



City of Phoenix

WATER SERVICES DEPARTMENT
Quality Reliability Value

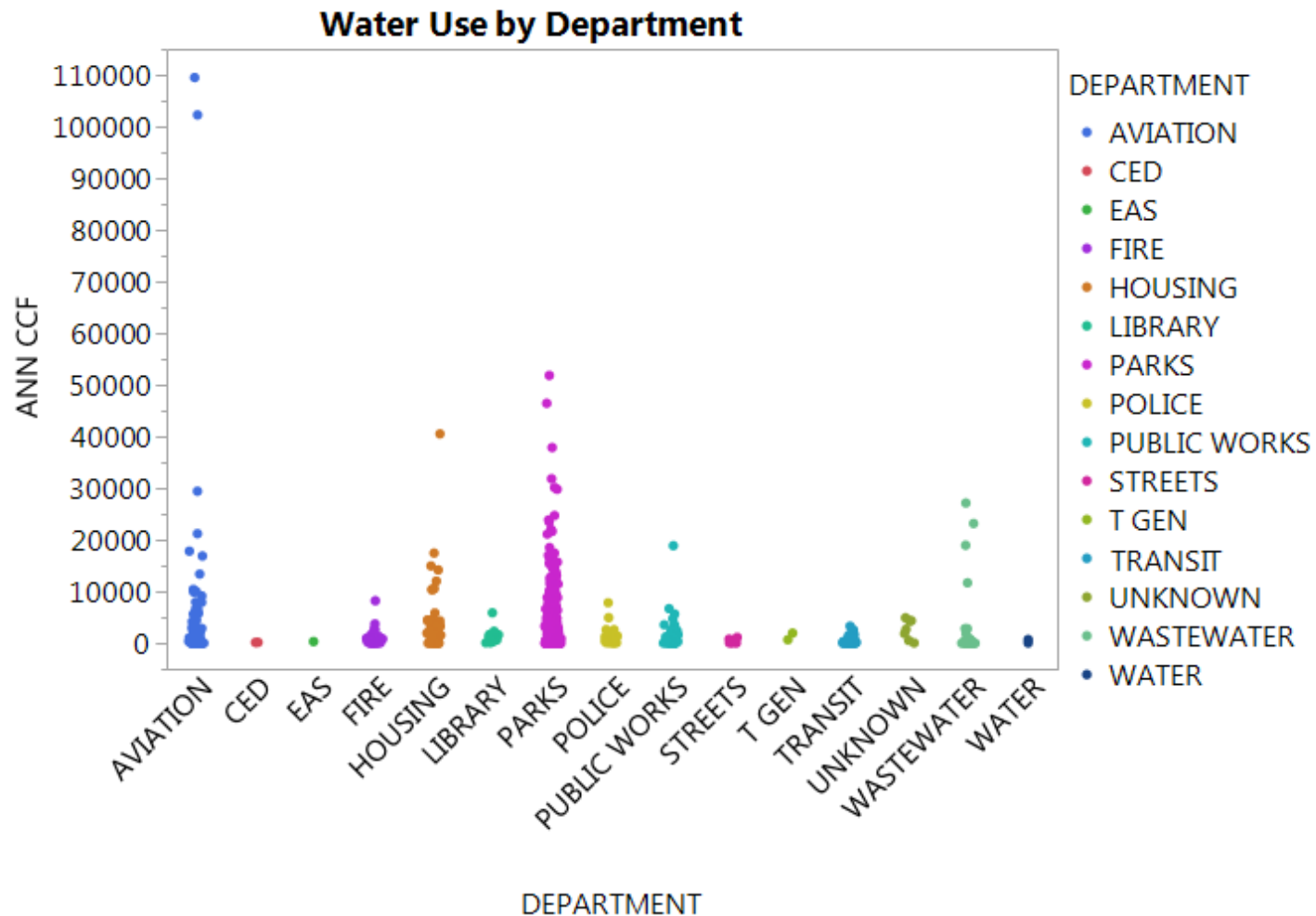
COOLING TOWER SYSTEM UPGRADES AT SKY HARBOR INTERNATIONAL AIRPORT



OVERVIEW

- Terminal 4 Cooling Towers
 - Project Review
 - Performance and Additional Changes
- New Installation at Terminal 3 Complete
- Rental Car Center

- Sky Harbor Airport
- 9,600 tons of cooling (all of Terminal 4)





SYSTEM CONDITIONS PRE-RENOVATION

- Heavy Scale and Corrosion
 - Chemical and physical removal
- 2.5 Cycles of Concentration at peak efficiency
- Conflict: Chemical Company vs Chiller Company
- Storage of Strong Acids (Health and Safety Concerns)



PROPOSED SYSTEM UPGRADES

- Add water softener
 - Swap the calcium (removal) with sodium (ion exchange)
- Add mixed oxidant generator (MIOX)
 - Use salt to generate bleach (predominant) and peroxide (minor)
 - Replaces Biocide
- Replace all media







OTHER IMPROVEMENTS





OTHER UPGRADES
SS PIPE INSTALLATION

NO MORE RUST CRABS



CIRCULATION JETS IN BASINS



ESTIMATED COSTS & RETURN ON INVESTMENT (SIMPLE PAYBACK)

- Initial estimate = \$295,000 (Capital and Labor)
- Actual = \$407,000 (Includes Media/Pipes)
- Estimated savings = \$140,000 per year
 - (Water = \$100K, Chemicals = \$40K)
- Estimated ROI = 2.9 years

HOW ARE WE DOING?

- 2.5 years in operation
- Monthly chemical monitoring
- Relocation of MIOX salt tank
- Achieving 6.5 COC on regular basis
- Water savings **underestimated (21 million gallons saved in 2018, or \$128,000, just in water)**
- **Actual ROI more like 2 years**

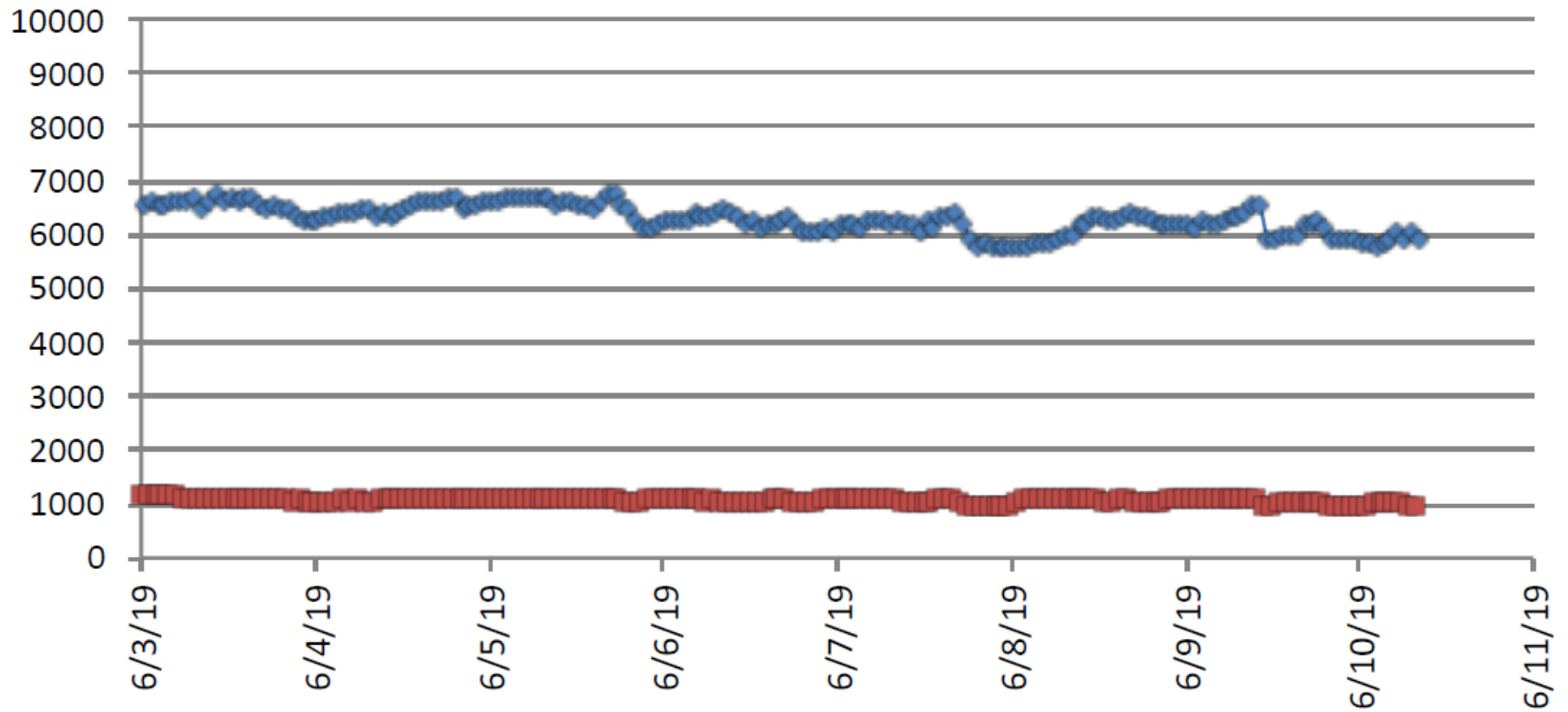
HOW ARE WE DOING?

- Water savings projected to be 26 MG in 2019
- Saved 13K pounds of chemicals in 2018
- Adding soft water feed to MIOX to control varying water quality
- Cleaning of media in towers is now done with garden hose
- Addressing implications if wastewater salinity standard is established
- Future Capital savings and reduced O & M costs not included in ROI (will be reviewed)

Sl	Cond	10813	μS
SS	MU Cond	1670	μS
ATI	49340	144.68	ppb
ATI	HACH CL	0.32	ppm
DIC	Bleed	224970	gal

No Alarms

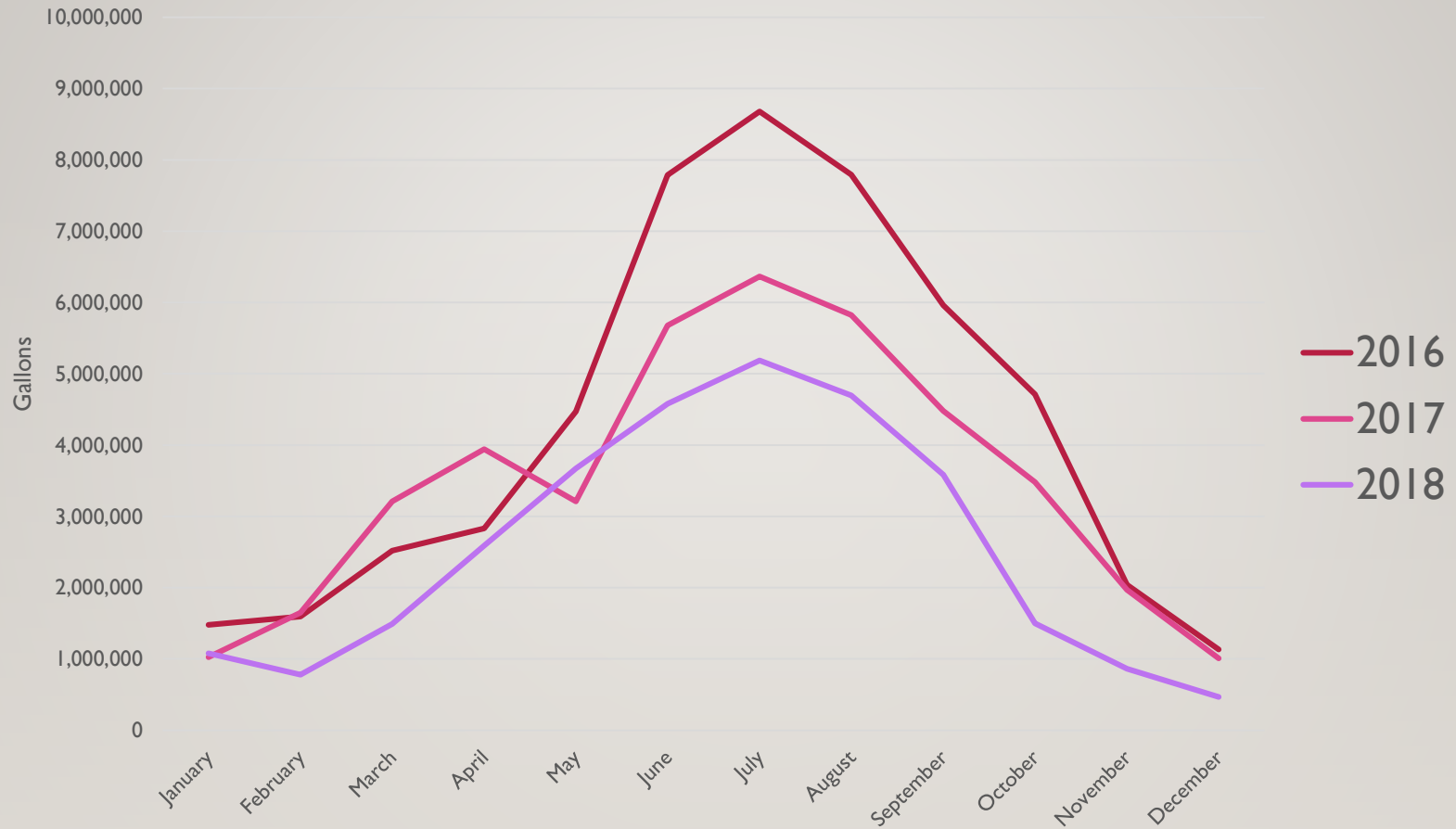
Terminal 4 Conductivity uS



Conductivity shows excellent control - no issues. Red line is make up conductivity line, showing excellent control. Tower conductivity currently increasing

ACTUAL WATER SAVING

Water Usage By Month for 2016 to 2018



ADDITIONAL INSTALLATIONS

- Replication of system in Terminal 3
(completed)
- Rental Car Center

TERMINAL 3

- New Cooling Towers
- 4 X 1,000 tons
- No previous performance for comparison – savings similar to T4
- Estimated 10 MG water savings

RENTAL CAR CENTER

- Replace Media
- 3 X 600 tons
- Same systems: Softening/MIOX
- Estimated 4 MG water savings

WHAT ABOUT SALINITY?

- No change to systems
- Minor operational changes
- 5 – 10 years to come into compliance if standard is adopted
- Compliance would not affect overall performance

QUESTIONS

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