaterManagement/Recharge/PermittedFacilities.htm

11 http://www.azwater.gov/azdwr/WaterManagement/AMAs/documents/ch2-tuc.pdf

The County and City of Tucson have an intergovernmental agreement regarding effluent entitlements and the City also has separate agreements with Oro Valley, Marana and Metro Water for effluent entitlements. In this planning area, the Marana water utility serves three specific areas. Marana currently relies exclusively on groundwater.[12] All of their entitlement is recharged to offset groundwater pumping. Tucson Water provides reclaimed water to several golf courses. Several smaller water providers provide municipal water to this planning area. None of these providers has a CAP or reclaimed water entitlement. There are several GRD member subdivisions. This planning area is highly dependent on groundwater because it is up gradient from the renewable sources of water, CAP water and reclaimed water, and because of the distance to these water sources.

San Pedro Planning Area (12)

The major source of water is groundwater. No major water providers are located in this planning area. Residential water service is provided by non-exempt wells. No reclaimed water is available to this area.

Ajo Planning Area (13)

Municipal water service is provided by the Ajo Improvement Company, a private water company regulated by the Arizona Corporation Commission. Groundwater is the major source of water for this area. The Ajo Improvement Company has approximately 1,100 customers and sold 0.5 acre-feet in 2012, according to an annual report filed with the Corporation Commission.[13]

Water Demand Assessment

Pima County is not a water provider and is not responsible for assuring water supply for residential or commercial users, therefore the County does not have actual demand data. Yet Pima County does ask for 100 year assured water supply from the developer while approving a residential subdivision. There is no requirement for 100 year assured supply for commercial development. On a per capita basis, residential demand has not increased due to various conservation approaches adopted by municipalities.

Current Water Demand

This section summarizes current water demand by planning area where data is available.

Avra Valley Planning Area (1)

This planning area is generally characterized as rural residential. Based on a population of 22,856 and an average per capita water consumption of 120 gallons per person per day, the estimated water demand is 384 acre-feet per year.

[12] Town of Marana 2010 Potable Water System Master Plan, August 31, 2012
[13] http://www.azcc.gov/Divisions/Utilities/Annual%20Reports/Wastewater.asp

The planning area is sparsely populated with pockets that have developed through unregulated lot splits. Many areas are not served by a municipal water provider and obtain their water from exempt wells. Exempt wells are primarily used for residential, non-irrigation purposes and have a maximum pump capacity of 35 gallons per minute. These wells are less regulated by the Arizona Department of Water Resources (ADWR) and are exempt from reporting well pumping volumes to ADWR. The proliferation of exempt wells can decrease groundwater levels. Because of its rural nature and number of unregulated subdivisions, many areas in the planning area are not connected to the public sewerage system and rely on individual septic tank systems for residential sewage. The northeast portion of the planning area is connected to a public sewerage system as detailed by the Regional Wastewater Reclamation Department (RWRD). For the less dense, rural areas, lack of connection to a public sewerage system means this wastewater cannot be captured as reclaimed water and used for irrigation and landscape.

The major demand for water in the area includes:

- Schools and parks with turf facilities utilize potable supplies since no reclaimed water infrastructure is available in this planning area. There are no golf courses in this planning area.
- Agricultural Water - The eastern portion of the planning area has 38,045 acres of agricultural lands. Groundwater pumping for agricultural use is regulated by ADWR. Only land with an Irrigation Grandfathered Right can be irrigated with groundwater within an AMA. The landowner must participate in one of two ADWR water conservation programs.
- Mining – The ASARCO Silverbell Mine is located in this planning area. Mines have rights to pump groundwater pursuant to Type 1 and Type 2 non-irrigation grandfathered water rights and groundwater withdrawal permits. The amount of groundwater used can fluctuate widely depending on the copper market conditions.

Tucson Mountains Planning Area (2)

This planning area is generally characterized as residential. Based on a population of 63,422 and an average water usage of 120 gallons per person per day, the estimated potable water demand in this planning area is 7.7 million gallons per day or 8,600 acre-feet per year. The largest commercial/industrial user is Carondelet St. Mary's Hospital which uses approximately 234,226 gallons per day and receives water service from Tucson Water.

Other water use sectors in this planning area include turf and sand/gravel operations. The predominant turf water demand is from parks and golf courses. Four golf courses are located in this area and all but one receives reclaimed water from the City reclaimed water system. A list of the area's golf courses, water source and water provider is listed in Table 4.2.b.

TABLE 4.2.b: Water Source and Water Provider for Golf Courses

Golf Course	Water Provider	Water Source
Starr Pass	Tucson Water	Reclaimed
Silverbell	Tucson Water	Reclaimed
El Rio	Tucson Water	Reclaimed
Quarry Pines	CMID	Groundwater

Source: Pima County Infrastructure Plan, 2013.

Schools and parks typically have playground and sports fields irrigated with water. The City of Tucson's parks are irrigated with reclaimed water and include Menlo Park, Joaquin Murrieta Park and Santa Cruz River Park from Mission Lane to Grant Road. Christopher Columbus Park is irrigated with low quality non-potable groundwater. Opportunities exist to bring reclaimed water to Sportspark as the Tres Rios (Ina Road) Water Reclamation Facility is close by. The Town of Marana operates a number of parks in this planning area that are irrigated with groundwater. These include Continental Ranch Community Park, Continental Reserve Park, Wade McLean Neighborhood Park and Crossroads at Silverbell District Park.

Southwest Planning Area (3)

Pima County's southwest area has been identified by County planners as a potential and strategic growth area. To accommodate population growth, the existing infrastructure must be improved and expanded. The Pima County Southwest Infrastructure Plan (SWIP) provides a basis for infrastructure decision-making related to development in the Southwest Planning Area. It quantifies the nature, phasing, financial impacts, and funding possibilities for those flood control, parks and recreation, transportation, water, wastewater infrastructure and other improvements that are necessary to service future saturation growth within the study limits. The SWIP includes a framework for sustainable infrastructure planning for water conservation and reuse.

Altar Valley Planning Area (4)

Encompassing a total of 1,027 square miles, Altar Valley is the largest planning area in Pima County. With a total population of 7,044 in 2010 and a population density of seven persons per square mile, Altar Valley is one of the least populated areas in Pima County. Only approximately 73.9 percent of this planning area, or 485,377 acres, is located within Pima County unincorporated area as large portions are included in the Buenos Aires National Wildlife Refuge, the Coronado National Forest, Baboquivari Peak Wilderness Area, and sections of the Tohono O'odham Nation.

Currently, approximately 84,200 acres, or 11.8 percent of this planning area is developed/non-vacant land including ranching/agricultural uses or open space. Of the vacant land, 56.1 percent is state owned; 29.8 percent is federally owned; 8.6 percent is owned by the Tohono O'odham Nation, 1.8 percent is county owned; and 0.5 percent is municipally owned. Most of the planning area is undeveloped with the following exceptions: Diamond Bell Ranch subdivisions; unplatted GR-1 zoned residential areas; Three Points and Arivaca.

The area's limited residential development is low density and dispersed in nature. The major water users include agriculture, mining, golf courses and schools, Tucson Water, and municipal, county, state and federal parks. There are 21 water providers in this planning area.

Green Valley Planning Area (5)

This planning area is generally characterized as a retirement community with a population of 49,820. The primary water users in this planning area are metal mining and agriculture. Other water uses include municipal, golf courses and sand and gravel operations. The following table shows current and projected water use data based on 2006 water use for each user sector.

TABLE 4.2.c: Green Valley Planning Area Water Use (acre-feet per year)

Major Water Users	Actual Water Use[14]	Projected Water Use[15]	
Year	**2006**	**2015**	**2025**
Metal Mining[16]	34,600	54,000	54,000
Agriculture	29,800	28,100	18,700
Municipal	7,575	14,100	16,300
Golf Courses	4,375	5,600	5,600
Sand & Gravel	475	700	700
Total	76,825	102,502	95,300

Source: Pima County Infrastructure Plan, 2013.

Metal Mining

Metal mining is the single largest groundwater user in the planning area. Two mines, Freeport McMoRan and ASARCO, use approximately 34,600 acre-feet of water annually and account for 45 percent of the water demand in the area. These mines have rights to pump groundwater pursuant to Type 1 and Type 2 non-irrigation grandfathered rights.

Reclaimed water from the Green Valley Water Reclamation Facility is fully committed to golf course irrigation. Effluent from the Arivaca Junction Water Reclamation Facility is delivered to a local ranch and is restricted to agricultural use.

Two water providers have CAP allocations; Community Water Company of Green Valley (CWCGV) has an allocation of 2,858 acre-feet per year while Green Valley Domestic Water Improvement District (GVDWID)

[14] *Estimated Water Usage for Upper Santa Cruz Providers and Users Group Years: 2006-2030*, USC/PUG, January 10, 2009.
[15] Tables ES-10and ES-11 *CAP Water Use Feasibility Analysis and Delivery System Optimization Study*, prepared by Malcolm Pirnie for the Arizona Department of Water Resources (1998).
[16] Includes ASARCO and Freeport McMoRan.

has an allocation of 1,900 acre-feet per year. CWCGV and GVDWID recharge their CAP water at recharge facilities located outside of this planning area. The remaining water providers pump groundwater pursuant to Type 1 and Type 2 non-irrigation grandfathered rights.

Golf Courses

Golf courses use groundwater to irrigate turf grass and landscaping. ADWR regulates the amount of groundwater used by golf courses. There are eight golf courses in this planning area. Six courses use groundwater provided by either the local municipal water providers or they pump groundwater pursuant to a Type 1 or Type 2 non-irrigation grandfathered right. One golf course, Canoa Ranch, is required to offset groundwater pumped by purchasing an equivalent amount of CAP water. The CAP water is recharged outside of the planning area. Another golf course, Quail Creek, purchases reclaimed water from Pima County's Green Valley Water Reclamation Facility and recharges it at an adjacent underground storage facility. The stored reclaimed water is recovered at the golf course site and used to irrigate turf. Golf courses account for 6 percent of the water demand in the planning area.

Sand and Gravel

Sand and gravel operations use water to remove fine-grained particles. Water is also used to produce ready-mix concrete, to control dust and other operations. In addition to recycling wash water, ADWR requires additional conservation measures relating to dust control and related clean-up activities. Sand and gravel operations use only one percent of the water demand in the planning area.

Mountain View Planning Area (6)

The Mountain View planning area encompasses 183,813 acres in the southeastern region of Pima County. Of this total, 60.8 percent is within Pima County jurisdiction, 21.3 percent is Coronado National Forest, 17.5 percent is Las Cienegas National Conservation Area, and 0.5 percent is Cienega Creek Natural Preserve. Privately owned lands constitute 14.5 percent of the planning area. The State Land Department owns 45.8 percent; the Bureau of Land Management owns 20.4 percent and the Coronado National Forest owns 14.5 percent of the planning area.

In 2010, the population was 1,331 with a population density of 5 persons per square mile. This sparsely-populated planning area contains very little development activity. Developed areas are primarily large lot, single-family residential. There is no water data available for this area.

Potential remedies and projects within this area will depend upon agreements with federal and state landowners as well as the for-profit businesses operating in the area, which the County has limited ability to regulate.

Southeast Planning Area (7)

This planning area encompasses 221,882 acres in the south-central region of eastern Pima County. Of this total, approximately 121,164 acres or 55 percent of the planning area is owned by the Arizona State Land department. Privately owned lands include 70,344 acres or 32 percent of the planning area. The balance of the planning area include lands owned by the Tohono O'odham Nation and the federal government, specifically the U.S. Forest Service and the Bureau of Land Management. By jurisdiction, 20 percent is within the City of Tucson, two percent is within the Town of Sahuarita and 42 percent is within unincorporated Pima County.

Water providers include the Vail Water Company serving the New Tucson Area; to the south in the Sahuarita/Green Valley Area water providers include Farmers Water, Sahuarita Water, Community Water and Green Valley Water Company. There are also small individual water providers including Voyager RV which serves an RV campground and the Arizona State Prison as well as numerous exempt private wells.

Reclaimed water is available to the urbanized portion of this planning area, generally along Drexel Road east of 6th Avenue, and north along 6th Avenue. Effluent is recharged through percolation ponds at the Green Valley and Corona de Tucson Wastewater Treatment Facilities.

Central Planning Area (8)

This planning area is generally characterized as residential, commercial and industrial. Based on a population of 321,216 and a per capita water use of 120 gallons per person per day, the estimated residential water use of this planning area is 43,200 acre-feet per year. Major commercial and industrial users and their average daily water consumption are shown in the following table.

TABLE 4.2.d: Major Water Users Central Planning Area

Commercial/Industrial Customer	Average Daily Water Use (gallons per day)
Davis Monthan Air Force Base	1,112,350
Tucson Electric Power	453,200
Carondelet St. Joseph Hospital	222,400
Tucson Medical Center	194,800
Southern Arizona Veterans Affairs Health Center	185,600
University Medical Center	178,300
University Physicians Hospital at Kino	114,400
Kalil Bottling Company	89,700

Source: RWRD Industrial Wastewater Control, 2013.

This planning area is highly urbanized and includes turf amenities such as regional and neighborhood parks that rely on either potable water or reclaimed water for irrigation. There are over eighty parks maintained by the City of Tucson, most of which use reclaimed water from the City's reclaimed water system. The City also maintains agreements with Tucson Unified School District, Amphitheater School District, Sunnyside School District and Flowing Wells School District to provide reclaimed water to school facilities where feasible. Five golf courses are located within this planning area, four of which are connected to the City of Tucson's reclaimed water system.[17]

Catalina Foothills Planning Area (9)

This planning area is generally characterized as residential. Based on a population of 176,901 and an average per capita water consumption of 120 gallons per person per day, the estimated water demand in this planning area is 23,800 acre-feet per year. Industrial water use is limited to golf courses.

TABLE 4.2.e: Golf Course Water Provider and Water Source Catalina Foothills Planning

Golf Course	Water Provider	Water Source
La Paloma	Tucson Water	Reclaimed
Ventana Canyon	Tucson Water	Reclaimed
Skyline Country Club	Tucson Water	Reclaimed
Quail Canyon	GC Owner	Groundwater
Arizona National	Tucson Water	Reclaimed
Forty-Niners	Tucson Water	Reclaimed
Tucson Country Club	Tucson Water	Reclaimed
Rolling Hills	GC Owner	Groundwater

Source: Pima County Infrastructure Plan, 2013.

Schools and parks typically have playground and sports fields irrigated with water. Most parks within the City of Tucson are irrigated with reclaimed water. Tucson Water has agreements with the Tucson Unified School District to provide reclaimed water to many schools.

Rincon Valley Planning Area (10)

This planning area is generally characterized as residential. Based on a population of 12,859 and an average per capita water consumption of 120 gallons per person per day, the estimated water demand in the area is 1,728 acre-feet per year.

This planning area has one golf course, del Lago. It has surface water rights to Cienega Creek and diverts surface water to irrigate the golf course turf.

[17] Randolph North, Del Urich, DMAFB Blanchard and Fred Enke are golf courses connected to the city reclaimed system. Dorado Golf Course is a private course with rights to pump groundwater.

Schools and parks typically have playground and sports fields that require irrigation. Since there is no reclaimed water infrastructure in this planning area, schools and park turf are irrigated with groundwater. Delivery of reclaimed water to this area would reduce groundwater pumping and is a sustainable, renewable water source.

Tortolita Planning Area (11)

This planning area is generally characterized as residential. Based on a population of 108,250 and an average water usage of 120 gallon per person per day, the estimated potable water demand in this planning area is 13 million gallons per day or 11,600 acre-feet per year. Major commercial and industrial potable water users and their average daily water consumption are shown in the following table.

TABLE 4.2.f: Major Water Users Tortolita Planning Area

Water User	Water Provider	Average Daily Water Use (gallons per day)
Northwest Hospital	Metro Water	116,000
Hilton Resort	Oro Valley	113,300
Sunrise of La Cholla	Metro Water	72,500
La Cholla Airpark	Oro Valley	71,600
Catalina Canyon Apts	Metro Water	67,300
PM Enclave Apts	Metro Water	65,000
Foothills Mall	Metro Water	64,300
Rockridge Apts	Oro Valley	57,900
Oro Valley Hospital	Oro Valley	50,800
HLS La Reserve Properties	Oro Valley	46,300

Source: Pima County Infrastructure Plan, 2013.

Other major water users in this planning area include schools, parks and golf courses. Many of Pima County's golf courses are located in this planning area and most receive reclaimed water from various entities that have reclaimed water entitlements. A list of the area's golf courses, water sources and water providers is included in the following table.

TABLE 4.2.g: Golf Course Water Source Tortolita Planning Area

Golf Course	Water Provider	Water Source
Crooked Tree	Pima County	Reclaimed
El Conquistador	Oro Valley	Reclaimed
The Gallery	Tucson Water	Reclaimed
Heritage Highlands	Tucson Water	Reclaimed
Oro Valley Country Club	Oro Valley Country Club	Groundwater

Golf Course	Water Provider	Water Source
Omni Tucson National	Metro Water[18]	Groundwater & Reclaimed
The Club at Vistoso	Oro Valley	Reclaimed
Ritz-Carlton	Tucson Water	Reclaimed
Stone Canyon	Oro Valley	Reclaimed
Pusch Ridge	Oro Valley	Potable
Sun City Vistoso	Oro Valley	Reclaimed

Source: Pima County Infrastructure Plan, 2013.

Schools and parks typically have playground and sports fields irrigated with water. Many schools and parks located in this planning area are not irrigated with reclaimed water. Opportunities to extend the reclaimed system where other turf users may exist could be explored.

San Pedro Planning Area (12)

This planning area encompasses approximately 174,332 acres in the northeastern region of Pima County. By jurisdiction, 90,180 acres or 51.7 percent is unincorporated Pima County. 75,070 acres, or 43.1 percent, is the Coronado National Forest, 8,867 acres or 5.1 percent, is the Saguaro National Park (east), and 215 acres, or .12 percent is the Bingham-Cienega Natural Preserve. Located within this area is Mt. Lemmon, which has a small year round population. According to the U.S. Bureau of the Census counts, the total population of this planning area decreased from a total of 137 persons in 2000 to a total of 107 persons in 2010. With an area of 272 square miles, this planning area has a population density of one person per square mile in 2000 and 2010 respectively.

Mt. Lemmon Water district is the water provider for the area. With fewer trees to catch rainfall, more water replenishes supplies. Additionally, the Mt. Lemmon Water district has added more than a million gallons of storage capacity. However, if the monsoons do not provide a consistent source of water, a system of water rationing goes into effect.

The first step is voluntary rationing following notices about the amount of water they use. The second step is mandatory. The third step is to shut down parts of the system and tell people they can bring water up from Tucson if necessary. [19]

Ajo-Why Planning Area (13)

The communities of Ajo and Why are located in this planning area. The basin and range aquifer system supplying Ajo extends underground over 200,000 square miles, and is composed of contained pockets of

[18] Omni Tucson National will receive reclaimed water when Metro Water delivery system is complete.
[19] https://www.azpm.org/p/top-news/2010/8/12/169-mt-lemmon-faces-drought-challenge/

water within a network of saturated and highly permeable sand and gravel called basin and fill. Though seemingly vast, water levels in portions of this aquifer have been significantly depleted. [20]

A subsidiary of Freeport-McMoran, Ajo Improvement Company (AIC), owns two wells that supply 1,100 Ajo households with water. Water in Ajo is pumped from the wells north of town and held in two storage towers near the mine pit. AIC also sells water to two other utility companies. One of these is Five Acres Water Company, which then resells the water in different geographic territories within Ajo. There are also private wells throughout the Ajo area that draw on the aquifer. It is unknown to what extent these wells are functioning. The site specific availability of water for new wells cannot always be predicted. An observation well must first be drilled to determine the suitability of a well. The testing can add more cost to an already expensive drilling process. [21]

Water in the Ajo area is of poor quality due to high levels of naturally occurring arsenic and fluoride, which the utility companies filter out to state regulated levels. Owners of residential wells may or may not filter their water. Given the naturally-occurring arsenic and fluoride and presence of up to seventy potential brownfield sites in Ajo, testing water before use on edible crops would be prudent. [22]

There is no available current water demand data for this planning area.

Projected Water Demand

In accordance with Arizona Administrative Code (AAC) R18-5-502 through -509, Pima County Department of Environmental Quality (PDEQ) is authorized to review and approve plans for water line extensions, modifications, or relocations, as well as new water sources, tanks, or other infrastructure for a Public Water System (PWS), in order to ensure that it is constructed in accordance to State standards and engineering guidelines published by the Arizona Department of Environmental Quality (ADEQ) under Engineering Bulletin Number 8 and Number 10. PDEQ is responsible for identifying new water systems that meet the definition of a PWS, and working with operators and responsible parties to ensure production and distribution of safe drinking water.

A Public Water System (PWS) is defined as a water system which serves 15 or more connections, or 25 or more people, for more than 60 days a year. There are approximately 200 currently identified PWS in Pima County. Without a centralized public water supply facilities monitoring system, the number of PWS makes it difficult to obtain consistent PWS data such as facility-design capacity, estimated demand per capita in gallons, estimated current demand, and estimated facility surplus capacity and number of potable water connections for residential and non-residential uses.

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20 Ahron Lerman, Susannah Spock, and Sean Walsh (2011) A Sonoran Oasis: Developing a Local Food System for Ajo, Arizona, Conway School of Landscape Design, Ajo, Arizona.

21 Ahron Lerman, Susannah Spock, and Sean Walsh (2011) A Sonoran Oasis: Developing a Local Food System for Ajo, Arizona, Conway School of Landscape Design, Ajo, Arizona.

22 Ibid.

The projected water demand is based on population projections, land use data, facility-design capacity, estimated demand per capita in gallons, estimated current demand, and estimated facility surplus capacity and number of potable water connections for residential and non-residential uses. Without such baseline data, it is impossible to estimate projected water demand. The compilation of such data is beyond the scope of this Comprehensive Plan.

City/County Wastewater Study

The Water and Wastewater Infrastructure, Supply and Planning Study (WISP) was completed in November 2011 with the adoption of the Action Plan for Water Sustainability (Action Plan). Implementation of the WISP Action Plan began in March 2011. Year-End Progress Reports on WISP Action Plan implementation describes the action items that have already been completed and the progress of shared Pima County and the City of Tucson water sustainability goals.

Progress has been made and is continuing in realization of WISP goals. Pima Prospers serves as the fundamental planning document that accomplishes a majority of the action items within WISP's Comprehensive Integrated Planning component, linking land use and water resources planning. Recent data are better informing design guidelines for neighborhood stormwater harvesting and regional assessment of residential development's water use, furthering goals associated with WISP's Demand Management component. Pima County has adopted a Net-Zero Energy Building Code, began administration of the Conservation Effluent Pool (CEP), revised riparian mitigation guidelines and drought management plans, accepted a strategic plan for utilization of the County's reclaimed water and partnered in the EPA-funded study of the Lower Santa Cruz River. Meanwhile, work continues on a joint recharge project with the City and issuance of the County's Section 10 permit and implementation of the Multi Species Conservation Plan is pending following federal approval.

Pima County and the City of Tucson have made great strides in completing action items identified in WISP. One item that remains unresolved for some in unincorporated Pima County is Tucson Water's Water Service Area Policy (CIP 21). In 2013, Mayor and Council adopted refinements to the 2010 City policy that resulted in the refusal of water service in designated growth areas. The refinements provide service to properties abutting current Tucson Water connections within certain limitations and allow for an appeals process upon denial of service and exceptions for economic development. While an improvement from the previous policy, some properties may remain in a non-expansion area with limited options for service.

Staff will continue to implement the WISP Action Plan and will report on progress made on continuing action items in annual Year End Progress Reports.

Water Conservation and Protection

The City/County Water and Wastewater Infrastructure, Supply and Planning Study listed accomplishments of phase 2 goals and recommendations for demand management. Tucson Water's Community

Conservation Task Force (CCTF) recommended a plan based on cost benefit analysis for enhanced water use efficiency programs with a focus on technology. The CCTF recommendations to Mayor and Council resulted in the development of a conservation fee to fund Tucson Water's conservation programs.

Adopted in 2008, the City of Tucson Water Harvesting and Graywater ordinances mandate that new commercial development utilize water-harvesting practices to meet 50 percent of the site landscape water requirement and dual plumbing to allow for graywater system installation in new homes.

Pima County 2006 and 2007 Water Conservation Code Amendments include requirements now in place for waterless urinals and automatic faucets in commercial buildings, sub-water meters in multifamily construction, pool covers for new pools and use of reclaimed water for new golf courses. In new construction, separate reclaimed-ready irrigation plumbing and irrigation with seasonal adjustments and rain sensors are required and restrictions on large water fountains and water features and turf areas are in place.

Pima County Green Building and LEED Certification programs were established in 2008 promoting the construction of sustainable homes.

Southern Arizona Water Rights Settlement Act

In 1982, the Southern Arizona Water Rights Settlement Act (SAWRSA) was enacted by Congress to address the water right claims of the San Xavier and Shuck Toak Districts of the Tohono O'odham Nation. SAWRSA awarded the districts an annual entitlement to 37,800 AF of CAP water and 28,200 AF of settlement water to be delivered by the Secretary of the Interior to the two districts. The districts may also pump annually up to 13,200 AF of groundwater from non-exempt wells. In addition to state and local financial contributions, the City of Tucson contributed 28,200 AF annually of effluent to be used by the Secretary to facilitate deliveries to the districts (through sale or exchange).

In December 2004 the President signed into law P.L. 108-451, the Arizona Water Settlements Act. Title III of the Act amended the 1982 SAWRSA and provided a mechanism to implement the settlement. The amendment identified the source of the settlement water as CAP Non-Indian Agricultural priority water. The Nation may lease its CAP water within the CAP service area. State law was amended to provide additional protection to groundwater resources on the San Xavier Reservation, and allow the Nation to store its CAP water in an in lieu fashion. The settlement was implemented in December 2007 and includes dismissal of claims against non-Indian parties in U.S. and State courts, and approval of the settlement by the Gila Adjudication Court for incorporation into the final decree in that case.

Although Pima County does not have jurisdiction over sovereign nations, the County works cooperatively with both the Tohono O'odham Nation and the Pascua Yaqui Tribe under existing intergovernmental agreements.

Tradeoffs for Human Populations, Energy Production and Economic Development

The development and implementation of renewable energy opportunities, efforts, and projects can present significant challenges in ecosystem and water management and ecosystem tradeoffs. For example, the solar power facility in Gila Bend may require as much as 60,000 acre-feet per annum (AFA) of groundwater for cooling, according to hydrologist Larry Onyskow. This estimate exceeds the estimated groundwater recharge rate of more than 9,000 to 88,000 AFA not including withdrawals from other water uses in the area. Although 100 – 246 million acre-feet of groundwater may be stored in the Lower Gila Basin, data and distribution of ground water throughout the entire area is not readily available, particularly for the 1220-square-mile Ten Mile Wash sub-basin in which the community of Ajo is located.[23]

Even with general data on the Lower Gila Basin, determining groundwater availability for a specific location in the sub-basin will require further scientific research, possibly including the drilling of test wells.[24]

Large-scale generation of solar power requires enormous areas of land to hold the multiple arrays of PV cells. Heating just a typical house may require a "collector area" of 200 square feet. Therefore, a large tract of land and habitat may be lost to produce solar energy which in turn impacts water recharge. The water required to cool such arrays may result in less sustainable practice than the solar energy production yield.

As a way to minimize tradeoffs for human populations, energy production, habitat and economic development, partnerships with the local university in the study of the impacts of clean energy production on other natural resources such as water must be conducted. The current practices are policy and legislator driven with very little integrated studies looking into the interdependence on numerous impacts and tradeoffs.

Emerging Issues

This section identifies emerging issues such as groundwater shortages, climate, and CAP Colorado River Supply.

Arizona Department of Water Resources (ADWR) Tucson Active Management Area

The Arizona Department of Water Resources (ADWR) manages the state's Assured Water Supply Program which covers subdivisions within Active Management Areas such as the Tucson Active Management Areas (Tucson AMA). This program was created as part of the 1980 Groundwater Management Act to conserve groundwater. The assured water supply regulations require all new subdivisions to be served by a water provider with a designated assured water supply or for an individual subdivision to be certified as having

[23] Arizona Department of Water Resources 2011
[24] United States Geological Survey (USGS) 2010.

an assured water supply. In planning the Upper Santa Cruz area, Sahuarita Water Company has been designated as having an Assured Water Supply by the ADWR through membership with the Central Arizona Groundwater Replenishment District. [25]

Subdivisions within the water service area of the other water providers must obtain a certificate of assured water supply from ADWR. Commonly, the subdivision joins the Central Arizona Groundwater Replenishment District which replenishesgroundwater pumped on their behalf.

Safe Yield Task Force was convened by the Arizona Department of Water Resources' Groundwater Users Advisory Committee (GUAC) to evaluate strategies for achieving safe yield in the Tucson Active Management Area by 2025. The Task Force explores priority issues that include CAP Utilization, recovery of long term storage credits, sub-area management and agricultural and industrial groundwater rights. Alternatives will be developed and submitted to the GUAC for further implementation and could form the basis of the Tucson Active Management Area's Fourth Management Plan.

Groundwater Shortage and Drought Impacts

According to theADWR, Local Drought Impact Groups (LDIG) consist of water providers and local, state and federal agencies. Pima County's LDIG meets bimonthly to monitor drought conditions, discuss drought impacts and coordinate drought declarations and responses. LDIG meetings include presentations on the winter and summer seasons from the National Weather Service, overview of the U.S. Drought Monitor from the Climate Assessment for the Southwest, Tucson Water's annual drought assessment and a status report on the Colorado River and reservoir levels at Lake Mead and Lake Powell from the Central Arizona Water Conservation District.

Pima County has had in place a Drought Response Plan and Water Wasting Ordinance since 2006. The year following its adoption, Pima County issued a Drought Stage One declaration in conjunction with the City of Tucson. This declaration has remained in place since then and its response measure is voluntary reduction in water use. During this time, Pima County's LDIG, functioning as the drought monitoring committee established in the ordinance, has met regularly to monitor the status of drought in Pima County and to assess the drought impacts. When Pima County adopted the Drought Response Plan, an emphasis was placed on water use impacts. However, drought has impacts to many sectors and therefore, an assessment of Pima County's vulnerability to drought was conducted.

That assessment reached a number of conclusions. County owned and maintained open space and riparian habitat is the most vulnerable county asset. The County's long term planning programs associated with these lands are also a significant asset. A drought management plan for the county should protect these investments by prioritizing adaptive management strategies and resources for these sectors. Agriculture and ranching are not dominant economic drivers in Pima County, however, are valued as a

[25] http://www.azwater.gov/azdwr/WaterManagement/AAWS/documents/documents/List_of_Designated_Providers_5-25-11.pdf

distinct regional cultural heritage. Ranching is most beneficial to the county as a land management and habitat maintenance tool. Birding and wildlife watching, combined with other outdoor recreation and tourism, are dominant economic drivers for the county. Birding offers economic benefits comparable to the region's largest copper mine. The county's habitat programs are of benefit to these economic sectors. Tourism is multi-faceted and duplicative in other sectors and sub-sectors. Of the drought sensitive industries considered in this narrative, it is the most dominant economic driver. Outdoor activities associated with the natural environment are the most popular county attractions. Socio-economic impacts are second and third order impacts easily overlooked. Collecting reports on all orders of impact is an important function of Pima County's LDIG.

Drought Impacts

The impacts of sustained drought were observed in several sectors throughout Pima County:

- At Cienega Creek, groundwater levels in three wells have dropped as much in the last year as they have in the last 15 years. Stream reaches are also shorter and the surface water volume is lower.
- Despite the warm, wetter summer weather patterns in eastern Pima County, water utilities continue to see a change in the peak high demand day. Usually occurring in mid- to late-June, the peak high water use day occurred in August and the peak was lower than in previous years.
- For ranchers, impacts to stock ponds and grasses continue to indicate drought conditions.

Drought Indicators

In 2010, ADWR began using the U.S Drought Monitor instead of the monthly ADWR Drought Monitor Report (DMR). The U.S Drought Monitor is a web-based reporting system and is now used because:

- In some cases, drought conditions can change rapidly
- The ADWR DMR was reporting conditions that were at least one month old
- The US Drought Monitor has better and more timely input
- The US Drought Monitor is a more sustainable process in light of the ADWR budget cuts

LDIG is now using the US Drought Monitor to monitor drought conditions in Pima County.

Drought-Related Actions

During the year, the City of Tucson and Pima County completed Phase 2 of a water/wastewater infrastructure study. Phase 2 establishes a framework for sustainable water resources planning through the implementation of 19 goals and 56 recommendations. Phase 1 was completed in 2009 and consisted of an infrastructure inventory. With respect to drought, the Phase 2 report recommends the City and County pursue adaptive, flexible, multi-pronged preparedness strategies, including diversification of water supplies and improved demand management, such as increased reliance on water harvesting. To

track and measure the plan's progress, an action plan implementing the goals and recommendation of Phase 2 is being completed.

On June 1, 2010, the City of Tucson began implementing a rainwater-harvesting ordinance that requires new commercial properties to provide a minimum 50 percent of their landscaping water budget from harvested rainwater.

Also on June 1, the City of Tucson began requiring all new one- and two-family dwellings to have gray water stub-outs for laundry drains. New single-family dwellings will be required to have separate drain lines for lavatories, showers and bathtubs to allow for future installation of distributed gray water systems.

Should drought conditions persist and curtailments of CAP water be declared, water providers have several response strategies in place. The first and second CAP curtailment levels will not affect deliveries to municipal water providers. However, drought response plans are in place and more restrictive drought response measures can be taken if a shortage is declared. The Arizona Water Bank Authority has stored unused CAP allocations at recharge facilities in the Tucson Active Management Area on behalf of Tucson Water and other CAP subcontractors in the region. This water can be recovered during shortage periods. Potential climate change impacts on water resources are also being assessed in a 26-member climate change committee being led by the City of Tucson.

Central Arizona Project (CAP) Colorado River Supply

The Central Arizona Project (CAP) is a 336-mile canal that delivers water from the Colorado River near Lake Havasu to Phoenix and on to Tucson.[26] Completed in 1993, it can deliver an average of 1.5 million acre-feet of water annually to municipal and agricultural users, as well as Indian communities. The CAP canal delivers water to regional recharge facilities, major water providers and Indian communities that have CAP entitlements.

Underground storage facilities store renewable water, either CAP water or reclaimed water, in an underground aquifer.[27] ADWR permits two types of underground storage facilities; constructed and managed. A constructed underground storage facilities uses a constructed device such as an injection well or percolation basin to recharge water underground. In a managed underground storage facility, water is recharged in a natural water-transmissive area such as a streambed that allows the water to percolate, or recharge into the aquifer. The entity storing water can either recover its water the same year it was stored (annual recovery) or can accrue long term storage credits and recover its stored water at a later date. Recovery of the long term storage credits must be consistent with a recovery well permit issued by ADWR and must not damage other land and water users.

26 http://www.cap-az.com/AboutUs/FAQ.aspx
27 http://www.azwater.gov/azdwr/WaterManagement/Recharge/TypesofRechargePermits.htm

The regulation of land and water rights is especially important in Arizona, where access to water is essential for land development due to the desert climate. Arizona policy makers have established a statutory scheme that protects individual rights and governs access to these resources so that one group is not unfairly advantaged over another in accessing these vital resources.

Arizona water law is established in Title 45 of the Arizona state law. The law places the Arizona Department of Water Resources (ADWR) in charge of regulating state water issues and establishes a system that regulates water usage differently depending on if the water is drawn from the surface or brought up from the ground.

Arizona water supply is categorized into four different sources, which are managed separately. These sources are the Colorado River, groundwater, surface water not related to the Colorado River and effluent outflows.

In order to gain the right to use surface water, potential water rights holders must apply to the department of water resources. The application process involves a public input mechanism where those opposed to the proposed use of the water can have their voices heard. Applicants can apply for rights to draw from surface water in order to create a municipal water supply, irrigate crops, create power, refresh groundwater resources and use for mining purposes.

Effluent, Water Harvesting and Recycling

In April 2008 the City of Tucson and Pima County initiated a joint effort for sustainable water resource planning known as the "City/County Water and Wastewater Infrastructure, Supply and Planning Study" (Water Study). The City/County Water Study is a multi-year effort to identify ways the City and County, which respectively own and operate the region's primary water and wastewater utilities, can work together to advance more cooperative and sustainable water planning.

After two years of intensive study under the guidance of a joint City/County Citizens Advisory Committee, City and County staff prepared the Phase 2 Water Study Report. The Phase 2 Report built upon the Phase 1 Report that preceded it and establishes a framework for sustainable water resources planning including 19 goals and 56 recommendations within four interconnected elements: Water Supply; Demand Management; Comprehensive Integrated Planning; and Respect for Environment. The City of Tucson Mayor and Council and the Pima County Board of Supervisors adopted the Phase 2 Report through City and County resolutions (No. 21478 and 2010-16 respectively), and directed staff to work together to create an Action Plan for implementing the Phase 2 goals and recommendations.

The following Action Plan represents a dramatic shift in business as usual for the City and County. It advances a set of 87 specific actions grouped within 14 City/County programs to implement the Phase 2 goals and recommendations and to achieve the following outcomes within the five-year planning horizon:

- Water, wastewater and stormwater resources are planned in an integrated fashion.

- More renewable water resources including effluent, reclaimed, stormwater and rainwater and graywater are put to use in an efficient manner.
- Water resource policies help further economic goals.
- Collaborative efforts are undertaken to acquire new water, to achieve greater flexibility in use of existing supplies, and to align and enhance standards for water use efficiency.
- Improved water quality resulting from regional wastewater treatment facility upgrades (i.e. the Regional Optimization Master Plan or ROMP) is matched to needs for recharge, environmental restoration and public amenities such as parks, golf courses and ball fields.
- Land use, infrastructure and water resources planning are linked and foster optimum use of renewable water resources in future growth areas and increased water and energy efficiency outcomes in new development.
- Water is dedicated and allocated to environmental needs, sensitive riparian ecosystems are preserved and maintained, and cost-effective and collaborative environmental restoration projects are advanced.
- Public values are considered in water resources planning and public awareness of the human, environmental and economic benefits of improving water use efficiency is increased.

Prior to the delivery of renewable Central Arizona Project (CAP) water, the Tucson region was the largest metropolitan area solely dependent on non-renewable groundwater resources. Beginning in the 1940s, groundwater withdrawals began to exceed replenishment and, like other growing areas of the state, the Tucson area began to experience groundwater overdraft leading to the lowering of groundwater tables and subsequent loss of riparian habitat, subsidence and declines in water quality.

The 1980 Arizona Groundwater Management Act (GMA) gave the state control of groundwater pumping and established a statewide goal known as “Safe Yield” within the Phoenix, Tucson and Prescott Active Management Areas (AMAs). Safe yield means that by 2025 the AMAs must pump groundwater at a rate no greater than the rate of natural and artificial replenishment. To reach safe yield by 2025, water users in the AMAs must offset all the groundwater uses that total more than the net natural recharge with renewable resources, like CAP water and effluent, or with artificial recharge.

The Arizona Department of Water Resources (ADWR) administers the safe yield goal through a series of ten-year management plans for each AMA. The Tucson AMA is currently operating under the Third Management Plan and the Fourth Management Plan is under development. Despite positive progress toward attaining the safe yield goal, ADWR notes in its Third Management Plan: “given current projections, the AMA will not reach safe-yield by 2025.”

Although of critical importance, even if the safe yield goal were met, it would not solve all the issues related to groundwater overdraft. Under the 1980 GMA, development may continue to mine groundwater through purchase of paper water recharge credits from the Central Arizona Project. State law allows for withdrawals in one part of the AMA to be offset by recharge in another hydrological disconnected

location. As such, safe yield applies strictly on an AMA-wide basis and can result in continued problems related to localized overdraft within sub basins. A Safe Yield Task Force deliberates on the topic of how to address the challenges of meeting safe yield in the Tucson AMA and the Fourth Management Plan, when completed, will provide specific steps to reach safe yield.

Additionally, the City/County Water and Wastewater Study recognized the need to go beyond safe yield when establishing a framework for sustainable water planning. In the Phase I Report the Oversight Committee concluded: "A definition of sustainable water management must consider the regional impacts of water use at the watershed scale and the localized impacts to aquifers and groundwater-dependent ecosystems. It must establish a link between sustainable groundwater use and the provision of renewable water sources to areas impacted by groundwater overdraft."

The primary sources of water addressed in the Action Plan are managed by three utilities: (1) The City of Tucson, Tucson Water Department operates and maintains the potable and reclaimed water systems; (2) Pima County Regional Wastewater Reclamation Department (RWRD) operates and maintains a regional wastewater conveyance and treatment system that generates the effluent used in the City of Tucson's reclaimed system; and (3) The Pima County Regional Flood Control District (RFCD) manages stormwater resources.

This Action Plan focuses on activities that will advance integrated water resource planning for all these sources of water within the combined service areas of Tucson Water and Pima County Regional Wastewater Reclamation Department.

Many of the activities are well suited to being implemented in partnership with other jurisdictions, water and wastewater providers and stakeholders and, where feasible and appropriate, the City and County will include outreach to potential partners as they implement these activities.

Tucson Water serves approximately 800,000 customers and accounts for 72 percent of municipal demand in Pima County. The City's obligated service area extends outside of its incorporated boundaries. Pima County is the Designated Management Agency for all of Pima County except the Tohono O'odham Nation, the Town of Marana and the Town of Sahuarita. The Pima County RWRD provides 97 percent of the total treatment capacity for Pima County[28]. Additionally, the Phases 1 and 2 Water Study reports highlighted the importance of rainwater and stormwater as a supplemental source of locally renewable water. Historically, stormwater has been treated as a safety hazard and managed for disposal not for beneficial use. The Phase 2 goals include a heightened emphasis on integrating land use and water resources planning which includes incorporating beneficial use of stormwater as feasible in new development and capital improvement projects.

[28] City/County Water & Wastewater Study Phase 1 Report, Executive Summary, page 11, 2008.

On June 1, 2010, the City of Tucson began implementing a rainwater-harvesting ordinance that requires new commercial properties to provide a minimum 50 percent of their landscaping water budget from harvested rainwater. Also on June 1, the City of Tucson began requiring all new one- and two-family dwellings to have gray water stub-outs for laundry drains. New single-family dwellings will be required to have separate drain lines for lavatories, showers and bathtubs to allow for future installation of distributed gray water systems. The County currently does not have a rainwater-harvesting ordinance and it will benefit to adopt one. The Town of Oro Valley water harvesting ordinance is a good regional model.

Water Resource Management and Reclamation

The Pima County Regional Wastewater Reclamation Department (RWRD) provides design, management and maintenance of the sanitary sewer system, including the conveyance and treatments systems (3,400+ miles of sewer, two metropolitan wastewater treatment plants and seven sub-regional facilities).

The Pima County Regional Flood Control District is responsible for regional flood control needs in Pima County including constructing major flood control facilities, purchasing flood and erosion-prone land, operating the community's flood warning system, and providing floodplain management activities for all unincorporated county areas. This includes activities aimed at enhancing wildlife, recreation and riparian habitats along watercourses and floodplains and constructing and operating groundwater recharge facilities that also have flood control benefits, among other services.

As provided in the Water Action Plan, to achieve water sustainability goals, changes to the existing infrastructure must begin by improving the efficiency and flexibility of the existing built environment, including roads, parks, public services water, wastewater and stormwater systems. In addition to considering the location and form of growth, integrated planning also needs to consider the efficient allocation, distribution and use of all available water resources including stormwater, effluent, reclaimed and potable water.

Such integrated planning efforts include updating the County Comprehensive plan in a manner that increases opportunities to influence future growth patterns in the region. Tools that may be used include:

- Analysis of infrastructure and public facilities' needs.
- Designation of suitable growth areas and job centers.
- Exploration of pre-zoning to encourage growth in line with the Plans.
- Identification of opportunities to promote mixed-uses, well-designed densities and infill.
- Establishment of improvement districts to direct growth, infrastructure phasing plan and an implementation component.
- Evaluation of improvement districts as tools to fund open space acquisition.
- Exploration of legislative changes to allow transfer of development rights from the unincorporated area to the City.

- Development of a fiscal sustainability model that understands true costs and funding mechanisms to provide public services and infrastructure based on various land use patterns.

Comprehensive Plan Water Policies for Rezoning Requests

The existing comprehensive plan has policies that propose water conservation measures as conditions of rezoning. Whether a rezoning proposal increases the water demand projections in areas that are less than five miles from a groundwater dependent ecosystem and if the development will have an adverse impact on a groundwater dependent ecosystem are evaluated during review.

Rezoning proposals that increase the water demand above existing zoning are evaluated as to whether they are fully offset in areas of shallow groundwater (less than 50 feet below the land surface). Increases in water demand can be offset by recharge, legal and verifiable water rights, or retirement or purchase of water rights from within the same or up-gradient shallow groundwater area. Per policy, rezoning proposals are not to increase the water demand above existing zoning in areas of Isolated Basins.

The existing plan states that rezoning proposals that rely on use of groundwater withdrawn from a five-mile radius of mapped groundwater-dependent ecosystems are to include a hydrologic impact analysis to show how groundwater withdrawn for the development may impact ecological assets. Policy states that rezoning proposals that may adversely impact groundwater-dependent ecosystems are to employ pump tests and monitoring and use avoidance strategies, including well site selection and screening of wells. Policies state that rezoning proposals located in areas that will not be served by a water provider with physical access to a renewable and potable water supply and are located in subsidence areas shall employ mitigation measures to minimize subsidence in the area. Certain mitigation measures are proposed to minimize subsidence in groundwater-dependent areas and areas located in high subsidence potential areas.

Per policy, a Final Integrated Water Management Plan (FIWMP) is submitted at the tentative plat or development plan stage of a proposed project for which a rezoning has been approved. The FIWMP should include proposed uses of all legally available water resources and pertinent details of reuse, replenishment, conservation and use of renewable supplies of water, all designed to minimize impacts to the aquifer.

Other Existing Water Conservation Measures/Management Tools

Per comprehensive plan policy, all rezoning applications that require a site analysis in the County currently entail a Water Resource Impacts Assessment. Most proposed comprehensive plan amendments currently entail a Water Supply Impact Review.

4.3 Energy

With more than 100 significant solar energy businesses already established in Arizona, building a robust industry that ranges from rooftop panel makers to major power generators, the state has become a preeminent location for the renewable energy industry. Along with a climate featuring more than 300 days of sunshine annually, a pro-business package, including the Renewable Energy Tax Incentive Program, have made Arizona especially advantageous. But there is more that can and needs to be done to promote this renewable energy source.

In 2014 the Solar Energy Industries Association (SEIA) ranked Arizona #7 nationwide (after CA, MA, NM, NJ, NC, and MO, in that order) in solar employment per capita, with an estimated 316 solar companies and 9,800 jobs. In fact, Arizona accounts for approximately 8.2 percent of the nation's total employment in the solar industry and consistently ranks as a top state for photovoltaic energy generation.[29]

SEIA also reports that Arizona has the most installed solar electrical watts per capita and the second-highest solar energy capacity in the United States, with enough solar energy installed in the state to power 158,800 homes. The Tucson area enjoys a percent of possible sunshine value of 85 percent annually, second in the state only to Yuma.[30] As of July 2009, 844 solar PV customers were connected to the electrical grid, an increase from 237 customers three years prior, for a total of 2,493 kW of solar photo voltaic distributed generation capacity. For current solar production in the form of residential, non-residential, and utility scale operations, the "Arizona Solar Map" found on the arizonagoessolar.org website shows the increasing use of solar energy.

Power generation requires significant water consumption;[31] water consumption varies greatly by the type of energy. For instance, solar consumes far less than coal. For each kilowatt-hour of electricity not generated, 2/3 of a gallon of water can be saved.[32] Conserving energy through the use of water efficient solar energy systems conserves water that would have been lost during power generation in other forms of fuel such as coal; and conserving water helps reduce energy demands from pumping, moving and treating water.

See Exhibit 4.3.a and 4.3.b for Pima County Electrical Utility Service Area maps.

Overall Energy Supply and Demand Summary

Quick facts about Arizona's energy system[33]:

- Arizona's Palo Verde, rated at 3,937 net megawatts, is the largest nuclear power plant in the nation.

[29] Arizona Commerce Authority
[30] Tucson Sustainable Design Assessment Team Report, June 11-13 2007, AIA Communities by Design
[31] Ibid
[32] Alternative Energy Options Accepted by Pima Association of Governments Regional Council, November 2006

[33] U.S. Energy Information Administration, State Energy Data System, U.S. Department of Energy, July 2012

- Arizona ranked second in the nation in solar photovoltaic installations as of 2014.
- Arizona, the 16th most populous state in 2010, ranked 45th in per capita energy consumption, partly due to the state's small industrial sector.
- Arizona's only operating coal mine, Kayenta, on the Navajo and Hopi reservations, supplies the 7 to 8 million short tons burned annually by the Navajo Generating Station's three 750-megawatt units.
- Arizona's Renewable Environmental Standard requires 15 percent of the state's electricity consumed in 2025 to come from renewable energy resources; in 2013 , approximately 8 percent of Arizona's net electricity generation came from renewable resources, primarily from the Glen Canyon and Hoover Dams.
- Twenty-five percent of the energy consumed in Arizona homes is for air conditioning, which is more than four times the national average of 6 percent according to the U.S. Energy Information Administration's Residential Energy Consumption Survey.

Energy Supply

Approximately 73 percent of Arizona's energy production is from coal, natural gas, and petroleum.

TABLE 4.3.a: Arizona Energy Production by Type

Energy Production Type	BTU's (trillion)	Percentage of Total
Coal	459.9	27
Natural Gas	293.7	17
Petroleum	500.9	29
Nuclear Energy	327.3	19
Renewable Energy **(includes conventional hydroelectric power, biomass, geothermal, solar thermal and photovoltaic and wind)**[34]	136.6	8
Total	1,718.4	100

Source: U.S. Energy Information Administration, Energy Conservation Overview, U.S. Department of Energy, 2011.

As shown in the previous table, Arizona produces 1,718.4 trillion BTUs of energy.[35] The ten largest Arizona plants by generation capacity in 2010 were:[36]

- The Palo Verde (nuclear) run by Arizona Public Service Company
- Navajo (coal) run by the Salt River Project (SRP)

[34] U.S. Energy Information Administration, Energy Consumption Overview, U.S. Department of Energy, 2011
[35] Ibid
[36] U.S. Energy Information Administration, U.S. Department of Energy, 2010.

- Gila River Power Station (gas) run by the Gila River Power Station Lp
- Springerville (coal) run by Tucson Electric Power Company
- Glen Canyon dam (hydroelectric) run by the US Bureau of Reclamation
- Santan (gas) run by SRP
- Mesquite Generating Station (gas) run by Mesquite Power LLC
- Harquahala Generating Project (gas) run by New Harquahala Generating Co., LLC
- Hoover Dam (hydroelectrical) run by the US Bureau of Reclamation
- Cholla (coal) run by the Arizona Public Service Company.

Arizona's electrical power currently comes primarily from coal, natural gas, and nuclear generation.[37] Electricity used in Pima County comes mainly from coal deposits in the northeast part of the state and western New Mexico.[38] Coal-fired plants provide almost 2/5 of the State's demand for electricity. The remainder is supplied mostly by natural gas fired plants and nuclear power. More than 1/3 of the coal produced goes to Nevada.[39]

Power Utilities in Pima County include:

- Tucson Electric Power Co. (TEP)
- Trico Cooperative (Trico)
- Arizona Public Service (APS)
- Western Area Power Administration (WAPA)
- Tohono O'odham Utility Authority (TOUA)
- Sulphur Springs Valley Electric Cooperative (SSVEC)
- Ajo Improvement Company
- Southwest Natural Gas
- Arizona Electric Power Cooperative[40]

Tucson Electric Power (TEP) is the largest electricity provider in Pima County.[41] TEP relies primarily on coal, supplied from outside the region, representing approximately 93 percent of power production fuel sources.[42] The three TEP generating stations within Tucson providing much of the Tucson area's energy (over 650 MW) needs are:

- Sundt facility which is the largest in Pima County and uses coal, oil, natural and/or landfill gas

37 Power Arizona, ArizonaExperience.org, 2013
38 Ties that Bind: Plans for New Energy Infrastructure in Pima County, Arizona, Julia Fonseca and Neva Connolly, Pima County Office of Sustainability and Conservation, February 2012
39 U.S. Energy Information Administration, Arizona State Energy Profile Analysis, U.S. Department of Energy, October 2009
40 Ties that Bind: Plans for New Energy Infrastructure in Pima County, Arizona, Julia Fonseca and Neva Connolly, Pima County Office of Sustainability and Conservation, February 2012
41 Ibid
42 Tucson Sustainable Design Assessment Team Report, June 11-13 2007, AIA Communities by Design

- DeMoss-Petrie generator can use gas or oil
- North Loop units fired by natural gas.

All three plants are necessary to meet peak power demands during the summer. TEP also uses landfill gases and solar to produce additional power from smaller facilities. The largest electricity provider in the state is Arizona Public Service (APS) which provides electricity services for Ajo, the Organ Pipe National Monument, and a small portion of the San Pedro River Valley in northeast Pima County. [43]

The Central Arizona Project (CAP) generates power at the Navajo plant to operate pumps that lift CAP water to Tucson, the San Xavier District, and the Mission mine. Tucson is nearly the highest elevation of the CAP canal therefore incurring the greatest accumulated pumping costs, but the City is not charged more than other CAP water customers.[44]

Arizona imports virtually all of its natural gas and petroleum products.[45] Arizona receives its petroleum supply from southern California and from El Paso mainly through the Kinder-Morgan pipeline.[46] In addition, the All-America Crude Oil Pipeline passes through the San Pedro Valley but does not go through Tucson. The petroleum products that move through Pima County include diesel, jet fuel, crude oil, ethanol and gasoline.[47]

El Paso Natural Gas (EPNG) provides wholesale natural gas to Southwest Gas, TEP and other major consumers in Pima County. EPNG has two distribution stations in Pima County, one in Vail and the other in north Tucson. Natural Gas has long been available to Ajo due to the mines where elsewhere connections can be a limiting factor. The main body of the Tohono O'odham Nation, Altar Valley and much of Pima County and a portion of San Pedro Valley lack access to natural gas.[48]

Arizona has one nuclear power plant – Palo Verde, which is the largest nuclear plant in the nation.[49] Palo Verde provides about ¼ of the state's total electricity generation.

The major renewable energy source remains hydroelectrical power derived from the Colorado River. In 2010, 11.9 percent of the electricity capacity derived from renewable supplies, including 10.1 percent from hydroelectrical power and 1.8 percent from wood/wood waste.[50] In 2007, the U.S. Department of

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43 Ties that Bind: Plans for New Energy Infrastructure in Pima County, Arizona, Julia Fonseca and Neva Connolly, Pima County Office of Sustainability and Conservation, February 2012

44 Ibid

45 Power Arizona, ArizonaExperience.org, 2013

46 Ties that Bind: Plans for New Energy Infrastructure in Pima County, Arizona, Julia Fonseca and Neva Connolly, Pima County Office of Sustainability and Conservation, February 2012

47 Ties that Bind: Plans for New Energy Infrastructure in Pima County, Arizona, Julia Fonseca and Neva Connolly, Pima County Office of Sustainability and Conservation, February 2012 (pg. 7)

48 Ibid

49 U.S. Energy Information Administration, State Energy Data System, U.S. Department of Energy, July 2012

50 U.S. Energy Information Administration, Arizona State Energy Profile Analysis, U.S. Department of Energy, October 2009

Energy designated Tucson as a "Solar America City". Arizona's large desert areas offer some of the highest solar power potential in the country.[51]

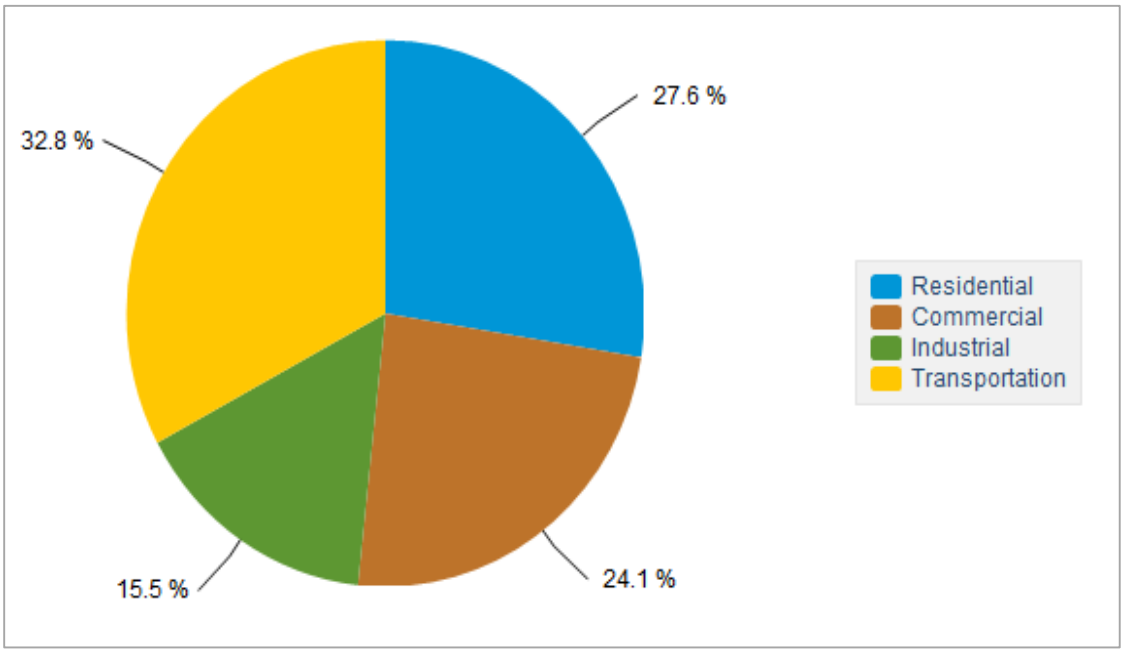
A number of fueling stations in the Tucson area offer alternative fuels, including biodiesel, compressed natural gas (CNG), electric power, ethanol (E85) and propane. The number of distribution and retail sites is expanding rapidly. CNG, propane and electric were among the first alternative fuel sources to be used. Tucson was one of the first five official launch markets for the Nissan LEAF (an all-electric passenger vehicle).[52] Wind energy in Arizona is largely limited to the consistent winds on the Colorado Plateau.[53]

Energy Demand

Arizona uses energy primarily in the forms of electricity and petroleum (for transportation).[54] While Arizona ranks near the middle of states in total energy consumption per capita, energy consumption is low and the state economy is not energy intensive. More than half of Arizona households rely on electricity for home heating mainly from coal-fired plants, hydroelectric power, and nuclear power.[55]

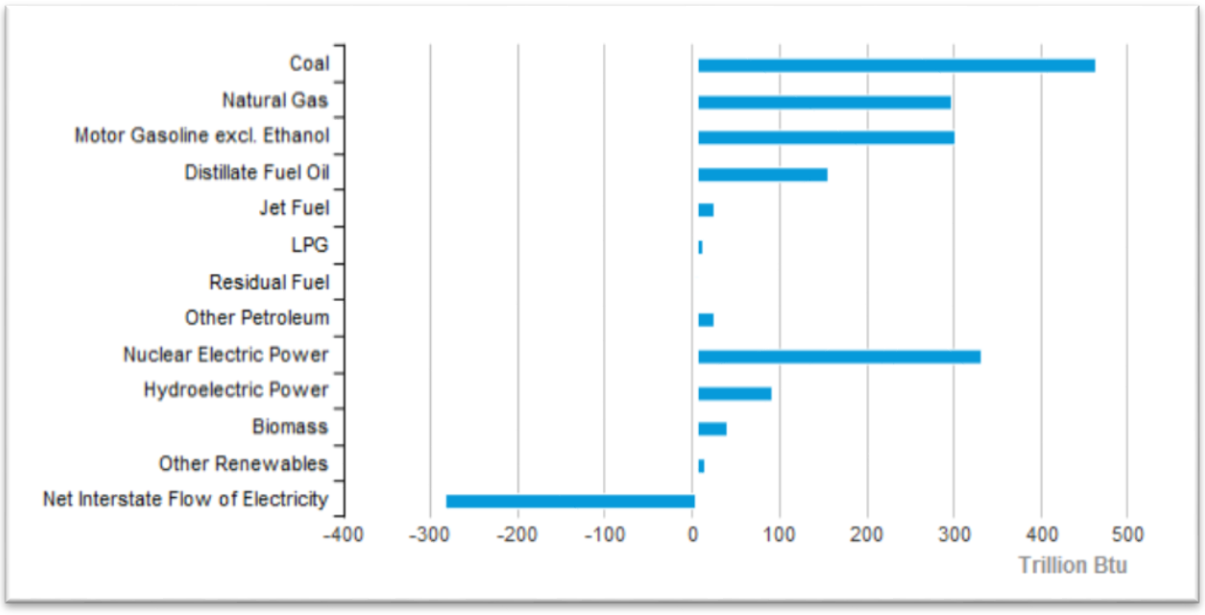
Residential consumers account for 394.7 trillion BTUs or 41 percent of the total energy use in the state, commercial for 345.5 BTUs or 36 percent, and 221 BTUs at 22 percent for industrial development.[56] Arizona households use 26 percent less energy than the U.S. average. Arizona consumers use 17% of their overall consumption for air conditioning whereas the national average is six percent with a greater percentage going toward space heating nationally (41 percent) than on a state level (15 percent).[57] Three fourths of the natural gas consumption in Arizona is for electricity. Two-fifths of Arizona households rely on natural gas for home heating. The middle range energy consumption by the state also means that the eight percent of renewable energy sources accounts for an even smaller impact on the use and type of energy.

51 Ibid
52 Ibid
53 Power Arizona, ArizonaExperience.org, 2013
54 Ibid
55 U.S. Energy Information Administration, Arizona State Energy Profile Analysis, U.S. Department of Energy, October 2009
56 U.S. Energy Information Administration, Energy Consumption Overview 2011
57 U.S. Energy Information Administration, Arizona State Energy Profile Analysis, October 2009



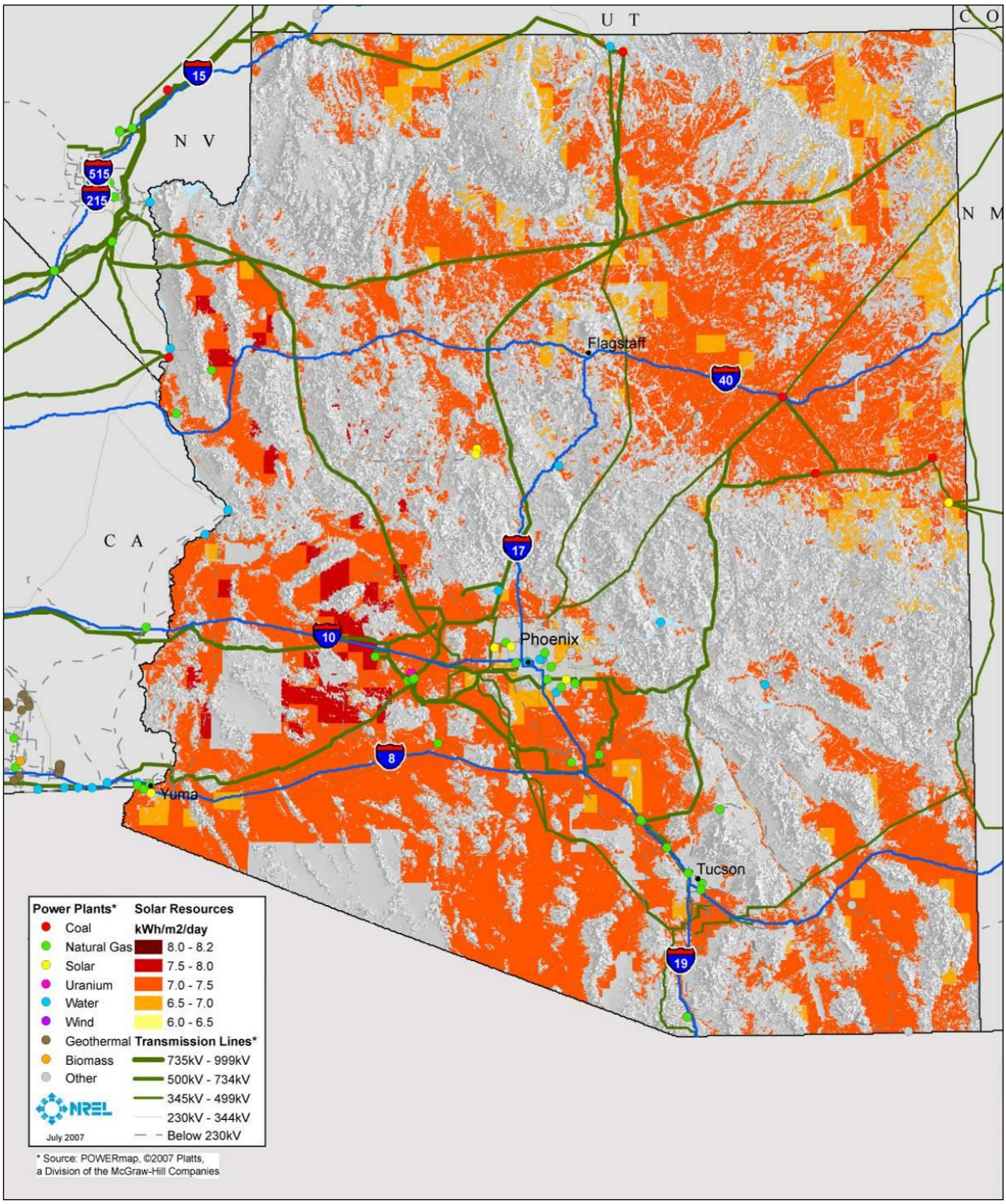
Source: U.S. Energy Information Administration, Arizona State Energy Profile Analysis, October 2009

Figure 23: Arizona State Energy Profile Analysis, 2009



Source: U.S. Energy Information Administration, Arizona State Energy Profile Analysis, October 2009

Figure 24: Arizona State Energy Profile Analysis, 2009



Source: Arizona Solar Power Map, National Renewable Energy Laboratory, July 2007

Figure 25: Arizona Solar Power map

Renewable Energy Incentive District (REID)

The Renewable Energy Incentive District (REID) ordinance was adopted by the Pima County Board of Supervisors to entice large-scale renewable energy facilities to develop on specifically selected sites. Given Pima County's abundant solar energy resources, the County wants to encourage its use to off-set the need for fossil fuels if they are photovoltaic solar facilities, and particularly on REID sites which are lands that do not compromise other County interests such as protecting unique desert resources. Establishing the REID sites minimizes potential adverse impacts and provides the development community more certainty in where to locate. REID solar facilities are limited to photovoltaic systems or "other technology that does not use any more water than would be used by a photo-voltaic system" as photovoltaic systems use little to no water. Incentives to develop on REID sites are offered by the various county development review departments and offices such as waived or reduced regulations and fees and expedited review processes. Promoting renewable energy sources also provides clean jobs and adds to the variety of industries upon which southern Arizona's economy is based. And, as solar development increases, it is likely that solar energy costs will decrease and photovoltaic production will become more and more cost-effective.

Other Forms of Clean Energy

In addition to solar and wind, the Arizona Corporation Commission's Renewable Energy Standards also encourage utility companies to use biomass, biogas, geothermal and other similar technologies to generate "clean" energy to power Arizona's future. Pima County's Regional Wastewater Reclamation Department (RWRD) is embarking on using biogas byproduct of wastewater treatment from its Tres Rios Wastewater Reclamation Facility. The Tres Rios WRF produces digester gas mostly of methane and carbon dioxide, a byproduct of the anaerobic digestion process.

Net Zero Energy

Local government energy policy commonly focuses on the supply of the necessary energy for the community. Energy efficiency is rarely considered a "source" of energy. However energy efficiency is the largest untapped "source" of cost effective energy. The baseline for building energy efficiency is the International Energy Conservation Code (IECC). Pima County adopted the 2012 IECC which is 30 percent more efficient compared with the 2006 IECC. A study by the U.S. Department of Energy found that the cost of the energy efficiency improvements in a typical 2012 code home are approximately $3,256 more than a 2006 code home with home owner savings per year of $293 for a return on investment of seven percent.

With its proximity to major markets coupled with large expanses of flat rooftops and relatively flat, open landscape, Pima County is well positioned for developing a thriving renewable energy industry that is prepared to satisfy the demands of the low carbon economy of the future. Per dollar invested, renewable energy and efficiency generate more jobs than any other energy-related industry sector and they rely primarily on the local workforce, ensuring the jobs stay local. Wide scale deployment over the next 10-15 years could generate tens of thousands of construction-phase jobs, $10 billion in earnings and economic

activity, and more than 4,000 permanent jobs and $750 million annually in earnings and additional economic activity. Robust investment in the development of a clean, renewable energy supply will build a foundation for economic stability and growth, generating thousands of new high-paying jobs, boosting economic activity, conserving scarce water supplies, improving public health and enhancing energy security.

4.4 Wastewater Treatment

The Pima County Regional Wastewater Reclamation Department (RWRD) provides design, management and maintenance of the sanitary sewer system, including the conveyance and treatments systems (3,400+ miles of sewer, two metropolitan wastewater treatment plants and seven sub-regional facilities).

Exhibits 4.4.a and 4.4.b, Sewer Service Areas, included at the end of this chapter, show Designated Management Area Wastewater Treatment Facilities, Non-Designated Management Area Treatment Facilities, Marana Wastewater Reclamation Facility Service Area, and Pima County Regional Wastewater Reclamation Department Service Area by planning area.

Table 4.4.a shows Sewer Service Areas total acreage.

TABLE 4.4.a: Sewer Service Areas Total Acreage by Planning Area

Planning Area	Pima County Regional Wastewater Reclamation Department Service Area (Acres)	Marana Wastewater Reclamation Facility Service Area (Acres)
1) Avra Valley	195	52,829
2) Tucson Mountains	11,519	2,147
3) Southwest	11,980	0
4) Altar Valley	0	0
5) Upper Santa Cruz	8,752	0
6) Mountain View	0	0
7) Southeast	13,162	0
8) Central	70,596	0
9) Catalina Foothills	50,233	0
10) Rincon Valley	6,141	0
11) Tortolita	26,026	20,140
12) San Pedro	7	0
13) Ajo-Why	0	0
Total All Planning Areas:	**198,610**	**75,116**
Total County:	**198,610**	**75,116**

Source: Pima County Information Technology Department, Geographic Information Systems, 2013

Wastewater Assessment

Avra Valley Planning Area (1)

Inventory and Service Baseline

This planning area is served by one wastewater treatment facility, the Marana Wastewater Reclamation Facility (WRF). Only the Marana facility is physically located in the planning area serving the residents in the northwestern portion of the town.

The Marana WRF, located in the northern portion of the town, is currently operated by the Town of Marana and has a Designated Management Agency (DMA) status. The DMA status gives the town the authority to construct and operate new reclamation facilities in Marana. The Marana facility serves several master planned communities, including the Gladden Farms, Rancho Marana, and San Lucas, as well as the Marana Main Street and the Town's Municipal Complex. The facility is permitted to treat a design flow of 0.70 million gallons per day (mgd). The town currently operates and maintains the sanitary sewer conveyance system tributary to the facility.

Two privately owned package plants are also located in this planning area, one serving the Marana High School and the other one serving the Marana Community Correctional Facility. The plants have capacity of 0.07 mgd and 0.13 mgd and are permitted to treat onsite sewage only.

Existing Deficiencies

Expansion of the treatment and conveyance systems is predicated upon growth, its expansion primarily driven by the development community. Current development and growth patterns suggest that the Tres Rios facility service area is being adequately served by RWRD. Due to topographic constraints, the service connection to the Tres Rios facility for future developments downstream of the facility may not be feasible without the addition of substantial infrastructure such as lift stations and lengthy conveyance lines. Future capacity allotments would require assessment by RWRD on a project-by-project basis. The Department has not identified and is not aware of any major service deficiencies within this area.

Potential Remedies and Projects

Necessary system augmentation is anticipated as new and infill developments occur in the planning area. The Department currently requires that any expansion of sanitary system resulting from new development shall be paid for by the developer or development.

Tucson Mountains Planning Area (2)

Inventory and Service Baseline

RWRD and the Town of Marana are the wastewater service providers in this planning area. There are three wastewater reclamation facilities in this planning area: the Tres Rios Water Reclamation Facility (TRWRF), the Agua Nueva (WRF), and the Rillito Vista Water Reclamation Facility.

The service area includes a mixture of sewer service users, including residential, commercial and industrial, of which the dense residential developments of a portion of the Town of Marana (e.g. Continental Ranch) and the City of Tucson comprise the majority. A well-served widespread sewer system exists for the Tres Rios and Agua Nueva wastewater facilities. Unincorporated areas of less dense suburban population are served by private individual septic systems. Such are the medium and large sized residential lots and single-family subdivisions located in the central portion of the planning area.

The Tres Rios WRF, located on N. Casa Grande Highway, collects and treats wastewater from the City of Tucson and surrounding areas. The facility is permitted to treat a design flow of 50 million gallons per day (mgd) of wastewater. The majority of the effluent produced is discharged into the Santa Cruz River.

The Roger Road WRF, located on W. Sweetwater Drive, along the east side of the Santa Cruz River, began operating in the 1950's. It is no longer in service and has been replaced by the Agua Nueva WRF. The plant had a maximum capacity of 41.0 mgd and collected and treated wastewater from within the City of Tucson and surrounding areas to the south as far as the state prison on Wilmot Rd., and east as far as the unincorporated community of Vail. The plant's effluent was discharged into the Santa Cruz River, or

reused for turf irrigation and other purposes, primarily through the City of Tucson's reclaimed water system. Sludge produced at the facility was transferred to the Regional Biosolids Facility for further treatment.

The Roger Road WRF was replaced by a new 32 mgd water reclamation facility, Agua Nueva WRF. The Roger Road plant was decommissioned after the new water reclamation facility was built.

Lastly, the Rillito Vista WRF is operated by the Town of Marana and comprised of a pond percolation wastewater treatment system; it currently serves the Rillito Vista subdivision of approximately 67 lots.

One private septic facility in this planning area is owned and operated by the Milagro Subdivision and Homeowner's Association. Disposal is via wetlands and subsurface drip irrigation. The system serves 28 homes.

Existing Deficiencies

The Department has not identified and is not aware of any existing service deficiencies within this planning area. The Department implemented the Regional Optimization Master Plan (ROMP) to ensure adequate treatment and conveyance capacity is available within this planning area and the greater metropolitan area.

Potential Remedies and Projects

Expansion of the treatment and conveyance systems is predicted upon growth, its expansion primarily driven by the development community. Currently, RWRD adequately serves existing development in the planning area. The ways in which this area develops will dictate the type of infrastructure expansion needed for RWRD to continue to effectively serve the area. Developer driven expansion of conveyance system will be required as infill development occurs. The Department currently requires that any necessary expansion of sanitary systems resulting from new development shall be paid for by the developer or development.

Increased treatment capacity at the Tres Rios WRF will meet the long-term treatment capacity needs for the area and the majority of tributary metropolitan area.

Growth and development, particularly in the western portion of this area, is limited due to topographical and environmental constraints, therefore the system infrastructure expansion in this direction is unlikely.

Phase two of the previously mentioned ROMP included an upgrade and capacity expansion of the Tres Rios WRF from 37.5 mgd to 50 mgd. The majority of flows from the Roger Road WRF service area are now being treated at the Tres Rios WRF after the facility expansion was completed in 2014.

Concurrently phase three of the ROMP implementation was completed, including the construction of the Water Campus just north of the existing Roger Road WRF. The Water Campus replaced the old Roger Road plant and was followed by the decommissioning of the Roger Road facility.

The new 32 million gallon-a-day Water Campus reduced the levels of ammonia and nitrogen in the effluent discharged into the Santa Cruz River, and is equipped with state-of-the art odor control features. The facility is highly automated and uses an innovative treatment technology that saves significant electrical power. No solids are handled at Water Campus, instead solids are conveyed to and treated at the upgraded Tres Rios WRF.

Southwest Planning Area (3)

The purpose of the wastewater management portion of the Southwest Infrastructure Plan (SWIP) is to quantify the impending consequences of proposed land uses in this planning area by developing a proposed interceptor sewer sizing and conceptual alignment plan. This servicing strategy considers serviceability and conversion issues for areas currently using septic systems. The infrastructure sizes, alignments, and locations provided in the SWIP are for planning purposes. Final details must be determined in follow-up preliminary and detailed design stages.

In addition, the study has included Pima County's ongoing and future planned upgrades at the Avra Valley Wasterwater Treatment Facility (WWTF) and quantifies the existing and committed capacity at the plant in light of the demand forecasts posed by the envisioned land uses in its upstream tributary area. Key wastewater treatment issues addressed by this study include effluent discharge issues posed by the receiving water bodies, regulatory constraints and treatment processes, biosolids handling, and opportunities for effluent water re-use. Probable capital and operations and maintenance (O&M) costs are included in the SWIP.

Analysis and Assumptions

Standard Pima County assumptions were used to estimate the sewer flows, including the following conservative assumptions. The average wastewater generation for residential development is 85 gallons per capita per day. The average wastewater generation for commercial and industrial developments is 1,000 gallons per acre per day. The average persons per dwelling unit is 2.7. Wastewater generation at existing school sites was calculated as number of students x 20 gallons per student per day. Additional assumptions and design criteria are provided in the SWIP.

For planning purposes, those areas with densities below an assumed cost-effective threshold of 1.33 residences per acre (RAC) were not serviced via traditional gravity sewers. It was assumed that these areas would be served by septic systems should they be developed. Triggering flows for any proposed treatment plant expansion were set at 85 percent of the plant design inflow.

Basis of Existing and Future Sewage Generation Estimates

The volume of wastewater generated by existing developments was roughly estimated using Transportation Analysis Zone (TAZ) data from the Pima Association of Governments (PAG). This TAZ data provided population data for both the year 2000 and projected populations at 2030. Current year (2007) population estimates were extrapolated from this 2000/2030 dataset assuming a constant linear growth rate.

Because TAZ data only extends out to the year 2030, the anticipated SWIP build-out will occur beyond the range of the current TAZ time frame. Future build-out flows were estimated based on the projected land use and population data provided by Pima County Planning Department.

Delineation of Sewer Sub-basins and Sub-areas

The study area within the Avra Valley sewer basin was divided into eight sub-basins numbered 1 through 8. These sub-basins were defined based on their natural drainage patterns and existing infrastructure. Given topographic conditions at the SWIP boundary, it may be possible to service additional adjacent areas in the future. One potential servicing expansion to the southwest towards Three Points was considered, however land uses in this area would quickly become constrained by the Conservation Land System (CLS), which forms the backbone of the Sonoran Desert Conservation Plan (SDCP).

Within the study area (but outside the delineated Avra Valley sewer service sub-basins) are three distinct sub-areas that are notable based upon their drainage condition. The 6,801 acre area located in the northwest corner of the study area cannot naturally drain to the Avra Valley WWTF via gravity flow. Given that the proposed growth density in this area is relatively low, on-site septic systems may prove to be the most feasible means of disposing of wastewater generated within this area.

The 5,219 acre area located in the eastern portions of the study area is part of the Agua Nueva WWTP sewer basin. In addition, on the ridge line between this area and the delineated Avra Valley WWTF sewer basin there is an indeterminate treatment destination area where future wastewater could potentially be directed to either the Avra Valley WWTF or the Agua Nueva WWTP. As directed by Pima County, areas outside the specifically delineated Avra Valley WWTF sewer basin were not examined in this Infrastructure Plan. Optimal means of servicing these subareas may be studied in subsequent planning projects.

Projected Population and Flow Statistics

The projected populations provided by Pima County planners at the time the SWIP was prepared were used to generate future wastewater flow estimates. Three growth scenarios were developed in Phase 1, describing higher density, medium density, and lower density scenarios. The Phase 2 population was closest to the Phase 1 medium density scenario.

In general, it does not make economic sense to provide public sewer service to subdivisions in locations where houses are located far away from each other. For the purposes of this planning level effort, only areas where the proposed RAC is higher than 1.33 (e.g. one unit on a lot equal to or larger than 0.75 acres)

was considered for public sewer servicing. Based on this assumption, low density areas with a proposed RAC less than 1.33 will be on septic systems and will not contribute wastewater to the public sewer facilities.

TABLE 4.4.b: Acreage of Sub-basins and Sub-areas

Sub-basins and Sub-areas	Total Acreage
1	5,500
2	4,851
3	2,691
4	2,241
5	1,895
6	4,264
7	3,853
8	2,771
Non-Serviceable Area (by Gravity to Avra Valley WWTF)	6,801
Area in Roger Road WWTP Sewer Service Basin	5,219
Indeterminate Treatment Destination Area	3,519

Source: Pima County Southwest Infrastructure Study, 2007.

TABLE 4.4.c: Projected Total and Effective Population

Sub-basins and Sub-areas	Total Acreage
1	5,500
2	4,851
3	2,691
4	2,241
5	1,895
6	4,264
7	3,853
8	2,771
Non-Serviceable Area (by Gravity to Avra Valley WWTF)	6,801
Area in Roger Road WWTP Sewer Service Basin	5,219
Indeterminate Treatment Destination Area	3,519

Source: Pima County Southwest Infrastructure Study, 2007.

TABLE 4.2.d: Projected Total and Effective Population (Phase II Density Scenario)

Sub-basins and Sub-areas	Total Population	Effective Population	Percent of Public Sewer
1	36,904	29,654	80.4
2	23,512	21,244	90.4
3	20,623	19,688	95.5
4	5,743	3,424	59.6
5	8,073	6,288	77.9
6	17,240	13,338	77.4
7	6,229	1,231	19.8
8	5,500	4,010	72.9
Sub-Totals	**123,822**	**98,877**	**79.9**
Non-Serviceable Area (by Gravity to Avra Valley WWTF)	4,126	0	0.0
Area in Roger Road WWTP Sewer Service Basin	20,785	16,926	81.4
Indeterminate Treatment Destination Area	5,584	2,079	37.2

Source: Pima County Southwest Infrastructure Study, 2007.

As expected, denser developments lead to higher percentages of the population being serviced by public sewers. The total predicted Phase 1 influent Average Dry Weather Flow (ADWF) flows at the Avra Valley WWTF ranged from 6.3 MGD for the lower density scenario up to 11.7 MGD for the higher density scenario. Inflows under the medium density scenario and the higher density scenario are higher than previously anticipated inflows to this facility. The addition of industrial and commercial lands to the development concept in Phase 2 resulted in a total predicted influent ADWF flow at the Avra Valley WWTF of 11.3 MGD.

Residual Capacity of Existing Sewers

For current conditions the great majority of the wastewater collection and conveyance system has sufficient capacity to convey the existing flow during peak wet weather flow periods. However, the residual capacity in the existing system is not sufficient to accommodate the proposed future flows at all locations.

Proposed Expansion of Conveyance Systems

Proposed expansion of conveyance systems is discussed in detail and mapped in the Pima County Southwest Infrastructure Plan (SWIP) study for this planning area.

Sub-basin/Sub-area Phase II Density Scenario

A revised wastewater servicing plan was developed during Phase II to accommodate the residential, industrial, and commercial lands in the altered development concept. The service areas include Ryan Airfield to support industrial employment possibilities. During both Phase 1 and Phase 2 it was determined that the existing system is not sufficient to accommodate the entirety of the anticipated future flows. It was assumed that in many cases the conveyance capacity of existing sewers would be augmented by the addition of sewers installed in parallel with existing sewers.

For Phase 1, in order to service the proposed development in the southwest corner of the SWIP area, a new trunk sewer will be necessary. The proposed trunk, which extends along the West Ajo Highway, is schematically shown on the maps for the purposes of this study. The eventual constructed alignment must be determined through a formal route study. This trunk has been sized to handle wastewater generated in the adjacent yellow-colored areas within the SWIP boundary.

For Phase 2, the concepts evolved. In Basin 6 the flow from the northeast was split. One segment flows to the south in an 8-inch line and then west in a 12-inch line. The other segment flows west and then south in a 12-inch line. It was assumed that the flow split could be accomplished so that the two segments would not exceed capacity. If this assumption is incorrect and the flow cannot be split to avoid exceeding capacity in either segment, portions of these sewers would have to be augmented. In order to service the proposed development in the southwest corner of the SWIP area, new trunk sewers will be necessary.

The proposed trunk sewers, which extend along West Ajo Highway and skirt the west edge of Ryan Airfield, are schematically shown in the SWIP study. The eventual constructed alignment should be determined through a formal route study. The route study should consider at least the following factors: the routing of the sewer or sewers to serve this area, the size of the sewers, and how much of the area, if any, could be served by a sewer west of Ryan Airfield.

Wastewater Treatment Capacity and Currently Proposed Expansion

Existing Treatment Capacity

The Avra Valley WWTF is a biological nutrient removal oxidation ditch with an ADWF design capacity of 4 MGD.

Expansion Acheived in CIP

Due to the ongoing and rapid growth in the Avra Valley WWTF service area, Pima County authorized a plant expansion of 4.0 MGD additional capacity. The new expansion constructed two new parallel 2.0 MGD process trains. The original oxidation ditch was designed and built as a temporary facility. After the 4.0 MGD expansion, the original oxidation ditch was taken out of service. The County then replaced the existing system with the new 4.0 MGD ditch system to the Modified Ludzak-Ettinger (MLE) process to create additional capacity.

The improvements provided an additional 4.0 MGD capacity including a new inlet gravity sewer and influent lift station, modifications to the headworks, two biological nutrient removal oxidation ditches, clarifiers, continuous backwashing deep bed filters, ultraviolet (UV) disinfection, sludge holding basins, sludge thickening equipment, dewatering equipment, means of additional effluent discharge to percolation basins and/or the Black Wash spray fields, and upgrades to the process water, odor control, and electrical systems. Initially, solids were stored on-site, dewatered to five percent to six percent solids content, and trucked to the Ina Road Water Pollution Control Facility (WPCF) for further digestion. Future on-site aerobic digestion may be considered at some point.

The influent lift station and headworks were designed for an ultimate ADWF flow of 6.2 MGD and a peak flow of 12.0 MGD. Solids handling from both new treatment trains and the existing system are combined and thickened in an aerated and mixed holding tank prior to aerobic digestion. The sludge is dewatered and trucked to land application sites. A tertiary filtration area was planned and basin capacity constructed for ultimate 6.2 MGD. The filtration and ultraviolet disinfection equipment was sized to treat 4.0 MGD.

This 4.0 MGD expansion was programmed within the CIP and is completed. The total combined cost for the Avra Valley WWTF 4.0 MGD Biological Nutrient Removal Oxidation Ditch (BNROD) Expansion project delivery is $44,900,000. Included in these costs is the purchase of heavy equipment to operate and maintain the effluent disposal ponds in a proactive manner to maximize their disposal capacity. This amount is being financed through a combination of 2004 Bonds under an amended bond authorization and System Development Funds.

Additional Required Treatment Capacity Expansion

In Phase 1 Pima County planners developed three SWIP scenarios with varying levels of development intensity. From a wastewater treatment design point of view, the total required treatment capacity at the Avra Valley WWTF for the higher, medium, and lower density scenarios were considered.

Lower Density Scenario

An expansion adding 4.0 MGD capacity has been programmed into the CIP and is in the process of being delivered. With this 4.0 MGD addition, the Avra Valley WWTF could theoretically treat an ADWF of up to 6.2 MGD, however the original oxidation ditch was designed and constructed as a temporary facility and has already been in operation for an extended period of time. Once the 4.0 MGD addition is finished, it is recommended that this temporary facility be taken out of service. A new facility expansion would then be pursued to provide sufficient treatment capacity to support the lower density scenario ADWF of 6.5 MGD.

Avra Valley WWTF requirements related to this scenario will include maintaining the proposed 4.0 MGD and replacing the existing 2.2 MGD capacity oxidation ditch with an equivalent means of treating 2.5 MGD capacity. Through these additions the Avra Valley WWTF would continue to be capable of producing Class A+ effluent.

Medium Density Scenario

An ADWF capacity of 9.5 MGD will be required to support the population represented by the medium density scenario. Avra Valley WWTF requirements related to this scenario will include the maintenance of a total capacity of 4.0 MGD from the ongoing expansion, and the construction of an additional 5.5 MGD of ADWF treatment processes capable of producing Class A+ effluent.

Higher Density Scenario

An ADWF capacity of 12.0 MGD will be required should the higher density development scenario transpire. Avra Valley WWTF requirements related to this scenario will include the maintenance of a total capacity of 4.0 MGD from the ongoing expansion, and the construction of an additional 8.0 MGD of ADWF treatment processes capable of producing Class A+ effluent.

In Phase 2, Pima County planners transitioned to a single most probable SWIP development scenario with projected levels of development intensity. An ADWF capacity of 12.0 MGD will be required for the Phase 2 development scenario. Avra Valley WWTF requirements related to this scenario include the maintenance of a total capacity of 4.0 MGD from the ongoing expansion, and the construction of an additional 8.0 MGD of ADWF treatment processes capable of producing Class A+ effluent.

Probable Costs for Effluent Disposal

As part of the SWIP, the probable costs for effluent utilization were developed based on three options. The first option assumed 100 percent of the treated effluent is recharged using on-site percolation ponds. The second option used a combination of percolation ponds and riparian restoration. The third option maximized urban re-use in combination with either percolation or both percolation and habitat restoration. Under option three, three major regional parks were included.

Summary of Wastewater Capital Costs

SWIP-related wastewater capital projects to be funded by Pima County (developer-borne conveyance costs have been omitted) depended upon the density scenario during Phase 1 but were simplified in Phase 2 to represent total approximate cost ranging from $127,652,000 to $165,067,000 in 2007.

Altar Valley Planning Area (4)

According to the 2000 and 2010 US Bureau of the Census, Altar Valley planning area as one of the lowest population densities in Pima County with 7 persons per square mile. The area includes portion of the Tohono O'odham Nation, the Buenos Aires National Wildlife refuge, the Baboquivari Peak Wilderness Area, the Coyote Mountain Wilderness Area, the Ironwood Forest National Monument and slivers of the Tohono O'odham Nation San Xavier District. Privately owned lands constitute approximately 16.8 percent of the planning area.

Most of the land in this planning area is under the Conservation Lands System. Most of the planning area is undeveloped. Therefore, most of the wastewater systems are serviced by septic tanks. Commercial development is limited to Three Points and Arivaca. Given the low population density, the low two percent increase in population between 2000 and 2010, the presence of a variety of wilderness areas and the current land use trends, it is anticipated that this area will remain serviced by private septic tanks or small treatment plants.

Upper Santa Cruz Planning Area (5)

Inventory and Service Baseline

There are two wastewater service providers in this planning area: the Town of Sahuarita and Pima County Regional Wastewater Reclamation Department (RWRD). There are two facilities physically located in this area: the Green Valley Wastewater Reclamation Facility (WRF), the primary wastewater service provider for the Area, and the Arivaca Junction WRF, serving two residential subdivisions. Both facilities are managed and operated by RWRD.

The Green Valley WRF, located at 19600 S. Old Nogales Highway, along the east side of the Santa Cruz River, is comprised of two independent treatment trains that are permitted to treat a design flow of 4.1 million gallons per day (mgd). Additional service areas for the Green Valley WRF will be determined by growth in the PAG Plan Joint Management Areas.

The Arivaca Junction WRF, located at 28601 S. Nogales Highway at the Pima/Santa Cruz County line, consists of a 3.2 acre pond and is permitted to treat 100,000 gallons per day (gpd). The plant is scheduled to close upon the completion of developer driven connection between the service area and Green Valley WRF.

Subsequent to the plant closure, the conveyance flows from the Arivaca Junction WRF service area will be diverted to the Green Valley WRF. The timing of the sewer extension is mainly driven by the Canoa Ranch Development, as the two most downstream phases of the sewer extension are to be built by the developer. The final phase, which consists of the construction of approximately one mile of gravity sewer tying into the existing line at Elephant Head Road, will be completed by the County.

Along with the future sewer extension, a scalping plant that would treat the combined effluent from the Arivaca Junction facility is being evaluated for the Old Canoa Ranch. This reclaimed water will be used for the park irrigation and habitat restoration at the Old Canoa Ranch.

Existing Deficiencies

The Department does not have any existing service deficiencies within this planning area. Expansion of the treatment and conveyance systems is driven by growth; its expansion is primarily driven by the development community. The facility is permitted to treat 4.1 million gallons a day (MGD), and currently sees flows that average 1.8 MGD to 2.2 MGD depending on the time of year.

The Green Valley WRF serves a population that is unique when compared to the service areas of other treatment facilities within Pima County. The population served by the Green Valley WRF is predominately made up of retired senior citizens, with a portion of them listing residences outside of southern Arizona as their primary residence. The make up of this population accounts for the fluctuation of flows over the course of the year.

Potential Remedies and Projects

The Department also desires to provide additional wastewater service to the areas surrounding the Green Valley WRF service area, as these areas develop and additional conveyance capacity is required.

Conveyance of the Arivaca Junction wastewater flows to the Green Valley WRF for treatment is a long range goal for this planning area. A couple of milestones must be reached before this takes place. First, the Canoa Ranch Development, on the west side of I-10, must construct two phases of sewer to serve the additional 3,917 dwelling units. Then, the County must build a new sewer to complete the connection.

Mountain View Planning Area (6)

Inventory and Service Baseline

Pima County Regional Wastewater Reclamation Department (RWRD) is the designated sewer service provider for this area. However, currently there is no public sewer infrastructure to serve this area. The nearest public sewer is several miles away in the adjacent Planning Areas 7 and 10.

The sparsely populated areas of this planning area are all served by private septic systems. RWRD currently does not have plans for sewer system extension in this area. Densities requiring public sanitary sewer service in this region are unexpected.

Most of the land within this planning area is owned by the Arizona State Land Department, the Bureau of Land Management and the Coronado National Forest. Only 14 percent of the area are privately owned lands. The sparsely populated area contains very little economic activity with just five Tucson business licenses. The area is sparsely developed and where developed is by large lot single-family. According to the US Bureau of the Census, the area had a population density of 4 people per square mile in 2000 and 5 people per square mile in 2010.

Southwest Planning Area (7)

Inventory and Service Baseline

There are two wastewater service providers in this planning area, the Town of Sahuarita and Pima County Regional Wastewater Reclamation Department. There are two facilities physically located in this planning area: the Corona de Tucson Wastewater Reclamation Facility (WRF) and the Pima County Fairgrounds WRF. Unincorporated areas of less dense rural population are served by septic systems. The Corona de Tucson WRF, located at 1100 W. Sahuarita Road, is permitted to treat 1.3 million gallons per day (MGD)

of wastewater. The facility is topographically constrained to areas south of West Sahuarita Road. Land ownership surrounding the facility is primarily large lot private residential, Bureau of Land Management, and State Trust Lands. The Pima County Fairgrounds WRF, located at 11300 S. Houghton Road, is permitted to treat an annual average of 20,000 gallons per day (GPD) of wastewater.

Existing Deficiencies

The RWRD does not have any existing service deficiencies. Expansion of the treatment and conveyance systems is driven by growth; its expansion is primarily driven by the development community.

There are landownership patterns that will markedly affect the current and future distribution of land uses in this planning area. On balance, there is a comparatively small percentage of land that is held in private ownership. The Arizona State Land Department, the U.S. Forest Service, and to a lesser degree, the Bureau of Land Management owns the majority of land in this planning area. With the location and speed of growth largely driven by the actions of the Arizona State Land Department, it is important that the growth occur in a radial manner, growing out from the existing system instead of leapfrogging. The RWRD continuously evaluates the capital costs associated with potential service deficiencies; however, current development and growth patterns suggest that this planning area is being adequately served.

While RWRD adequately serves existing development in the planning area, the possibility of an additional 350,000 people would require the expansion of services within this area. How this area develops will dictate the type of infrastructure expansion needed for RWRD to continue to effectively serve the area. RWRD does not foresee the need, nor are there plans, to rehabilitate or augment any of their treatment or conveyance systems within the Southlands Service Area within the next six years. Both the treatment and conveyance systems within this area are relatively new, and in compliance with all permits that apply to the respective system.

The Town of Sahuarita Southeast Conceptual Area Plan

The Town of Sahuarita is currently working with the Arizona State Land Department in the preparation of the Town of Sahuarita Southeast Conceptual Area Plan (SECAP) within this planning area. The SECAP encompasses approximately 38,170 acres or 59.6 square miles. It is anticipated that this area will be annexed to the Town's corporate boundary.

Potential Remedies and Projects

RWRD recognizes that future growth in this area will necessitate the expansion of these systems, but at a cost to the developer. It is RWRD's current requirement that any expansion needs that arise from new development shall be paid for by the developer or development.

Specific service considerations related to the potential for growth are:

- *Verano: Projected 1.72 million gallons per day.* If developed according to existing planned residential and non-residential uses, this 3,200-acre development, at build-out, would generate approximately 1.72 million gallons per day (mgd) which would be treated at the proposed Southlands WRF. The timing for construction of this facility will be determined by growth in the area. The RWRD is sufficiently able to handle the current level of service required of the system's users. The RWRD is continuously evaluating the needs for future treatment and conveyance capacities relative to future growth to ensure continued level of service demands are met.
- *Southlands WRF:* This WRF will be designed to accommodate the 1.72 mgd to be generated from Verano as well as the additional 9.7 mgd projected to be generated by the balance of the Southlands Service Area. However, the Southlands WRF would likely be designed initially to accommodate flows yielded by the first phases of development in Verano with allowances for additional expansion capacity to treat flows generated from the rest of the Southlands Service Area. When and where flows from future development in the Southlands Service Area exceed the availability of treatment capacity at the Southlands WRF, some developments may be required to convey wastewater flows to other adjoining service areas. The proposed Hook M development near Kolb and Sahuarita Roads also falls within the Southlands Service Area, but flows could be conveyed via force main to the Corona de Tucson WRF if the Southlands WRF is not constructed.
- *Fairgrounds WRF*: This facility has operational capacity for approximately 20,000 gpd, however, this has been allocated for developments within the Southlands Service Area that are coming online currently and in the immediate future. Once sufficient base flows have been established, the flows may be conveyed to either the Agua Nueva basin, via the Southeast Interceptor, or the proposed Southlands WRF.
- *Corona de Tucson WRF*: This WRF and its associated service basin is constrained due to surrounding topography and little land available for future development within the service basin. Any additional development, beyond what is entitled and platted, will likely require expansion of the treatment facility. Unless the potential for future development increases due to the release of tracts of State Trust land, the need to consider providing increased treatment capacity would likely come from developments located in the Southlands Service basin that must convey flows to the Corona de Tucson WRF.

Central Planning Area (8)

While RWRD adequately serves existing development in the planning area, how this area develops will dictate the type of infrastructure expansion needed for RWRD to continue to effectively serve the area. RWRD does not foresee the need, nor are there plans, to rehabilitate or augment any of their treatment or conveyance systems in this planning area within the next six years. Both the treatment and conveyance systems within this area are relatively new and in compliance with all permits that apply to the respective system.

RWRD does recognize that future growth in this area will necessitate the expansion of these systems, but at a cost to the developer. It is RWRD's current requirement that any expansion needs that arise from new development shall be paid for by the developer or development.

Inventory and Service Baseline

Pima County Regional Wastewater Reclamation Department (RWRD) is the wastewater service provider for this area. Three facilities serve this planning area, the Agua Nueva Wastewater Reclamation Facility (WRF), the Tres Rios Water Reclamation Facility (TRWRF), and the Randolph Road WRF. Only the Randolph Road WRF is physically located in this planning area.

The Randolph Park WRF is a scalping plant located at 3805 E. 22nd Street. The facility treats wastewater en route to the Agua Nueva WRF and has a maximum average monthly flow of 3.5 MGD diverted from an interceptor two miles to the west. The treatment process consists of anoxic tanks, aeration tanks, membrane bioreactors and ultraviolet (UV) disinfection. Class A quality reclaimed water is pumped into the City of Tucson's Reclaimed Water System. A limited amount of water is used for onsite landscape irrigation. Generated sludge is further processed at the Tres Rios Water Reclamation Facility. There are no current plans to expand the capacity of the Randolph Park WRF.

Conveyance of wastewater flow from this planning area tributary areas to the Agua Nueva WRF is accomplished by multiple interceptors: the Southeast Interceptor (SEI), Aviation Corridor to Santa Cruz (ACSC), Aviation Corridor to Southeast (ACSE), Santa Cruz Interceptor (SCI), South Rillito (SRI), and Pantano Interceptor (PTI). Conveyance of flow to the Tres Rios Water Reclamation Facilityis by the North Rillito Interceptor (NRI).

Existing Deficiencies, Future Concerns, and Potential Remedies

The Department has not identified and is not aware of any existing service deficiencies within this planning area. The Department has completed the Regional Optimization Master Plan (ROMP) to ensure adequate treatment and conveyance capacity is available within the metropolitan area.

Expansion of the treatment and conveyance systems is predicated upon growth, its expansion primarily driven by the development community. The majority of land in this planning area is privately owned and developed as this area includes the densely populated central region of Tucson. However, significant growth has occurred in the last several years in the southeast section of this planning area where the majority of private land is still available for development.

Augmentation of the SEI segment along Euclid Avenue between 36th Street and 18th Street, primarily conveying flow from the southeast area, has been identified by the Department as a short term priority to mitigate this concern. The Department is currently calibrating the hydraulic model it uses to determine the potential impacts of various proposed hydraulic planning scenarios. These scenarios can be further developed to determine if additional expansion of the SEI is necessary. Further augmentation of other segments of the conveyance system is also anticipated as new development and infill occurs in this area.

Currently, the relatively slow pace of development does not create immediate demand for additional treatment capacity. Increased treatment capacity at the Ina Road WRF, which is currently undergoing upgrade and expansion, will meet the long-term treatment capacity needs for this area and the majority of metropolitan area.

The need for a new sub-regional facility and/or a new scalping plant to serve the far southeast area has been identified in the 2006 Metropolitan Area Facility Plan Update. Three potential locations in the planning area have been evaluated by the Department. A major factor in assessing the timeframe (year 2010 or 2015) for facility construction was the rate of development of the Houghton Area Master Plan (HAMP), which to date remains largely undeveloped. ROMP implementation process, of which the first phase of the plant interconnect was completed in 2010, and the two subsequent phases were completed in 2014. The plant interconnect consists of the construction of the Santa Cruz Interceptor that allows a portion of the wastewater tributary to the Agua Nueva WRF to now be conveyed to the Tres Rios WRF for treatment. The new interceptor was primarily constructed to increase flow and capacity management opportunities between the two plants. It consists of five mile pipes varying in size from 60 to 72 inches in diameter, and is designed to handle an average flow of 36 MGD with 81 MGD peak flow.

Phase two included an upgrade and capacity expansion of the Tres Rios WRF from 37.5 MGD to 50 MGD. The majority of flows from the Agua Nueva WRF service area are treated at the Tres Rios WRF. The third phase of the ROMP implementation process was the construction of a new water reclamation campus north of the Roger Road WRF. The new facility is designed to reduce the levels of ammonia and nitrogen in the effluent discharged into the Santa Cruz River. The facility does not handle solids, which will be conveyed to and treated at the Tres Rios Water Reclamation Facility WRF. Class A+ quality effluent will be produced.

Functional Area-specific Considerations

Wastewater Reclamation

Currently, RWRD adequately serves existing development in the planning area. The ways in which this area develops will dictate the type of infrastructure expansion needed for RWRD to continue to effectively serve the area. Developer driven expansion of conveyance system will be required as infill development occurs, particularly in the southeast area. The RWRD has identified two primary goals for this area: (1) augmentation of the SEI, a short-term priority aimed at mitigating flow concerns associated with growth in the southeastern section, and (2) construction of a new regional reclamation facility and/or a scalping plant, a long-term planning goal for this planning area.

RWRD recognizes future growth in this area will necessitate the expansion of treatment and conveyance systems. The Department currently requires that any necessary expansion of sanitation systems resulting from new development shall be paid for by the developer or development.

Catalina Foothills Planning Area (9)

Inventory and Service Baseline

Pima County Regional Wastewater Reclamation Department (RWRD) is the wastewater service provider for this planning area. The area is served by three wastewater treatment facilities, of which only the sub-regional Mt. Lemmon Wastewater Reclamation Facility (WRF) is located in this planning area. The other two facilities are the Agua Nueva WRF and the Tres Rios WRF, located in Planning Area 2.

The Mt. Lemmon WRF service area is comprised of the Catalina Mountains of unincorporated Pima County, including the community of Summerhaven in Mt. Lemmon, as well as the far-east side of the Tucson metropolitan area. These are the northernmost and easternmost points of the RWRD service area. All population in the service area is well served by existing facilities. Low-density suburban and rural populations in this planning area are served by private septic systems.

Two gravity interceptors are responsible for collecting wastewater flow from the south-central portion of this area to the receiving treatment plants on the west side of the Tucson metropolitan area. They are the North Rillito Interceptor (NRI) and the Tanque Verde Interceptor (TVI). In addition, the Summerhaven community on Mt. Lemmon is served by isolated conveyance system that covers a small service area of less than a square mile in size.

The Mt. Lemmon WRF, located on N. Sabino Canyon Park Road, in the town of Summerhaven, is permitted to treat domestic sewage from a maximum of 77 properties. Currently the system has only 49 connections of which only 45 percent is active. The maximum treatment capacity requirement is established by an agreement between Pima County and the United States Forest Services (USFS). The Mt. Lemmon WRF service area is primarily residential with a few commercial establishments, including restaurants and gift shops.

The current treatment capacity of the Mt. Lemmon WRF is 20,000 gallons per day (gpd). The facility uses an oxidation ditch with chlorination and dechlorination providing secondary treatment of domestic sewage. Produced sludge is hauled off the mountain to the nearest sewer line, from where it is further conveyed to the Tres Rios WRF and the Regional Biosolids Facility for processing and conditioning.

Since the Mt. Lemmon sewer system is entirely within the boundaries of the Coronado National Forest, the USFS has significant input into future plans for growth, water use, and effluent disposal for the sewer system. This requires continuous collaborative efforts between the RWRD and USFC in preparing long-range plans for the future of the Mt. Lemmon sewer system.

Also, in this planning area, specifically in the Santa Catalina Mountains, USFC operates a small treatment system, an anaerobic lagoon type of system that treats sewage from a local ranger station. Treated effluent is seasonally reused for irrigation.

Existing Deficiencies

Expansion of the treatment and conveyance systems in predicated upon growth, its expansion primarily driven by the development community. Currently, RWRD adequately serves existing development in the planning area. The ways in which this area develops will dictate the type of infrastructure expansion needed for RWRD to continue to effectively serve the area.

The department is constructing an augmentation project to increase capacity of the NRI.

The Department has not identified and is not aware of any other major service deficiencies within this planning area. Augmentation of other segments of the conveyance system is anticipated as new development and infill occur in the planning area. The Department currently requires that any necessary expansion of sanitation systems resulting from new development shall be paid for by the developer or development.

Due to current economic trends that have greatly slowed growth taking place on the mountain, the sub-regional wastewater treatment facility of the Mt. Lemmon is anticipated to remain the same in regards to current treatment capacity, serving limited service area with steady service demand. In addition, development in Summerhaven is rather limited due to topographical and environmental constraints. Future connections to the collection system are currently allowed at the expense of developers and new home construction. RWRD remains the service provider retaining the sole system ownership.

Potential Remedies and Projects

Increased treatment capacity at the Tres Rios WRF will meet the long-term treatment capacity needs for this area.

Rincon Valley Planning Area (10)

Inventory and Service Baseline

Pima County Regional Wastewater Reclamation Department (RWRD) is the wastewater service provider for this planning area. There are currently no RWRD wastewater facilities in this planning area. The sewer infrastructure is limited to serving residential subdivisions in the western portion of the planning area.

This area is situated within the group of sewer basins tributary to the Agua Nueva Wastewater Reclamation Facility (WRF). Wastewater is collected via gravity sewer and conveyed to the Agua Nueva WRF for treatment. Two major interceptors serve this area, the Pantano Interceptor (PTI) and the Southeast Interceptor (SEI). The PTI collects sewage from the northern portion while the SEI generally

collects sewage from the southern portion of the planning area. The interceptors are located outside this area.

The service area is comprised of mostly single family residential subdivisions in the Vail Valley Ranch Specific Plan area. The service area boundary extends to the edge of the existing subdivisions. A number of low to medium density subdivisions, including individual lots of less dense population are served by private septic systems.

Existing Deficiencies

Expansion of the treatment and conveyance systems is predicated upon growth; its expansion primarily driven by the development community. Current development and growth patterns suggest that this area is being adequately served by RWRD. Future capacity allotments would require assessment by RWRD on a project-by-project basis. The Department has not identified and is not aware of any major service deficiencies within this area.

Potential Remedies and Projects

Necessary system augmentation is anticipated as new and infill developments occur in the planning area. The Department currently requires that any expansion of sanitation system resulting from new development shall be paid for by the developer or development.

Service expansion is anticipated as new growth materializes particularly in the proposed master-planned community of Rocking K. Augmentation of the PTI would be necessary in order for this development and other planned developments in the northern portion of this area to be adequately served by public sewer. Similarly, planned expansion of the SEI capacity would benefit the southern portion of the planning area, as well as the adjacent Planning Areas 7 and 8.

Tortolita Planning Area (11)

Inventory and Service Baseline

Pima County Regional Wastewater Reclamation Department (RWRD) is the primary wastewater service provider for this planning area. The service area includes the Towns of Marana (east of I-10) and Oro Valley, unincorporated areas between the Towns of Marana and Oro Valley, including the village of Catalina, as well as several subdivisions in Pinal County. A small portion of Area 11 on the east side of I-10 is served by the Marana Wastewater Reclamation Facility (WRF), currently maintained and operated by the Town of Marana.

The developed parts of the service area consist primarily of low to medium density residential and rural residential transitioning to suburban/urban land uses. Additional land uses in the area include commercial and industrial. A potential for extensive development and additional sewer service demand in this area exists.

Currently there are no existing RWRD wastewater facilities in this planning area. The primary wastewater service facility is the Tres Rios WRF, located in Planning Area 2. Combined flows from this planning area tributary areas are conveyed via the Canada del Oro Interceptor (CDO). Unincorporated areas of less dense population are served by septic systems.

Two small privately-owned wastewater facilities are located in this planning area, the Adonis Sanitary Sewerage Facility and the Saguaro Ranch Guest Ranch package plant. Both are limited by permits to only treat flow from the Homeowner's Association (approximately 150 mobile homes) and the Guest Ranch.

Existing Deficiencies

The Department has not identified and is not aware of any existing service deficiencies within this area. The Department has implemented the Regional Optimization Master Plan (ROMP) to ensure adequate treatment and conveyance capacity is available within this area.

Potential Remedies and Projects

Expansion of the treatment and conveyance systems is predicated upon growth, its expansion primarily driven by the development community. Currently, RWRD adequately serves existing development in the planning area. The ways in which this area develops will dictate the type of infrastructure expansion needed for RWRD to continue to effectively serve the area. Developer driven expansion of conveyance system will be required as infill development occurs. The Department currently requires that any necessary expansion of sanitation systems from new development shall be paid for by the developer or development.

The relatively slow pace of development currently does not create immediate demand for additional conveyance capacity. Increased treatment capacity at the Tres Rios Water Reclamation Facility WRF, which has undergone an upgrade and expansion, will meet the long-term treatment capacity needs for this area and the majority of metropolitan area. Future development in Area 11 will be served by either the Tres Rios WRF or Marana WRF. A new public wastewater facility is planned by the Town of Marana to serve the town's projected planning area. One of the alternative locations for the new WRF is in this area.

Phase two of the previously mentioned ROMP implementation included an upgrade and capacity expansion of the Tres Rios WRF from 37.5 million gallons per day (MGD) to 50 MGD. The majority of flows from the Agua Nueva WRF service area are treated at the Tres Rios WRF since the expansion completion in 2014.

San Pedro Planning Area (12)

Inventory and Service Baseline

Pima County Regional Wastewater Reclamation Department (RWRD) is the designated sewer service provider for this planning area. The planning area is outside the reach of public conveyance system. No RWRD facilities exist in this area. The primarily rural population is served by private septic systems. The nearest public sewer is in the adjacent Planning Area 9, serving the Mt. Lemmon area.

Current development and growth patterns suggest that this planning area will continue to be served by on-site septic systems. RWRD currently does not have plans for sewer extension in this area. Densities requiring public sanitary sewer service in this region are unexpected.

Ajo-Why Planning Area (13)

Inventory and Service Baseline

Pima County Regional Wastewater Reclamation Department (RWRD) does not provide wastewater services to this planning area.

The Ajo Improvement Company owns the sewer treatment facility which treats over 46 million gallons of wastewater per year. There is interest in finding a new method of processing the wastewater, especially its disposal which is currently pumped to the top of the New Cornelia mine trailings dam.

TABLE 4.4.e: Existing Capacity for Wastewater Facilities with a Design Capacity of 100,000 Gallons or More per Day by Sub-region

Facility Name	Facility Location	Design Capacity (Gallons)	Estimated Current Demand (Gallons)
Agua Nueva WRF		Agua Nueva WRF: 32.0 mgd	N/A
Arivaca Junction WRF	28601 Old Nogales Highway, Amado, AZ	100,000 gpd	48000 gpd
Avra Valley WRF		4.0 mgd	1.3 mgd
Corona de Tucson WRF	1100 W Sahuarita Road	1.3 mgd	0.27 mgd
Green Valley WRF	19600 S. Old Nogales Hwy, Green Valley	4.1 mgd	1.77 mgd
Tres Rios WRF	7101 N. Casa Grande Hwy	50 mgd	22.45 mgd
Randolph Park WRF	3805 E. 22nd Street	3.5 mgd	2.2 mgd
Roger Road WRF	2600 W. Sweetwater Drive	decommissioned	N/A

Source: Pima County Infrastructure Study 2013

Notes:

1. Regulatory Agency – Arizona Department of Environmental Quality (ADEQ)
2. Operational Responsibility – Pima County Regional Wastewater Reclamation Department
3. Type of Facility - The department operates numerous types of treatment processes including: evaporation ponds, aerated lagoons, oxidation ditches, closes loop reactors, biological nutrient removal, and bardenpho among others.
4. Estimated population served – data non provided
5. Estimated surplus capacity in gallons – Dynamic. It changes every day.
6. The estimated demand per capita (gallons per person per day - 80 gallons per capita per day (gpcd), 2.7 people per home, 216 gallons per dwelling unit
7. Percent of residential connections – unknown.

4.5 Environmental: Air Quality and Solid Waste

Air Quality Trends and Projections

Pima County Department of Environmental Quality (PDEQ) monitors ambient (outdoor) air pollutants throughout eastern Pima County. There are six criteria pollutants that are monitored in accordance with the National Ambient Air Quality Standards (NAAQS) set by the Environmental Protection Agency (EPA) to comply with the Federal Clean Air Act. The NAAQS were established to protect public health and the environment. The six criteria pollutants are: carbon monoxide (CO), ozone (O3), particulate matter (PM10 and PM2.5), nitrogen dioxide (NO2), sulfur dioxide (SO2) and lead (Pb).

Carbon monoxide concentrations have declined in the past three decades mostly due to the use of cleaner burning fuels and cleaner cars. The levels of CO remain around 20 percent of the standard.

Pima County's ground level ozone concentrations have remained relatively steady at 95 percent of the standard. Ground level ozone concentrations are highest in the summer months due to the intense sunlight and heat. Oxides of nitrogen and volatile organic compounds react in the presence of sunlight to form ozone.

PM10 is particulate matter with an aerodynamic diameter of 10 microns or less and PM2.5 is particulate matter with an aerodynamic diameter of 2.5 microns or less. Pima County violated the PM10 standard in 1999 with four recorded exceedances of the standard. The County developed a plan that included measures to minimize contributing controllable sources, increased enforcement and education. The County is in attainment of the current standards.

PDEQ also measures nitrogen dioxide and sulfur dioxide. No significant changes in the levels of these two pollutants have been seen in the past 20 years. Concentrations of nitrogen dioxide average about 30 percent of the standard. Sulfur levels continue to be extremely low with averages around 7 percent of the standard.

The other criteria pollutant measured by PDEQ is lead. Most urban areas have seen a dramatic decrease in ambient lead levels since the phase out and ban of lead in gasoline. On October 15, 2008, EPA strengthened the lead standard which required Pima County to perform area monitoring at one location. The EPA has initiated an evaluation of the current ozone standard to determine if it is sufficiently protective of public health and the environment. If the standard is lowered in the future, Pima County may be in nonattainment of the revised standard. Were that to happen, the County would need to develop an air quality control plan to reduce emissions to return the area to compliance. The chart below shows the data for ozone.

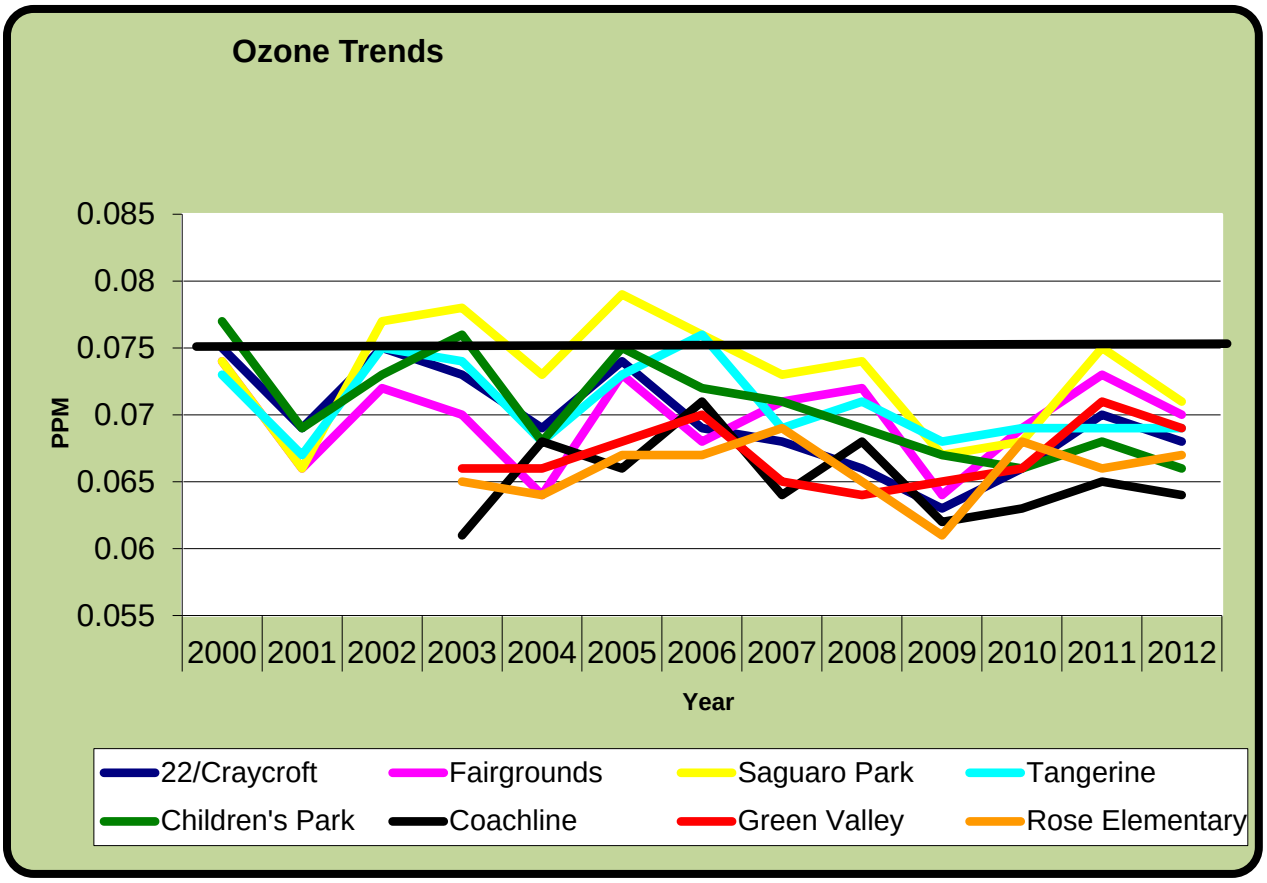


Figure26: Pima County Ozone Trends

Waste Removal, Recycling and Solid Waste

The City of Tucson maintains a curbside garbage and recycling collection program within city limits. The rest of the County is either served by private waste haulers or residents self-haul waste and recycling to approved disposal locations. There are several landfills, transfer stations, recycling centers, and waste haulers throughout the county allowing for environmentally appropriate disposal options.

The overall goal of urban solid waste management is to collect, treat, recycle (when possible) and dispose of solid wastes generated by all urban population groups in an environmentally and socially satisfactory manner using the most economical means available.

As of June 1, 2013 Pima County entered into a contract with Tucson Recycling and Waste Services to operate the County's landfills and transfer stations. The county will continue to own the facilities.

TABLE 4.5.a: County Landfills and Transfer Stations

Facility Name	Facility Location
Tangerine Landfill	10220 W. Tangerine Road
Sahuarita Landfill	16605 S. La Canada (Sahuarita
Ajo Landfill	2000 N. Ajo Well #1 Road (Ajo)
Catalina Transfer Station	14425 N. Oracle Road
Ryan Airfield Transfer Station	6455 S. Continental

Source: Pima County Development Services Department, 2013

Neither the Tangerine Landfill nor the Ina Road Landfill are currently accepting waste. The Sahuarita Landfill and the Ajo Landfill are operated by Tucson Recycling and Waste Services (TRWS). TRWS also manages two rural collection centers and the county's waste-tire collection program. The two rural collection centers are in Arivaca and Arivaca/Sasabe Junction.[58] [59] Pima County offers single stream recycling at all the operating landfills and transfer stations. The City of Tucson offers curbside collection of both trash and recycling, while also operating 13 neighborhood recycling centers throughout the city. The City of Tucson also operates a Household Hazardous Waste Program. Pima County manages an illegal dumping program that provides a website and phone number for reporting illegal dumping, as well as an inspector who investigates illegal dumping and conducts enforcement actions. Picking up pet waste is required by Pima County and the Pima County Department of Environmental Quality (PDEQ) has regulatory authority over the proper storage and disposal of manure.

Avra Valley Planning Area (1)

The County does not have any active landfills in this planning area. Residents either self-haul their waste or contract with a private hauler. Waste Management Inc. operates the nearby Marana Regional Landfill.

Tucson Mountains Planning Area (2)

The County does not have any active landfills in this planning area; however, a historical landfill El Camino del Cerro Landfill is located in the area. The El Camino del Cerro Landfill was a former gravel pit that was operated as a municipal solid waste landfill from 1973 through 1977. The former landfill is part of an Arizona Department of Environmental Quality Water Quality Assurance Revolving Fund (WQARF a.k.a. State Superfund) remediation site. The City of Tucson also operated a number of historical landfills in this planning area. They include the Mission Landfill, A Mountain Landfill, Tumamoc Landfill, Rio Nuevo South Landfill (Nearmont), Rio Nuevo North Landfill, St. Mary's Landfill, Dragoon Landfill, State Pit Landfill, and

[58] Memorandum from the County Administrator to the Board of Supervisors dated April,9, 2013.
[59] Arizona Daily Star, Joe Ferguson, May 25, 2013

the Silverbell Landfill. The City of Tucson's Silverbell Landfill is also a WQARF site. There is a small area of groundwater contamination associated with the City of Tucson's Tumamoc Landfill.

Southwest Planning Area (3)

The County does not have any active landfills in this planning area, however, the county does operate the Ryan Field Transfer Station through a contractor, Tucson Recycling and Waste Services. Residents can either dispose of their waste at the transfer station or contract with a private waste collection company for disposal.

Altar Valley Planning Area (4)

The County does not have any active landfills in this planning area, however, the county does operate two rural collection centers, one in Arivaca and another at the Arivaca-Sasabe Junction. These two sites are now operated by a contractor, Tucson Recycling and Waste Services.

Upper Santa Cruz Planning Area (5)

The County's Sahuarita Landfill is the only municipal landfill located in this planning area and is operated through Tucson Recycling and Waste Services. The landfill has only about one year of capacity remaining and will then be closed to the public. Tucson Recycling and Waste Services will construct and operate a transfer station at the site.

In June 2006, the Arizona Department of Environmental Quality (ADEQ) issued a Mitigation Order on Consent to Freeport McMoran (at the time Phelps Dodge Sierrita, Inc.) for the sulfate plume contamination. Freeport submitted a Mitigation Plan including completing the purchase of 9,000 acres of state lands and obtaining the permits needed for the construction of a new tailings impoundment in this area. Currently, Freeport continues to implement their deferred Mitigation Plan in the interim through continued well monitoring, obtaining easements and right-of-ways, and submittal of purchase application to State land.

Mountain View Planning Area (6)

The County does not have any active landfills in this planning area. Residents in the area can dispose of their household garbage at a nearby landfill or contract with a private waste hauler for disposal.

Southeast Planning Area (7)

The City of Tucson's Los Reales Landfill is the only municipal landfill located in this planning area. The landfill has a minimum of 60 years of remaining capacity. For residents within its jurisdictional limit, the City of Tucson provides weekly trash collection services for municipal waste and recycling materials. Residents in unincorporated areas must make their own arrangements for the disposal of household waste and recycling either through a commercial hauler or by hauling their own trash and recycling to an approved facility (including the Los Reales Landfill).

Within this planning area, there is one WQARF site and one federal Superfund (Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)) site. The WQARF site is the Los Reales Landfill. It is located at 5300 E. Los Reales Road, south of Interstate-10 and in the vicinity of the intersection of Swan Road and East Los Reales Road. The City of Tucson is the owner and operator of this active municipal sanitary landfill and is monitoring and performing cleanup of groundwater impacted with tetrachloroethene (PCE) and trichloroethene (TCE) from the unlined portion of the landfill. The Superfund Site is at the Tucson International Airport Area (TIAA) located south of Ajo Way, north of Hughes Access Road, west of Alvernon Way, and east of Interstate 19. Groundwater and soil contamination are under investigation and remediation.

Central Planning Area (8)

Land in the Central Planning area within the City of Tucson is served by City Environmental Services which provides weekly pickup of waste and recycling. Areas outside of City limits are responsible for hiring a private municipal waste collection service or self-hauling to an approved waste disposal site.

Catalina Foothills Planning Area (9)

Residents in the area who live within the City of Tucson have garbage collection provided by the City. Residents who live outside of the City contract for private haulers or dispose of their household waste at an approved area disposal location. There are two landfills in this planning area, the closed Vincent Mullins operated by the City of Tucson and the adjacent private Speedway Recycling and Landfill Facility owned by The Fairfax Companies.

Rincon Valley Planning Area (10)

Residents who live in this planning area contract for waste disposal with private haulers or dispose of their household waste at an approved area disposal location. There are no landfills in the planning area; the nearest landfill is the Tucson City Los Reales Landfill located at 5300 E. Los Reales Road.

Tortolita Planning Area (11)

The County does not have any active landfills in this planning area but does have the Catalina Transfer Station. The Catalina Transfer Station is also the location of the closed Catalina Landfill. The landfill was operated by Pima County but was closed when the transfer station was opened. Residents currently make their own arrangements for the disposal of household waste and recycling either through a commercial hauler or by hauling their own trash and recycling to an approved facility (including the Catalina Transfer Station).

San Pedro Planning Area (12)

The County does not have any active landfills in this planning area. Residents in the area can dispose of their household garbage at a nearby landfill or contract with a private waste hauler for disposal.

Ajo/Why Planning Area (13)

The Ajo landfill is currently operating under the direction of Tucson Recycling and Waste Services.

4.6 Communications

Communication Networks

In April 2014, the county's new public safety voice radio network, funded by bonds approved by voters in 2004 began operation. The new Pima County Wireless Integrated Network (PCWIN) system includes over 7,000 radios, serving over 50 fire, law enforcement, and emergency management and public service agencies from Tucson to Ajo, from Sahuarita to Mount Lemmon, and from the Rincon Valley to Avra Valley, enabling all of these agencies to talk to each other by radio in real time on a single system, regardless of their jurisdictional boundaries.

The County completed the construction and implementation of the PCWIN project with the guidance of a cross jurisdictional Executive Management Committee chaired by the Pima County Sheriff. Now that the system is fully functional, operations are governed by a cross jurisdictional Board of Directors. The PCWIN Board of Directors is the overarching governing body responsible for setting strategic direction, policy formation, financial oversight, and the ongoing viability of the PCWIN Cooperative. Each member organization of the PCWIN Cooperative will have a voting Representative on the Board of Directors. The tactical operations and direction are handled by the PCWIN Executive Director with guidance from a seven member Executive Committee that is appointed by the Board of Directors and serves in an advisory capacity to the Board and the Executive Director. Members of the Executive Committee are executive level members of police, fire, information technology, maintenance organizations, and an Indian Community or at-large member.

Another critical component of public safety communication and coordination is the Pima County Office of Emergency Management and Homeland Security (PCOEMHS). When major incidents occur, whether they involve public safety organizations or infrastructure and emergency management personnel, it is important that everyone work together to address the issue at hand in a coordinated manner. The Pima County Office of Emergency Management and Homeland Security has the lead role in coordination of all assets needed to address regional emergency situations, whether they are weather-related or pose a risk to the community in other ways. PCOEMHS utilizes a standardized suite of web-accessible communications systems and follows a nationally defined structure and process for incident management. These standardized systems and processes are critical to timely and effective support to an incident commander. The Pima County Office of Emergency Management and Homeland Security also coordinates regular classroom and operational training exercises to insure procedures and communication systems work in times of major emergencies.

The new Emergency Operations Center is an integral part of the Pima County Emergency Communications and Operations Center (PECOC) that was constructed as a part of the Bond project approved in 2004. This state of the art facility is the communications hub, not only for regional radio communications but also is capable of capturing and analyzing input from a wide range of resources to insure decision makers and first responders have the maximum amount of useful and coordinated information available to them to address the issue at hand.

Data Communication

To address the growing demand for cross-jurisdictional information across Pima County, the infrastructure for data communication among various government agencies becomes a key factor in overall regional coordination. While each of the various agencies and utilities have developed their own information highway infrastructure, a collaborative process to interconnect the various jurisdictional networks has been under way for several years. Not only do these agreements allow for data sharing, but they also minimize capital and operating costs where current technology allows various jurisdictions to utilize the same infrastructure in a secure, segregated manner. If an agency needs a network presence at a site that is nearby a network managed by another agency, intergovernmental agreements allow for the extension of the closest network with appropriate cost allocation, but at significant cost savings as opposed to expensive extensions of other agency networks.

Site selection priorities by potential employers looking to locate in the region include the availability of robust data communication networks. Regional collaboration to maximize the value of every jurisdiction's communications infrastructure not only benefits the jurisdictions, but also sends a clear message to employment prospects that there is a collaborative solution that raises the data communications level for all in the region. This kind of collaboration is also critical to attracting regional infrastructure grants and commercial networks such as Google Fiber. The Google Fiber Community Checklist is one that Pima County, City of Tucson and other jurisdictions, the University of Arizona, and some of the utilities are following to insure maximum opportunity to attract such a commercial network presence. All of these infrastructure planning efforts are aimed at creating more jobs in the community while lowering operating costs of the cooperating agencies.

Pima County Office of Emergency Management and Homeland Security

The Office of Emergency Management and Homeland Securityparticipates in PECOC. . The County Emergency Operations Center and support staff offices will be a tenant in the planned Pima County Regional Emergency Communications and Operations Center. OEM staff is expected to participate in planning and implementation of the communications and emergency operations center(s).

Pima County Real Property

Pima County Real Property is responsible for acquiring any new property required by the PECOC. The Office may also be involved in preparing and negotiating tenant leases as requested by the Sheriff's Department.

Voice & Data Radio Project Participants

Multiple jurisdictions will benefit from the PCWIN project. The degree of participation expected during implementation is directly related to the degree of benefit, risk, contribution and stake that each jurisdiction has in the PECOC. All jurisdictions will have an interest in planning future systems that will meet their end-user communications requirements and will therefore be expected to participate in User Committee activities.

Some jurisdictions will have a more significant role; some will be direct participants in the communications facility aspects of the project and/or may provide other assets that contribute to the success of the projects. Each jurisdiction will have some degree of responsibility for assisting with planning, training, cutover activities, and intergovernmental agreements.

The following jurisdictions will have additional specific responsibilities:

City of Tucson

Pima County and the City of Tucson are the two largest jurisdictions participating in the project. City of Tucson communications assets and facilities figure prominently in the PCWIN Conceptual Architecture Plan. These assets are expected to be important to the PECOC. The city is the largest single participant in the communications facility component of the PECOC. As a result, the City of Tucson has a larger stake in the PECOC and it is expected that their level of participation will be significant. The City will be responsible for approving agreements with the County to make use of the City assets, reviewing and approving design plans for City facilities, assisting with configuration of City communications assets to support PCWIN systems, assisting with organization of a radio maintenance shop, assisting with development and implementation of cut-over plans, and contribution of technical advice. The City will retain control and ownership of their facilities and will be responsible for maintaining and operating their facilities.

Town of Marana

The Town of Marana has deployed a Motorola Astro25 voice radio system. This system and its associated communications equipment assets also figure prominently in the PCWIN Conceptual Architecture Plan. The Town will be responsible for approving agreements with the County to make use of Town assets if proposed by the selected radio vendor, assisting with configuration of Town communications assets to support PCWIN systems, assisting with organization of a radio maintenance shop, and contribution of technical advice.

Tohono O'odham Nation

The Tohono O'odham Nation has jurisdiction over two communications sites required to provide countywide radio coverage that will primarily benefit the Nation's end-users. The Nation has also utilized grant funds to purchase microwave equipment and an equipment shelter that are intended to contribute to the PCWIN project. The Nation will be responsible for approving agreements with the County to permit use of the Nation's land, facilities and equipment to support the PCWIN systems.

Communications & Emergency Operations Center(s) Project Participants

Tucson Police Department Communications Section

The Tucson Police Department Communications Section call-taker and dispatch operations will be located in the Pima County Regional Emergency Communications and Operations Center. TPD representatives will participate in the design planning effort and coordinate integration of agency specific technology into the new facility.

Tucson General Services Department – 9-1-1 Public Safety Answering Point and Fire Dispatch

The Tucson General Services Department - 9-1-1 Public Safety Answering Point (PSAP) and Fire Dispatch functions will be located in renovated facilities at the City of Tucson Thomas Price Service Center. Department representatives will participate in the design planning effort and coordinate integration of agency specific technology into the new facility.

County Fire District Dispatch Organization

The Northwest and Drexel Heights Fire Districts are leading an organizing effort to develop a dispatch organization that will provide services to the various county fire districts. The fire districts are responsible for their organizational development activities outside of the PCWIN project. Because the new organization will operate from facilities to be renovated by the PCWIN project, representatives of this organization will need to participate in the design planning effort for the dispatch facilities, and coordinate integration of agency specific technology into the new facilities.

Pima County Sheriff's Department Communications Section

The Pima County Sheriff's Department Communications Section will be located in the Pima County Regional Emergency Communications and Operations Center. PCSD representatives will participate in the design planning effort and coordinate integration of agency specific technology into the new facility.

Pima County Office of Emergency Management & Homeland Security

The County Emergency Operations Center and support staff offices will be a tenant in the planned Pima County Regional Emergency Communications and Operations Center. OEM staff is expected to participate in planning and implementation of the communications and emergency operations center(s).

4.7 Public Buildings and Facilities

Like all local governments, Pima County owns or in some instances, leases, a vast inventory of both special use public facilities and general office buildings, as well as physical plant, surface and subsurface infrastructure all of which must be maintained and periodically improved. County facilities include: libraries, food banks, health clinics, service centers, race track, schools, fuel stations, sports stadium, performing arts center, fairgrounds, rodeo grounds, parking garages, community centers, landfills, wastewater treatment facilities, animal care center, wastewater lift stations, pump stations, jail, parks, vocational school, archery range, campgrounds, shooting range and a multitude of administration buildings.

The Board of Supervisors adopted the Sustainable Action Plan for County Operations (SAPCO) in August 2008 to implement the Sustainability Initiatives and in April 2012, the Board expanded the SAPCO by adopting the Health and Wellness Chapter. Many initiatives to increase energy efficiency, reduce waste and promote green building have been applied to County facilities.

A variety of strategies can incorporate the mission of public facilities with healthy community principles. These may include incorporation of arts and culture, grouping of public facilities that provide compatible functions, the integration of government facilities into mixed use projects, and the provision of services to rural areas through existing or new multipurpose community centers. Public facilities and buildings can serve as canvases for portraying the local history and celebrating the County identity, character, heritage and sense of place. Murals, fountains, gathering plazas, and promenades articulate the unique meaning, value, and character of the physical and social form of the community, creating space for social intimacy, enhancing the community's character or sense of place and promoting health and enhancing well-being.

See Exhibit 4.7.a and 4.7.b for maps of Pima County Public Buildings and Facilities.

Figure 27: Soundwall Along I-10 at Barrio Anita – Mural and pocket park.

Mixed Use and Grouping Public Buildings that Provide Complementary Functions

The grouping of complementary public functions is a way to establish the placemaking necessary to create a destination. Government centers where multiple governmental uses and activities are closely clustered contribute to sense of place, improve walkability, decrease reliance on automobiles, strengthen the economic vitality of an area by becoming a focus of activity, and can reduce facility costs and increase operational efficiency. Examples of this type of activity node or activity center are the Pima County Health Center Complex at Kino and the new Pima County Court System Complex in Downtown Tucson, a short walk away from the Tucson Modern Streetcar line.

Locating public and government buildings with complementary functions in areas with the infrastructure required to support larger-scale, higher-density development promotes healthy community principles and can decrease development costs. Incorporating green features in such development such as green roofs and complete green streets will contribute to the identity and sense of place, increase revenues, spur economic development and create healthy activity centers where people can live, work, shop, play, learn, and improve their health.

The Role of Multipurpose Community Centers in Exurban Areas

Multipurpose community centers are vital activity centers in exurban areas. Such public facilities can offer a central venue for social, food, health care, recreation, and educational services to the more remote areas of the County such as Ajo/Why, Amado, Arivaca, Three Points and Picture Rocks. With a large aging population, aging-in-place in remote areas of the County will require access to health services, community facilities, transportation, recreation, work training programs, emergency services and a variety of other services and programs. Clustering services in community centers is more cost effective in exurban areas.

Many of the existing community centers already provide a variety of services such as library, youth and senior programs, meal services, exercise classes, and other community functions.

Figure 28: Flowing Wells Community Center.

4.8 Trails

Pima County Regional Trail System Master Plan

Recent changes in river park and greenway standards convinced staff of the need to update the Eastern Pima County Trail System Master Plan, which was last updated in 1996. The overall goal of the 2011 Pima Regional Trail System Master Plan was to expand the trail system both internally to the urban zone of the area's jurisdictions and to explore new opportunities in outlying areas.

The plan builds on the efforts of the previous Master Plan, taking another careful look at both the areas surrounding the cities in the county, and the urban context of downtown and suburban Tucson and the towns that are located on its periphery. The updated system consists of 853 miles of existing and proposed trails, paths, greenways, river parks, bicycle boulevards and enhanced corridors that connect regional destinations, parks, schools, and preserve areas. In addition, there are 1,422 miles of single track trails that connect the urban core to the large natural preserves in Eastern Pima County, for a total of 2,275 miles of trail. The trails system includes trails, parks, trailheads and boundary access points to increase user access to the system, as well as detailed design standards for the first time—including the Divided Urban Pathway (DUP) standard for river parks and greenways--to guide the future development of the system.

The goals of the plan are to:

1) provide a regional trails network;
2) improve/expand the trail system within the urban core;
3) update the trails plan to reflect regional growth;
4) integrate the trails plan with regional land-use plans;
5) provide improved access to natural resource areas; and

6) integrate trails across jurisdictional boundaries.

Collaborating jurisdictions include the City of Tucson, Pima County, City of South Tucson, Town of Marana, Town of Sahuarita and Town of Oro Valley. The Master Plan includes background data, system features, a trail system element, standards, an inventory of facilities, implementation and funding. The trail system encompasses trails, single-track trails, paths, river parks, greenways, enhanced bicycle/pedestrian corridors, bicycle boulevards, trailheads and entry nodes, boundary access points, crossings, interpretive and regulatory signs, pedestrian districts, and pedestrian activity areas.

It is anticipated that Pima Prospers policy will support the implementation of the existing plan rather than duplicating this effort. For a complete inventory of trails facilities, the Pima Regional Trail System Master Plan is available under a separate cover from Pima County Natural Resources Parks and Recreation Department.

Figure 29: Pima County Regional Trail System

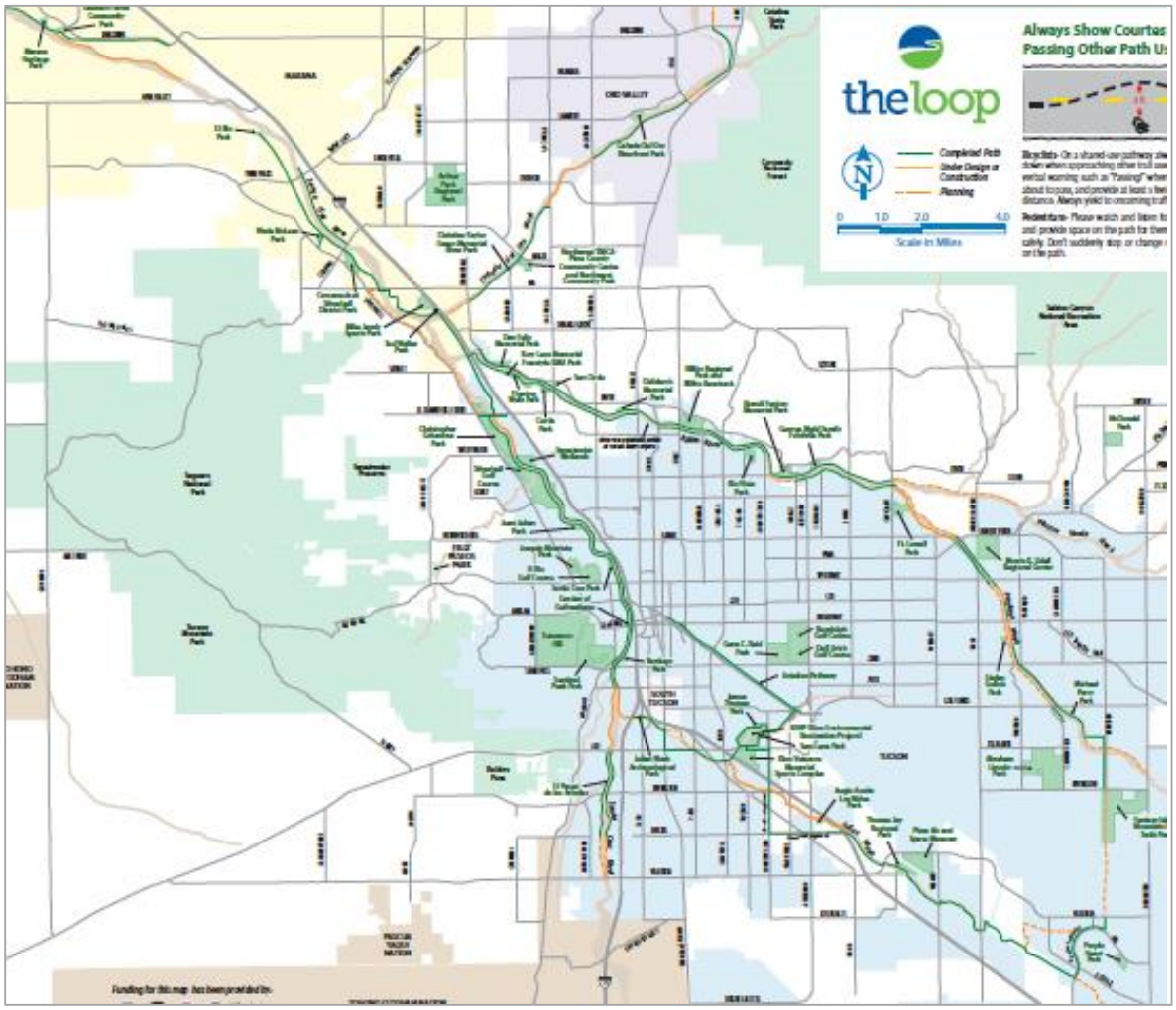


Figure 30: The Loop

Trail System, Transportation Modes, Healthy Communities & Economic Development

Pima Prospers recognizes the connection between physical activity and healthy bodies and minds. Trails contribute to healthy lifestyles, offer access and serve as alternate transportation modes, and provide connectivity from neighborhoods to diverse land uses, recreation areas and open space. They also provide an opportunity to exercise, breathe clean air, reduce mental stress and offer opportunities for residents and visitors to learn about the lush Sonoran desert. When appropriately branded, such trails attract visitors to the area.

The Loop

When completed, The Loop will include 131 miles of paths connecting the Rillito, Santa Cruz, and Pantano River Parks with the Julian Wash and Harrison Road Greenways. Loop links will extend the network of multi-use paths to Marana, Oro Valley, Tucson, and South Tucson. These exciting connections are the result of Pima County's cooperative partnerships with these jurisdictions.

The Loop will connect parks, trailheads, bus and bike routes, work places, schools, restaurants, hotels and motels, shopping areas, and entertainment venues. Visitors and Pima County residents will enjoy The Loop on foot, bikes, skates, and horses. If it does not have a motor, it's good to go on The Loop.

This type of effort ties together the trails system, transportation mode, healthy communities and economic development. Pima Prospers policies should continue to support and maintain a trail system that integrates the four spheres of healthy community, healthy people, healthy environment and healthy economy.

Figure 31: The Loop provides alternate transportation modes.

4.9 Flood Control/Drainage

The Pima County Regional Flood Control District strives to use forward-looking floodplain management practices to minimize flood and erosion damage to property and infrastructure, both public and private. Regionally, the District is involved in a variety of flood monitoring, flood control and natural resource management activities. It also performs floodplain management activities within unincorporated portions of Pima County. While the District is a regional authority, undertaking flood mitigation efforts throughout Pima County, it does not regulate floodplains within incorporated areas or on Tribal Nations.

Regional Flood Control District (RFCD)

Current and Proposed RFCD Efforts

The Regional Flood Control District impacts land use in three basic ways: providing flood hazard mapping information, building flood control infrastructure and protecting the natural functions of floodplains. The District updates Federal Emergency Management Agency (FEMA) Special Flood Hazard Maps and makes these and studies of flood prone areas not mapped by FEMA available to the public. Capital improvements programs continue to reduce flood damage risk and provide amenity in developed areas while the protection of natural floodplains as a successful non-structural floodplain management tool has also received increasing attention.

The most significant flood hazard in this region is flash flooding and erosion including channel migration. Development within these hazard areas is prevalent due to historical development patterns, lack of floodplain mapping and understanding risks associated with flooding in an arid region. Following the floods of the latter part of 1983 and 1993, efforts focused on bank stabilization for major watercourses including the Santa Cruz River, Rillito and Pantano. In addition to these capital improvements, sediment management, floodplain map updates, and land acquisitions have also been extensive.

The hidden costs of not conducting these activities include increased risk of flood damages including loss of property and life, ongoing excessive maintenance costs, increased liability, and development of the perception of overly burdensome and unnecessary public expenditures. Furthermore, failure to pursue these activities results in increased flood insurance rates and reduced availability of post-disaster federal assistance.

Looking ahead, regional detention facilities will be considered due to downstream flow constraints including transportation infrastructure. Protection of natural flow corridors and habitat in the overbanks will also help attenuate flood flows and reduce the need for increasing downstream channel, bridge and culvert sizes. The District's encroachment criteria, detention and habitat protection requirements all contribute to this approach.

As a result of these capital improvements and land acquisitions, the District is responsible for maintenance of 23,818 acres of land. Of this, 14,812 acres are owned in fee title, with 9,006 acres via easements, IGA and Special Conditions. The District also owns the flood control improvements placed thereon including levees, bank protection, detention basins, channels, and multi-use facilities.

Traditional floodplain activities such as agriculture, aggregate mining, and waste disposal have been on the decline. This trend has been bolstered by adoption of the Important Riparian Area component of the Maeveen Marie Behan Conservation Lands System and incorporation of this component into the Floodplain Management Ordinance. Not only has this resulted in the identification and protection of major flow corridors, it has forged the basis for The Loop, an urban, non-vehicular circulation route.

The Pima County Emergency Planning

The Pima County Multi-Hazard Mitigation Plan was prepared according to The Disaster Mitigation Act of 2000 (DMA2K). The DMA2K requires all local, county, tribal and state governments to have a FEMA approved hazard mitigation plan in order to be eligible for certain federal disaster mitigation funds and is considered in the National Flood Insurance Program Community Rating System which determines insurance rates within the County. This plan focuses on the area's most threatening hazards and provides a strategy to reduce or eliminate the risk from those hazards to the people and property of Pima County. These include dam failure, disease, drought, earthquake, extreme heat, flood, hail, Hazardous Material Events, lightning, severe winds, subsidence, thunderstorm, tornado, tropical cyclone and wildfire. While vulnerability is assessed for each of these hazards specifically, the plan also provides a basis for responding to any declared emergency event.

Planning makes it possible to manage the entire life cycle of a potential crisis. Strategic and operational planning establishes priorities, identifies expected levels of performance and capability requirements,

provides the standard for assessing capabilities, and helps stakeholders learn their roles. The planning elements identify what an organization's Standard Operating Procedures (SOP) or Emergency Operations Plans (EOP) should include for ensuring that contingencies are in place for delivering the capability during a large-scale disaster.

All-hazards planning is built upon scalable, flexible, and adaptable coordinating structures that allow for planning documents to be useful for both the expected and unexpected incidents as they arise, no matter the size, scope or complexity. Encouraged from within Federal doctrine, such as the National Response Framework, all-hazards planning has become the preferred method and is in use across all Pima County planning documents.

The hazards and vulnerability assessments contained in the Multi-Hazard Plan are incorporated by reference in this Background and Current Conditions volume. The Multi-Hazard Plan assesses the vulnerability of Critical Facilities as defined by FEMA and the Pima Community College Department of Public Safety and is intended to coordinate their integration into responses both as providers and potential victims.

Critical facilities include hospitals, police and fire stations, public works machinery yards, libraries and schools which are involved in emergency response as well as electrical, water and sewer facilities which must remain functional during emergencies. Hazardous waste storage facilities are considered critical as they may exacerbate an event if unprotected or damaged, as in the case of nuclear power plants and fuel storage. Lastly facilities such as nursing homes and jails which house people who may not be sufficiently mobile to evacuate on their own are considered critical. Critical facilities are regulated under the Floodplain Management Ordinance per FEMA guidelines. However, these provisions were adopted in 2013 and therefore many grandfathered facilities exist in vulnerable areas. Secondly, the 2005 plan used assumptions rather than inventories so the value of this information is limited.

Storm Water Runoff

Pima County manages stormwater to ensure public safety through three regulatory mechanisms. First, the Pima County Regional Flood Control District, through the Floodplain Management Ordinance, addresses the impact of development on flooding, erosion and riparian habitat. The purpose of the Ordinance is to protect lives and property from flood risk and ensure no adverse impact to adjacent or downstream properties. These are accomplished by establishing encroachment thresholds, flood peak and flood volume reduction requirements, and incentives for avoiding the disturbance of riparian habitat. Flood Control policy recognizes beneficial functions of floodplains and riparian areas including flood attenuation, recharge, pollution control, and habitat. In recent years, as part of drought response and resiliency the County has been cooperating with other local and regional entities to develop guidelines for the benficial use of stormwater including green infrastructure and low impact development techniques such as water harvesting.

Second, the Department of Environmental Quality administers programs to address stormwater quality. In 1972, the U.S. Congress passed the Clean Water Act (CWA) to protect and improve the quality of the water of the United States. The State of Arizona gained the primacy, or authority, to implement this federal program at the state level in 2002. The Arizona Pollutant Discharge Elimination System (AZPDES) is the state program that protects surface water quality.

Pima County holds a Municipal Separate Storm Sewer System (MS4) Permit which authorizes the county to discharge stormwater from its MS4 to receiving waters. The county's MS4 consists of 2,087 miles of roadways, 39 miles of storm drains, and infrastructure collecting runoff into stream channels. The program includes control measures to minimize the discharge of pollutants carried by runoff. In order to control the pollutants that enter and exit the MS4, the County performs inspections of construction and industrial sites that are permitted via the AZPDES Construction General Permit and Multi-Sector General Permit, respectively.

Lastly, the building code and zoning codes contain provisions establishing minimum standards for site grading, site drainage and design. The largest area for improvement is in coordination and integration as already reflected in the infrastructure and land management programs.

Drainage Integration

While landowners and investors desire coordinated regulation, integration also offers opportunity to achieve community quality of life goals including safety, accessibility, amenity and habitat preservation. While the building code and Floodplain Management Ordinance provide design guidance to minimize flood risk and off-site impacts, the riparian habitat, water quality, comprehensive plan water policy, Native Plant Preservation Ordinances (NPPO) and zoning code all contain integrative provisions which have been underutilized.

For example, while the Floodplain Management Ordinance encourages avoidance of riparian habitat, it does not require it and design and performance criteria are provided. On the other hand, the NPPO requires mapped riparian habitat to be set-aside as open space. Application of this NPPO provision strengthens the protection of riparian habitat as intended by the Floodplain Management Ordinance.

The District has developed criteria which would apply at rezoning that define when floodplains and mapped riparian habitat are to be set-aside as open space. In addition, the zoning code provides for modification of development standards in riparian areas. The existing comprehensive plan land use designation, Resource Transition (RT) was meant to ensure low density development within floodplains and habitat. Plan policies regarding the definition, treatment and distribution of RT have been re-evaluated. Pima Prospers proposes updating these maps to reflect updated floodplain and habitat distribution and to strengthen avoidance provisions.

By weaving together watercourses, riparian and upland habitat, and recreation, better urban development can be achieved. This includes increases in property value and services availability. New guidelines under development address water harvesting and habitat mitigation and offer further opportunity for integration, particularly for drought response. Both regulation and infrastructure programs offer these opportunities and will continue to be utilized.

4.10 Infrastructure Concurrency

Land use actions heard by the Board of Supervisors, particularly rezoning requests, undergo staff review for concurrency for transportation, flood control, wastewater/environmental quality, parks and recreation, water, and school services. Staff verify whether the request has adequate infrastructure capacity to serve the proposed development.

It is the policy of the previous 2008 comprehensive plan to "Establish a formal Concurrency Management System" and "Establish a formal permit review procedure to allow the County to determine and coordinate the individual and cumulative impacts each proposed development request will have on each of the minimum level-of-service standards identified for the urban service/expansion area where the development request is located."

And finally, the plan suggests to "Establish a scale of development assessment fees to finance necessary public infrastructure and facilities. Once the built-out projection of a given Urban Service Area or Urban Expansion Area has been used to calculate its total public infrastructure requirement, a total cost estimate for the area's public infrastructure can be completed. This total infrastructure cost estimate can then be used to establish equitable developer-assessment fees for each area."

Exhibit 4.1.a: Major Streets and Scenic Routes

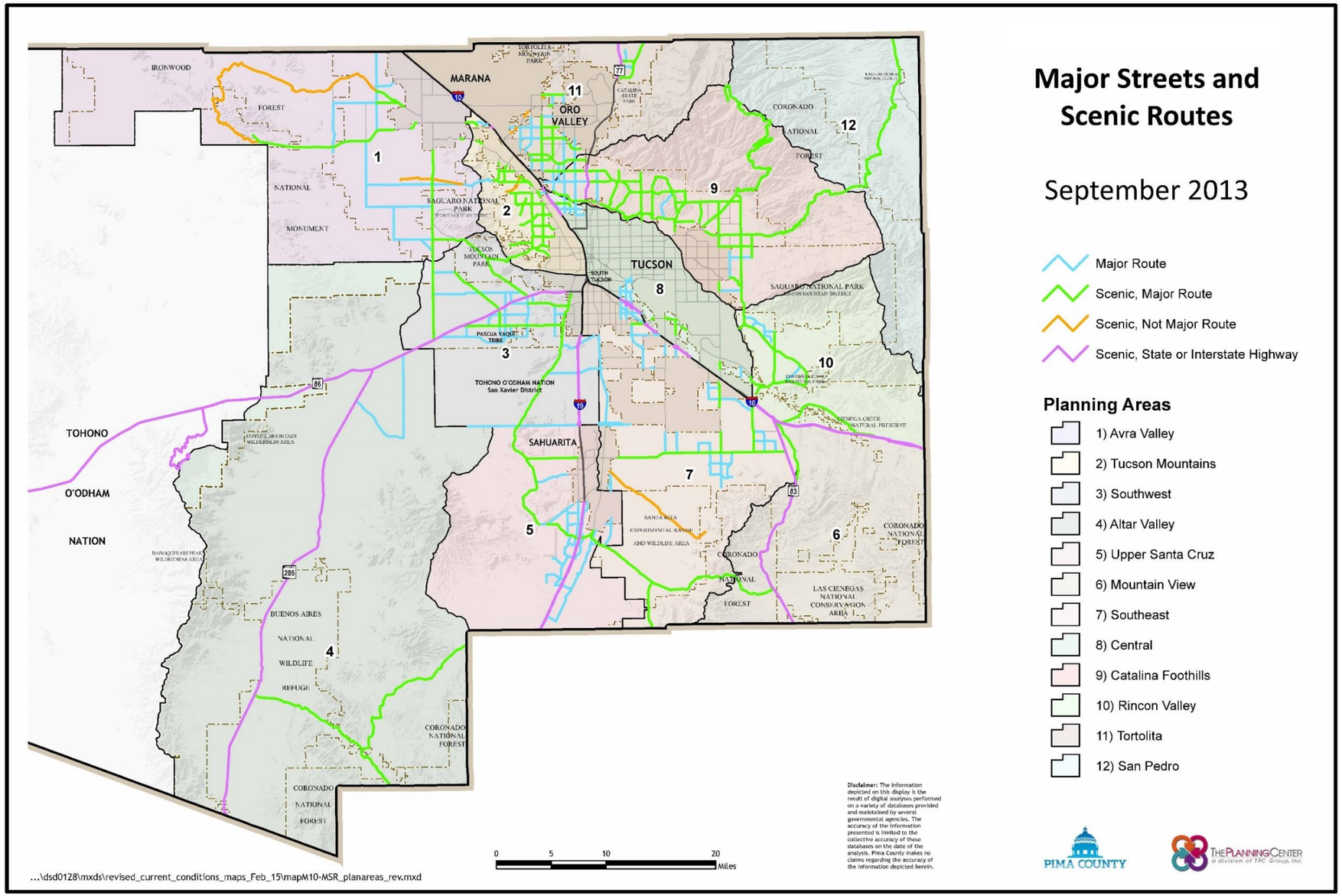


Exhibit 4.1.b: Major Streets and Scenic Routes

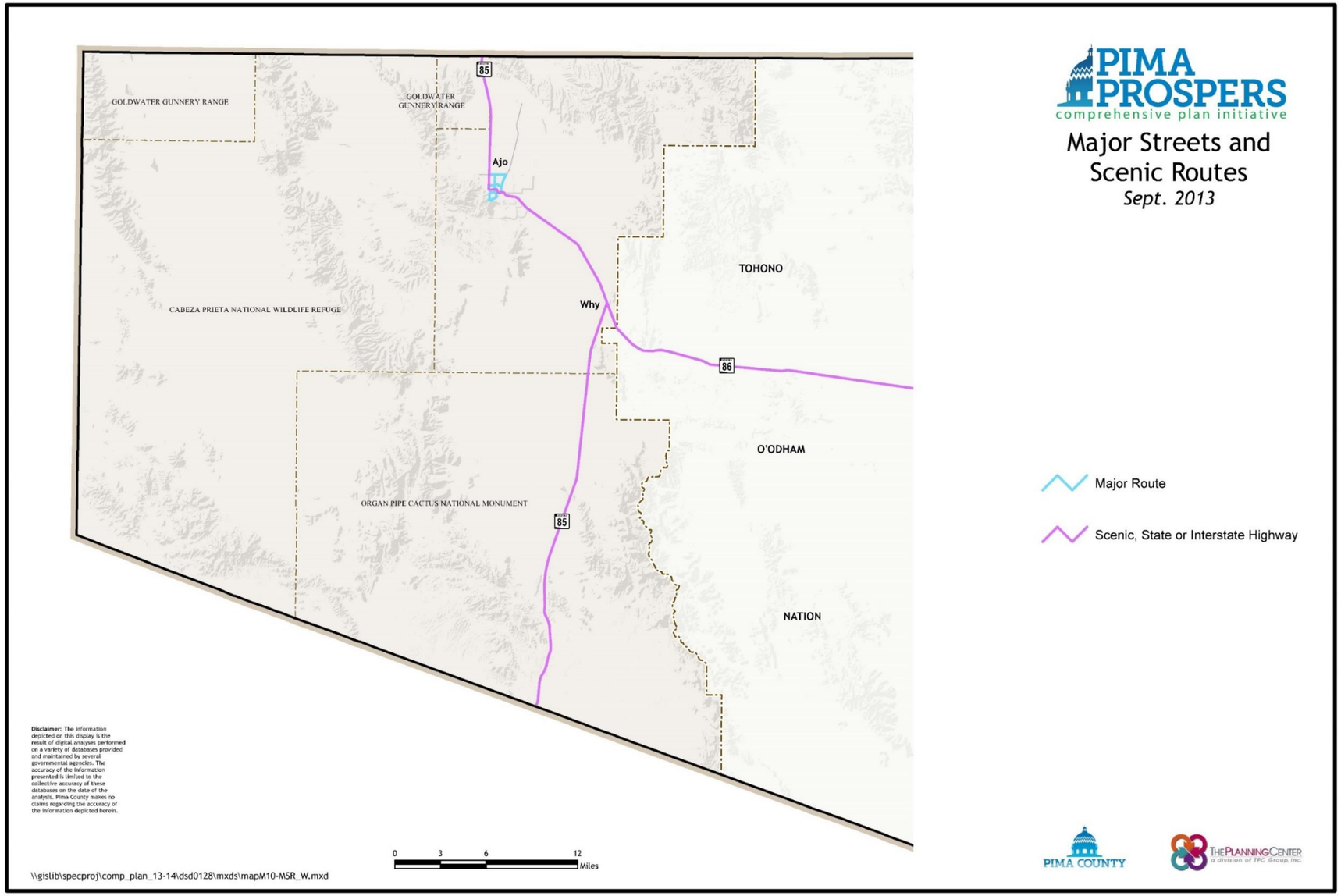


Exhibit 4.2: Water and Service Areas

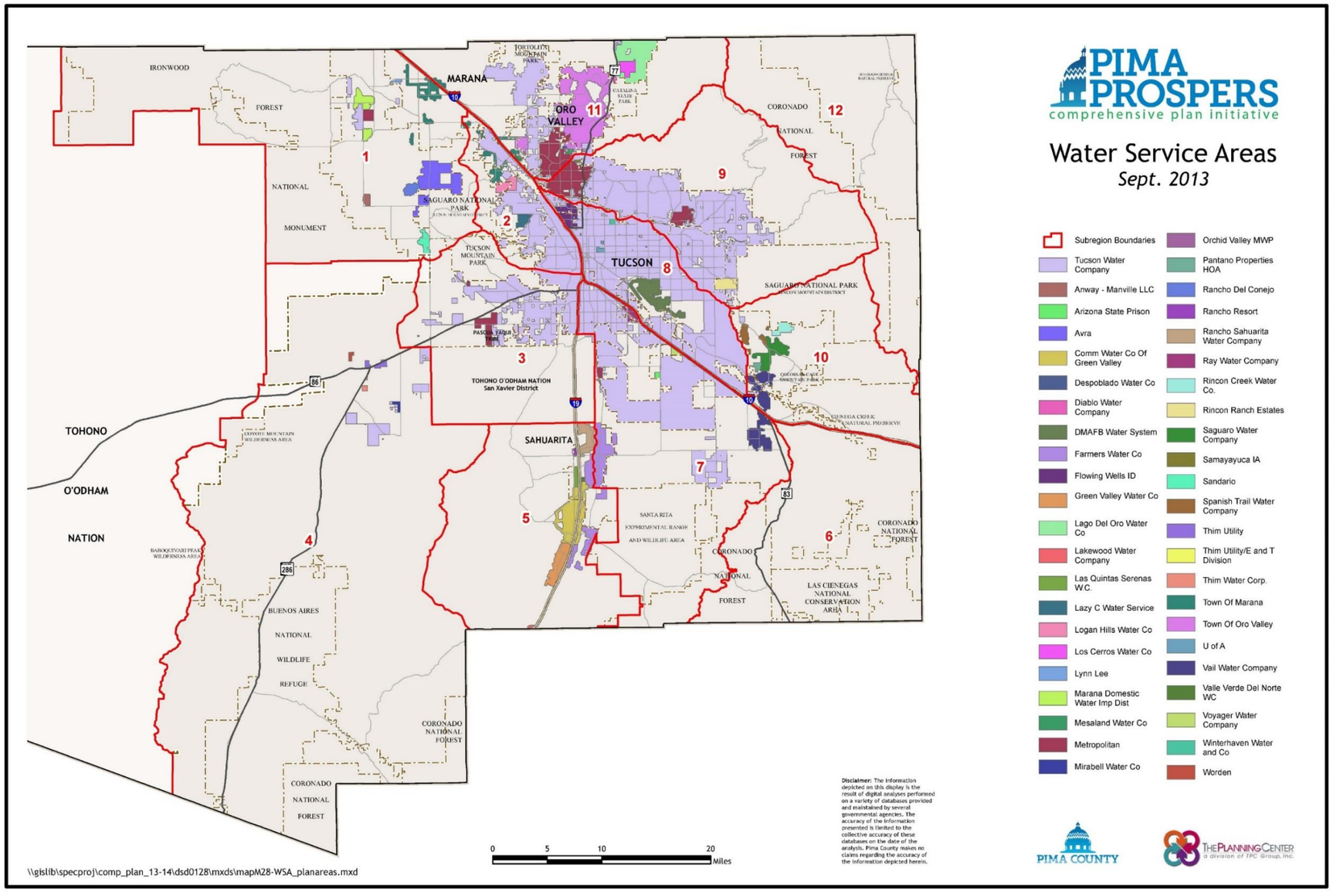


Exhibit 4.3.a: Electrical Utilities Service Area