



Name:

Class:

Date:

Part 1: Audit of Strategies to Save Water In Multifamily Buildings

Through this audit you'll gather data to support your recommendations for how your multifamily property could save water.

First, you'll inspect your multifamily building to see if the strategies on the following pages might be water saving opportunities for your building. You'll do that by gathering and analyzing data, identifying opportunities for water efficiency improvements in and around the multi-family housing where you live (apartment building, triplex, condo, etc).

Then you'll make data-based recommendations to increase the water efficiency throughout the entire building. If possible, you'll implement and measure the impact of efficiency strategies to support your recommendations with real-world evidence.

Your findings, when shared with your utility and landlord, can help efficiency upgrades get made in your building.

Note: If you get a water bill then it is likely that your unit has its own separate meter and you can collect data from the meter to enter into MeterHero. However, it is more likely that your building has a single water meter for all units. In that case, you might still be able to gather consumption data from an irrigation meter that tracks just the water used outdoors. Individual units often have their own electricity and gas meters, and if water heaters are in individual units, then track those energy meters as hot water saving efficiency strategies are implemented.

How?

Consult with your family, neighbors, and if possible a facilities person at your apartment building for assistance.

Water Efficiency Strategy 1 - Reduce Water Use Indoors

How: Identify water fixtures in your multifamily building that could accomplish the same task while using less water.

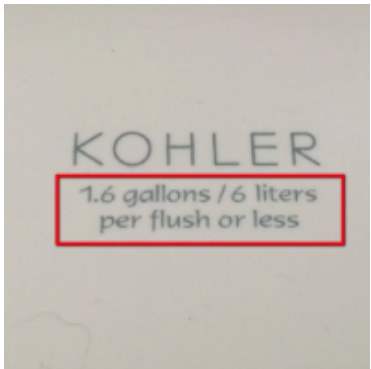
- Review water fixtures (showerheads, toilets, faucets, urinals, dishwashers, etc..) that could be upgraded to a more efficient model.
- Use a stopwatch and flow bag to measure actual water consumption.

Why: Designers and engineers have figured out how to maintain or increase performance of water fixtures while at the same time reducing how much water they require. If they can't be replaced, a fixture might be retrofitted (updated) with items like aerators, motion sensors, and automatic shut-off valves to reduce their water use.

Complete the data table below with information about the water using devices throughout the multifamily building. Add rows if necessary to collect information on all of the indoor devices in your home.

Type of Fixture (Faucet, Toilet, Urinal, Shower, bath diverter, etc)	Gallons Per Minute (or Gallons per flush)	Location(s) (Circle anywhere there was a leak)	Total Count (Use tally marks) ¹
<i>Toilet</i>	<i>3.5 gpf</i>	<i>Unit 3A</i>	 (8)

¹ Idea: Talk to your neighbors to see if their units have inefficient fixtures and or leaks

			
Tip: Find the Gallons Per Minute and Gallons Per Flush value by locating "GPM" or "GPF" usually written on the fixture			Use a flow bag to calculate actual gallons per minute flow

***Dual-Flush Toilets:** For dual-flush toilets, which flush at different volumes depending upon the need to flush liquid or solid waste, enter the "effective flush volume" = $([2 \times \text{low flush volume}] + [1 \times \text{high flush volume}]) / 3$.

***Toilets with unknown flush volumes:** If the flush volume of a toilet is unknown, use the information below to estimate the existing flush volume based on the date of installation/initial construction:

- Installed From 1994 to Present = 1.6 gallons per flush;
- Installed Between 1977 and 1994 = 3.5 gallons per flush;
- Installed Before 1977 = 5.0 gallons per flush

***Faucets or showerheads with unknown volumes:** Kitchen faucets often have a flow rate of 2.2 gallons per minute (GPM) but more efficient models are 1.8 GPM and below. If the flow rate is not visible on the faucet or faucet aerator, the flow rate can be determined using this simple procedure:

- o Turn on the faucet to its full operating position.
- o Place a container under the faucet or showerhead and collect water for 10 seconds.
- o Measure the volume of water collected in the container. Convert to gallons if necessary.
- o Multiply the measured volume of water by 6 to calculate the flow rate in gpm [e.g., (0.35 gallons collected in 10 seconds x 6) = 2.1 gpm].

***Make sure to note leaks, because:**

	Faucets	Every fixture that drips at a rate of one drip per second could waste nearly 3,200 gallons per year.
	Toilet leaks	While leaks from worn toilet flappers may be hard to detect, even small toilet leaks can waste approximately 30 gallons of water per day and 900 gallons per month. During your assessment, perform dye tests in tank-type toilets to look for worn flappers. Drop a dye tablet or several drops of food coloring into the toilet tank. After 10 minutes, check if the dye seeped into the bowl (if it has, there is likely a leak). Flush the toilet immediately after conducting this test to prevent staining.
	Bath and shower diverter	A bath and shower diverter is the little up and down plunger that sends water into the bathtub or up and out the showerhead. If it leaks 0.1 gallons per minute it can waste the average family 650 gallons of water, 79 kilowatt-hours of electricity, and more than \$15 in water and electricity costs per year.²

² Source: Environmental Protection Agency WaterSense® Multifamily Housing Water Assessment

Water Efficiency Strategy 2 - Reduce The Amount of Water Thirsty Landscaping

Why: Outdoor irrigation is often the largest use of water at any building or home. Large amounts of water can be saved by replacing landscaping that requires large amounts of watering, especially decorative-only turf grass that is not used for sports or activities, with plants that need less or no watering.

Complete the data table on the following page about outdoor water use at your multifamily housing. Add rows as needed.

Location (description)	Function (decorative, athletic, food, academic, shade, etc.)	Waterings per week	Duration (minutes)	Time of day	Percentage of area that is watered turf grass	Size of the area ³	How it turns on & off (Manual, Weather-based, Timer)	Signs of inefficient use ⁴
<i>Grass strip next to entrance road</i>	<i>Decorative</i>	<i>7</i>	<i>18</i>	<i>10am</i>	<i>0%</i>	60 sq.feet	Timer	B, D

³ Get an approximate measurement of the area by pacing it out (walking with one foot in front of the other), or using a tool like Google Maps (right click, then select "Measure distance")

⁴ Potential signs that there are opportunities for greater water efficiency:

- A) Soggy patches in the grass, in flower beds or in other landscaped areas; (B) Puddles or standing water resulting from irrigation runoff; C) Moss growing or slippery-wet areas on any paved areas; D) Wet areas of sidewalk or pavement after irrigation sessions

Water Efficiency Strategy 3 - Improve Outdoor Operations and Maintenance

Based on your observations of the outside areas around your building, how would you prioritize each one of these water efficiency best practices where you live? Note: You might consider variables such as how much water could be saved over time, how much effort and financial investment it would take to implement the strategy, as well as how residents might react to the change.

Priority of the Opportunity to Save Water Outdoors Through Operations and Maintenance			
	Low	Medium	High
Landscape			
Use mulch (4") around trees and plant beds.	☐	☐	☐
Remove weeds from any irrigated landscape so water is available for the desired landscaping; pull weeds manually instead of using herbicides.	☐	☐	☐
Raise the blade on mowers to allow grass to grow longer and more drought-resistant.	☐	☐	☐
Plant additional trees and shrubbery to increase the amount of shaded area.	☐	☐	☐
Irrigation System			
Ensure the irrigation system takes into account local weather conditions to determine how much water landscapes need.	☐	☐	☐
Avoid watering during the hottest parts of the day when more water is lost through evapotranspiration.	☐	☐	☐
Check that sprinkler heads are not broken and that spray is not directed onto non-landscaped areas such as sidewalks and driveways.	☐	☐	☐
Water Features			
Shut off water features when possible to reduce evaporation losses and check water recirculation systems annually for leaks and other damage.	☐	☐	☐
Pools			
Use physical covers and/or liquid evaporation barriers ⁵	☐	☐	☐
Reduce wind movement across the water by using fences, walls, hedges, etc.	☐	☐	☐
If the water level drops more than 2" per week, there is likely a leak.	☐	☐	☐

⁵ Evaporation losses can be reduced by 30 to 50 percent by using pool covers and 10 to 30 percent with liquid evaporation barriers.

Part 2: Evidence Based Recommendations and Actions

Support your recommendation with evidence-based arguments:

State your claim, and the supporting argument you will choose to make. Example arguments are included below.

Examples: My recommendation is to reduce my apartment building's outdoor irrigation because it will reduce water use in one of my building's biggest categories. Or, My recommendation is to fix leaking shower diverters in the bathrooms of 10 units because it will save roughly 6,500 gallons of water per year.

- **The strategy could save a significant amount of water (and energy), and money**
 - Reduced operating and maintenance (O&M) costs, since less water will be used and charged for, plus, newer, more efficient appliances and equipment typically requires less servicing and maintenance. Moreover, the utility might have special programs that help cover the costs for multifamily properties to implement efficiency strategies.
 - Using less water can help out the local ecosystem and utility system, especially in areas with limited water supplies.
 - *Tip: Model out the potential savings if your strategy was implemented across all the units or property of your building. Use the Estimating Occupancy worksheet on the following pages for assistance.
 - Reduced energy consumption associated with water heating and pumping, especially during times of peak demand when the water and energy system are under more stress and prices might be higher.
 - Increased water efficiency might help make the water bill more consistent which can make it easier for the property owner to manage their budget.
- **The action will help our building gain valuable recognition for its water saving efforts**
 - Local media often covers positive stories of students and community members collaborating for environmental causes. Your local utility likely has a public relations person who can help coordinate.
 - Building owners might be able to get recognition for their water saving efforts, from the local utility or through the [EPA Water Score program](#), and market that commitment to water efficiency to tenants and property investors.
 - Replacing turf grass with more visually interesting drought-tolerant landscaping can help a property stand out and be more attractive to potential tenants.

Estimating Occupancy

Knowing whole property or individual unit occupancy is important when determining estimated water and energy savings from certain water efficiency strategies. For example, replacing two showerheads with more efficient WaterSense labeled models in an apartment with four occupants will achieve more water and energy savings than replacing the same showerheads in an apartment with one occupant.

Occupancy Information Summary

Unit Type	Number of Units	Unit Occupancy Estimate ⁶		Total Occupants per Unit Type
	A	B		= A x B
1 Bedroom		Multifamily Occupancy Estimate; or	1.94 occupants	
		Low-Income Multifamily Occupancy Estimate	2.26 occupants	
2 Bedroom		Multifamily Occupancy Estimate; or	2.39 occupants	
		Low-Income Multifamily Occupancy Estimate	2.83 occupants	
3 Bedroom		Multifamily Occupancy Estimate; or	2.84 occupants	
		Low-Income Multifamily Occupancy Estimate	3.40 occupants	
4 Bedroom		Multifamily Occupancy Estimate; or	3.29 occupants	
		Low-Income Multifamily Occupancy Estimate	3.97 occupants	
Estimated Total Property Occupants				

⁶ Florida Solar Energy Center. *Estimating Daily Domestic Hot-Water Use in North American Homes*. FSEC-PF-464-15. June 30, 2015.
www.fsec.ucf.edu/en/publications/pdf/FSEC-PF-464-15.pdf

Estimating Financial Savings

If you get utility bills for electricity, natural gas and/or water, you can use them to find your rates and thus calculate the financial benefits of the efficiency strategies.

If you do not receive a water bill it is likely that your individual unit does not have its own *submeter* but rather, the whole building just has a single *master meter*. The very act of submetering has been shown to reduce overall property water use as it encourages individual residents to conserve water since doing so more directly will affect their water bill.

Sample Calculation:

[estimated units of energy or water saved by strategy (per unit)] x [number of devices] x [monthly use] x [number of units] x [cost per unit of energy or water]

=

monthly savings