CAG 208 Plan and DMA Draft Amendment

CAG 208 ID #2020-2 October 2021

Prepared for Superstition Mountains Community Facilities District No. 1
5561 South Ironwood Drive, Apache Junction, Arizona 85120

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This plan supersedes SMCFD No. 1's 2011 CAG 208 Plan Amendment (CAG 208 ID# 2007-10).

208 Plan Amendment

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List of Acronyms

208 Plan	Per the Clean Water Act (Section 208 of Federal Water Pollution Control Act Amendments, 1972) a regional water quality management plan.
ADEQ	Arizona Department of Environmental Quality
ADWR	Arizona Department of Water Resources
AJWD	Apache Junction Water District
APP	Aquifer Protection Permit
ASLD	Arizona State Land Department
AWC	Arizona Water Company
AZPDES	Arizona Pollutant Discharge Elimination System (surface water discharge permit
CAG	Central Arizona Governments
CAP	Central Arizona Project
CAWCD	Central Arizona Water Conservation District
CFR	Code of Federal Regulations
CWA	Clean Water Act (Federal Water Pollution Control Act Amendments of 1972 [P.L. 92-500])
DMA	Designated Management Agency
DPA	Designated Planning Agency
EPA	United States Environmental Protection Agency
gpd	gallons per day
gpm	gallons per minute
LTSC	long term storage credit
MAG	Maricopa Association of Governments
MGD	million gallons per day
PVR Dams	Powerline, Vineyard Road and Rittenhouse Dams
RAZ	regional analysis zone
SMCFD	Superstition Mountains Community Facilities District No. 1
USGS	United States Geological Survey
WIFA	Arizona's Water Infrastructure Finance Authority
WMU	Wastewater Management Utility
WQM	Water Quality Management
WRF	Water Reclamation Facility
WS	Water Storage (Permit)

Glossary

Biochemical Oxygen Demand (BOD)	A measurement of the amount of oxygen used by the decomposition of organic material, over a specified time period (usually 5 days) in a wastewater sample; it is used as a measurement of the readily decomposable organic content of a wastewater.
Capacity Assurance	Per A.A.C. R18-9-E301 (C)(2), the sewer collection system downstream from this project can maintain the performance standards required under AAC R18-9-E301(B) for the increased flow from the proposed system or expansion.
Design Capacity	Volume of a containment feature at a discharging facility that accommodates all permitted flows and meets all permit conditions, including allowances for appropriate peaking and safety factors to ensure sustained, reliable operations. [18 A.A.C. 9.101]
Design Flow	Daily flow rate that a facility is designed to accommodate on a sustained basis while satisfying all permit discharge limitations and treatment and operational requirements. Design flow either incorporates or is used with appropriate peaking and safety factors to ensure sustained, reliable operation. [18 A.A.C. 9.101]
Designated Management Agency	An agency identified by a WQM plan and designated by the Governor to implement specific control recommendations. [40 CFR §130.2]
Designated Planning Agency	Established local, regional, state or federal agency or another entity with adequate resources, authority and desire to assume responsibility for WQM planning activities in a particular area; DPA for this project is CAG.
On-Site Wastewater Treatment System	Any combination of unit processes or best management practices designed to receive, treat, and dispose of wastewater from individual structures (such as homes and businesses). Examples are septic tanks and holding tanks.
Operational Flow	The maximum monthly average measured flow based on last 12 months of flow.
Planning Area	For a DMA, the planning area is the DMA boundary. For a WMU, the planning area is anything outside of the Certificate of Convenience and Necessity (CC&N).
Publicly Owned Treatment Works (POTW)	A wastewater treatment facility owned by a public entity, such as a city, county, or special sanitary district. [40 CFR §403.3]
Reclaimed Water	Effluent that has been treated by a wastewater treatment plant or on-site wastewater treatment facility.
Service Area	For a DMA, the service area is the boundary of the existing collection system. For a WMU, the service area is anything within of the Certificate of Convenience and Necessity (CC&N)

Sewage	Untreated wastes from toilets, baths, sinks, lavatories, laundries, other plumbing fixtures, and waste pumped from septic tanks in places of human habitation, employment, or recreation. [18 A.A.C. 9.101]
Sewage Collection System	A system of pipelines, conduits, manholes, pumping stations, force mains, and all other structures, devices, and appurtenances that collect, contain, and convey sewage from its sources to the entry of a sewage treatment facility or on-site wastewater treatment facility serving sources other than a single-family dwelling. [18 A.A.C. 9.101]
Wastewater Management Utility	A privately-owned centralized wastewater treatment facility and a collection system that provides services to multiple properties and may expand these services or facilities in the future. Functions similar to a DMA, but a WMU cannot be a DMA.

1.0 INTRODUCTION

1.1 ABSTRACT

The City of Apache Junction (City) is proposing to expand its Designated Management Agency (DMA) boundary approximately 11 square miles to accommodate the Superstition Mountains Community Facilities District No. 1 (SMCFD or District) expanded Service Area as a Plan Amendment under the Central Arizona Governments' (CAG) 208 Water Quality Management Plan (WQM). The current DMA boundary contains approximately 40 square miles. The City and SMCFD are both identified in the current 2016 CAG 208 Water Quality Management Plan (CAG 208 Plan) as DMAs. This amendment proposes to clarify that the City is the DMA for the defined planning areas. The proposed DMA boundary expansion will also include the District's expanded Service Area. The proposed expansion of the DMA boundary is located within the City of Apache Junction's 2020-2050 General Plan land use area. The City is in the process of annexing the land within the proposed DMA boundary expansion. The current and proposed Service Areas are entirely within the current and proposed DMA boundaries.

In 2011, the CAG Regional Council approved the Superstition Mountains Community Facilities District No. 1 Plan Amendment (SMCFD 2011 Plan Amendment) under CAG 208 ID 2007-10. The current DMA boundaries as amended in 2011, and the proposed DMA expansion shown in **Figure G.1** are: McKellips Boulevard to the north, Meridian Road to the west, Elliot Avenue to the south, and between Goldfield Road and Barkley Road to the east. The proposed DMA boundary is shown as a dashed line to the south of the current boundary. The 2011 amendment was congruent to the Arizona State Land Department's (ASLD) development plan for a master-planned community that was not completed.

The City's proposed DMA boundary expansion is located in Pinal County and includes predominantly Arizona State Trust Land that is currently undeveloped. A segment of approximately 2,783 acres within the proposed expanded DMA boundary was sold by ASLD to D.R. Horton in November 2020. Estimates for build out capacity of wastewater flows for the DMA boundary expansion are based on ADEQ guidelines, engineering estimates, and transition from current to anticipated land use zoning and densities.

The DMA boundary is being expanded to the south due to the pending progress of ASLD development to the west of the CAP Canal. Expansion of the City's DMA boundary will ensure orderly growth of regional wastewater collection and treatment services and protect groundwater resources within the area.

The District owns and operates a wastewater collection system for the conveyance of sewage to the WRF located within the City's DMA Boundary (**Figure G.2**). SMCFD is in the process of increasing its WRF capacity from 2.14 MGD to 3.0 MGD, which falls within the current maximum approved capacity of 16 MGD listed within the CAG 208 Plan. This Plan Amendment is also proposing to increase the Build-Out capacity from 16 MGD to 26 MGD. The WRF currently treats to B+ reclaimed water standards with approved and permitted effluent uses that included groundwater recharge and intermittent surface discharges into Weekes Wash, when recharge basins cannot accept flow or are offline. However, treatment of reclaimed water standards will be increased to A+ once future reclaimed water customers are established for reuse purposes pending the new development within the proposed DMA boundary expansion.

1.2 HISTORY FOR THE PROPOSAL

This CAG 208 Plan Amendment proposal to expand the City's current DMA boundary is intended to ensure that the City and SMCFD are able to sufficiently provide sewer services to the pending development on the land proposed to be annexed located within the expanded DMA boundary. SMCFD was formed in 1992 by the Apache Junction City Council pursuant to Title 48, Chapter 4, Article 6 of the Arizona Revised Statutes to operate and maintain a wastewater collection, treatment and reuse system. The system consists of a sanitary sewer collection system, a pump station, a water reclamation facility, and groundwater recharge basins. SMCFD operates as a governmental entity, separate from the City, and is generally vested with the rights and powers of a special taxing district pursuant to Arizona Revised Statutes.

The City, in conjunction with the District, proposes to expand the DMA boundary to include politically negotiated territory south of the current boundary to meet the Town of Queen Creek's expanded DMA boundary (2019). The District intends to collect and treat future wastewater generated by the anticipated development.

The City Council appoints an independent five-member Board of Directors to govern the district. The Board of Directors sets the District's rates, fee and charges for its services and adopts the annual operating budget.

1.3 AUTHORITY

The City of Apache Junction has served as the DMA since 1990 and has delegated its authority to manage and operate wastewater services within the DMA Boundary to SMCFD. The City self-certifies that is has the authorities required by section 208(c)(2) of the Clean Water Act to implement the plan for its proposed amended planning area.

1.4 NATURAL ENVIRONMENT

The geology of the proposed area includes predominantly silt, sand and gravel. Additional geologic units that are relevant to the aquifer include: recent stream alluvium, basin fill (Carefree Formation), basin fill with interbedded basalt, and conglomerate sedimentary rock (Arizona Department of Water Resources, n.d.).

Groundwater beneath the District and the City of Apache Junction is part of the Eastern Salt River Valley (ESRV) Sub-Basin Aquifer, which falls within the Phoenix AMA under ADWR (Arizona Department of Water Resources, n.d.). This groundwater flows from the Lake Pleasant and Eloy Sub-Basins (Pinal AMA) into the ESRV Sub-Basin. This aquifer is naturally recharged along stream channels and from recharge along the Superstition Mountains. Pumping in the sub-basin has caused problems with subsidence and fissures, as seen in the City of Apache Junction in August 2018 (AZ Family, 2018).

Groundwater quality standards in Arizona are known to be challenging. Historical drinking water quality exceedances for well sites in the City of Apache Junction include arsenic, nitrate, fluoride, and lead (Arizona Department of Water Resources, n.d.). Minimal data exists for the proposed expanded DMA boundary area to date because it is primarily undeveloped, though it likely has similar groundwater quality conditions.

Surface water conveyances that exist within the current and proposed DMA boundary include the CAP Canal, Siphon Draw, and Weekes Wash. The CAP Canal conveys water year-round, with intermittent, short-term dry-ups for maintenance, whereas Siphon Draw and Weekes Wash are ephemeral streams, with water flowing after precipitation events. The City published a Flood Risk Report in 2016 that describes Weekes Wash and Siphon Draw as the primary sources for flooding in the current and proposed DMA boundary with additional concern from Palm Wash, Bulldog Wash and Goldfield Wash.

Because of geologic and topographic conditions, FEMA has designated the area that includes the proposed DMA boundary expansion to be an ‘area of minimal flood hazard’ (Federal Emergency Management Agency, n.d.). This is in part due to the presence of the PVR dams to the east of the CAP Canal along the extent of the proposed DMA boundary expansion. The dams are maintained by the Flood Control District of Maricopa County.

The topography of the area generally decreases in elevation from the north and east to the south and west, away from the Tonto National Forest and Superstition Mountains and toward the City of Mesa and the Town of Queen Creek.

Weekes Wash is an area of concern for habitat that has already been incorporated into the District’s Service Area. There are no plans to develop within Weekes Wash. As the proposed DMA boundary expansion currently consists of primarily undeveloped state lands, existing habitats may be present which would require sensitivity during land development.

2.0 PROJECT DESCRIPTION

This section provides proposed DMA boundaries, facility details and growth projections for the existing Service Area and expanded planning area in units of flow and population and provides a review of the existing data from the Apache Junction Master Plan (AJWD) and the District's Master Plans.

2.1 OVERVIEW

The District's 2011 208 Plan Amendment expanded the DMA boundary to approximately 40 square miles. The existing northern and southern boundaries are McKellips Boulevard and Elliot Avenue, respectively. The western boundary generally follows Meridian Road and the eastern boundary matches that of the City of Apache Junction. The DMA boundary approved in the 2011 208 Plan Amendment and the proposed boundary expansion are shown on **Figure G.1.** The expanded DMA boundary amended herein (**Table 2.1**) represents an additional 11 square miles. This additional land area extends from Elliot Avenue on the north to the Frye Road alignment on the south. The western boundary is Meridian Road and the eastern boundary is the CAP Canal.

Table 2.1 DMA Boundary

DMA Area	Area
Current Apache Junction DMA Boundary	40 square miles
Proposed Apache Junction DMA Boundary Expansion	11 square miles
Total	51 square miles

All of the wastewater collection and treatment facilities within the existing and proposed Apache Junction DMA boundaries will be owned and operated by the Superstition Mountains Community Facilities District No. 1.

The existing and proposed Apache Junction DMA boundaries include the following wastewater facilities:

- Wastewater collection system for the conveyance of sewage
- Pump station for the pumping of sewage to the treatment facility
- Water Reclamation Facility for the treatment of wastewater
- Recharge facility

Table 2.2 provides a summary of the build out capacity of facilities before and after this proposed Plan Amendment. Current numbers are revised based on the recently completed SMCFD Wastewater Collection System Master Plan (2021), which compiled land use data from the City's 2020-2050 General Plan.

Table 2.2 Facility Capacity 208 DMA Boundaries

Facilities	Current Approved Capacity (MGD)	Proposed Capacity (MGD)
WRF Capacity at Full Build Out	16.00	26.00

The expanded DMA boundary is located within the incorporated limits of the City of Apache Junction. Most of the proposed expansion to the DMA boundary is owned by ASLD and a private developer.

Below are the identified stakeholders through this Plan Amendment process for the City and the District. The purpose of the stakeholders is to provide comments and/or input that are focused on the technical aspects and completeness of the amendment proposal to seek any potential issues prior to moving forward with the Consistency Review and the public process.

- The City of Mesa
- The Town of Queen Creek
- Arizona State Land Department
- Pinal County

Liberty Utilities was also identified as a stakeholder early in the process and were invited to the Stakeholders Meeting at the beginning of the CAG 208 planning process. However, Liberty Utilities was not in attendance and a required Stakeholder Letter stating if they are in Support, have No Objection, or Object to the proposal was not submitted by the deadline. Therefore, according to CAG's 208 Water Quality Management Plan, they are no longer considered as a "stakeholder," but will continued to be notified for each public comment opportunity throughout the remaining planning process.

2.2 BOUNDARY AND LOCATION DESCRIPTIONS

SMCFD and the City seek to expand the current DMA boundary by approximately 11 square miles to the existing 40 square miles, totaling 51 square miles. A map of the proposed DMA boundary is provided in **Appendix G-1**. to include the following extents: Elliot Avenue to the north, Frye Road alignment to the south (planned alignment for State Road 24), Meridian Road to the west and the CAP Canal to the east. The additional 11 square miles is primarily undeveloped land. The District's existing Service Area extent is from Lost Dutchman Boulevard to the north to Baseline Avenue to the south between Meridian Road and Mountain View Road.

The District's Water Reclamation Facility is located at 5661 South Ironwood Drive, Apache Junction, Arizona at the intersection of Ironwood Drive and Guadalupe Road.

The proposed expanded DMA boundary, located in Pinal County, starts at the Frye Road and Meridian Road intersection and heads east along the Frye alignment 3.5 miles to the CAP canal. Follow on the CAP canal northwesterly approximately 3.9 miles to the Elliot Avenue alignment. Then follow Elliot Avenue alignment 2.3 miles west to Meridian Road, then south 3.5 miles to the intersection of Frye Road and Meridian Road.

The proposed DMA boundary expansion includes the following sections (obtained from Pinal County Recorder's office):

- T1S, R8E: sections 16, 17, 18, 19, 20, 21, 28, 29, 30; and the northern half of section 31, northern half of section 32, northern half of section 33, northern half of section 34

County islands are part of the District's existing Service Area and City's DMA Boundary.

For the complete Legal Description see **Appendix D**.

2.3 CURRENT AND FUTURE CONDITIONS

The existing DMA boundary and proposed DMA boundary expansion details are summarized in **Table 2.3** below for current and future conditions of area, population, and sewage generation. Detailed tables for 2020, 2025, 2030, 2035, 2040 and buildout are provided in subsequent sections.

Table 2.3 Summary of Current and Future Conditions

	Area (sq. mi)	Current Population (2020)	Buildout (>2060) Population	Buildout Avg. Wastewater Flow Rate (MGD)
Current DMA Boundary	40	43,639[1]	193,782	19
Proposed DMA Boundary Expansion	11	51[1]	83,292	7
[1] From State Population Projections (MAG TAZ 2019 Projections). https://azgeo-data-hub-agic.hub.arcgis.com/apps/AZMAG::projections/explore				

2.3.1 Population

The State Population Projections estimate that the Municipal Planning Area population of Apache Junction was approximately 60,752 people in 2020, and the United States Census Bureau estimates that the population of Pinal County was approximately 446,175 people. MAG has also made projections as to how the population will increase in Pinal County and Apache Junction from 2018 to 2050 based on Transportation Analysis Zones. **Table 2.4** lists the 2020, 2025, 2030, 2035, and 2040 population projections for Apache Junction using the TAZ estimates. It is assumed that the basis of the MAG population estimates use the Apache Junction boundaries described under the Land Use Plan in effect at the time the evaluation was made. It is not anticipated that the population of either the existing or expanded service area will reach buildout by 2040.

Table 2.4 Population Estimates and Future Population Projections

Location	2020	2025	2030	2035	2040
Apache Junction Current DMA Boundary[1]	43,639	44,496	45,353	46,023	46,692
Apache Junction Expanded DMA Boundary [1]	51	1,344	2,637	6,388	10,139
Pinal County	446,175	535,014	616,200	712,892	820,877
[1] From State Population Projections (MAG TAZ 2019 Projections). https://azgeo-data-hub-agic.hub.arcgis.com/apps/AZMAG::projections/explore [2] From US Census Bureau Data (2018) for Pinal County					

The District's WRF is the sole sewer treatment facility for the current and expanded DMA Boundary Area. All flow from the current and expanded DMA boundaries will be routed to the existing SMCFD WRF.

2.3.2 Land Use

The Apache Junction General Plan 2020 – 2050 contains the most current Land Use Plan for the current and proposed DMA boundary expansion. The Apache Junction General Plan outlines the City's Municipal Planning Boundary (MPA) that addresses land uses for both their incorporated land, as well as adjacent lands that are expected to be annexed in the future. The proposed DMA boundary expansion represents an area the City is expecting to annex in the future. Survey results reported in the General Plan 2020-2050 indicated that many acres of incorporated land within Apache Junction remain undeveloped.

A breakdown of the population, land use, and resulting wastewater flow rates for the current and proposed DMA boundaries is provided below in **Table 2.8**.

Table 2.5 Land Use by Current & Proposed DMA Boundaries

Land Use Category	Existing DMA Boundary (acres)	Existing DMA Boundary	Proposed DMA Boundary (acres)	Proposed DMA Boundary
Commercial	640	3%	0	0%
Conservation (1 DU/AC)	2,696	11%	0	0%
Light Industrial/Business Park and Industrial	588	3%	0	0%
Open Space and Recreation	2,929	12%	93	1%
Public/Institutional	445	2%	0	0%
Transportation	1,348	6%	61	1%
Low Density Residential (1 DU/1.25 AC)	3,088	13%	0	0%

Land Use Category	Existing DMA Boundary (acres)	Existing DMA Boundary	Proposed DMA Boundary (acres)	Proposed DMA Boundary
Medium Density Residential (10 DU/AC Max)	3,060	13%	0	0%
High Density Residential (40 DU/AC Max)	1,723	7%	0	0%
Master Planned Community (20 DU/AC Max)	6,983	30%	6,941	98%
Total	23,500	100%	7,095	100%

The City's General Plan (2020) provided updated densities from the City's General Plan (2010) for dwelling units per acre, as shown below in **Table 2.6**. The 2020 numbers represent maximum densities allowed for new developments in each category and are not meant to be representative of actual/planned densities for that category. For the purposes of calculating the flows based on land use (as represented in **Table 2.6**) for this 208 Amendment, the SMCFD Wastewater Master Plan (2021) numbers were used. The SMCFD Wastewater Master Plan (2021) land use densities are based on trends in development in the City and surrounding metropolitan area and reflect coordination efforts with the developer planning to build in the expanded DMA Boundary area.

Table 2.6 Land Use Densities based on Planning Documents

Land Use Category	Apache Junction General Plan (2010)	Apache Junction General Plan (2020)	SMCFD Wastewater Master Plan (2021)
Low Density Residential	1.25 ac min. lots	1 DU / 1.25 AC	1 DU / 1.25 AC
Medium Density Residential	6 DU / AC (max)	10 DU / AC (max)	3.5 DU / AC
High Density Residential	20 DU / AC (max)	40 DU / AC (max)	12 DU / AC
Master Planned Community	4-8 units per acre, mixed use	20 DU / AC (max)	6 DU / AC

Land ownership within the proposed DMA boundary expansion is shown in **Table 2.7**. The City's General Plan indicates that the plan is for the entirety of the proposed DMA boundary expansion to be converted from undeveloped land into master planned community. For the purposes of estimating dwelling units and wastewater flows, a density of 6 DU/ac was used per the SMCFD Wastewater Master Plan.

Table 2.7 Distribution of Land Ownership within Expanded DMA Boundary

Owner	Area (square miles)	Area (acres)	Area (%)
Privately Owned	4.5	2,898	41%
State Land	6.5	4,197	59%
Total	11	7,095	100%

2.3.3 Wastewater Flows

The District's Wastewater Collection System Master Plan (2021) uses City of Phoenix guidelines for population density based on residential zoning categories, including:

- 3.2 people per dwelling unit for very low, low, medium density residential
- 2 people per dwelling unit for high density residential and master planned community

Population equivalencies have been established for non-residential areas to determine peak requirements for the collection system. These population equivalencies are based on average daily flow projections estimated to be 80 gallons per person per day for these non-residential areas. Flow projections for industrial/business and retail/employment are based on City of Phoenix Development Guidelines for Type A and Type B employment, respectively:

- 1,000 gallons per acre per day for industrial/business
- 1,500 gallons per acre per day for retail/employment (general commercial)
- 1,500 gallons per acre per day for public and institutional

A summary of the population, land use and wastewater generation in the existing and proposed DMA boundaries is provided in **Table 2.8**. It is not expected that the existing DMA boundary will reach build out by 2050, therefore build out is provided separately in the table. The wastewater flow rate as shown in **Table 2.8** is based on the existing number of dwelling units (customers) within the District's service area, which was 7,000 as of 2020. Future years were based on an estimated 3% growth rate per year for the existing service area until 2040.

Table 2.8 City of Apache Junction DMA Boundary Population, Dwelling Units and Wastewater Flow Rate Summary

	2020	2025	2030	2035	2040	Build Out
Existing DMA Boundary						
Total Population[1]	43,639	44,496	45,353	46,023	46,692	193,782 [3]
Service Area Population	22,400	25,968	30,104	34,899	40,457	193,782 [3]
Service Area Dwelling Units	7,000	8,115	9,407	10,906	12,643	80,934 [3]
Wastewater Flow (to SMCFD, MGD)	1.80	2.1	2.4	2.8	3.2	19 [3]
Proposed DMA Boundary Expansion[2]						
Population[1]	51	1,344	2,637	6,388	10,139	83,292 [3]
Dwelling Units	30 (est.)	672	1,319	3,194	5,070	41,646 [3]
Wastewater Flow (to SMCFD, MGD)	N/A	0.1	0.2	0.6	0.9	7 [3]

[1] Population based on State Projections (MAG Socioeconomic Projections of Population - TAZ), June 2019.

[2] Proposed DMA boundary is zoned as Master Planned Community in the Apache Junction General Plan 2020-2050, and a density of 6 dwelling units per acre and 2 persons per dwelling unit is assumed for this zoning designation.

[3] Build out populations and flows were based on the City's General Plan 2020-2050 land use, dwelling unit densities and population per dwelling unit. See Section 3.2.2 for details. It was assumed that the low density residential customers will not be connected to the District's Service Area and that non-residential land uses do not contribute to population, only wastewater flow rates.

2.3.4 Water Master Plan

The City of Apache Junction is served by two water providers within the existing DMA boundary, the Apache Junction Water District (AJWD) and Arizona Water Company. The proposed DMA boundary expansion is intended to be served by AJWD. The most recent water master plan for AJWD is dated September 2010.

The Apache Junction Master Plan addresses water resource needs for two types of anticipated growth: organic growth within the existing DMA boundary and developer driven growth associated with master-planned communities in the proposed DMA boundary expansion and remainder of the Municipal Planning Area. Current water demand can be met with existing water resources for the existing and proposed DMA boundary expansion, but buildout of the entire Municipal Planning Area will require the City to acquire additional water supply.

The water resources portfolio for the existing DMA boundary and proposed DMA boundary expansion relies on a combination of groundwater production wells and the Central Arizona Project (CAP) water allotment.

The Apache Junction Master Plan anticipates that expansion of their surface water treatment plant will be required around 2025. It is expected that a transition to 80% surface water and 20% groundwater will coincide with the water treatment facility expansion. A total capacity of 4.0 MGD is anticipated to be needed by 2040. The Master Plan recommends a separate treatment facility for the master planned community area in the proposed DMA boundary expansion.

To meet the 100-year Assured Water Supply for development, AJWD will continue to pursue additional CAP rights to allow for further growth in the City's Municipal Planning Area. Expansion of infrastructure will be contingent on growth in the planning area and water demand.

2.3.5 Sewer Master Plan

SMCFD updated its Wastewater Collection System and Water Reclamation Facility Master Plans in 2021. The revised Master Plans considered the potential growth within the current DMA boundary, which will be primarily through infill activity. Also evaluated was the impact the development of land located in the proposed DMA boundary expansion will have on future wastewater flows. The recently revised Master Plans also contain land areas beyond the current DMA Boundary and proposed DMA Boundary expansion which will not be addressed herein. The existing sewer system adequately collects sewage and transports it to the District's WRF. No improvements are needed to serve the District's currently connected users. The District continues to monitor the collections system for adequacy.

ADEQ recommends that facilities begin planning for expansion once 80% of capacity is reached. While this has not yet occurred, the District is currently pursuing re-rating to 3.0 MGD, which is possible with some improvements and process modifications and will not require major construction. Typical minimum time frames for physical expansion are two to four years for planning, design, funding acquisition, construction, and start-up. If growth within the proposed DMA boundary expansion is more rapid than expected, expansion plans of the Districts WRF must be proactively pursued.

The WRF site is sized adequately to accommodate the build-out flow (26 MGD) for the facility without adding additional land area. However, the treatment process selection will need to change as the plant expands to accommodate higher rated effluent quality (A+), and more compact footprints for treatment processes to maintain adequate space onsite, for both solids handling and liquids stream treatment. The recharge capacity at the current WRF site does not appear to be adequate to progress much beyond 3.0 MGD, and the development of additional recharge basins or alternative effluent disposal solutions (e.g., injection wells, aquifer storage and recovery wells) will be required to further expand the plant.

3.0 WASTEWATER MANAGEMENT

3.1 SEWAGE COLLECTION SYSTEM

The wastewater system that serves the existing DMA boundary is located to the north and east of the CAP canal that crosses the District's Service Area in a northwesterly to southeasterly direction. The CAP canal is a physical barrier to the collection system and requires a lift station to deliver wastewater to the existing WRF, which is south and west of the CAP canal.

In general, the ground surface in Apache Junction declines in elevation from the northeast to the southwest. For this reason, most of the proposed gravity sewer lines are laid out to convey wastewater in a general southwesterly direction. Most of the sewer alignments follow the right of way of the major streets or the section lines and flow either south or west by gravity.

The District's collection system currently has approximately 115 miles of sewer pipe the majority of which is constructed with PVC pipe. The collection system ranges from 6" to 36" diameter pipes, with about 80% at 8" diameter. Using the design criteria presented in **Section 2.0** and the City's land use plan, the existing collection system is adequately sized in all but three (3) segments to serve the ultimate land use buildout of the current DMA boundary. Three pipeline segments on the original 74-mile core system within the City center may require parallel collection sewer lines as Apache Junction develops, depending on future population densities and flow trends.

The District's proposed Service Area expansion south of Elliot Avenue will resemble the existing collection system with trunk mains varying in size from 8" to 36" diameter and constructed of plastic. This area is in the proposed DMA boundary expansion and is not currently connected as part of the District's Service Area. Sewage generation from this area will be conveyed by gravity to a pump station on the southwest corner of the proposed DMA boundary expansion. Wastewater will then be pumped to the existing WRF for treatment.

The District has a comprehensive maintenance program that includes routine cleaning, closed-circuit TV inspections and a pre-treatment program. All additions to the collection system must be designed and constructed in accordance with the District's Standard Specifications of Construction.

3.1.1 Existing Pump Station and Force Main

All flow in the District's existing Service Area flows by gravity to the Baseline Pump Station, which is required due to the physical barrier created by the CAP Canal and is then pumped through the force main which crosses the CAP Canal and then follows the canal alignment to the WRF. The lift station is located just north of Baseline Avenue at the half-mile point between Meridian Road and Ironwood Drive. The existing lift station is adequately sized to meet current WRF capacity and to serve the existing Service Area. However, when sewage flows approach buildout of 26.0 MGD, it will be necessary to expand the current pump station or add additional pump stations to manage the flows from the existing DMA boundary and proposed DMA boundary expansion south of Baseline. The existing gravity collection system, lift station, and force main are shown on **Figure G.1** in **Appendix G**.

3.1.2 Proposed Pump Stations

The undeveloped portion of the existing DMA boundary from Baseline Avenue southward to Elliot Avenue could generate up to 6.4 MGD of flow and would require at least one additional pump station east of the CAP Canal to convey the wastewater to the WRF due to the topography and spatial layout. This would also require expansion or upgrades to the existing Baseline Pump Station to accommodate an additional force main and/or expand pumping capacity. Future growth south of Baseline Avenue and east of the CAP Canal, would require sewage to be pumped to the north around the PVR Dams, which do not currently allow utility crossings except along road bridges.

The proposed DMA boundary expansion, which is situated entirely west of the CAP Canal, would require at least one pump station to convey the anticipated build out flow of roughly 7 MGD (SMCFD Wastewater Collections System Master Plan, 2021) to the existing WRF site. The proposed locations of a future pump station and force mains are contained within the District's Wastewater Collection System Master Plan.

3.1.3 Easements and Setback Requirements

Since the 2011 amendment, the District purchased additional land for increased setbacks and room for future growth. The existing WRF sits on a 97-acre site, which adequately provides 1,000-foot setback as required for all odor-producing treatment process units by ADEQ. The current WRF site provides adequate land space for expansion to build out, which may require some process modifications, as described in the District's Water Reclamation Facility Master Plan (2021).

The District intends to partner with developers in planning for additional growth, to provide easements and necessary infrastructure per the District's specifications. The land in the proposed DMA boundary expansion is primarily undeveloped. This provides opportunity to negotiate setbacks and easements within the land development phase rather than acquiring setbacks once prior ownership has been established. It is expected that the majority of acreage south of Baseline Avenue will be developed as a residential master planned community. To date, the District has not had issue acquiring easements for the expansion of sewer collection infrastructure. As new pump stations become necessary, appropriate land area will be obtained, via negotiation with developers or purchase.

3.2 TREATMENT FACILITY DESCRIPTION

The District's existing Water Reclamation Facility is located at the southeast corner of Ironwood Drive and Guadalupe Road at 5661 South Ironwood Drive, Apache Junction, AZ 85120. It is rated at 2.14 MGD and uses an extended aeration, activated sludge process to reclaim water to B+ quality. SMCFD is undergoing a capacity change to 3.0 MGD, which falls within the current approved buildout maximum of 16.0 MGD listed within the CAG 208 Plan. Residual solids are processed into Class A, EQ biosolids compost or disposed of at a landfill. The District holds permits from ADEQ and ADWR that allow for disposal of effluent through aquifer recharge, direct reuse, or discharge to an ephemeral wash. The WRF currently treats to B+ reclaimed water standards with approved and permitted effluent uses that include groundwater recharge and intermittent surface discharges into Weekes Wash, when recharge basins cannot accept flow or are offline. However, treatment of reclaimed water standards will be increased to A+ once future reclaimed water customers are established for reuse purposes pending the new development within the proposed DMA boundary expansion.

The District's existing WRF site has sufficient land area to satisfy additional sewage treatment requirements of the existing DMA boundary and proposed DMA boundary expansion. This land area is adequate for the disposal through aquifer recharge in the near term, but additional land will be required prior to nearing full build out at 26 MGD. The additional land area may be purchased adjacent to the existing site or in off-site locations with higher recharge potential.

3.2.1 Flow Rates

The District's maximum month average daily flow for 2020 was roughly 1.63 MGD, which represents 76% of the current permitted capacity. Average daily flow for a 12-month period is approximately 1.44 MGD, which represents 67% of permitted capacity. Re-rating to 3.0 MGD will decrease these percentages of anticipated permitted capacity used to 54% and 48%, respectively. Data in the Wastewater Collection System Master Plan indicates that flows have not significantly increased between 2014 and 2019 despite the addition of new service connections. This is likely due to increased water conservation efforts and premise plumbing updates.

The District's flows fluctuate due to seasonal variability in population, with peak flows in the winter months due to winter visitors. With future development and conversion of septic to sewer connections, it is anticipated that these flow numbers will grow to buildout of 26.0 MGD, as described herein.

Because of the remaining high prevalence of septic systems for both commercial and residential properties in the current DMA boundary, the current estimated flow rate based on population equivalency flow and the actual flow rate at the WRF are very different, which is why the estimated Service Area population is shown in **Table 2.8**. It is anticipated that the gap will close as remaining on-site systems are converted to sewer connections. Estimates provided in **Table 2.8** are provided based on a population equivalency, which accounts for the wastewater produced on an average per capita basis as well as for industrial/business, retail/employment, and public and institutional areas (methodology described in 3.2.2).

3.2.2 Methodology of Calculations

Population density at build out, estimated from the City's General Plan 2020-2050, is shown in **Table 2.8**. These values are taken from the 2020-2050 Land Use Map provided in **Appendix G (Figure G.4)**. City of Phoenix Development Guidelines state population density equivalency is:

- 3.2 people per dwelling unit for very low, low, and medium density residential
- 2 people per dwelling unit for high density residential and master planned community

For the 2020, 2025, 2030, 2035, and 2040 Existing DMA Boundary wastewater flow rates shown in **Table 2.8**, the Service Area dwelling units for 2020 (7,000 units) was used to estimate the Service Area population and wastewater flow rate to SMCFD. Because the District's service area does not reach the extent of the existing DMA boundary, the population of the DMA Boundary and the Service Area are different. Growth in the Existing DMA Boundary was estimated to progress at 3% per year, with some population growth in the Service Area due to development and some due to added connections from the existing population. The corresponding Service Area population was calculated from the dwelling units assuming 3.2 people per dwelling unit.

An example calculation for the 2020 wastewater flow rate for the existing DMA boundary is as follows (3.2 persons per dwelling unit was assumed conservatively):

$$WW_{EXISTING-DMA,2020} = 7{,}000\ du * \frac{3.2\ person(s)}{1\ du} * \frac{80\ gal}{1\ person * 1\ day} * \frac{1\ MG}{1{,}000{,}000 gal} = 1.8\ MGD$$

The flows for the Proposed DMA Boundary Expansion in **Table 2.8** were tabulated based on TAZ population assuming the land use per the General Plan 2020-2050.

$$WW_{PROPOSED-DMA,2030} = 1{,}344\ persons * \frac{80\ gal}{1\ person * 1\ day} * \frac{1\ MG}{1{,}000{,}000 gal} = 0.1\ MGD$$

Buildout wastewater flow volumes (**Table 2.8**) were calculated for each dwelling type and by acreages as projected in the 2020-2050 Land Use Map. All residential categories are assumed to be 80 gallons per person per day. All calculations were compiled with data regarding population estimates based on land use and dwelling unit densities and equivalent populations as described below. A peaking factor of 1.128 was used to calculate buildout flows based on values observed at the District's WRF.

An example calculation is as follows for Master Planned Community zoning for one acre (assumed 80 gallons per person per day):

$$WW_{MPC,1acre} = 1\ acre * \frac{6\ du}{1\ acre} * \frac{2\ person(s)}{1\ du} * \frac{80\ gal}{1\ person * 1\ day} = 960\ gal\ per\ day$$

Population equivalencies have been established for industrial, business, retail, employment, public and institutional areas to determine peak requirements for the collection system. Flow projections for industrial/business and retail/employment are based on City of Phoenix Development Guidelines for Type A and Type B employment, respectively:

- 1,000 gallons per acre per day for light industrial/business
- 1,500 gallons per acre per day for retail/employment/commercial
- 1,500 gallons per acre per day for public and institutional

Table 3.1 and **Table 3.2** provide detail for the buildout flow calculations for the existing DMA boundary and proposed DMA boundary expansion.

Table 3.1 Existing DMA Boundary Flow Calculations for Buildout

Land Use Type	Land Use Category	Existing DMA Boundary (acres)	DU/ac or Flow-Equivalency	Population per DU	Wastewater Flow Projected (gal)	Wastewater Flow (with 1.128 Peaking Factor)
Non-Residential	Commercial	640	1,500	-	960,000	1,080,000
	Conservation (1 DU/AC)	2,696	-	-	-	-
	Light Industrial/Business Park and Industrial	588	1,000	-	588,000	661,500
	Open Space and Recreation	2,929	-	-	-	-
	Public/Institutional	445	1,500	-	667,500	750,940
	Transportation	1,348	-	-	-	-
Residential	Low Density Residential (1 DU/1.25 AC)	3,088	1	3.2	-	-
	Medium Density Residential (10 DU/AC Max)	3,060	6	3.2	4,700,160	5,287,680
	High Density Residential (40 DU/AC Max)	1,723	12	2.0	3,308,160	3,721,680
	Master Planned Community (20 DU/AC Max)	6983	6.0	2.0	6,703,680	7,541,640
Non-Residential + Residential Totals		23,500	-	193,782	16,927,500	18,043,440

Table 3.2 Proposed DMA Boundary Expansion Flow Calculations for Buildout

Land Use Type	Land Use Category	Proposed DMA Boundary Expansion (acres)	DU/ac or Flow-Equivalency	Population per DU	Wastewater Flow Projected (gal)	Wastewater Flow (with 1.128 Peaking Factor)
Non-Residential	Commercial	0	1,500	-	-	-
	Conservation (1 DU/AC)	0	-	-	-	-
	Light Industrial/Business Park and Industrial	0	1,000	-	-	-
	Open Space and Recreation	93	-	-	-	-
	Public/Institutional	0	1,500	-	-	-
	Transportation	61	-	-	-	-
Residential	Low Density Residential (1 DU/1.25 AC)	0	-	3.2	-	-
	Medium Density Residential (10 DU/AC Max)	0	6	3.2	-	-
	High Density Residential (40 DU/AC Max)	0	12	2.0	-	-
	Master Planned Community (20 DU/AC Max)	6,941	6.0	2.0	6,663,360	7,496,280
Non-Residential + Residential Total		7,095	-	83,292	6,663,360	7,496,280

3.2.3 Sewage Acceptance

Approximately 80% of incoming wastewater is generated by residential users. This percentage is not expected to change with the proposed DMA boundary expansion. The remaining 20% of wastewater generation is municipal wastewater that comes from commercial users and public/institutional users. The District does not currently receive any industrial waste. The District has a pre-treatment program in place should industrial users be added in the future. Pre-treatment is already required for many existing non-residential users, and multi-unit residential users with centralized on-site food service operations.

The WRF accepts septic waste from commercial haulers, who provide services both within and outside of the existing and proposed DMA boundaries, and is equipped with special facilities to process this waste stream. The current average flow from septage is about 35,000 gallons per day (excluding days with no septage receipt, i.e., weekends). Septage flows are not anticipated to increase with the proposed DMA boundary expansion, because all new systems are required to connect to sanitary sewer service. In the future, this flow is expected to decline as existing septic systems fail, and connection requirements to follow the District's Operating Policies and Procedures if properties are adjacent to existing infrastructure and may connect to the regional sewer collection and treatment system.

3.2.4 Treatment Process

The WRF uses primary treatment, enhanced secondary treatment (nitrogen removal), clarification, and chlorine disinfection to process and treat incoming wastewater. The residual solids of the extended aeration activated sludge process are thickened, dewatered on polymer-assisted drying beds, and then composted using the windrow method or disposed of at a landfill. Reclaimed water is recharged into the aquifer via on-site recharge beds, with intermittent discharge into an ephemeral wash.

Treatment Monitoring

Treatment monitoring is conducted at the following key locations within the plant and at monitoring wells downstream of effluent recharge basins:

- Septage: in-house sampling for process control
- Influent: combined septage and force main flow for in-house monitoring and regulatory compliance
- Effluent: after disinfection and dechlorination for compliance monitoring
- Monitoring Wells: two, for regulatory compliance

Odor Control

Due to the geographical location of the WRF odor control is managed by setback requirements and waivers and does not require technological intervention at this time. Waivers are from Arizona State Land Department and Central Arizona Project. The Baseline Pump Station manages odor through the addition of ozone in the wet well.

Septage Receiving Station

The WRF is permitted through ADEQ to accept and treat septage, and it functions as the major septage receiving facility serving the East Valley of the greater Phoenix metropolitan area. The septage receiving station consists of a rock trap, grinder, mechanical screening unit, passive grit chamber, five aerated holding tanks and several septage pumps. Each of the holding tanks has a capacity of approximately 5,000 gallons for a total storage capacity of 25,000 gallons. The septage is aerated for a period of time, prior to being introduced to the influent waste stream, to reduce any operational impact of the septage on the WRF treatment process.

Headworks

The influent wastewater flows through the WRF headworks that consists of a mechanical bar screen and a grit removal unit. The mechanical bar screen has a screen opening size of approximately 1/4 inch to remove any coarse debris from the influent. The screenings are sent through a wash compactor where solids are dewatered and conveyed to a dumpster that is taken to a landfill.

The grit removal system consists of two aerated grit settling basins where grit settles out of the process flow. There are four recessed impeller pumps, one in each sump, that pump the grit slurry to a cyclone separator. The separator dewaters the grit and conveys it to a dumpster for removal to a landfill.

Secondary Treatment

From the headworks, the wastewater influent is split between two aeration basins. The basins are aerated by an air distribution system with three centrifugal blowers. The system consists of 8 parallel laterals per basin that float on the water surface, with each lateral fitted with 16 diffusers, and each diffuser with 5 tubes. The diffusers hang from the surface lateral line and are placed about a foot from the bottom of the 12-foot basin.

The secondary clarifiers are designed as integral clarifiers. The mixed liquor from the aeration basins flows through the bottom of the wall that divides the basin and the clarifier. The return activated sludge (RAS) is collected from the bottom of the clarifier and is pumped back to the front of the aeration basin where it mixes with the raw sewage influent downstream of the headworks.

Filtration

Filtration is required by the State of Arizona to reclassify effluent as A+. The installation of a rotating disk filter, downstream of secondary clarifiers, is in process. The WRF currently treats to B+ reclaimed water standards with approved and permitted effluent uses that include groundwater recharge and intermittent surface discharges into Weekes Wash, when recharge basins cannot accept flow or are offline. However, treatment of reclaimed water standards will be increased to A+ once future reclaimed water customers are established for reuse purposes pending the new development within the proposed DMA boundary expansion.

Disinfection

Clarified effluent travels through a chlorine contact basin where sodium hypochlorite is added for disinfection. The hypochlorite is pumped from a storage tank and applied at an approximate dose of five (5) parts per million (ppm). The chlorine contact basin serpentines the flow back and forth allowing the hypochlorite to have sufficient contact time to kill the microorganisms. Sodium thiosulfate is added at the end of the disinfection process to de-chlorinate effluent that is discharged to Weekes Wash pursuant to the AZPDES permit.

Sludge Processing

Residual solids are thickened, dewatered, and either composted to create Class A Exceptional Quality (EQ) biosolids as permitted or disposed of at a landfill. Waste activated sludge (WAS) with an average density of 1% are initially sent to stabilization lagoons where they gravity thicken. The solids are mixed with polymer for further thickening and then pumped to drying beds. When the solids have partially dried and thickened they are either sent to the landfill or composted into a soil amendment as permitted by ADEQ regulations. Prior to 2020, SMCFD composted all biosolids. The District transitioned to landfilling biosolids in 2020 because a suitable customer for the compost was not found. The District plans to retain the permit to allow for biosolids composting should a future compost customer arise but plans to continue landfilling all residual solids until a compost user is found.

3.2.5 Products

Effluent is directed to 11 on-site rapid infiltration recharge basins, some of which are fitted with vadose zone wells and others with gravel lined bore holes, to improve recharge efficiency. Effluent may be intermittently discharged to Weekes Wash. In recent years, the District has realized a decrease in the efficiency of its existing recharge basins. In 2020, the District completed installation of four new effluent recharge basins onsite to reduce dependence on surface discharge. The new basins have demonstrated significant improvement to the rate of recharge. No effluent is currently sent off-site for reuse. Further details on effluent management are provided in Section 3.3.

All biosolids residuals are currently disposed of at a landfill: Republic Services Apache Junction Landfill located at 4050 S Tomahawk Rd, Apache Junction, AZ 85119.

3.3 EFFLUENT MANAGEMENT

SMCFD currently produces B+ quality effluent. Prior to the expansion of the District's recharge facility (in 2020), any effluent that was not able to be recharged was discharged intermittently to Weekes Wash. Since the expanded facility was placed into service 100% of the effluent has been recharged into the groundwater aquifer using on-site recharge basins fitted with boreholes to improve infiltration. With the addition of the proposed DMA boundary expansion, a portfolio of effluent reuse/recharge options are under consideration both onsite and offsite to meet the ultimate buildout capacity of the facility.

The District holds Aquifer Protection Permit No. P-102873 and AZPDES Permit No. AZ0023931 issued by ADEQ allowing discharge to Weekes Wash, groundwater recharge via infiltration basins and vadose zone wells, and for direct reuse as reclaimed water with a B+ rating. SMCFD also holds a Constructed Underground Storage Facility Permit No. 71-584469.0003 and Water Storage Permit No. 73-58469.0101, which are both issued by the Arizona Department of Water Resources (ADWR) and allow the District to receive Long Term Storage Credits for effluent that is recharged. The District maintains compliance with all regulatory permits.

Modification of the AZPDES permit will be required when the existing WRF is re-rated to 3.0 MGD to match the APP permit (anticipated in 2022). As the District pursues physical expansion of the WRF further permit modifications will be required. The WRF currently treats to B+ reclaimed water standards with approved and permitted effluent uses that include groundwater recharge and intermittent surface discharges into Weekes Wash, when recharge basins cannot accept flow or are offline. However, treatment of reclaimed water standards will be increased to A+ once future reclaimed water customers are established for reuse purposes pending the new development within the proposed DMA boundary expansion.

4.0 CONSTRUCTION

4.1 CONSTRUCTION SUMMARY

ADEQ recommends that facilities start the expansion planning process when facilities reach 80% of their capacity. The District's Master Plans were revised in 2021 to address upcoming development in the proposed DMA boundary expansion in preparation for this 208 Plan Amendment. At this time, the construction schedule, delivery method, and contractor have not yet been selected for the expansion of the treatment campus as it is in the early planning stages.

4.2 PHASING

The District's current Water Reclamation Facility Master Plan presents the following construction phasing for the WRF expansion:

- Current Capacity 2.14 MGD re-rated to 3 MGD (estimated 2021-2022)
- Phase 1 6 MGD (estimated 2027 - 2029)
- Phase 2 12 MGD (estimated 2040+)
- Full Buildout 26 MGD (estimated 2040+)

A detailed map with phasing of treatment and repurposing of existing facility is provided in **Appendix G (Figure G.3)**.

When flows reach 90% of the average daily flow in a month, the District will begin construction on the next phase of expansion. Details for the expansion timeline are dependent on the progress of development in the proposed expansion to the DMA boundary. It is expected that planning for expansion beyond 3.0 MGD should be initiated in 2024-2025 to adequately prepare for completed construction. The District will construct, operate, and maintain the collection and wastewater treatment systems when construction is completed.

5.0 IMPACT

5.1 KNOWN WATER QUALITY ISSUES

The proposed expanded planning area will improve groundwater quality in the Apache Junction area, as more of the community is brought onto a centralized sewer collection and treatment system from existing septic tanks. The District's operating policies ensure compliance with environmental water quality standards, regulatory permits, and regional and national environmental laws.

5.2 POINT SOURCE POLLUTION

In the District's existing Service Area, all known point sources of pollution (i.e., wastewater dischargers) are either connected to the District's sewer collection and treatment system or have onsite systems permitted through Pinal County. The land in the proposed DMA boundary expansion is primarily undeveloped and has no point sources of pollution.

There remain a large number of septic tanks still in use within areas that can be served by the District's wastewater collection system. On-site septic systems provide primary treatment and can contribute to elevated nitrates in groundwater. The District's regional sewage collection and water reclamation facility provide long term solutions to on-site septic systems.

Properties within the District's Service Area are required to connect to the District's wastewater system unless the District has made a written determination that it will not provide service. The District's current policy allows properties that the District determines can be served by its sewer system but that have a properly functioning on-site system to continue use of the existing on-site system as long as there are no changes to the property and the on-site system remains in use without repair or alteration.

A property must be connected to the District and the on-site system properly abandoned whenever:

- an existing non-residential or residential dwelling unit on the property is modified, expanded, or replaced;
- there is placement or new construction of a non-residential or residential dwelling unit on the property;
- the existing on-site system serving the property needs repairs, needs to be expanded, needs to be altered in any manner or needs to be replaced.

5.3 NON-POINT SOURCE POLLUTION

There are no known non-point sources of water pollution within the District's existing DMA boundary or proposed DMA boundary expansion. The proposed DMA boundary expansion is currently primarily undeveloped land and has not historically had agricultural development. The City of Apache Junction has implemented a city-wide storm water management plan to prevent storm water as a possible non-point source of pollution. At the District's WRF storm water is retained separately to prevent comingling with treatment flows and biosolids facilities. Throughout any future expansion activities, the District will adhere to storm water pollution prevention requirements to prevent non-point source pollution.

5.4 SOIL EROSION

The District will adhere to known prevention practices to prevent soil erosion during construction operations and from discharge or reuse of effluent.

5.5 AIR QUALITY

The District has an Air Quality Permit issued by Pinal County for its WRF. The District will adhere to particulate emission pollution prevention practices during any construction activities and will apply appropriate techniques to prevent particulates from blowing in areas that have been graded.

The District will also adhere to recognized odor prevention methods, whether by acquiring additional land to provide adequate setbacks for its WRF and/or by adding odor prevention or odor-reducing equipment as the treatment process footprint is expanded. These requirements are a part of ADEQ standards for water reclamation facilities.

6.0 PERMITS

District operations, including any expansion of the collection system or WRF, require that certain types of permits be obtained, and their regulations adhered to. Current efforts are focused on increasing permitted capacity of the existing plant to 3.0 MGD.

6.1 AIR QUALITY PERMIT

The Pinal County Air Quality Control District issued the District's **Air Quality Permit No. S16129.000** to regulate the emissions from its diesel-powered emergency generator at the WRF and to monitor hydrogen sulfide emissions through periodic ambient monitoring.

6.2 ADWR UNDERGROUND STORAGE FACILITY AND WATER STORAGE PERMITS

The District's effluent recharge activities are permitted by ADWR under its **USF Permit No. 71-584469.0003** and **WS Permit No. 73-584469.0101**. The USF permit currently allows the District to recharge up to 3,363 acre-feet per year. The WS permit grants authority to the District to store water in its USF. These permits will require amendment when the District expands the WRF.

6.3 ADWR RECOVERY WELL PERMIT

The District does not plan to install or utilize recovery wells.

6.4 AQUIFER PROTECTION PERMIT (APP)

The District's WRF is authorized to operate by **Aquifer Protection Permit No. P-102873** issued by ADEQ. The permit allows for operation of the WRF, groundwater recharge, or beneficial reuse under a valid purpose. The permit authorizes operation with a current maximum average monthly flow of 2.1 MGD up to a maximum average monthly flow of 3.0 MGD. The WRF will be rerated from 2.1 MGD to 3.0 MGD in the phases identified in the permit with minor plant and equipment modifications. The permit will need to be amended when the District expands its WRF.

6.5 AZPDES / NPDES PERMIT

The District is authorized to discharge up to 2.14 MGD of effluent from its WRF into Weekes Wash by **AZPDES Permit No. AZ0023931** issued by ADEQ. This permit will require amendment to match the capacity of the APP. The District intends to adhere to a policy of zero surface water discharge.

The AZPDES permit requires the District's effluent to meet the A&WEDW: Aquatic & Wildlife, Effluent Dependent Water and the PB: Partial Body Contact standards. Part III of the District's AZPDES Permit (AZ0023931) contains the regulatory requirements for the management of the District's sludge/biosolids.

6.6 AZPDES / NPDES STORM WATER POLLUTION PREVENTION PERMIT

The District follows storm water regulations according to its coverage under the Multi-Sector General Permit. When the District expands its WRF, it may be required to obtain a AZPDES Stormwater Pollution Permit from ADEQ.

6.7 CAG 208 WATER QUALITY MANAGEMENT PLAN AMENDMENT

This CAG Section 208 Water Quality Plan Amendment is submitted by Superstition Mountains Community Facilities District No. 1 and the City of Apache Junction to propose the expansion of the DMA boundary. This is the fourth 208 Plan Amendment pertaining to the District's wastewater system and shall supersede all prior amendments.

6.8 CONSTRUCTION PERMITS

The District obtains necessary permits from the City of Apache Junction concerning its construction activities related to expansion of its collection system. Expansion of the District's WRF will require building permits and contractors hired to perform the expansion work will be responsible for obtaining all necessary permits.

6.9 LOCAL FLOODPLAIN AND DRAINAGE REGULATIONS

The WRF is located downstream of the CAP Canal and the Powerline Flood Retarding Structure which provides protection of the facility from 100-year flood events. The WRF site has drainage channels and retarding basins that are designed to discharge storm water runoff at a rate equal to or less than the runoff rate if the property was undeveloped. When the District expands its WRF the drainage plan will be reviewed and approved by the City of Apache Junction.

The proposed Service Area expansion of the eastern boundary is downstream of the CAP and the Powerline, Vineyard, and Rittenhouse (PVR) Flood Retarding Structure. At the alignment of Elliot Avenue, the PVR dam has a significant spillway, which the District will take into account when delineating allowable infrastructure for the proposed Service Area expansion. Any District facilities planned in the proposed Service Area expansion will be designed to allow storm water runoff at a rate equal to or less than the runoff rate if the property was undeveloped. Plans for this area will be reviewed and approved by the City of Apache Junction.

6.10 NON-POINT SOURCE PERMITS

There are no non-point issues related to the operation of the District's water reclamation facility.

6.11 RECLAIMED WATER REUSE PERMIT

An Individual or General Reclaimed Water Permit will be required when the District's reclaimed water is used for beneficial reuse.

6.12 SLUDGE MANAGEMENT

The District currently either composts residual solids into a soil amendment as permitted by ADEQ regulations or disposes of solid residuals at a landfill: Republic Services Apache Junction Landfill located at 4050 S Tomahawk Rd, Apache Junction, AZ 85119. The District is currently permitted to produce Class A EQ biosolids compost following the terms specified within **AZPDES Permit No. AZ0023931** issued by ADEQ but has suspended composting until a customer is identified.

7.0 FINANCE INFORMATION

The District operates without the use of tax revenues, and depends entirely on revenues generated by its rates, fees, service charges, and earned interest. Current rates, fees and charges and the District's Annual Budget can be found on their website at www.smcfd.org. The current debt was incurred for the initial construction of the District's wastewater collection system and the WRF and will be paid in full in 2025. Construction of the existing WRF and collection system was financed using tax-exempt revenue bonds.

The District will seek to finance the first phase of its WRF expansion through a WIFA loan or second bond issue. Repayment of any new debt would likely come through connection fees and other charges levied against new customers as they move forward with connection to and use of the District's sewer services.

The District's most recently audited financial report is summarized below:

Table 7.1 Comprehensive Annual Financial Report Summary (for year ending June 30, 2020)

Assets	$ 22,049,570
Deferred Outflow of Resources	$ 267,161
Liabilities	$ 15,261,788
Deferred Inflow of Resources	$ 297,400
Net Position	$ 6,757,543

208 PLAN AMENDMENT

Appendices

Appendix A 208 CHECKLIST

Requirement	Provide Brief Summary On How Requirements Are Addressed	Addressed On
AUTHORITY 1) Proposed Designated Management Agency (DMA) shall self-certify that it has the authorities required by Section 208(c)(2) of the Clean Water Act to implement the plan for its proposed planning and service areas. Self- certification shall be in the form of a legal opinion by the DMA or entity attorney.	The City of Apache Junction is the DMA for the expanded planning area. A letter of self-certification can be referenced in Appendix B.	Appendix B
20-YEAR NEEDS Clearly describe the existing wastewater treatment (WWT) facilities: 2) Describe existing WWT facilities.	Superstition Mountains Community Facilities District No. 1 (District) operates one Water Reclamation Facility (WRF) that is currently rated at 2.14 MGD (future re-rating at 3.0 MGD). It uses an extended aeration, activated sludge treatment process with nitrogen removal. Sludge is disposed of at a landfill. The site is located on a 97-acre parcel on the east side of Ironwood Drive at its intersection with Guadalupe Road in Apache Junction. The site is surrounded by the CAP canal on the north side and State Trust Land on the other three sides.	Page 3.13-3.20
3) Show WWT certified and service areas for private utilities and sanitary district boundaries if possible.	Figures G.1 and G.2 depict the current DMA boundary (blue, 40 sq-mi), the proposed expanded DMA boundary (green, 11 sq-mi), and the proposed future planning area boundary (black/pink). The District's Service Area (collection system) is shown in light green. All of the District's current service area is within the current DMA boundary.	Appendix G, Figure G.1 and G.2.
Clearly describe alternatives and the recommended WWT plan: 4) Provide POPTAC population estimates (or COG-approved estimates only where POPTAC not available) over 20-year period.	State projections (MAG TAZ) population estimates were used for population projections in accordance with previous CAG 208 plan amendments. Buildout population estimates were obtained using the City's 2020 General Plan, which delineates land use and projected dwelling units per zoning criteria.	Table 2.4, Page 2.7

Requirement	Provide Brief Summary On How Requirements Are Addressed	Addressed On
5) Provide wastewater flow estimates over the 20-year planning period.	Wastewater flow estimates are provided in detail for the buildout of the current DMA boundary area and proposed expanded DMA boundary in addition to the next 30 years. The combined flow rate from the existing DMA boundary and proposed DMA boundary expansion is 1.8 MGD for 2020 and 4.1 MGD for 2040. Full buildout is dependent on the sale of ASLD land and may not occur within 20 years.	Table 2.8, Page 2.9
6) Illustrate the WWT planning and service areas.	The expanded DMA boundary conforms, with a few exceptions, to the City of Apache Junction's Municipal Planning Area (per the City's 2020 General Plan). The planning area for potential future growth extends from the City's current southern boundary of Elliot Road to the Frye Road alignment. This is depicted in Figures G.1 and G.2 in Appendix G.	Appendix G, Figures G.1 and G.2
7) Describe the type and capacity of the recommended WWT Plant.	The District's WRF will be expanded to 6 MGD incrementally up to the buildout capacity of 26 MGD. The facility will transition from an extended aeration, activated sludge treatment process with nitrogen removal to a smaller footprint process such as an MBR. The solids handling system will be transitioned into anaerobic digestion at 6 MGD. For 6 MGD, the existing facility can run in parallel to the new unit processes, with the exception of one sludge lagoon. The 6 MGD expansion will begin construction when the WRF reaches 90% of permitted flow, at which point filtration would be added if a non-potable water customer is available.	Section 3.0, Appendix G, Figure G.3

Requirement	Provide Brief Summary On How Requirements Are Addressed	Addressed On
8) Identify water quality problems, consider alternative control measures, and recommend solution for implementation.	There are a very large number of on-site septic tanks still in use in areas that can be served by the District's sewage collection system. Abandonment of these systems and connection to the District's regional sewage collection and water reclamation facility will improve water quality.	Page 5.23
9) If private WWT utilities with certificated areas are within the proposed regional service area, define who (municipal or private utility) serves what area and when. Identify whose sewer lines can be approved in what areas and when?	The District is the only regional sanitary sewer provider within the current and proposed expanded DMA boundaries. All future development will be required to connect to the District's sewer collection system unless a letter clearly specifying exemption is granted by the District.	Page 2.4
10) Describe method of effluent disposal and reuse sites (if appropriate).	The District holds an Aquifer Protection Permit from ADEQ that allows disposal by groundwater recharge, surface discharge, and reclaimed water for reuse. Although the District does not currently transport reclaimed water for reuse, this may change as the State Land to the south of the WRF undergoes development as a master planned community. District policy is to eliminate all surface discharge, with a long-term goal of 80% groundwater recharge and 20% water for reuse. The WRF currently treats to B+ reclaimed water standards with approved and permitted effluent uses that include groundwater recharge and intermittent surface discharges into Weekes Wash, when recharge basins cannot accept flow or are offline. However, treatment of reclaimed water standards will be increased to A+ once future reclaimed water customers are established for reuse purposes pending the new development within the proposed DMA boundary expansion.	Pages 3.20-3.21
11) If Sanitary Districts are within a proposed planning or service area, describe who serves the Sanitary Districts and when.	The District is the only regional sanitary sewer provider within the current and proposed expanded DMA boundaries.	1.1-1.2

	Requirement	Provide Brief Summary On How Requirements Are Addressed	Addressed On
12)	Describe ownership of land proposed for plant sites and reuse areas.	The District owns the 97-acre site for the existing WRF. This site is sufficient to satisfy the sewage treatment requirements of the current and expanded DMA boundaries and a portion of the groundwater recharge facilities. Future reuse areas (recharge or reclaimed water reuse) will be public areas owned by the City of Apache Junction, the District, Homeowners Associations and other public-use entities or areas as negotiated with developer and DMA.	Pages 1.1, 2.4, 3.12
13)	Address time frames in the development of the treatment works.	The District has completed a Sewer Collection System Master Plan and a Water Reclamation Master Plan to map development in the DMA boundary and needs for expansion on the WRF site. The District plans to move forward with re-rating to 3.0 MGD with some site improvements in 2021-2022 and then will move forward with expansion to 6.0 MGD when the maximum month average daily flow rate reaches 80% of capacity (detailed phasing to be determined as development progresses). Final design, financing, permitting, and construction would then follow with an estimated timeline of five years from the start of design to the actual startup of the expanded facility. Subsequent expansions would be undertaken to expand to 12 MGD and then up to buildout at 26 MGD. It is anticipated for the first facility expansion to be required between 2030-2040 based on anticipated development.	Page 4.22
14)	Address financial constraints in the development of the treatment works.	The District is financially stable and has the capability to provide service to the current and expanded DMA boundaries as presented in Section 7. The District is currently at a net positive position of $6.7M and will take tax-exempt bonds or WIFA loans to build additional facilities. The District is on track to be debt free in 2025.	Page 7.28

Requirement		Provide Brief Summary On How Requirements Are Addressed	Addressed On
15)	Describe how discharges will comply with EPA municipal and industrial stormwater discharge regulations (Section 405, CWA).	The City has implemented a city-wide stormwater management plan. The District manages stormwater at its WRF so that it retains all water from its treatment and biosolids facilities with no co-mingling with runoff from storms. During any of its future expansion activities, the District will adhere to stormwater pollution prevention requirements to prevent non-point source pollution.	Pages 6.25-6.26
16)	Describe how open areas and recreational opportunities will result from improved water quality and how those will be used.	When reuse customers become available the District will improve the current B+ reclaimed water to A+ reclaimed water as an end product. A+ reclaimed water can be used to irrigate golf courses, restricted access landscapes, impoundments, school grounds, residences, and open access landscapes, as well as for recreational impoundments.	Pages 3.21, 6.25
17)	Describe potential use of lands associated with treatment works and increased access to water-based recreation, if applicable.	State Land in the expanded DMA boundary was sold to a developer with intent to build a master planned community. The Developer's engineer is working with the District to identify opportunities for effluent reuse and offsite effluent recharge but this is still in the planning phase.	Pages 3.21, 6.25-26
REGULATIONS 18)	Describe types of permits needed, including NPDES, APP and reuse.	Air Quality Permit (Pinal County) No. S16129.000 ADWR Underground Storage Facility (USF) Permit No. 71-584469.0003 and Water Storage (WS) Permit No. 73-584469.0101. ADEQ Aquifer Protection (APP) Permit No. P-102873 ADEQ AZPDES Permit No. AZ0023931 AZPDES/NPDES Stormwater Pollution Prevention Permit No. AZ0023931 CAG 208 Areawide Water Quality Management Plan Amendment Construction Permits, as needed	Section 6

Requirement	Provide Brief Summary On How Requirements Are Addressed	Addressed On
19) Describe restrictions on NPDES permits, if needed, for discharge and sludge disposal.	The AZPDES permit requires the District's effluent to meet the A&WEDW: Aquatic & Wildlife, Effluent Dependent Water and the PB: Partial Body Contact standards. Part III of the District's AZPDES Permit (AZ0023931) contains the regulatory requirements for the management of the District's sludge/biosolids.	Page 6.25
20) Provide documentation of communication with ADEQ Permitting Section 30 to 60 days prior to public hearing regarding the need for specific permits.	The District was granted a revised APP to re-rate to 3.0 MGD, but no further permit changes are expected within 30 to 60 days prior to the public hearing.	N/A
21) Describe pretreatment requirements and method of adherence to requirements (Section 208 (b)(2)(D), CWA).	There are no industrial dischargers into the WRF system at present. The District is aware that industrial dischargers could be added in the future and has a pre-treatment program in place for that purpose. Pre-treatment is already required for existing non-residential users as well as residential users with on-site food service operations. Septage haulers must meet pre-screening criteria before septage is accepted by the District.	Page 3.18
22) Identify, if appropriate, specific pollutants that will be produced from excavations and procedures that will protect ground and surface water quality (Section 208(b)(2)(K) and Section 304, CWA).	There are no known pollutants that will be produced from excavations. Due diligence will be conducted prior to any construction work. If necessary, a Storm Water Pollution Prevention Permit will be obtained at the time of construction during the facility expansion phase.	Pages 5.23-5.24
23) Describe alternatives and recommendation in the disposition of sludge generated. (Section 405 CWA)	Residual solids from the WRF treatment process are thickened, dewatered, dried. For the foreseeable future, the District plans to landfill biosolids products. The District can produce Class A Biosolids under its existing permit through composting if a user is identified.	Page 3.20

Requirement		Provide Brief Summary On How Requirements Are Addressed	Addressed On
24)	Define any nonpoint issues related to the proposed facility and outline procedures to control them.	There are no known non-point sources of water pollution for the current or expanded DMA boundaries that are caused by the existing or proposed sanitary sewer collection, pump station, or water reclamation facilities. The City has implemented a city-wide stormwater management plan. The District manages stormwater at its water reclamation facility so that it retains all water coming from its treatment and biosolids facilities with no co-mingling with runoff from storms. During any of its future expansion activities, the District will adhere to stormwater pollution prevention requirements to prevent non-points source pollution.	Page 5.23
25)	Describe process to handle all mining runoff, orphan sites and underground pollutants, if applicable.	Not applicable.	-
26)	If mining related, define where collection of pollutants has occurred, and what procedures are going to be initiated to contain contaminated areas.	Not applicable.	-
27)	If mining related, define what specialized procedures will be initiated for orphan sites, if applicable.	Not applicable.	-
<u>CONSTRUCTION</u> 28)	Define construction priorities and time schedules for initiation and completion.	As growth occurs and flows increase to the WRF, the District intends to follow a similar pattern of development for the 6 MGD phase and subsequent phases of the expansion of the WRF. Planning for expansion starts when the maximum month average daily flow reaches 80% of capacity and final design, financing, permitting, and construction starting when maximum month average daily flow reaches 90% capacity. This is anticipated to occur between 2030-2040 for the 6MGD upgrade.	Page 4.22
29)	Identify agencies that will construct, operate and maintain the facilities and otherwise carry out the plan.	The District will construct, operate, and maintain the collection and wastewater treatment systems.	Page 4.22

Requirement	Provide Brief Summary On How Requirements Are Addressed	Addressed On
30) Identify construction activity-related sources of pollution and set forth procedures and methods to control, to the extent feasible, such sources.	Both particulate emissions and stormwater runoff will be controlled during construction to prevent unnecessary generation of particulates or erosion into storm channels. When the District's facility expansion is under construction, a general SWPPP may be needed to be obtained by the contractor to minimize pollution.	Page 4.22
FINANCING AND OTHER MEASURES NECESSARY TO CARRY OUT THE PLAN 31) If plan proposes to take over certificated private utility, describe how, when and financing will be managed.	Not applicable.	-
32) Describe any significant measure necessary to carry out the plan, e.g., institutional, financial, economic, etc.	The District will obtain financing to expand the facility from 3 MGD to 6 MGD. The District will collaborate with developers in the proposed DMA Boundary expansion to fund expansion of the sanitary sewer collection system and allocate land for recharge or reuse sites and infrastructure.	7.28
33) Describe proposed method(s) of community financing.	The District currently intends to finance its WRF expansion through a new bond issue or a loan obtained through Water Infrastructure Finance Authority of Arizona (WIFA). Repayment of the new debt would ostensibly come through connection fees levied against developers as they move forward with new projects.	7.28
34) Provide financial information to assure DMA has financial capability to operate and maintain wastewater system over its useful life.	The DMA (City of Apache Junction) is not financially responsible for the operation and maintenance of the wastewater collection or water reclamation facility. SMCFD is financially responsible, and documentation has been provided. The District is currently at a net positive position of $6.7M and will take tax-exempt bonds or WIFA loans to build additional facilities. The District is on track to be debt free in 2025.	Page 7.28

Requirement	Provide Brief Summary On How Requirements Are Addressed	Addressed On
35) Provide a timeline outlining period of time necessary for carrying out plan implementation.	The District intends to move forward with the 3 MGD re-rating, as the facility nears 80% of its current capacity (1.71 of 2.14 MGD). For the 6 MGD expansion, design will begin when the maximum month average daily flow rate reaches 80% of capacity. Final design, financing, permitting and construction would then follow with an estimated timeline of 5 years from the start of design to the actual startup of the expanded facility. Development in the expanded DMA boundary will drive the schedule for approaching 80% of capacity, currently estimated to around years 2027-2029.	Page 4.22
36) Provide financial information indicating the method and measures necessary to achieve project financing. (Section 201 CWA or Section 604 may apply).	The District intends to finance its WRF expansion through a new tax-exempt bond issue or a loan obtained through WIFA. Repayment of the new debt would ostensibly come through connection fees levied against developers as they move forward with new projects. Current rates, fees and charges and the District's Annual Budget can be found on the District's website at www.smcfd.org.	Page 7.28
IMPLEMENTABILITY 37) Describe impacts and implementability of Plan. 38) Describe impacts on existing wastewater (WW) facilities, e.g., Sanitary district, infrastructure/facilities and certificated areas.	The District is the only sewer service provider for the current and proposed expanded DMA boundary. Properties within the current DMA boundary are required to connect to the District's sewage collection system unless the District has made a written determination that it will not provide service at this time.	1.2
39) Describe how and when existing package plants will be connected to a regional system.	There are no existing packaged plants in the current or proposed DMA boundary at this time. Users not currently connected to sewer are using septic systems.	-

	Requirement	Provide Brief Summary On How Requirements Are Addressed	Addressed On
40)	Describe the impact on communities and businesses affected by the plan.	Expanding the DMA boundary will ensure that the community will be able to grow connected to a sanitary sewer system in lieu of on septic tanks. The District's recharged water benefits the community through recycling back into the groundwater aquifer (indirect reuse) and in the future through direct reuse by irrigation with reclaimed water. This extends the available potable water supply for community growth.	1.1
41)	If a municipal WWT system is proposed, describe how WWT service will be provided until the municipal system is completed: i.e., will package plants and septic systems be allowed and under what circumstances (Interim services).	The District is already providing regional sewage treatment through its existing WRF. The existing facility will be expanded as demand requires in order to provide continuous regional sewer service within the proposed DMA boundary expansion.	1.1
PUBLIC PARTICIPATION			
42)	Submit copy of mailing list used to notify the public of the public hearing on the 208 Amendment. (40 CFR, Chapter 1, part 25.5)	*To be completed by CAG Staff.*	Appendix E
43)	List location where documents are available for review at least 30 days before public hearing.	*To be completed by CAG Staff.*	Appendix E
44)	Submit copy of the public notice of the public hearing as well as an official affidavit of publication from the area newspaper. Clearly show the announcement appeared in the newspaper at least 45 days before the hearing.	*To be completed by CAG Staff.*	Appendix E
45)	Submit affidavit of publication for official newspaper publication.	*To be completed by CAG Staff.*	Appendix E
46)	Submit responsiveness summary for public hearing.	*To be completed by CAG Staff.*	Appendix E

Appendix B SELF-CERTIFICATION LETTER

City of Apache Junction

300 East Superstition Boulevard • Apache Junction, Arizona 85119 • www.ajcity.net

April 14, 2021

Andrea Robles, Executive Director
Central Arizona Governments
2540 W Apache Trail, Suite 108
Apache Junction, AZ 85120

Dear Ms. Robles:

Although the City of Apache Junction serves as the Designated Management Agency for its area, it has delegated the authority to manage and operate wastewater services to the Superstition Mountains Community Facilities District No. 1.

On behalf of the City of Apache Junction, Arizona (the "City"), I hereby certify, in connection with wastewater collection and treatment facilities that serve homes, businesses, industries and other users within the jurisdictional limits of the City (which wastewater facilities are referred to in this letter as the "Subject Facilities") and pursuant to the Clean Water Act Section 208(c)(2) [33 U.S.C. § 1288(c)(2)], that the City, or its delegate, is authorized by law:

A. to carry out appropriate portions of Central Arizona Association of Governments' Areawide Water Quality Management Plan (the "208 Plan") developed under the Clean Water Act Section 208, subsection (b);

B. to manage effectively the Subject Facilities and any other waste treatment works and related facilities servicing such area in conformance with the 208 Plan;

C. directly or by contract, to design and construct the Subject Facilities and any other new works, and to operate and maintain new and existing works as required by the 208 Plan;

D. to accept and utilize grants, or other funds from any source, for waste treatment management purposes;

E. to raise revenues, including the assessment of waste treatment charges;

F. to incur short- and long-term indebtedness;

G. to assure in implementation of the 208 Plan that each participating community pays its proportionate share of treatment costs;

H. to refuse to receive any wastes from any municipality or subdivision thereof, which does not comply with any provisions of the 208 Plan applicable to such area; and

I. to accept for treatment industrial wastes.

Please let me know if you need any additional information with this self-certification.

Sincerely,

Bryant Powell

Bryant Powell
City Manager

Appendix C LETTERS OF SUPPORT

Douglas A. Ducey
Governor

Lisa A. Atkins
Commissioner

Arizona State Land Department

1616 West Adams, Phoenix, Arizona 85007
(602) 542-4631

April 22, 2021

Travis Ashbaugh, AICP
Transportation Planning Manager
Central Arizona Governments
2540 W. Apache Trail, #108
Apache Junction, AZ 85120

Re: CAG 208 Plan Draft Amendment, Superstition Mountains Community Facilities District No. 1 & City of Apache Junction, Pinal County

Dear Mr. Ashbaugh,

The Arizona State Land Department (ASLD) received a DRAFT proposal from Central Arizona Governments (CAG) for comment and review entitled "CAG 208 Plan Draft Amendment for Superstition Mountains Community Facilities District No. 1, dated March 2021" prepared by Stantec Consulting Services Inc. CAG has requested a letter of Support, No Objection, or Objection from ASLD as part of your review process.

ASLD has reviewed the DRAFT proposal and based on the information provided at this time "Support" the proposed 208 Amendment. ASLD reserves the right to modify its decision, if warranted later in the process as additional information becomes available.

Should you have any questions please do not hesitate to contact Manny Patel, Water Resource Engineer via e-mail at mpatel@azland.gov or by phone at 602-364-1596.

Sincerely,

Jim Perry,
Deputy Commissioner

Leo Lew
County Manager

PINAL COUNTY
WIDE OPEN OPPORTUNITY

April 13, 2021

Andrea Robles
Executive Director
Central Arizona Governments
2540 W. Apache Trail, Suite 108
Apache Junction, AZ 85120

Re: CAG 208 Plan Amendment for Apache Junction / Superstition Mountain Community Facilities District No. 1.

Dear Ms. Robles:

This constitutes Pinal County's comment/response with respect to the CAG 208 application by Apache Junction / Superstition Mountain Community Facilities District No. 1. The application is in regards to expanding their Designated Management Agency (DMA) Boundary for wastewater services, as well as increase the build-out capacity of the current wastewater facility.

Pinal County has long maintained that 208 applications should clearly affirm whether adjoining political subdivisions and wastewater providers within the CAG Region support CAG 208 applications. Pinal County supports Apache Junction / Superstition Mountain Community Facilities District No. 1. efforts to obtain a CAG 208 Amendment and recommends approval of their application.

Should you have any further questions or concerns, do not hesitate to discuss the matter with me at your convenience.

Sincerely,

Lester A Chow

Lester A Chow
Community Development Director

COMMUNITY DEVELOPMENT

31 North Pinal Street, Building F, PO Box 2973, Florence, AZ 85132 T 520-866-6442 FREE 888-431-1311 F 520-866-6530

www.pinalcountyaz.gov

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PO Box 1466
Mesa, Arizona 85211-1466

April 8, 2021

Andrea Robles, Executive Director
Central Arizona Governments
2540 W. Apache Trail, Ste. 108
Apache Junction, AZ 85120

Subject: Letter of Support for proposed Apache Junction/Superstition Mountains Community Facilities District No. 1 CAG 208 Amendment

The City of Mesa supports the proposed Apache Junction/Superstition Mountains Community Facilities District No. 1 CAG 208 Amendment to expand its Designated Management Agency (DMA) boundary. Specifically, we support the proposed DMA boundary of expansion in the area from Elliott on the north to the SR 24 alignment on the south, Meridian on the west to the CAP Canal on the east.

We appreciate the opportunity to provide support for this expansion and expect that any development in the expanded DMA area will be thoughtfully planned with respect to the overflight of the Phoenix-Mesa Gateway Airport which is a valuable regional asset, as well as the industrial businesses that parallel the DMA along Meridian Road.

Please contact Kathy Macdonald, Water Resources Planning Advisor at (480) 644-4364 or kathy.macdonald@mesaaz.gov with any questions.

Sincerely,

John Giles
Mayor

Kevin Thompson
Councilmember, District 6

480.644.2388 (tel)
480.644.2175 (fax)

April 14, 2021

Travis Ashbaugh
Central Arizona Governments
Transportation Planning Manager
2540 W. Apache Trail #108
Apache Junction, AZ 85120

Re: Letter of Support

The Town of Queen Creek (the "Town") submits this Letter of Support in regards to the Apache Junction / SMCFD 208 Plan Amendment ("AJ/SMCFD 208 Amendment").

The Town is appreciative of having the opportunity to be included as a stakeholder in the AJ/SMCFD 208 Amendment approval process. The new proposed AJ/SMCFD 208 designated management area (DMA) will extend to be located adjacent to the Town's existing 208 DMA located at the Frye Road alignment between Meridian Road and the CAP canal. The Town is pleased with the idea that a reputable utility such as AJ/SMCFD would be our neighbor.

In addition to the Letter of Support, the Town would at this time make the following comments in regards to the proposed 208 amendment as it moves through the process:

1) **Sewer Lift Station at Meridian and Frye area:** The Town would ask that additional information be provided in the narrative of the proposal that identifies the location and expected build out pumping demands that will be placed on this station. Additionally, it would be helpful if a map was included that identified the sub-basin that would be served by the lift station.

2) **Sewer Lift Station Redundancy**: There may be some alternatives in relation to the lift station due to: 1) It will be located in close proximity to the Town's service area; 2) Over 10 square miles of sewer flow will be collected at the lift station and then pumped to the treatment plant; and, 3) the return force main line will be close to 7 miles in length. Giving these conditions, the Town would recommend that consideration be given to greater than normal redundancies at the lift station and with regard to the force main line. A few options the Town would recommend for AJ/SMCFD to consider includes: 1) Provide for extra redundancies at the lift station in regards to pumping, holding capacity, and power; and, 2) Construct a second completely redundant force main line that is able to convey flows if the primary force main line were to break. Alternatively, AJ/SMCFD could also partner

with the City of Mesa or possibly with the Town in regards to establishing an emergency means of conveying flows if failure occurred at the lift station or force main line.

The Town provides this Letter of Support and note that the above identified items be considered.

Respectfully,

Bruce R. Gardner
Assistant Town Manager
Town of Queen Creek
22350 S. Ellsworth Road
Queen Creek, Arizona 85142

Appendix D LEGAL DESCRIPTIONS

The current DMA Boundary for the City of Apache Junction is shown in **Table D.1**.

Table D.1 City of Apache Junction's Current DMA Boundary Description

Section	Includes	Township	Range
7, 8, 9, 10, 11	All	1N	8E
14, 23, 36	Partial	1N	8E
15, 16, 17, 18, 19, 20, 21, 22	All	1N	8E
26, 27, 28, 29, 30, 31, 32, 33, 34, 35	All	1N	8E
24	Partial	1N	7E
1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12	All	1S	8E

The proposed DMA Boundary expansion for the City of Apache Junction includes the following sections, shown in **Table D.2**.

Table D.2 City of Apache Junction's Proposed DMA Boundary Expansion Description

Section	Includes	Township	Range
17, 18, 19, 20, 28, 29, 30	All	1S	8E
16, 21, 27, 31, 32, 33, 34	Partial	1S	8E

For the City of Apache Junction's proposed DMA Boundary expansion, all sections shown as partial are for the land areas west of the CAP canal and north of the Highway 24 alignment.

Appendix E RECORD OF PUBLIC PARTICIPATION

To be provided by CAG after Regional Council to be inserted here before the plan is sent to the State Water Quality Management Working Group.

Appendix F COMMUNICATIONS

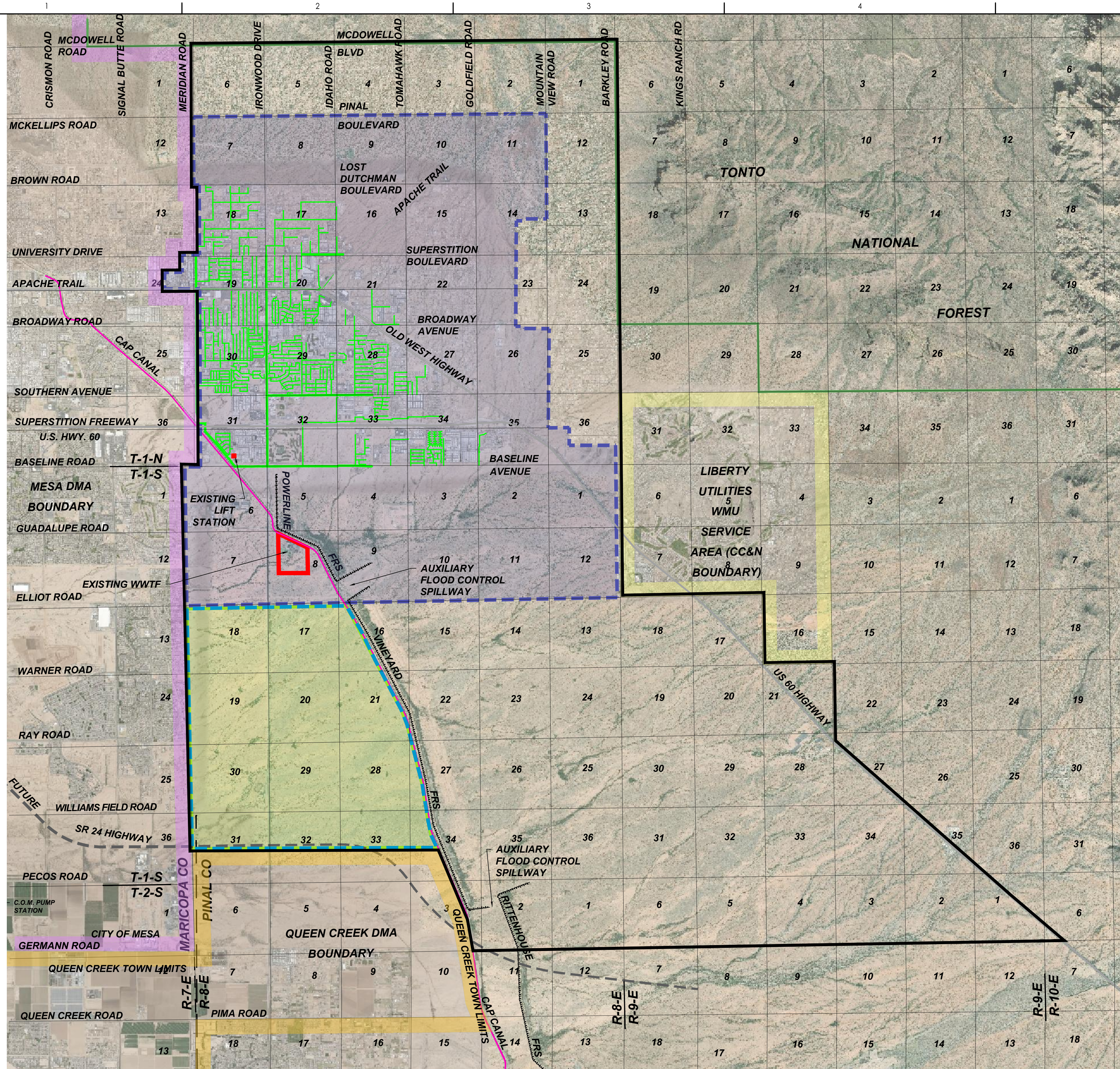
Appendix G MAPS AND FIGURES

G.1 DMA BOUNDARY MAP

G.2 FACILITY LOCATIONS MAP

G.3 PROPOSED SITE AND PHASING TO 26 MGD BUILDOUT

G.4 LAND USE MAP FROM APACHE JUNCTION GENERAL PLAN 2020-2050



0 3500' 7000'

Scale in feet

Stantec

Stantec Consulting Services Inc.
3133 West Frye Road Suite 300
Chandler AZ 85226-5110
Tel: (480) 687-6100
www.stantec.com

Consultant

LEGEND

- CITY OF APACHE JUNCTION LIMITS AND EXISITNG DMA BOUNDARY
- PROPOSED EXPANDED DMA BOUNDARY
- MESA DMA BOUNDARY
- QUEEN CREEK DMA BOUNDARY
- LIBERTY UTILITIES WMU SERVICE AREA (CC&N BOUNDARY) DMA BOUNDARY
- SMCFD NO. 1 EXISTING SERVICE (COLLECTION SYSTEM)
- TONTO NATIONAL FOREST BOUNDARY
- MUNICIPAL PLANNING AREA

Client/Project Logo

SMCFD

Client/Project

208 PLAN AND DMA BOUNDARY AMENDMENT

Apache Junction, Arizona

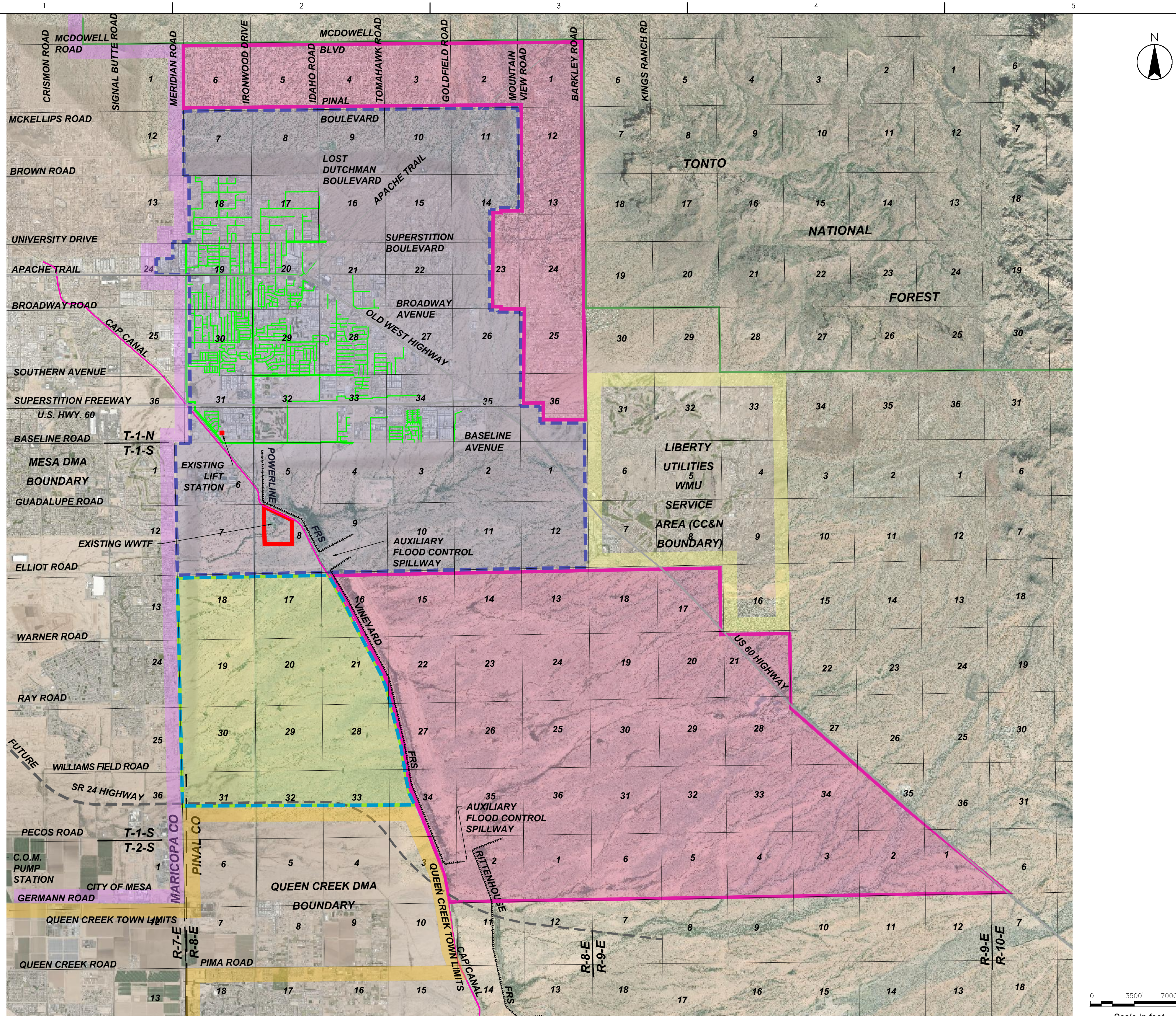
Title

DMA BOUNDARY MAP

Project No.	Scale
181300816	AS SHOWN

Revision	Sheet	Figure
0	of	G.1

ORIGINAL SHEET - ARCH D



Stantec

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Consultant

LEGEND

- CITY OF APACHE JUNCTION LIMITS AND EXISTING DMA BOUNDARY
- PROPOSED EXPANDED DMA BOUNDARY
- FUTURE PLANNING AREA
- MESA DMA BOUNDARY
- QUEEN CREEK DMA BOUNDARY
- LIBERTY UTILITIES WMU SERVICE AREA (CC&N BOUNDARY) DMA BOUNDARY
- SMCFD NO. 1 EXISTING SERVICE (COLLECTION SYSTEM)
- TONTO NATIONAL FOREST BOUNDARY

Client/Project Logo

SMCFD

Client/Project
208 PLAN AND DMA BOUNDARY AMENDMENT

Apache Junction, Arizona

Title
FACILITY LOCATIONS

Project No.	Scale
181300816	AS SHOWN

Revision	Sheet	Figure
0	of	G.2

PROCESS UNIT CONFIGURATIONS, PHASING AND DIMENSIONS NOTES

1. BUILDOUT DESIGN AVERAGE FLOW = 26 MGD
   ASSUMED BUILDOUT PEAK FLOW = 42 MGD

2. PROPOSED EXPANSION PHASING:
   a. RE-RATE THE EXISTING PLANT TO 3.0 MGD
   b. 3 MGD TO 6 MGD EXPANSION WITH 3 MGD MBR PROCESS UNIT, UPGRADE THE EXISTING SLUDGE HANDLING TO MECHANICAL DEWATERING, BUILD NEW HEADWORKS (SCREENS AND GRIT REMOVAL)
   c. 6 MGD TO 12 MGD ADD TWO ADDITIONAL 3 MGD MBR PROCESS UNITS, DECOMMISSION EXISTING 3 MGD BIOLAC, BUILD ANAEROBIC DIGESTERS/EXPAND HEADWORKS, DECOMMISSION THE EXISTING HEADWORKS AND THE EXISTING TREATMENT FACILITY
   d. 12 MGD TO 26 MGD EXPANSION WITH MBR PROCESS

3. PROPOSED 3 MGD MODULAR/PHASES EXPANSIONS
   a. 3 MGD TO 6 MGD EXPANSION WITH MBR
   b. 6 MGD TO 9 MGD EXPANSION WITH MBR
   c. 9 MGD TO 12 MGD EXPANSION WITH MBR
   d. 12 MGD TO 15 MGD EXPANSION WITH MBR
   e. 15 MGD TO 18 MGD EXPANSION WITH MBR
   f. 18 MGD TO 21 MGD EXPANSION WITH MBR
   g. 21 MGD TO 24 MGD EXPANSION WITH MBR
   h. 24 MGD TO 26/27 MGD EXPANSION WITH MBR

4. FINE SCREENING (2 MM OR SMALLER), BASED ON ASSUMED PEAK FLOW
   a. EACH SCREEN =6 MGD
   b. TOTAL 8 UNITS AT BUILDOUT (7 DUTY+ 1 STANDBY) DEPENDING ON PEAK FLOW
   c. ESTIMATED SCREEN DIMENSION = 6 FT X 25 FT FOR EACH UNIT

5. GRIT REMOVAL, BASED ON PEAK FLOW
   a. 7 MGD PER UNIT DESIGN FLOW DEPENDING ON PEAK FLOW
   b. TOTAL 6 UNITS (NO STANDBY)
   c. EACH UNIT DIMENSION 12 FT X 12 FT PER HYDRO INTERNATIONAL TRAY UNIT

6. BIOREACTORS
   a. DESIGN HRT =8 HOURS
   b. BASIN SWD = 20 FT, FLEXIBLE FOR OTHER PROCESS, AND SMALLER FOOTPRINT
   c. REQUIRED VOLUME FOR 3 MGD = 133,690 FT3
   d. REQUIRED SURFACE AREA FOR 3 MGD = 6,685 SF
   e. TOTAL AREA FOR 26 MGD = 60,160 SF
   f. LENGTH/BASIN = 200 FT
   g. WIDTH/BASIN = 40 FT

7. MEMBRANE TANKS AND ACCESSORIES
   a. 3 MGD SYSTEM WIDTH =25 FT PER ZENON CUT SHEET
   b. 3 MGD SYSTEM LENGTH = 75 FT PER ZENON CUT SHEET

8. SLUDGE HANDLING SYSTEM
   a. SLUDGE THICKENING WITH RDT, OFFSITE TO LANDFILLING
   b. TOTAL 3 UNITS (2 DUTY+ 1 STANDBY)
   c. EACH UNIT FOOTPRINT = 10 FT X 25 FT
   d. SLUDGE ANAEROBIC DIGESTION
   e. TOTAL 7 UNITS (6 DUTY+ 1 STANDBY)
   f. EACH UNIT FOOTPRINT =55 FT DIAMETER
   g. SLUDGE DEWATERING WITH BFP OR CENTRIFUGE
   h. TOTAL 2 UNITS (1 DUTY+ 1 STANDBY)
   i. EACH UNIT FOOTPRINT = 15 FT X 18 FT

9. ODOR CONTROL WITH BIOFILTERS
   a. TWO FOR HEADWORKS, EACH DIAMETER OF 40 FT
   b. TWO FOR SLUDGE HANDLING, EACH DIAMETER OF 30 FT
   c. TWO FOR BIOREACTORS, EACH DIAMETER OF 30 FT

10. MCC BUILDING, 75 FT X 150 FT
11. ADMIN/OPERATION BUILDING, 100 FT X 100 FT
12. MAINTENANCE BUILDING, 125 FT X 50 FT
13. CHEMICAL BUILDING, 75 FT X 60 FT
14. BLOWER BUILDING, 75 FT X 180 FT
15. CONVERT THE EXISTING OPERATION BUILDING TO STORAGE USES

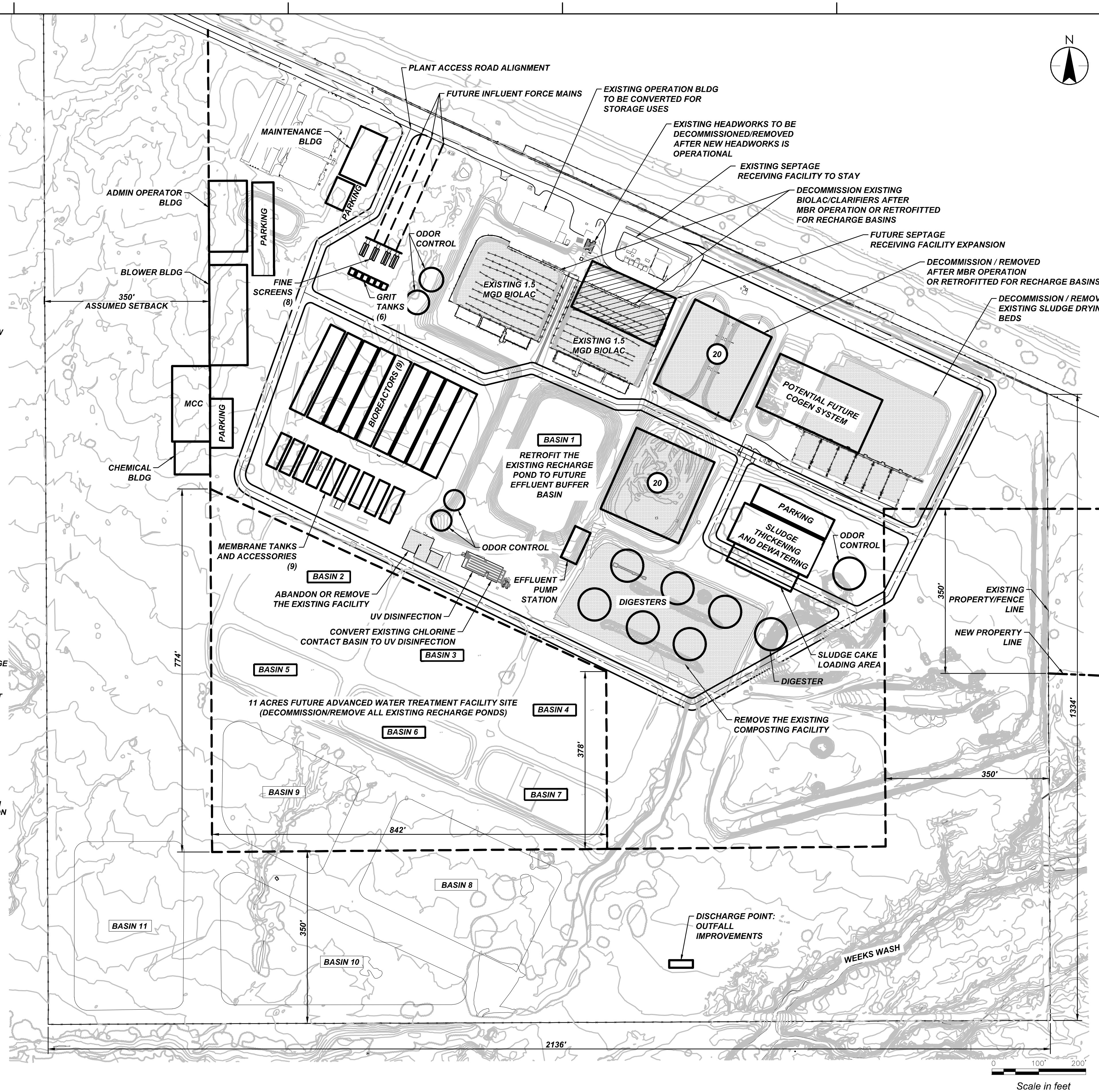
16. EFFLUENT DISINFECTION WITH UV
    EACH UV CHANNEL IS 25 FT LONG PER TROJAN CUT SHEET
    EACH CHANNEL HAS 3 UV UNITS IN SERIES
    EACH UV CHANNEL IS 4 FT WIDE
    EACH UV CHANNEL IS RATED 3 MGD
    TOTAL NO OF UV CHANNELS IS 9

17. CONVERT ONE OF THE RECHARGE BASIN TO FUTURE EFFLUENT BUFFER BASIN

18. BUILD AN EFFLUENT PUMP STATION

19. UPGRADE TO EXISTING OUTFALL

20. OPTION TO RETROFIT 3 MGD ADDITIONAL BIOLAC BASINS IN EXISTING SLUDGE HANDLING BASINS FOR 6 MGD EXPANSION IF RECHARGE BASINS AVAILABLE; DECOMMISION AND REMOVE AT 12 MGD EXPANSION



Stantec

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www.stantec.com

Consultant

LEGEND

EXISTING PROPERTY/FENCE LINE
NEW PROPERTY LINE
EXISTING SETBACK LINE

Client/Project Logo

SMCFD

Client/Project

208 PLAN AND DMA BOUNDARY AMENDMENT

Apache Junction, Arizona

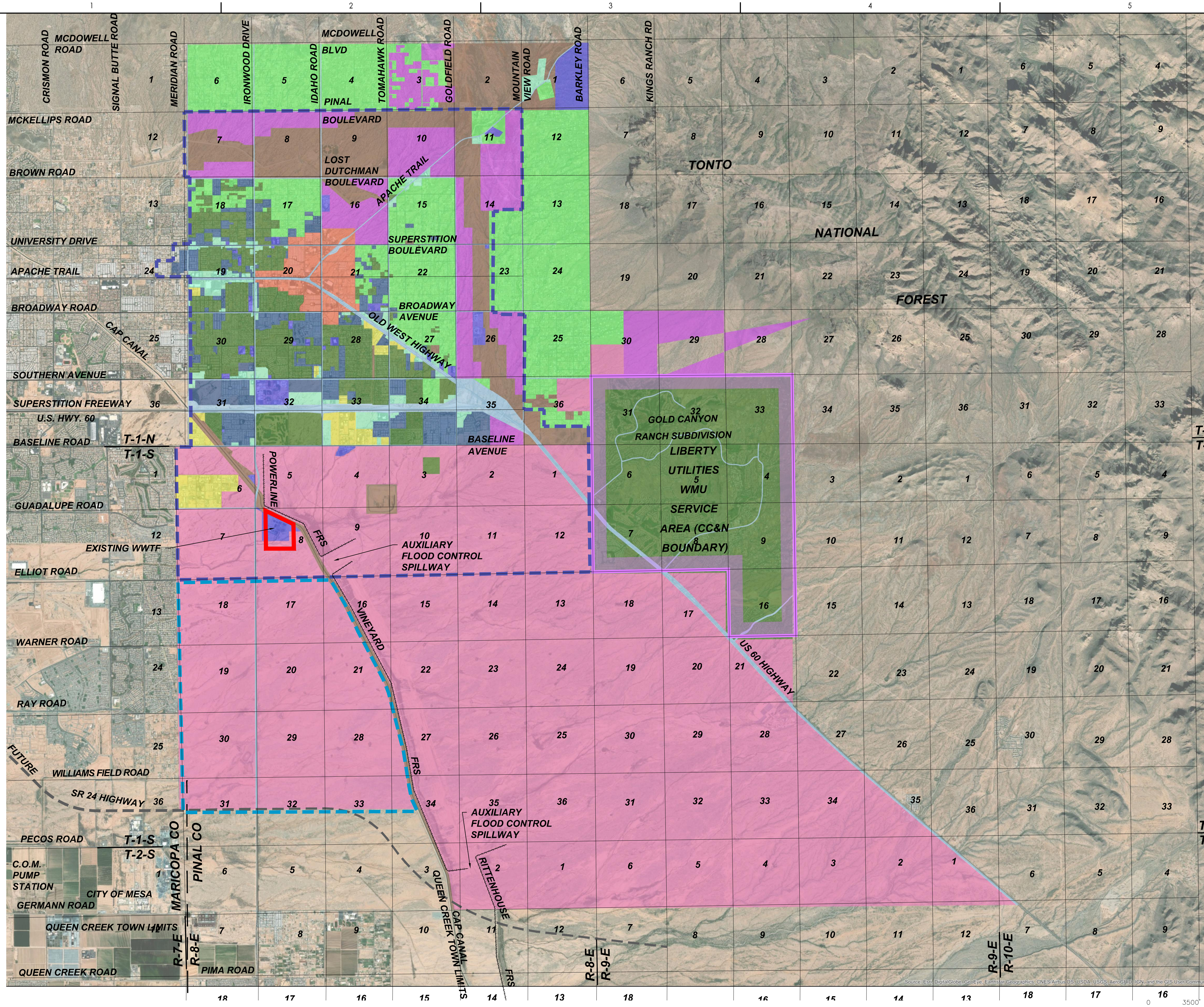
Title

PROPOSED SITE AND PHASING TO 26 MGD (BUILDOUT)

Project No.	Scale
181300816	AS SHOWN

Revision	Sheet		Figure
0		of	G.3

ORIGINAL SHEET - ARCH D



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www.stantec.com

Consultant

LEGEND

Landuse

- Commercial
- Conservation (1 DU/AC)
- Downtown Mixed Use
- High Density Residential (40 DU/AC Max)
- Light Industrial/Business Park and Industrial
- Low Density Residential (1 DU/1.25 AC)
- Master Planned Community (20 DU/AC Max)
- Medium Density Residential (10 DU/AC Max)
- Open Space and Recreation
- Public/Institutional
- Transportation

- CITY OF APACHE JUNCTION LIMITS AND EXISITNG DMA BOUNDARY
- CITY OF APACHE JUNCTION EXPANDED DMA BOUNDARY

Client/Project Logo

SMCFD

Client/Project
208 PLAN AND DMA BOUNDARY AMENDMENT

Apache Junction, Arizona

Title
CITY OF APACHE JUNCTION
LAND PLAN
(GENERAL PLAN 2020)

Project No.	Scale
181300987	AS SHOWN

Revision	Sheet	Figure
0	of	G.4

Appendix H SMCFD AND APACHE JUNCTION MASTER PLAN DOCUMENTS

AJWC
Apache Junction
Water Company

APACHE JUNCTION WATER COMPANY

APACHE JUNCTION MASTER PLAN
FINAL REPORT

SEPTEMBER 2010

Registered Professional Engineer
CERTIFICATE NO. 28112
RAMESH NARASIMHAN
(Civil)
Date Signed 9/2/10
ARIZONA, U.S.A.
exp 9/30/2012

NCS
Narasimhan
Consulting Services, Inc.

3660 N. Third Street
Phoenix, Arizona 85012
(602) 629-0206

APACHE JUNCTION MASTER PLAN
FINAL REPORT

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FINAL REPORT

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APACHE JUNCTION MASTER PLAN
FINAL REPORT

LIST OF FIGURES (Cont)

APACHE JUNCTION MASTER PLAN
FINAL REPORT

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EXECUTIVE SUMMARY

BACKGROUND

The City of Apache Junction, Arizona is located in Pinal County approximately 30 miles east of Phoenix. The Apache Junction Water Company (AJWC) is responsible for the administration, design, operations, and maintenance of the water system for a portion of the City. Currently (2009), AJWC supplies water to a population of approximately 12,700 along with its commercial customers. Within the next five years, modest growth is expected within the established AJWC service area. In addition, a Master Planned community (Portalis), is expected to be developed and increase water demands.

Narasimhan Consulting Services, Inc. (NCS) was tasked with developing a Master Plan for the Apache Junction Water Company (AJWC) to address issues related to water resources, water distribution, water quality and system improvements from current conditions through build-out. Concurrently, a water distribution model for the system was also developed by NCS. This model provided the capability to analyze changes to the distribution system and their impacts on water quality, operations and operational costs. This model was used to develop the Master Plan to provide guidance for the orderly expansion of the water service system, including both production and distribution system facilities, and identified the need for system improvements.

The purpose of this Master Plan is to provide a comprehensive roadmap by which AJWC can plan and implement a reliable and high quality water supply from now through build-out of the service area.

APPROACH

The overall approach used in developing this Master Plan was to consider the available and pursuable water resource options, water production alternatives and infrastructure needs. In considering the various alternatives, the potential water resources were balanced based on minimizing costs and maintaining sustainable resources. Scheduling of necessary infrastructure and source procurement needs are triggered by growth milestones, providing separation from a strict timeline in the event future growth proceeds at a slower than predicted pace.

Two types of future growth are expected for AJWC: (1) Growth within the existing AJWC service area, and (2) Growth associated with the proposed master planned Portalis community. In this Master Plan, water resources and distribution infrastructure are planned separately for both communities, but their interaction and ability to share resources and costs are considered.

Historical water use and anticipated growth rates were used to estimate future demands. Build-out for the established community was defined in the General Plan (based on land use) as 5,404 AFY (acre-feet per year), not including the Portalis development. For Portalis, the developer will be responsible for providing wells and any required treatment to meet demands and comply with SDWA rules. Average day demand at build-out for the Portalis community has been defined as 10.9 MGD (Wood, Patel & Associates, 2009). It is anticipated that the initial demand for this community will be 1.0 MGD, starting in 2012.

A future demand scenario was developed based on observed growth patterns in similar communities, and on best professional judgement. For the existing service area, the projections were based on the continuation of current growth at 0.5% until the end of 2012, followed by a consistent 2.5% growth until build-out. The Portalis development is expected to grow at 5.8% per year from initiation in 2012 to build-out.

A water distribution model for the system was developed and used to provide the capability to analyze changes to the distribution system and their impacts on water quality, operations, and operational costs. This model provided the basis in guiding the orderly expansion of the water service system, including both production and distribution system facilities, and identified the need for system improvements.

RESOURCES OVERVIEW

AJWC's current water resources include groundwater supply using three production wells, and surface water supply using their Central Arizona Project (CAP) allotment. The options for future groundwater sources include developing new wells for the established AJWC service area and new well development for the Portalis community. Wastewater recharge credits are purchased and accumulated in a recharge credit bank, which can be applied to future overdrafts of groundwater. Surface water resource options include usage through the Arizona Water Company or City of Mesa interconnections, or recharge of CAP water. The portion of the annual CAP allotment not used for potable supply is available for recharge and recharge credit. For drinking water treatment, AJWC can chose to take delivery of CAP water treated by the City of Mesa through an existing agreement, or alternatively build its own treatment plant in the future. AJWC desires to balance the various sources to obtain a sustainable, economically feasible arrangement through a blend of groundwater wells, surface water treatment and wastewater recharge.

CONJUNCTIVE USE PROGRAM

The optimal blend of groundwater and surface water resources is one which is cost-effective and considers the balance between utilizing groundwater resources without depleting the reserve of recharge credits. In the long run, the desired goal is an 80% surface water, 20% groundwater split. In working toward that goal, the feasibility of implementing either a 50% surface water, 50% groundwater blend or a 75% surface water, 25% groundwater split are considered here.

AJWC currently has 30,000 acre-feet (ac-ft) in accumulated recharge credits, and is purchasing wastewater recharge credits at a rate of 1,200 ac-ft per year (AFY). In addition, AJWC has a Central Arizona Project (CAP) allocation of 2,919 AFY, and can receive recharge credit for the potion of this surface water allocation not used and recharged. This balance of storage credits can be applied to future overdrafts of groundwater use, if needed, to meet future demands as expansion occurs.

Groundwater resources are not subject to peaking limits, seasonal dry-ups and drought, notwithstanding capacity limitations. Given that Arizona is a junior rights holder with respect to Colorado River resources (and CAP water rights), a reliable groundwater source is critical in securing future water reserves. A healthy reserve of groundwater credits is desired when drought conditions threaten surface water sources, therefore, it is important to maintain this reserve. Banked groundwater credits should be maintained at a minimum of 10,000 ac-ft (3,260 MG).

The target of maintaining 10,000 ac-ft of banked recharge credits in the long term provides AJWC with sufficient capacity to meet the average day demand at build-out for five years using only groundwater sources, provided wastewater is recharged continuously for aquifer sustainability.

In order for the Portalis system to meet the same reserve capacity criteria (i.e., meet the average day demand at build-out for five years using only groundwater sources), long term banked recharge credits needs to be maintained at 24,000 ac-ft. Thus, in the long term, a total of 34,000 ac-ft would be needed to protect both communities from a 5-year extreme drought condition.

AJWC also has an agreement with the City of Mesa, to receive treated CAP water through an interconnection to the Mesa water system. Based on actual usage and billings, the unit cost of water to AJWC under this agreement is $1.00 per 1,000 gallons. For planning purposes, this cost is assumed to increase by 10% for future unknowns, contingencies and changes in the agreement. Also, in future years, a 2% per year increase was considered for the CPI.

Water Treatment Plant Expansion Schedule

To facilitate planning, demand milestones have been identified to trigger CIP planning actions five years in advance. This will allow sufficient time to secure funds and complete design and construction of needed infrastructure. Demand triggers have been identified five years prior to when true capacity equals the projected maximum monthly average day demand.

Initially a 1.1 MGD surface water treatment plant is planned to come on-line by 2015. Prior to 2015, surface water will be obtained through the Mesa interconnect. Surface water will make up 50% of the average day demands until 2030. As of 2019, the additional water required to meet 50% of the demand in excess of the WTP capacity will be supplied through the Mesa interconnect.

The transition to 80% surface water and 20% groundwater will occur in 2030 when a 2.0 MGD surface water treatment expansion is recommended, providing a total surface water treatment capacity of 3 MGD. The trigger to begin CIP planning actions for this expansion is at an average day demand of 2.25 MGD, expected to occur in 2025.

AJWCFD Svc. Area

The next expansion trigger is expected in 2040 (or when average day demand reaches 3.2 MGD), when a 1.0 MGD expansion will need to be initiated to come on-line by 2045. This will provide a total capacity of 4.0 MGD, sufficient to maintain the 80% surface water, 20% groundwater split until build-out and beyond.

For Portalis, a 3 MGD total surface water treatment plant is recommended to come on-line by 2030 in order to maintain the balance between groundwater use and recharge credit reserves to meet drought conditions.

Groundwater Expansion Schedule

A wellfield expansion schedule has been developed to provide groundwater only supply in severe drought conditions. Under this scenario, such as a Stage 4 Drought Condition, compulsory conservation and mandated shutoff rules will necessitate a 50% reduction in maximum month average day demand. Well capacity will be needed to meet this demand, without surface water supplementation. The demand trigger is identified as the point when maximum month average day demand reaches 3.48 MGD (or when 50% of the maximum month average day demand reached 1.75 MGD). When this demand is realized, a 1.0-MGD expansion should be initiated to provide severe drought protection through build-out.

SHORT TERM CAPITAL IMPROVEMENT PROGRAM

Three scenarios were considered for analyzing the status of the recharge credit bank:

(1) Baseline surface water usage (1.0 MGD consistent with the current baseline condition water use strategy)
(2) Meeting 75% of demand with surface water, and 25% of demand with groundwater
(3) Meeting 50% of demand with surface water, and 50% of demand with groundwater

In Scenario 1, at the predicted rate of future demand, current source water usage, and current rate of recharge credit accumulation, the bank of recharge credit will be exhausted by 2045.

In Scenario 2, increasing the portion of future demand served by 75% surface water, and 25% groundwater will enable recharge credits to increase and stabilize over the planning period to build-out. This scenario, as in Scenario 1, assumes that the current rate of credit accumulation, without excess CAP credit purchase, is maintained.

In Scenario 3, increasing the portions of future demand to be supplied equally by surface and groundwater provides a balance in resources and maintains a desired target of long-term reserve capacity (10,000 ac-ft) until build-out.

Assuming an 80% and 20% surface water to groundwater ratio for the AJWC service area and a total of 6.3 MGD surface water treatment plant requirement, Portalis will require a new treatment plant (or expansion of an AJWC treatment plant) to 3 MGD.

TOTAL DEMANDS PORTALIS & AJWC

Build out average day demand for AJWC is 4.8 MGD, while that of Portalis is 10.9 MGD. The total demands imposed by both developments together is approximately 15.7 MGD. From the historical records, it is observed that the total recharge to demand ratio is approximately 0.6. This means that approximately 60% of 15.7 MGD of consumed water would be recharged leaving about 15% water for reuse purposes (while 25% is consumptive use). Therefore, to maintain a usage rate that does not either build up a bank or draw a bank down, groundwater can only be used as much as it can be recharged. The total groundwater use would be approximately 9.4 MGD. Approximately 6.3 MGD of surface water would be required for build-out. This corresponds to CAP credits of 7,033 ac-ft/yr. AJWC has a CAP allotment of 2,919 ac-ft/yr. An additional 4,114 ac-ft/yr would be required in the long term under this sustainable scenario.

To take delivery of surface water under each of these options, the CAP supply can be treated by Mesa and delivered to AJWC using the Mesa Interconnect (under the agreement); or AJWC can take direct delivery of CAP and treat it its own new water treatment plant.

A comparison of the two water delivery methods (separate WTP versus Mesa interconnect) for the three water resource scenarios is presented below:

Scenario 1 - 1 MGD Surface Water Usage With Mesa Interconnect

Separate AJWC Treatment Plant (1.0 MGD): $4,874,000 PW (Annualized Cost $425,000)
Mesa Agreement (1.0 MGD): $5,158,000 PW (Annualized Cost $449,000)

Scenario 2 - 75% Surface Water, 25% Groundwater

Separate AJWC Treatment Plant (1.6 MGD): $6,445,000 (Annualized Cost $562,000)
Mesa Agreement: $7,496,000 (Annualized Cost $654,000)

Scenario 3 - 50% Surface Water, 50% Groundwater

Separate AJWC Treatment Plant (1 MGD): $5,145,000 (Annualized Cost $449,000)
Mesa Agreement: $5,674,000 (Annualized Cost $495,000)

Based on the above analysis, it is cost-effective for AJWC to develop the surface WTP than to have continued reliance on the Mesa interconnect. Also, based on balancing costs and long term water resource goals, water resource Scenario 3 (50% surface water and 50% groundwater) is recommended for the short term. This will provide a long term sustainable groundwater supply that is available for surface water drought conditions while balancing the overall costs to AJWC. As the WTP is expanded, the AJWC main service area will move towards meeting the 80% surface water, 20% groundwater goal. Further, the cost-effectiveness of providing surface water through a new jointly-owned WTP with the City of Mesa should also be evaluated in a separate study.

If the Portalis master planned community develops, it should provide a 3 MGD treatment plant to AJWC to maintain recharge credit bank and sustainable operations.

Short Term Water Distribution System Infrastructure Upgrades

Based on the hydraulic modeling runs, upgrades were identified for booster stations to meet maximum day fire flow and peak hour demand conditions. The required pumping upgrades were identified to meet redundancy and firm capacity requirements. Storage tank upgrades were also identified to meet diurnal demand variation. Pipeline upgrades were identified to correct deficiencies in pressures, velocities and flows and to meet fire flow requirements. The costs presented below do not include engineering fees or contingencies.

Two booster station upgrade projects are recommended at a total cost of $ 1,242,000 ($900,000 plus 20% contingency and 15% engineering). Three storage tank projects are recommended (one new tank at booster site 2, one new clearwell at the WTP site, and a rehabilitation of the existing tank at booster site 2). The cost of these improvements is estimated at $2,967,000 ($2,150,000 plus 20% contingency and 15% engineering).

The total cost of the 5-year CIP for the AJWC is estimated at $9,555,000 for the projects described above. This includes construction and engineering costs but does not include any land acquisition costs. However to adequately plan and budget for future conditions an additional 15% contingency is recommended to plan for unforeseen conditions in the market place and miscellaneous projects that may be identified in the future. Therefore the total amount recommended to be funded in the 5-year CIP is $ 10,988,000 ($9,555,000 plus 15% general contingency)

INTERMEDIATE TERM CAPITAL IMPROVEMENT PROGRAM

When the average daily demand reaches 2.24 MGD, CIP planning for intermediate growth should be initiated. This will allow system improvements to be completed for the intermediate growth.

CIP and funding initiation should be started for the first expansion of this plant when the demand reaches 2.24 MGD. The expansion of the plant will be 1.9 MGD. Additionally, the strategy of surface water use will increase to 80% surface water to 20% groundwater ratio.

Additional well expansion of 1 MGD would be required to allow supplying up to 50% of the demands using groundwater for the existing AJWC service area. This would allow drought mitigation to a great extent.

Intermediate Term Water Distribution System Infrastructure Upgrades

For the intermediate growth CIP additional pumping capacity would be required to meet the peak hour demands. A total of two (1.3 MGD, Booster Station #1 and 1.7 MGD, Booster Station #2) pumps would be required to reach to a total demand capacity of 10.1 MGD.

Booster Station #1 will require a tank upgrade by 2 MG. This upgrade will allow meeting the fire flow, emergency and diurnal usage requirement. This additional storage can also be provided at the WTP if required.

Based on the water distribution system hydraulic analyses conducted for Peak Hour and Maximum Day Fire Flow Conditions the following improvements are recommended. A list of the pipes required for upgrade in this growth scenario has been identified.

A pressure zone split should be considered by allowing Portalis to grow as a separate zone. Further more, the line on the south east side of the City should be placed into this new zone. A new PRV will be required on the 8 inch line.

Future Master Planning efforts should re-evaluate time frame and triggers for new Storage Tank and Booster Station Upgrades.

LONG TERM CAPITAL IMPROVEMENT PROGRAM

CIP and funding initiation should be started for the build out conditions when the average day demand reaches 3.2 MGD with a reference year of 2040. This would be the last expansion of 1 MGD. No additional well field expansion will be required for this scenario.

Long Term Water Distribution System Infrastructure Upgrades

For the build out CIP additional pumping capacity would be required to meet the peak hour demands. Multiple pumps would be required to reach to a total demand capacity of 17.3 MGD. Because hydraulically the capacity at Booster Station #2 is maximized, the new pumps would be required at Booster Station #1.

The Booster Station #1/WTP will require a total tank upgrade by 4.7 MG. This upgrade will allow meeting the fire flow, emergency and diurnal usage requirement. This additional storage can also be provided at the WTP if required.

Based on the water distribution system hydraulic analyses conducted for Peak Hour and Maximum Day Fire Flow Conditions the following improvements are recommended. A list of the pipes required for upgrade in this growth scenario has been identified.

Future Master Planning efforts should re-evaluate time frame and triggers for new Storage Tank and Booster Station Upgrades. The schedule of implementing upgrades for the build-out scenario should be re-evaluated during future master plans to narrow the reference years and update the impact of demand changes.

SUMMARY OF RECOMMENDATIONS

In considering the various scenarios, the potential water resources were balanced based on minimizing costs and maintaining sustainable resources. Scheduling of necessary infrastructure and source procurement needs have been identified and are triggered by growth milestones and a reference timeline. The major recommendations include obtaining Council approval and obtaining funding for the short term (5-year) Capital Improvement Program that includes a new 1.1 MGD surface water treatment plant, distribution system piping upgrades, booster station upgrades, and storage tank rehabilitation and new clearwell. The planning and implementation of a new Water Treatment Plant to treat CAP surface water should be commenced immediately.

AJWC should continue to pursue additional CAP rights. A 50% surface water, 50% groundwater supply strategy should be adopted, working toward a 80% surface water, 20% groundwater strategy by 2030. A water quality modeling study should be conducted when considering migrating to surface water use. If the Portalis master planned community develops, it should provide a 3 MGD treatment plant to AJWC to maintain recharge credit bank and sustainable operations.

A non revenue water study should be initiated to determine the feasibility of recovering lost revenue potential. In addition, the feasibility of a joint WTP with the City of Mesa should be studied.

In the next 10 years, planning for the intermediate phase as demand triggers appear should begin. Finally, the Master Plan should be revisited and upgraded (if necessary) by 2020.

SECTION 1
INTRODUCTION

1.1 BACKGROUND

The City of Apache Junction, Arizona, is located in Pinal County approximately 30 miles east of Phoenix. The Apache Junction Water Company (AJWC) is responsible for the administration, design, operations and maintenance of the water system for a portion of the City. As of 2009, AJWC supplies water to a population of approximately 12,750, along with its commercial customers. AJWC operates three wells (Wells 5, 6 and 8), and as a supplemental source, obtains water from the Arizona Water Company (AWC) and the City of Mesa via interconnections. Water from these interconnections is blended with groundwater in storage tanks. Wells 5 and 6 have capacities of 600 and 500 gallons per minute (gpm), respectively. Well 8 has a production capacity of approximately 250 gpm. Water from the wells is conveyed to four system storage tanks located at two booster stations, with a combined capacity of 3 million gallons (MG). Figure 1.1 shows the current system facilities. Figure 1.2 shows a schematic elevation profile of the existing system operations.

Narasimhan Consulting Services, Inc. (NCS) was tasked with developing this Master Plan. It addresses issues related to water resources, water distribution, water quality and system improvements for AJWC from current conditions through build-out. Concurrently, a water distribution model for the system has also been developed by NCS. This model provided the capability to analyze changes to the distribution system and their impacts on water quality, operations and operational costs. This model was used to develop the Master Plan to provide guidance for the orderly expansion of the water service system, including both production and distribution system facilities, and identified the need for system improvements.

1.2 PURPOSE

The purpose of this Master Plan is to provide a comprehensive roadmap by which AJWC can plan and implement a reliable and high quality water supply from now through build-out of the service area. Key goals and issues addressed within this Master Plan include:

- Provide updated water demand projections through build-out based on previous planning documentation and analysis of existing data.
- Plan the efficient utilization of existing and future surface and groundwater resources, and the optimal balance between viable options.
- Using an accurate and calibrated model of the distribution system, determine the required storage, booster and distribution elements.
- Optimize water production and storage strategies to meet water quality regulations and minimize water age and degradation.
- Provide guidance on integrating the Portalis master planned community into the AJWC system with similar water resources and operational characteristics.
- Provide a long term, sustainable water use plan.
- Evaluate options for efficient delivery of surface water (Mesa Interconnect versus separate AJWC water plant).

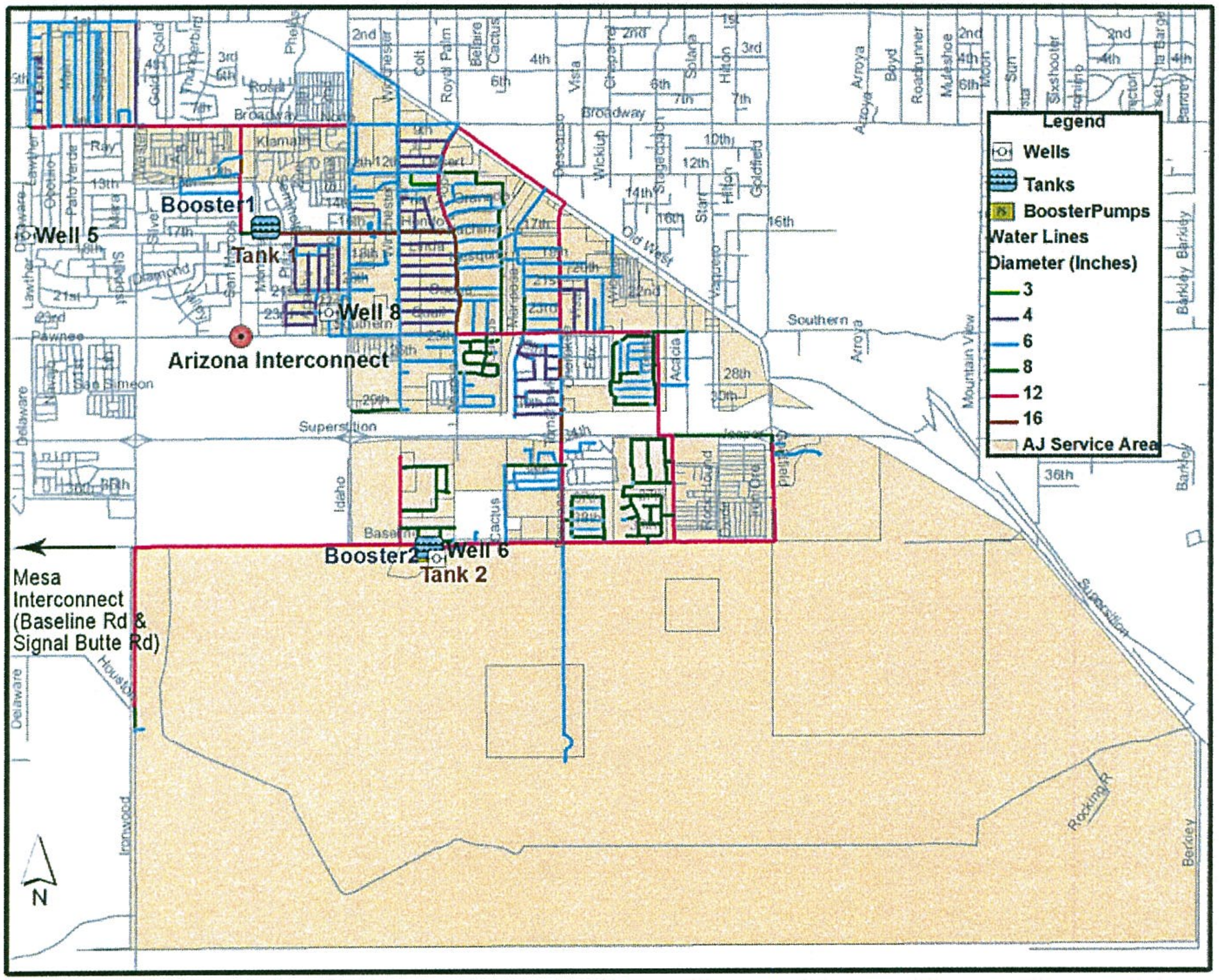


Figure 1.1: Layout of the Apache Junction Water Company Distribution System and Service Area

Final Report
Apache Junction Water Company

AJWC
Apache Junction Water Company

Narasimhan Consulting Services, Inc.

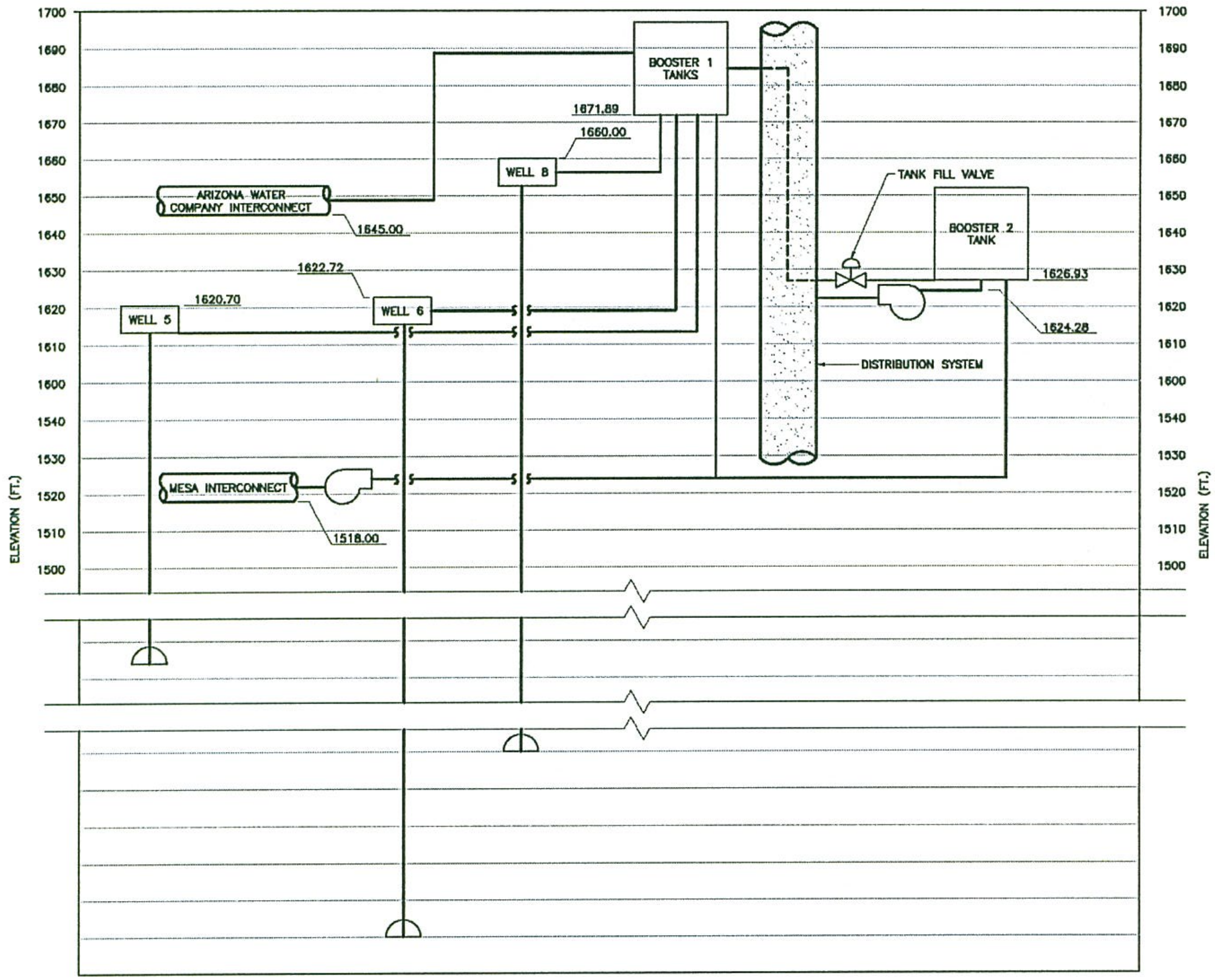


Figure 1.2: Schematic Elevation Profile of Existing System Operations

Final Report
Apache Junction Water Company

- Plan for drought mitigation.
- Provide both a time-phased and demand-triggered Capital Improvement Program (CIP) plan for water production, distribution infrastructure and storage facilities through build-out. Demand triggers allow AJWC to adapt its CIP on actual demand milestones rather than relying on temporal triggers alone.

1.3 APPROACH

The overall approach used in developing this Master Plan was to consider the available and pursuable water resource options, water production alternatives and infrastructure needs. In considering the various alternatives, the potential water resources were balanced based on minimizing costs and maintaining sustainable resources. Scheduling of necessary infrastructure and source procurement needs are triggered by growth milestones, providing separation from a strict timeline in the event future growth proceeds at a slower (or faster) than predicted pace. For this reason, a realistic customer growth rate has been adopted to provide reasonable facility costs for planning future needs. The optimal course of action, including a recommended Capital Improvement Program, is summarized in Section 9.

1.4 REFERENCE DOCUMENTS

- *City of Apache Junction 1999 General Plan.* City of Apache Junction.
- *Apache Junction Water Master Plan*, June 2001, ARCADIS Geraghty & Miller, Inc.
- *Water Master Plan for Lost Dutchman Heights*, April 09, 2009. Wood, Patel & Associates, Inc.
- OnBoard LLC population data from website accessed Feb 24, 2010: http://homes.point2.com/Neighborhood/US/Arizona/Maricopa-County

1.5 ABBREVIATIONS

AFY	acre-feet per year
AJWC	Apache Junction Water Company
AWC	Arizona Water Company
CIP	Capital Improvement Program
EPA	U.S. Environmental Protection Agency
gpm	gallons per minute
MCL	maximum contaminant level
MG	million gallons
MGD	million gallons per day
mg/L	milligrams per liter
NCS	Narasimhan Consulting Services, Inc.
SDWA	Safe Drinking Water Act

1.6 REPORT ORGANIZATION

This Master Plan is divided into major sections as follows:

- Section 1 (Introduction) outlines the background, purpose, approach, reference material and abbreviations.
- Section 2 presents a discussion of water quality and regulations.
- Section 3 describes current and future water demands in the AJWC service area, and the methods future projections were derived.
- Section 4 presents the various source water options.
- Section 5 describes the current and future production facility needs.
- Section 6 presents the existing and future water distribution infrastructure.
- Section 7 summarizes the modeling conducted to identify system requirements.
- Section 8 presents present value capital and operating costs for the various alternatives.
- Section 9 presents the short term, mid term and long term CIP initiatives recommended through build-out.

SECTION 2
WATER QUALITY AND REGULATORY ISSUES

2.1 REGULATIONS

In 1974, Congress passed the Safe Drinking Water Act (SDWA), which requires the United States Environmental Protection Agency (EPA) to establish regulations on limiting contaminants that may be present in public water supplies and represent potential health risks. The SDWA was amended by Congress in 1986 and again in 1996. The EPA sets legal limits for contaminants based on public health protection and the ability of utilities to meet the standards using the best available technology. In addition, EPA rules dictate water testing schedules and procedures, and list acceptable technologies for treating contaminated water. The SDWA allows states to set and enforce their own regulations, providing they are at least as stringent as those set by the EPA.

The 1986 Amendments replaced the original National Interim Drinking Water Regulations with the National Primary Drinking Water Regulations (NPDWRs), and required implementation of Best Available Technologies (BATs) for regulated contaminants. For each contaminant, the EPA sets a public health goal, which is quantified as a Maximum Contaminant Level Goal (MCLG). At this level, a person could drink two liters of water containing the contaminant every day for 70 years without incurring any unacceptable health effects due to the regulated contaminant. While public water systems are not legally obliged to meet MCLGs, they are obliged to meet the MCLs, which are set as close to MCLGs as is practical based on technical and financial challenges.

Secondary Maximum Contaminant Levels (SMCLs) were enacted to provide guidelines for contaminants that may affect the appearance or taste/odor of water, but do not have adverse health effects (e.g., total dissolved solids). SMCLs are non-enforceable under Federal guidelines. The EPA recommends that monitoring for secondary contaminants be performed at intervals no less frequent than those for inorganic chemicals applicable to community public water systems (e.g., three years for ground water systems and annually for the surface water systems).

2.1.1 Groundwater

Systems using groundwater sources must comply with specific rules. These include:

- Groundwater Rule
- Radionuclides Rule

All future groundwater wells used as drinking water sources for AJWC must be assessed and, if necessary, provide mitigation to comply with these rules. Based on water quality data and current disinfection practices, the AJWC's facilities appear to comply with these rules. It may be desirable for AJWC to submit to Arizona Department of Environmental Quality (ADEQ) the 4-log virus inactivation credit.

2.1.2 Surface Water

Surface waters are subject to rules specific to this type of source and to the treatments used in the production of safe drinking water. These rules include:

- Surface Water Treatment Rule
- Interim Enhanced Surface Water Treatment Rule
- Long Term 2 Enhanced Surface Water Treatment Rule
- Filter Backwash Recycle Rule

Any future surface water sources (e.g., CAP) used by AJWC will have to be treated to comply with these rules. Such costs are included in the surface water treatment alternatives discussed in this Master Plan.

2.1.3 Rules Affecting Both Surface Water and Groundwater Sources

In addition to the rules mentioned above, several others apply to all community water systems. These include:

- Primary MCLs
- Total Coliform Rule
- Lead and Copper Rule
- Unregulated Contaminant Monitoring Rule
- Arsenic Rule
- Disinfectants/Disinfection By-Products Rule
- Contaminant Candidate List

Based on a review of water quality data, the AJWC appears to comply with these rules.

2.2 WATER QUALITY

A review of the historical records indicates that the water distributed by AJWC meets the current EPA maximum contaminant levels (MCLs), and the rules discussed above. Although all regulated organic and inorganic compounds are tested regularly for water systems, the following parameters are most commonly critical in Arizona water systems in this area. The current MCLs for these parameters are presented below:

- Nitrate (NO_3): 10.0 milligrams per liter (mg/L)
- Arsenic (As): 0.010 mg/L
- pH acceptable range: 6.5 - 8.5 standard units (SU)

The existing AJWC well sources are compliant with these MCLs, as treatment and blending are used for arsenic compliance.

Another parameter of potential concern is total dissolved solids (TDS). TDS is not regulated for drinking water use, and primarily impacts the taste and appearance of the water. The standards for nitrate and arsenic are primary drinking water standards and enforceable by the Arizona Department of Environmental Quality (ADEQ).

2.2.1 Groundwater

The groundwater quality in the Apache Junction area tends to be elevated in arsenic, pH and slightly elevated in TDS. Arsenic is a naturally occurring element in the soil, relatively common in Arizona. AJWC currently blends water to meet these MCLs. Nitrate levels are also a potential concern, but so far have not exceeded MCLs. It is anticipated that future compliance for arsenic can be met with treatment. For planning purposes, a typical arsenic groundwater treatment train is assumed. For the local water quality profile and anticipated capacities, the most appropriate technique is a wellhead partial stream adsorption treatment system.

2.2.2 Surface Water

AJWC currently has rights to an annual allocation of surface water through the Central Arizona Project (CAP) canal system. The primary concern with CAP source water is the potential for disinfection by-products (DBPs) formation. Typically, CAP source water quality has low turbidity (around 4 NTU), moderate total organic carbon (TOC [4 mg/L]), low specific ultraviolet absorbance (SUVA [2 L/mg-m]), moderate pH (8.3) and alkalinity (140 mg/L as $CaCO_3$), low bromide (0.1 mg/L) and relatively high TDS (700 mg/L). Based on the SUVA data, the source water is not amenable to TOC removal, an important parameter in DBP occurrence. Existing water treatment plants on CAP source water have utilized direct filtration or dissolved air flotation treatment processes because of low source water turbidity levels.

For planning purposes, a typical surface water treatment train is assumed and cost estimated in Section 5. The treatment processes include lined raw water storage, chlorine dioxide pre-oxidation, package water treatment system (Trident or similar) using coagulation, high rate clarification and dual media filtration and chlorine for secondary disinfection. This process was selected based on discussions with AJWC personnel, ability of the process to comply with drinking water regulations and cost comparisons from other similar WTP projects for CAP water.

2.3 CONCLUSIONS

Future water sources will need to be evaluated for drinking water compliance and suitability for treatment. A specific concern for groundwater resources is arsenic. Surface water sources are particularly susceptible to DBP formation. The cost of surface water and groundwater treatment must be considered in context of these regulations for planning updates.

SECTION 3
WATER DEMANDS

3.1 INTRODUCTION

3.1.1 Service Area

Historical water use, current growth trends, and anticipated growth rates were used to estimate future demands. For planning purposes, future growth was considered using two different components: (1) Growth within the existing AJWC service area, and (2) Growth associated with the proposed master planned Portalis community. Future demands were projected for each of these areas separately. In this manner, water resources and distribution infrastructure can be planned separately for both communities, however their interaction and ability to share resources and costs were considered.

3.1.1.1 Existing Developed Community

The AJWC service area is shown in Figure 3.1. Build-out for the established community was defined in the General Plan (based on land use) as 5,404 AFY (acre-feet per year), not including the Portalis development.

3.1.1.2 Portalis

The proposed Portalis development is shown in Figure 3.2. The developer will be responsible for providing wells, surface water facilities and any required treatment to meet demands and comply with SDWA rules. Average day demand at build-out for the Portalis community has been defined as 10.9 MGD (Wood, Patel & Associates, 2009). It is anticipated that the initial demand for this community will be 1.0 MGD, starting in 2012.

3.1.2 Methodology

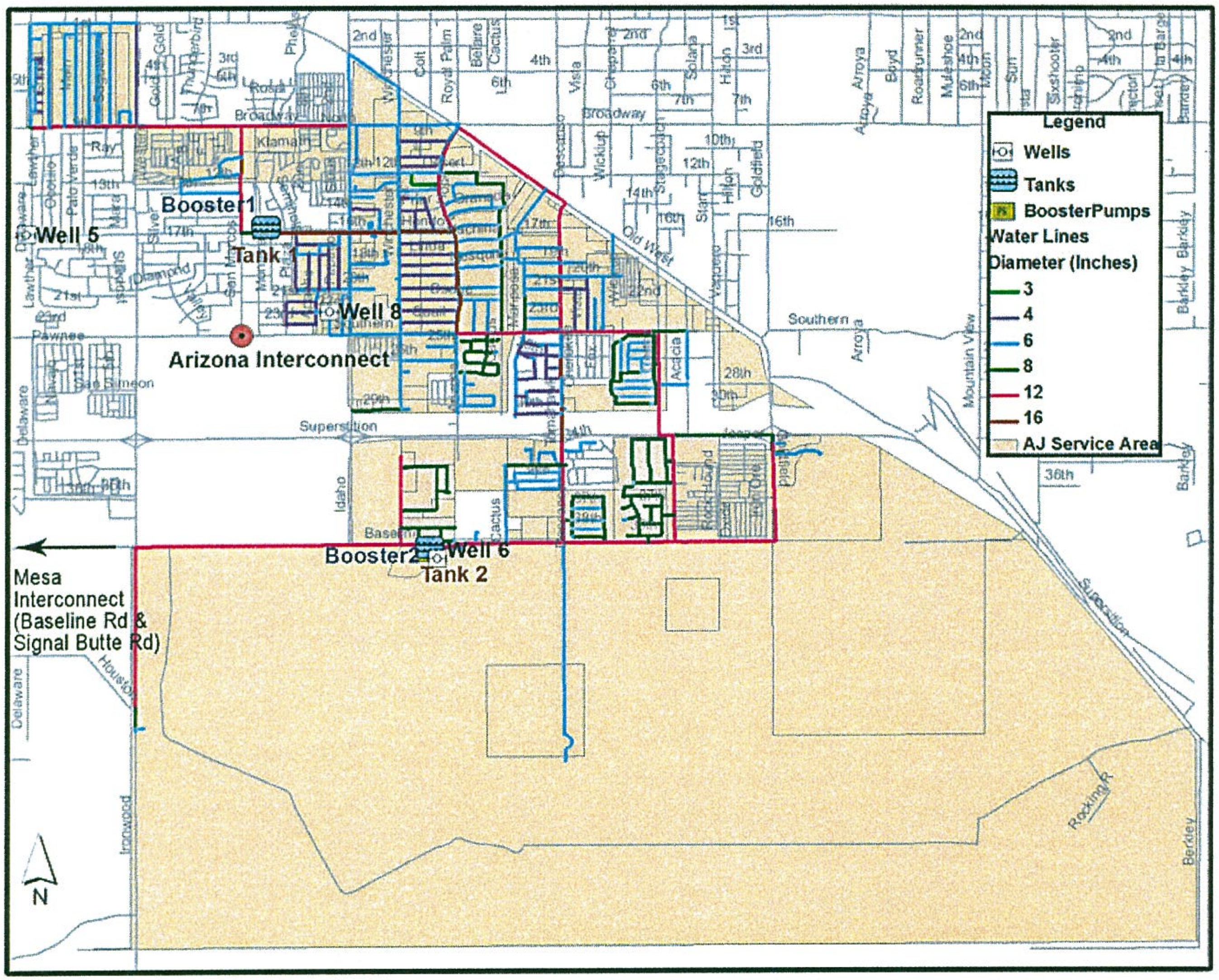
Water demands can vary temporally (i.e., with time) or geospatially (i.e., with location). Temporal variations of demands can be short-term usage variations, such as diurnal water use variations or long-term trending variations (i.e., variations due to increase in customers, etc).

Master planning includes analysis for water resources as well as the water distribution system. For water resources estimation, long-term demand variations are more critical then short term. For water distribution modeling analysis, short term variables, such as diurnal patterns, are more critical.

Long-term variations for demands include trending changes as well as geospatial relative demand changes. Changes in geospatial relative demand occur, for example, when several new customers move into a sparsely populated area, changing the trending demand and at the same time changing the density and the dynamics of the system as increased supply is needed to the area.

Demand estimation was carried out for current as well as future conditions. Demand estimation for current conditions include:

1. Estimating geospatial variation of demands:



Apache Junction Water Company

Figure 3.1: Layout of the Apache Junction Water Company Distribution System and Service Area

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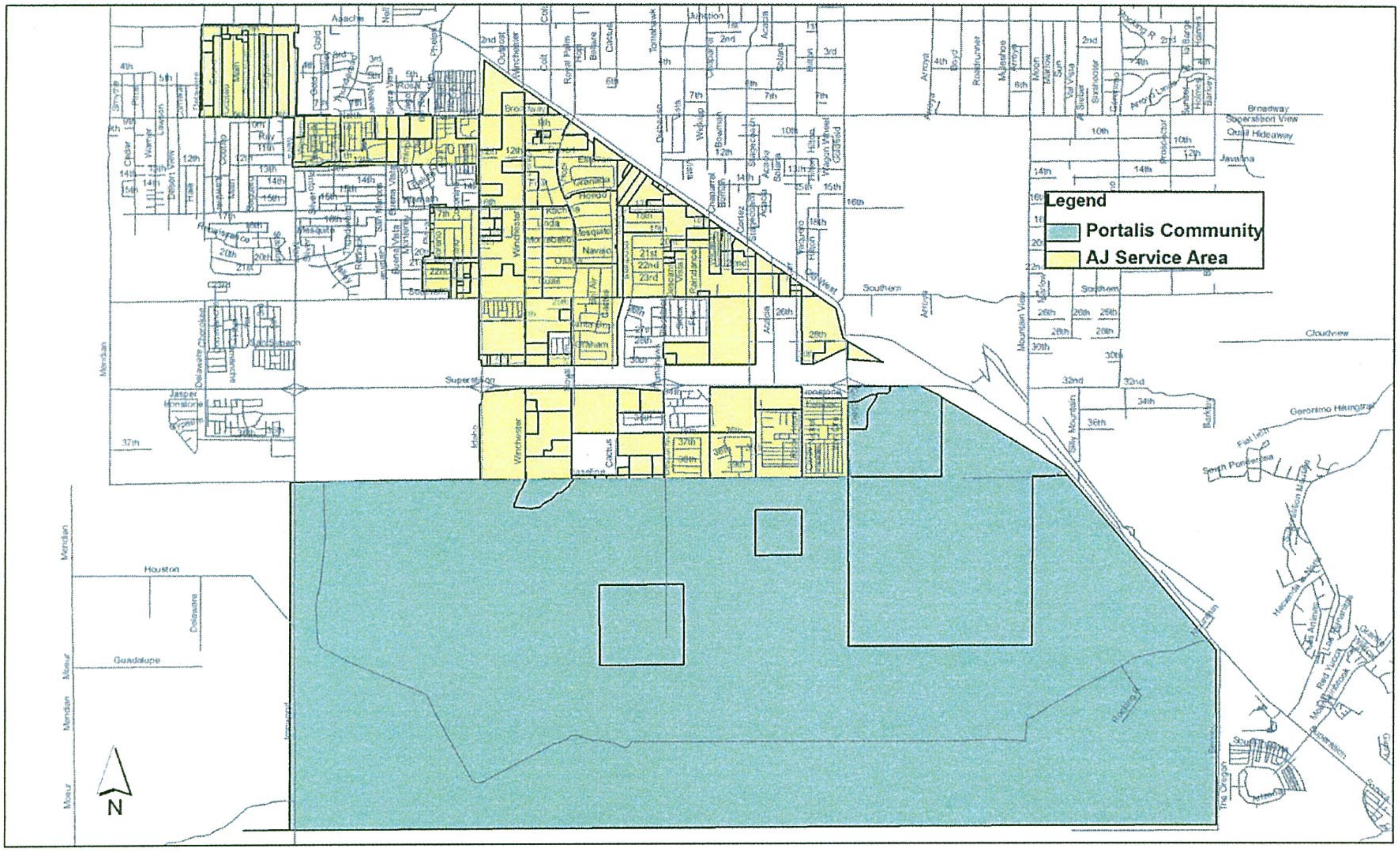


Figure 3.2: Proposed Portalis Master Planned Community Development

This can be done using billing data. Billing data records how much each meter consumed in which month. However, this is not useful for developing demand calculations for periods shorter than a month. At the same time, meters are read at different times each month and thus that difference factor also has to be accounted for.

2. Diurnal variation of demands:

   This data can be obtained from flow meters at pump discharge facilities. However, care has to be taken to ensure that the mass balance accurately reflects customer use demands and not the demands imposed by a tank.

3. Monthly Demand Trending:

   Demands depend on several additional factors, such as weather, temperature, water use, etc. Some of these factors change daily, therefore each month will have a different consumption compared to other months. These monthly demand variations can be used to help the utility prepare for both low and high demand situations. A monthly demand trend factor is used to identify low and high demand months.

Demand estimation for future conditions include:

1. Estimating geospatial variation of demands:

   This can be done in several ways. The most common approach is to use Maricopa County's population quarter section geospatial population data (if available). However, with the recent downturn in the economy, these projections are not realistic. Thus, an alternate technique was used. This technique included using land use projections and identifying per acre usage from the current use patterns, and applying that to develop geospatial projections. This technique was used and escalated to the General Plan demand of 4.85 MGD as a total demand in the existing system.

2. Diurnal variations of demands:

   Diurnal variations developed for current conditions can be used for future predictions. The largest use of diurnal demand variation is to develop a peaking factor.

3. Demand Trending:

   Demand trending can be carried out in several ways. Historical data can be analyzed and extrapolated to predict the future growth rate. Other parameters, such as population increase, can be used to estimate growth rates. In this Master Plan, several data sources as well as current growth rates were used to identify various possible demand trends. In consultation with the City staff, a demand trend that was most appropriate for AJWC was adopted, as discussed below.

Demand estimates were developed for both the existing AJWC service area as well as the Portalis master planned community.

3.2 MONTHLY DEMAND TREND FACTORS

Figure 3.3 shows the monthly water production for the years 2004 through 2009. The average monthly production over this time period is also shown.

Figure 3.4 shows the monthly demand trend factor developed from the data provided by AJWC over several years. The figure shows yearly variation in the demand trend factors and averaged demand variations.

General variation in demands range between 0.9 to 1.1 times the average day demand. This is an unusually flat demand condition throughout the year. From these graphs, a yearly maximum month average day to average day ratio of 1.1 was developed and used.

From previous studies (e.g., the General Plan and other similar communities in the area), a maximum day to average day ratio of 1.8 was also adopted.

3.3 GEOSPATIAL VARIATION OF DEMANDS

Demands vary geospatially each day. The resolution of adapting geospatial variation was to ensure that peak month geospatial variations are addressed. It was ensured that the billing data from the peak month was used to create a geospatial allocation of demands. Please refer to Appendix A for more information.

Allocating future geospatial demands was conducted by using land use classification developed in the City's General Plan. Figure 3.5 summarizes land use zoning for the AJWC service area. Build-out for the established community was defined in the General Plan (based on land use) as 5,404 AFY (acre-feet per year). This was super-imposed with current usage and current meter information to obtain a per acre land usage. This was then converted to total demands for build-out.

3.4 DIURNAL VARIATION OF DEMANDS

AJWC does not have fixed flow meters on the pump discharge headers. There are cumulative gauges that give daily totals for the flow, but do not provide flow or cumulative volume for each hour (or lower time increment). Therefore, additional flow meters were rented to define diurnal flow for a period of five days from August 12, 2009 to August 17, 2009.

Figure 3.6 shows the diurnal flows for these days, and average diurnal demand factors for weekend and weekdays.

The demand factor variation defines the need for storage for equalization purposes.

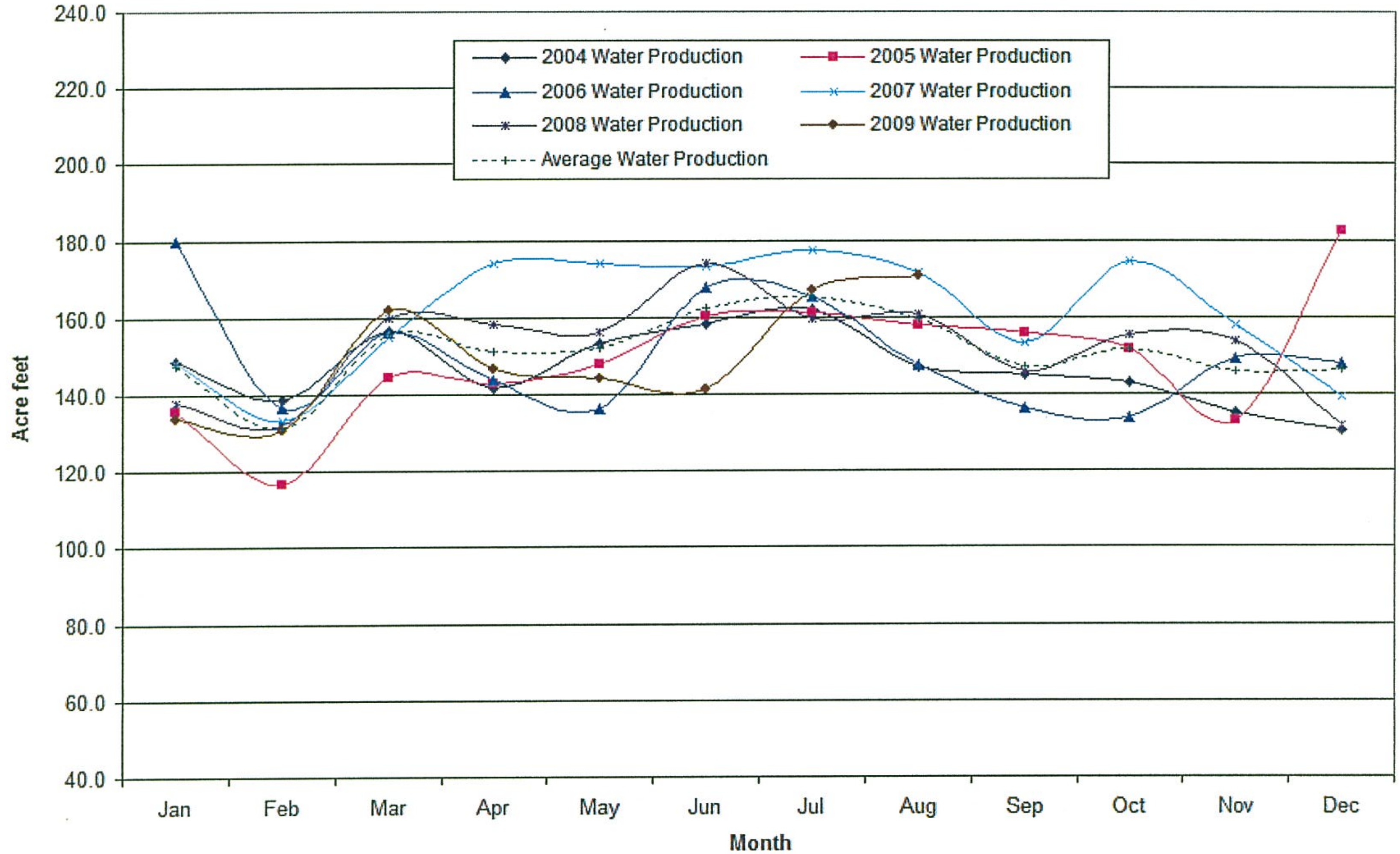


Figure 3.3: AJWC Monthly Water Production for 2004 Through 2009

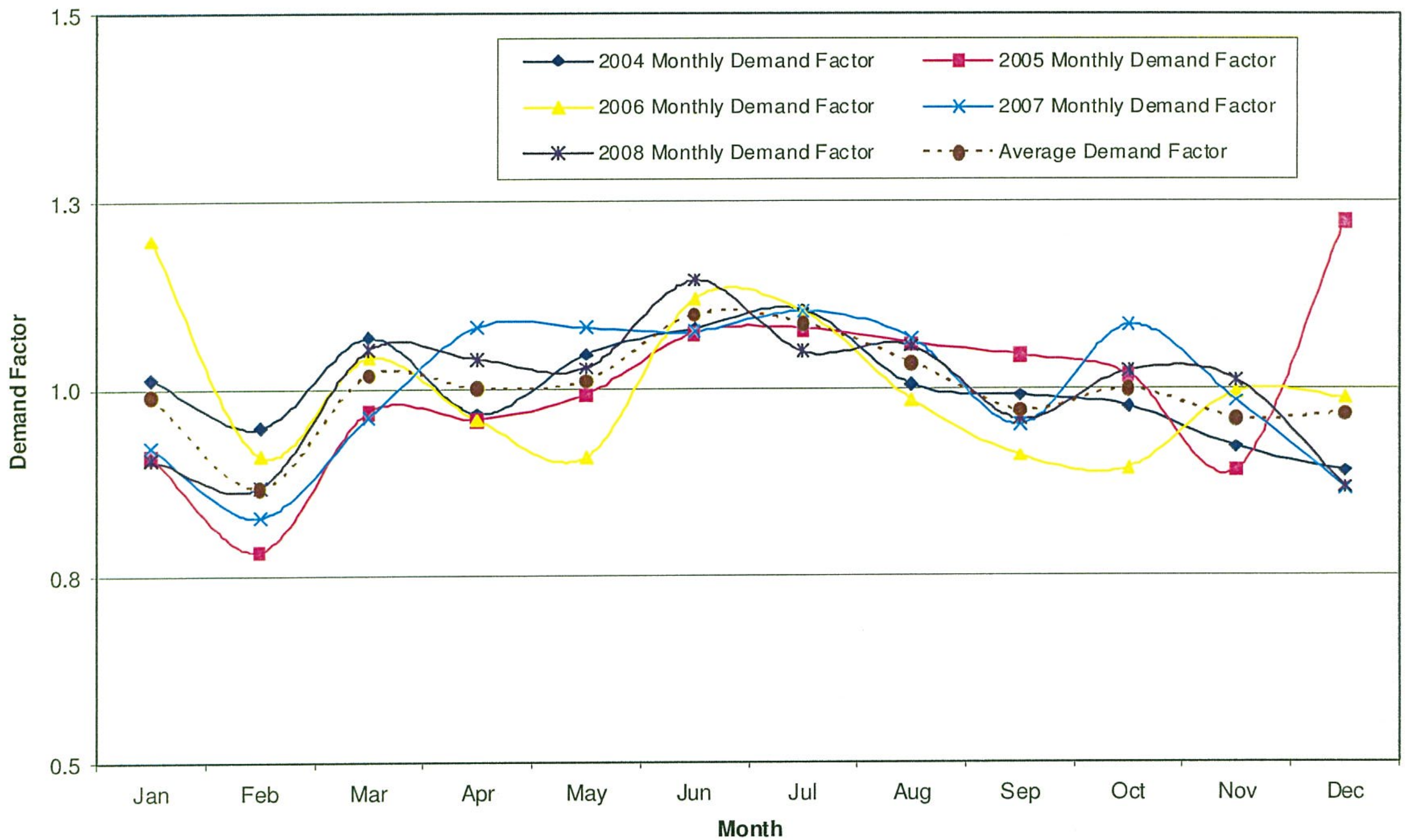


Figure 3.4: AJWC Monthly Production Factor

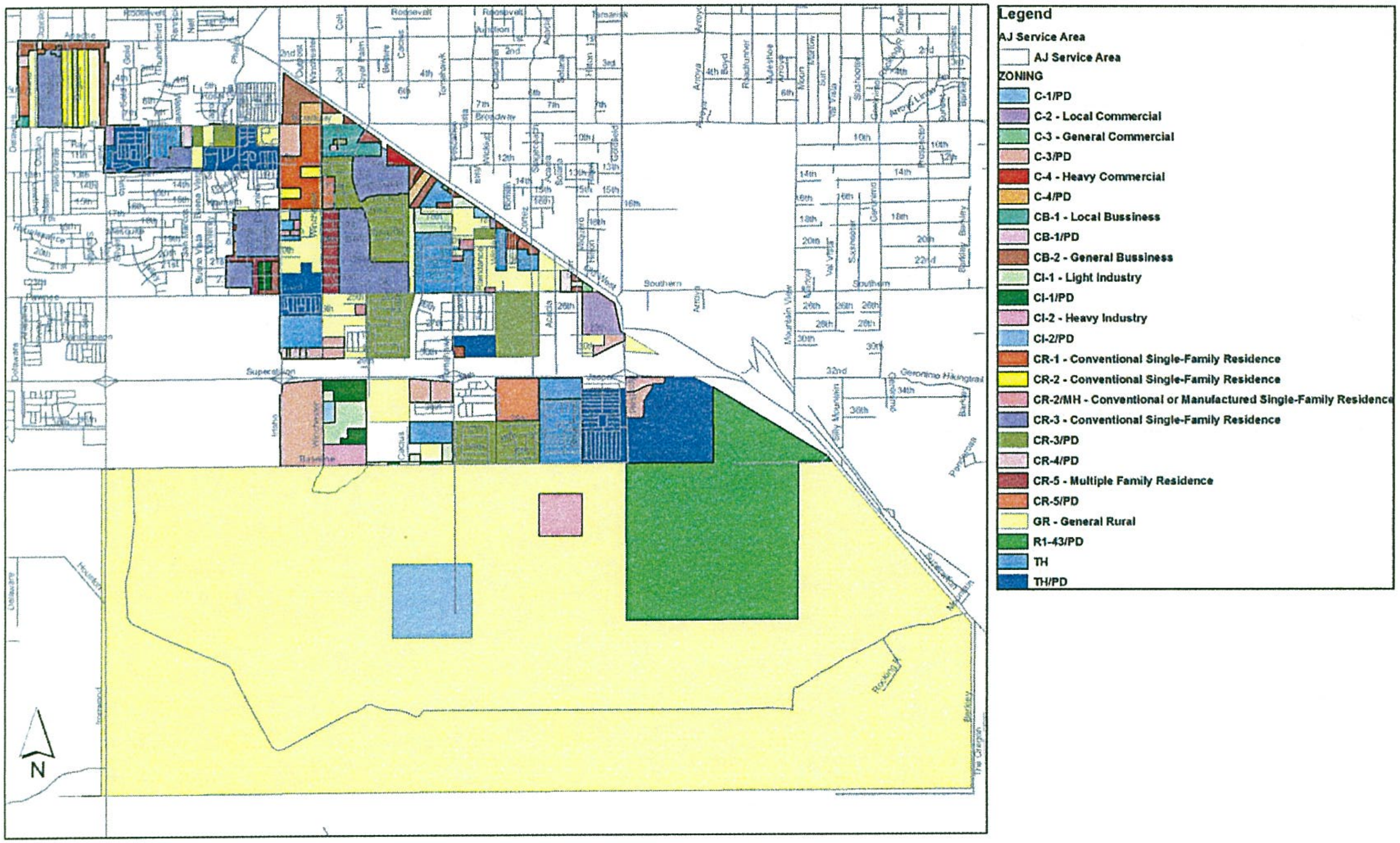


Figure 3.5: Land Use Zoning for the AJWC Service Area

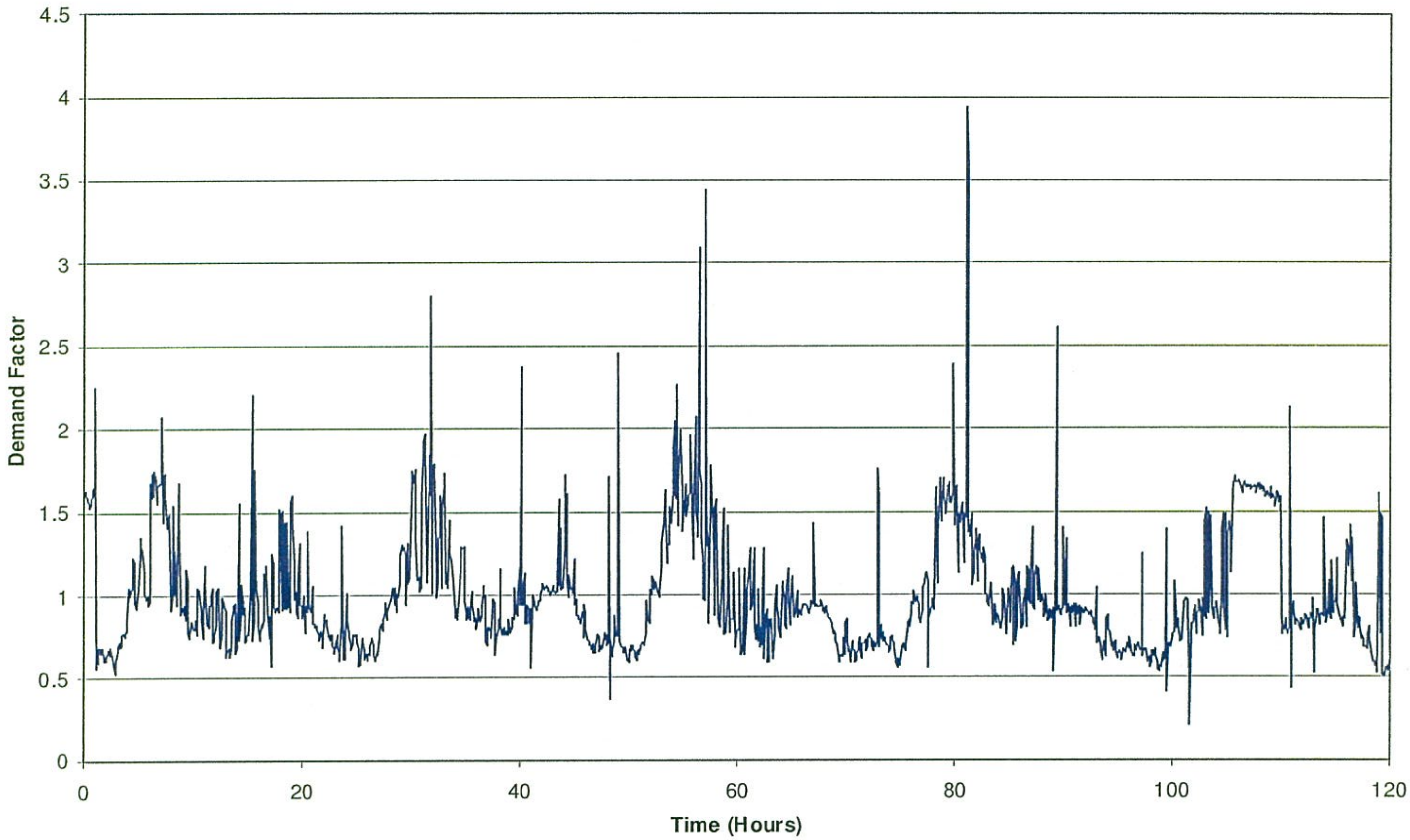


Figure 3.6: Demand Pattern Curve

3.5 DEMAND TRENDING

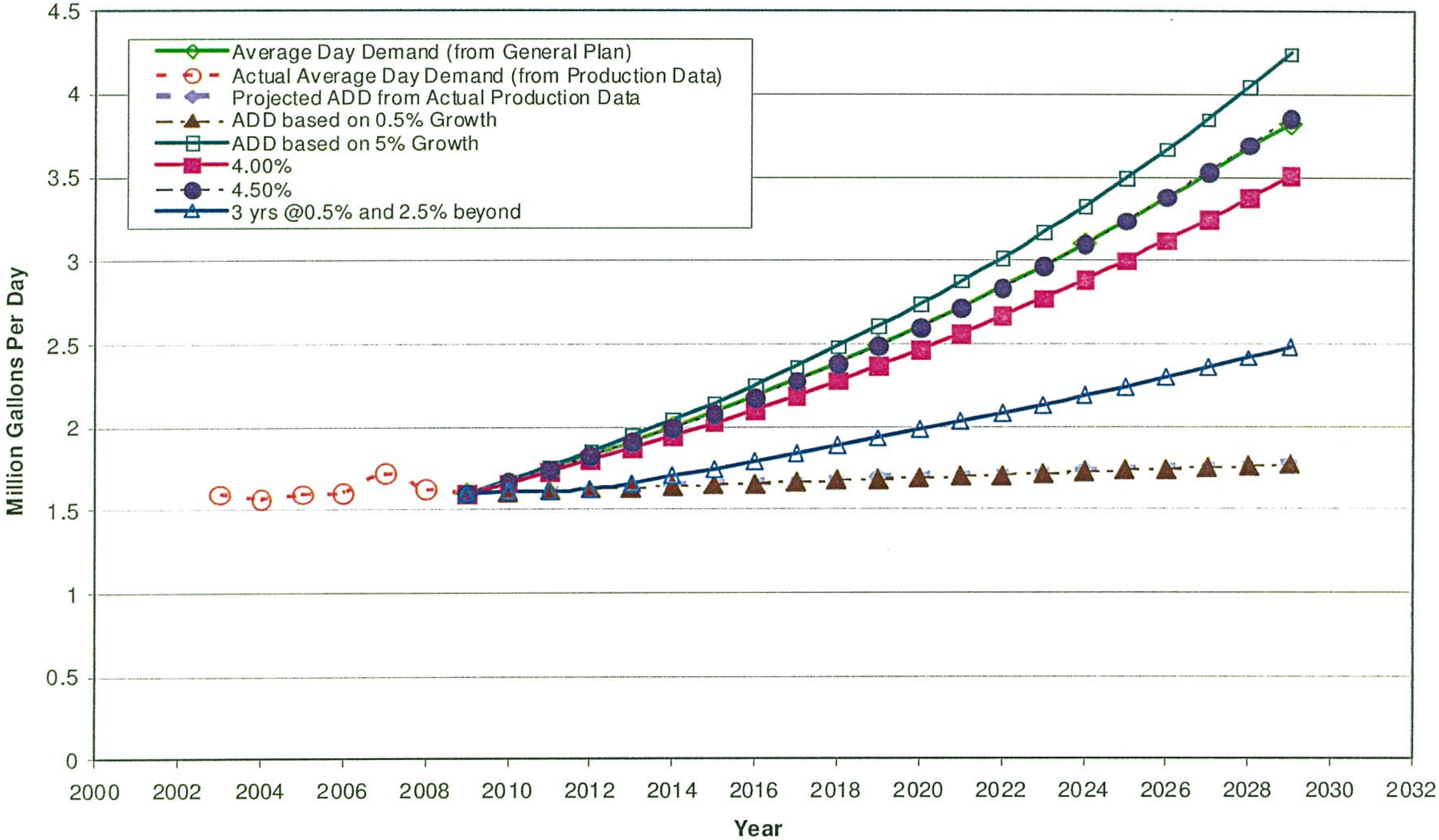
3.5.1 AJWC Service Area

Future average day water demands were forecast to build-out starting with 2009 as the base year. Historical average day water consumption based on available actual records from 2003 through 2009 were plotted to evaluate recent growth rates. Previous projections from the 2001 Water Master Plan (ARCADIS, 2001) and the General Plan were also plotted (average day demands). These were compared to a "best-fit" extrapolation of the historical data, and to generic growth rates of 0.5%, 4.0% and 5.0%. A future demand scenario was developed based on observed growth patterns in similar communities, on best professional judgement and discussions with AJWC. Figure 3.7 summarizes predicted growth rates in average day water demands from several sources and methods: (1) Projections from the 2001 Master Plan, (2) Projections from the Apache Junction General Plan, and (3) An extrapolation of historical data dating back to 2004. Superimposed on this figure are generic 0.5%, 4.0%, 4.5% and 5.0% growth curves.

Given the recent economic downturn since 2007, predictions that seemed reasonable a few years ago are no longer realistic. The 2001 Master Plan forecast is no longer valid. The projections from the General Plan, shadowing a 5% rate of growth, are considered too aggressive given recent trends. The "best fit" extrapolation of the available historic data approximate the 0.5% growth rate, which for planning purposes, is probably appropriate for current economic conditions.

The projections were based on the continuation of current growth at 0.5% until the end of 2012, followed by a consistent 2.5% growth until build-out. This value is consistent with other similar communities in the Phoenix area. Available data from the City of Litchfield Park, a similarly sized community located a similar distance from the Phoenix city center, was analyzed as the basis for this future growth rate. Between 2000 and 2008, Litchfield Park's population grew 34.5% (US Census Bureau). Allowing for relatively accelerated growth (rate of 5%) between 2004 and 2007, Litchfield Park averages a 2.5% annual growth rate during a period of economically sustainable growth (i.e., neither boom nor recessed) between 2000 and 2004. By comparison, the Ahwatukee Foothills community in Phoenix showed a 3.0% average annual growth rate between 2000 and 2007 (OnBoard LLC, 2007).

Figure 3.8 illustrates the predicted growth in maximum monthly average day demands for the existing community. At the projected growth rates of 0.5% per year until 2012 and 2.5% thereafter, build-out is expected to occur in 2056. Figure 3.9 shows these projections for the existing community for maximum monthly average daily, the maximum day and the peak hour (on maximum day) demands.



Average Day Demand (from General Plan)
Actual Average Day Demand (from Production Data)
Projected ADD from Actual Production Data
ADD based on 0.5% Growth
ADD based on 5% Growth
4.00%
4.50%
3 yrs @0.5% and 2.5% beyond
Million Gallons Per Day
Year
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
2000
2002
2004
2006
2008
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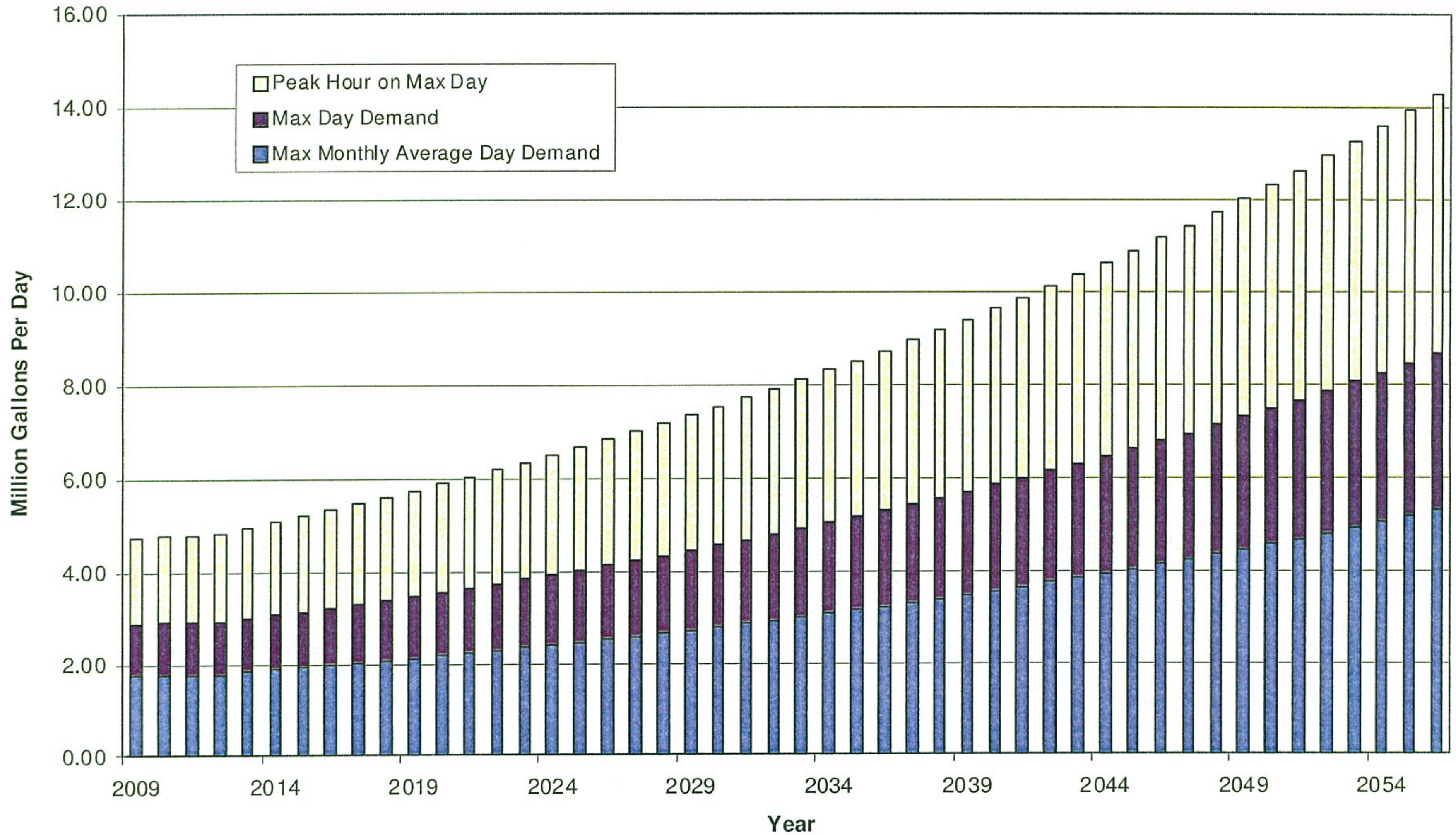

Figure 3.9: AJWC Existing Developed Community Predicted Maximum Monthly Average Day, Maximum Day and Peak Hour Demands

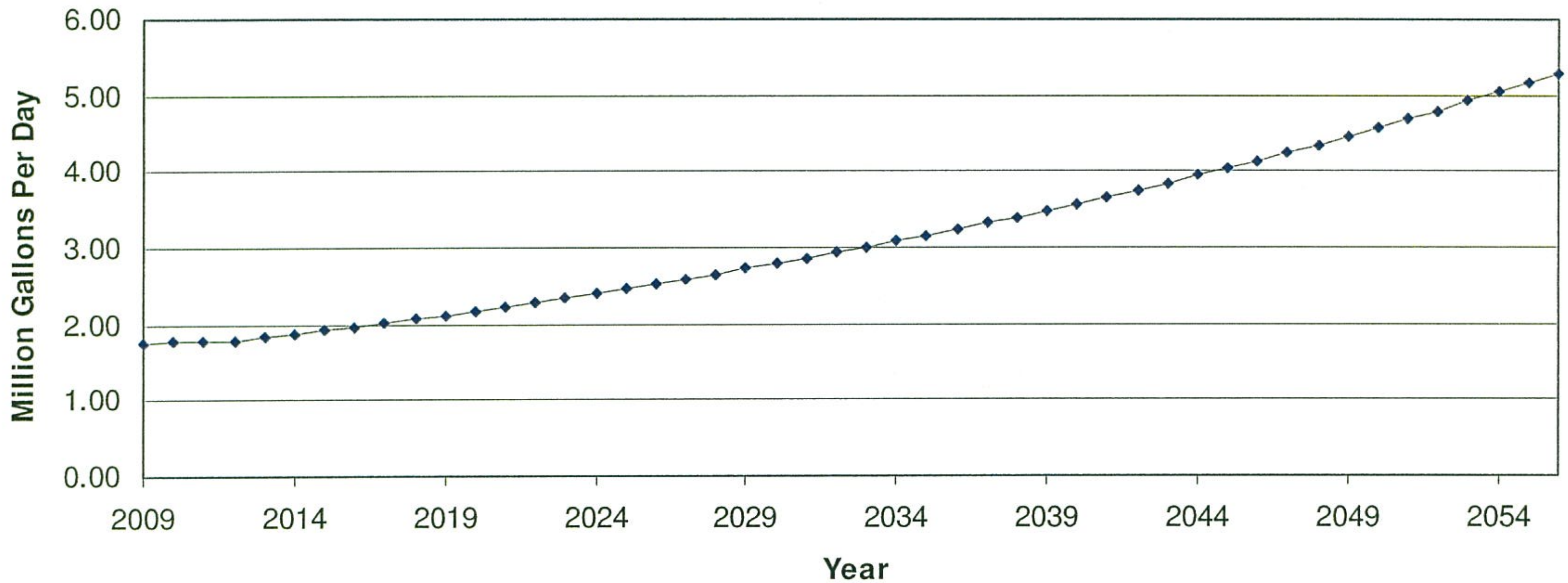

Figure 3.8: Projected Growth in Maximum Monthly Average Day Demands for Existing Community

3.5.2 Portalis Master Planned Community

Portalis is a Master Planned Community. Its growth rate is usually different and faster from the general growth rate of the rest of the City because of financial implications of slower growth rates. Similar sized utilities, such as the City of Litchfield Park, showed a growth rate that was similar to the growth rate proposed in this study. There is no impact of the growth rate on the current CIP or future system upgrades. However, the growth rate will define the water use/recharge and CAP credit balance.

The Portalis development is expected to grow at 5.8% per year. This rate of growth is based on observed growth of the community of Anthem, Arizona, a similar master planned community to Portalis. Available data indicates the community grew 67% between 2000 and 2007 (OnBoard LLC, 2007). Assuming an annual 10% growth spurt during boom years (2005 to 2007), a growth rate of 5.8% per year was back calculated for the more sustainable period of 2000 to 2004.

Figure 3.10 illustrates the predicted growth in maximum monthly average day demands for the Portalis development. In order to meet the expected maximum monthly average day demand in 2012, a 1.0 MGD reliable capacity is required. This capacity expectation is based on the observed growth rate and needs of Anthem, Arizona, a similar development to the Portalis community.

At the projected growth rate of 5.8% per year, build-out is expected to occur in 2056. The build-out capacity required at build-out will be 12.81 MGD (maximum month average day demand).

3.5.3 Storage/Production Capacities

Figure 3.9 illustrates the future requirements in terms of water use demands on the established community system. There are several ways to provide the required volumes. Maximum monthly average day demands could be provided by production capacity, and maximum day and/or peak hour demands could be provided by storage capacity. Any combination between these two extremes are possible. For example, it may be feasible to provide enough production capacity to meet the maximum day scenario. The various alternatives are addressed in Section 5.

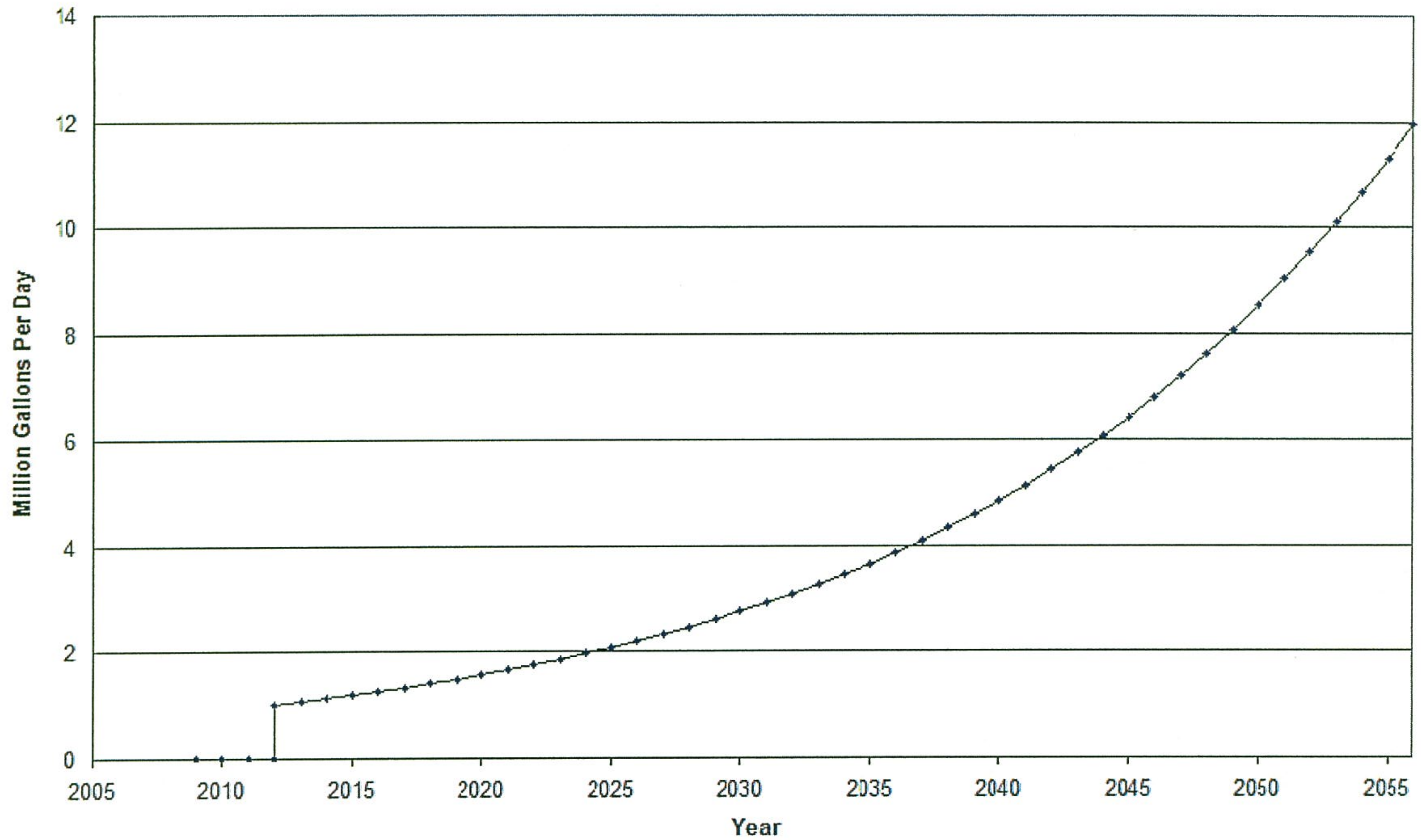

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Figure 3.10: Projected Growth in Maximum Monthly Average Day Demands for Portalis

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SECTION 4
WATER RESOURCES

4.1 RESOURCES OVERVIEW

AJWC's current water resources include groundwater supply using three production wells, and surface water supply using their Central Arizona Project (CAP) allotment. The options for future groundwater sources include developing new wells for the established AJWC service area and new well development for the Portalis community. Wastewater recharge credits are purchased and accumulated in a recharge credit bank, which can be applied to future overdrafts of groundwater. Surface water resource options include usage through the Arizona Water Company or City of Mesa interconnections, or recharge of CAP water. The portion of the annual CAP allotment not used for potable supply is available for recharge and recharge credit. For drinking water treatment, AJWC can chose to take delivery of CAP water treated by the City of Mesa through an existing agreement, or alternatively build its own treatment plant in the future. AJWC desires to balance the various sources to obtain a sustainable, economically feasible arrangement through a blend of groundwater wells, surface water treatment and wastewater recharge.

4.2 CONJUNCTIVE USE PROGRAM

The optimal blend of groundwater and surface water resources is one which is cost-effective and considers the balance between utilizing groundwater resources without depleting the reserve of recharge credits. In the long run, the desired goal is an 80% surface water, 20% groundwater split. In working toward that goal, the feasibility of implementing either a 50% surface water, 50% groundwater blend or a 75% surface water, 25% groundwater split are considered here.

4.2.1 Effluent Recharge, Recovery and Reserve Criteria

Currently, 80% of effluent is recharged and 20% is used in landscaping. No potable water is used for turf irrigation or landscaping. AJWC currently has 30,000 acre-feet (ac-ft) in recharge credits, and is currently buying 1,200 ac-ft/yr.

4.2.2 CAP Recharge

All current wells in the AJWC system are classified as recovery wells (using recharge credits).

4.2.3 Water Use Balance

A conceptual water resource balance is shown in Figure 4.1. AJWC customer demand is met with supply from groundwater pumping and surface water from AJWC's CAP allotment. A portion (25%) of this demand goes to consumptive use, such as garden watering, and the remainder (75%) is treated at the Superstition Mountains Communities Facilities District No. 1 wastewater treatment plant (WWTP). About 20% of the WWTP effluent is used for irrigation, and 80% is recharged and is accumulated in credits in a groundwater recharge bank. These credits are available as a groundwater resource which can be pumped to supply AJWC customer demand.

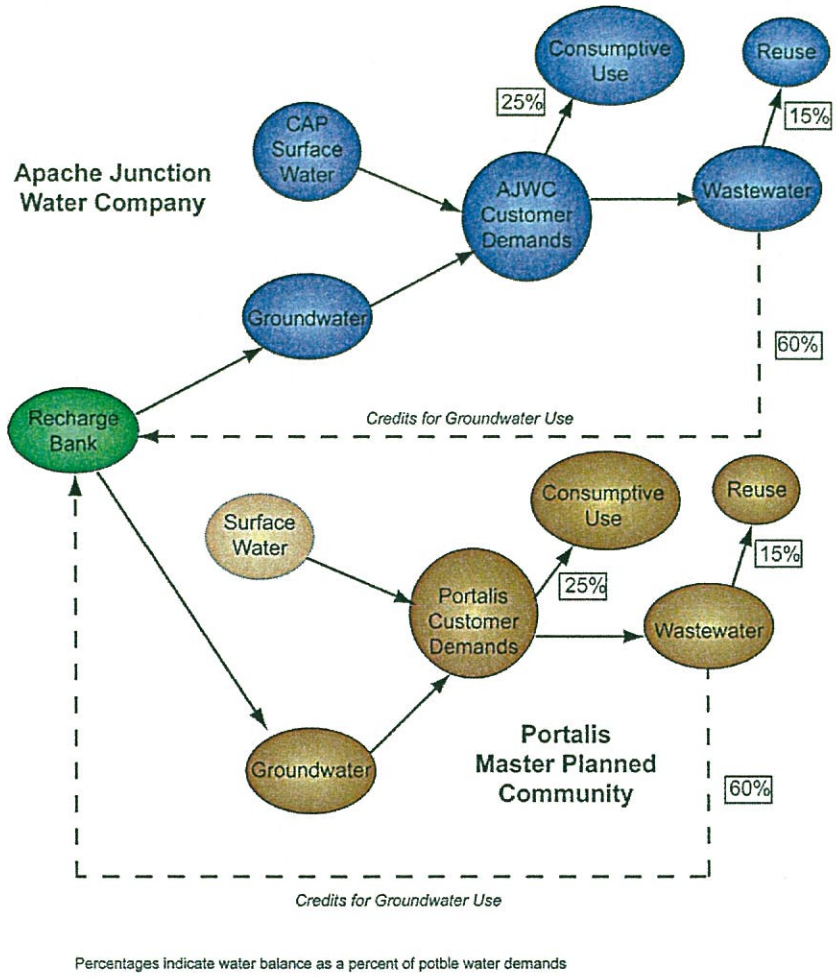

Figure 4.1: AJWC's Water Resource Balance Diagram

For Portalis, customer demand will be supplied through surface water and groundwater. It is assumed that similar to AJWC, about 25% of the demand will be consumptive use, and that 75% will be treated at the WWTP. About 20% of the effluent will be reused as irrigation, and 80% will be recharged into the groundwater recharge bank.

4.3 GROUNDWATER RESOURCES

4.3.1 Operational Constraints

Primary operational concerns with groundwater resources are the capacity of installed wells and water quality. It is assumed, based on historical experience, that future wells within the AJWC service area will be limited to a 600 gpm pumping capacity. Water quality may require treatment or blending for arsenic and/or possibly nitrate contamination.

4.3.2 Drought Susceptibility

Groundwater resources are not subject to peaking limits, seasonal dry-ups and drought, notwithstanding capacity limitations. Given that Arizona is a junior rights holder with respect to Colorado River resources (and CAP water rights), a reliable groundwater source is critical in securing future water reserves. A healthy reserve of groundwater credits is desired when drought conditions threaten surface water sources, therefore, it is important to maintain this reserve. Banked groundwater credits should be maintained at a minimum of 10,000 ac-ft (3,260 MG).

The target of maintaining 10,000 ac-ft of banked recharge credits in the long term provides AJWC with sufficient capacity to meet the average day demand at build-out for five years using only groundwater sources, provided wastewater is recharged continuously for aquifer sustainability.

In order for the Portalis system to meet the same reserve capacity criteria (i.e., meet the average day demand at build-out for five years using only groundwater sources), long term banked recharge credits need to be maintained at 24,000 ac-ft. Thus, in the long term, a total of 34,000 ac-ft would be needed to protect both communities from a 5-year extreme drought condition.

4.4 SURFACE WATER RESOURCES

4.4.1 Central Arizona Project

The AJWC has a CAP allocation of 2,919 ac-ft/yr (2.61 MGD). AJWC receives recharge credit for a portion of this surface water allocation not used and recharged.

AJWC has been accumulating credits since 1997, and, as of 2009, has accumulated 30,000 ac-ft 9775.54 ~~(9.78 MG)~~. This balance of storage credits can be applied to future overdraft of groundwater use, if needed, to meet future demands as expansion occurs.

AJWC also has an agreement with the City of Mesa, to receive treated CAP water through an interconnection to the Mesa water system. This agreement, signed March 17, 2006, stipulates that the City of Mesa will provide treatment and delivery of AJWC's CAP allotment (2,919 Ac-ft/yr) at an in initial cost of $254.56/MG used, plus a capacity charge of $9,380.00 per month based on a usage of 0.6 MGD. These charges are adjusted based on actual usage. The $256.56/MG cost is adjusted annually on the effective date based on the *Consumer Price Index - All Urban Consumers* (CPI), as published by the US Bureau of Labor Statistics, from the same month of the previous year, using the month preceding the effective date. The capacity charge is adjusted annually based on actual usage. Based on actual usage and billings, the unit cost of water to AJWC under this agreement is $1.00 per 1,000 gallons. For planning purposes, this cost is assumed to increase by 10% for future unknowns, contingencies and changes in the agreement. Also, in future years, a 2% per year increase was considered for the CPI.

Build out average day demand for AJWC is 4.8 MGD, while that of Portalis is 10.9 MGD. The total demands imposed by both developments together is approximately 15.7 MGD. From the historical records, it is observed that the total recharge to demand ratio is approximately 0.6. This means that approximately 60% of 15.7 MGD of consumed water would be recharged leaving about 15% water for reuse purposes (while 25% is consumptive use). Therefore, to maintain a usage rate that does not either build up a bank or draw a bank down, groundwater can only be used as much as it can be recharged. The total groundwater use would be approximately 9.4 MGD. Approximately 6.3 MGD of surface water would be required for build-out. This corresponds to CAP credits of 7,033 ac-ft/yr. AJWC has a CAP allotment of 2,919 ac-ft/yr. An additional 4,114 ac-ft/yr would be required in the long term under this sustainable scenario.

4.5 INTERCONNECTIONS

AJWC has emergency interconnections with the City of Mesa and with the Arizona Water Company (AWC). It is AJWC's intent to use the City of Mesa as the primary interconnect source and retain AWC as an emergency backup source.

4.6 NON-REVENUE WATER

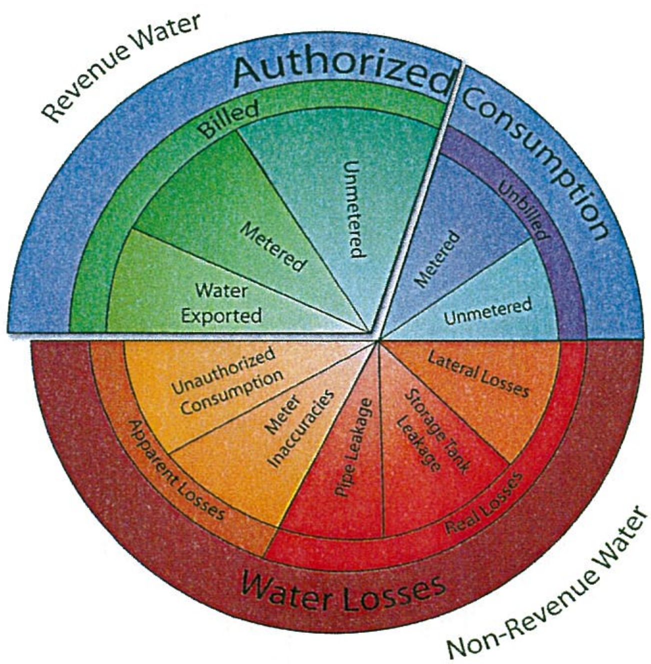

Figure 4.2: Revenue Water vs. Non-Revenue Water

Potential revenue recovery is attainable through management of AWJC's system unaccounted water losses. Non-revenue water can be composed of unbilled authorized consumption, such as internal use, but also from unauthorized consumption (theft), customer meter inaccuracies, leakage from transmission and distribution mains, storage tank overflows, and leakage from service connections (Figure 4-2).

It is recommended that AWJC conduct a detailed non-revenue study to determine what mitigative mechanisms are possible and the feasibility of recovering lost revenue.

4.7 WATER SUPPLY OPTIONS

AJWC currently has 30,000 acre-feet (ac-ft) in accumulated recharge credits, and is purchasing wastewater recharge credits at a rate of 1,200 ac-ft/yr. In addition, AJWC has a CAP allocation of 2,919 ac-ft/yr, and can receive recharge credit for the potion of this surface water allocation not used and recharged. This balance of storage credits can be applied to future overdrafts of groundwater use, if needed, to meet future demands as expansion occurs.

The AJWC service area can be supplied by one of the options below:

1. **Continue using groundwater (similar to the existing strategy):**
   This is not a recommended option because it may become expensive to sustain the assured water supply designation. Additionally, it may deplete groundwater sources and could hurt the capacity of the utility to supply water in the event of a drought.

2. **Utilize surface water from interconnections (primarily the 16-inch interconnect from Mesa):**
   The current goal of the utility is to reach 80% supply of the existing demands using surface water from the City of Mesa. The interconnect is on Baseline and Signal Butte Rd. There is a 16-inch line available that supplies both Storage Tank #1 and #2. This 16-inch line can supply up to approximately 5 MGD without much headloss. The infrastructure is already built for this option. There is an Arizona Water Interconnect that can supply 250 gpm of flow to AJWC as well. However, it is AJWC's preference to keep this as an emergency interconnect only. Therefore, this connection was not used in any comparisons in this Master Plan.

3. **Construct an AJWC owned Water Treatment Plant:**
   Under this option, AJWC will develop a new water treatment plant (WTP) with a capacity to supply 80% of demands for a maximum month average day condition. The peak month variations would be handled using the water from the City of Mesa interconnect. This would allow developing a utility-owned WTP without excessive costs. A cost benefit analysis and recharge credit analysis were performed to determine the most cost-effective and value-added strategy for AJWC customers. Section 4.8 compares several options and their impacts on recharge credits available to AJWC. Section 4.9 considers water supply cost comparisons for Options #2 and #3 presented below.

4. **Share plant capacity at the City of Mesa Water Treatment Plant:**
   If the total present worth cost of this option is significantly lower than Option #2 or #3, then this could be a viable alternative. Through this option, AJWC will own production capacity at the new City of Mesa WTP. A separate study should be conducted to address viability of this option.

4.8 WATER SUPPLY - RECHARGE CREDIT COMPARISON

Three scenarios were considered for analyzing the status of the recharge credit bank:

(1) Baseline surface water usage (1.0 MGD consistent with the current baseline condition water use strategy)
(2) Meeting 75% of demand with surface water, and 25% of demand with groundwater
(3) Meeting 50% of demand with surface water, and 50% of demand with groundwater

Scenario 1 is illustrated in Figure 4.3. At the predicted rate of future demand, current source water usage, and current rate of recharge credit accumulation, the bank of recharge credit will be exhausted by 2045.

Scenario 2 is illustrated in Figure 4.4. Increasing the portion of future demand served by 75% surface water, and 25% groundwater will enable recharge credits to increase and stabilize over the planning period to build-out. This scenario, as in Scenario 1, assumes that the current rate of credit accumulation, without excess CAP credit purchase, is maintained.

Scenario 3 is illustrated in Figure 4.5. Increasing the portions of future demand to be supplied equally by surface and groundwater provides a balance in resources and maintains a desired target of long-term reserve capacity (10,000 ac-ft) until build-out.

Assuming an 80% and 20% surface water to groundwater ratio for the AJWC service area and a total of 6.3 MGD surface water treatment plant requirement, Portalis will require a new treatment plant (or expansion of an AJWC treatment plant) to 3 MGD. Figure 4.6 shows a graph of recharge credit bank accumulation with the conjunctive use strategy including the Portalis master planned community.

4.9 WATER SUPPLY COST OPTIONS

In this section a discussion of the cost comparison of utilizing surface water from the interconnect versus developing AJWC's own WTP is presented. Section 4.9.1 describes utilizing the City of Mesa interconnect, while Section 4.9.2 describes developing an AJWC WTP.

4.9.1 Treatment by City of Mesa, Wholesale to AJWC

As detailed in Section 4.4.1, AJWC has an agreement with the City of Mesa to receive treated CAP water through the interconnection to the Mesa water system. Based on actual usage and billings, the unit cost of water to AJWC under this agreement is $1.00 per 1,000 gallons. This cost was increased by 10% for future unknowns, contingencies and changes in the agreement. Also, in future years, a 2% per year increase was considered for the CPI.

4.9.1.1 1.0 MGD Surface Water Usage with Mesa Interconnect

- Annualized 20-year costs, including groundwater costs: $449,000
- Present value (20 years, 6%), including groundwater costs: $5,158,000

This option assumes continued annual purchase of wastewater recharge credits (1,200 ac-ft per year) for sustainability and that the annual CAP allotment is purchased only equal to the need for surface water until the recharge credit bank of 30,000 acre-ft is reduced to 10,000 acre-ft (Year 2040). After 2040, additional CAP credits would be purchased to replenish the groundwater supply to maintain a 10,000 acre-ft bank.

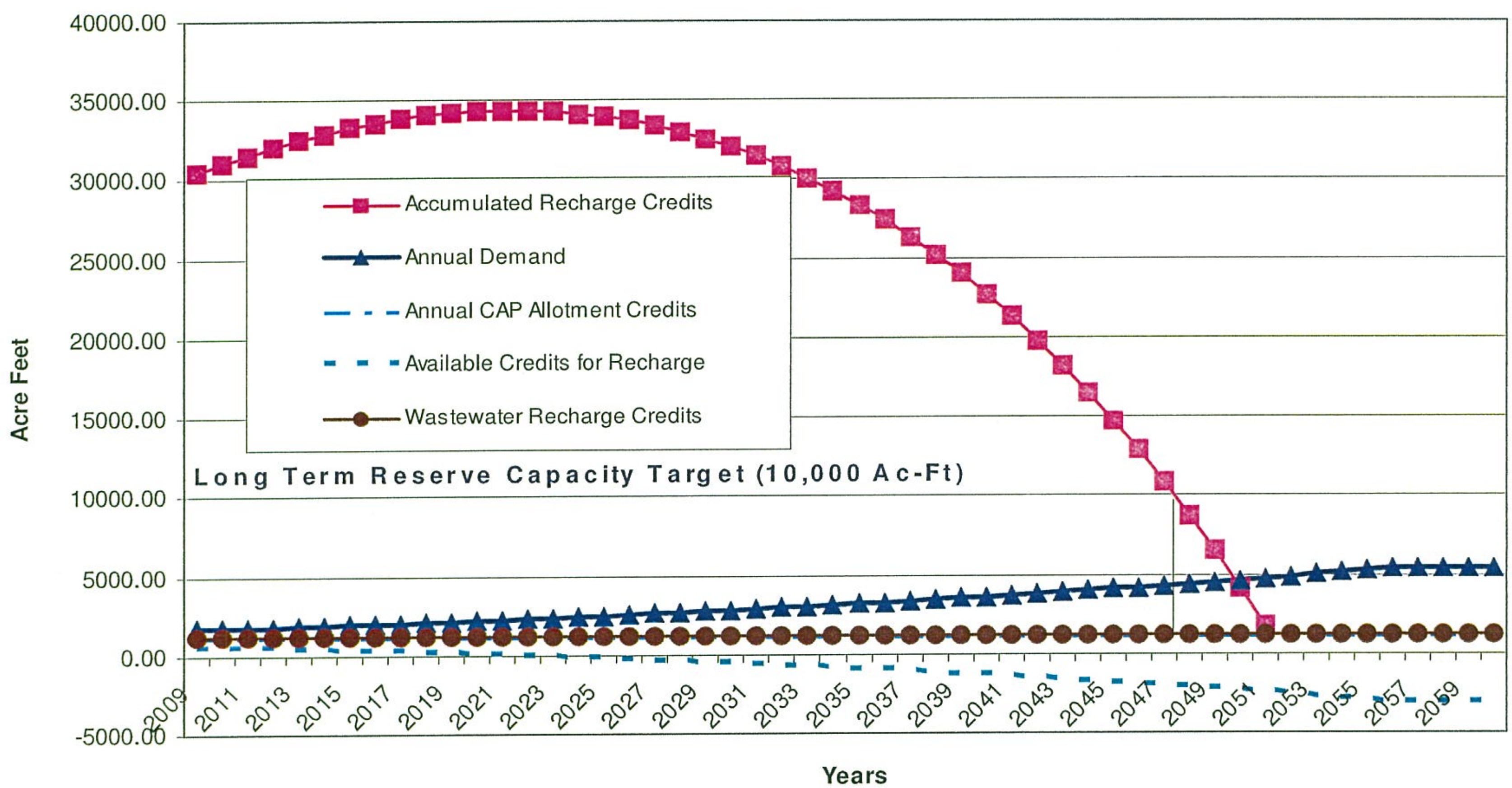

Figure 4.3: Scenario 1 - Current Condition - 1.0 MGD Surface Water Use

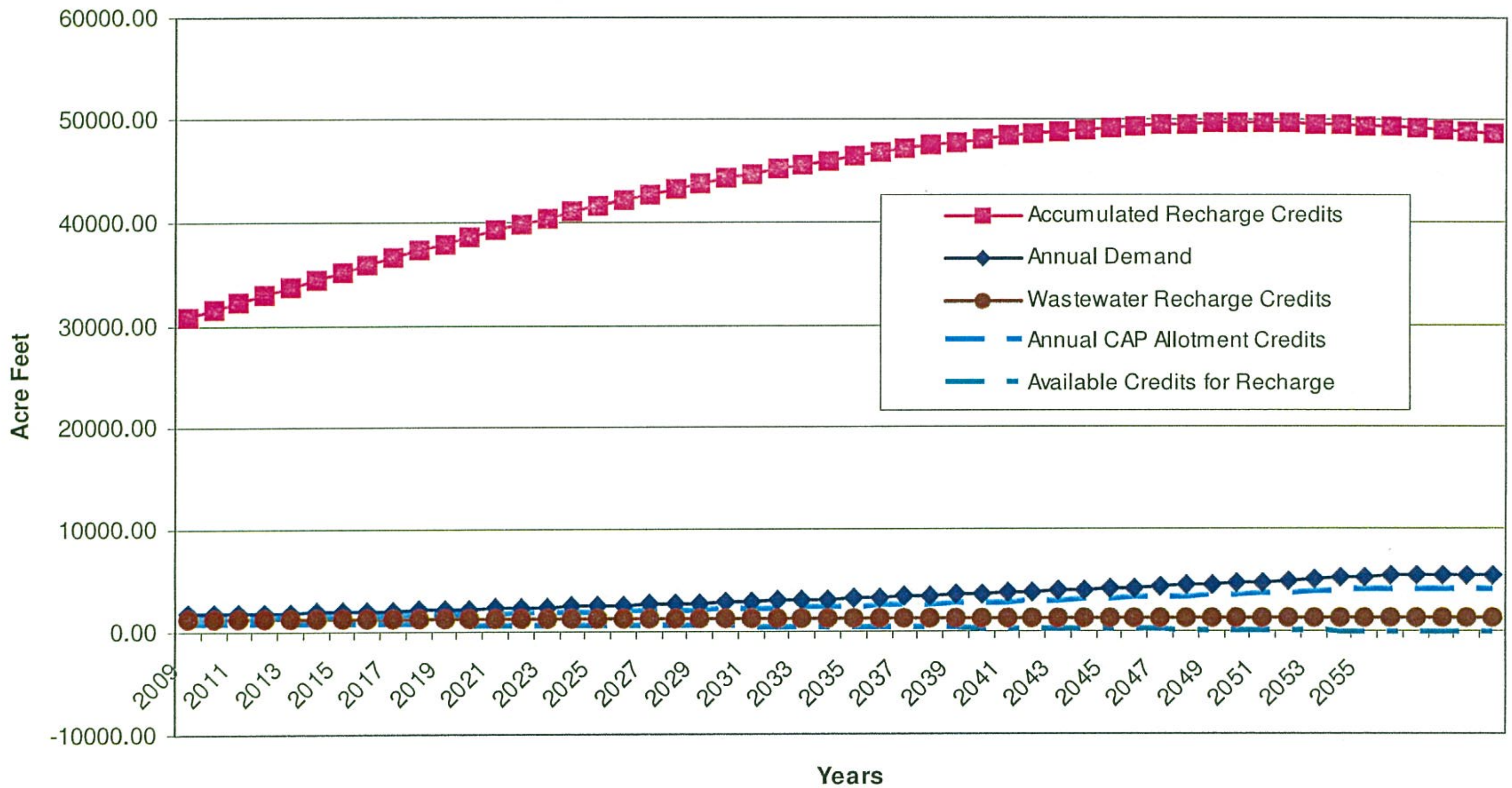

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Figure 4.4: Scenario 2 - 75% Surface Water and 25% Groundwater

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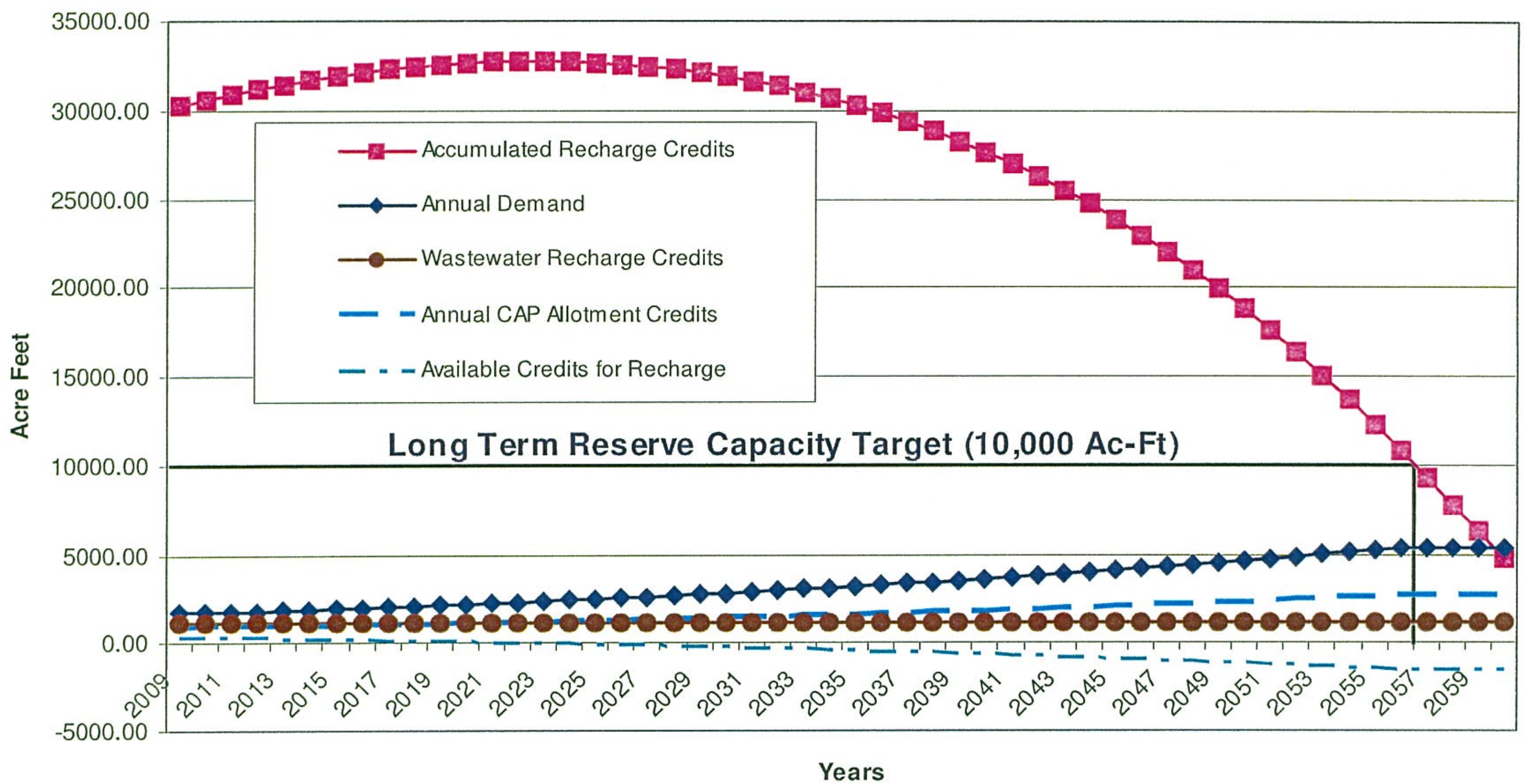

35000.00
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Acre Feet
Accumulated Recharge Credits
Annual Demand
Wastewater Recharge Credits
Annual CAP Allotment Credits
Available Credits for Recharge
Long Term Reserve Capacity Target (10,000 Ac-Ft)
2009
2011
2013
2015
2017
2019
2021
2023
2025
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Years

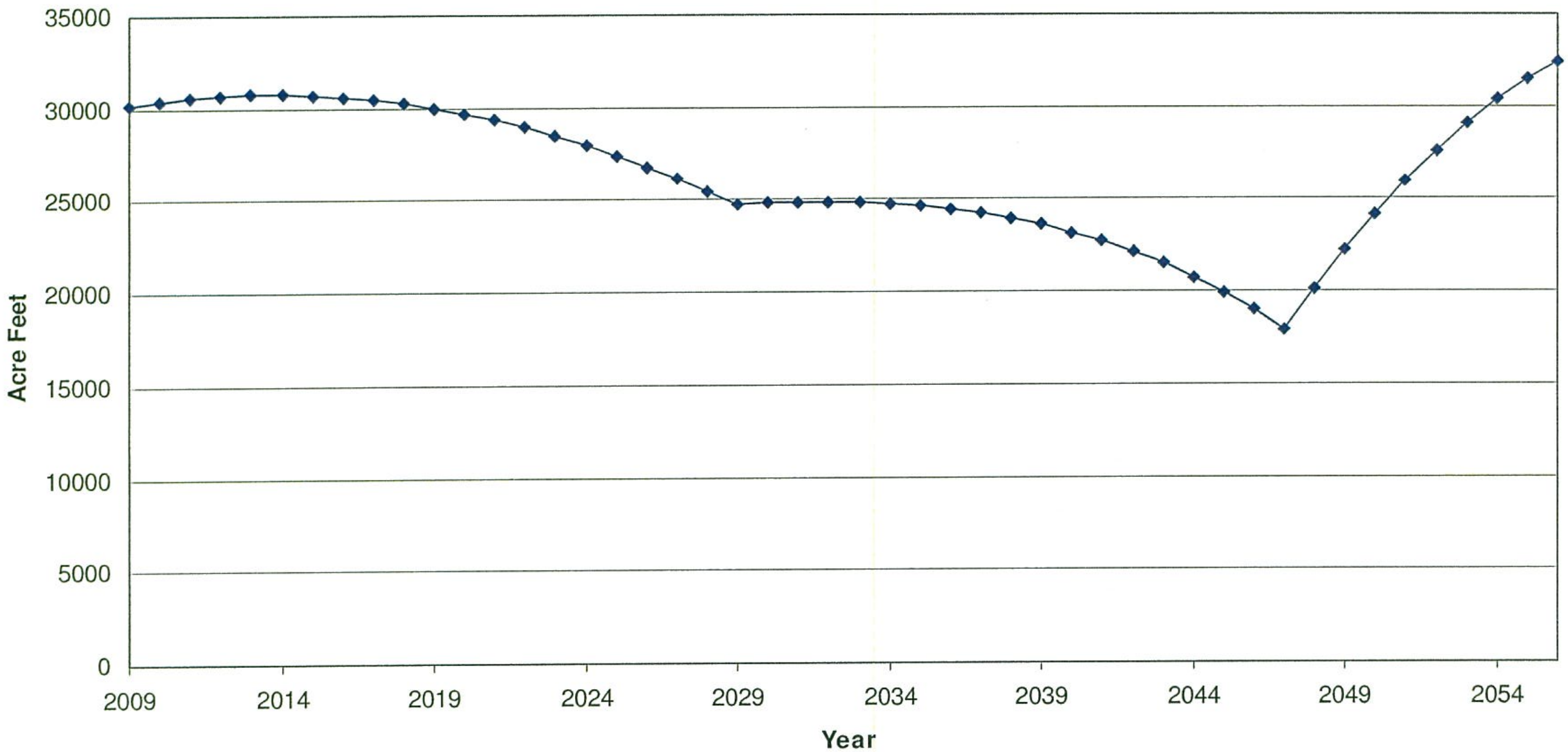

Figure 4.6: Recharge Credit Bank Accumulation with the Conjunctive Use Strategy

4.9.1.2 75% Surface Water with Mesa Interconnect, 25% Groundwater

- Annualized 20-year costs, including groundwater costs: $654,000
- Present value (20 years, 6%), including groundwater costs: $7,496,000

This option assumes continued annual purchase of wastewater recharge credits (1,200 ac-ft per year) for sustainability and that the annual CAP allotment is purchased only equal to the need for surface water.

4.9.1.3 50% Surface Water with Mesa Interconnect , 50% Groundwater

- Annualized 20-year costs, including groundwater costs: $495,000
- Present value (20 years, 6%), including groundwater costs: $5,674,000

This option assumes continued annual purchase of recharge credits (1,200 ac-ft per year) for sustainability. Also, the CAP allotment is purchased only equal to the need for surface water until the recharge credit bank of 30,000 acre-ft is reduced to 10,000 acre-ft (Year 2057). After 2064, additional CAP credits would be purchased to replenish the groundwater supply to maintain a 10,000 acre-ft bank.

4.9.2 Separate AJWC Water Treatment Plant

Under this scenario, a new surface WTP would be constructed for AJWC to take delivery of the CAP water. The size of the WTP would vary based on the three water resource options discussed above. The treatment processes included in the plant would be lined raw water storage, chlorine dioxide pre-oxidation, package water treatment system (Trident or similar) using coagulation, high rate clarification and dual media filtration, and chlorine for secondary disinfection. This treatment train was selected based on discussions with the AJWC, ability of the processes to comply with drinking water regulations and cost comparisons from other similar WTP projects for CAP water. The costs of providing a separate WTP for the various water resource options are presented below:

4.9.2.1 1.0-MGD Surface Water with New WTP

- 1.0-MGD Treatment Plant Capital Costs: $2,243,000
- Annual Operating Cost: $146,000
- Annual Groundwater O&M Cost: $83,400
- Total Present Value (20 yrs, 6%): $4,874,000
- Annualized Cost: $425,000

The capital costs do not include land costs for the new site, but include 15% for engineering and construction management. This option assumes continued annual purchase of wastewater recharge credits (1,200 ac-ft per year) for sustainability and that the annual CAP allotment is purchased only equal to the need for surface water until the recharge credit bank of 30,000 acre-ft is reduced to 10,000 acre-ft (Year 2040). After 2040, additional CAP credits would be purchased to replenish the groundwater supply to maintain a 10,000 acre-ft bank.

4.9.2.2 75% Surface Water with New WTP, 25% Groundwater

- Capital Costs for New 1.6-MGD WTP: $3,588,000
- Annual Operating Cost: $233,000
- Annual Groundwater Cost: $43,000
- Present Value (20 yrs, 6%): $6,445,000
- Annualized Cost: $562,000

The capital costs do not include land costs for the new site, but include 15% for engineering and construction management. This option assumes continued annual purchase of wastewater recharge credits (1,200 ac-ft per year) for sustainability.

4.9.2.3 50% Surface Water with New WTP, 50% Groundwater

- 1.1-MGD Surface Water Treatment Plant Capital Costs: $2,377,000
- Annual Operating Cost: $155,000
- Annual Groundwater Cost: $87,000
- Present Value (20 yrs, 6%): $5,145,000
- Annualized Costs: $449,000

The capital costs do not include land costs for the new site, but include 15% for engineering and construction management. This option assumes continued annual purchase of recharge credits (1,200 ac-ft per year) for sustainability. Also, the CAP allotment is purchased only equal to the need for surface water until the recharge credit bank of 30,000 acre-ft is reduced to 10,000 acre-ft (Year 2064). After 2064, additional CAP credits would be purchased to replenish the groundwater supply to maintain a 10,000 acre-ft bank.

4.10 PORTALIS INFRASTRUCTURE CONCEPT

The Portalis master planned community is projected to have demands that are much larger than the build-out demands projected by the existing AJWC service area. For AJWC, it is important to ensure that the demands are sustainable and that the infrastructure is robust. Figure 4.7 shows the location of the AJWC proposed water treatment plant. This location would be within the Portalis service area. There are several ways to supply water to the Portalis community:

1. **Supply using several groundwater wells:**
   This is the proposed option by the developer of the community. However, for this option, AJWC needs to consider recharge issues as identified in Section 4.8. Additionally, in order to minimize cost on operations, it is recommended that several hubs of wells be developed with common treatment facilities. Each facility should be able to pump up to Storage Tank #2. This provides an interoperability and redundancy in the system. Additionally, if Storage Tank #2 cannot provide sufficient pressures under gravity for Portalis then a booster pump station to supply water to Portalis should be provided at Storage Tank #2. This will allow moving water from the AJWC existing service area to the Portalis community.

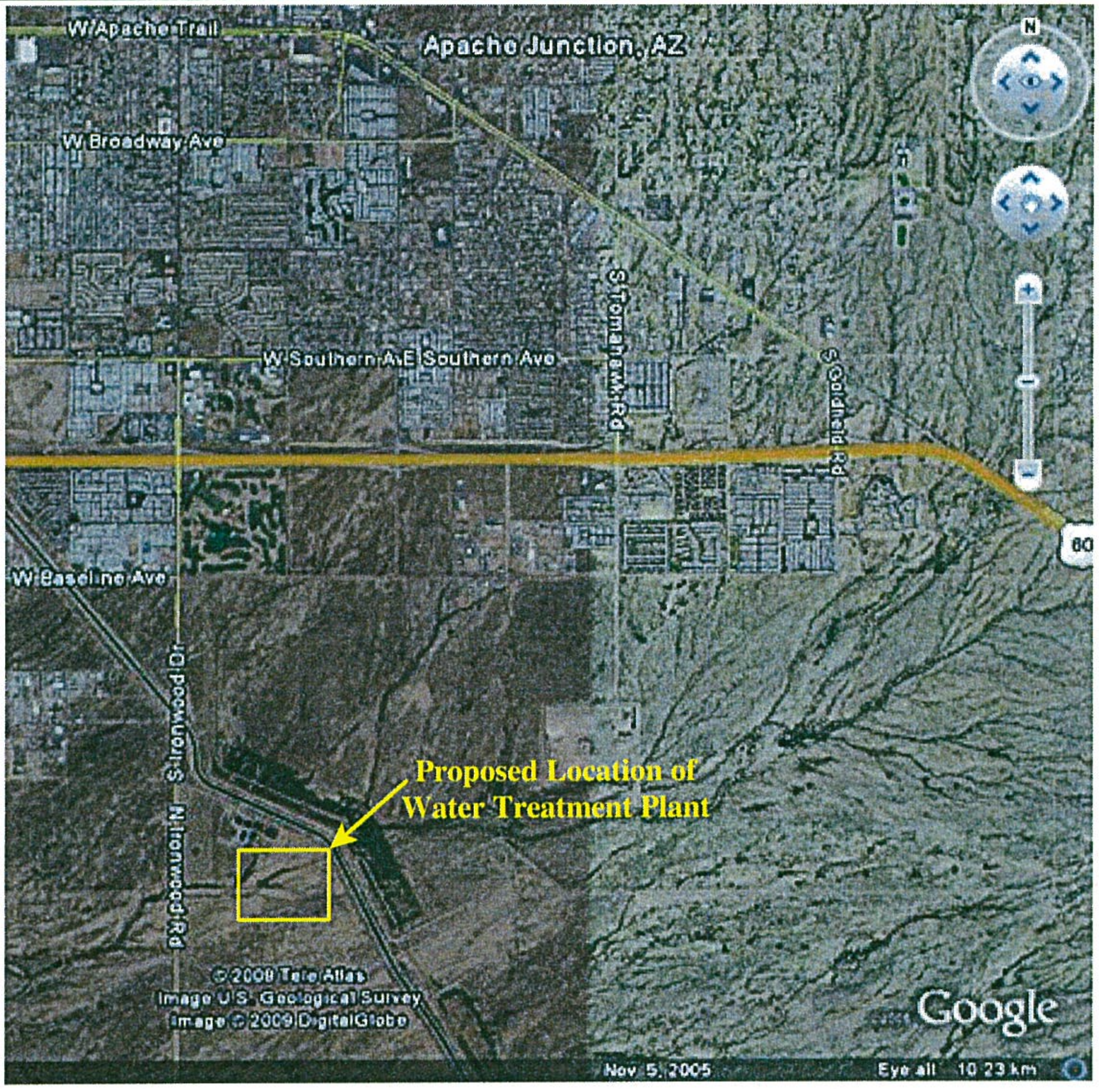

Figure 4.7: Location of Proposed Water Treatment Plant for AJWC

2. **Share the cost of new treatment plant/purchase production capacity:**
In addition to groundwater wells, the Portalis community should provide a new treatment plant with a capacity equal to approximately 3 MGD. It is expected that the new facility will be brought online with intermediate growth expansion on the AJWC treatment plant. There may be a need for more expansion based on the actual growth rate of Portalis. This facility should be able to pump up to Storage Tank #2. This provides an interoperability and redundancy in the system. Additionally, if Storage Tank #2 cannot provide sufficient pressures under gravity for Portalis, then a booster pump station to supply water to Portalis should be provided at Storage Tank #2. This will allow moving water from the AJWC existing service area to the Portalis community.

3. **Construct a new Water Treatment Plant:**
Alternatively, Portalis can provide a new water treatment plant for its service area (up to 3 MGD at build out). This facility should be able to pump up to Storage Tank #2. This provides an interoperability and redundancy in the system. Additionally, if Storage Tank #2 cannot provide sufficient pressures under gravity for Portalis, then a booster pump station to supply water to Portalis should be provided at Storage Tank #2. This will allow moving water from the AJWC existing service area to the Portalis community.

4.11 SUMMARY AND RECOMMENDATIONS

A comparison of the two water delivery methods (separate WTP versus Mesa interconnect) for the three water resource scenarios is presented below:

Scenario 1 - 1 MGD Surface Water Usage With Mesa Interconnect

Separate AJWC Treatment Plant (1.0 MGD): $4,874,000 PW (Annualized Cost $425,000)
Mesa Agreement (1.0 MGD): $5,158,000 PW (Annualized Cost $449,000)

Scenario 2 - 75% Surface Water, 25% Groundwater

Separate AJWC Treatment Plant (1.6 MGD): $6,445,000 (Annualized Cost $562,000)
Mesa Agreement: $7,496,000 (Annualized Cost $654,000)

Scenario 3 - 50% Surface Water, 50% Groundwater

Separate AJWC Treatment Plant (1.1 MGD): $5,145,000 (Annualized Cost $449,000)
Mesa Agreement: $5,674,000 (Annualized Cost $495,000)

Based on the above analysis, it is more cost-effective for AJWC to develop its own surface WTP than to have continued reliance on the Mesa interconnect. Also, based on balancing costs and long term water resource goals, water resource Scenario 3 (50% surface water and 50% groundwater) is recommended for the short term. This will provide a long term sustainable groundwater supply that is available for surface water drought conditions while balancing the overall costs to AJWC. As the WTP is expanded, the AJWC main service area will move towards meeting the 80% surface water, 20% groundwater goal. Further, the cost-effectiveness of providing surface water through a new jointly-owned WTP with the City of Mesa should also be evaluated in a separate study. *

When the Portalis master planned community develops, it should provide a 3 MGD treatment plant to AJWC to maintain the recharge credit bank and sustainable operations.

A detailed 5-year CIP that includes these recommendations is attached as Appendix B to this report.

* MET W/ MARK HOLMES, BRYAN DRAPER FROM C.O.M. TO TALK ABOUT TIMING – MAYBE NO CAP. WTP UNTIL 2020 → AJ. SHOULD BUILD OWN W.T.P.

SECTION 5
WATER PRODUCTION INFRASTRUCTURE

5.1 EXISTING FACILITIES

AJWC operates three wells (Wells 5, 6 and 8) and, as supplemental sources, obtains water from the Arizona Water Company and the City of Mesa via interconnections. Water from these interconnections is blended with groundwater in storage tanks. Wells 5 and 6 have capacities of 600 and 500 gallons per minute (gpm), respectively. Well 8 has a production capacity of approximately 250 gpm. Water from the wells is conveyed to four system storage tanks located at two booster stations, with a combined capacity of 3 million gallons (MG).

The true capacity of the three existing permitted wells is 1.95 MGD. Further, the 16-inch Mesa interconnect has a capacity of 5 MGD. The Arizona Water interconnect has a capacity of around 0.8 MGD though the typical flow rate of 250 gpm. For the established AJWC service area at the projected rate of growth, the true capacity will match the expected maximum monthly average day demand in 2044.

For Portalis, in order to meet initial peak day demands in 2012 (estimated development date), approximately 1.86 MGD in firm capacity will be required.

5.2 METHODOLOGY

Water supply during peak demand conditions can be provided either through the storage tanks or through the production facilities. Storage facilities are usually more cost effective to construct compared to water treatment plants (WTPs) to meet peak demands. Section 5.2.1 describes strategies for balancing WTP expansion with existing/new storage in the system.

5.2.1 Storage/Production Capacities

There are multiple temporal variations in demands:

1. Demands vary diurnally (i.e., different demands at different times of day)
2. Demands vary daily (i.e., different demands on different days)
3. Demands vary seasonally
4. Demands vary annually

The demand factors of most concern to a utility are:

1. Maximum Day to Average Day Ratio

   This ratio signifies how much additional demand will be imposed on a system during the maximum day compared to an average day. For a large utility, maximum day demand could be a considerably large value compared to a smaller utility. However, the storage availability at smaller utilities are usually larger as they are dictated more by fire, emergency and flex operational requirements rather than demand requirements. This could lead to the possibility of using storage to manage larger variations in flows. The maximum day to average day ratio for AJWC is 1.8.

2. Peak Hour to Average Day Ratio

   This ratio signifies how much additional demand will be imposed for a small fraction of time on this system. This is usually exclusively supplied by the storage. If a utility does not have sufficient storage, then it is supplied by pumps or other conveyance equipment. The ratio is typically used for sizing pipes. As the demands increase, this could become a dominating factor. The peak hour to average day ratio for AJWC is 3.6.

3. Maximum Month Average Day to Average Day Ratio

   Maximum month average day demand signifies a demand condition that will be higher than most days of the year. There could be a lot of days higher than the maximum month average day. For a small utility, designing a surface WTP for this demand condition may allow supplying surface water for a majority of the year. The rest of the time, water can be supplemented with wells and other water sources, such as interconnects. The maximum month average day to average day ratio for AJWC is 1.1.

If a surface WTP is required, it can be sized on various criteria. However, if sufficient redundancy is available for the service area, it can be sized for Maximum Month Average Day demands with peak demands supplied through either interconnect water, well water or storage tanks. This reduces the reliance on sizing the WTP with capacities that will not be required for the majority of the year.

5.2.2 Water Treatment Plant Description

One option to provide future surface water is for AJWC to build its own surface WTP to treat its CAP allotment, as opposed to buying wholesale from the City of Mesa. For planning purposes, a typical surface water treatment train is assumed (similar to other similar applications in the CAP system). Costs are estimated and presented in Section 8.

The assumed treatment processes includes lined raw water storage, chlorine dioxide pre-oxidation, package water treatment system (Trident or similar) using coagulation, high rate clarification and dual media filtration, and chlorine for secondary disinfection. This train was selected based on discussions with AJWC personnel, ability of the process to comply with drinking water regulations and cost comparisons from other similar WTP projects for CAP water.

The Trident package water treatment system is composed of high-rate settling, adsorption clarification, mixed media filtration and chlorine disinfection. This multiple-barrier process is well-suited for all surface and groundwater applications, including high turbidity and color, variable water conditions, and enhanced coagulation operation. The process would also include chlorine dioxide for pre-oxidation control.

In this treatment train, coagulant and polymer are added at the influent to support the flocculation process. A sludge recycle flow is introduced near the coagulation point to aid in floc formation. This recycle flow also serves to maintain the steady-state solids concentration and to minimize variations in influent solids concentration. The tube clarification stage reduces influent solids concentration prior to the adsorption clarifier stage, leaving the majority of coagulated particles in the tube clarifier. Overall, the tube clarifier reduces plant waste volume and improves organics removal.

In the second stage, a buoyant adsorption media bed provides second-stage clarification. The media further reduces solids prior to filtration. Captured solids are periodically flushed from the clarifier using an air-water combination.

Mixed media filtration removes the remaining solids using a bed of anthracite, sand and high-density garnet. Disinfection treatment is provided by a chlorination system (gas or liquid) to inactivate bacteria.

5.2.3 Water Treatment Plant Expansion Schedule

To facilitate planning, demand milestones have been identified to trigger CIP planning actions five years in advance. This will allow sufficient time to secure funds and complete design and construction of needed infrastructure. Demand triggers have been identified five years prior to when true capacity equals the projected maximum monthly average day demand. Figure 5.1 illustrates the surface water use and the demand triggers for expansion.

Initially a 1.1 MGD surface water treatment plant is planned to come on-line by 2015. Prior to 2015, surface water will be obtained through the Mesa interconnect. Surface water will make up 50% of the average day demands until 2030. As of 2019, the additional water required to meet 50% of the demand in excess of the WTP capacity will be supplied through the Mesa interconnect.

The transition to 80% surface water and 20% groundwater will occur in 2030 when a 2.0 MGD surface water treatment expansion is recommended, providing a total surface water treatment capacity of 3 MGD. The trigger to begin CIP planning actions for this expansion is at an average day demand of 2.25 MGD, expected to occur in 2025.

The next expansion trigger is expected in 2040 (or when average day demand reaches 3.2 MGD), when a 1.0 MGD expansion will need to be initiated to come on-line by 2045. This will provide a total capacity of 4.0 MGD, sufficient to maintain the 80% surface water, 20% groundwater split until build-out and beyond. — CURRENT/EXISTING SERVICE AREA —

For Portalis, a 3 MGD total surface water treatment plant is recommended to come on-line by 2030 in order to maintain the balance between groundwater use and recharge credit reserves to meet drought conditions.

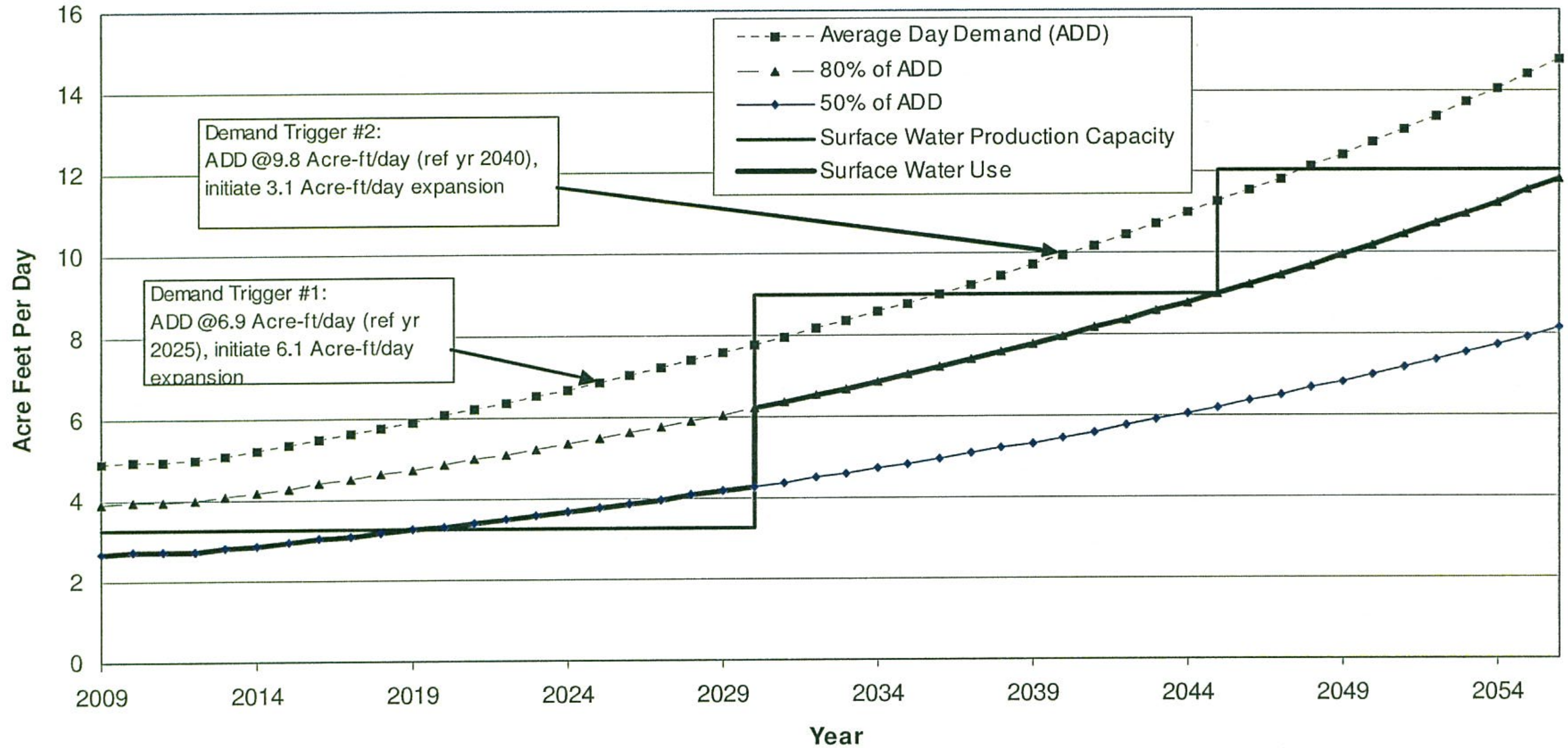

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Figure 5.1: AJWC Existing Developed Community Only
Surface Water Demand Triggers Based on Average Day Demand

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5.2.4 Groundwater Expansion Schedule

A wellfield expansion schedule has been developed to provide groundwater only supply in severe drought conditions. Under this scenario, such as a Stage 4 Drought Condition, compulsory conservation and mandated shutoff rules will necessitate a 50% reduction in maximum month average day demand. Well capacity will be needed to meet this demand, without surface water supplementation. Figure 5.2 shows the demand trigger (when 50% of the maximum month average day demand reached 1.75 MGD, or when maximum month average day demand reaches 3.48 MGD) to provide this capacity. When this demand is realized, a 1.0-MGD expansion should be initiated to provide severe drought protection through build-out.

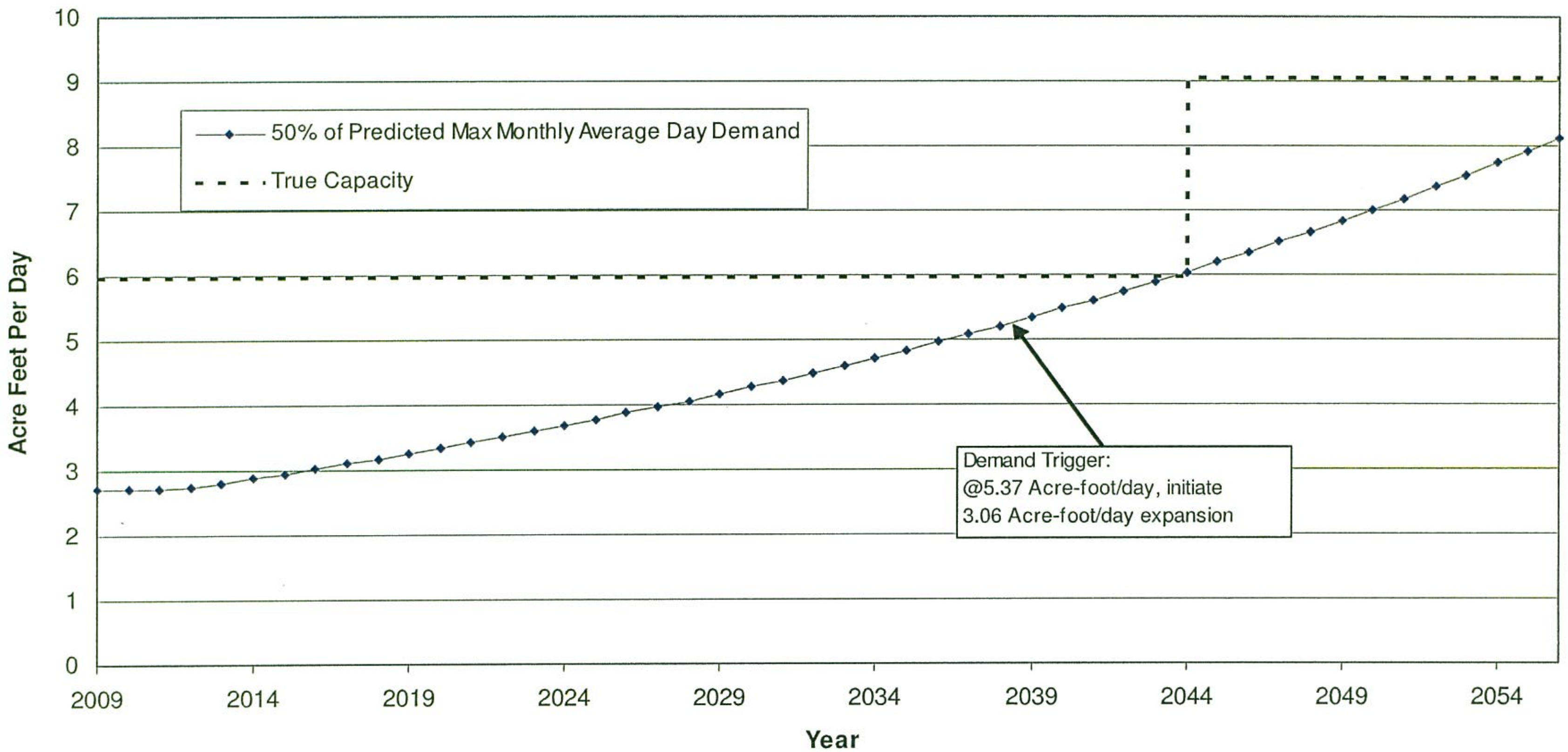

Figure 5.2: Demand Trigger for Groundwater Expansion for Existing Community

SECTION 6
WATER MODEL DEVELOPMENT AND CALIBRATION

6.1 INTRODUCTION

This section provides a summary on the water model development and calibration activities. A detailed description of water model development and calibration is provided in Appendix A.

Several different data sources were available for the development of the AJWC system model. The data sources include:

1. AutoCAD DWG files for the utility transmission and service lines, streets and hydrants
2. Quarter section map for Apache Junction area
3. Water billing data as an Excel file showing consumption per meter
4. Dimensions of storage tanks
5. Control logic data (set points)
6. USGS elevation maps
7. Streets shapefile from USGS and streets shapefile from AJWC

6.2 NETWORK DEVELOPMENT

Based on the review of the available sources, GIS data and Quarter Section maps were utilized to create the integrated water model.

6.2.1 Elevation Extraction

Water models calculate pressure as the last step. Pressures themselves are not critical to the solution of the water network equations. Water network equations are dependent on hydraulic grade lines and water demands. Once the hydraulic grade calculations are completed, elevations are subtracted from the hydraulic grade line to calculate pressure head in terms of length. This pressure head is then converted to pressure in pounds per square inch (psi) by using the specific gravity of water and performing unit conversion. It is essential to start with correct elevations in order to obtain correct pressures. In order to obtain elevations at several different locations, USGS elevation maps were used. However, when overlaying USGS elevation maps, it was observed that the street alignments in USGS (and thus the elevations) do not overlay perfectly. Because the differences seemed minor in most cases, the determination was made to use the USGS elevations. Elevations were extracted by overlaying the water distribution model over the USGS elevation maps and interpolating to extract elevation at the junctions.

6.3 DEMAND ALLOCATION

In order to carry out the demand allocation, NCS utilized the billing data provided by AJWC. AJWC provided the billing data as an Excel (.xls) file showing consumption per meter.

The Excel file has approximately 4,122 customer accounts. Each account has a meter ID and monthly consumption (in gallons). In order to utilize this information in the water distribution system model for the AJWC service area, the Excel-based meter data has to be converted into a GIS-based data format, such as a shapefile. This allows a modeler to allocate the demands to specific nodes in the model. The process of assigning Excel data with addresses on each row to a specific location on the surface of the earth is called geocoding. Geocoding is the process of finding associated geographic coordinates (often expressed as latitude and longitude) from other geographic data, such as street addresses or zip codes. With geographic coordinates, the features can be mapped and entered into a GIS platform. (*Source: Wikipedia, http://en.wikipedia.org/wiki/Geocoding*). This is an ArcGIS-based functionality that relies heavily on how well the meter addresses are recorded. If there are typographical errors, then an automated correlation cannot be obtained. For the AJWC model, several techniques were utilized, including correcting errors and updating the base streets shapefile to introduce new streets where construction has been carried out.

Once a majority of these errors were eliminated by a review and corrections procedure, the new meter shapefile had 4,037 meters. The Excel file had 4,122 meters, therefore an excellent level of geocoding was achieved. The meters whose addresses did not match are listed in Appendix D.

An automated demand allocation strategy was followed to allocate demands. The following logic describes the demand allocation procedure:

1. Thiessien Polygons were created around each node of the system. Thiessien Polygons are polygons prepared to ensure that one polygon surrounds each junction and intersects the straight line connecting any two junctions at a 90° angle. While creating Thiessien Polygons, it was further ensured that the polygons break at the pressure zone boundaries and do not allocate demands to incorrect nodes.

2. All the billing meters within the polygons were allocated to the junction within the polygon.

3. Some of the meters that were not geocoded do not have an associated address. Some of the billing meters' addresses fall outside the boundary of the Apache Junction service area. These meters were not used for demand allocation. However, the production data was used to ensure that the total demands are correct.

6.4 CONTROL STRATEGY

NCS organized a field visit with the AJWC operations staff to note the set points and operating strategy for all major facilities. These strategies were incorporated into the control logic of the facilities.

AJWC had provided pump operating set points across the system. These set points were introduced into the system.

6.5 FACILITY INFORMATION

Facility information, such as booster pump definitions, tank volumes, diameters and heights, was obtained from discussions and documents from AJWC staff.

6.6 CALIBRATION

The calibration criteria based on accepted industry standards for utilities are presented below (similar to the EPA criteria for the initial distribution system evaluation):

Flow Criteria:

Modeled flows should be within 5% of the measured flows at all locations of measurement.

Pressure Criteria:

The total difference between the measured and modeled data at all points in steady state calibration should be within 5% (or 3 psi pressure difference whichever is more) and should be within 10% for extended period calibration (or 7 psi pressure difference whichever is more).

As a result of this coordinated exercise with engineering and operations staff, a high level of confidence was built into the model. A steady state model calibration and an extended period simulation (EPS) calibration were conducted. Tables 6.1, 6.2 and 6.3 show the EPS comparison for flows and pressures as well as a steady state comparison. As evidenced in the table, the calibration is achieved for all parameters.

Table 6.1: Observed Versus Modeled Pressures

Pressure Recorder Number	Modeled Pressure (psi)	Observed Pressure (psi)	Error (psi)	Error (%)
PR - 1	82	76	6	7%
PR - 2	59	58	1	2%
PR - 4	54	54	0	0%
PR - 5	61	60	1	2%
PR - 6	75	69	6	8%
PR - 7	66	60	6	9%
PR - 11	59	57	2	3%
PR - 12	74	72	2	3%
PR - 13	82	76	6	7%
PR - 14	75	69	6	8%
PR - 15	77	73	4	5%
PR - 16	85	79	6	7%

Table 6.2: Flow Comparison at Water Plant Discharge Stations

Water Plants	Modeled Flow (gpm)	Observed Flow (gpm)	Error (psi)	Error (%)
Booster 1 Discharge	1,133	1,125	8	1%
Booster 2 Discharge	354	364	-10	-3%
Booster 2 Inflow	335	324	11	3%

Table 6.3 : Hydrant Test Comparison

Data Location	Observed Data			Modeled Data		Error Calculations			
	Residual Hydrant Static Pressure (psi)	Residual Hydrant Residual Pressure (psi)	Flowing Hydrant Flow (gpm)	Residual Hydrant Static Pressure (psi)	Residual Hydrant Residual Pressure (psi)	Error (psi) - Residual Hydrant Static Pressure (psi)	Error (%) - Residual Hydrant Static Pressure (psi)	Error (psi) - Residual Hydrant Residual Pressure (psi)	Error (%) - Residual Hydrant Residual Pressure (psi)
Location 1	78	60	837	80.4	57.1	-2.4	2.9	-3.08%	4.83%
Location 2	48	40	666	50.4	37.8	-2.4	2.2	-5.00%	5.50%
Location 3	42	58	666	42	60.1	0	-2.1	0.00%	-3.62%
Location 4	58	40	750	55.7	39.3	2.3	0.7	3.97%	1.75%
Location 5	85	48	837	86.3	45.7	-1.3	2.3	-1.53%	4.79%

In general, the model seems to provide a very good correlation between observed values and modeled values in the system for flows and pressures. It is recommended, however, that with a new GIS mapping program, a better correlation is developed between the USGS alignments and AJWC alignments so that the elevations can be used directly without requiring readjustment of the elevation/model overlay.

SECTION 7
WATER DISTRIBUTION SYSTEM INFRASTRUCTURE

7.1 INTRODUCTION

This section defines the strategy adopted for predicting infrastructure upgrades to the existing distribution system. The existing distribution system consists of two booster stations, each with its own storage tanks.

Distribution system infrastructure consisting of several elements, including reservoirs (storage tanks), pumps, pipes and PRVs, were evaluated. Section 7.2 discusses the methodology for the evaluation.

In addition to this, it is essential to evaluate the operational flexibility that is available by segregating the utility service area into different pressure zones. Section 7.5 describes evaluation of pressure zones.

7.2 METHODOLOGY

The water distribution model was used for estimating the usage requirements for all distribution system infrastructure upgrades. However, several facilities, such as storage tanks and pumps, have requirements that are based on various factors, such as fire flows and peak hour demands. These requirements dictate the sizing of these facilities. Detailed sizing requirements are presented in subsequent sections. The criteria used for sizing is presented below:

- Piping upgrades are defined based on Maximum Day + Fire Flow Demand or peak hour, whichever is dominating
- Minimum Pressure in the system should be no less than 20 pounds per square inch (psi) for fire flow conditions and 40 psi for peak hour conditions
- Maximum Velocity in the system should be no more than 8 feet per second (fps) during fire flow conditions and no greater than 5 fps during peak hour conditions.

The required fire flow estimate used for piping upgrades was 1,500 gpm for commercial services and 1,000 gpm for residential services. This was based on information from the Apache Junction Fire Marshall. Based on the hydraulic modeling runs, upgrades were identified for booster stations to meet the maximum day fire flow and peak hour demand conditions.

7.3 STORAGE TANKS

Storage tanks provide water for use in emergencies, peaking and fire flow conditions. They help equalize variations in demands caused by a number of different factors. The total storage required for a utility should be based on fire storage required + emergency storage + diurnal peaking storage.

7.3.1 Emergency Storage

Emergency storage is calculated as 10% of maximum day demand. This is approximately equal to 340,000 gallons for current conditions. For intermediate conditions (approximately year 2030) the total storage required is 450,000 gallons and for buildout 864,000 gallons.

7.3.2 Fire Storage

Through conversations with the Fire Marshall for the City of Apache Junction, it was determined that the maximum fire flow requirement is 1,500 gpm within the City at all locations for a period of 3 hours. Therefore, the total volume of water storage required currently is 270,000 gallons.

However, for future storage predictions, better storage estimates can be obtained by using industry standard parameters, such as fire storage estimates based on formula for minimum fire flow defined by the American Insurance Association. The formula states that the required fire flow should be:

$Q = 1020 * P^{0.5}*(1-0.01*P^{0.5})$

Where

Q = Flow rate in gpm
P =Population in 1000s

Assuming that the demand increase is proportional to population increase, it can be estimated that the AJWC population should increase to approximately 19,900 people by 2030 (intermediate CIP time frame). Using the above formula, this equates to 4,341 gpm of fire flow for 3 hours, which would equate to approximately 781,000 gallons of storage.

Up to build-out, the Portalis population should increase to 38,100 people. It is assumed that if the Portalis master planned community develops, it will handle fire storage requirements as a part of the development. Otherwise, during the next Master Plan update, additional storage capacity for system demands in that area should be considered. This translates to approximately 5,907 gpm of fire flow for 3 hours, which equals approximately 1.06 MG of storage.

This approach was recommended by the American Insurance Association for future planning. This formula, in some cases, may underpredict the actual fire flow requirement based on the Fire Code, while in other cases it may recommend a more conservative number. It is essentially a population-based requirement as opposed to the Fire Code Criteria, which is has land usage-based requirements. The City of Phoenix design standards states that storage for fire fighting capabilities should be based on the required fire flow rate for the most intensive land use within the zone multiplied by duration.

7.3.3 Diurnal Storage

Total diurnal storage required for any given system is approximately equal to the difference in the peak hour to maximum day demand. The peak hour to maximum day ratio is approximately 2 based on the flow metering exercise that was conducted in AJWC.

The short term maximum day demand for the AJWC service area is 3.4 MGD. The total equalization storage for meeting the diurnal variation for the short term condition (up to 2015) is approximately 2.8 MG.

7.3.4 Total Storage Required

Minimum Total Storage Required (MG) = Emergency Storage (MG) + Fire Flow Storage (MG) + Diurnal Storage (MG)

7.3.4.1 Short-Term Storage (Up to 2015)

The requirements for short-term storage are:

- Emergency Requirements = 340,000 gallons
- Fire Flow Storage = 270,000 gallons
- Diurnal Equalization Storage = 3,400,000 gallons

The total minimum firm storage capacity required for the short term is approximately 4 MG. The existing system's firm storage capacity is approximately 2 MG (with one 1 MG tank out of service). Therefore, an additional 2 MG of storage capacity will be required in the short term CIP. This will be comprised of additional storage at the water treatment plant and one new storage tank of 1 MG at Booster Station #2. These storage tanks will also help with operations and maintenance as well as flexible operations requirements.

7.3.4.2 Intermediate Term Storage (Year 2030)

The requirements for intermediate storage are:

- Emergency Requirements = 450,000 gallons.
- Fire Flow Storage = 781,000 gallons.
- Diurnal Storage = 4,500,000 gallons

The total minimum firm storage capacity required for the intermediate term is approximately 5.8 MG of firm capacity.

For the intermediate scenario, an additional storage capacity of 1.8 MG will be required by 2030 (or similar demand trigger).

7.3.4.3 Build Out

The requirements for build-out storage are:

- Emergency Requirements = 864,000 gallons.
- Fire Flow Storage = 1,060,000 gallons.
- Diurnal Storage = 8,640,000 gallons.

Thus, the total minimum firm storage capacity required for build out is approximately 10.5 MG of firm capacity.

For the build out scenario, an additional storage capacity of 4.7 MG will be required by build out.

7.4 PUMPS

There are no elevated tanks in the system. Therefore, booster pumps need to be able to supply peak hour demands every day with minimum pressures every where in the system to stay above 40 psi as the minimum design criteria.

System needs require enough pumping capacity in terms of flows and pressures and low headloss. Head losses can be reduced with larger pipe diameters. Too little headloss may require large pipe sizes resulting in higher costs. However, having reasonable headlosses by ensuring pipe velocities do not exceed 5 fps and having large pumps, the same results can be achieved through lower overall costs.

The peak hour demand for the short term scenario (2015) is approximately 6.8 MGD. The current firm pumping capacity for the AJWC service area is 4.4 MGD (i.e., 2.7 MGD at Booster Station #1 and 1.7 MGD at Booster Station #2). For short term requirements, there is a deficit of approximately 2.4 MGD. This can be corrected by adding additional pumps at Booster Station #1 (1.3 MGD) and Booster Station #2 (1.7 MGD). This will raise the firm capacity to 7.5 MGD.

The peak hour demands for the intermediate scenario (2030) is approximately 9 MGD. For the intermediate scenario, an additional 1.5 MGD pump capacity will be required at Booster Station #1. This will raise the firm capacity to 9.2 MGD.

The peak hour demands for the build-out scenario is approximately 17.3 MGD. For build-out, additional booster pumps totaling a flow of 8 MGD discharging at approximately 70 psi would be required.

7.5 PRESSURE ZONE MANAGEMENT

Figure 7.1 shows elevation variations through AJWC service area. Pressure zones are developed in water systems to allow flexibility in operations between large elevation changes. With approximately 150 feet of elevation difference, the pressure difference between the lowest and highest point in the zone is approximately 65 psi. Thus, when the lowest node is at 100 psi, the highest location in the zone is 35 psi. Therefore, an elevation variation above 150 feet will lead to either too low pressures in one part of the zone or too high in the other.

Having, too low a difference in elevation can also lead to further problems with pressure zone management. The recommended elevation difference is approximately 100 feet, which is similar to the elevation differences in pressure zones of cities around AJWC, such as the City of Phoenix.

The elevation variations through the AJWC service area shows that most of the utility locations are within 100 feet of elevation variation. However, there is one small area that has higher variation. Therefore it is proposed that an additional pressure zone be developed by adding a PRV on the 12-inch line from Booster Station #2 along the Baseline Road alignment towards Ironwood Road as shown on Figure 7.2.

Furthermore, elevation variations for Portalis are substantial and therefore one or more zones should be developed in that region.

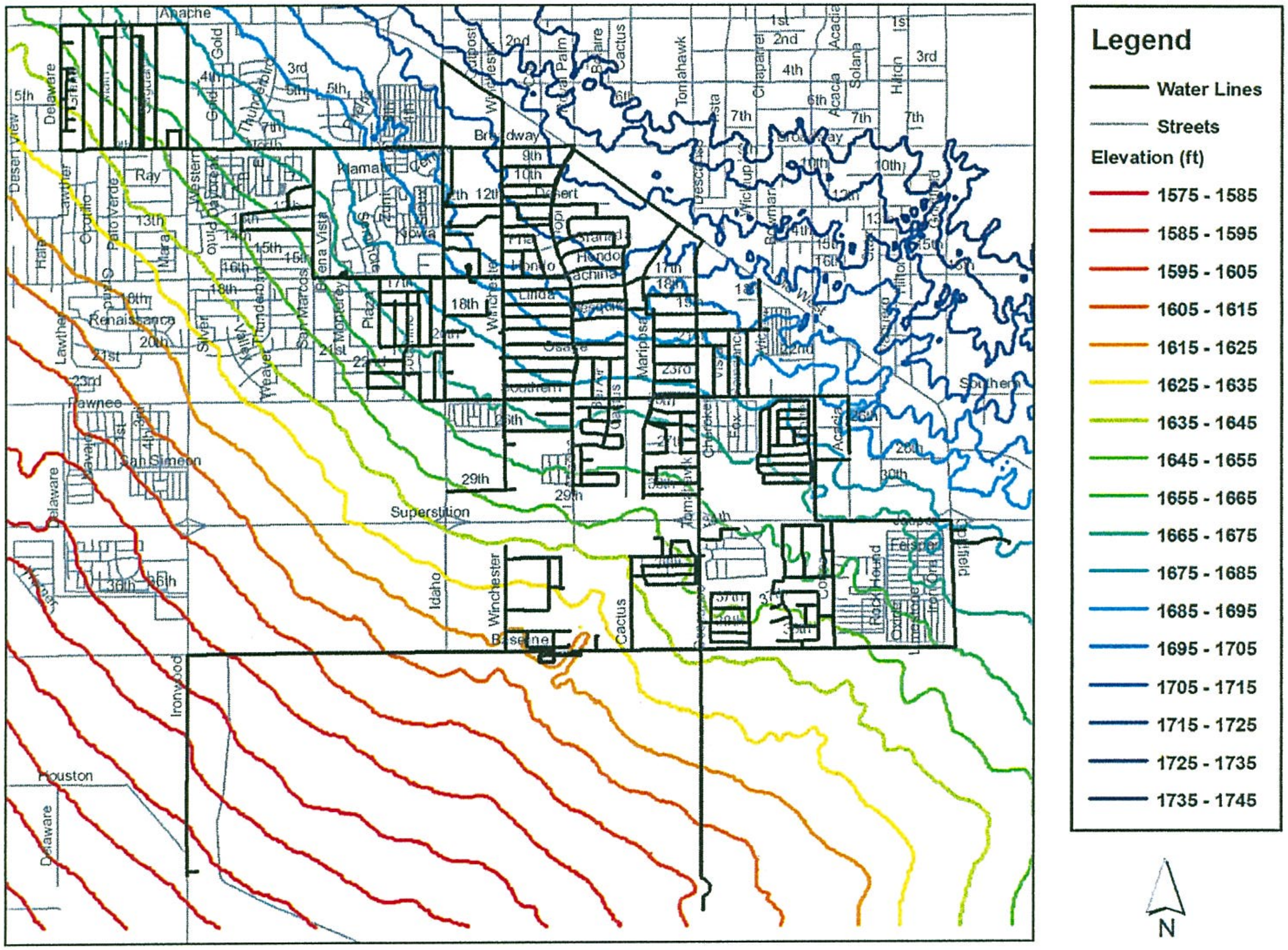

Figure 7.1: Elevation Variations Through AJWC Service Area

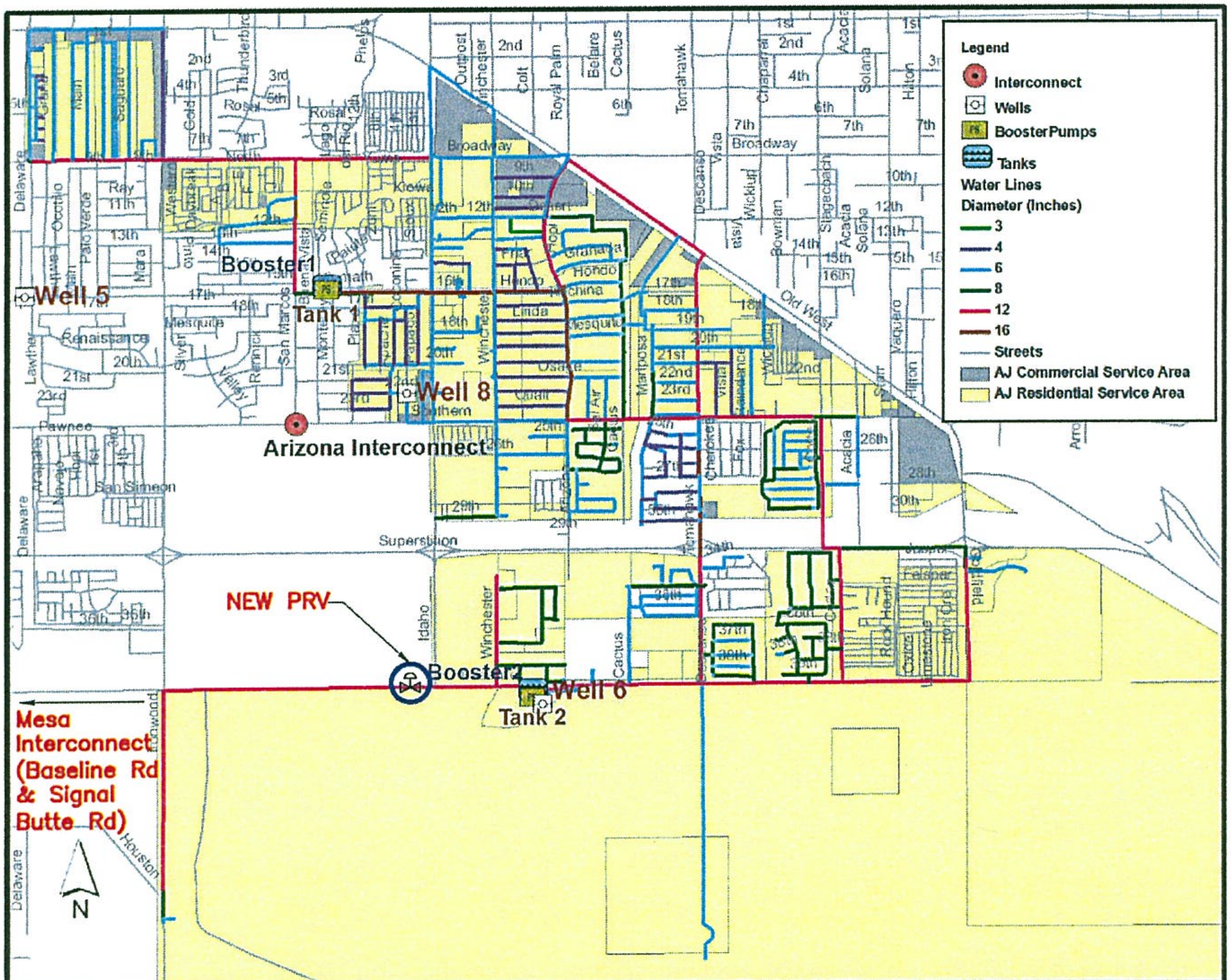

Figure 7.2: Proposed PRV Location in AJWC Service Area

Final Report
Apache Junction Water Company