Pacific Northwest
NATIONAL LABORATORY

Water Efficiency in Federal Facilities

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U.S. DEPARTMENT OF ENERGY BATTELLE

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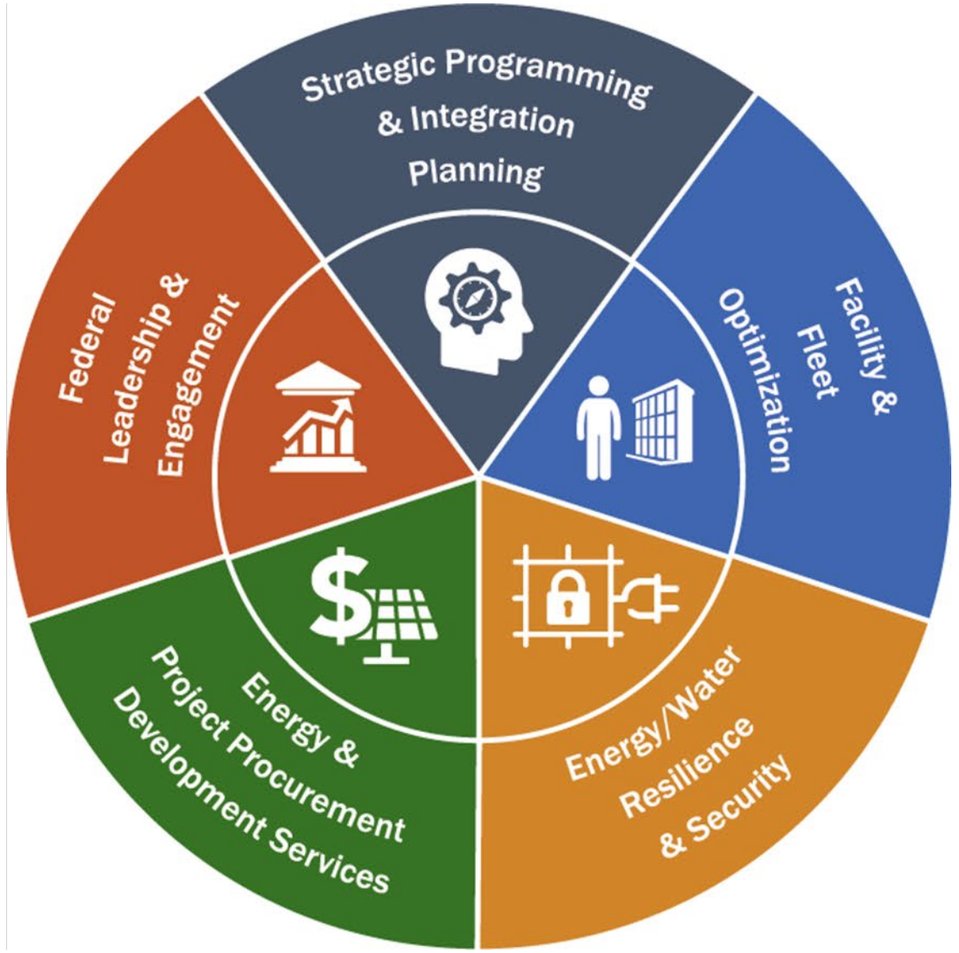
FEMP Federal Energy Management Program

***Mission**:*
*Providing **strategic energy and water management for agencies** to become resilient, efficient and secure in support of Administration priorities for American Energy Dominance, Increased Government Accountability and Development of a Future-Focused Workforce.*



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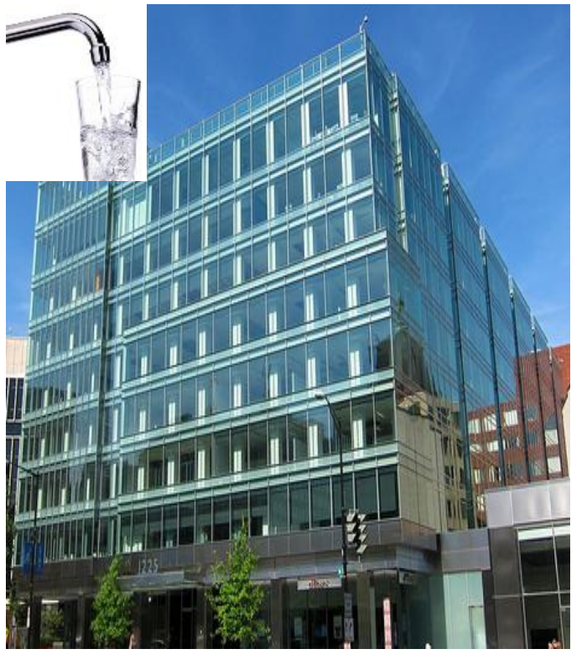
Agenda

- Water Basics
- Federal Water Requirements
- Water Management Planning
  - Goal Setting
  - Comprehensive Evaluations
  - Water Efficiency
  - Alternative Water

Basic Water Categories



Potable water from freshwater sources*: Water from surface and groundwater (e.g., lakes, aquifers) is treated and permitted for human consumption

Non-potable water from freshwater sources: Water from surface and groundwater NOT treated and permitted for human consumption

Alternative water: Water NOT supplied from fresh surface or groundwater

*Freshwater: water sourced from surface or groundwater that has low concentrations of dissolved solids, which excludes sea or brackish water

History of Federal Water Requirements

- **Executive Order (EO) 13423: Potable water use intensity (WUI) reduction through FY 2015**
- **Energy Independence and Security Act (EISA) 2007: Comprehensive water evaluations**
- **EO 13514: Extends potable WUI through FY 2020, adds new water use reduction for ILA* water use**
- **EO 13693: Supersedes EO 13514 and EO 13423, extends reduction requirements to FY 2025**
- **EO 13834: Supersedes previous executive orders, removes specific future reduction requirements for potable and ILA water use**

*ILA = industrial, landscaping, and agricultural

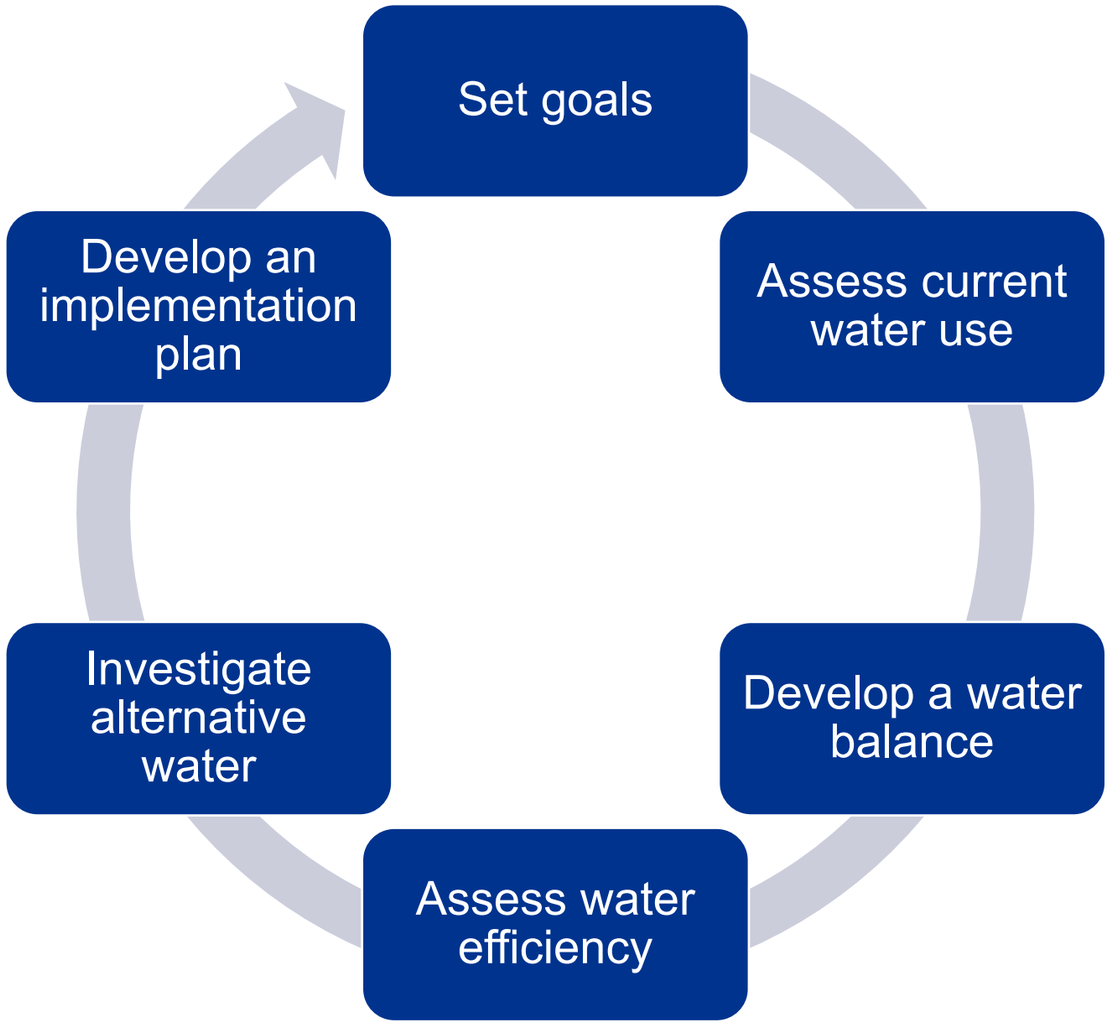
Federal Water Policy – Executive Order 13834

- Council on Environmental Quality Executive Order 13834 Implementing Instructions Requirements:
  - Report annual potable water use to Federal Energy Management Program (FEMP)
  - Reduce potable freshwater use intensity by 20% compared to FY2007 baseline
  - Demonstrate *agency targeted* annual potable freshwater use intensity reduction each year
  - Reduce non-potable freshwater (no reduction goals specified)
  - Comply with comprehensive water evaluations per EISA of 2007
  - Comply with stormwater management requirements in EISA 2007

EO 13834 – Water Management Strategies

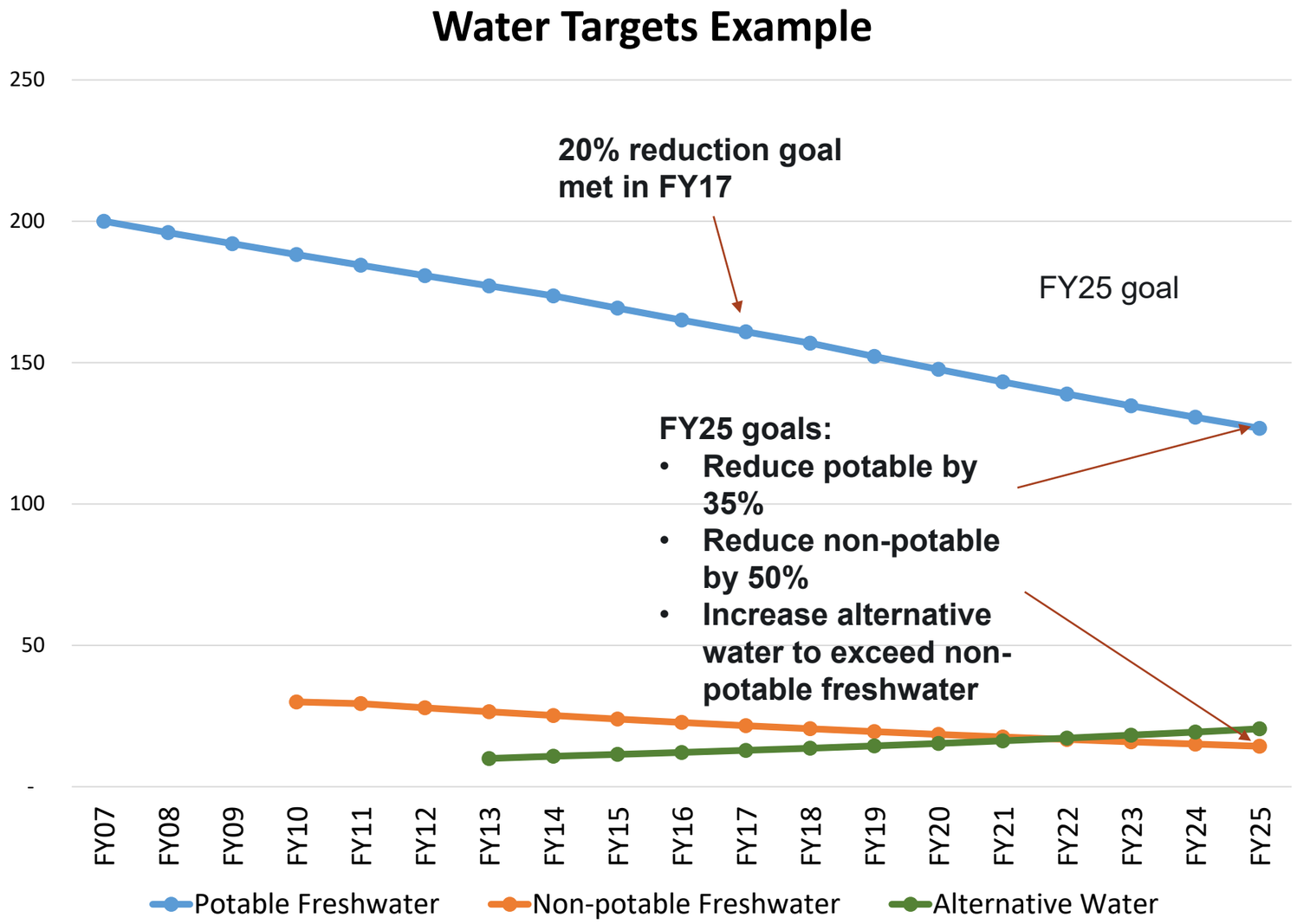
- Eliminate Waste
- Increase Efficiency
- Increase alternative water (to decrease freshwater demand)
- Complete water balance analysis
- Install water meters to measure water use

Water Management Planning Steps



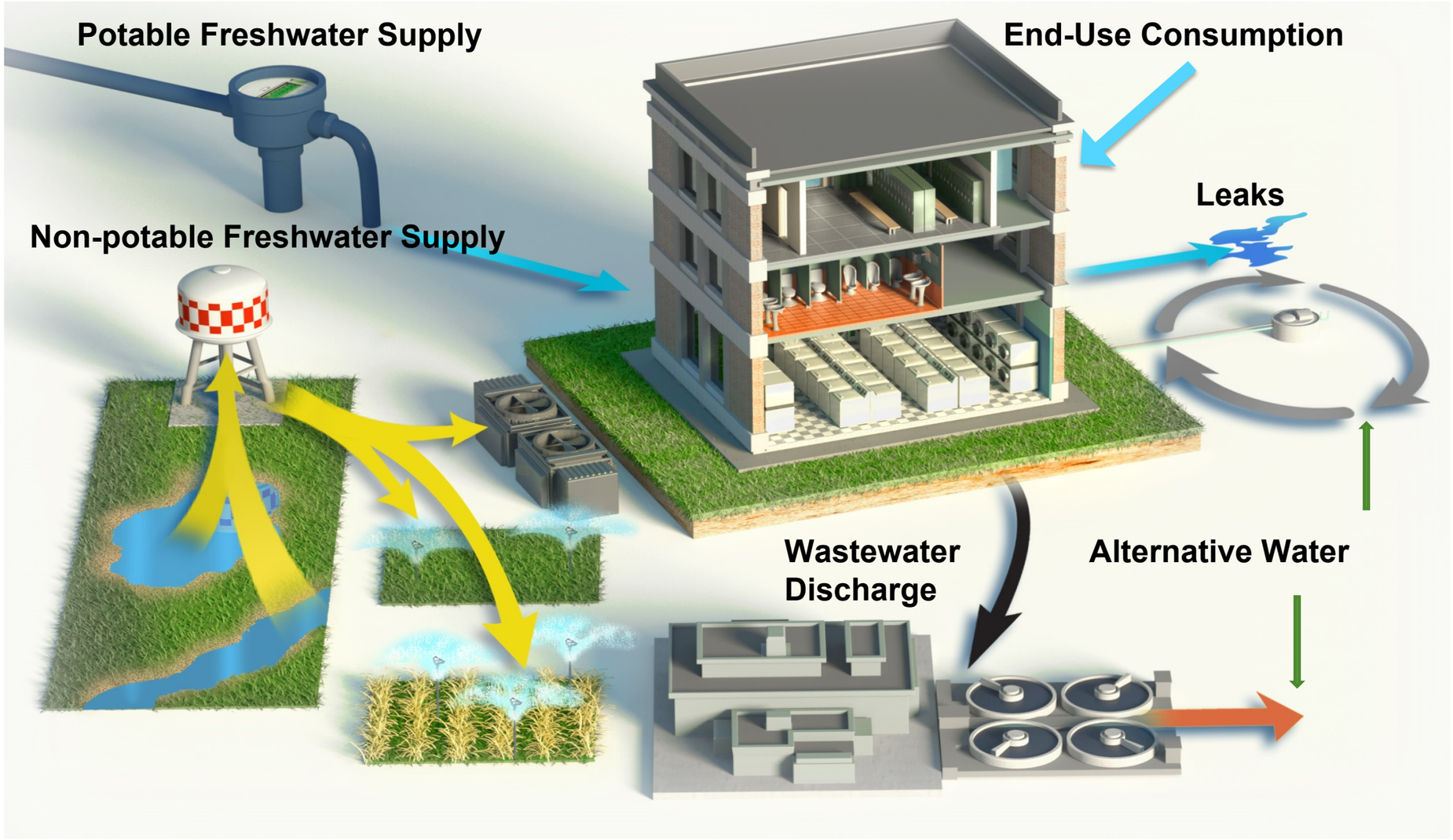
Set Goals

- Set annual targets for the following:
  - Reduce potable freshwater
  - Reduce non-potable freshwater
  - Increase the use of alternative water

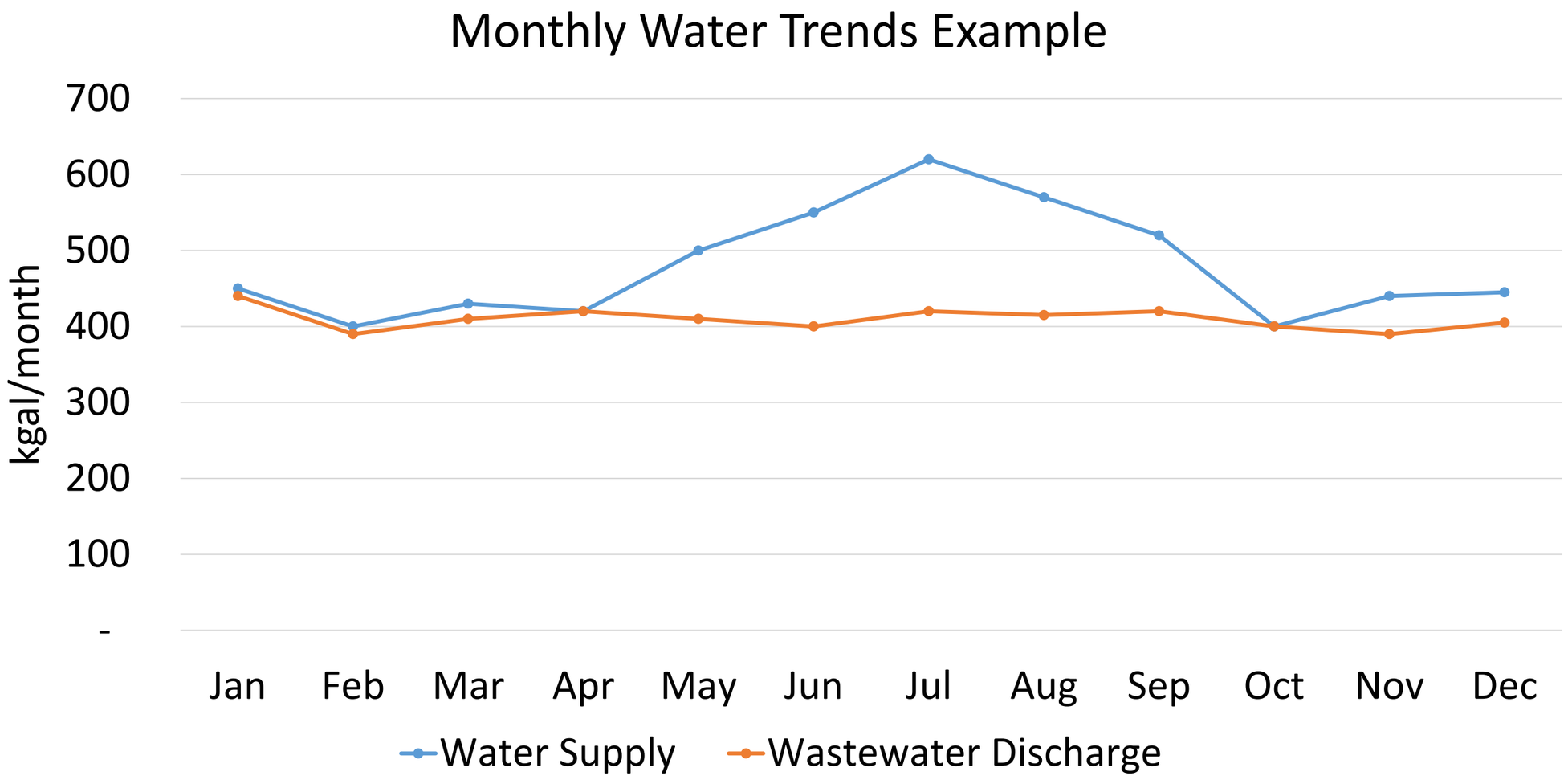


Assess Current Water Use

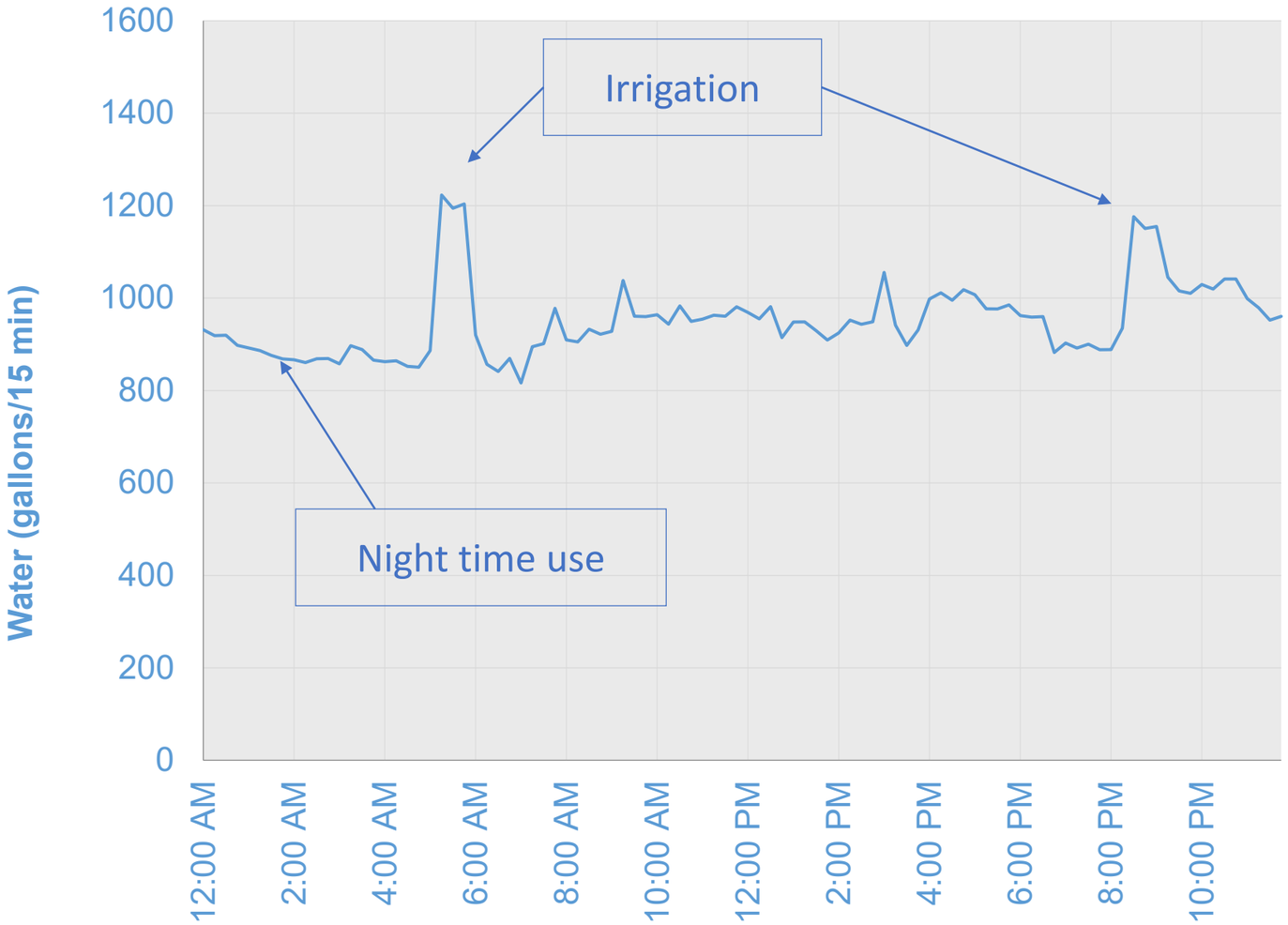
Facility Water Cycle



Quantify Water Supply
Track Monthly Water Use



The Power of Advanced Meters!



FEMP Resources:

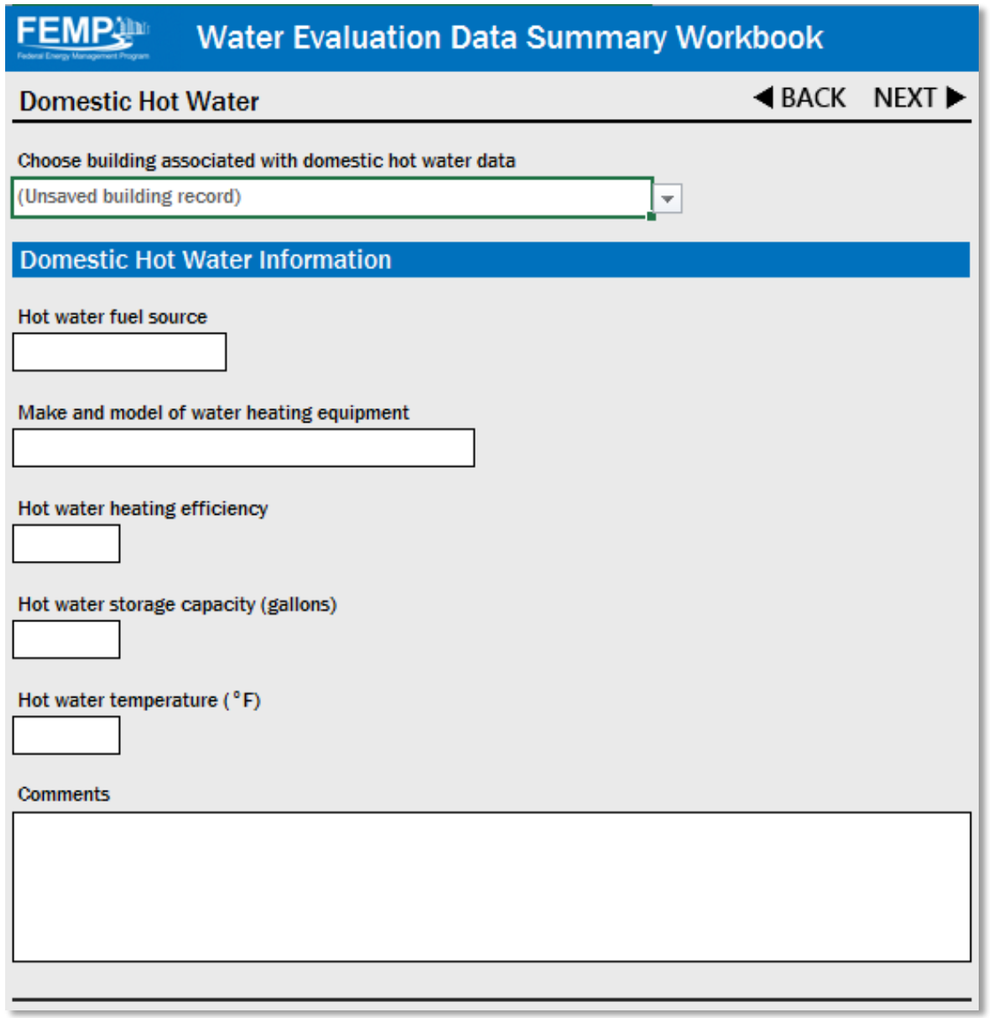
- Prioritizing Building Water Meters
  - Step by step approach on how to strategically select buildings for water meters
  - https://www.energy.gov/eere/femp/prioritizing-building-water-meter-applications
- Water Meter Selection Guide
  - Overview of water metering technology options and selection criteria to support the implementation of water meters
  - https://www.energy.gov/eere/femp/technical-water-meter-selection-guidelines

Comprehensive Walk-Through Survey

Identify buildings to survey

List all major water using equipment

Collect key information on equipment needed to calculate water use



FEMP Resource:

- Handbook on how to conduct a comprehensive water survey
- Excel workbook tool to store and organize data for analyses

https://www.energy.gov/eere/femp/downloads/water-evaluation-data-tool

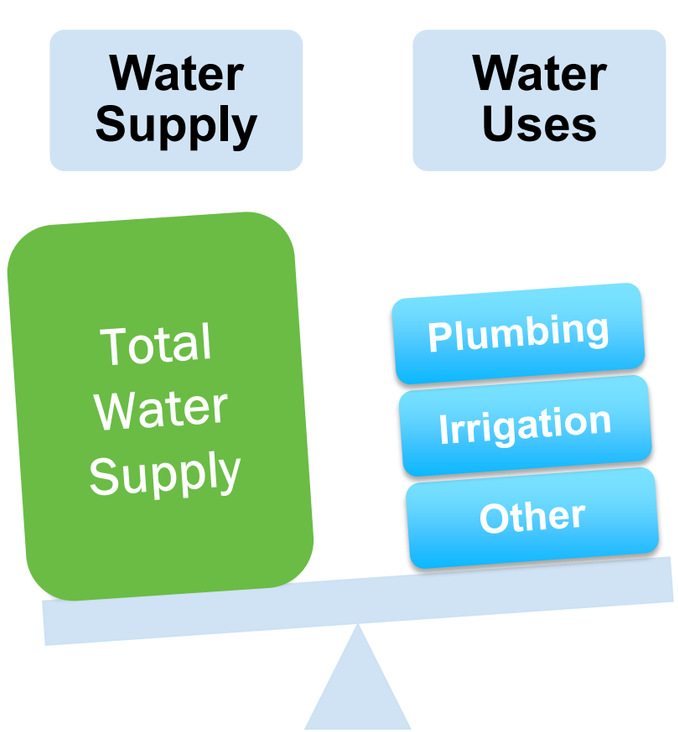
Develop a Water Balance

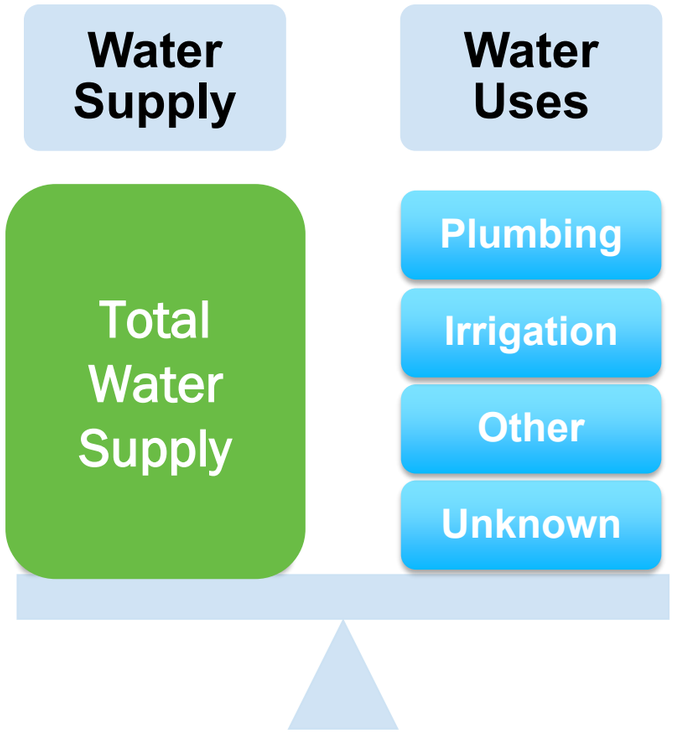
Total Water Supply ≥ ∑ Water Uses

Difference between the supply and end-uses is the “unknown”.

This creates the “balance”.

This shows an “unbalanced” water balance where the sum of the end-uses is less than the total supply.



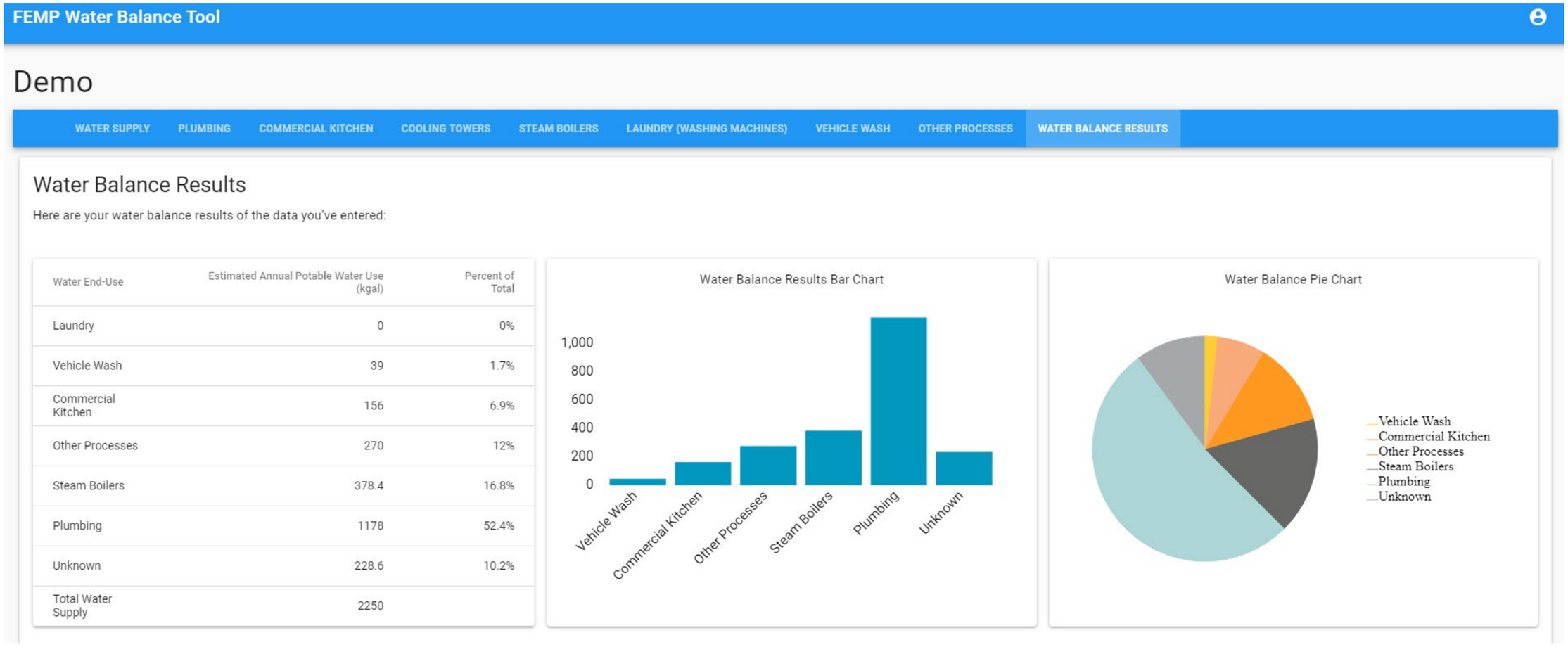


FEMP Water Balance Tool

A water balance provides useful data that:

- **Reveals the largest end-use**
- **Helps to prioritize water efficiency efforts**
- **Uncovers potential losses and operational problems**

FEMP is releasing a water balance tool in early FY20 that estimates water use by major end-use category

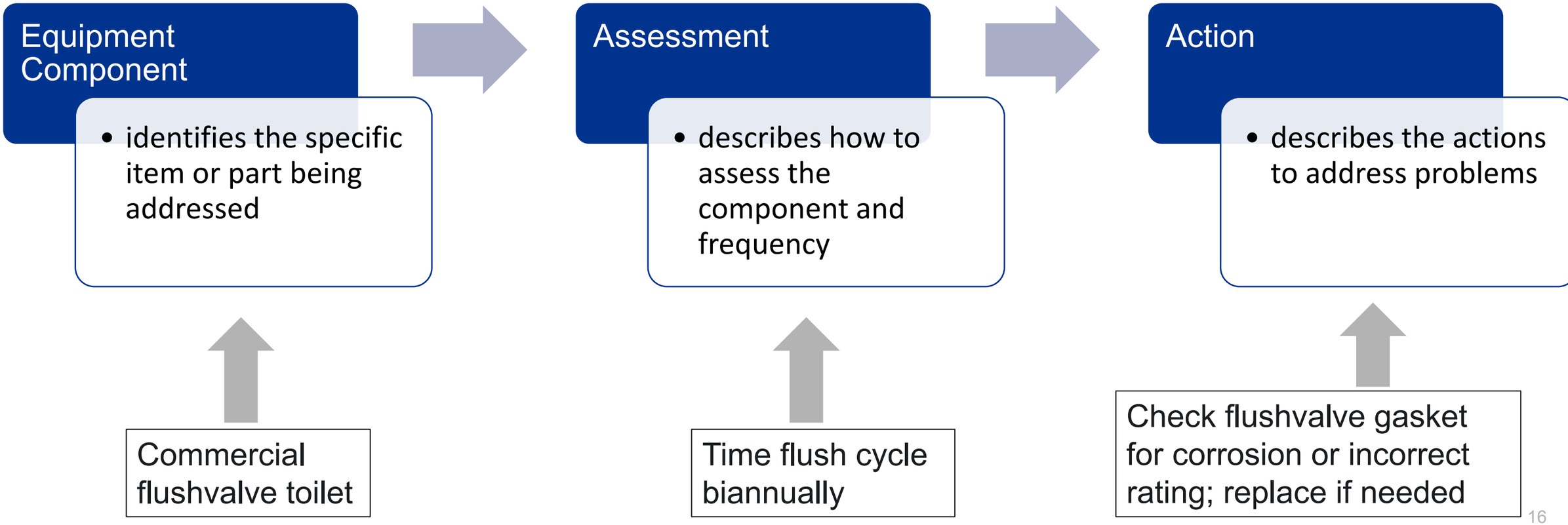


Assess Water Efficiency

- **Improve Operations and Maintenance**

FEMP Resource:

- **O&M Guidelines**: https://www.energy.gov/eere/femp/technical-operations-and-maintenance-guidelines-common-water-equipment



Assess Water Efficiency

FEMP Resource:

FEMP BMPs give tips on optimized operation and retrofit/replacement options:

1	• Water Management Planning
2	• Information and Education
3	• Leak Detection
4	• Water-Efficient Landscape
5	• Water-Efficient Irrigation
6	• Toilets & Urinals
7	• Faucets & Showerheads
8	• Boiler/Steam Systems
9	• Single Pass Cooling
10	• Cooling Towers
11	• Commercial Kitchens
12	• Lab/Medical Equipment
13	• Other Intensive Equip.
14	• Alternative Water Sources

https://www.energy.gov/eere/femp/best-management-practices-water-efficiency

Federal Procurement of Water-Efficient Equipment

- Federal agencies are required to purchase Environmental Protection Agency (EPA) ENERGY STAR equipment or FEMP designated products
  - Statutory authority: 42 U.S.C Section 8259(b)

- Water-Efficient Covered Products:
  - EPA WaterSense Plumbing Fixtures
  - ENERGY STAR Commercial Kitchen Equipment:
    - ✓ Dishwashers
    - ✓ Steam Cookers
    - ✓ Ice Machines
  - ENERGY STAR Clothes Washers

EPA WaterSense


High-Efficiency Residential and Commercial Toilets


High-Efficiency Flushing Urinals


High-Efficiency Private Lavatory Faucets


High-Efficiency Showerheads


Advanced Landscape Controllers


Spray Sprinkler Bodies

WaterSense labeled products are third–party certified and meet EPA's specifications for water efficiency and performance

WaterSense Resources:

- **WaterSense Products:**
  https://www.epa.gov/watersense/watersense-products
- **WaterSense for Commercial Buildings:**
  https://www.epa.gov/watersense/commercial-buildings

Underutilized Water-Efficient Products and Systems

FEMP Resource:

Factsheets on underutilized technologies that have broad applicability, market availability, and have proven water savings

- Leak noise loggers
- Advanced cooling tower controls
- Connectionless food steamers
- Multi-stream rotational sprinklers
- Sprinkler automatic shut-off devices
- Steam sterilizer condensate retrofit kit

https://www.energy.gov/eere/femp/water-efficient-technology-opportunities

Acoustic Leak Loggers

Technology Description

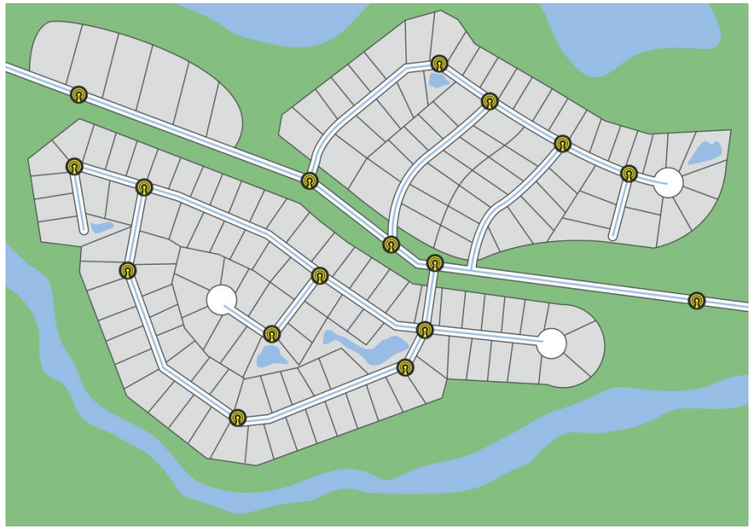
- Wireless acoustic sensors are installed throughout the distribution system
- Sensors “listen” for leaking water from pipes
- Data is recorded by a centralized system that provides leak alerts

Considerations

- Options to attach permanently or temporarily
- Sampling frequency can be set by user
- Works better on metal pipes
- More suitable for pipes with diameter of 16 inches or less

Proven Savings

- Tobyhanna Army Depot identified 6 leaks responsible for an estimated 90,000 gallons of water per day



Multi-Stream Rotational Sprinkler Heads

Technology Description

- Applies water in rotating trajectories with reduced flow rate
- Applies water more evenly over landscape

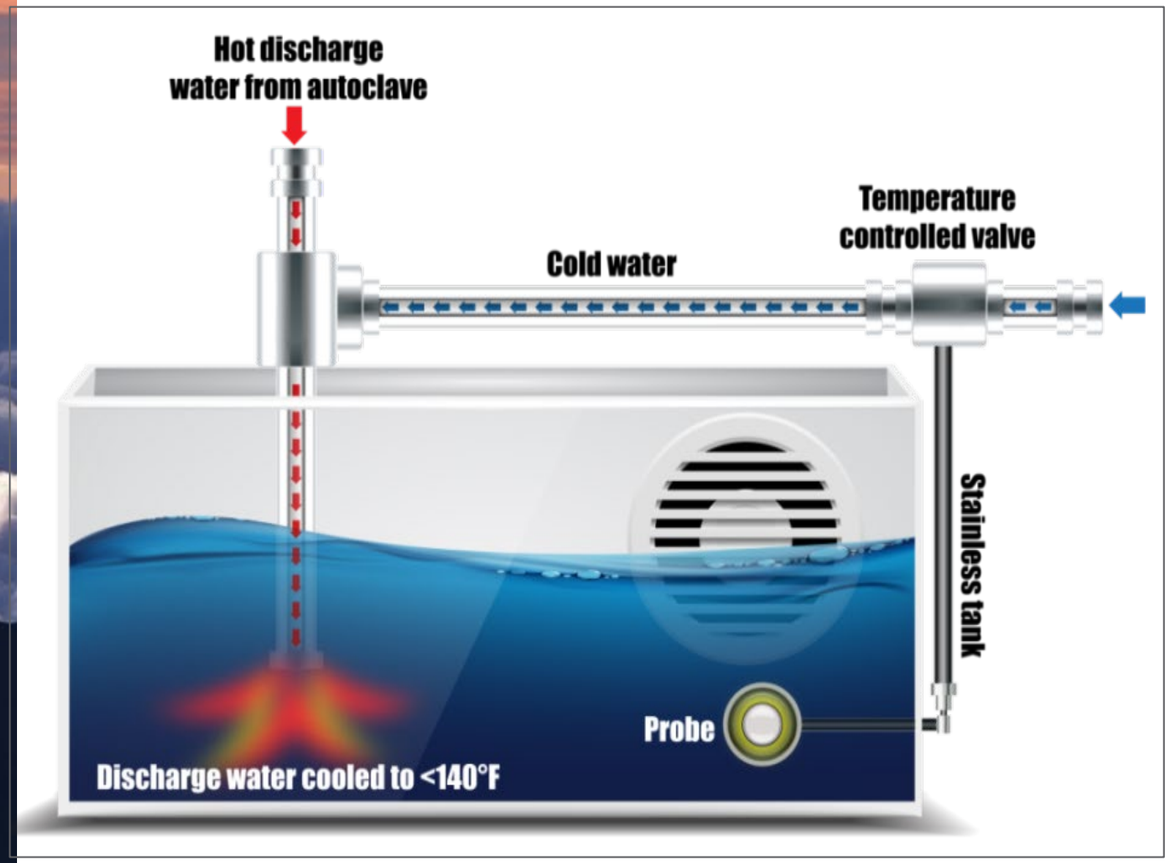
Considerations

- Easy retrofit on existing pop-up spray heads
- Best suited for smaller landscape

Proven Savings

- Southern Nevada Water Authority study:
  - Precipitation rate fell from 2 inches per hour to 1 inch per hour
  - Distribution uniformity improved by 45%

Steam Sterilizer Condensate Retrofit Kit



Technology Description

- Tank captures condensate during ready/standby mode and dissipates heat before discharging the cooled condensate
- Thermostatically controlled valve allows cool tap water to enter the chamber to meet discharge water temperature code requirements

Considerations

- Easily retrofitted on existing systems
- Most applicable for large, freestanding sterilizers
- Space constraints are generally not an issue

Proven Savings

- Stanford University Study found 90% reduction of tempering water

https://suwater.stanford.edu/sites/default/files/sem_steamsterilizers_stanford_2013.pdf

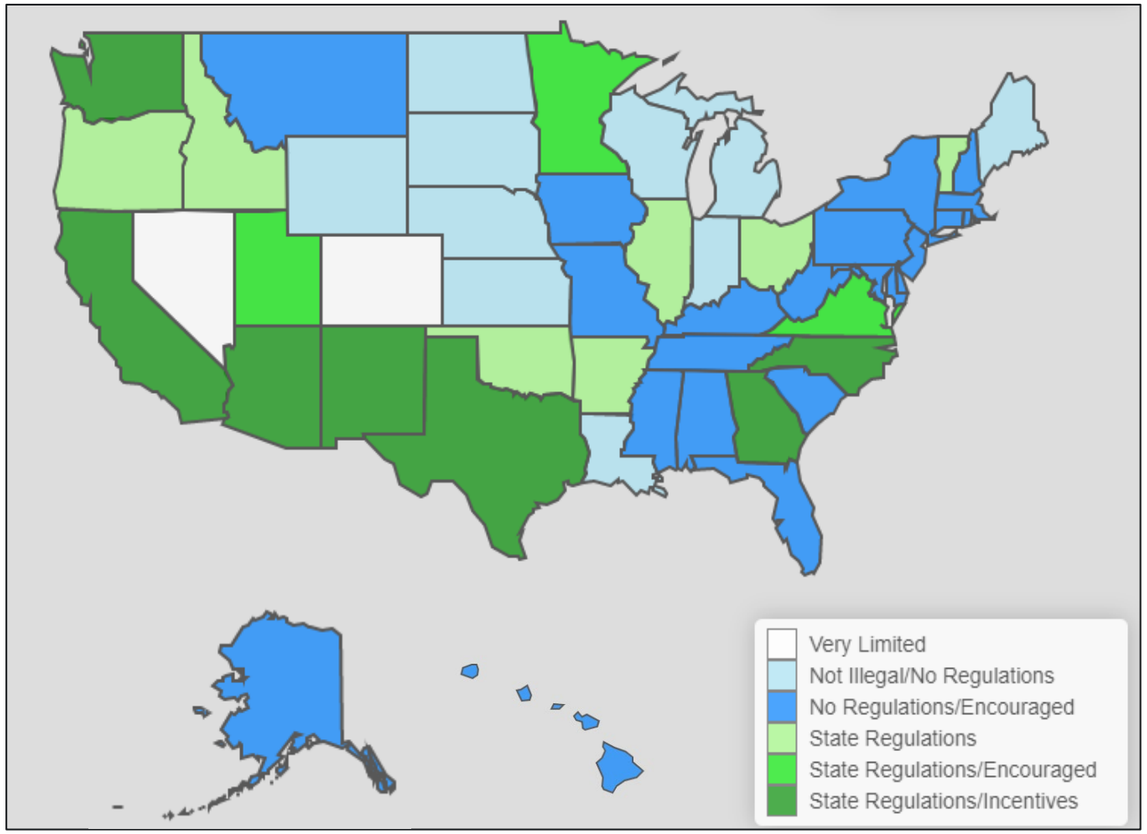
Investigate Alternative Water

Alternative water sources are derived from sustainable supplies to offset the use of fresh surface or groundwater sources.

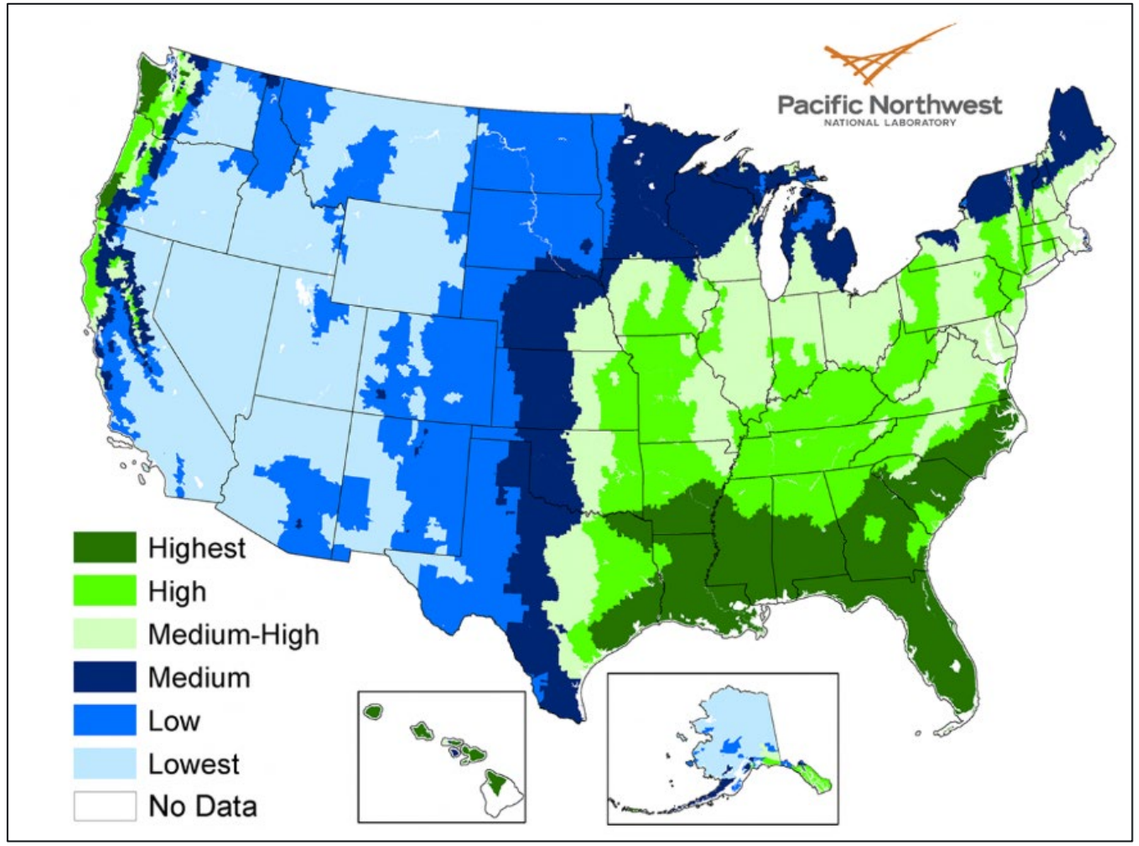
- Rainwater
- Reclaimed Wastewater
- Condensate Capture
- Atmospheric Water Generation

Rainwater Harvesting

Rainwater Harvesting Regulations

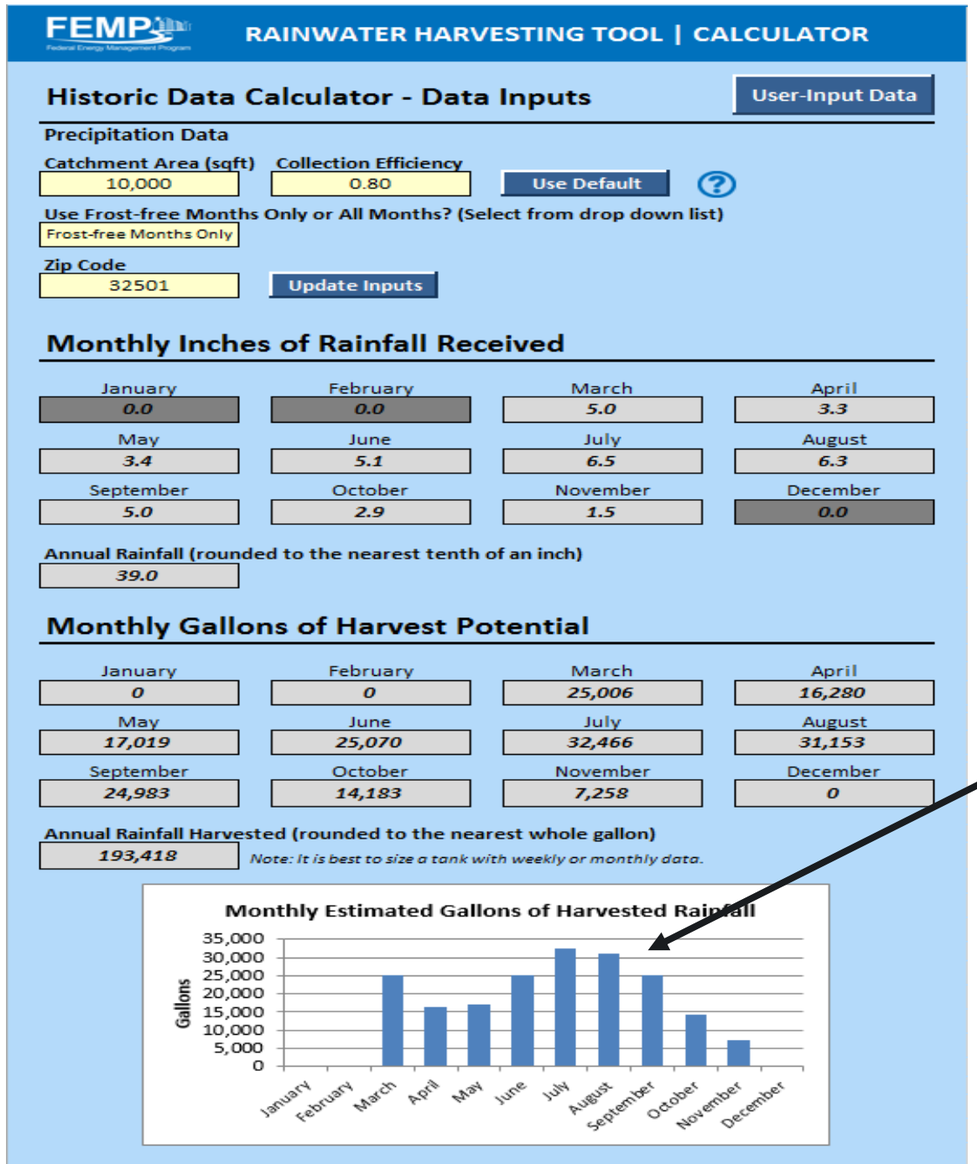


Rainwater Availability Map



https://www.energy.gov/eere/femp/alternative-water-sources-maps

Rainwater Harvesting Calculator

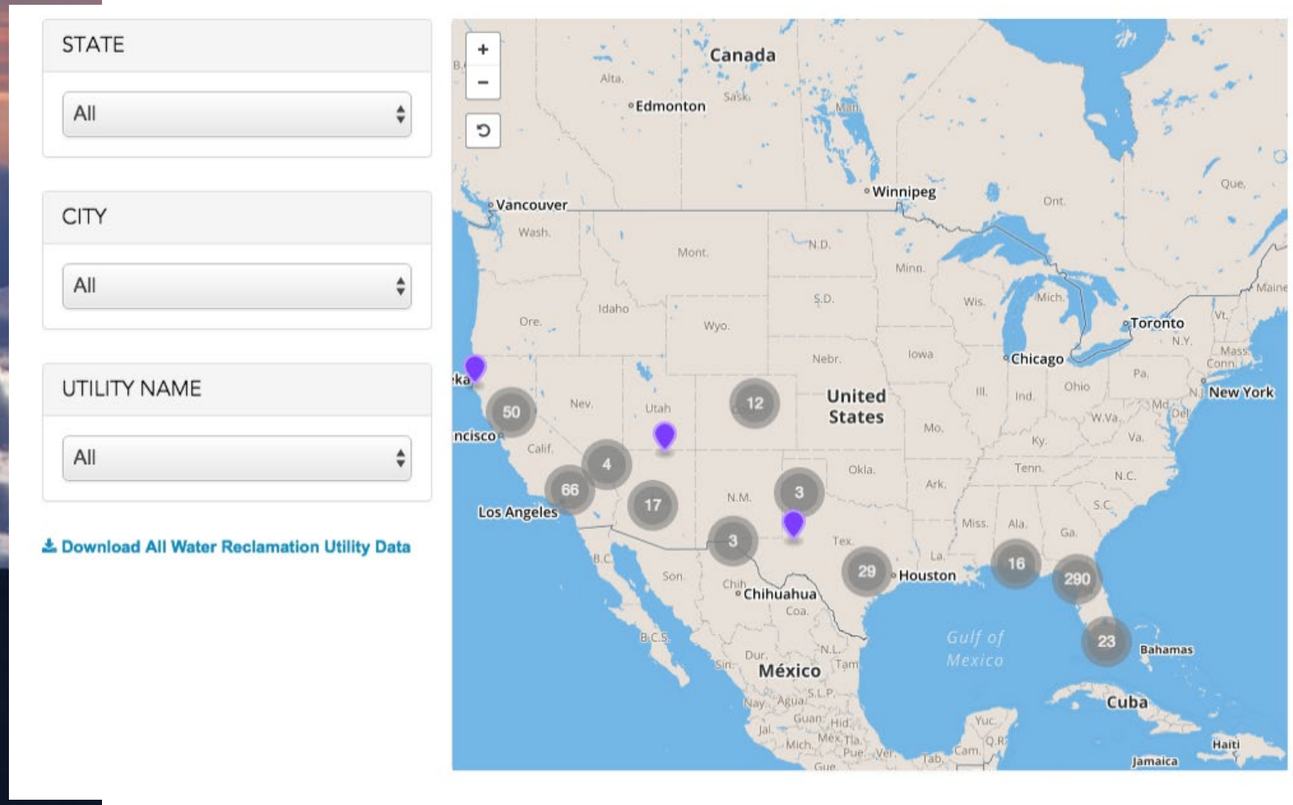


Excel based tool:

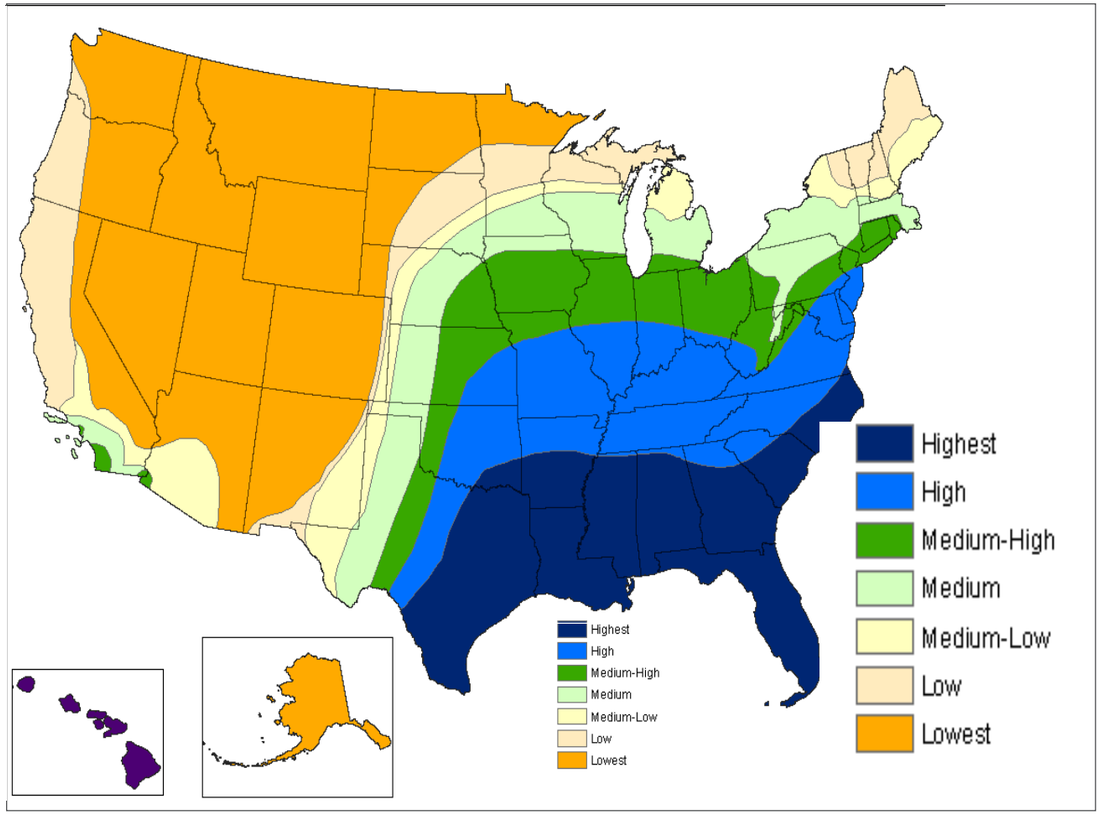
- Calculates monthly rainfall available for harvesting from rooftops or other hard surfaces
- Uses 30-year historic rainfall data or user-inputted rainfall
- Assists in estimating size of the storage tank

Reclaimed Wastewater & Condensate Capture

Reclaimed Wastewater Providers



Condensate Capture Potential



https://www.energy.gov/eere/femp/alternative-water-sources-maps

Develop an Implementation Plan

- Conduct a life-cycle cost analysis to determine cost effectiveness:
  - Consider all ancillary savings such as O&M, energy, and chemical savings
  - Make sure to properly escalate water rates: https://www.energy.gov/sites/prod/files/2017/10/f38/water_wastewater_escalation_rate_study.pdf
- Prioritize projects:
  - Optimize systems that reduce water demand before investigating alternative water project
  - Make water resilience and security a driver for alternative water projects
- Identify funding sources:
  - Appropriated funds
  - Third Party Financed
    - ✓ Energy Savings Performance Contracts
    - ✓ Utility Energy Service Contracts
    - ✓ https://www.energy.gov/eere/femp/energy-and-project-procurement-development-services

Learn More through FEMP Training

Using Effective Water Management to Build Resilience

LIVE ONLINE
Jun 25, 2019
1.5 hours
0.20 CEU

Intermediate
Webinar will discuss how alternative solutions and resilience can work together to create an effective water program at the site level.

Best Practices for Comprehensive Water Management for Federal Facilities

ON-DEMAND
4.5 hours
0.50 CEU

Advanced
Course provides federal facility and energy managers with knowledge and skills to assist in meeting water-related legislative and executive order requirements. Learners will develop skills in increasing water efficiency and reducing water use through sound operations and maintenance practices and water-efficient technologies.

Managing Water Assessment in Federal Facilities

ON-DEMAND
3.5 hours
0.40 CEU

Intermediate
Course focuses on managing the water-assessment process in federal facilities and assists federal energy and facility managers in complying with executive orders and legislative mandates and meet the requirements of Section 432 of the Energy Independence and Security Act of 2007.

Using Metered Data to Improve Energy and Water Efficiency

ON-DEMAND
1 hour
0.10 CEU

Intermediate
Course discusses how to use metered data to identify system-level or facility-wide efficiency changes and dashboards to present information tailored to stakeholders.

Water Management Basics

ON-DEMAND
2 hours
0.30 CEU

Introductory
Course provides learners with a concise introduction to comprehensive water management, including the key topic areas of basic water management terminology, the history of federal water mandates, best practices associated with comprehensive water management, and proven water conservation financing mechanisms and strategies.

https://www7.eere.energy.gov/femp/training/

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Thank you

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