



Three for the Price of One

The Benefits of Aquifer Storage and Recovery (ASR)

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Agenda

- Introduction
- City of Cornelius
- ASR 101
- Overview of the City's Potable Water Distribution System
- Three for the Price of One
- Future Steps
- Summary

Introduction

Introduction

Cornelius
Oregon's Family Town

Jacobs

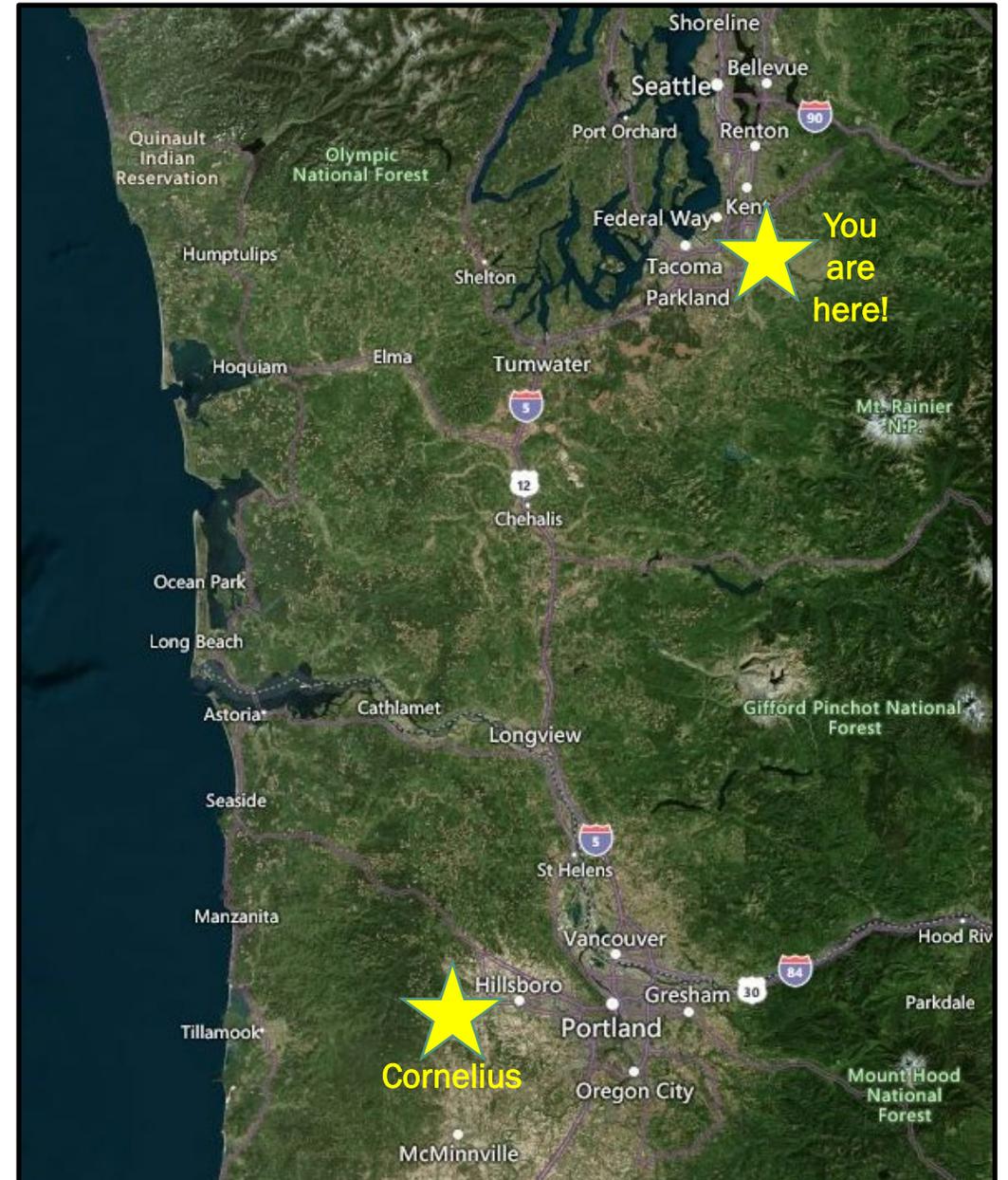
Challenging today.
Reinventing tomorrow.



City of Cornelius

Cornelius, Oregon

- Incorporated in 1893
- Population 13,500
- Twenty-five miles west of Portland, Oregon in Washington County
- Mostly residential with some light industrial
- Water purchased from City of Hillsboro
- Delivered to City through three master meters from a 70-inch transmission line



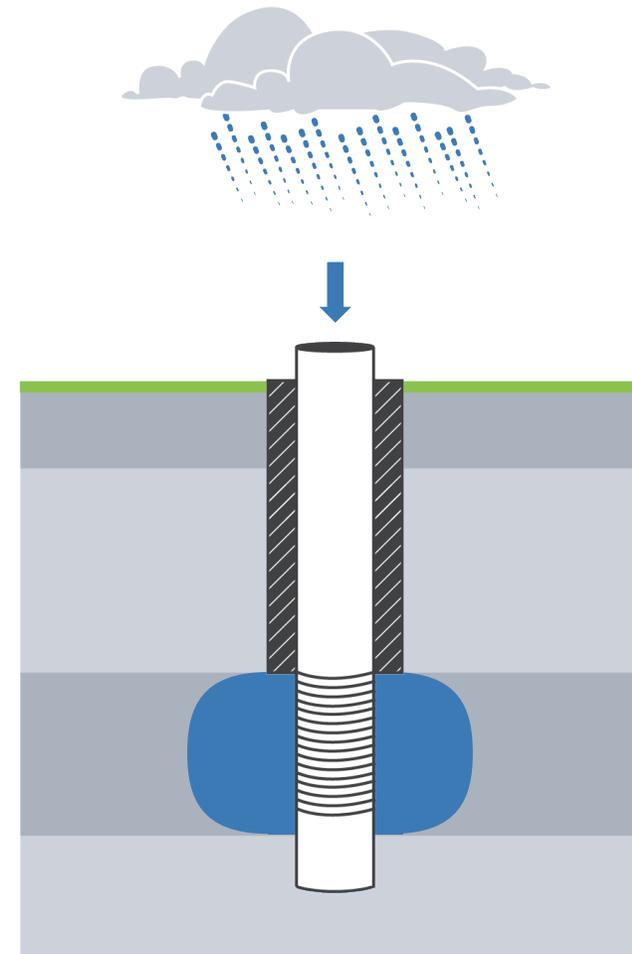
ASR 101



ASR is a water management tool which stores surface water underground making it available later when needed.

ASR: How it works

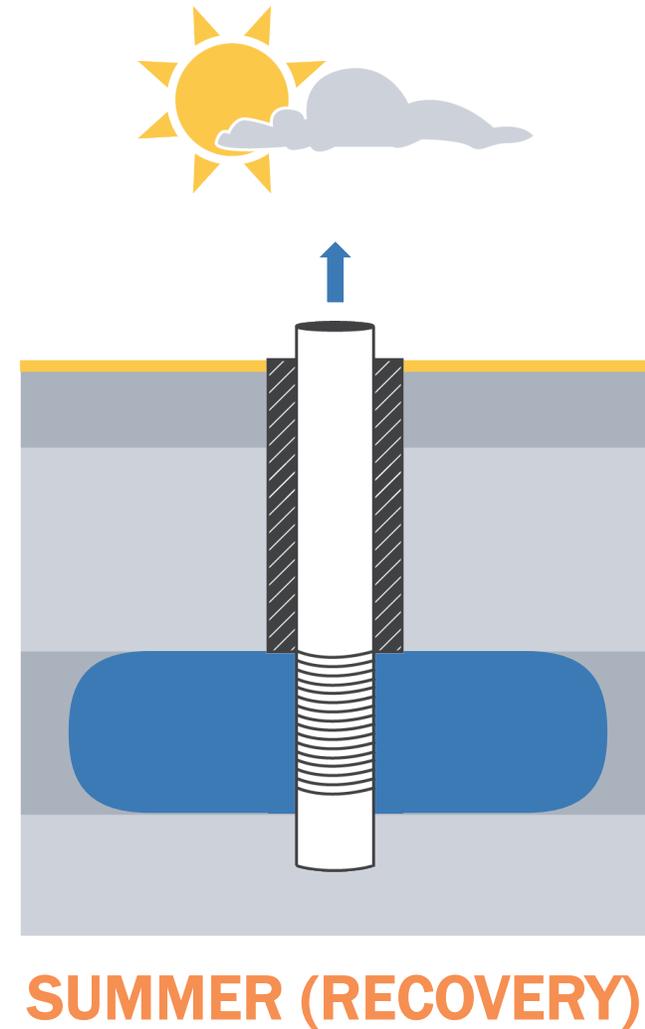
Winter (injection): Water is collected and stored underground when precipitation is plentiful, and demands are lower



WINTER (INJECTION)

ASR: How it works

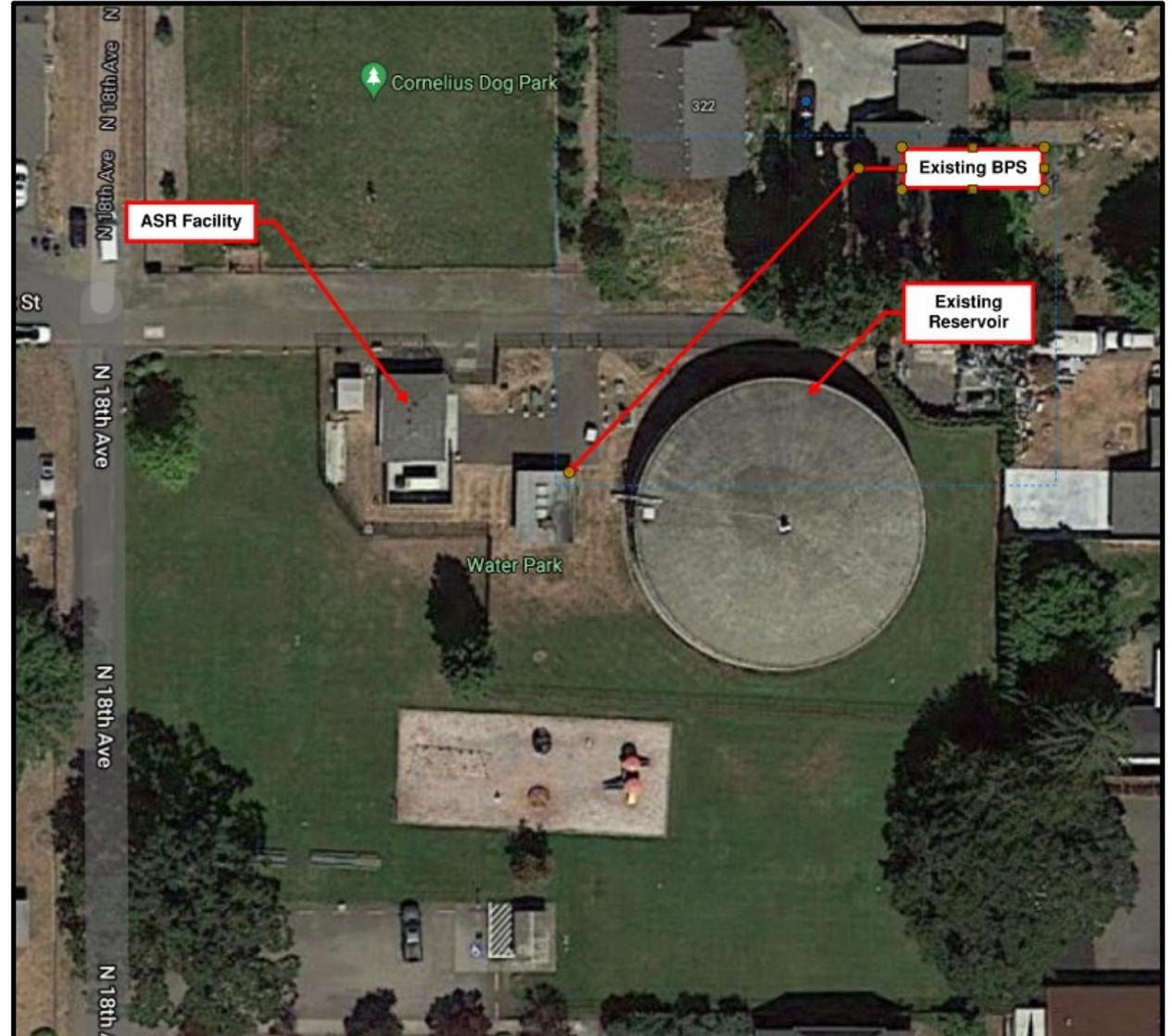
Summer (recovery): Water is pumped out when demand is high and surface water sources are strained



Overview of the City's Potable Water Distribution System

The Basics...

- 1.5-million-gallon reservoir
- Booster pump station
- ASR facility
- 47 miles of pipeline
- Purchase water from City of Hillsboro



Reservoir and Booster Pump Station



ASR Facility

- ASR constructed in 2017
- 1,589 ft deep well
- Basalt aquifer under pressure
- 58 psi distribution system
- 80 MG storage
- 300 gpm capacity
- Onsite disinfection
- Emergency generator



Existing Facilities – Well House

- Submersible pump & motor
 - 40 hp
 - VFD
 - 350 feet bgs
- Downhole control valve
 - 340 feet bgs
 - Control flow into aquifer
- Level & pressure instrumentation
- Air release valve



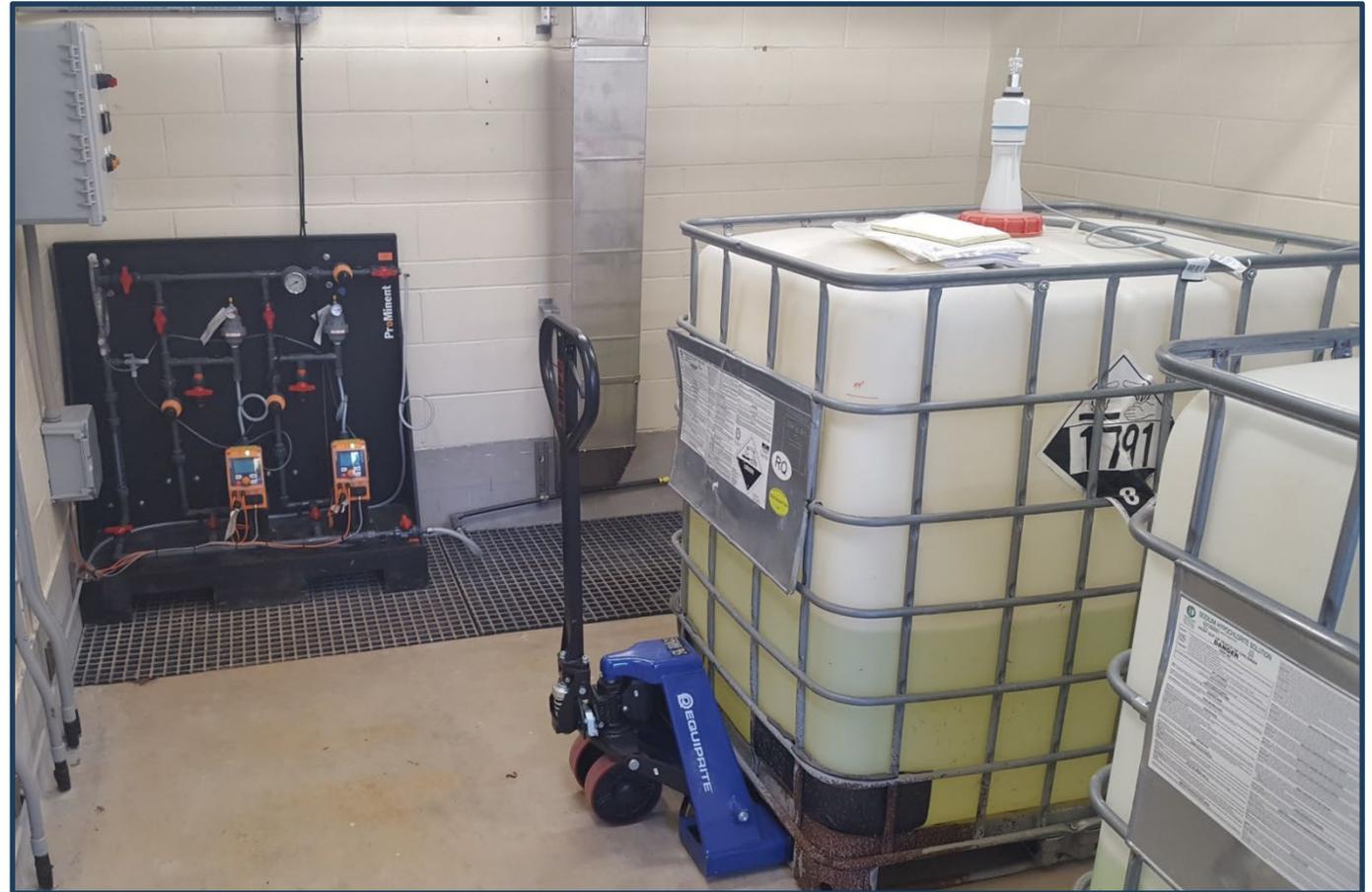
Existing Facilities – Control Room

- Complex piping system with multiple valves for isolation and flow control
- Sophisticated instrumentation and control system constantly monitors ASR well injection and extraction



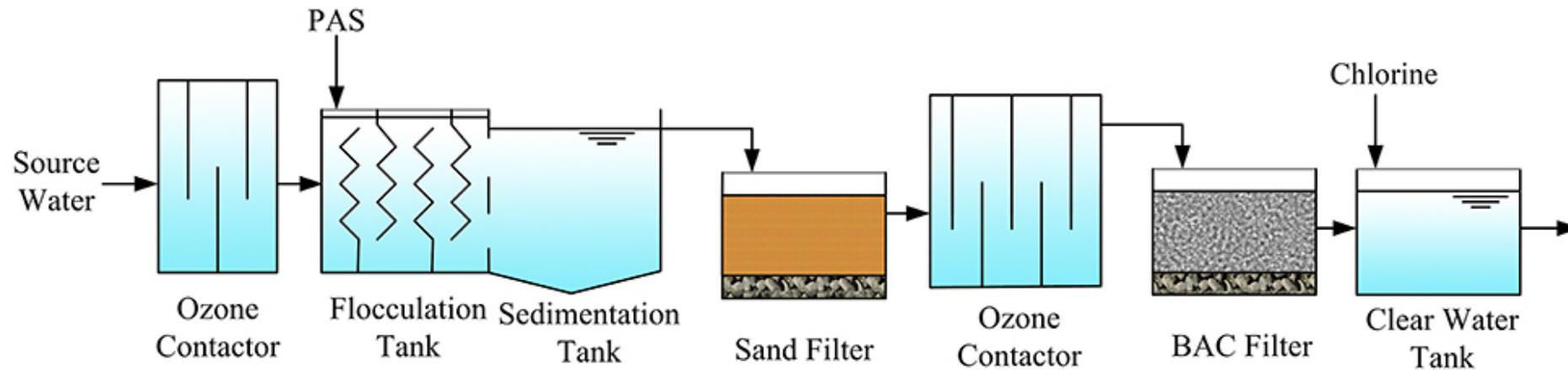
Existing Facilities – Disinfection

- Bulk sodium hypochlorite (12.5%)
- Chemical metering pumps
- Distribution piping
- Boost residual chlorine levels back to source water levels

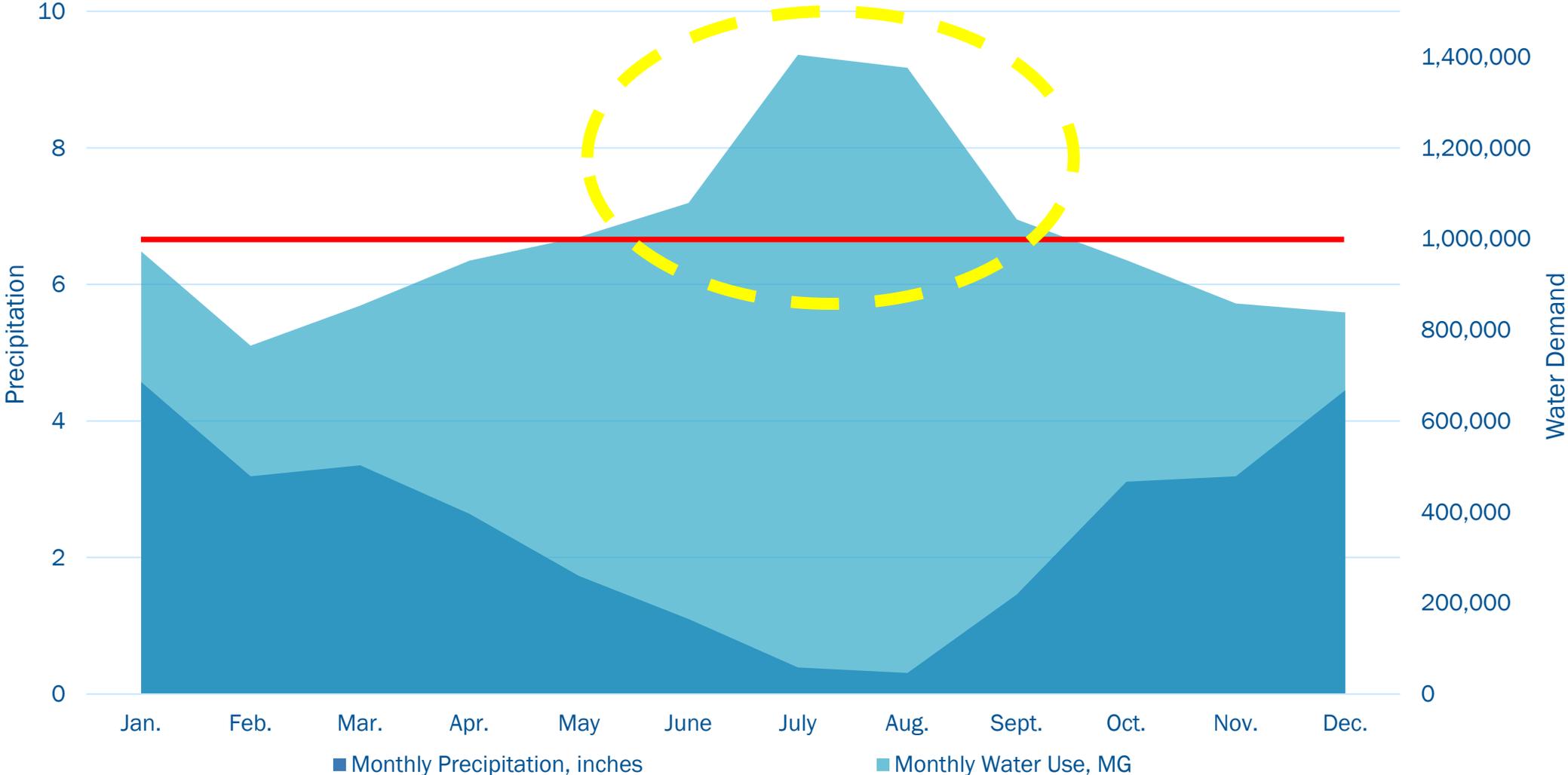


Three for the Price of One

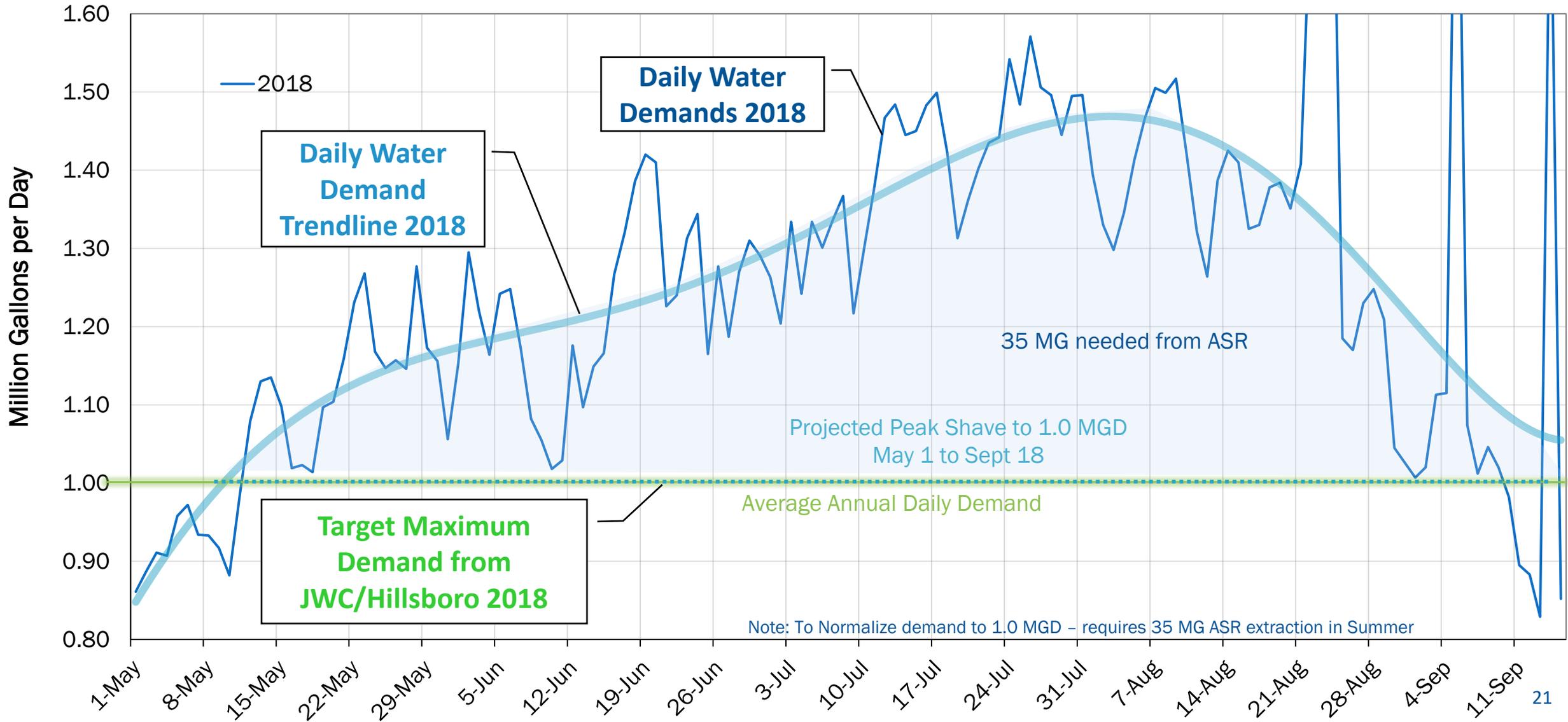
#1 - Shave off Peak Summertime Demands



The City's water demand is highest when rainfall is lowest

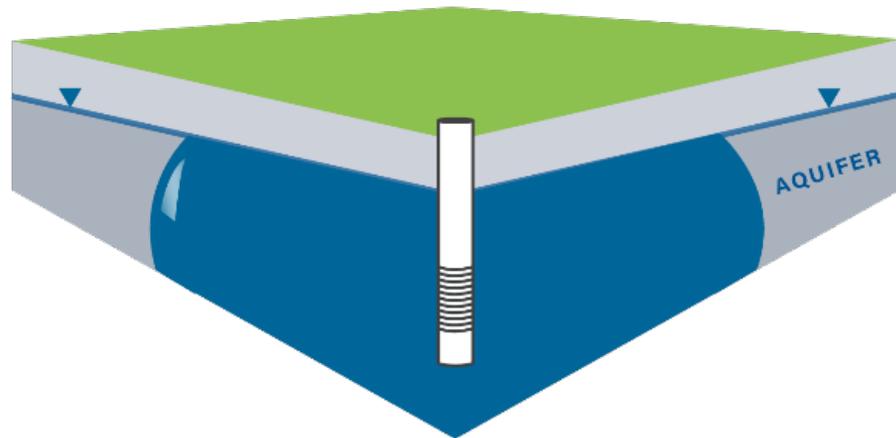


City of Cornelius Daily Water Supply, Summer 2018



#2 - Increase City's Storage Capacity

ASR Capacity =
80 MG



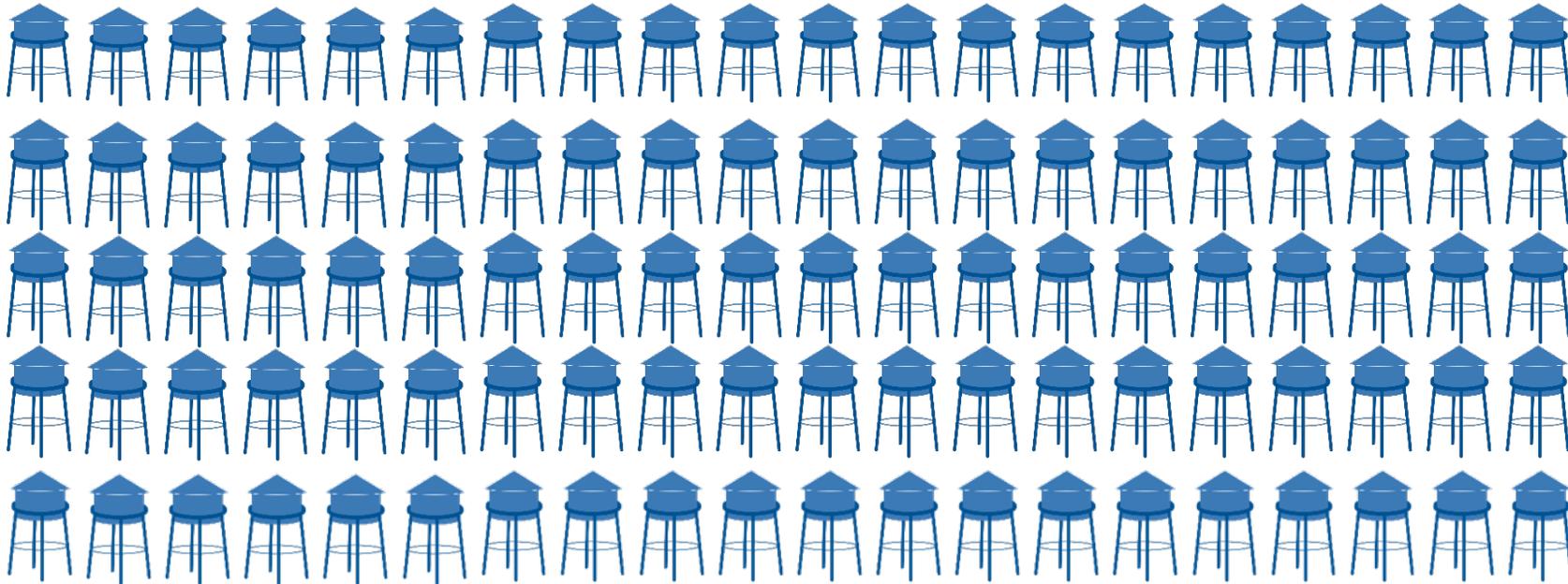
Storage Tank Capacity =
1 to 50 MG



Notes: ASR storage capacity depends on aquifer conditions and other factors.

ASR does not meet short-term flow needs like an aboveground tank, which is important to meet fire flow.

The Cornelius ASR Well Storage Capacity is equal to eighty 1 MG above ground storage tanks



WOW!

ASR Costs vs. Conventional Storage

Example	Total Storage Capacity	Total Cost	Cost per gallon
Recent/Local Water District Reservoir Project	8 MG	\$10 million	\$1.25
City of Cornelius ASR Facility	80 MG	\$2.7 million	\$0.03

Note: ASR does not satisfy fire flow requirements like a storage tank, thus both ASR and Infrastructure components are vital to any water system.

#3 - Emergency Use

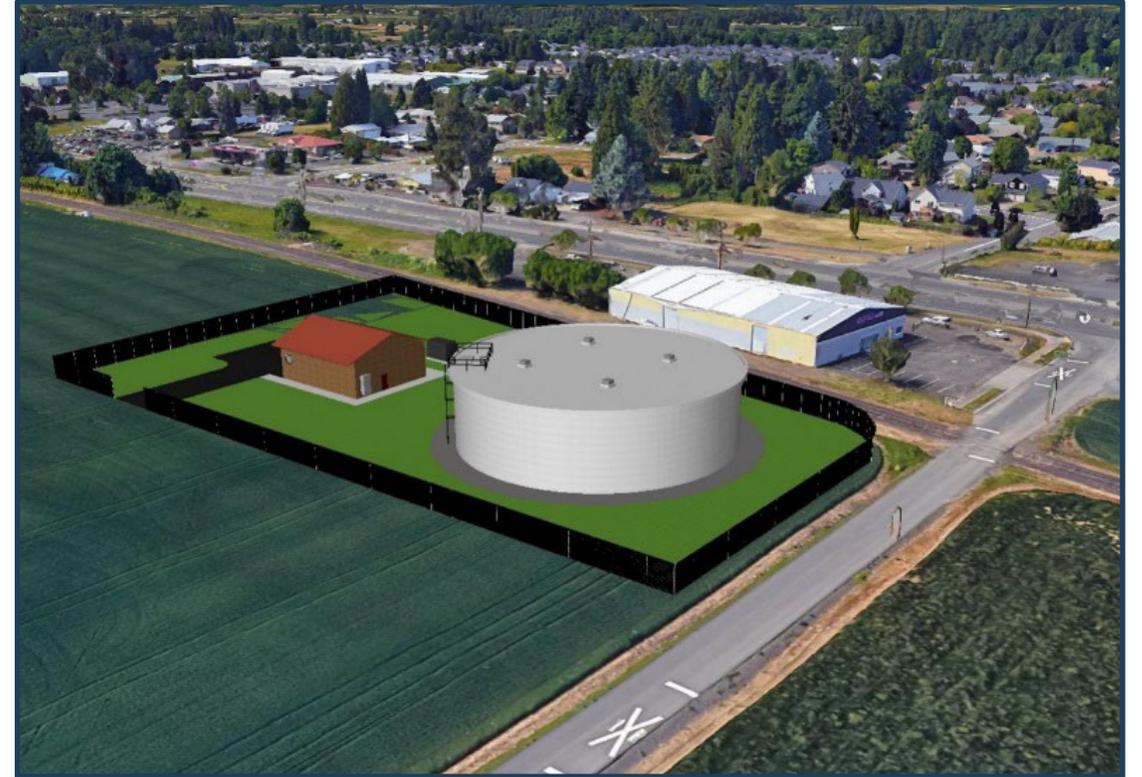
- When the City's primary source of water is offline the ASR can provide water at a rate of 0.432 MGD or about half the City's winter Average Daily Demand.
- The City would need to curtail water usage, but the storage provided by the ASR facility would allow the City to extend their water supply for several days or even weeks depending on the aggressiveness of the curtailing strategies.



Future Steps

Future Steps

- City current designing a replacement booster pump station at Water park to improve overall reliability and resiliency.
- Plans for the construction of a second reservoir and pump station to meet the future growth of the City.
- The existing reservoir at Water park will ultimately be replaced after the second reservoir and booster pump station constructed.



Summary

- The City's ASR Facility reduces peak withdrawals from the JWC/Hillsboro Supply
- Address the City's potable water storage needs
- Provides an additional emergency backup source for the city in addition to their reservoir





THANK YOU!