Chapter 2 Planning Area Characteristics

CHAPTER OVERVIEW

The Pima County Metropolitan Area Facility Plan (Facility Plan) will focus on the Metropolitan Tucson Wastewater Planning Area (Planning Area). The Planning Area is defined for this Facility Plan as the sewer system tributary to Ina Road Wastewater Pollution Control Facility (WPCF), Roger Road Wastewater Treatment Plant (WWTP) and the Randolph Park Water Reclamation Facility (WRF). To successfully plan for the future, it is important to have knowledge of the physical and cultural characteristics of the Planning Area, as they relate to the conveyance and treatment of sewage.

The Planning Area is located within the Sonoran Desert and has a climate typical to the lower elevations in the American Southwest. The planning area is constrained by mountains on most sides. Surface runoff generally flows northward and westward through the basin. The Santa Cruz River is the major surface drainage channel in the Planning Area and flows northward to the Planning Area's western boundary. The two major treatment plants, Roger Road WWTP and Ina Road WPCF are located in low-lying areas on the western edge of the basin. The effluent from these two treatment facilities is:

- Discharged to the Santa Cruz River.
- Reused by PCWMD and the City of Tucson Reclaimed System.
- Recharged to the aquifer.

The three main elements of the Planning Area are physical characteristics, cultural characteristics and population/land use. Important elements of the physical characteristic are reuse or effluent and the geology of the Planning Area. Effluent discharged to the Santa Cruz River provides year around flows downstream.

Area soils, outside of stream channels, have, at best, moderate infiltration rates. The effects of the infiltration characteristics are low natural groundwater recharge rates and relatively high volumes of surface runoff. Other areas in Planning Area may prove highly conductive for recharge using surface spreading methodologies, dependent on local site conditions. The infiltration rates in the area impact land requirements for effluent to recharge groundwater. Reuse water supplies golf courses, schools and other private and public uses throughout the basin and replace precious groundwater for these uses.

Archaeology is an important issue in the cultural characteristics. Conducting detailed archaeological surveys of proposed conveyance system routes or new wastewater treatment plants prior to construction will aid in the preservation of the archaeological resources.

Finally population and land use impact the timing and size of future improvements. The current general employment trend in the Planning Area is increased employment in the service and hotel/ lodging sectors. High technology manufacturing has been strong. The long-term outlook predicts continued growth with firms immigrating to the area to take advantage of the favorable climate, the labor force, and the low cost of living. The Planning Area population is projected to grow by about 11 percent between 2005 and 2010, 10 percent between 2010 and 2015, 9 percent between 2015 and 2020, 8 percent between 2020 and 2025, and 8 percent between 2025 and 2030.

SUB-CHAPTER 2.1 PLANNING AREA CHARACTERISTICS

Chapter 2.1 provides general descriptions of the physical and cultural characteristics of the Planning Area, as well as the outlying areas served by Pima County Wastewater Management Department (PCWMD).

The characteristics of the Planning Area include:

- Physical Characteristics.
  - ✓ Geography.
  - ✓ Geology.
  - ✓ Hydrogeological conditions.
  - ✓ Surface hydrology.
  - ✓ Climate.
  - ✓ Air quality.
  - ✓ Biotic communities.
- Cultural Characteristics.
  - ✓ Archeology.
  - ✓ Economic base.
  - ✓ Employment trends.
- Population and Land Use.
  - ✓ Land uses.
  - ✓ Population trends.

Pertinent to the area are such elements as physical, cultural characteristics and historical wastewater treatment practices.

Physical Characteristics

Geography

The Planning Area is located in Eastern Pima County (Tucson Valley Basin). Elevations in this basin range from 3,720 feet in the southeast to 2,030 feet in the northwest. The basin floor is generally level, and there are several primary and secondary drainage channels draining to the northwest. These channels convey surface runoff northward and westward through the basin.

The Tucson Basin is roughly ringed by (clockwise from the north) the Santa Catalina, Tanque Verde, Rincon, Empire, Santa Rita, Sierrita, Tucson and Tortillita Mountains. The Santa Catalina, Rincon, Tucson and Tortillita ranges abut the Planning Area. The generally gentle slope of the basin floor tends to increase rapidly as it nears the various mountains ranges.

The two major metropolitan wastewater treatment facilities, Roger Road WWTP and Ina Road WPCF, are located in low lying areas on the western edge of the basin to take advantage of the gravity flow provided by the shape and slope of the basin. See Figure 2.1.1.

The Randolph Park WRF is more centrally located within the basin, and requires a lift station to convey wastewater flow to the facility.

Geology

The mountains surrounding the Tucson Basin are composed of metamorphic, sedimentary, and intrusive igneous rock extending beneath the alluvial material filling the basin. This impermeable material provides a physical boundary that forms the area's groundwater basins.

Over time, erosion or weathering of the mountainous areas has resulted in the deposition of alluvium up to 7,000 feet thick in areas south and southeast of Tucson. A stratigraphic section through the basin reveals, from the ground surface downward, superficial deposits (primarily stream channel and terrace deposits) of the Fort Lowell Formation, the Tinaja beds, and the Pantano Formation. The Pantano Formation is composed primarily of Catalina granite and gneiss, ranging from loosely packed to weakly cemented into place. The Tinaja beds are a series of beds composed of Catalina gneiss changing to volcanics with increasing depth, ranging from sandy gravel along the basin's margins to gypsiferous clayey silt and mudstone in the center of the basin. The thickness of each unit varies throughout the basin, with the deeper beds generally thicker than those overlying them.

The basin is interwoven with deep geologic faults, which are considered to be inactive. Evidence of inactivity is provided by the deformations observed in the Pantano Formation and the Tinaja beds, but generally absent from the younger Fort Lowell Formation. Seismic activity is not anticipated to affect any operational facilities.

Characteristics of the alluvium on the basin floor could potentially present obstacles during and after construction of new wastewater management facilities. Calcium carbonate lenses, known locally as caliche, are interspersed throughout the Planning Area. The caliche lenses vary in thickness and aerial extent and may be encountered anywhere within the basin.

The combined effects of groundwater extraction and the introduction of surficial loads may result in subsidence in the unconsolidated upper alluvium. Alluvium with high clay content may be subject to swelling when it is wetted. The unconsolidated material can be easily eroded, particularly during the summer's short duration, high intensity rains and subsequent runoff events referred to as monsoons. Detailed geotechnical investigations during design phases will decrease the probability of any of these potential problems affecting new wastewater facilities.

The uppermost alluvial deposits within the Tucson basin contain most of the groundwater extracted and used in the Metropolitan Area. Most in-service wells penetrate the upper Tinaja beds. Very few wells penetrate the middle and lower units of the Tinaja beds or the Pantano Formation beneath them. The three geological units, though possessing unique lithological and hydraulic characteristics, are hydraulically connected and comprise a single aquifer.

Soils

Soils in the Planning Area are primarily the results of fluvial deposition of weathering products from the surrounding mountains. Soil particle sizes typically decrease as distance from the mountain fronts increases. Organic residue does not typically accumulate on and near the soil surface.

Area soils have, at best, moderate infiltration rates. Infiltration rates tend to decrease near the mountains and are generally lower in the extreme southeastern and northeastern portions of the Planning Area. The effects of the soils' infiltration characteristics are low natural groundwater recharge rates and relatively high volumes of surface runoff.

Site-specific soil characteristics will require field studies for complete, specific definitions. Soil mapping to date has been done in a generalized manner. Potentially critical parameters may not be apparent on existing maps and should be identified in design phases.

Hydrogeology

Until the 1990s, the Metropolitan Tucson Area relied entirely on groundwater to meet all potable water needs. This total dependency on groundwater combined with a continually increasing population has resulted in a declining water table and groundwater overdraft. Since the 1990s:

- The City injected CAP water during direct delivery from 1992 to 1994.
- The City has recharged CAP water via surface spreading basins since 1997.
- The blend of groundwater and recharged CAP water has been utilized by Tucson Water as a supply source since 2001.
- The main goal of these efforts is to reduce reliance on groundwater, which will serve to stabilize groundwater levels and reduce the potential for additional lane subsidence. In some areas, groundwater levels in the regional aquifers have already begun rising.

In 1940, 85 percent of the groundwater recovered was used for irrigation purposes. Since that time, water usage patterns have undergone significant change. The peak year for agricultural use occurred in 1976, which at approximately 325,000 acre feet per year (AF), represents 66 percent of the total pumped that year. Ground water pumping in the Tucson Basin reached its peak in 1975/76. By 1980/81, agricultural pumping within the Tucson Basin had been reduced to approximately 180,000 acre feet approximately 55 percent of the overall usage. However, as agriculture usage has decreased, industrial and municipal usage has increased in accordance with population growth within the Planning Area.

In 1980, the Arizona Groundwater Management Act was enacted. As part of this policy, Active Management Areas (AMA) were established and the goal of safe-yield was established (volume of groundwater-recovered equal to the volume of water recharged). The Arizona Groundwater Management Act encourages the Tucson AMA to reach this goal by 2025. This requires the community to look at other sources such as:

- Utilization of Arizona's allocation of Colorado River Water.
- Effluent reuse to offset groundwater withdraws (primarily golf courses).
- Recharge.
- Conservation.

Data from Arizona Department of Water Resources (ADWR) indicates in 2000, the Tucson AMA utilized 326,103 AF of water broken down as follows: for agricultural irrigation (105,041 AF), for municipal use (159,649 AF), industrial use (17,978 AF), and for mining use (43,435 AF).

In an effort to reduce groundwater demand, the Tucson AMA began taking deliveries of Colorado River water from the Central Arizona Project (CAP) in 1992. CAP allocations were divided among four major municipal water providers, Tucson Water (135,966 AF), Metropolitan Domestic Water Improvement District (8,858 AF), Flowing Wells (4,354 AF), and Oro Valley Water Utility (6,748 AF).

In order to reach the assured water supply rules objectives, several utilities are currently recharging both CAP and effluent into storage facilities. Presently, Tucson Water is recharging 60,000 AF annually of CAP water and is in the process of finalizing a recharge application with ADWR to increase this by an additional 20,000 AF annually. Tucson Water plans for recharge are set forth in Tucson Water's *Water Plan: 2000-2050* to which the reader is referred for further details. Metropolitan Domestic Water Improvement District is utilizing their allocation through either recharging or trading with existing agricultural groundwater permit holders.

Reuse of effluent is an important component in the overall safe-yield objectives. PCWMD recently completed an advanced 3 MGD combination biological nutrient removal (BNR)/immersed membrane water reclamation facility (Randolph Park WRF). This facility is permitted for Class A effluent and will supply the Tucson Water Reclaimed System with Class A effluent; however it is capable of producing Class A+ effluent for future delivery.

Tucson Water has one of the most extensive reclaimed water systems in the United States, and Oro Valley is currently developing its own reclaimed water distribution system. These systems will supply golf courses, schools and other private and public uses throughout significant portions of the Tucson and Avra Valley Basins.

Depths to groundwater vary from about 50 feet along Tanque Verde Wash in the northeastern portion of the Planning Area to about 450 feet in the southeastern and north-central portions of the Planning Area. Depths to groundwater have steadily increased throughout the Planning Area since the early 1940s. The water table is deep enough that infiltration into the wastewater conveyance system is considered negligible, except during significant rainfall events.

Natural recharge of the aquifer occurs primarily along the mountain fronts and in stream channels in response to precipitation events. Under flow, the influx of groundwater from another basin occurs primarily along the Planning Area's southern boundary and along the Canada del Oro Wash in the northeastern portion of the Planning Area. Incidental recharge occurs as a secondary product of human activities and includes turf irrigation (parks and golf courses) and discharge of secondary effluent into the Santa Cruz River from the Roger Road WWTP and the Ina Road WPCF. The local municipalities within the metro vicinity of the Tucson AMA are collecting groundwater storage credits.

Surface Hydrology

The main drainage channels within the Planning Area are ephemeral streams, fed by precipitation and snowmelt from higher elevations. Numerous secondary channels serve as tributaries to the primary drainage channels. These channels are generally entrenched, though not as deeply as the larger channels. The natural channels combine into a dendritic drainage pattern. The pattern has been slightly modified by construction. Many streets were designed and constructed to serve as temporary channels. Runoff in the streets is typically discharged into natural channels.

Drainage channel floors within the basin provide most of the area's aquifer recharge. Precipitation during the winter season usually occurs over a widespread area and lasts from one to several days and is of low intensity. Runoff resulting from these storms flows slowly through the drainage channels, which facilitates recharge. Recharge rates decrease as the season progresses due to sediment deposition, which plugs many of the surface voids, impeding infiltration.

Summer storms are highly localized, typically lasting from a few minutes to an hour, and precipitation can be extremely intense. Runoff from these storms flows rapidly through the channels. The rapid flow rates are less conducive to recharge than the slower winter flows. Summer flows are able to carry a large sediment load and effectively scour channel bottoms re-establishing higher infiltration rates.

Occasionally, flash floods flow through the drainage system. Impacts of these floods are generally limited to temporary closure of roadway crossings. More severe flooding has occurred in the Planning Area. Unusually high surface flows were recorded in 1915, 1921, 1929, 1935, 1940, 1965, 1979, 1983 and 1993. Over bank flow did not occur in the urbanized portions of the Planning Area during the 1983 flood event. Channel cutting did occur in the urban areas. Erosional processes caused

millions of dollars worth of damage to private property, roadways, bridges and public utility networks. Extensive erosion-controlling channel improvements have subsequently been implemented.

The Santa Cruz River is the major surface drainage channel in the Planning Area. The river flows northward near the Metropolitan Area's western boundary. The Pantano Wash and Tanque Verde Wash drain the area's southeastern and eastern extents respectively. The Rillito River, originating at the confluence of Pantano and Tanque Verde Washes, provides surface drainage for the north-central portion of the Planning Area before discharging into the Santa Cruz. The area between the Santa Catalina and Tortillita Mountains is drained by the Canada del Oro Wash that also flows into the Santa Cruz River. All of the primary drainage channels are well entrenched.

The Santa Cruz River originates as a small southerly flow in the San Rafael Valley, looping down into Mexico, and then back up into the United States. Historically, the Santa Cruz was a perennial stream until it reached Tubac, where it went subsurface. From the late 1800s to the mid-1900s, the Santa Cruz reemerged in the San Xavier Mission area. Perennial flow in these sections of the Santa Cruz River maintained marshes, or cienegas. These segments of lush vegetation and plentiful water were localized and the other segments of the channel were characterized as dry, sandy riverbed (Betancourt and Turner 1985). The two major regional treatment plants discharge effluent into the Santa Cruz River channel, providing year around flows downstream from these plants. These two metropolitan plants are sited within the boundaries of the floodplain of the Santa Cruz River. Both plants, however, are at elevations greater than the anticipated 100-year flood event.

Climate

The Metropolitan Tucson Area is located within the Sonoran Desert and has a climate typical to the lower elevations in the American Southwest. Winters are mild and generally dry. The summer season typically lasts from May through September. During this period the daytime temperatures are generally above 100 degrees.

Almost one-half of the annual precipitation occurs during the summer months. Orographic, convectional air currents give rise to isolated thunderstorms. The remainder of the annual precipitation occurs primarily during the winter. Pacific storms occasionally travel far enough southward to bring slow moving, gentle storms to the Tucson area.

Drought conditions have been in affect since approximately 1997. While drought conditions are generally temporary, they have been known to last as long as 40 years. In comparison to the last seven years, the winter of 2005 brought more precipitation. While this could mean an end of the drought period, it will take several years of like precipitation to return to normal.

The general wind pattern within the Planning Area consists of light southeasterly winds in the morning and light northwest winds in the afternoons. Variations to the general pattern are introduced by the diurnal mountain-valley thermal gradients; superadiabatic air currents associated with summer thunderstorms and frontal storm systems altering regional airflow.

Air Quality

Topographic conditions of the Tucson Basin affect the area's air quality, particularly during the winter months. Thermal inversions trap pollutants (primarily vehicular combustion byproducts). Inversions occur year round, but are more persistent during the winter months.

Vehicular emissions are the primary sources of gaseous atmospheric pollutants. State mandated emissions inspections and improved automobile emission controls have reduced carbon monoxide levels below the higher levels observed during the early to mid-70s. The volume of vehicular traffic has steadily increased, leading to the required use of oxidant-containing fuels (e.g. gasohol) during

the winter months. The methanol added to the gasoline provides for more complete combustion and fewer combustion byproducts.

Particulates in the air are primarily the results of earth disturbing activities. Reduced particulate concentrations were achieved by paving unpaved streets and roads, reducing allowable speeds on the remaining unpaved roadways, and enacting and enforcing strict dust control levels at construction sites.

Biotic Communities

Three principal plant communities are found within the Planning Area: creosote bush, the palo verde-saguaro, and the riparian-woodland. Each plant community has an associated animal community, ranging from minuscule insects to large game animals and predators. These communities overlap in transition zones. As a response to environmental stress, animal species may relocate and adapt to a non-typical plant community. In the highly urbanized portions of the Planning Area, the natural plant and animal communities have been largely displaced and replaced by non-indigenous species.

The creosote bush community occupies most of the gently sloping basin floor in the undeveloped southern, southeastern and northwestern portions of the Planning Area. As slopes increase near the eastern, northern and western Planning Area boundaries, the creosote bush community yields to the palo verde-saguaro community. The riparian-woodland community is most apparent along Tanque Verde and Pantano Washes and their tributary washes and in isolated incidences along the Santa Cruz River and their tributary washes.

Archaeology

The Arizona State Museum has conducted general and site-specific archaeological surveys within the Planning Area. Archaeological findings to date indicate that the area's earliest inhabitants were the hunting and gathering Indians, who inhabited the area about 7000 B.C. Hunting and gathering groups were replaced by the agriculturally oriented Hohokam, who inhabited the Tucson Basin from about 500 to 1400 A.D. Pima Indians inhabited the basin from about the 1600s until Spanish settlement began in the mid-nineteenth century. Artifacts from each of the Tucson Basin's inhabitants have been found.

Existing archaeological records for the area suggest that potentially significant archaeological sites remain undiscovered within this large Planning Area. Conducting detailed archaeological surveys of proposed conveyance system routes or new wastewater treatment plants prior to construction will aid in the preservation of the archaeological resources.

Cultural Characteristics

Economic Base

The economic base of the Planning Area has gradually shifted away from agriculture and copper mining toward high technology and service industries. Education, military and government services play important roles in maintaining the Planning Area's economic base. Tourism and recreation have become increasingly important to the economic base.

Employment Trends

The ten major employers within the Planning Area are the University of Arizona, Raytheon Missile Systems, State of Arizona, Davis-Monthan Air Force Base, Tucson Unified School District, Pima County, City of Tucson, Wal-Mart Stores Inc. and the Carondelet Health Network. These are followed by, Tohono O'Odham Nation, TMC HealthCare, University Medical Center Corp., Pasqua Yaqui Tribe, U.S. Border Patrol, Pima Community College, Sunnyside Unified School District, Northwest Medical Center and Fry's Food and Drug Stores.

Governmental activities are focused in downtown Tucson, as is a significant portion of the finance, real estate and insurance sector. The trade and service sectors are widely scattered throughout the Planning Area. Manufacturing is generally concentrated along Interstate 10 and adjacent to the Union Pacific railroad tracks. Employment within the construction sector generally follows a cyclic pattern, with years of high activity followed by years of low activity.

The current general employment trend in the Planning Area is for increased employment in the service and hotel/lodging sectors. High technology manufacturing has been strong with Raytheon being the most notable in this sector. The long-term outlook predicts continued growth with firms immigrating to the area to take advantage of the favorable climate, the semi-skilled to skilled labor force, and the low cost of living.

Population and Land Use

Land Uses

Land use within the Planning Area is determined by the planning and zoning agencies of the incorporated communities and, in unincorporated areas, by the Pima County Department of Planning and Development Services.

Sonoran Desert Conservation Plan

The Sonoran Desert Conservation Plan, which received the American Planning Association's 2002 Outstanding Planning Award, covers a 59 million-acre portion of the Sonoran Desert ecosystem in Pima County, Arizona - one of the fastest growing counties in the U.S. The County Administrator and Board of Supervisors initiated the plan in 1998 in response to conservation needs for a handful of rare species, most significantly the federally listed cactus ferruginous pygmy owl. The purpose of the plan is to ensure the long-term protection of "the heritage and natural resources of the west in Pima County." The Sonoran Desert Conservation Plan contains six areas of focus: Protection of Critical Habitat, Biological Corridors, and Mountain Parks, Riparian Restoration, Historic and Cultural Preservation and Ranch Land Conservation. Over 205 reports have been produced, including a mapped conservation reserve design that prioritizes the protection of the region's biodiversity by applying the six areas of focus above. In the future, Pima County plans to apply for a multi-species Habitat Conservation Plan permit under the U.S. Endangered Species Act to allow less protections for 55 federally listed species in exchange for habitat protection in the conservation reserve system.

The effort has created a partnership among more than a dozen local, state, and federal land management agencies that together have authority over 97 percent of the 59-million-acre planning area. It has involved more than 5,200 participants in various committees, task forces, advisory groups and study teams. The process has been open to the public and based on partnerships. The Pima County Board of Supervisors led the effort, coordinating with 12 major government land managers and about 40 community groups.

In December 2001, Pima County incorporated the Sonoran Desert Conservation Plan into its comprehensive land use plan. The comprehensive land use plan addresses many problems caused by urban sprawl, such as a declining tax base, land consumption, water availability, and a loss of cultural identity. It prescribes the Sonoran Desert Conservation Plan to address natural and cultural resource protection and incorporates the conservation reserve design into a Conservation Lands System categorizing future land use in all unincorporated lands in the planning area. The land use categories in the Conservation Lands System include: Important Riparian Areas, Biological Core Areas, Scientific Research Management Areas, Multiple Use Management Areas, Recovery Management Areas, Agriculture within Recovery Management Areas and Critical Landscape Connections.

The planning process generated a series of policy changes and conservation achievements. Over the last few years a series of ordinances were passed that seek to protect biological resources while maintaining better quality urban design. Ordinances include buffer overlay zones around biological preserves, hillside development restrictions, riparian habitat mitigation, native plant protection, conservation subdivisions, big box store limitations and home design standards. The research and inventory work of the plan generated the scientific and historical justification for two new Bureau of Land Management areas: the Ironwood National Monument and Las Cienegas National Conservation Area. Also, Pima County acquired and protected substantial ranch and parklands and riparian areas. Finally, many policies were adopted that introduced and institutionalized standards in the built environment for growth areas, mixed use development, inclusionary and mixed income programs, transit oriented development to promote the neighborhood unit, concurrency based on level of service standards, infrastructure service area boundaries and water conservation. (Compiled from Biodiversity Partners website www.biodiversitypartners.org).

Population Trends

The population of the Metropolitan Planning Area has steadily increased since the late 1940s, growing to 265,660 in 1960, 431,400 in 1980, and 843,746 in 2000. This trend is expected to continue throughout the 20-year planning period covered by this Facility Plan Update. Pima Association of Governments (PAG) June 2005 Population Growth Forecast for the Planning Area projects an increase in population of about 11 percent between 2005 and 2010, 10 percent between 2010 and 2015, 9 percent between 2015 and 2020, 8 percent between 2020 and 2025 and 8 percent between 2025 and 2030.

SUB-CHAPTER 2.2 METROPOLITAN PIMA COUNTY SEWER HISTORY

The first public sanitary sewers in Pima County were installed in Tucson in 1900, and the first wastewater treatment facility was constructed in 1928. Prior to construction of the treatment facility, wastewater was used directly for farm irrigation. In 1951 Phase 1 of the City of Tucson's Roger Road WWTP began operation, and in 1961 the Pima County Sanitary District #1 installed the first wastewater treatment lagoon at the Ina Road WPCF site. This sanitary district was dissolved in 1968 and replaced with the Pima County Department of Sanitation, which was later renamed the Pima County Wastewater Management Department in 1978.

In 1974, the City of Tucson and Pima County created, through an intergovernmental agreement, the Metropolitan Utilities Management Agency. The City and County created this agency to coordinate the operations of water and sewerage systems within the Tucson city limits and the unincorporated areas of Pima County (PAG, 1975). However, the City of Tucson and Pima County continued to operate their respective sewerage systems. The joint agency was dissolved in 1976.

Also in 1974, the Governor of Arizona designated Pima Association of Governments (PAG) as the Designated Planning Agency (DPA) for Pima County. The PAG 208 Plan was completed in 1978, and it identified both Pima County and the City of Tucson as Designated Management Agencies responsible for sewerage facilities. However, the EPA preferred a single management agency, and the 1978 PAG 208 Plan recommended consolidation of sewage treatment programs in the metropolitan area.

In 1979, the ownership and all responsibilities for the construction, operation, and maintenance of the City of Tucson's sewerage systems were transferred to Pima County. In recognition of the pending consolidation of facilities, the PAG Regional Council passed resolution 78-12-07 in December 1978 requesting the Governor designate Pima County as the single 208 Designated Management Agency (DMA) for municipal wastewater treatment and sewer system operations. This designation is noted in a 1980 amendment to the 1978 PAG 208 Plan.

The 1979 IGA, transferring the sewerage system, stipulated the City of Tucson would own and have unilateral control over the use and disposition of effluent discharged from metropolitan treatment facilities. The IGA stated that Pima County was entitled to up to 10 percent of the effluent for use on County parks, golf courses and recreational facilities. A supplemental IGA between Pima County and the City of Tucson was negotiated in 2000. It addressed control of effluent from non-metropolitan facilities, access by other water providers to effluent derived from their water supplies, and establishes a conservation pool of up to 10,000 AF per year for use of effluent in habitat conservation plans or other approved projects.

Pima County remained the sole DMA in the PAG planning area until March 1999, when the PAG Regional Council approved a 208 Plan Amendment designating the Town of Sahuarita as a management agency. The area designated for the new Sahuarita DMA encompassed the incorporated Town of Sahuarita limits excluding areas already served by Pima County. No additional DMAs have been proposed.

Early Operational History

Pima County and City of Tucson have a history of wastewater collection and treatment activities dating to the beginning of the 20th century. The Metropolitan Area system has progressed significantly from the initial collection system of several miles utilizing raw wastewater irrigation as treatment to the present 3,300 miles of interceptors and 69 MGD of advanced wastewater treatment capability. A chronology of early 20th Century activities is shown in Table 2.1.1.

Table 2.1.1 Operational History of Pima County and City of Tucson Wastewater Collection and Treatment Systems

Year	Operational History
1900	Installed first sewer on Main Avenue between 17th Street and St. Mary's Road. Raw wastewater was used for irrigation.
1917	Installed 30-inch outfall paralleling Southern Pacific Railroad tracks from St. Mary's Road north to Sunshine Lane and west across Santa Cruz River. Raw wastewater was still used for irrigation.
1928	Constructed primary treatment plant at outfall terminal. Primary effluent was used for irrigation.
1942	Enlarged and improved existing primary plant. Primary effluent still used for irrigation.
1948	Formed Sanitary District, resulting from a study to handle problems within the County and outside city limits.
1951	Constructed a 12 MGD activated sludge treatment plant and put into operation at West Sweetwater Drive near highway (present site of the Roger Road WWTP). Old, primary plant abandoned and flows diverted to new plant through a 42- and 48-inch outfall sewer extending from Sunshine Lane.
1955	Sold balance of effluent for irrigation use.
1960	Completed expansion of facilities to increase combined treatment capacity to 24 MGD. New plant was a high-rate trickling filter in parallel with existing plant.
1968	Completed expansion of facilities to increase combined treatment capacity to 36.9 MGD. New plant was activated sludge treatment in parallel with other two plants.

Recent Operational History

In the early 1970s, to protect the public health and to conserve water resources in the water-conscious Tucson area, a comprehensive review of the water, wastewater, and refuse handling was undertaken. A study was authorized by PAG and resulted in "A Regional Plan for Water, Sewage, and Solid Waste Management." The report concluded that the most economical way to meet the wastewater treatment needs of the rapidly growing Tucson Metropolitan area would be to construct a regional treatment facility at the Ina Road WPCF to the north and west of Tucson. In addition, the PAG study recommended reusing the wastewater generated at the local and regional treatment plants whenever economically and institutionally possible.

This recommendation led to the construction of the 25 MGD Ina Road WPCF in 1975. This plant replaced Pima County's existing treatment facility, which was comprised of 22 acres of oxidation ponds. The plant was constructed as a high-pressure pure oxygen (HPO) activated sludge system and was operated by Pima County. As part of the PAG report recommendations, a 1.5 MGD plant was constructed by the City of Tucson at Randolph Park in 1975 to utilize treated effluent for irrigation of the park's two golf courses and also to relieve capacity issues on the wastewater conveyance in the area.

A major milestone was achieved in 1979 regarding a regional approach to wastewater conveyance, treatment and reuse. An Intergovernmental Agreement (IGA) with the City of Tucson gave Pima County the responsibility to construct all capital projects and maintain and operate the facilities necessary to insure compliance with existing Federal (EPA) and State (ADEQ) wastewater requirements.

Pima County completed its first major plant retrofit at the Roger Road WWTP in 1982 by modifying the high-rate trickling filter (Plant 2) to bio towers and increasing the capacity of Plant 2 from 12 MGD to 30 MGD. At the same time, the two activated sludge treatment systems, Plants 1 and 3, were taken off line. This resulted in a reduction in the total net capacity of Roger Road WWTP from 36.9 MGD to 30 MGD. The activated sludge plants were taken off line due to operational problems.

To improve handling efficiencies of digested sludge (biosolids) generated at the Roger Road WWTP and Ina Road WPCF, a 5.3-mile sludge force main was constructed in 1987. Since its startup, all sludge thickening and disposal operations for both the Roger Road WWTP and Ina Road WPCF have been conducted at the Ina Road WPCF.

It became apparent in the late 1980s and early 1990s that capacity at the Roger Road WWTP needed to be increased. Prior to any major plant improvement, the plant operators utilized Plant 3 activated sludge processes during known periods of high flow to ensure the effluent from the Roger Road WWTP was within permit limits. The first major retrofit was accomplished in 1997 after the installation of additional primary and secondary digesters, two more primary clarifiers, and other components to the activated sludge process. The resulting capacity was 11 MGD for the activated sludge system with a net capacity of 41 MGD at the Roger Road WWTP. At present, the activated sludge portion of the Roger Road WWTP facility is utilized for supplemental treatment during a majority of the year in order to produce a high quality effluent for delivery to the Tucson Water reclaimed water system.

In 1996, the Randolph Park WRF was taken out of service and reclaimed irrigation water for the park was provided by the City of Tucson's reclaimed water distribution system utilizing effluent from the Roger Road WWTP.

In 2003, the Randolph Park WRF underwent a major upgrade and expansion to produce 3 MGD of effluent for reuse with an ADEQ reuse classification of A. The plant utilizes an activated sludge membrane bioreactor (MBR) treatment process. The effluent from the Randolph Park WRF is discharged to the Tucson Water Reclaimed Water System for beneficial reuse, such as golf course irrigation and riparian restoration.

Currently, the Ina Road WPCF is in the final construction phase of being expanded by 12.5 MGD with a new process train to run parallel to the existing pure oxygen activated sludge plant. The new train will be a biological nutrient removal (BNR) system (via nitrification-denitrification) using anoxic and aerobic basins. This activated sludge treatment system has the objective of denitrification of the 12.5 MGD resulting in a net reduction of nitrogen in the Ina Road WPCF discharges to the Santa Cruz River.

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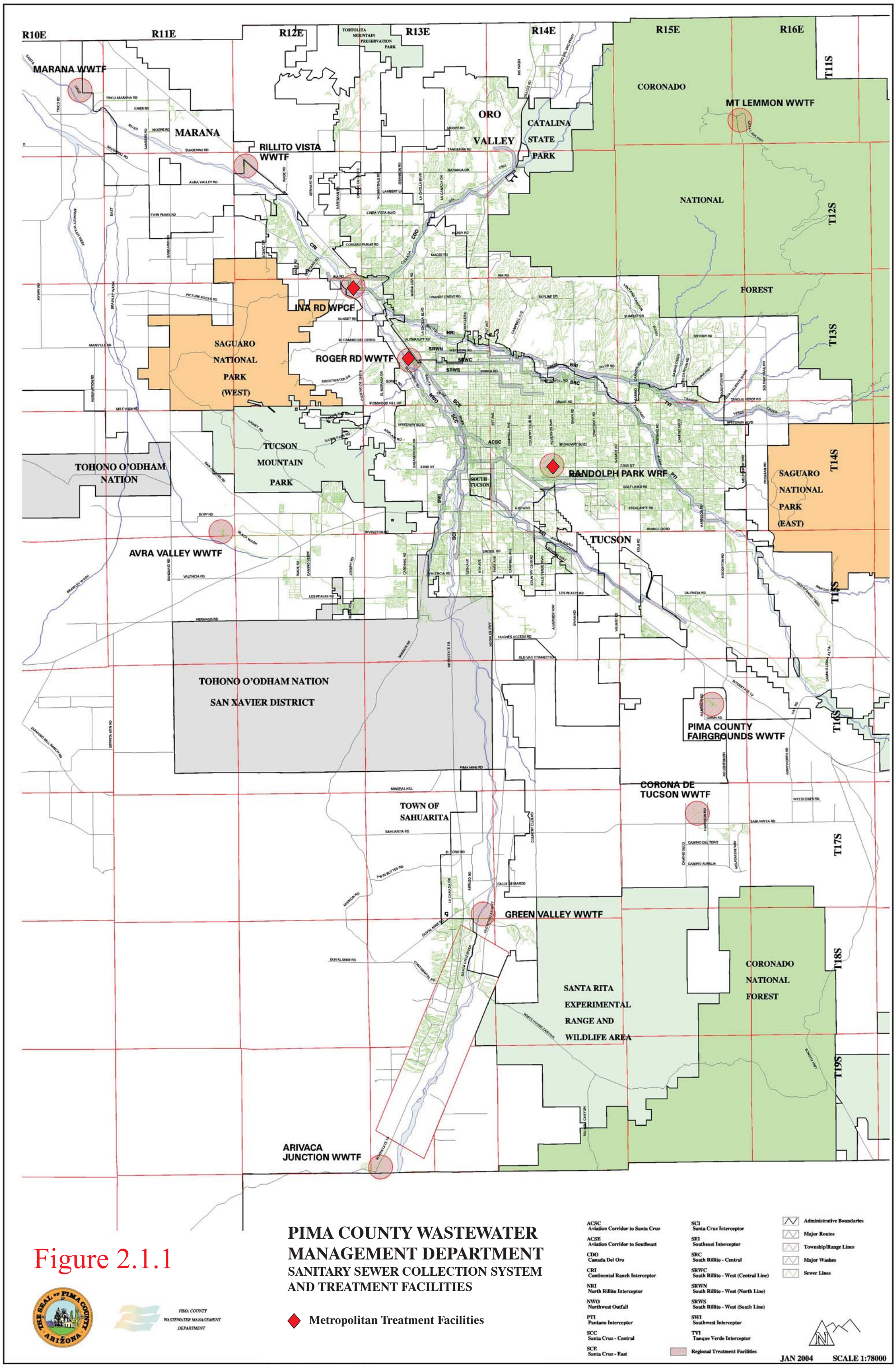

Figure 2.1.1