MEMORANDUM

Date: June 27, 2018

To: The Honorable Chairman and Members
Pima County Board of Supervisors

From: C.H. Huckelberry
County Administrator

Re: **2017 Effluent Generation and Utilization Report**

The Regional Wastewater Reclamation Department (RWRD) annually produces an Effluent Generation and Utilization Report. The 2017 Effluent Generation and Utilization Report details the use and reuse of treated effluent from our wastewater reclamation facilities. It is important to remember these facilities now produce effluent that is equivalent to a drinking water standard. A key finding in the report is that in 2017, over 62.2 percent of the Class A effluent generated by our facilities was discharged to the Santa Cruz River and not put to direct beneficial use.

This discharged water is classified as instream recharge and receives only 50 percent credit for recharge because of existing Arizona law. This needs to be changed to receive 100 percent credit if we have any chance to preserve our riparian habitat. We believe many, if not most, environmental interests would be supportive of amending State law to allow 100 percent credits for discharging effluent to maintain a well established riparian habitat on the Santa Cruz River. Unfortunately, these efforts have not proved fruitful; hence, the County is now planning an effluent diversion project into the property acquired by the Regional Flood Control District on the Santa Cruz River, north of Sunset Road. This would divert the County 10 percent of effluent that remains unused for turf irrigation so the County may receive 100 percent recharge credit. While it is uncertain if this effluent will completely recharge to the aquifer at this location, an outlet will be provided to reroute this reclaimed water back into the Santa Cruz River after diversion. Such demonstrates the unintelligent policy objectives of constructed versus instream recharge in a riparian environment.

Finally, I recently met with the "Tucson Regional Water Coalition" and addressed the issue of differential water fees being applied to unincorporated area residents of Tucson Water even though residents adjacent to incorporated communities, such as Marana, Oro Valley and Tucson, would not be charged a surcharge. Such seems problematic from a utility equity prospective. I indicated the County would not be involved in this issue, but I reinforced the fact that the County operates our wastewater utility as simply a utility and not used as a revenue source for general County operating expenses. We have, since formation of our RWRD, insisted that the utility be a standalone economic entity and not subsidized by the County General Fund, nor receive excess revenues to supplement General Fund expenditures.

Attachment

CHH/anc

PIMA COUNTY
WASTEWATER RECLAMATION
201 NORTH STONE AVENUE
TUCSON, ARIZONA 85701-1207

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DIRECTOR

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June 26, 2018

TO: Effluent Generation Report Recipients

FROM: Barbara Escobar, Program Manager
Compliance & Regulatory Affairs Office BAE

SUBJECT: 2017 Effluent Generation and Utilization Report

Enclosed is a copy of Pima County Regional Wastewater Reclamation Department's report regarding Effluent Generation and Utilization throughout calendar year 2017. This report documents the production of effluent/reclaimed water from County wastewater reclamation facilities during the year. It also accounts for effluent/reclaimed water use by the County and by others who have a role in utilizing this resource.

This report also includes a table summarizing effluent production and use for the Tucson AMA. This information presents a broader picture of how this region relies upon effluent/reclaimed water as a vital water resource.

Pima County RWRD will soon make this 2017 report available on its website, which is accessible at http://webcms.pima.gov/government/wastewaterreclamation/ If you wish to find the online version of the Effluent Generation and Utilization report on this link, at the bottom of the screen click on "Reports." There you will also find other past reports dating back to 2003. For questions or additional information, please contact Jim DuBois at james.dubois@pima.gov or 520-724-6009.

BAE:kb
Enclosure

JUN26 2:50PM

Pima County Regional Wastewater Reclamation Department

EFFLUENT GENERATION AND UTILIZATION REPORT

2017

Prepared by:
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Pima County RWRD
Compliance & Regulatory Affairs Office
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PIMA COUNTY
WASTEWATER RECLAMATION

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I. Executive Summary

The Pima County Regional Wastewater Reclamation Department (RWRD) is dedicated to the goal of protecting public health and the environment in a manner sustainable and beneficial to current citizens and future generations. RWRD meets this commitment through the significant use of reclaimed water for groundwater recharge, reuse, and environmental restoration. Our activities in this regard aid in mitigating demand on potable water systems, thereby sustaining groundwater levels and preserving green infrastructure throughout our community.

During 2017, RWRD operated eight treatment facilities, and this report provides a narrative description of the different wastewater treatment processes used at each facility along with the quantity of wastewater received and the amount of effluent produced. During calendar year 2017, RWRD facilities treated wastewater to produce a total of 63,676 acre-feet (AF) of effluent. Figure 1 shows the contributions to total effluent generation in 2017 by RWRD facilities. Tres Rios (formerly known as Ina Rd) Wastewater Reclamation Facility (WRF) and Agua Nueva WRF (replacement facility for the closed Roger Road WRF) represent the current metropolitan facilities identified by the 1979 Intergovernmental Agreement (IGA) between the City of Tucson (COT) and Pima County (PC). Metropolitan facilities generated the majority of effluent with total production at 59,625 AF. Non-metropolitan, sub-regional facilities produced the remaining portion, totaling 4,051 AF.

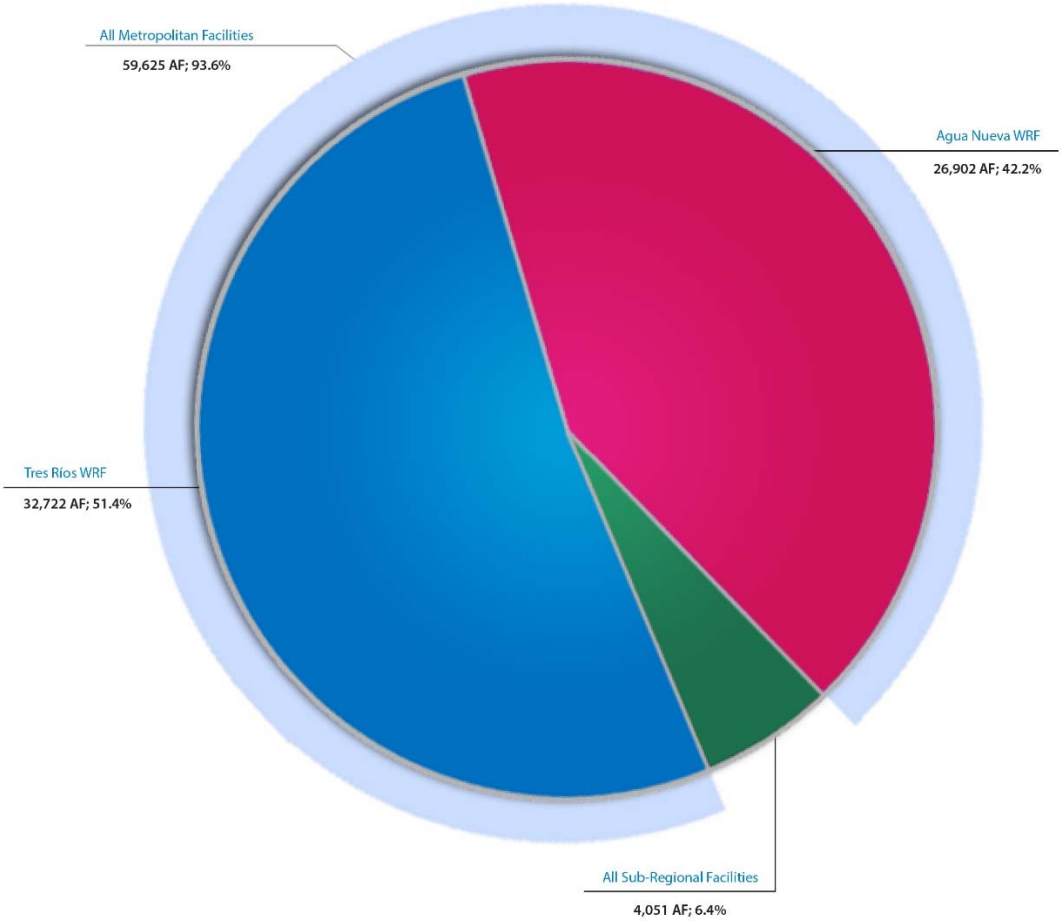


Figure 1: 2017 Effluent Production by Pima County RWRD Facilities – Total Volume Shown is 63,676 Acre-Feet.

I. **Executive Summary** (Continued)

Figure 2 illustrates the various modes of delivery or discharge for the total metropolitan and non-metropolitan effluent. RWRD delivered an appreciable portion of the total effluent volume, consisting of 19,966 AF, or more than 31%, to the City of Tucson's Reclaimed Water System. In addition, direct delivery of reclaimed water by RWRD to other parties accounted for 1,640 AF. Reuse for landscape, construction, or dust control at WRF sites utilized 69 AF. Direct discharge to groundwater using various means, such as percolation beds and recharge basins, accounted for 2,411 AF. The balance of effluent, or 39,590 AF, was released through surface water discharge under the authorization of Arizona Pollution Discharge Elimination System (AZPDES) permits.

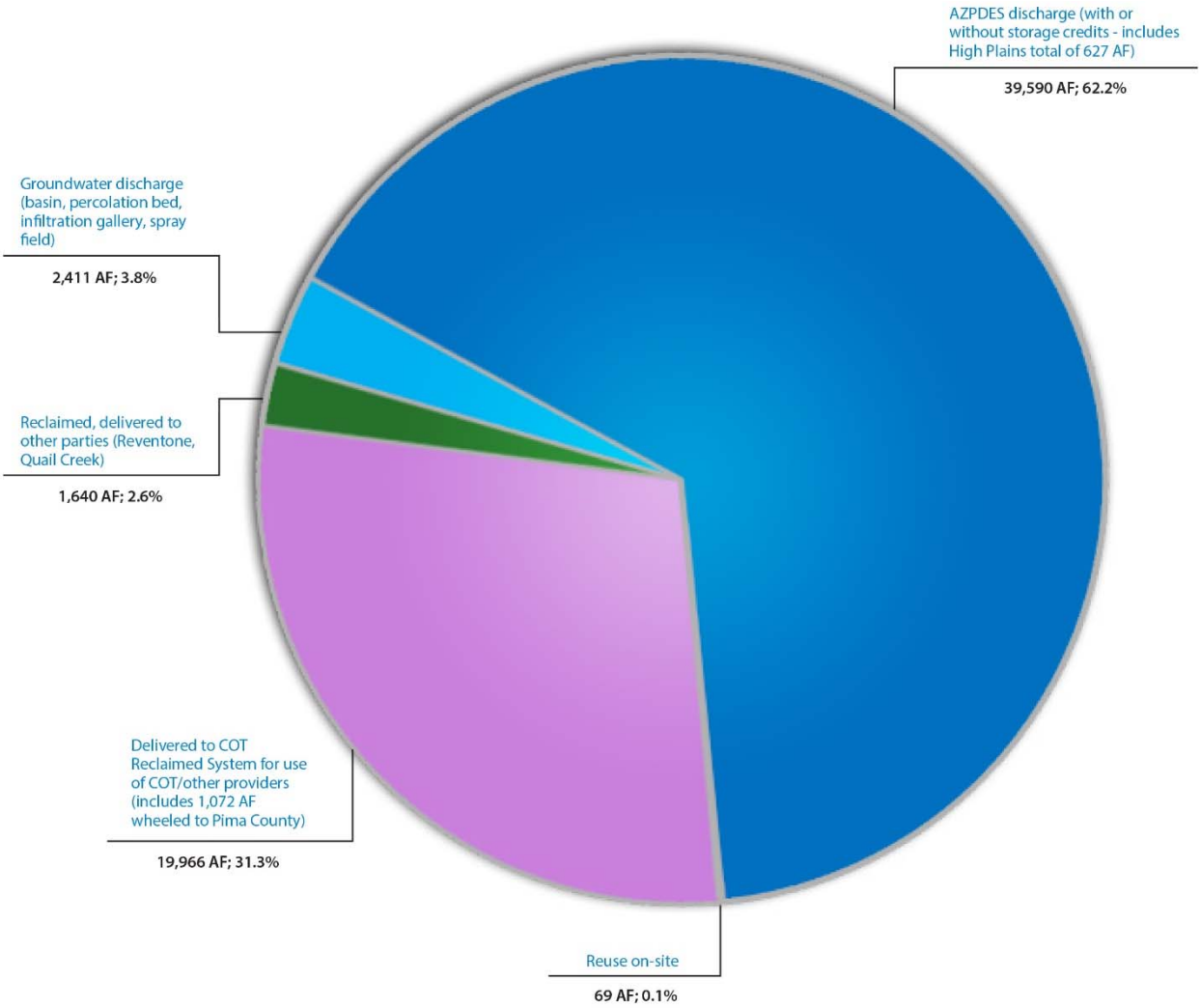


Figure 2: Effluent from All Pima County RWRD Facilities by Type of Discharge, Delivery, or Use for 2017

I. **Executive Summary** (Continued)

Figure 3 illustrates how the 1979 IGA and subsequent agreements govern effluent entitlement from the metropolitan facilities, and this report describes how Pima County's share of the effluent entitlement was used. In 2017, the effluent allocation formula designated the fixed amount of 28,200 AF for the Bureau of Reclamation to manage under Southern Arizona Water Rights Settlement Act (SAWRSA). No effluent was used for the Conservation Effluent Pool. Of the remaining portion, 28,282.3 AF were accorded to the City of Tucson and other water providers, while Pima County retained 3,142.5 AF.

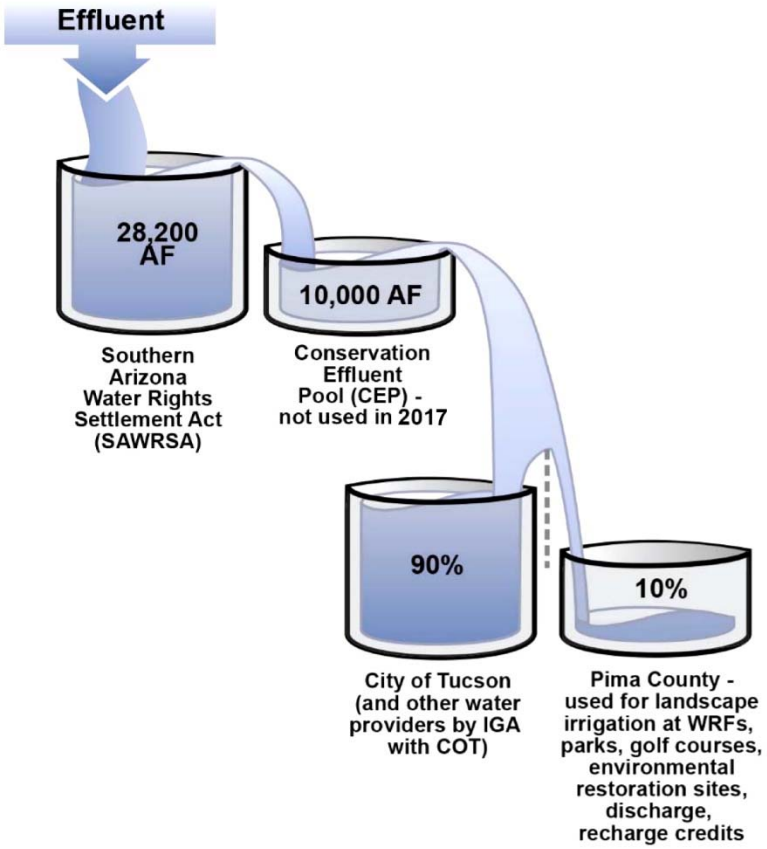


Figure 3: Effluent Entitlement from the Metropolitan Facilities

I. **Executive Summary** (Continued)

Figure 4 shows the manner in which Pima County's share of metropolitan effluent was distributed in 2017. Reuse, either on-site at the WRFs or wheeled through the Reclaimed Water System, accounted for approximately 36% of the total. Pima County used 55.4% of its metropolitan effluent to serve as water delivery to underground storage facilities recharging the aquifer: the Lower Santa Cruz Managed Recharge Project (LSCMRP) and the High Plains Constructed Recharge Project. Pima County's portion of the outflow from the storage reach on the Santa Cruz River comprised 184 AF, making up 5.9% of Pima County's total metropolitan effluent allocation.

As a result of groundwater recharge project activities in 2017, Pima County will receive credit to its long-term storage account for 2,768.30 AF of effluent. This volume includes 323.54 AF of underground storage credits for its share of effluent discharged into the Lower Santa Cruz Managed Recharge Project and 600.00 AF for effluent diverted off-channel into the High Plains Effluent Recharge Project. Pima County received an additional 368.15 AF of underground storage credits for its non-metropolitan effluent recharged at the Corona de Tucson WRF, and 1,476.62 AF of underground storage credits at the Avra Valley WRF.

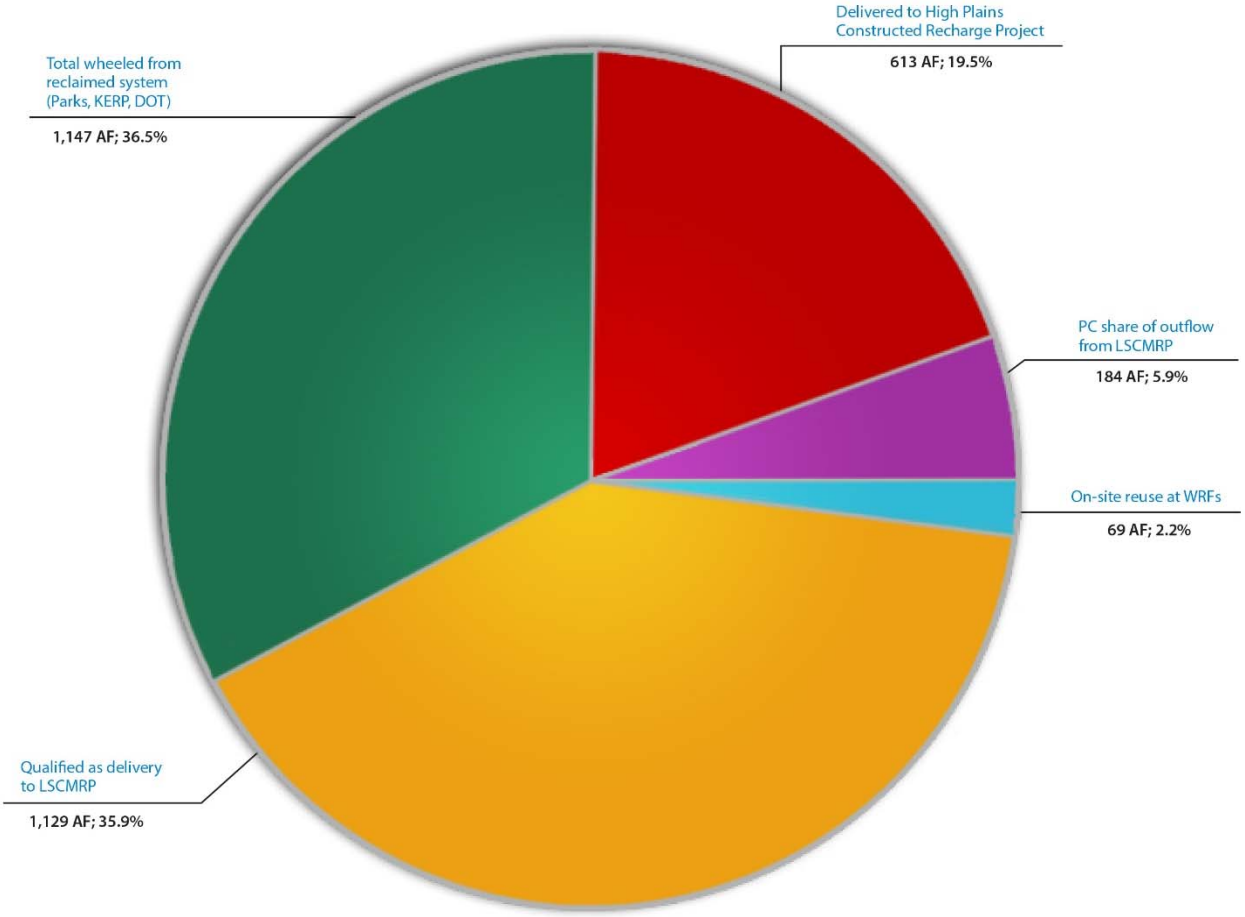


Figure 4: Distribution of Pima County's Share of Metropolitan Effluent in 2017

II. Benefits of Effluent/Reclaimed Water as a Resource

Reclaimed water is a vital, locally generated, renewable resource and a key component in Pima County's available water resources. Reclaimed water, as defined in A.R.S. §49-201(32) is water that has been treated or processed by a wastewater treatment plant. This water resource is regarded by a growing number of people as "recycled water" but is also sometimes referred to simply as "effluent." In 1989, the Arizona Supreme Court refused to characterize effluent as either surface water or groundwater, choosing instead to characterize it as "nothing more than sewerage effluent." This decision kept this part of the water supply from being regulated in the same manner as waters of the state. The Court held that local governments do not "own" the effluent, but have the right to put it to a beneficial use. Wastewater, treated to suitable reuse standards to protect public health as established by the Arizona Department of Environmental Quality (ADEQ), makes up a growing and increasingly important portion of Arizona's water supply.

Pima County has legislative authority under ARS §11-264 to construct and operate the regional wastewater system in Pima County. As such, the County is the major producer of effluent/reclaimed water in eastern Pima County.

Effluent/reclaimed water is generally used for three purposes:

- direct reuse
- environmental enhancement
- aquifer replenishment

Pima County uses its highly treated reclaimed water, much of it delivered through Tucson Water's reclaimed distribution system, to irrigate County parks, turf facilities and other landscape vegetation, to provide water for construction and dust control, and to sustain vegetation for environmental restoration projects. Using reclaimed water instead of potable supply for these purposes preserves our groundwater for the future. An additional use of the County's effluent/reclaimed water entitlement is long-term storage in underground storage (recharge) facilities. In this manner, reclaimed water is "banked" for future use and serves to replenish the aquifer until it is recovered.

III. Effluent Generated at Regional and Sub-Regional Wastewater Reclamation Facilities

A. Metropolitan Facilities

1. Tres Rios Wastewater Reclamation Facility

In recognition of the substantial reconfiguration and expansion at the Ina Road facility, it was renamed the Tres Rios WRF in 2013. RWRD's largest facility is located in the northwestern part of the Tucson basin and serves Oro Valley, Marana and the northwest portions of Tucson. The original facility was constructed in 1979 as a 25 Million Gallon per Day (MGD), High-Purity Oxygen (HPO), activated sludge process. Capacity at this facility was increased in 2006 with the addition of a 12.5 MGD, Biological Nutrient Removal Activated Sludge process, thereby increasing the overall combined plant capacity to 37.5 MGD. Completion of RWRD's Regional Optimization Master Plan allowed an increase in capacity to 50 MGD. A new plant interconnect pipeline between Agua Nueva WRF and Tres Rios WRF allows additional sewage flow to be diverted to the Tres Rios Facility. Other modifications include the following components:

- Expansion of preliminary and primary treatment facilities.
- New 25 MGD west train using 5-stage Bardenpho process to replace the HPO process.
- Replacement of Biological Nutrient Removal Activated Sludge process with a Bardenpho process train.
- New aeration tanks and secondary clarifiers for each train.
- New chlorine contact basins with chemical feed and mixing equipment.
- Additional biosolids processing facilities with new sludge thickening, anaerobic digestion, digested sludge thickening/dewatering, and final product storage and load-out facilities.

The addition of the Bardenpho process achieves compliance with regulatory requirements to reduce total nitrogen concentrations to 8 mg/L or less. This facility uses chlorination to disinfect and is permitted (mid-2016) for producing Class A+ reclaimed water. Effluent undergoes dechlorination prior to discharge.

The Tres Rios facility discharges into the Santa Cruz River under authorization of an AZPDES permit. Effluent discharged into the Santa Cruz River flows into the Lower Santa Cruz Managed Recharge Project (LSCMRP) which extends along the river channel from Ina Road to Trico Road. Groundwater storage credits are issued from the Arizona Department of Water Resources (ADWR) for half of the effluent that reaches the water table. Credits are apportioned among participants in the LSCMRP in accordance with IGAs that recognize each party's entitlement.

III. Effluent Generated at Regional and Sub-Regional Wastewater Reclamation Facilities (Continued)

A. Metropolitan Facilities (Continued)

1. Tres Rios Wastewater Reclamation Facility (Continued)

Tres Rios WRF					
Description			AFY	MG/Year	MGD Average
Influent			33,494.31	10,914.15	29.90
Process Water	*Used in industrial process at WRF, not included in effluent total used for allocations*		2,619.91	853.70	2.34
Effluent Usage	AZPDES discharge	*Outfall to Santa Cruz River, some available for storage credits*	32,714.93	10,660.19	29.21
	Reuse on-site	*N. and S. Irrigation and Fill Stand*	7.34	2.39	0.01
Effluent Total	*Used for calculation of effluent allocations*		32,722.27	10,662.58	29.21

2. Agua Nueva Wastewater Reclamation Facility

The Agua Nueva WRF is located west of I-10 just south of El Camino del Cerro. This facility was built to replace the Roger Road WRF and began discharge in December 2013. It services a population of approximately 500,000 people in the city of Tucson and has a capacity of 32 MGD. Similar to the Tres Rios upgrade, this new treatment facility utilizes a 5-stage Bardenpho treatment process to achieve nutrient removal.

The effluent produced at this facility can meet A+ reclaimed water standards, but is currently classified as Class B+ reclaimed water utilizing chlorination for disinfection. After dechlorination, it also meets AZPDES permit standards for the Santa Cruz River, as well as numeric Aquifer Water Quality Standards (AWQS). An average of nearly 18 MGD of the total effluent produced was sent to the City of Tucson Reclaimed Water System in 2017. A small percentage of treated effluent is reused for irrigation onsite, at the adjacent Pima County Water Campus, and to maintain wildlife ponds at the former Roger Road facility. The remaining portion of the effluent is discharged to the same outfall previously used by the Roger Rd WRF in the Santa Cruz River at an average rate of 6.1 MGD. Some of the treated wastewater becomes process water used in transporting biosolids pumped by pipeline to the Tres Rios WRF. Biosolids at Tres Rios are treated and transported off-site for use in agricultural land application and mine reclamation.

III. Effluent Generated at Regional and Sub-Regional Wastewater Reclamation Facilities (Continued)

A. Metropolitan Facilities (Continued)

2. Agua Nueva Wastewater Reclamation Facility (Continued)

Agua Nueva WRF					
Description			AFY	MG/Year	MGD Average
Influent			27,998.02	9,123.18	25.00
Process Water	*Used in biosolids flush water and other industrial processes at WRF, not included in effluent total used for allocations*		657.02	214.09	0.59
Effluent Usage	AZPDES discharge	*Outfall to Santa Cruz River, some available for storage credits*	6,875.17	2,240.28	6.14
	Delivered reclaimed water	*Input to COT reclaimed system*	19,966.11	6,505.98	17.82
	Reuse on-site	*Irrigation at WRF, CLC Irrigation and RR Pond*	61.27	19.96	0.05
Effluent Total	*Used for calculation of effluent allocations*		26,902.55	8,766.22	24.02

3. Randolph Park Wastewater Reclamation Facility

The Randolph Park WRF is located in midtown Tucson at the City-owned Randolph Park. This is a 3.5 MGD membrane bioreactor facility and utilizes an ultraviolet light disinfection system. This facility produces Class A effluent that is delivered directly into the COT's Reclaimed Water System.

The Randolph Park WRF did not operate in 2017. In December 2014 the Randolph Park WRF was placed in temporary cessation by Pima County RWRD. This was done to realize some cost savings and to rely on the new metropolitan WRFs. Because reclaimed water was not produced by Randolph Park WRF, Pima County's effluent was wheeled through Tucson Water's Reclaimed Water System from Agua Nueva WRF.

III. Effluent Generated at Regional and Sub-Regional Wastewater Reclamation Facilities (Continued)

A. Metropolitan Facilities (Continued)

4. Metropolitan Facilities Summary Table

Metropolitan Facilities - Overall Usage						
Description		Tres Rios WRF	Agua Nueva WRF	All Facilities		
		AFY		AFY	MG/Yr	MGD
Influent Total		33,494.31	27,998.02	61,492.33	20,037.34	54.90
Process Water Total		2,619.91	657.02	3,276.93	1,067.79	2.93
Effluent Usage	AZPDES Discharge	32,714.93	6,875.17	39,590.10	12,900.47	35.34
	Delivered to COT Reclaimed Water System	0.00	19,966.11	19,966.11	6,505.98	17.82
	Reuse on-site	7.34	61.27	68.61	22.36	0.06
Effluent Total		32,722.27	26,902.55	59,624.82	19,428.81	53.23

5. Metropolitan Facilities Historic Data

Year	Influent Received AF	Effluent Reused On-site at County WRFs AF	Effluent Discharged or Delivered to Reclaimed AF	Effluent Total AF
Tres Rios				
2003	27,071.50	806.9	26,407.60	27,214.50
2004	28,714.70	605.6	27,925.50	28,531.10
2005	26,149.80	665.7	24,552.10	25,217.80
2006	25,854.40	613.2	24,968.10	25,581.30
2007	28,840.60	8.0	27,856.30	27,864.30
2008	32,192.00	22.2	31,545.70	31,567.90
2009	28,960.41	24.61	28,527.58	28,552.19
2010	28,982.23	48.06	28,821.21	28,869.27
2011	27,746.58	60.91	27,368.49	27,429.40
2012	25,227.94	56.91	24,390.54	24,447.45
2013	28,334.77	26.08	27,954.40	27,980.48
2014	36,292.58	9.71	35,995.70	36,005.41
2015	34,285.79	26.92	33,760.91	33,787.83
2016	34,514.80	22.32	33,678.13	33,700.45
2017	33,494.31	7.34	32,714.93	32,722.27

III. Effluent Generated at Regional and Sub-Regional Wastewater Reclamation Facilities (Continued)

A. Metropolitan Facilities (Continued)

5. Metropolitan Facilities Historic Data (Continued)

Year	Influent Received AF	Effluent Reused On-site at County WRFs AF	Effluent Discharged or Delivered to Reclaimed AF	Effluent Total AF
Roger Road				
2003	41,991.90	119.7	40,862.20	40,981.90
2004	40,957.00	599	39,025.80	39,624.80
2005	43,239.00	13.6	42,311.50	42,325.10
2006	43,381.20	63	40,864.80	40,927.80
2007	40,730.70	60.1	37,763.20	37,823.30
2008	36,823.60	116.3	34,194.20	34,310.50
2009	37,542.80	107.73	35,339.57	35,447.30
2010	35,279.07	70.31	33,261.83	33,332.14
2011	36,327.65	84.23	34,258.96	34,343.19
2012	37,166.37	106.02	34,391.17	34,497.19
2013	32,700.14	103.35	29,907.98	30,011.33
2014	388.40	2.53	300.30	302.83
2015	closed	closed	closed	closed
Agua Nueva				
2013	222.60	0.49	215.60	216.09
2014	24,252.07	55.78	23,488.06	23,543.84
2015	28,641.53	33.86	27,534.56	27,568.42
2016	28,073.66	44.78	26,910.53	26,955.31
2017	27,998.02	61.27	26,841.28	26,902.55
Randolph Park				
2003	1.4	1.4	0	1.4
2004	114.7	0	97.5	97.5
2005	1,579.60	408.4	1,055.90	1,464.30
2006	2,785.40	679.5	1,878.50	2,558.00
2007	2,866.50	0.5	2,610.40	2,610.90
2008	2,973.60	0.3	2,661.60	2,661.90
2009	2,649.11	235.31	2,176.30	2,176.65
2010	2,738.75	0.30	2,337.37	2,337.67
2011	2,521.23	0.21	2,143.83	2,144.04
2012	2,816.99	0.22	2,447.78	2,448.00
2013	2,690.67	0.34	2,364.24	2,364.58
2014	2,618.01	0.20	2,267.63	2,267.83
2015-2017	0.00	0.00	0.00	0.00

III. Effluent Generated at Regional and Sub-Regional Wastewater Reclamation Facilities (Continued)

A. Metropolitan Facilities (Continued)

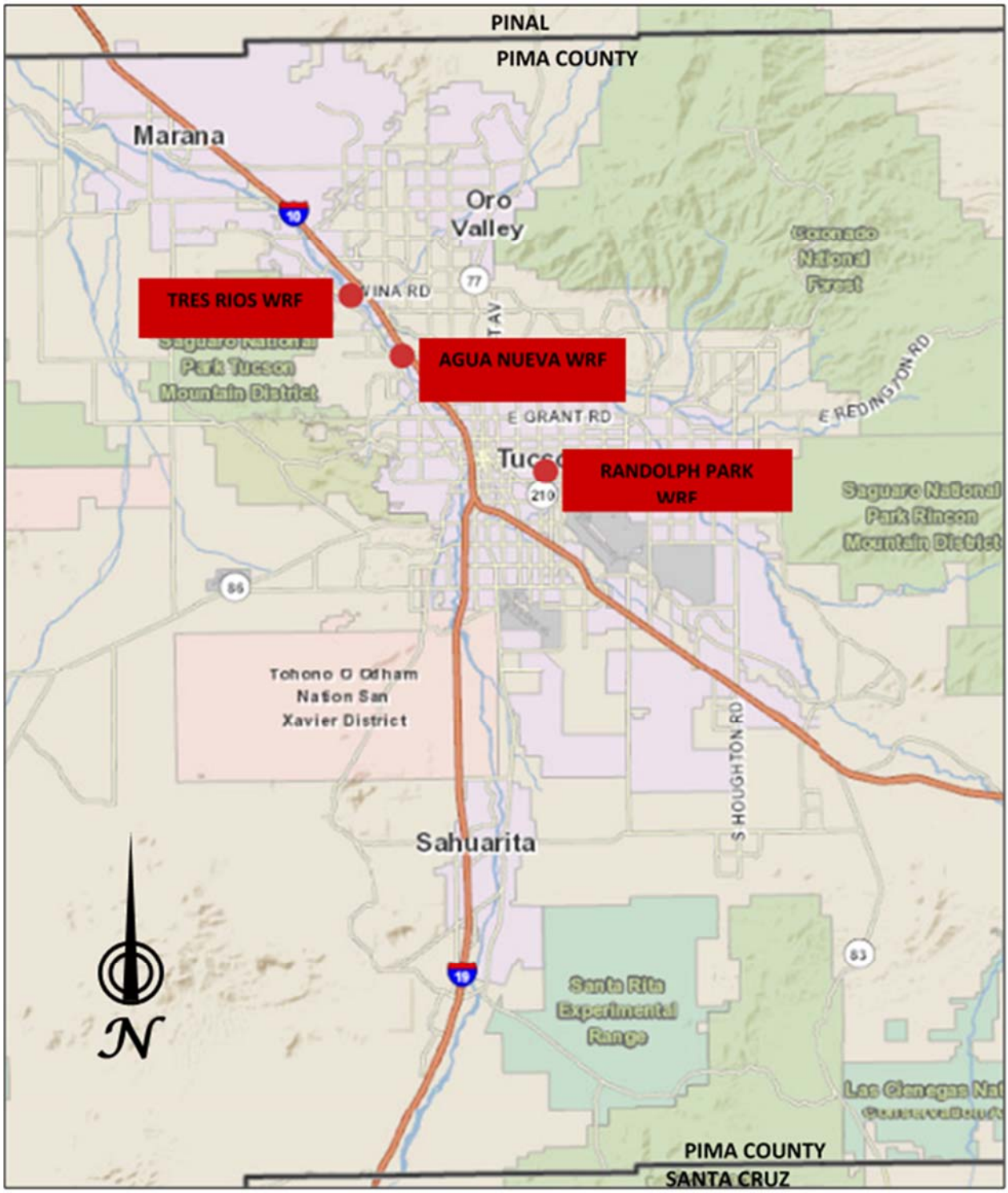
5. Metropolitan Facilities Historic Data (Continued)

Year	Influent Received AF	Effluent Reused On-site at County WRFs AF	Effluent Discharged or Delivered to Reclaimed System AF	Effluent Total AF
Metropolitan Facility Totals				
2003	69,064.80	927.9	67,269.90	68,197.80
2004	69,786.40	1,204.60	67,048.80	68,253.40
2005	70,968.40	1,087.70	67,919.50	69,007.20
2006	72,021.00	1,355.70	67,711.40	69,067.10
2007	72,437.80	68.6	68,229.90	68,298.50
2008	71,989.20	138.8	68,401.50	68,540.30
2009	69,152.32	367.65	66,043.45	66,411.10
2010	67,000.05	118.67	64,420.41	64,539.08
2011	66,595.46	145.35	63,771.28	63,916.63
2012	65,211.30	163.15	61,229.49	61,392.64
2013	63,948.18	130.26	60,442.22	60,572.48
2014	63,551.06	68.22	62,051.69	62,119.91
2015	62,927.32	60.78	61,295.47	61,356.25
2016	62,588.46	67.10	60,588.66	60,655.76
2017	61,492.33	68.61	59,556.21	59,624.82

III. Effluent Generated at Regional and Sub-Regional Wastewater Reclamation Facilities (Continued)

A. Metropolitan Facilities (Continued)

6. Metropolitan Facilities Map



III. Effluent Generated at Regional and Sub-Regional Wastewater Reclamation Facilities (Continued)

B. Non-Metropolitan Sub-Regional Facilities

1. Arivaca Junction Wastewater Reclamation Facility

The Arivaca Junction WRF is located in the town of Amado, approximately 38 miles south of Tucson. It consists of a single, 3.2-acre, aerated lagoon with a permitted treatment capacity of 100,000 gallons per day (GPD). Chlorination is the method of disinfection. Effluent disposal is via evaporation, percolation through the base of the unlined pond, and reuse. Evaporation ranges from 7,000 to 14,000 GPD, while percolation is approximately 10,000 GPD. RWRD has a reuse agreement with Reventone Ranch to accept delivery of this facility's Class C reclaimed water for restricted agricultural use.

Arivaca Junction WRF					
Description			AFY	MG/Year	MGD Average
Influent			47.10	15.35	0.04
Process Water	*Used in biosolids flush water and other industrial processes at WRF, not included in effluent total used for allocations*		0.00	0.00	0.00
Effluent Usage	Reclaimed, delivered to other parties	*Reventone Ranch*	19.21	6.26	0.02
	Groundwater Discharge	*Percolation through base of impoundment (estimated at 10,000 gallons per day)*	11.23	3.66	0.01
	Reuse on-site	*Irrigation at WRF*	0.07	0.02	0.00
Effluent Total			30.51	9.94	0.03

2. Avra Valley Wastewater Reclamation Facility

The Avra Valley WRF is located on the west side of the Tucson Mountains, approximately 20 miles southwest of Tucson. The treatment facility has a permitted capacity of 4.0 MGD using two oxidation ditches for achieving nitrification and denitrification. It utilizes sand filtration, and UV treatment is the method of disinfection. Effluent produced at this facility can meet Class A+, but is permitted for Class B+ reclaimed quality. Effluent is discharged primarily by percolation through five basins permitted for groundwater recharge. Also, on-site reuse is possible for irrigation and dust control, and limited surface water discharge to Black Wash is covered under an AZDPES permit.

III. Effluent Generated at Regional and Sub-Regional Wastewater Reclamation Facilities (Continued)

B. Non-Metropolitan Sub-Regional Facilities (Continued)

2. Avra Valley Wastewater Reclamation Facility (Continued)

Avra Valley WRF					
Description			AFY	MG/Year	MGD Average
Influent			1,476.33	481.06	1.32
Process Water	*Used in industrial processes at WRF, not included in effluent total used for allocations*		71.47	23.29	0.06
Effluent Usage	AZPDES Discharge	*Black Wash Spray Field*	0.00	0.00	0.00
	Groundwater Discharge	*Percolation beds and ponds - groundwater recharge with storage credit accrual*	1,493.85	486.77	1.33
	Reuse on-site	*Irrigation at WRF*	0.00	0.00	0.00
Effluent Total[1]			1,493.85	486.77	1.33

[1]A volume of 1,476.62 AF in storage credits was reported to ADWR for this recharge after subtracting evaporative losses of 17.0 AF (slight delivery volume discrepancy due to difference in number of significant figures in daily readings during 2017).

3. Corona de Tucson Wastewater Reclamation Facility

The Corona de Tucson WRF is located 22 miles southeast of Tucson. The facility consists of two 0.5 MGD BNROD (oxidation ditch) treatment trains with closed loop reactors for achieving both nitrification and denitrification. This facility is not classified for reuse. Effluent is disposed into percolation basins designed and permitted for groundwater recharge. Recent changes include a new chlorine contact basin and sodium hypochlorite feed system which were added as the method of disinfection in 2016.

Corona de Tucson WRF					
Description			AFY	MG/Year	MGD Average
Influent			392.31	127.83	0.35
Process Water	*Used in industrial processes at WRF, not included in effluent total used for*		0.00	0.00	0.00
Effluent Usage	Groundwater Discharge	*Percolation beds and ponds - groundwater recharge with storage credit accrual*	368.95	120.22	0.33
Effluent Total[2]			368.95	120.22	0.33

[2]A volume of 368.15 AF in storage credits was reported to ADWR for this recharge after subtracting evaporative losses of 0.8 AF.

III. Effluent Generated at Regional and Sub-Regional Wastewater Reclamation Facilities (Continued)

B. Non-Metropolitan Sub-Regional Facilities (Continued)

4. Green Valley Wastewater Reclamation Facility

The Green Valley WRF is located approximately 29 miles south of Tucson and serves the town of Green Valley. This facility is comprised of two distinct treatment sequences. The first consists of a 2.0 MGD BNROD (oxidation ditch) achieving nitrification and denitrification. Sand filtration followed by chlorination of this effluent produces Class A+ reclaimed water. The reclaimed water is delivered to Robson/ Quail Creek for groundwater recharge. The other option for treatment at the facility can handle up to 2.1 MGD. It consists of two separate secondary aerated lagoons, two separate polishing ponds, and four percolation ponds. It produces the equivalent of Class B reclaimed water, but this stream is not classified for reuse in the Aquifer Protection Permit. Effluent from this portion of the facility is disposed of only through percolation. In 2016 an ADEQ permit amendment was issued to allow discharge of BNROD effluent into selected on-site percolation ponds.

Green Valley WRF					
Description			AFY	MG/Year	MGD Average
Influent			2,106.21	686.31	1.88
Process Water	*Used in industrial processes at WRF, not included in effluent total used for allocations*		0.00	0.00	0.00
Effluent Usage	Reclaimed, delivered to other parties	*Effluent from BNROD to Robson/ Quail Creek for groundwater recharge*	1,620.69	528.10	1.45
	Groundwater Discharge	*Percolation ponds (Lagoon Facility) - groundwater recharge without storage credit accrual*	517.01	168.47	0.46
Effluent Total			2,137.70	696.57	1.91

5. Mt. Lemmon Wastewater Reclamation Facility

The Mt. Lemmon WRF is located in the Village of Summerhaven in the Catalina Mountains. This facility operates under a special use permit issued by the United States Forest Service (USFS), which authorizes a treatment capacity of 17,000 gallons per day. The facility consists of a closed loop BNROD (oxidation ditch) for achieving both nitrification and denitrification. Effluent is disposed of through an off-site sprayfield, through a French drain, and through a surface water discharge to an unnamed tributary to the San Pedro River under an AZPDES permit. The facility currently is regulated by an APP general permit, so a reclaimed water classification is not possible. The spray application is to a restricted area of forest and is not regarded as reuse by ADEQ.

III. Effluent Generated at Regional and Sub-Regional Wastewater Reclamation Facilities (Continued)

B. Non-Metropolitan Sub-Regional Facilities (Continued)

5. Mt. Lemmon Wastewater Reclamation Facility (Continued)

Mt. Lemmon WRF					
Description			AFY	MG/Year	MGD Average
Influent			3.60	1.17	0.0032
Process Water	*Used in industrial processes at WRF, not included in effluent total used for*		0.00	0.00	0.0000
Effluent Usage	Groundwater Discharge	*Discharge to spray field, drain, or AZPDES release to unnamed tributary to San Pedro River*	3.44	1.12	0.0031
Effluent Total			3.44	1.12	0.0031

6. Pima County Fairgrounds Wastewater Reclamation Facility

The PC Fairgrounds WRF is located approximately 18 miles southeast of Tucson and serves the fairgrounds complex. This facility has a permitted capacity of 20,000 GPD. It uses stabilization lagoons and the effluent is disposed of through evaporation and percolation. The facility currently is regulated by an APP general permit, so a reclaimed water classification is not possible.

Pima County Fairgrounds WRF					
Description			AFY	MG/Year	MGD Average
Influent			16.72	5.45	0.0149
Effluent Usage	Groundwater Discharge	*Percolation*	16.72	5.45	0.0149

III. Effluent Generated at Regional and Sub-Regional Wastewater Reclamation Facilities (Continued)

B. Non-Metropolitan Sub-Regional Facilities (Continued)

7. Sub-Regional Facilities Summary

Sub-Regional Facilities - Effluent Usage										
		Arivaca	Avra Valley	Corona	Green Valley	Mt. Lemmon	Fair-grounds	All Facilities		
Description		AFY						AFY	MG/Yr	MGD
Influent Total		**47.10**	**1,476.33**	**392.31**	**2,106.21**	**3.60**	**16.72**	**4,042.27**	**1,317.18**	**3.61**
Process Water Total		**0.00**	**71.47**	**0.00**	**0.00**	**0.00**	**0.00**	**71.47**	**23.29**	**0.06**
Effluent Usage	AZPDES Discharge		0.00					0.00	0.00	0.00
	Reclaimed, delivered to other parties	19.21			1,620.69			1,639.90	534.36	1.46
	Groundwater Discharge (basin, percolation bed, infiltration gallery, spray field)	11.23	1,493.85	368.95	517.01	3.44	16.72	2,411.20	785.69	2.15
	Reuse on-site	0.07	0.00					0.07	0.02	0.00
Effluent Total		**30.51**	**1,493.85**	**368.95**	**2,137.70**	**3.44**	**16.72**	**4,051.17**	**1,320.08**	**3.62**

III. **Effluent Generated at Regional and Sub-Regional Wastewater Reclamation Facilities** (Continued)

B. Non-Metropolitan Sub-Regional Facilities (Continued)

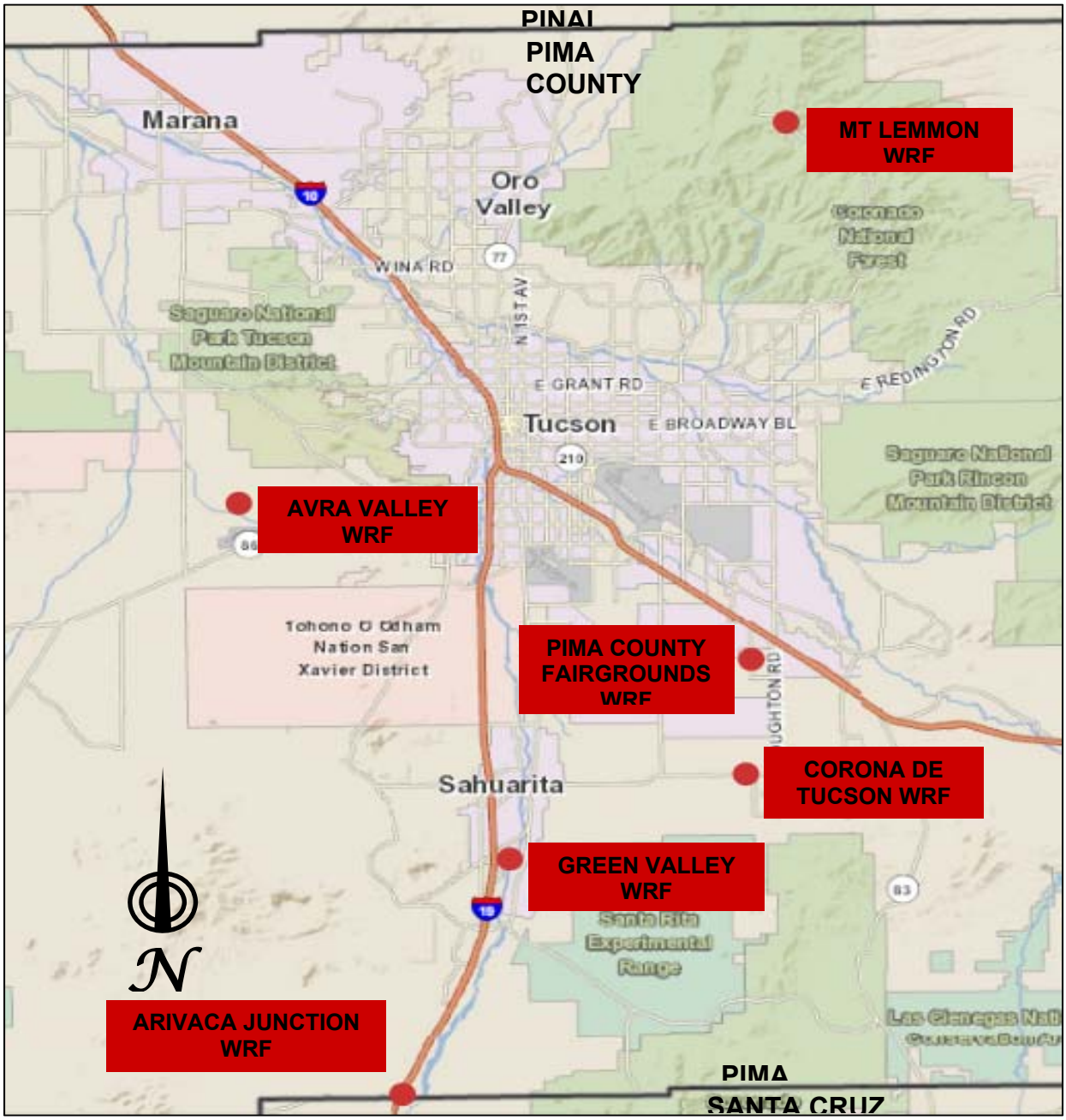
8. Summary Table of All Facilities

All Facilities - Effluent Usage					
	Metropolitan	Sub-Regional	All Facilities		
Description	AFY		AFY	MG/Yr	MGD
Influent Total	**61,492.33**	**4,042.27**	**65,534.60**	**21,354.51**	**58.51**
Process Water Total	**3,276.93**	**71.47**	**3,348.40**	**1,091.08**	**2.99**
AZPDES Discharge	39,590.10	0.00	39,590.10	12,900.47	35.34
Delivered to COT Reclaimed System	19,966.11		19,966.11	6,505.98	17.82
Reclaimed, delivered to other parties		1,639.90	1,639.90	534.36	1.46
Groundwater Discharge		2,411.20	2,411.20	785.69	2.15
Reuse on-site	68.61	0.07	68.68	22.38	0.06
Effluent Total	**59,624.82**	**4,051.17**	**63,675.99**	**20,748.89**	**56.85**

III. Effluent Generated at Regional and Sub-Regional Wastewater Reclamation Facilities (Continued)

B. Non-Metropolitan Sub-Regional Facilities (Continued)

9. Non-Metropolitan Facilities Map



IV. Reclaimed Water for Reuse, Environmental Restoration and Underground Storage (Groundwater Recharge)

A. Reclaimed Water Wheeled Through Tucson Water Reclaimed System

To take advantage of effluent as a renewable water supply, Pima County reuses a substantial volume of its wastewater for irrigation, construction, environmental restoration and other purposes. Most of this reuse is conducted by the Natural Resources, Parks and Recreation Department and the Kino Sports Complex/Kino Environmental Restoration Project. Pima County Regional Flood Control District and Pima County Department of Transportation also use reclaimed water for certain projects. RWRD periodically draws on the reclaimed supply for sewer line flushing and construction use. The supply of reclaimed water for various County sites is Class A reclaimed water wheeled through the City of Tucson Reclaimed Water System and delivered in the amounts shown in the following tables.

Natural Resources, Parks and Recreation			
2017 Monthly Reclaimed Water Use			
Month	**Gallons**	**Ccf**	**AF**
January	7,427,408	9,929.0	22.79
February	6,552,187	8,759.0	20.11
March	12,966,732	17,334.0	39.79
April	23,532,218	31,458.0	72.22
May	34,764,218	46,473.0	106.69
June	39,266,743	52,492.0	120.51
July	42,106,348	56,288.0	129.22
August	22,847,003	30,542.0	70.11
September	26,173,590	34,989.0	80.32
October	28,506,764	38,108.0	87.48
November	25,845,195	34,550.0	79.32
December	17,524,613	23,427.0	53.78
Total	**287,513,018**	**384,349.0**	**882.34**

Regional Flood Control District			
2017 Monthly Reclaimed Water Use			
Month	**Gallons**	**Ccf**	**AF**
January	226,660	303.0	0.70
February	174,296	233.0	0.53
March	216,935	290.0	0.67
April	324,655	434.0	1.00
May	796,675	1,065.0	2.44
June	733,839	981.0	2.25
July	598,442	800.0	1.84
August	204,966	274.0	0.63
September	378,514	506.0	1.16
October	485,486	649.0	1.49
November	399,460	534.0	1.23
December	286,504	383.0	0.88
Total	**4,826,431**	**6,452.0**	**14.81**

IV. Reclaimed Water for Reuse, Environmental Restoration and Underground Storage (Groundwater Recharge) (Continued)

A. Reclaimed Water Wheeled Through Tucson Water Reclaimed System (Continued)

Department of Transportation			
2017 Monthly Reclaimed Water Use			
Month	**Gallons**	**Ccf**	**AF**
January	0	0.0	0.00
February	0	0.0	0.00
March	0	0.0	0.00
April	0	0.0	0.00
May	0	0.0	0.00
June	0	0.0	0.00
July	0	0.0	0.00
August	0	0.0	0.00
September	0	0.0	0.00
October	0	0.0	0.00
November	0	0.0	0.00
December	0	0.0	0.00
Total	**0**	**0.0**	**0.00**

Regional Wastewater Reclamation Department			
2017 Monthly Reclaimed Water Use *			
Month	**Gallons**	**Ccf**	**AF**
January	0	0.0	0.00
February	0	0.0	0.00
March	0	0.0	0.00
April	0	0.0	0.00
May	0	0.0	0.00
June	0	0.0	0.00
July	0	0.0	0.00
August	0	0.0	0.00
September	0	0.0	0.00
October	0	0.0	0.00
November	0	0.0	0.00
December	0	0.0	0.00
Total	**0**	**0.0**	**0.00**

*Water used for sewer line flushing.

IV. Reclaimed Water for Reuse, Environmental Restoration and Underground Storage (Groundwater Recharge) (Continued)

A. Reclaimed Water Wheeled Through Tucson Water Reclaimed System (Continued)

Kino Sports Park & KERP			
2017 Monthly Reclaimed Water Use			
Month	**Gallons**	**Ccf**	**AF**
January	3,137,330	4,194.0	9.63
February	986,681	1,319.0	3.03
March	0	0.0	0.00
April	9,424,706	12,599.0	28.92
May	12,134,151	16,221.0	37.24
June	14,943,086	19,976.0	45.86
July	15,530,306	20,761.0	47.66
August	0	0.0	0.00
September	0	0.0	0.00
October	0	0.0	0.00
November	1,196,135	1,599.0	3.67
December	9,778,535	13,072.0	30.01
Total	**67,130,930**	**89,741.0**	**206.02**

Historical Water Use at Kino Sports Park & KERP			
	Reclaimed		Harvested Stormwater*
Year	**Ccf**	**AF**	**AF**
2003	156,042.8	358.2	87.00
2004	143,723.0	329.9	30.70
2005	78,493.0	180.2	64.90
2006	171,955.0	394.8	0.00
2007	69,389.0	159.3	65.95
2008	81,916.0	188.1	95.85
2009	163,725.0	375.9	0.00
2010	56,140.0	128.9	88.53
2011	74,907.7	172.0	50.22
2012	94,651.0	217.3	36.79
2013	80,297.0	184.3	126.81
2014	76,132.0	174.8	149.39
2015	39,865.0	91.5	187.77
2016	40,631.0	93.3	318.14
2017	89,741.0	206.0	118.47
Total	**1,417,608.5**	**3,254.4**	**1420.52**

*2016 was a record high volume for stormwater harvested.

IV. Reclaimed Water for Reuse, Environmental Restoration and Underground Storage (Groundwater Recharge) (Continued)

A. Reclaimed Water Wheeled Through Tucson Water Reclaimed System (Continued)

Yearly Reclaimed Water Use by Pima County from Tucson Water's Reclaimed System			
Year	**Gallons**	**Ccf**	**AF**
2003	69,573,993	93,006.9	213.51
2004	86,118,658	115,123.9	264.29
2005	74,349,631	99,391.0	228.17
2006	92,822,026	124,085.0	284.86
2007	295,588,987	395,145.0	907.13
2008	302,590,005	404,504.0	928.61
2009	418,643,532	559,645.0	1,284.77
2010	317,788,925	424,822.0	975.26
2011	366,899,807	490,473.7	1,125.97
2012	330,454,192	441,753.0	1,014.13
2013	360,033,662	481,295.0	1,104.90
2014	360,110,712	481,398.0	1,105.14
2015	301,148,509	402,577.0	924.19
2016	335,933,344	449,077.6	1,030.94
2017	**359,470,379**	**480,542.0**	**1,103.17**

B. Environmental Restoration with Reclaimed Water

As part of Pima County's Sustainable Action Plan begun in FY `09, RWRD began tabulating the volume of effluent used for environmental restoration or riparian enhancement at various projects and sites. For some of the listed projects, riparian vegetation is one of the multiple benefits derived from operating a groundwater recharge project.

IV. Reclaimed Water for Reuse, Environmental Restoration and Underground Storage (Groundwater Recharge) (Continued)

B. Environmental Restoration with Reclaimed Water

Environmental Restoration with Reclaimed Water			
Project Name	**Volume (AF)**	**Multibenefit Recharge Project?**	**Comments**
Kino Environmental Restoration Project (KERP)*	0.0		Reclaimed water was not needed for riparian vegetation at the site during the year. KERP's vegetation is usually supported with harvested stormwater, except in particularly dry years.
Lower Santa Cruz Managed Recharge Project	173.1	Yes	This volume represents Pima County's share of the total evapotranspiration (ET) from the managed recharge project. The total ET was 1016.64 AF, and this volume is split among the participants by an agreed upon allocation formula.
Marana High Plains Effluent Recharge Project	8.7	Yes	Delivery of 613.4 AF was diverted from Santa Cruz River. Calculated evapotranspiration of 8.7 AF is the portion of the delivery volume that supports riparian vegetation.
Rillito Riparian/Swan Wetlands*	0.3		Reclaimed water is being used for sustaining plants that were installed as part of this ecosystem restoration project.
Roger Rd WRF Pond	34.8		This volume is used to support a riparian and wildlife viewing pond adjacent to the Santa Cruz River on-site at the Roger Rd WRF.
Santa Cruz River- West Branch Bosques*	0.7		Small wetland area managed by PCRFCD. Reclaimed water used for vegetation establishment in water harvesting basins adjacent to existing mesquite bosque along West Branch of Santa Cruz River. Previously (2005-2011) provided drought relief for mature bosque vegetation.
Paseo de las Iglesias*	1.2		Project involves bank protection, paved pathway River Park with new vegetation, water harvesting basins and preservation of in-place areas of vegetation/habitat on the Santa Cruz River near Silverlake Road, managed by PCRFCD.
Arroyo Chico*	4.8		Construction of a series of detention basins in Arroyo Chico near Cherry Avenue including athletic fields and environmental restoration of habitat and revegetation within the basins. Managed by PCRFCD.
Annual Total	**223.6**		

*Reclaimed water delivered through COT reclaimed

IV. Reclaimed Water for Reuse, Environmental Restoration and Underground Storage (Groundwater Recharge) (Continued)

C. Underground Storage (Groundwater Recharge) of Effluent

Pima County operates, or participates in operation of four facilities designed to replenish groundwater supply by recharging the aquifer. The source water for this recharge is wastewater effluent that has been treated to a high quality. Each recharge project operates under an Aquifer Protection Permit issued by ADEQ and an Underground Storage Facility Permit issued by ADWR. The tables below reflect the groundwater recharge credits earned and the most recent balance of Pima County's Long-term Storage Account with ADWR.

Recharge Volumes - Calendar Year 2017 in Acre Feet (AF)

PROJECT	Delivery Volume	Evapo-transpiration	Contribution to Stream Diversions	Outflow	Cut to Aquifer	Recharge Credit
Lower Santa Cruz Managed Recharge Project (LSCMRP)	1,129.21	173.10	309.03	183.95	323.54	323.54
Marana High Plains Effluent Recharge Project (MHPERP)	613.40	8.70				600.00
Corona de Tucson	368.95	0.8				368.15
Avra Valley	1,493.62	17.0				1,476.62
Total	3,605.18	199.60	309.03	183.95	323.54	2,768.31

Long-term Storage Credit Summary

Year	County Share of Metro Effluent (AF)	County Storage Credits (AF)	Cumulative Credits (AF)
2003	3,999.80	58.10	58.10
2004	4,005.30	449.30	507.40
2005	4,080.70	535.10	1,042.50
2006	4,086.70	532.30	1,574.80
2007	4,009.90	788.38	2,363.18
2008	4,034.00	1,025.89	3,389.07
2009	3,821.10	977.41	4,366.48
2010	3,633.91	1,085.37	5,451.85
2011	3,571.66	990.06	6,441.91
2012	3,319.26	1,131.71	7,573.62
2013	3,237.25	962.69	8,536.31
2014	3,391.99	1,339.98	9,876.29
2015	3,315.63	1,910.89	11,787.18
2016	3,245.58	2,789.40	14,576.58
2017	3,142.48	2,768.31	17,344.89

IV. Reclaimed Water for Reuse, Environmental Restoration and Underground Storage (Groundwater Recharge) (Continued)

D. Summary of Use or Distribution of Pima County's Metropolitan Effluent Allotment

Pima County Effluent Use Summary (10% Metropolitan Allotment)					
Description			AFY	MG/Yr	MGD
Reuse	Reclaimed System	Natural Resources, Parks and Recreation	882.34	287.51	0.79
		Kino Sports Park & KERP	206.02	67.13	0.18
		Department of Transportation	0.00	0.00	0.00
		Regional Flood Control District	14.81	4.83	0.01
		Regional Wastewater Reclamation	0.00	0.00	0.00
		System Loss (4% in 2017)	44.13	14.38	0.04
		Total from Reclaimed System	1,147.30	373.85	1.02
	Reuse on Metropolitan WRF sites		68.61	22.36	0.06
Santa Cruz Releases	Delivered to High Plains Constructed Recharge Project		613.40	199.88	0.55
	Qualified as Delivery to Lower Santa Cruz River Managed Recharge Project (LSCMRP)		1,129.21	367.95	1.01
	PC Share of Outflow from LSCMRP		183.95	59.94	0.16
Effluent Total			**3,142.47**	**1,023.98**	**2.81**

V. Effluent Entitlements

The 1979 IGA and subsequent agreements govern effluent entitlement from the metropolitan facilities. In 2017 the total metropolitan effluent produced was 59,624.82 AF. The effluent allocation formula designated the fixed amount of 28,200 AF for the Bureau of Reclamation to manage under Southern Arizona Water Rights Settlement Act (SAWRSA). Of the remaining portion, the City of Tucson and other water providers received 28,282.3 AF, while Pima County retained 3,142.5 AF.

Entitlement Calculations	Effluent Total (AF)
Total Effluent	59,624.8
SAWRSA	28,200.0
Total Less SAWRSA*	31,424.8
Water Providers Share	0.9
Pima County Share	0.1
Entities Share 2016	
- Water Providers (90%)	28,282.3
- Pima County (10%)	3,142.5

*SAWRSA = Southern Arizona Water Rights Settlement Act.

Allocation and use of effluent in Pima County are governed by a series of agreements and legal constraints. The key agreements are listed and described below:

A. 1979 Intergovernmental Agreement, Resolution No. 1979 - 78

The 1979 Intergovernmental Agreement, signed on June 26, 1979, was the original agreement between Pima County and the City of Tucson. This agreement assigned control of wastewater conveyance and treatment activities to PC RWRD. In exchange, the COT would receive 90% of all effluent produced at the RWRD metropolitan sites, which were limited to Ina Road WRF and Roger Road WRF at the time.

B. Southern Arizona Water Rights Settlement Act (SAWRSA)

SAWRSA stands for the Southern Arizona Water Rights Settlement Act of 1982 (P.L. 97-293) and the subsequent Arizona Water Settlements Act (P.L. 108-451--12/10/2004). The U.S. Department of Interior Bureau of Reclamation receives, on behalf of the Tohono O'Odham Nation, 28,200 acre-feet per year of secondary treated effluent from Tucson area wastewater treatment plants to assist in implementation of the settlement. Reclamation currently recharges this treated effluent in the Santa Cruz River and receives credit for 50% of the water recharged.

C. City of Tucson-Pima County Supplemental Intergovernmental Agreement Relating to Effluent, Resolution No. 2000-28

The 2000 Supplemental Intergovernmental Agreement signed on February 8, 2000, placed restrictions on how PC could use effluent. This agreement also exempted Sub-Regional treatment facilities from the City control, identified the need for reopening the Randolph Park

V. **Effluent Entitlements** (Continued)

C. City of Tucson - Pima County Supplemental Intergovernmental Agreement Relating to Effluent, Resolution No. 2000-28 (Continued)

WRF, and provided an avenue for the County to deliver County effluent to County facilities. This supplemental agreement also established a Conservation Effluent Pool for use with riparian habitat projects and identified how the Southern Arizona Water Rights Settlement Act (SAWRSA) volumes are to be treated in determining effluent allocations.

D. Conservation Effluent Pool Agreement

The Conservation Effluent Pool (CEP), which is a specific quantity of effluent that can be used for conservation projects, was identified in the 2000 Supplemental Intergovernmental Agreement. The CEP agreement was approved by the Board of Supervisors in December 2010 and was approved by the City of Tucson's Mayor and Council in January 2011. The CEP administrative procedures will establish the process for considering CEP requests, address how allocations and apportionments will be made, require an accounting of quantities used, address how CEP water will be delivered and scheduled, and require project status reporting. No CEP water has been used through the reporting year, 2017. However, Pima County has appointed a Conservation Effluent Pool Administrator and a CEP Taskforce has identified 13 prospective sites.

E. Intergovernmental Agreement between the COT and PC for Treating Effluent and Wheeling Reclaimed Water (Wheeling Agreement), Resolution No. 2003-286 and Resolution No. 2017-17

The Wheeling Agreement, signed December 16, 2003, governs reclaimed water transactions between RWRD (the effluent provider), the City of Tucson (COT, the distributor and a reclaimed water user) and other County facilities (reclaimed water users). Effluent enters the reclaimed water system at the COT Sweetwater Plant and formerly through direct delivery from the Randolph Park WRF, where it is piped to various locations. The agreement governs the costs per acre-foot that will be charged to Pima County by COT for distribution of Pima County effluent to County sites. In 2016 and 2017, the COT and Pima County approved revision to the 2003 Wheeling Agreement which will facilitate adding new sites where reclaimed water can be delivered.

F. Intergovernmental Agreement - Permitting and Operating Managed In-Channel Recharge of Effluent in the Santa Cruz River Channel (Managed Recharge IGA 2003)

The Managed Recharge IGA 2003 governs the recharge of effluent and the associated groundwater storage credits made available from recharging effluent into LSCMRP (Lower Santa Cruz Managed Recharge Project) between the Tres Rios (at that time, Ina Road) WRF and Trico Road in Marana. Participants include the Town of Marana, Cortaro-Marana Irrigation District, Avra Valley Irrigation District, Metropolitan Domestic Water Improvement District, Flowing Wells Irrigation District, Oro Valley, Spanish Trail Water Co, Pima County, and the City of Tucson.

VI. Effluent Generation and Use in the Tucson Active Management Area (TAMA)

ADWR and local water managers often examine the water budget from the perspective of the entire Tucson Active Management Area (TAMA). In order to show the overall picture of effluent production and use for this region, a table is included here that depicts the amount of effluent each entity controlled and how that effluent was utilized. Pima County's wastewater production constitutes the primary source of effluent in the region, but there are a number of other entities that operate treatment facilities. This data is somewhat incomplete in that information is not available for all of the smaller wastewater treatment facilities. However, future reports may be able to capture additional data in this regard, and the majority of effluent generated in the TAMA is represented below.

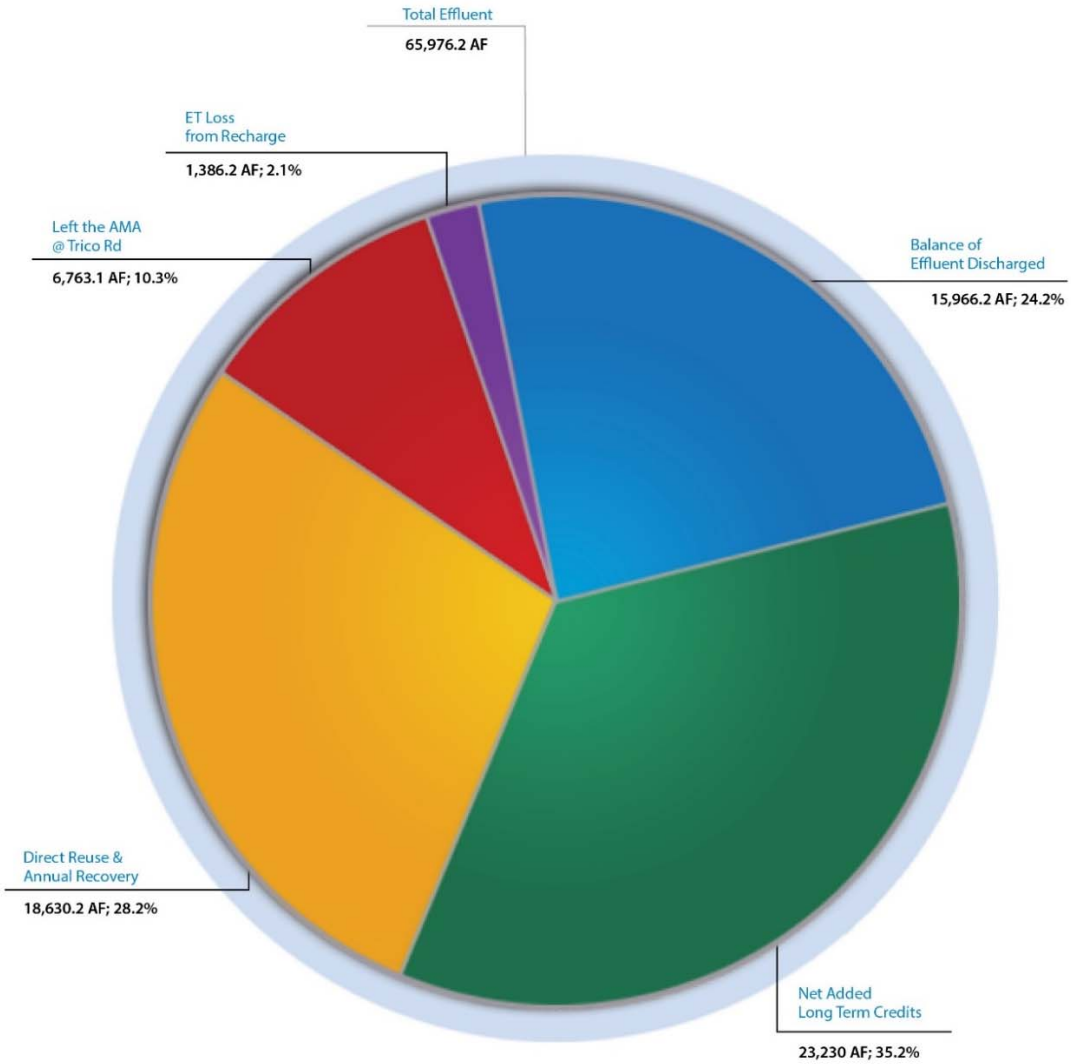


Figure 5: 2017 Tucson AMA Effluent Use and Dispensation

In 2017, the total amount of effluent produced in the TAMA was 65,976 AF. Of this total, a volume of 18,630 AF or 28% was either directly reused or recharged with subsequent recovery for use during the year. Aquifer recharge activity resulted in net accrual of 23,230 AF in long-term storage credit, slightly less than what was stored in 2016. Only 10% of the effluent produced, or 6,763 AF, flowed out of the AMA according to measurement at the Trico Road gage on the Santa Cruz River. This volume of outflow was slightly more than in 2016, but considerably less than in previous years.

VI. Effluent Generation and Use in the Tucson Active Management Area (TAMA) (Continued)

Increased infiltration and dramatically reduced outflow are likely due to improved water quality from upgraded treatment plants and concurrent clearing of organic matter that was plugging sediment in the channel bottom. Additionally, in 2017 Tucson Water diverted more effluent to their Sweetwater recharge basins where a total of 11,887 AF was used. Finally, in 2017 a total volume of 15,966 AF or 24% of the effluent was either "cut to the aquifer" from recharge accounting or simply discharged in a manner that it was not accounted for as either reuse or recharge credit.

VI. Effluent Generation and Use in the Tucson Active Management Area (TAMA) (Continued)

Tucson AMA
Annual Effluent Utilization

Entities with Effluent	2017 Effluent Generation & Use in the Tucson AMA (values in acre-feet)												2017 Effluent Recharge Balance Activity			
			Off Channel Recharge (Constructed USF or GSF)				In Channel Recharge						Off Channel Recharge (Constructed USF or GSF)		In Channel Recharge	
	Net Effluent	Off Channel Recharge and Direct Reuse	Delivered to Off-Channel Recharge	Calculated Evapora-tion (ET loss)	Cut to the Aquifer	Annual Recovery	Delivered to In-Channel Recharge	Share of Down-stream Diversions[2]	Calculated Evaporation (ET loss)	Cut to the Aquifer	Outflow at Trico Rd Gage	Annual Recovery	Long-Term Credits Earned/ Reported	Long-term Credits Recovered	Long-Term Credits Earned/ Reported	Long-term Credits Recovered
PC Metropolitan WRFs																
Secretary of the Interior[1]	28,200.0						22,517.3			11,258.6	5,682.7				11,258.6	
Conservation Effluent Pool																
Pima County[3]	3,142.5	1,829.3	613.4	8.7			1,129.2	309.0	173.1	323.5	184.0		600.0		323.5	
City of Tucson[1,4]	23,303.5	16,722.2	11,887.3	45.5		7,966.5	4,779.7	827.7	732.1	2,130.1	492.7		3,874.7		2,130.1	
Marana	254.5						218.9	59.9	33.6	62.7	35.7	62.7				
Oro Valley	2,093.4	2,093.4														
Metro Water	2,086.0						1,793.8	490.9	275.0	514.0	292.2				514.0	
Flowing Wells	497.6	3.2					425.1	116.3	65.2	121.8	69.3	121.8				
Spanish Trail	47.3						40.7	11.1	6.2	11.7	6.6				11.7	
Subtotal	59,624.8	20,648.1	12,500.7	54.2		7,966.5	30,904.7	1,815.0	1,285.1	14,422.3	6,763.1	184.5	4,474.7		14,237.9	
PC Non-Metro WRFs	2,430.5	1,881.9	1,862.6	17.8									1,844.8			
Other Facilities																
Marana WRF	450.3															
Milagro	1.9	1.9														
Marana - Rillito Vista	1.4															
Marana High School	13.4															
Robson Ranch Quail Creek[5]	1,620.7	1,620.7	1,620.7	7.3									1,613.4			
Saddlebrooke/Saddlebrooke Ranch[6]	525.0	268.9	6.6	0.0									6.6			
Sahaurita	1,177.2	1,177.2	1,177.2	21.7		102.3							1,053.2			
U of A Tech Park	131.1	131.1														
Effluent Total	65,976.2	25,729.7	17,167.8	101.0		8,068.8	30,904.7	1,815.0	1,285.1	14,422.3	6,763.1	184.5	8,992.7		14,237.9	

Data from Entities with Effluent Entitlements, ADWR, ADEQ, or Corporation Commission records.

[1] In-channel recharge data include credits from both SCRMUSF + LSCRMRP.

[2] Diversion of effluent off-channel is for agricultural use, which also counts as reuse.

[3] Off channel recharge and direct reuse data for Pima County include direct reuse of 1,215.9 af plus 613.4 af directed to constructed recharge.

[4] Off channel recharge and direct reuse data for City of Tucson include direct reuse of 4,834.9 af plus 11,887.3 af directed to constructed recharge.

[5] Robson recharges effluent from Green Valley WRF. Delivery is the volume reported to ADWR for 2017, but ET and credits earned are estimated.

Summary Table

	AF	% of Total
Effluent Available	**65,976.2**	**100**
Direct Reuse & Annual Recovery	**18,630.2**	**28.2**
Net Added Long Term Credits	**23,230.6**	**35.2**
ET Losses from Recharge	**1,386.2**	**2.1**
Left Tucson AMA (@ Trico Rd)	**6,763.1**	**10.3**
Effluent Balance	**15,966.2**	**24.2**

VII. Glossary of Terms & Acronyms

Acre-foot (AF): A measure of water volume. One acre-foot of water will cover one acre to a depth of one foot and equals 43,560 cubic feet or 325,851 gallons. An acre-foot of water meets the needs of three average Tucson families for one year.
AFY: Acre-feet per year.
AMA or **Active Management Area:** Areas with heavy reliance on mined groundwater were identified and designated as Active Management Areas (AMAs) by the 1980 Arizona Groundwater Management Act. There are five AMAs: Prescott, Phoenix, Pinal, Tucson, and Santa Cruz, where groundwater is subject to state regulation.
Aquifer Protection Permit (APP): ADEQ's permit program to protect groundwater quality from discharging facilities.
Arizona Department of Environmental Quality (ADEQ): State agency responsible for groundwater quality protection, water quality standards, and wastewater reclamation and reuse permits.
Arizona Department of Water Resources (ADWR): State agency responsible for water management and administration of water-related programs within the State.
Arizona Pollutant Discharge Elimination System (AZPDES): Arizona's permit program to protect surface water quality. ADEQ holds NPDES primacy from EPA.
BADCT - Best Available Demonstrated Control Technology – the technical design standard applied by ADEQ in their APP program.
CCF: A water billing unit that equals 100 cubic feet or 748 gallons – this is the typical measure of metering for water delivery volumes for residential and commercial customers.
BNR - Biological Nutrient Removal.
BNRAS - Biological Nutrient Removal Activated Sludge.
BNROD - Biological Nutrient Removal Oxidation Ditch.
Class A Reclaimed Water: Treated wastewater that has undergone secondary treatment, filtration and disinfection to a level that is essentially pathogen-free. The "A" designation established by ADEQ is suitable for outdoor irrigation with unrestricted access and certain industrial uses.
Class A+ Reclaimed Water: Means wastewater that has undergone secondary treatment with nutrient reduction so that total nitrogen is less than 10 mg/l, followed by filtration and disinfection to a level that is essentially pathogen-free. The "A+" designation by ADEQ is suitable for "A" category uses without the need for liners, volume restrictions, and certain reporting requirements.
Class B Reclaimed Water: Treated wastewater that has undergone secondary treatment, and disinfection to meet the Partial Body Contact criteria. The "B" designation by ADEQ is suitable for outdoor irrigation with restricted access, construction, dust control, and livestock watering.
Class B+ Reclaimed Water: Treated wastewater that has undergone secondary treatment with nutrient reduction so that total nitrogen is less than 10 mg/l, followed by disinfection to be meet the Partial Body Contact criteria. The "B+" designation by ADEQ is suitable for "B" category uses without the need for liners, volume restrictions, and certain reporting requirements.
Class C Reclaimed Water: Treated wastewater that has undergone secondary treatment in a stabilization lagoon with aeration. This reclaimed water is suitable for livestock watering of non-dairy animals and irrigation of non-food crops.
Conservation Effluent Pool (CEP): Effluent set aside each year pursuant to an intergovernmental agreement between the City of Tucson and Pima County for use in riparian restoration projects.
Constructed Recharge: Replenishing the aquifer using a facility that is designed and constructed, in-channel, or off-channel, to store water underground pursuant to permits issued by ADWR.
COT: City of Tucson.
Disinfection: The treatment of water to inactivate, destroy, and/or remove disease-producing bacteria, viruses, and other microorganisms.
Effluent: Treated municipal wastewater.

VIII. Glossary of Terms & Acronyms (Continued)

Environmental Restoration: (also referred to as Riparian Restoration, Riparian Enhancement, or Habitat Restoration) Environmental restoration means enhancing existing ecosystems or creating new habitat. The goal of restoration is recovery of some functional characteristics of the ecosystem including plant communities and habitat structure. In most instances replication of historical ecosystems isn't possible, but enhancing vegetation can result in sustainable habitat that helps restore ecosystem function and its support for wildlife and increased biodiversity. Enhancements may also include erosion control, improved water quality and achieving a self-sustaining, functional flow regime.
ET: Evapotranspiration, which accounts for water that is both evaporated and absorbed by plants and transpired into the atmosphere.
GPD: Gallons per day.
Intergovernmental Agreement (IGA): An agreement authorized by state statute between two or more governmental entities that provides for joint action or joint exercise of governmental powers.
KERP: Kino Environmental Restoration Project. The KERP basin is approximately 27 acres of watercourse and riparian habitat within the 120-acre Ajo Detention Basin. This project harvests stormwater and uses reclaimed water for both environmental restoration and irrigation of sports fields and landscape.
LSCMRP: Lower Santa Cruz River Managed Recharge Project.
Managed Recharge: A facility that uses the unmodified natural channel of a stream to artificially recharge and store water underground in an aquifer pursuant to permits issued by ADWR.
Metropolitan (or Metro) Wastewater Reclamation Facility: This term refers to any of the three metropolitan wastewater reclamation facilities operated by RWRD: Ina Rd, Roger Rd, and Randolph Park.
MG: Million gallons.
MGD: Million gallons per day – one means of measuring discharge or flow volume.
MHPERP: Marana High Plains Effluent Recharge Project.
Milligrams per Liter (mg/l): A unit of measure of dissolved or suspended concentration within a fluid that equates to parts per million.
Oxidation Ditch: The oxidation ditch is a component of the wastewater treatment process that provides long-term aeration. It consists of a long channel laid out in an elliptical or circular configuration. The channel is equipped with mechanical aeration equipment, such as brush rotors, disc aerators, draft tube aerators, or fine bubble diffusers. The design generates wastewater flow through the ditch, stirring water in the channel and supplying oxygen. A certain amount of settled solids (sludge) is added into the incoming wastewater in order to activate the bacterial treatment.
PC: Pima County.
Recharge: Water that replenishes an aquifer by surface infiltration or by other natural or induced means.
Reclaimed Water: Means water that has been treated or processed by a wastewater treatment plant (A.R.S. §49-201.31).
Regional Wastewater Reclamation Facility: This term refers to any of the three metropolitan wastewater reclamation facilities operated by RWRD: Ina Rd, Roger Rd, and Randolph Park.
RFCD (or PCRFCD): Pima County Regional Flood Control District.
RWRD (or PCRWRD): Pima County Regional Wastewater Reclamation Department.
Riparian: Pertaining to or situated on the bank of a body of water, especially a river.
Soil-Aquifer Treatment: Use of the physical, chemical, and/or microbiological properties of the soil and the aquifer to provide treatment of water introduced into the groundwater system.
Southern Arizona Water Rights Settlement Act (SAWRSA): 1982 federal legislation to settle water-rights claims of the Tohono O'odham Nation against City of Tucson and several other parties.
Stabilization Lagoons: This type of treatment facility consists of shallow man-made basins comprising a single or several series of anaerobic, facultative or maturation ponds that are operated without aeration. Such ponds allow suspended solids to settle and the soluble element of organic matter (BOD) is reduced through the coordinated activity of algae and heterotrophic bacteria.

VIII. Glossary of Terms & Acronyms (Continued)

Sub-regional: A term used to describe the non-metropolitan wastewater reclamation facilities in Pima County. This group includes Arivaca Junction, Avra Valley, Corona de Tucson, Green Valley, Marana, Mount Lemmon, Pima County Fairgrounds, and Rillito Vista.
Surface Water: Water on the Earth's surface, such as in a stream, river, lake, or reservoir.
Underground Storage: Recharge of the groundwater in a manner that anticipates eventual recovery from the aquifer. In Arizona this usually involves establishing an account with ADWR for tracking short- or long-term storage credits.
USBR: United States Bureau of Reclamation.
UV: Ultra-Violet, which is a band of wavelengths of light that is useful in disinfecting wastewater.
Water Harvesting: The process of intercepting stormwater from a surface, such as a roof, parking area, or land surface, and putting it to beneficial use.
Wheeled Water or Water Wheeling: Water transferred between two agencies whereby one agency uses its system infrastructure to treat and/or convey water that is owned by the receiving agency.
WRF: Wastewater Reclamation Facility.