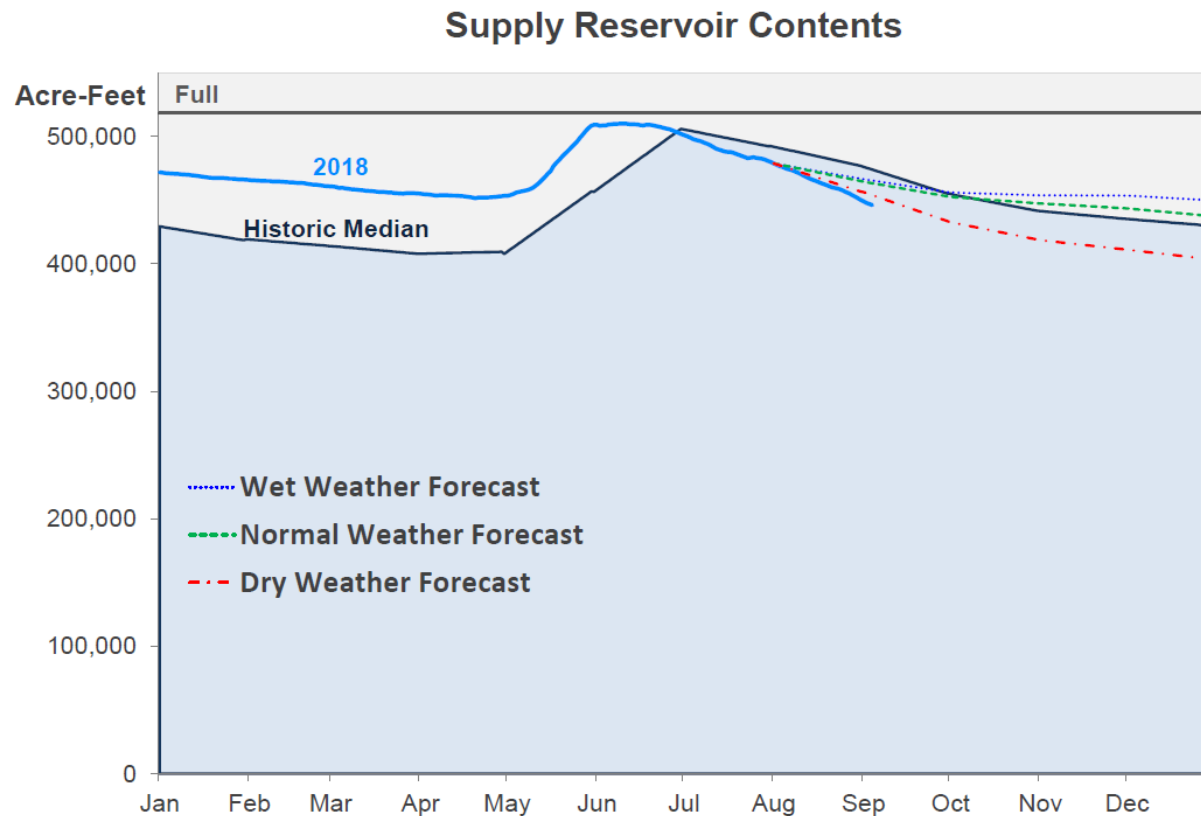


# GREEN ROOF INITIATIVE – IMPLICATIONS TO DENVER WATER



# GREEN ROOF INITIATIVE – IMPLICATIONS TO DENVER WATER

September 4, 2018



Note: Denver Water forecasts seasonal reservoir storage contents under dry future weather, normal future weather and wet future weather scenarios.

# DATA AND ASSUMPTIONS

- Calculated Gross Floor Area (GFA)
- Green roof applied to correct roof % category based on ordinance
- All buildings have max green roof, not solar or a combination
- 1.5% growth per year
- 95% of installed green roofs will be sedum or native plant equivalent (3.12 gallons/sqft)
- 5% of installed green roofs will be agricultural or turf grass equivalent (18 gallons/sqft)



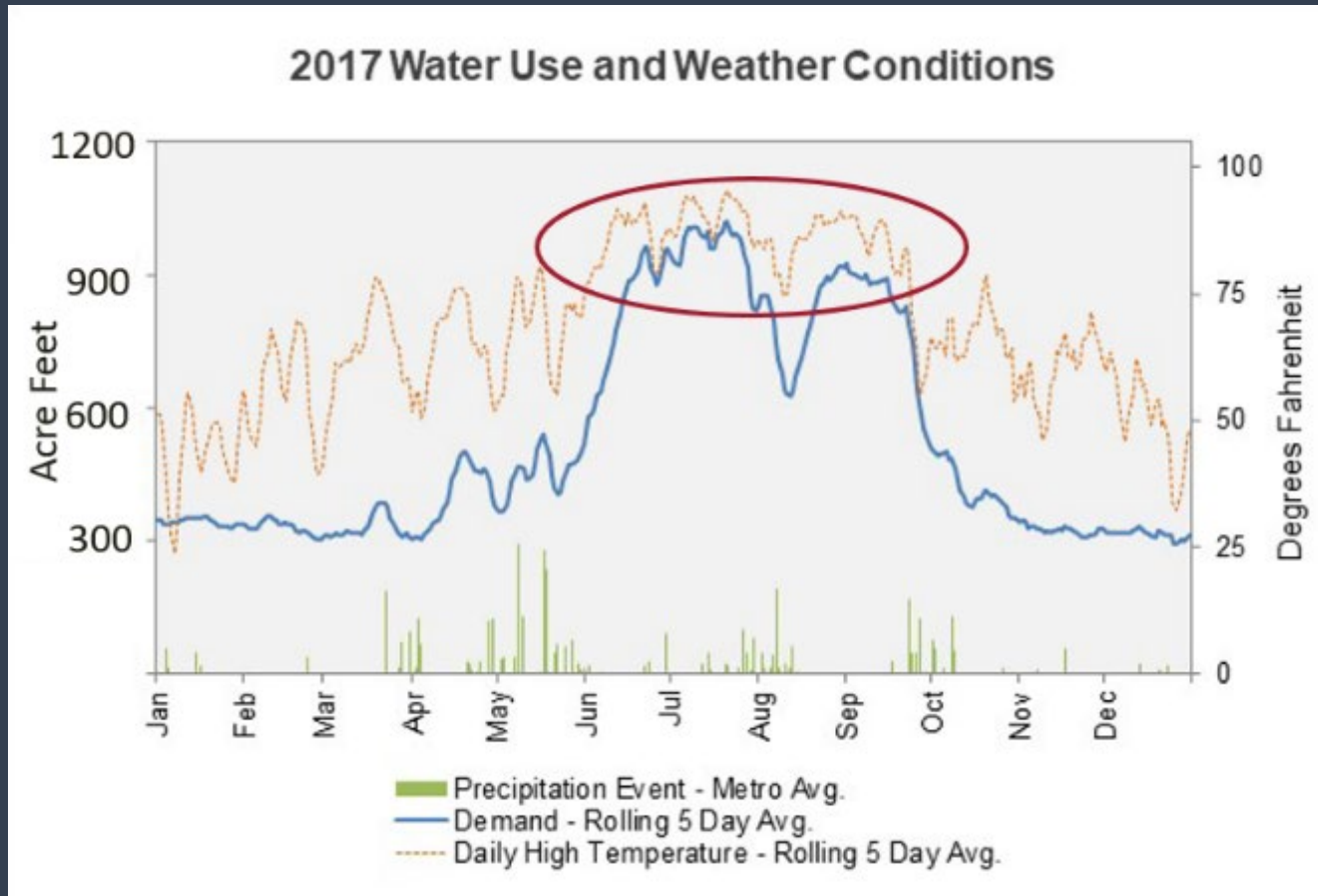


# ADDITIONAL WATER DEMAND

- Additional potable demand ranges from 576 Acre Feet – 1836 Acre Feet

	Building sqft (existing 2014)	New Water Demand AF	Building sqft 2014-2045	Future Water Demand AF	Est. Building sqft 2050	2045 Green Roof Water Demand AF
Commercial	23,841,794	258	13,983,842	151	37,825,635	409
Industrial	2,275,023	25	1,334,361	14	3,609,384	39
Residential	7,511,113	81	4,405,466	48	11,916,579	129
<b>Total</b>	<b>33,627,930</b>	<b>363</b>	<b>19,723,669</b>	<b>213</b>	<b>53,351,599</b>	<b>576</b>

# 2017 POTABLE WATER DEMAND



# POTENTIAL RISKS

- Added demand during our peak season
  - Can we increase alternative water sources?
- Drought implications
  - Change Denver Water operating rules to reflect best management practices?
- Water quality at the building level
  - Backflow preventer required for all irrigation
- Perception that green roofs are not in alignment with conservation



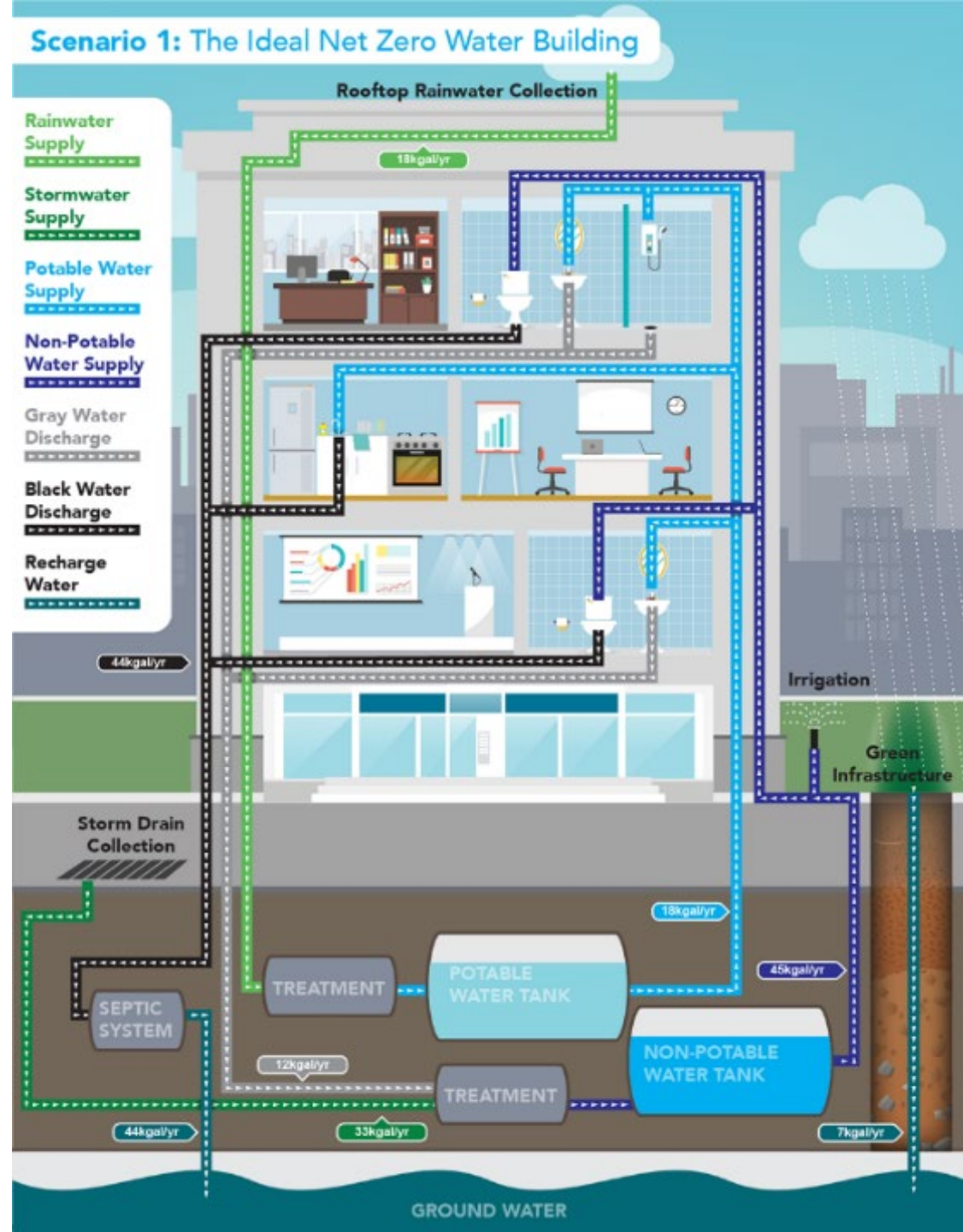
# POTENTIAL BENEFITS



- Examples of climate appropriate landscapes
- Reduction of urban heat island could reduce cooling demands for building near green roof
- Many One Water benefits on the stormwater side
- Furthers the discussion of limitations of Colorado Water law

# Strategies for getting to net zero water

- Sources
- Uses
- Re-Use
- Storage
- Filtration
- Health and Safety
- Use Awareness





# Wastewater and Reuse



## Clean Water

*Springs, wells,  
purified water,  
city water, rain water*



## Greywater

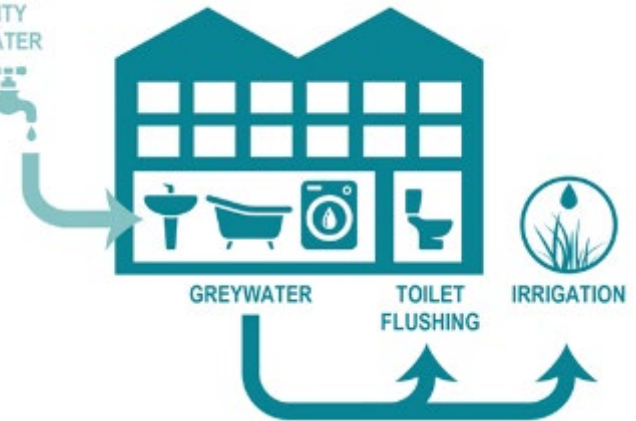
*Used water without  
toxic chemicals  
and/or excrement*



## Blackwater

*Contaminated water  
with toxic chemicals  
and/or excrement*

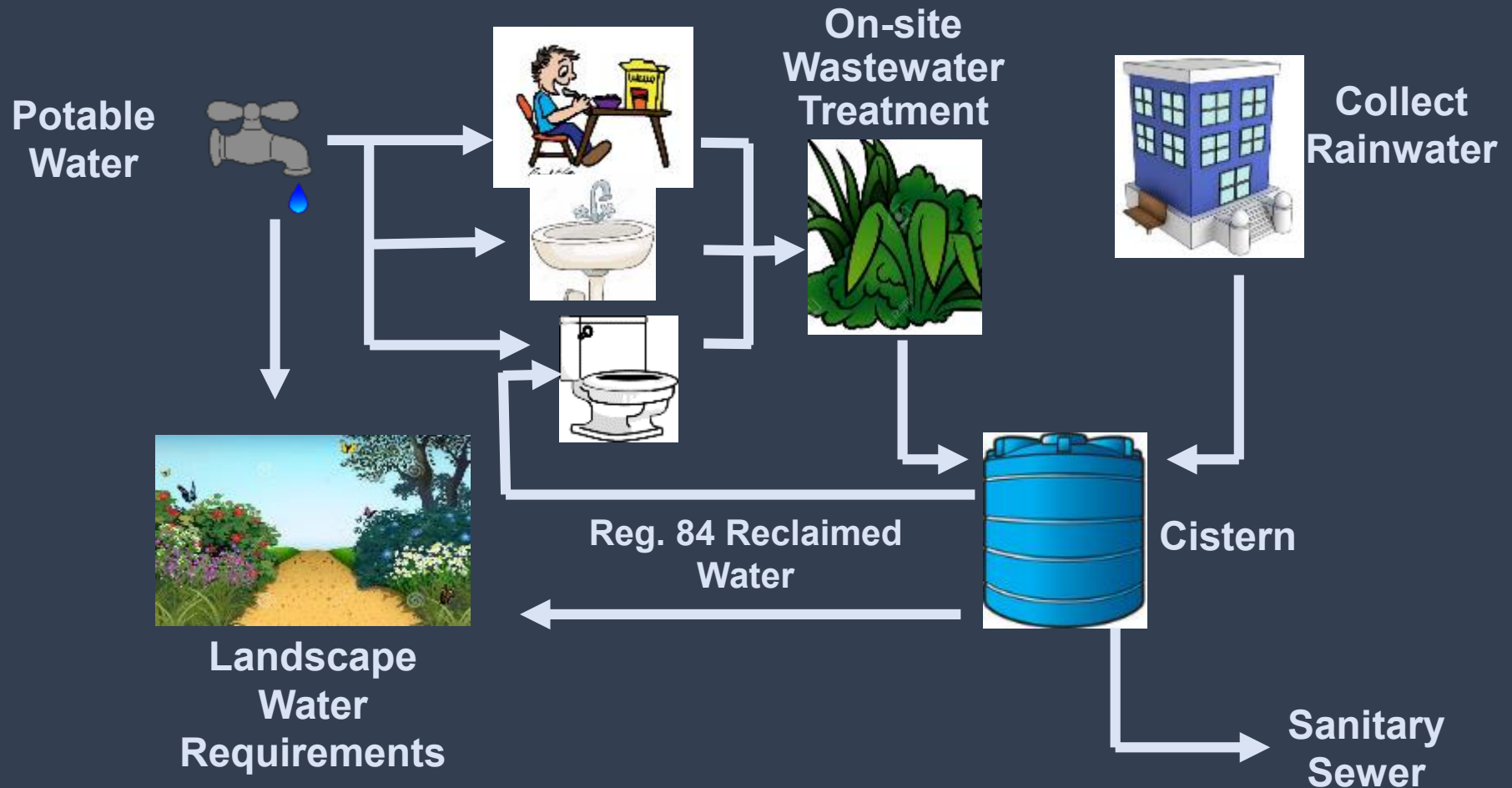
POTABLE  
CITY  
WATER



# DENVER WATER'S NEW CAMPUS



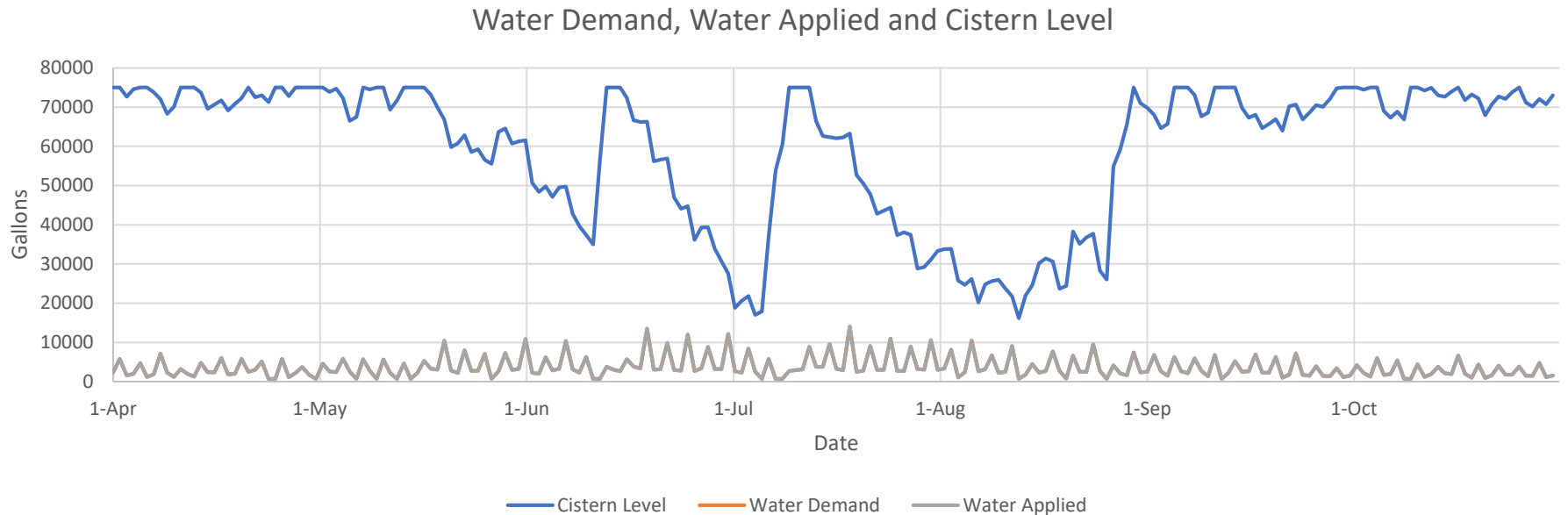
# DENVER WATER'S NEW CAMPUS



# ONE WATER BOUNDARY



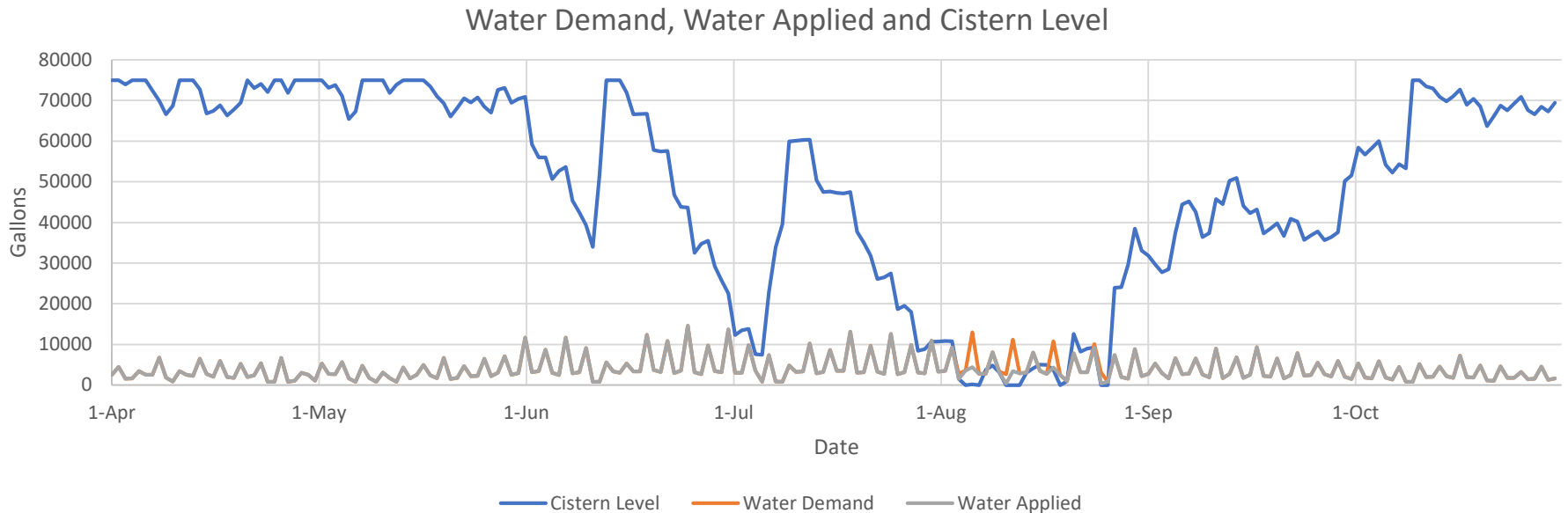
# MODEL OUTPUT – AVERAGE ET AND RAINFALL



Annual Irrigation Demand = 788,000 gallons

System provides 100% of demand with excellent landscape quality

# MODEL OUTPUT – HIGHEST OBSERVED ET AND PREDICTED RAINFALL UNDER CLIMATE CHANGE



Annual Irrigation Demand = 859,000 gallons

System provides 96% of demand with excellent landscape quality

System provides 100% of demand with landscape quality changes

# ONE WATER IMPACTS

- Annual Savings of 5,000,000+ Gallons
- Annual Water/Sewer costs savings of \$36,000 per year
- Water Tap Fee savings of \$322,000

	Tap Fees	Water/Sewer Rates
Baseline Design	\$575,000	\$50,862
Efficient Design	\$339,000	\$21,916
One Water Solution	\$253,000	\$14,935