

**APPENDIX C**

**EFFLUENT GENERATION PROJECTION MEMORANDUM**



# MEMORANDUM



**Pima County  
Wastewater  
Management  
Department**

**Date:** November 29, 2005

**To:** David V. Modeer  
Director  
Tucson Water

Michael Gritzuk  
Director  
Pima County Wastewater Management Department

**From:** Joint Planning Group – Population and Effluent Projections

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**Subject: Resolution of Population and Effluent Variances between the Tucson Water and Pima County Wastewater Management Long-Range Plans**

Within the last year, the Pima County Wastewater Management Department (PCWMD) and Tucson Water have each released draft long-range plans for community comment. Staff members of PCWMD and Tucson Water have met frequently over the last several months to resolve the methods used by each entity to project future population and effluent availability in the greater Tucson area. The details of this process are provided in the attached "Joint Planning Summary".

The initial drafts of Tucson Water's *Water Plan: 2000-2050* (November 2004) and Pima County Wastewater Management Department's *Facility Plan* (May 2005) presented markedly different projections of future population and effluent availability even though both plans utilized data from the Pima Association of Governments (PAG) in their analyses. These differences are attributable to the following factors:

- The data sets used by each entity were different (although both were obtained from PAG),
- The two plans covered slightly different time horizons,  
The two plans covered significantly different areas, and
- Each entity applied its own set of assumptions to project effluent volumes.

The methods used in each draft plan are defensible in their own right; however, the desire to achieve consistent results led to the formation of the Joint Planning Group.

This process has resulted in concurrence amongst the members of the Joint Planning Group on recommended projections of population and effluent availability to be used in the final versions of each plan. Both plans will project population and effluent availability within the five major sewer tributary areas (Roger Road including the Randolph Plant, Ina Road, Marana, Avra Valley, and the Southlands

including Corona de Tucson) for every five years through 2030 based on PAG's Traffic Analysis Zone (TAZ) data. Both entities will assume the same factors for the percentage of population on septic systems and the daily per capita rate of sewer return flow. For the year 2030, the Joint Planning Group projects a total of 1,247,963 customers on sewer that will generate 106.14 MGD (118,900 AF/YR) of effluent in the five sewer tributary areas.

In addition to resolving the current projections of population and effluent availability, the Joint Planning Group developed recommendations for further work. These recommendations include:

- Provide the results of this process to PAG for use in their current "208 Plan" update,
- Closely monitor water deliveries and sewer return flows in two neighborhoods (one established and one newly constructed) to collect additional information on effluent generation over time, and
- Continue an ongoing dialogue between PCWMD, Tucson Water, and PAG staff to obtain improved future projections of population and apply consistent assumptions for forecasting effluent availability in the community.

If you should have any questions regarding this transmittal memorandum or the attached Joint Planning Summary, please contact Bill Richardson (PCWMD) at 740-6567 or Tim Thomure (Tucson Water) at 791-5080 x1404.

CC:

City of Tucson – Marie Pearthree, Bruce Johnson, Dennis Rule, Ralph Marra, Jeff Biggs, Mark Seamans, Karen Dotson, Chris Avery, Joint Planning Group Members

Pima County – Paul Bennett, Ed Curley, Harlan Agnew, Paul Loucks, Jackson Jenkins, Joint Planning Group Members

## Joint Planning Summary

### **Background**

Within the last year, the Pima County Wastewater Management Department (PCWMD) and Tucson Water have each released draft long-range plans for community comment. Projections of population and effluent production are critical factors that affect both plans. In order to bring a common basis to influent/effluent forecasting, PCWMD and Tucson Water staff have met periodically to discuss and resolve the variances between their respective population and effluent projections. For purposes of this discussion, Treatment Plant influent and effluent flows are used interchangeably.

### **Population**

Tucson Water's draft Water Plan ("Water Plan: 2000-2050" – November 2004) used the Pima Association of Governments (PAG) Transportation Analysis Zone (TAZ) population forecast to estimate the effluent flow in the Tucson Water Long Range Planning Area for the years through 2030.

Pima County Wastewater Management Department's Facility Plan first draft (May 2005) used PAG's Census Tract data in the Facility Plan Model to forecast influent flow to the five major plants (Roger Road including the Randolph Plant, Ina Road, Marana, Avra Valley, and the Southlands including Corona de Tucson) in the Eastern Pima County Area for the years through 2025. The Census Tract and TAZ population forecasts vary significantly in magnitude and location of growth.

Based on the recommendations of PAG and discussions with Tucson Water, PCWMD will use the PAG TAZ population forecasts through 2030 in its final version of the Facility Plan. PAG supplied PCWMD with its TAZ population forecasts in June 2005. PCWMD has incorporated these forecasts in its Facility Plan Model to develop the Treatment Plant influent projections that will be compared to the Tucson Water effluent projections based on TAZ data.

Tucson Water compared the PCWMD June 2005 TAZ projections with the TAZ data issued in 2003 that was originally used in the Water Plan. These two data sets are slightly different; therefore, Tucson Water will utilize the more recent PAG TAZ data to update the Water Plan projections. The 2005 PAG TAZ's will be used to generate the joint TW/PCWMD projections.

Also of note, PAG is in the process of upgrading its method of projecting population to the process currently used by the Maricopa Association of Governments (MAG). The MAG model is based on a 1-acre grid which is much more refined than the TAZ data. PCWMD and Tucson Water anticipate using the 2005 PAG TAZ data until such time as PAG develops the new system. However, if the new system is not on-line within two to three years, both entities will request updated TAZ projections from PAG for updating their respective plans.

### **Tucson Water Long Range Planning Area vs PCWMD Five Treatment Plant tributary areas**

Tucson Water's Long Range Planning Area encompasses eastern Pima County from Robles Junction in the west to the Pima/Cochise county boundary in the east and from the Pinal County line in the north to Pima Mine Road in the south. The area defined by PCWMD's five treatment plant tributary boundaries is significantly smaller. The areas included in the Water Plan but not in PCWMD's Facility Plan are generally on the outskirts of the Metropolitan area in regions of low population density. The population in the non-overlapping areas is about 3% of the 2030 projected population (45,187 out of a total of 1,382,587 people). The use of different planning areas for each entity is appropriate due to the different purposes of each plan. However, in order for both entities to utilize the same projections of future effluent generation, these areas must be reconciled as discussed below.

## **Effluent/Influent Quantity Generation Methodology**

### *Tucson Water's Previous Methodology*

In the draft Water Plan, Tucson Water forecasted effluent quantities based upon a population of 1,405,799 people living within the Long Range Planning Area in 2030. Tucson Water records support potable water deliveries of 162.84 gallons/person/day (GPCD) over the past several years. This per capita water usage was assumed to remain unchanged through 2030. To project future effluent quantities, Tucson Water applied a sewer return flow factor of 60% of potable supply or  $162.84 \times 60\% = 97.7$  GPCD. Tucson Water further estimated that 90% of the population in the Long Range Planning Area will be connected to a wastewater treatment plant in 2030 ( $1,405,799 \times 90\% = 1,265,219$  people). Based on these assumptions, that population would generate 123.62 MGD (138,469 AF/YR).

### *Pima County Wastewater Management Department's Previous Methodology*

PCWMD forecasted influent flow by arranging the individual sewer basins in the five treatment plant tributary areas in a hierarchal manner from the basins on the outskirts of the metropolitan area to the basins closest to the treatment plant. The basins in each tributary area flow to the next basin through the major interceptors in the conveyance system. The population within each basin was assigned a return flow in GPCD and the calculated flow was compared to flow meters located within the collection system in 2005. A system-wide average figure of about 85 GPCD was found to most closely match the metered flow in 2005 and was thus used in the Facility Plan projections through 2025. Further, the number of people on septic within each basin as of 2005 was estimated from the Pima County Map Guide by observing the location of sewer lines in relation to housing. Housing without adjacent sewers was considered on septic. For future projections, all new development within the five treatment plant tributary areas was assumed to be connected to sewer. (Therefore, the population on septic systems is projected to remain unchanged through 2025 within the five treatment plant tributary areas.) The overall percentage of septic tank usage projected for the year 2025 within the five tributary areas was about 6.7%. The draft Facility Plan applied the calculated GPCD factors and septic percentages to the PAG Census Tract data for future years to project effluent production. The draft Facility Plan projected an effluent volume for the five treatment plant tributary areas (Roger Road including the Randolph Plant, Ina Road, Marana, Avra Valley, and the Southlands including Corona de Tucson) for 2025 of 87.27 MGD (97,750 AF/YR).

### *Joint Planning Future Methodology*

In order to achieve consistent projections of effluent, PCWMD and Tucson Water staff discussed the most appropriate data sets and assumptions to apply. The entities agreed to the following:

- PCWMD will shift toward using the PAG TAZ data and will extend their plan to 2030;
- Tucson Water will continue use of the PAG TAZ's, but will update to the 2005 data set;
- PCWMD will summarize the development of the GPCD sewer return flow rates (Table 1) in the final Facility Plan and Tucson Water will reference this source in the final Water Plan;
- PCWMD will summarize the development of the septic usage values (Table 1) in the final Facility Plan and Tucson Water will reference this source in the final Water Plan;
- Tucson Water will adopt the GPCD sewer return flow rates developed by PCWMD (instead of using 60% of potable GPCD);
- Tucson Water will adjust its method of estimating the use of septic tanks as follows:
  - 1) The population located within the Long Range Planning Area, but outside of the five sewer tributary areas, will be assumed to be on septic.
  - 2) The population located within the five sewer tributary areas will assume to have the septic usage values presented in Table 1.

The net result of these agreements is that, for purposes of projecting effluent availability:

- Both entities will be working from the same basic data set (PAG TAZ 2005),
- Both entities will assume the same number of customers connected to septic in five-year increments (see Table 1), and
- Both entities will apply the estimated GPCD factors (Table 1) to calculate sewer return flows in five-year increments.

Utilizing this methodology, PCWMD's and Tucson Water's current estimate of the total population within the five treatment plant tributary areas in the year 2030 is 1,337,400 people. (The total population located within Tucson Water's Long Range Planning Area is 1,382,587, with the assumption that the 45,187 people living outside the five tributary areas will be served by septic systems.) Applying the septic and GPCD factors shown in Table 1 results in a projection of 1,247,963 persons on sewer in the five plant tributary areas in 2030, generating 106.14 MGD (118,900 AF/YR) of influent/effluent. This volume is then analyzed based on the various intergovernmental agreements relating to effluent to determine the projected distribution of effluent entitlements in 2030 for resource planning purposes. Table 1 presents the projected population, effluent volume, GPCD factor, and septic tank factor for every five years from 2005 through 2030.

**Roger Road, Ina Road, Avra Valley, Marana and Southlands Treatment Plants**

	<b>2005</b>	<b>2010</b>	<b>2015</b>	<b>2020</b>	<b>2025</b>	<b>2030</b>
Total Projected Population in Sewer Basins	837,571	928,849	1,031,142	1,133,129	1,235,513	1,337,400
Projected Population on Septic Systems	89,437	89,437	89,437	89,437	89,437	89,437
Percentage of Projected Population on Septic Systems	10.68%	9.63%	8.67%	7.89%	7.24%	6.69%
Projected Population Connected to Sewer	748,134	839,412	941,705	1,043,692	1,146,076	1,247,963
Sewer Flow GPCD Factor	85.53	85.39	85.28	85.18	85.12	85.05
Total Influent/Effluent Plant Flows (MGD)	63.99	71.68	80.31	88.90	97.55	106.14
Total Influent/Effluent Plant Flows (AF/YR) - <i>Rounded</i>	71700	80300	90000	99600	109300	118900

**Table 1** – Projections of Population and Effluent, 2005-2030

Also of note, the Pima Association of Governments (PAG) is in the process of updating the regional "208 Plan" relating to wastewater planning. TW and PCWMD staff have met with PAG staff and have determined that the 208 Plan will use these same projections of population and effluent generation. PCWMD and Tucson Water have also agreed to study two test areas within the sewer collection systems to collect additional information on the GPCD factor and determine if/how this factor may change in the future as new development occurs. The two areas include an older neighborhood located in central Tucson and a newly constructed neighborhood in the Continental Ranch area. Finally, PCWMD and Tucson Water staff agree to work cooperatively in the future when forecasting effluent availability so that subsequent planning efforts are closely aligned for the community.