WaterSense for Commercial, Institutional, and Industrial Facilities

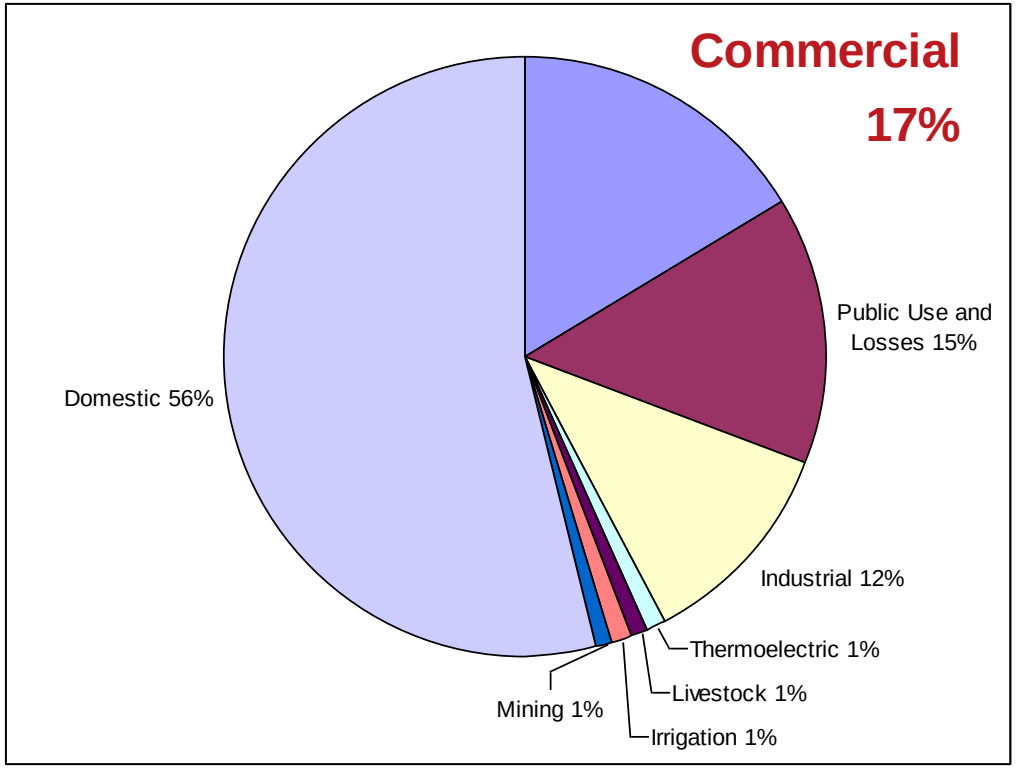
NW PA TAC Meeting
March 26, 2024

Agenda

- National Perspective/Background on Commercial Water Use
  - What is it?
- WaterSense Resources
  - ENERGY STAR Portfolio Manager
  - WaterSense at Work Best Management Practices
  - Focus on end-uses for education and retail
- Questions

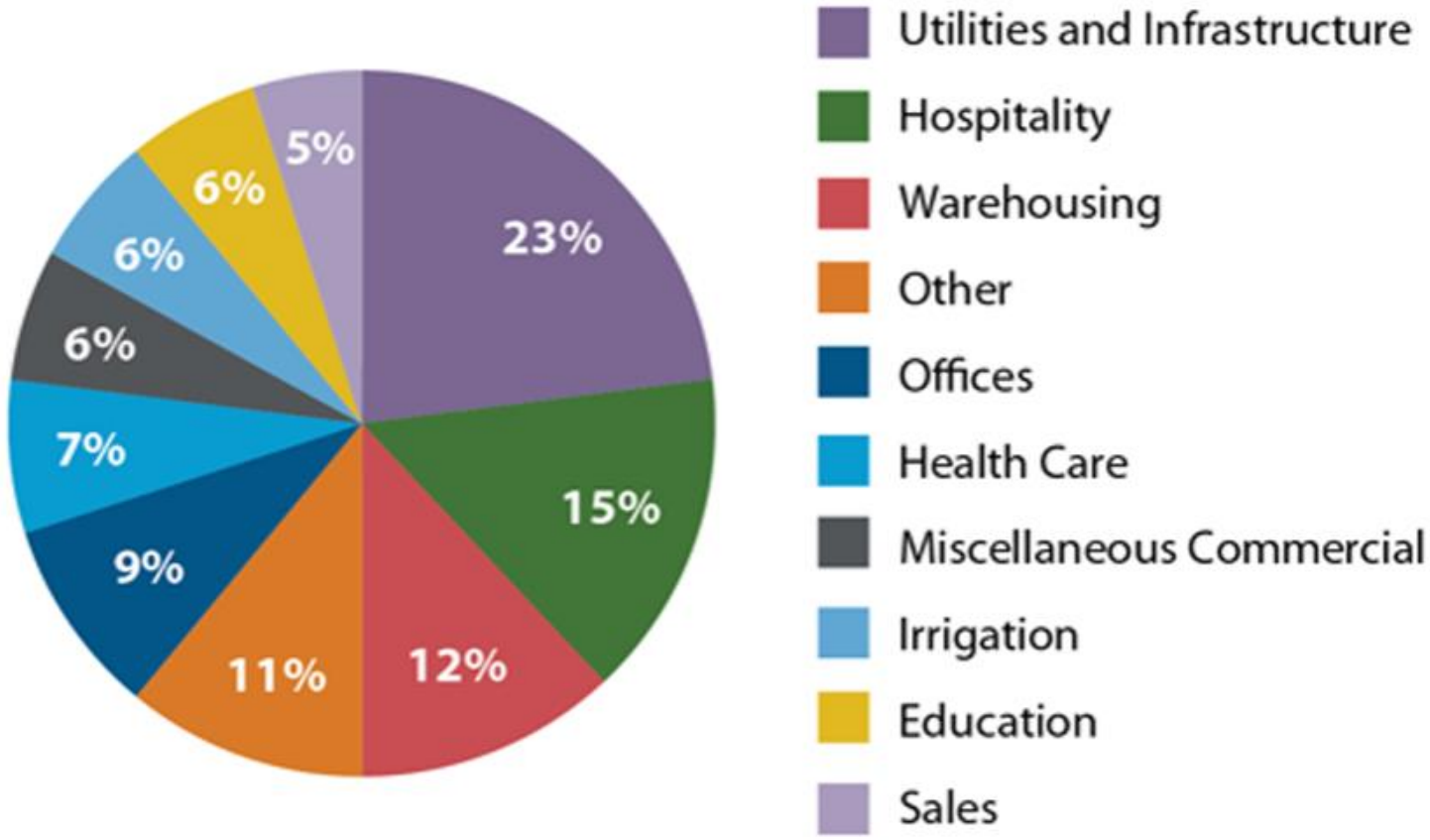
What We Know

- Water efficiency and conservation programs have historically focused on residential solutions
  - Highest overall category of water use
  - High level of consistency across major end uses
- Commercial is the second largest consumptive use
  - Represents a higher concentration of accounts
- Industrial is largely self-supplied at a national level



From USGS Estimated Use of Water in the United States in 1995. This is the last year that USGS collected this data.

What We Know

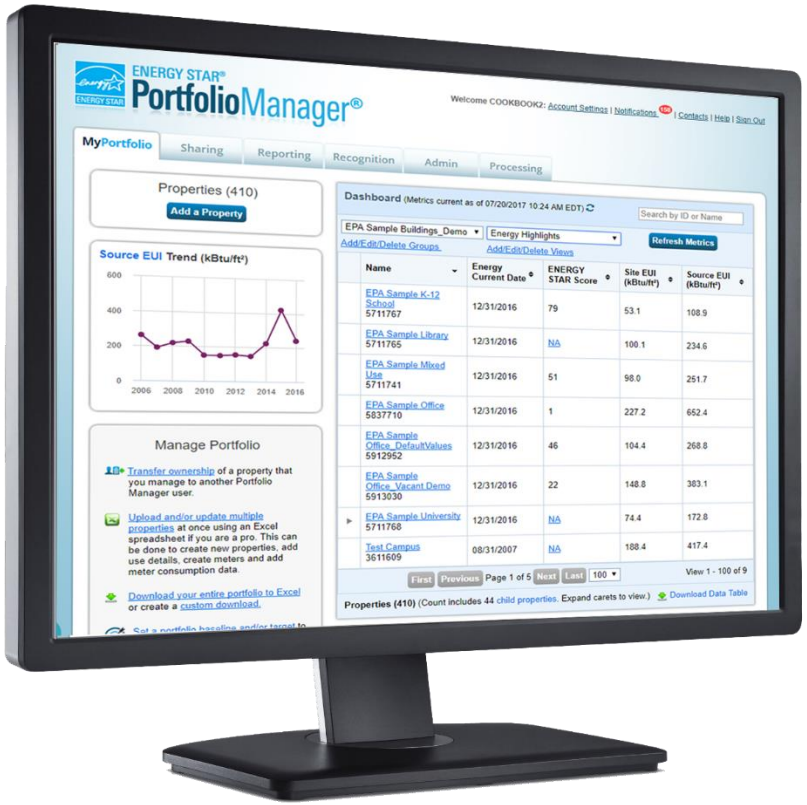


Source: Dziegielewski, et al. 2000. *Commercial and Institutional End Uses of Water*. American Water Works Association Research Foundation.

ENERGY STAR®

PortfolioManager®

look for WaterSense Meets EPA Criteria



Who Uses Portfolio Manager?

- More than half a million properties track energy use
- 25% of the commercial building stock in the U.S.
- More than half of Fortune 100 companies
- Half of the largest healthcare organizations
- Numerous municipalities that require reporting of energy and/or water through Portfolio Manager

Comparing Facilities

Better than nothing

Comparing water use between two facilities in the same use class

Good

Normalizing water by a simple, universally available metric. Ex: gal/square foot

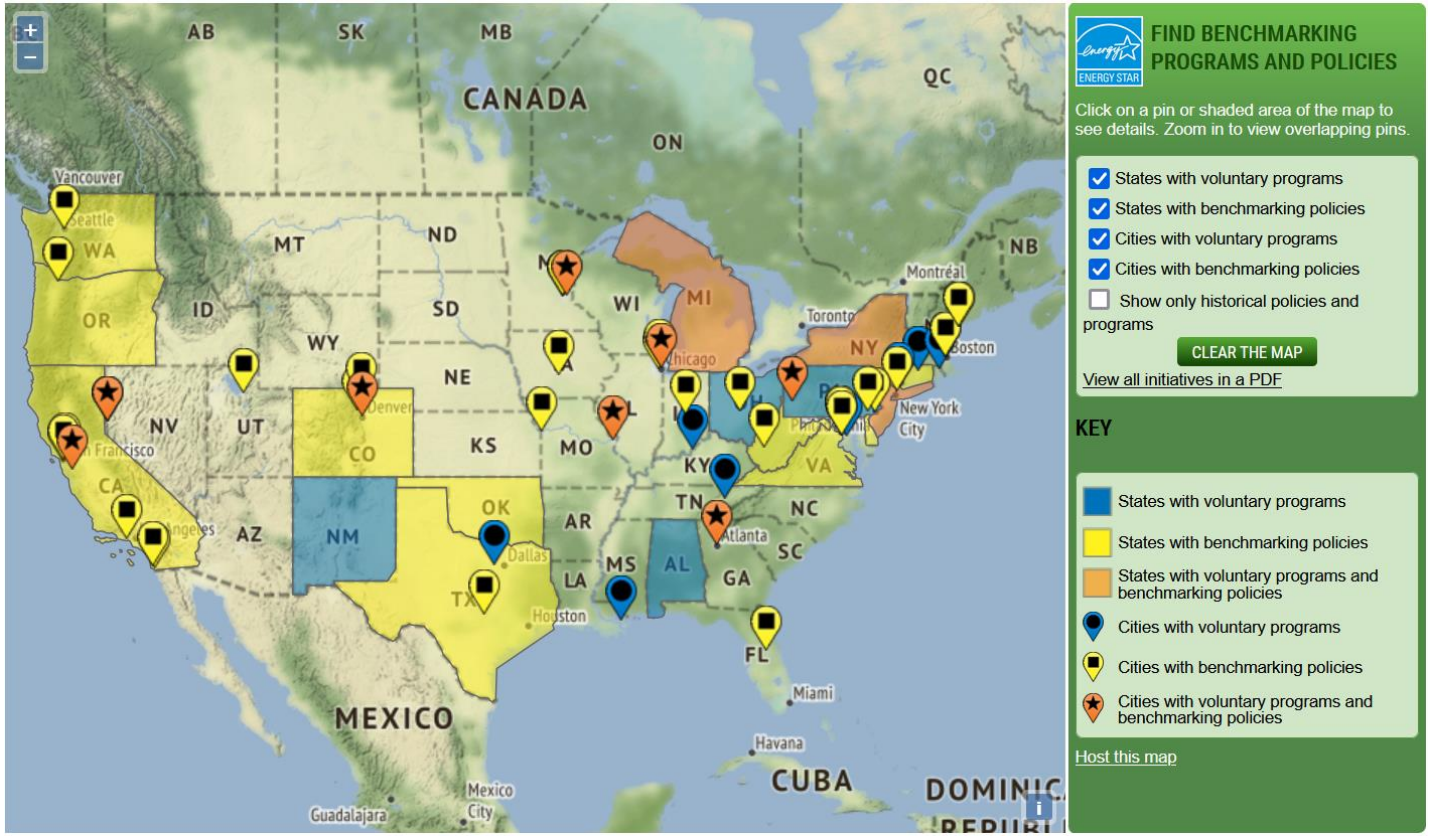
Better

Normalizing water by a property-type specific metric,. Ex: gal/hospital bed

Best

Normalize across multiple characteristics. Ex: EPA Water Score

How Does Data Get Into Portfolio Manager?

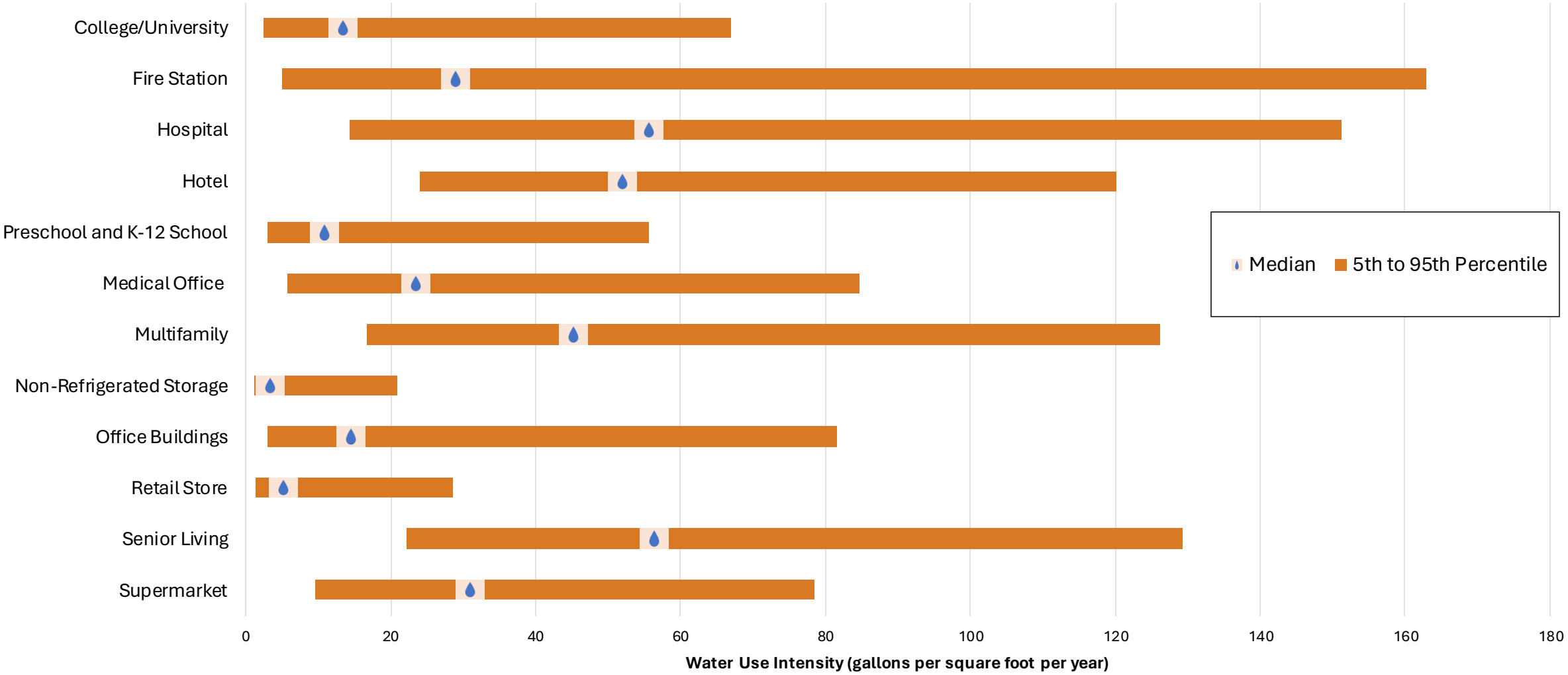


U.S. National Water Use Intensity (WUI) Reference Values for Select Portfolio Manager Property Types

Portfolio Manager Property Type	Number of Observations	WUI (gal/ft²/year) Percentile					Median Property Type-Specific Metrics
		5th	25th	50th/Median	75th	95th	
College/University	590	2.48	6.20	13.40	28.34	66.92	N/A
Fire Station	126	5.00	13.95	28.90	54.29	162.95	N/A
Hospital (General Medical & Surgical)	347	14.30	38.28	55.71	77.44	151.18	107,000 Gal/hospital bed/year
Hotel	1,488	23.94	40.06	52.02	69.28	120.23	33,500 Gal/guest room/year
K-12 School (includes Pre-school/Daycare)	1,588	3.04	6.88	10.84	19.71	55.69	11,200 Gal/worker/year
Medical Offices (includes Urgent Care/Clinic/Other Outpatient)	1,177	5.73	12.86	23.40	38.82	84.71	N/A
Multifamily*	258	16.76	31.71	45.15	65.56	126.14	43,600 Gal/unit/year
Non-Refrigerated Warehouse (includes Self-Storage Facility and Distribution Center)	1,675	1.15	1.84	3.43	6.69	20.88	N/A
Office (includes Bank Branch/Financial Office/Other Offices)	9,627	2.93	7.83	14.48	29.41	81.52	6,020 Gal/worker/year
Retail Store	4,382	1.41	2.84	5.24	8.99	28.59	N/A
Senior Living Community	1,232	22.18	39.80	56.41	77.69	129.26	39,800 Gal/resident/year
Supermarket (includes Grocery Store, Wholesale Club and Supercenter)	432	9.65	21.03	31.00	45.58	78.42	N/A

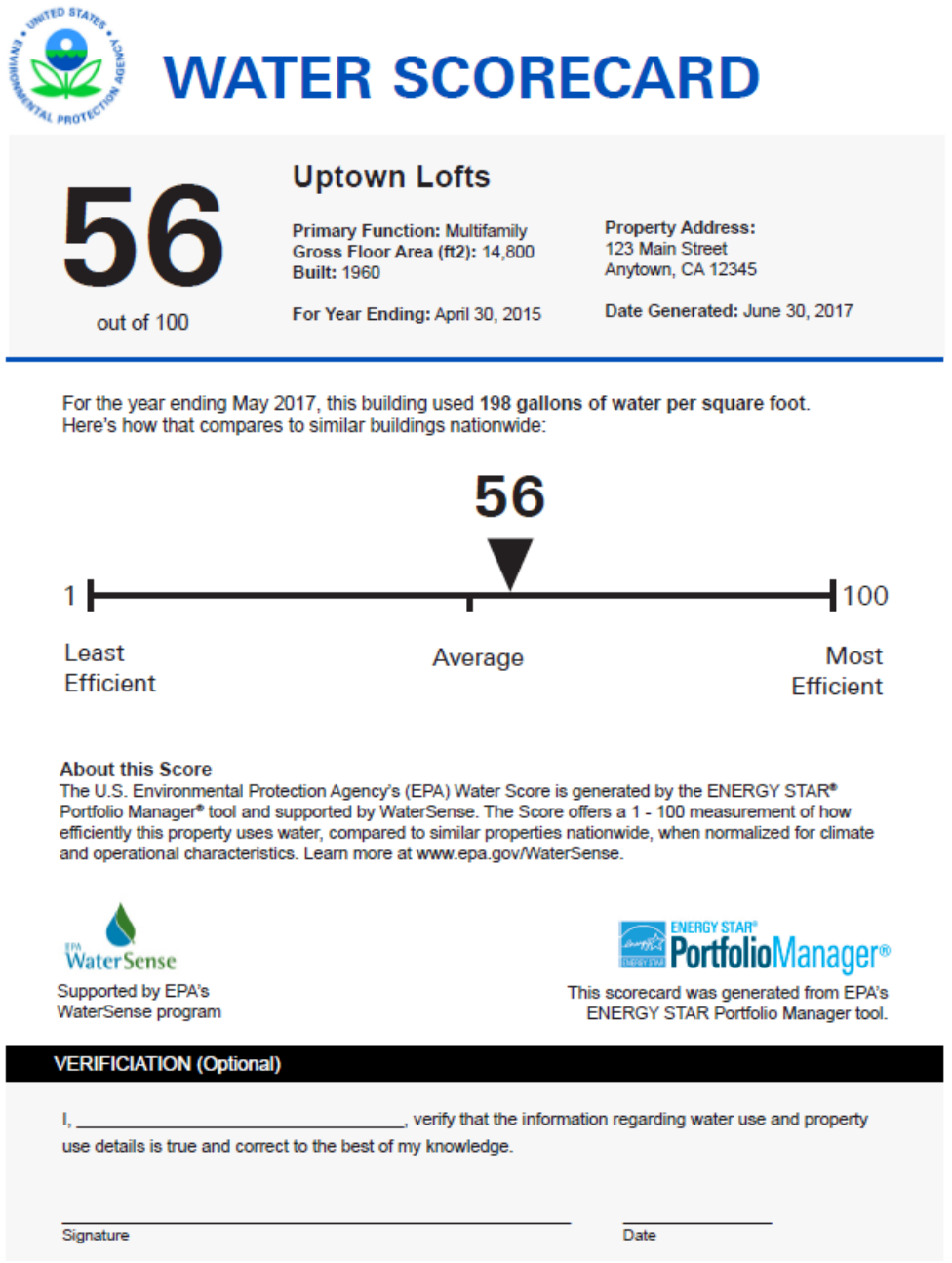
* Data Source: 2012 Fannie Mae Energy and Water Market Research Survey (https://multifamily.fanniemae.com/media/6656/display)

National Water Use Intensity Technical Reference



EPA Water Score for Multifamily Buildings

- For existing multifamily buildings
- Provides a 1-100 score analogous to an ENERGY STAR score
- Supported through ENERGY STAR Portfolio Manager
- Creates a meaningful peer comparison



WATER SCORECARD

56
out of 100

Uptown Lofts

Primary Function: Multifamily
Gross Floor Area (ft2): 14,800
Built: 1960

For Year Ending: April 30, 2015

Property Address:
123 Main Street
Anytown, CA 12345

Date Generated: June 30, 2017

For the year ending May 2017, this building used **198 gallons of water per square foot.**
Here's how that compares to similar buildings nationwide:

56

1 — 100

Least Efficient | Average | Most Efficient

About this Score
The U.S. Environmental Protection Agency's (EPA) Water Score is generated by the ENERGY STAR® Portfolio Manager® tool and supported by WaterSense. The Score offers a 1 - 100 measurement of how efficiently this property uses water, compared to similar properties nationwide, when normalized for climate and operational characteristics. Learn more at www.epa.gov/WaterSense.

EPA WaterSense
Supported by EPA's WaterSense program

ENERGY STAR® PortfolioManager®
This scorecard was generated from EPA's ENERGY STAR Portfolio Manager tool.

VERIFICIATION (Optional)

I, _____, verify that the information regarding water use and property use details is true and correct to the best of my knowledge.

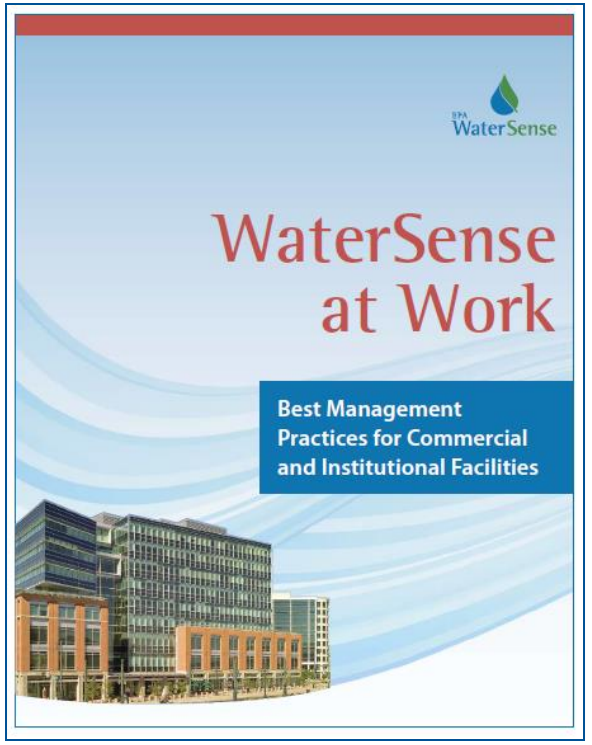
_____ Signature

_____ Date

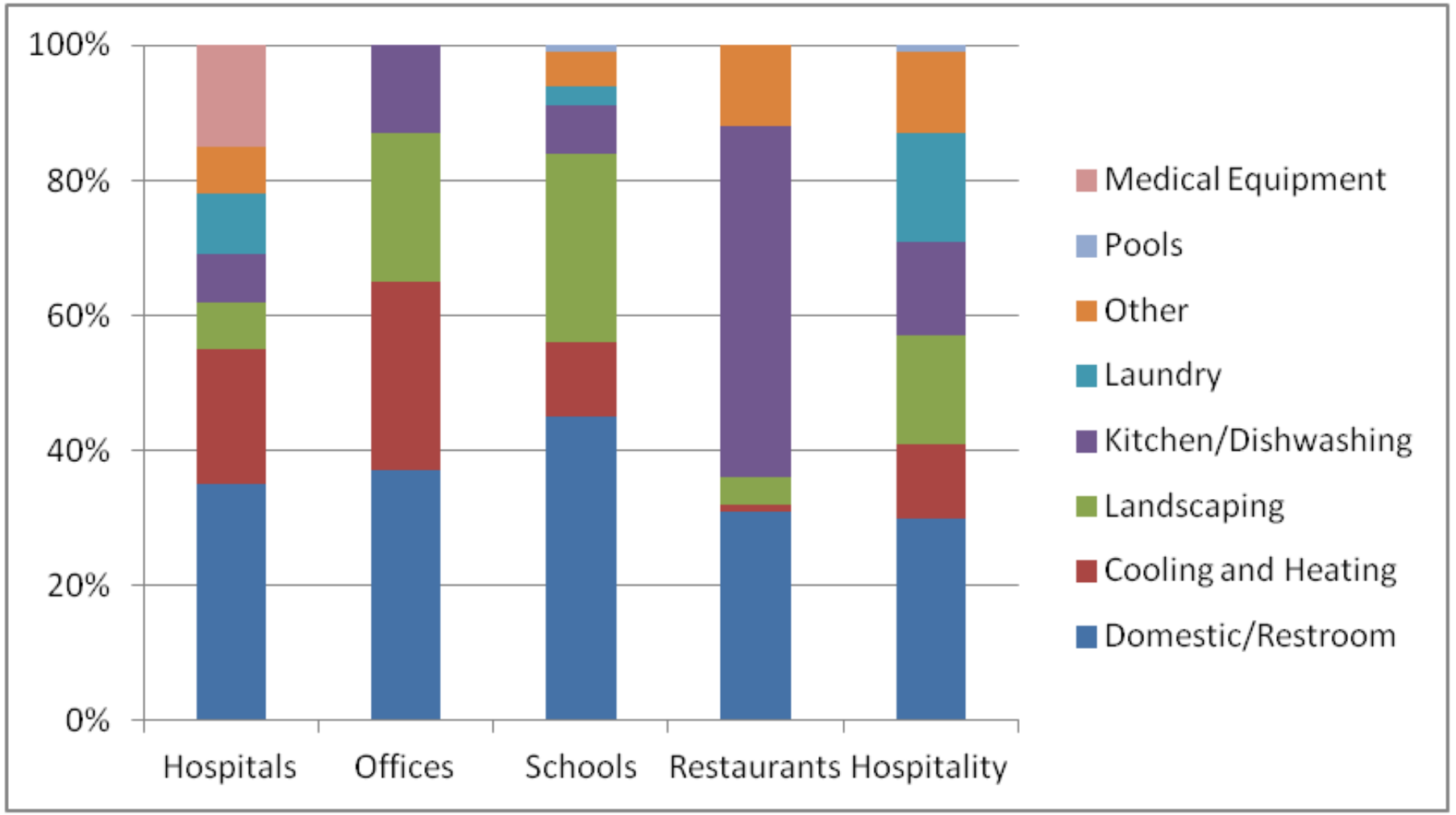
WaterSense at Work

WaterSense at Work is a comprehensive set of water-efficiency best management practices created to help commercial and institutional facilities manage their water use. The guidebook includes information about:

- Water management planning
- Water use monitoring and education
- Sanitary fixtures and equipment
- Commercial kitchen equipment
- Outdoor water use
- Mechanical systems
- Laboratory and medical equipment
- Onsite alternative water sources
- Case studies



Water Use Profiles of Commercial Facilities



Created by analyzing data from: New Mexico Office of the State Engineer, American Water Works Association (AWWA), AWWA Research Foundation, and East Bay Municipal Utility District

Quick Wins – Low level of effort, no/low capital expenditure

- Changes to O&M practices
- Minor/low-cost retrofits or replacements

Moderate Scale Projects – Moderate LOE and investment

- ex. conduct a full water assessment over time with flowmeters to verify problems and savings

Large Scale Projects - High LOE, capital expenditures

- ex. equipment and system replacements, renovations, new spaces

General Restroom Maintenance

Test

Test the water pressure serving each floor to achieve expected fixture performance – optimal pressure is between 20 and 80 psi

Inspect

Annually inspect valves and replace worn parts

Adjust automatic sensors on fixtures to avoid double or phantom flushes and faucets running longer than necessary

Check

Check for tampering – dissatisfied users can disable sensors, remove aerators, or otherwise damage fixtures

Remove

Regularly inspect for and remove scale build-up and biofilm on all fixtures especially faucets and showerheads

Automatic Sensors

Automatic sensors don't save water on their own especially if not maintained properly

Malfunctioning sensors can:

- Flush toilets and urinals unnecessarily – known as double or phantom flushes
- Run faucets longer than needed or cut off too early forcing users to use extra cycles

Can be disabled by dissatisfied users or cleaning staff

Calibrate sensors regularly using the manufacturer's instructions

Water Efficient Restroom Fixtures

	Private Restrooms or Patient Rooms	Public Restrooms
Toilets	Tank-type ≤ 1.28 gpf	Flushometer Valve ≤ 1.28 gpf
Faucets/Laminar Flow Devices	Lavatory ≤ 1.5 gpm	0.5 gpm OR 0.25 gpc
Showerheads	≤ 2.0 gpm	
Urinals	Flushing Urinals ≤ 0.5 gpf	

Faucet Aerators

Average cost = $5-10 each

Standard Aerator

Residential

Spray Aerator

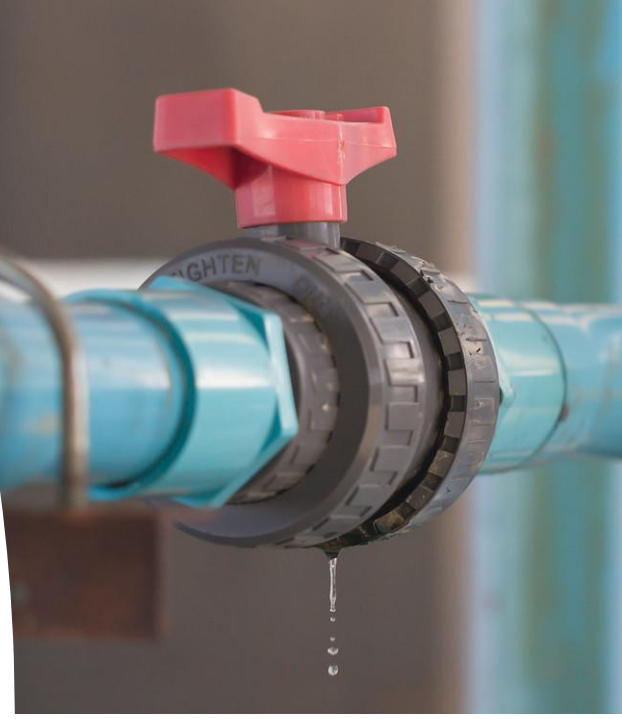
Commercial Public Restrooms

Laminar Flow Device

Commercial – High flow applications or healthcare facilities

Target Mechanical Systems

- Mechanical systems can account for up to 30% of water use
- Submeter systems and check for leaks and inefficiencies – especially hot water and steam
- Minimize water use in single-pass cooling systems
- Maximize cooling tower cycles of concentration



Single-Pass Cooling

Single-pass or once-through cooling systems use water to remove heat and cool equipment

– Uses **40 times** more water than a cooling tower

Types of equipment that could use single-pass cooling include:

- Ice machines
- Refrigeration systems
- Vacuum systems
- Air conditioners
- Air compressors

Single-Pass Cooling Efficiencies

Maximize efficiency of existing systems

- Use minimum flow rate required for cooling set by manufacturer
- Install a control valve to turn off cooling water when there is no heat load – standby mode
- Regularly check operation of the water control valve
- Recirculate water by connecting cooling lines to existing chilled water loops

In the long-run, eliminate single-pass cooling systems

- Replace with air-cooled equipment
- Reuse water in a closed-loop recirculation system

Cooling Towers

Cooling towers can be **20-50%** of total facility water use

- High energy use to pump water continuously
- Evaporation is not the target for water efficiency
- Monitor water chemistry and flow
- Maximize cycles of concentration

Cooling Tower BMPs

Main goal: maximize cycles of concentration

Cycles of concentration is an indicator of the number of times water can be recirculated in the system before it's discharged to the sewer

- Limited by the concentration of minerals in the water often measured by a conductivity meter - can lead to scaling and mineral build-up
- Increasing cycles from 3 to 6 reduces make-up water by 20% and blowdown water by 50%

- Install submeters on the make-up and blowdown lines to monitor flow
- Ensure cooling tower fill valves cut off cleanly
- Choose a water treatment vendor that specializes in water efficiency
- Read water chemistry reports to verify progress toward goals
- Use make-up water submeter to measure evaporation losses to request a sewer credit from your utility

Outdoor Water Use

20-30% of a building's water can be used outdoors

- Minimize amount of water needed to supplement rainwater to meet a plant's watering needs
- Landscape and irrigation service agreements should include:
  - Water efficiency goals
  - Requirements for local water restrictions
- Existing staff can attend courses or seminars to learn water-efficient techniques

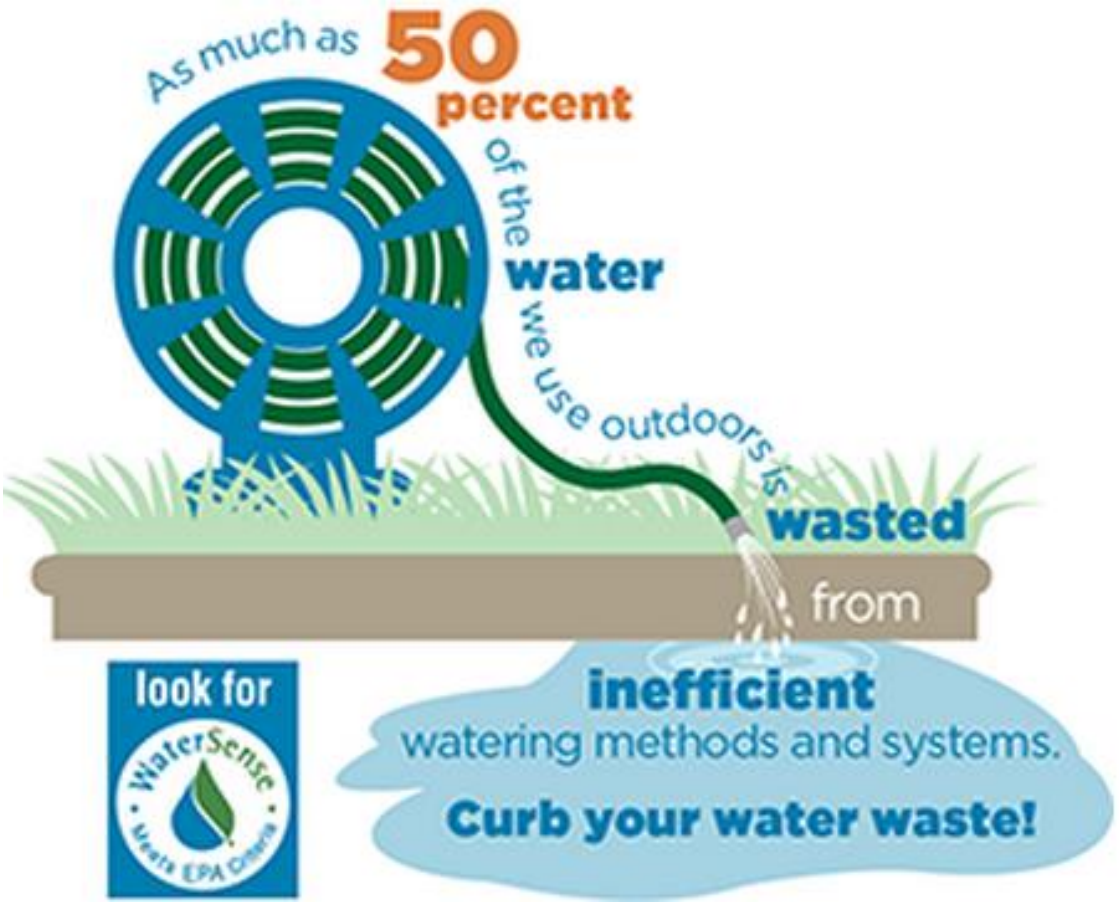
Landscaping: O&M

- Protect your investment in plants
  - Overwatering can damage plants more than underwatering and can damage building foundations
  - Remove weeds so water is available for desired plants
  - Raise the blade - allow turfgrass to grow longer, promoting deeper root growth
  - Make shade and apply less water to shaded areas
- Minimize water used for other purposes
  - Shut off water features whenever possible
  - Recirculate in water features
  - Sweep, don't water hard surfaces

Irrigation

Water losses from wind, evaporation, and over-watering caused by:

- Poor irrigation system design
- Improper system installation and management
- Lack of maintenance
- Improper scheduling



https://www.epa.gov/watersense/outdoors

Find Outdoor Water Waste

- Check the system for broken or clogged sprinkler heads
- Make sure sprinkler heads do not tilt too high or too low
- Move or adjust sprinkler components to avoid watering pavement
- Look for pooling and puddling
- Audit your irrigation system using an irrigation professional certified by a WaterSense labeled program every 3 years

https://www.epa.gov/watersense/irrigation-pro

Irrigation Efficiencies

Irrigation system operation

Update irrigation schedules regularly

Schedule each individual zone separately

Install and monitor submeters to indicate inefficiencies or leaks

Irrigation controllers

Replace traditional manual or clock timers with WaterSense labeled controllers

Install rain shutoff devices or sensors

Sprinklers

Check the pressure in the irrigation system – high or inconsistent pressure wastes water

Install WaterSense labeled Spray Sprinkler Bodies to maintain constant pressure and flow

Commercial Kitchens

Turn equipment down or off at slow times or when not in use

- Consider installing automatic shut-off valves

Check all valves and self-closing nozzles

- to make sure they are stopping water flow correctly

Reduce waste from steam equipment

- Keep doors and lids closed and secured
- Replace the gaskets and tighten the hinges to create a good seal to retain heat and steam

Minimize use of food disposal systems ~ 15 gal/min

- Run cold water through the system to minimize energy
- Turn water off when not in use
- Encourage users to scrape food waste into a compost bin

Tools for Getting Started

WaterSense Simple Water Assessment Checklist

Writable PDF to help quickly identify and target potential projects and best management practices

WaterSense Operations and Maintenance Checklist

Checklist of low- or no-cost changes to operation and maintenance procedures can start saving water, energy, and costs quickly.

Sample Worksheets in Appendix B of *WaterSense at Work*

Building Water Survey, List of Water Meters, Water Consumption History; Equipment and Water Use Inventory

WaterSense Commercial Facility Leaks Checklist

PDF checklist to help quickly identify leaks and potential water waste

www.epa.gov/watersense/tools-ci-facilities

O&M Checklist

Tips to Identify and Address Potential Water Waste	Section of *WaterSense at Work*[1]	Done ✓	Notes
SANITARY FIXTURES			
10. Post signs in restrooms to instruct users to report leaks and continuously flushing fixtures.	3.2 – 3.4		
11. **Tank-type toilets:** Check tank-type toilets regularly for leaks, broken flappers, and other parts failures. Annually test toilets using a dye test to ensure the flappers are not worn or allowing water to seep from the tank into the bowl and down the sewer. Drop a dye tablet or several drops of food coloring in the tank. After 10 minutes, see if the dye has leaked into the bowl, which indicates a leak. Flush immediately.	3.2		
12. Check the toilet fill valves for water overflow to make sure fill valves are not running constantly.	3.2		
13. **Flushometer-valve toilets and urinals:** Inspect diaphragm or piston valves annually and replace any worn parts. To determine if the valve needs replacement, time the complete flush cycle. A properly functioning flushometer valve toilet should not have a flush cycle longer than four seconds for a 1.6 gallon per flush (gpf) valve and three seconds for a 1.28 gpf valve. A urinal flush cycle should be completed in three seconds for a 1.0 gpf valve and two seconds for a 0.5 gpf valve. If longer, check the flush volume adjustment screw or consider replacing the valve or valve insert.	3.2 – 3.3		
14. Periodically check to ensure the control stop (which regulates the flow of water from the inlet pipe to the flushometer valve) is set to fully open during normal operation.	3.2 – 3.3		
15. Periodically inspect the flush volume adjustment screw to ensure the flush volume setting has not been modified from the original settings to use more water per flush than needed.	3.2 – 3.3		
16. If replacing valves or valve inserts, make sure the new ones are consistent with the manufacturer's specifications. Ensure the rated flush volume matches the acceptable range for the fixture.	3.2 – 3.3		

Other Resources

City of Boulder Commercial, Industrial, and Institutional (CII) Water Assessment Tool and User's Guide – based on WaterSense at Work

https://www.brendlegroup.com/actions-insights/resources/

South Florida Water Management District *Water Efficiency and Self-Conducted Water Audits at Commercial and Institutional Facilities Guide*

https://www.sfwmd.gov/documents-by-tag/waterefficiency

Environmental Defense Fund, AT&T, & GEMI

Water Efficiency Toolkit with Scorecard and WaterMAPP Tool

http://gemi.org/EDFGEMIwaterMAPP/

DOE Federal Energy Management Program Water Project Screening Tool – http://energy.gov/eere/femp/downloads/water-project-screening-tool

Thank you!

- Contact
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- Website
  - Website: www.epa.gov/watersense
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  - Partner website: projects.erg.com/wspartner/index.html