Residential Water Use Calculator Technical Documentation

The residential water use calculator estimates household water use based on user input about water habits, appliances, and fixtures, supplemented by research-based defaults and national averages when needed. It also compares results to a water-efficient home to highlight potential savings. This document provides an overview of the calculator's methodology, data sources, equations, and supporting research.

The calculator is organized into six sections, including:

(1) household

(2) bathroom

(3) kitchen

(4) laundry room

(5) outdoor, and

(6) results

The calculator methodology for each section is explained below.

Household

This section collects information on **Household Size** and **Home Age** to ensure water use estimates reflect the entire household and to inform assumptions about the likely efficiency of fixtures and appliances.

Household Size

Question How many people live in your household?

Answer type Numerical open-ended

Explanation Household size directly affects total water use because more people in the home means more activities that use water (for example more toilet flushes, more showers, more faucet use, more loads of laundry and dishes).

Default Value If no value is provided, the calculator defaults to the average for Kane County of **2.8 people**.[1]

Home Age

Question Was your home built after 2006?

Answer type Discrete Choice (Yes / No / Not Sure)

Explanation The year the home was built provides a clue as to the plumbing efficiency. Homes built after 2006 are more likely to have WaterSense-certified fixtures as WaterSense standards began that year.[2]

Default Value If *Not Sure* is selected less efficient fixtures are assumed.

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[1] Chicago Metropolitan Agency for Planning. "Community Data Snapshot: Kane County." *CMAP*, Aug. 2024, https://cmap.illinois.gov/wp-content/uploads/dlm_uploads/Kane-County.pdf.

[2] United States Environmental Protection Agency. "WaterSense." *EPA*, July 9 2025, https://www.epa.gov/watersense.

Bathroom

Questions on Toilet Replacement, Showering Time,

Number of Baths, and Low Flow Faucets are included in this section.

Toilet Replacement

Question Have your toilets been replaced since 2006?

Answer type Discrete Choice (Yes / No / Not Sure)

Explanation The amount of water a toilet uses is largely determined by its gallons per flush (gpf) rating. Knowing if toilets have been replaced since 2006, the year that WaterSense standards went into effect, help determine if the toilet is high-efficiency.

Default Value If Not Sure is selected, Home Age is used to determine gpf, if Home Age is missing, regional average toilet gpf is assumed.

Toilet Water Use Calculation

Toilet water use = gallons per flush (gpf) × flushes per person per day × household size

Gallons per flush (gpf) is based on user responses about toilet replacement as follows:

- **Yes** (toilet replaced since 2006): **1.28 gpf** (WaterSense standard) is assumed[3]
- **No** (toilet not replaced since 2006): **2.44 gpf** is assumed[4]
- **Not Sure (**does not know if toilet has been replaced since 2006) Home Age is used to determine gpf as follows:
    - **Yes** (home built after 2006): **1.28 gpf** is assumed[5]
    - **No** or **Not Sure** (home built 2006 or earlier, or unknown): **2.44 gpf** is assumed[6]

Flushes per person per day set at a national average of **5.5 flushes per person per day**[7]

Household Size taken from Household Size question response.

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[3] United States Environmental Protection Agency. *WaterSense Specification for Tank-Type Toilets*. EPA, Sept. 2021, www.epa.gov/sites/default/files/2021-09/documents/ws-products-toilets-spec.pdf.

[4] Schneemann, Margaret. "A Framework for Estimating Water and Energy Savings Potential of Regional Demand-Management Strategies." 2025. IISG25-RCE-PRA-021.

[5] EPA, *WaterSense Specification for Tank-Type Toilets*.

[6] Schneemann, *"Framework for Estimating Water and Energy Savings."*

[7] Vickers, Amy. "Handbook of Water Use and Conservation", *Waterplow Press*, 2001. https://www.waterplowpress.com/.

Showering Time

Question How many minutes does a typical shower last in your home? Leave blank if you are unsure

Answer type Numerical open-ended

Explanation Because water flows continuously during a shower, longer showers result in greater water use over time. The amount of water used by showerheads is measured in gallons per minute (gpm). WaterSense showerheads use less gallons per minute compared to standard models.

Default Value If left blank, set at a national average **7.8 minutes**.[8]

Showerhead Water Use Calculation

Showerhead water use= gallons per minute (gpm) × number of showers × minutes per shower × household

Gallons per minute (gpm) is based on user responses about **Home Age** as follows:

- **Yes** (home was built after 2006): **2.0 gpm** (WaterSense standard) is assumed[9]
- **No** (home built in 2006 or earlier): **2.5 gpm** (national standard) is assumed[10]
- **Not Sure** (age unknown) **2.5 gpm** (national standard) is assumed[11]

Number of showers set at a national average of 0.7 showers per person per day[12]

Minutes per shower taken from **Showering Time** question response.

Household Size taken from **Household Size** question response.

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[8] DeOreo, William et al. "Residential End Uses of Water, Version 2." *Water Research Foundation*, 2016, pp. 4, www.waterrf.org/research/projects/residential-end-uses-water-version-2.

[9] United States Environmental Protection Agency. "Showerheads." *WaterSense*, 11 Apr. 2025, www.epa.gov/watersense/showerheads.

[10] U.S. EPA, *Showerheads.*

[11] U.S. EPA, *Showerheads.*

[12] U.S, EPA. "Water Efficiency Management Guide: Bathroom Suite." *WaterSense*, Nov. 2017, pp. 8, https://www.epa.gov/sites/default/files/2017-12/documents/ws-commercialbuildings-waterscore-bathroom-resource-guide.pdf.

Number of Baths

Question How many baths are taken in your household each week?

Answer type Numerical open-ended

Explanation The greater the number of baths taken, the higher the water use, measured by gallons per bath (gpb).

Default Value If left blank, **0.7 baths** a week is used = $\frac{25.2 \text{ gallons per household per week}}{36 \text{ gallons per bath}}$[13][14]

Bath Water Use Calculation

Bath water use (daily) = $\frac{(gallons\ per\ bath \times number\ of\ baths\ per\ week\ per\ household)}{7}$

Gallons per bath is assumed to be **36 gallons**

Number of baths per week per household taken from

[13] DeOreo, William et al. "*Residential End Uses of Water, Version 2.* "*Water Research Foundation*, 2016, pp. 8, https://www.waterrf.org/research/projects/residential-end-uses-water-version-2.

[14] United States Geological Survey. "*How Much Water Do You Use at Home?*" *USGS Water Science School*, https://water.usgs.gov/edu/activity-percapita.php.

Number of Baths question response

Low Flow Faucets

Question Do your bathroom sinks have low-flow faucets?

Answer type Discrete Choice (Yes / No / Not Sure)

Explanation: Faucet flows can be measured by gallons per minute (gpm), with low-flow faucets using less gpm.

Default Value If Not Sure is selected, less efficient fixtures are assumed to be 2.2 gpm, following federal rulings for standard faucets.[15]

Faucet Use Calculation

Faucet water use = gallons per minute × minutes of use per day × household size

Gallons per minute (gpm) is based on user responses about the presence of low-flow faucets as follows:

- **Yes** (low-flow): **1.5 gpm** (WaterSense standard) is assumed[16]
- **No** (not low-flow): **2.2 gpm** is assumed[17]
- **Not Sure (**type of faucet unknown): Home Age is used to determine gpm
    - **Yes** (home built after 2006): **1.5 gpm** (WaterSense standard) is assumed[18]
    - **No** or **Not Sure** (home built in 2006 or earlier, or age unknown): **2.0 gpm is** assumed[19]

Minutes of use per day a shower length of **8.1 minutes per person per day** is assumed[20]

Household Size is based on response to Household Size question

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[15] U.S. EPA. "WaterSense Labeled Homes Technical Sheet: Bathroom Sink Faucets." *WaterSense*, July 2023, www.epa.gov/system/files/documents/2023-08/ws-homes-TRM-3-BathroomSinkFaucetsTechSheet.pdf.

[16] U.S. EPA. "WaterSense Labeled Bathroom Sink Faucets & Accessories." *WaterSense*, 10 June 2025, www.epa.gov/sites/default/files/2017-01/documents/ws-products-factsheet-bathroom-faucets.pdf.

[17] U.S. EPA, *"Bathroom Sink Faucets Tech Sheet."*

[18] U.S. EPA, *"Bathroom Sink Faucets Tech Sheet."*

[19] U.S. EPA, "WaterSense High-Efficiency Bathroom Sink Faucet Specification Supporting Statement," *WaterSense*, February 2007, pp. 3, https://www.epa.gov/sites/default/files/2017-02/documents/ws-background-faucets-suppstatement.pdf .

[20] DeOreo, William et al. "Residential End Uses of Water, Version 2." *Water Research Foundation*, 2016, pp. 9, https://www.waterrf.org/research/projects/residential-end-uses-water-version-2.

Kitchen

This section includes questions on

Dishwasher and Dishwashing Frequency. Any kitchen faucet use is included in the bathroom faucet calculation.

Dishwasher Efficiency

Question Have you purchased and installed an EnergyStar dishwasher since 2023?

Answer type Discrete Choice (Yes / No / Not Sure)

Explanation: EnergyStar dishwashers use fewer gallons per load (gpl).

Default Value If Not Sure is selected 3.5 gpl is assumed.[21]

Dishwashing Frequency

Question How many dishwasher loads are done each week in your household?

Answer type Numerical open-ended

Explanation: More frequent dishwasher loads mean greater water use.

Default Value If left blank, the model assumes **1.96 loads** per household per week.[22]

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[21] U.S. Environmental Protection Agency. "ENERGY STAR Residential Dishwasher Version 6.0 Final Program Requirements." *EPA Energy Star*, 29 Apr. 2015, www.energystar.gov/sites/default/files/ENERGY%20STAR%20Residential%20Dishwasher%20Version%206.0%20Final%20Program%20Requirements.pdf.

[22] U.S. EPA. "Water Efficiency Management Guide: Kitchen & Laundry Suite." *WaterSense*, Nov. 2017, pp. 1-16 www.epa.gov/sites/default/files/2017-10/documents/ws-commercialbuildings-waterscore-residential-kitchen-laundry-guide.pdf.

Dishwasher Water Use Calculation

Dishwasher water use (daily) = $\frac{(gallons\ per\ load\ (gpl) \times number\ of\ loads\ per\ week)}{7}$

Gallons per load (gpl) is based on user responses to **Dishwasher Efficiency** as follows:

- **Yes** (EnergyStar): **3.2 gpl** is assumed[23]
- **No** or **Not Sure** (not EnergyStar): **3.5 gpl** is assumed[24]

Number of loads per week taken from **Dishwashing Frequency** question response

[23] U.S. EPA. "ENERGY STAR Version 7.0 Residential Dishwasher Final Specification." *EPA Energy Star*, 19 July 2022, www.energystar.gov/sites/default/files/asset/document/ENERGY%20STAR%20Version%207.0%20Residential%20Dishwasher%20Final%20Specification.pdf.

[24] U.S. EPA. "*ENERGY STAR Residential Dishwasher Version 6.0 Final Program Requirements.*"

Laundry Room

This section asks about

Washer **Efficiency** and Laundry Frequency.

Washer Efficiency

Question Do you own a high efficiency washing machine?

Answer type Discrete Choice (Yes / No / Not Sure)

Explanation: High efficiency clothes washers use less gallons per load (gpl).

Default Value If Not Sure is selected, the calculator assumes the washing machine reflects the national average efficiency.[25]

Laundry Frequency

Question How many loads of laundry are done (in your household) each week?

Answer type Numerical open-ended

Explanation More loads per week means more water use.

Default Value If left blank, the model assumes **5.88 loads** per household per week.[26]

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[25] The national average washing machine efficiency in water use terms is taken from: AW4E, "AWE/Flume Data Labs Household Water Use Index Q1 2024." YouTube, 9 May 2024, https://www.youtube.com/watch?v=YzTuVQDQgh0. According to Flume's 2023 national dataset, the average household does 0.71 loads of laundry per day and uses 17.8 gallons of water per day, for a national average of approximately 25 gpl.

[26] U.S. EPA. "Water Efficiency Management Guide: Kitchen & Laundry Suite." *EPA Energy Star*, Nov. 2017, pp. 8 www.epa.gov/sites/default/files/2017-10/documents/ws-commercialbuildings-waterscore-residential-kitchen-laundry-guide.pdf.

Laundry Water Use Calculation

$$\textit{Laundry water use (daily)} = \frac{(gallons\ per\ load\ (gpl) \times number\ of\ loads\ per\ week)}{7}$$

Gallons per load (gpl) estimate is based on the Integrated Water Factor (IWF), a U.S. Department of Energy metric that measures water used per wash cycle per cubic foot of washer capacity, assuming a washer size of 3.5 cubic feet, and based on user responses to Dishwasher Efficiency as follows:[27]

- **Yes** (washing machine is high efficiency): **13.1 gpl** is assumed[28]
- **No** (washing machine is not high efficiency): **20 gpl** is assumed/IWF of 5.6 (average between top-loading and front-loading washers) applied to 3.5 cubic feet washers[29]
- **Not Sure** (do not know if washing machine is high efficiency or not): **25 gpl** is assumed[30]

Number of loads per week taken from **Laundry Frequency** question response

[27] Although clothes washer sizes can vary, a washer size of 3.5 cubic feet is used to allow for comparison of less efficiency machines with more efficient, ENERGY STAR certified machines, as the certification only applies to machines greater than 2.5 cubic feet. U.S. Environmental Protection Agency. "ENERGY STAR Version 8.1 Clothes Washers Technical Specification." *EPA Energy Star*, April 2021, https://www.energystar.gov/products/spec/clothes_washer_specification_version_8_0.

[28] An Integrated Water Factor (IWF) of 3.75 is the average of standard top-loading (4.3) and front-loading (3.2) ENERGY STAR washers. Applied to a 3.5 cubic foot washer, this yields 13.1 gallons per load (3.75 × 3.5). U.S. Environmental Protection Agency. "ENERGY STAR Version 7.0 Clothes Washers Technical Specification." *EPA Energy Star*, May 2015, www.energystar.gov/sites/default/files/asset/document/ENERGY%20STAR%20Version%207.1%20Clothes%20Washers%20Program%20Requirements.pdf.

[29] An IWF of 5.6 is the average of standard top-loading (6.5) and front-loading (4.7) washers. Applied to a 3.5 cubic foot washer, this yields 19.6 gallons per load, rounded to 20 gpl. Code of Federal Regulations. "Title 10 Part 430.32 Energy and Water Conservation Standards and Their Compliance Dates". Paragraph (g).

[30] AW4E, "AWE/Flume Data Labs Household Water Use Index Q1 2024." YouTube, 9 May 2024, https://www.youtube.com/watch?v=YzTuVQDQgh0. According to Flume's 2023 national dataset, the average household does 0.71 loads of laundry per day and uses 17.8 gallons of water per day, for a national average of approximately 25 gpl.

Outdoor

This section includes questions on:

Irrigation Technology,

Landscaping Practices, and

Watering Restrictions. The resulting information is used in combination with the indoor water use estimate to estimate outdoor water use.

Irrigation Technology

Question Do you have a smart irrigation controller, such as a weather-based and soil moisture-based controller system?

Answer type Discrete Choice (Yes / No / Not Sure)

Explanation Irrigation systems can be a major source of outdoor water use, especially if they operate on fixed schedules regardless of weather. Smart irrigation controllers, which adjust watering based on soil moisture or weather conditions, improve efficiency.

Default Value If Not Sure is selected, less efficient outdoor water use is assumed.[31]

Landscaping Practices

Question Have you incorporated water-efficient landscape practices, replacing lawn with native plants, into your landscape?

Answer type Discrete Choice (Yes / No / Not Sure)

Explanation Replacing lawn with native or drought-tolerant plants reduces irrigation requirements. Understanding whether a household has adopted water-efficient landscaping helps estimate how much water is needed to maintain the outdoor space.

Default Value If Not Sure is selected, less efficient practices are assumed.[32]

[31] Schneemann, Margaret. "A Framework for Estimating Water and Energy Savings Potential of Regional Demand-Management Strategies." 2025. IISG25-RCE-PRA-021. Less efficient use in the region is assumed to be 10% of a indoor water use.

[32] Schneemann, *"Framework for Estimating Water and Energy Savings."*

Watering Restrictions

Question Does your community have a lawn watering restriction ordinance?

Answer type Discrete Choice (Yes / No / Not Sure)

Explanation Community lawn watering restrictions can limit timing, frequency, and type of lawn irrigation. Knowing whether such ordinances are in place allows for adjusting the outdoor water use estimation.

Default Value If Not Sure is selected, it is assumed there are no restrictions in place.

Outdoor Water Use Calculation

Outdoor water use = (1 – percent water savings) × (10% × ($\frac{Indoor\ Water\ Use}{0.75}$))

Percent Water Savings is based on user responses to **Irrigation Technology**,

Landscaping **Practices** and

Watering **Restrictions** as follows:

- If **Irrigation Technology** is **Yes** (have a smart irrigation controller) then water savings is 13.5%[33]
- If
- Landscaping **Practices** is **Yes** (have incorporated water efficient landscape practices) then water savings is 6.9%[34]
- If

[33] Schneemann, *"Framework for Estimating Water and Energy Savings."*

[34] Alliance for Water Efficiency. *Landscape Transformation: Assessment of Water Utility Programs and Market Readiness*. Feb. 2019. www.allianceforwaterefficiency.org. The 6.9% is from the Guelph, Canada Healthy Landscape Assessment Program.

- Watering Restrictions is Yes (have incorporated water efficient landscape practices) then water savings is 12%[35]

Note, water savings from the three practices are additive, for a total potential outdoor water savings of 32.4% if all three practices are in place.

[35] Meyer, Peter, et al. *Outdoor Water Savings Research Initiative, Phase 1: Final Report*. Alliance for Water Efficiency, Jan. 2015, https://allianceforwaterefficiency.org/wp-content/uploads/2019/06/AWE-OWSRI-Phase-1-Final-Report-01-2015-60b.pdf.

Results

This section displays the Total Household Water Use Calculation as well as a hypothetical Efficient Household Water Use Calculation, both in gallons per household per year.

Total Household Water Use Calculation

Total Water Use = Indoor Water Use + Outdoor Water Use + Leaks

Indoor Water Use is the sum of Bathroom, Kitchen, and

Laundry **Room** water use multiplied by the number of days in the year (365)

Outdoor Water Use is:

Outdoor water use multiplied by the number of days in the year (365)

Leaks are estimated as *14% of total annual water use*[36]

Efficient Household Water Use Calculation

The efficient household water use represents the hypothetical water use when water-efficient practices are in place.

Efficient Household Water Use = Efficient indoor use + efficient outdoor use + efficient leak level) x 365

Efficient Indoor Water Use all appliances meet water sense standards and baths are only filled to 20 gallons per bath (EPA recommends filling tubs halfway for efficiency),[37] assuming a full bathtub is at least 40 gallons.[38]

Efficient Outdoor Use smart irrigation controllers, water efficient landscaping, and lawn watering restrictions are all in place.

Efficient Leak Level Water loss from leaks in an efficient household is estimated at **7% of indoor water use**.[39]

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[36] Schneemann, *"Framework for Estimating Water and Energy Savings."*

[37] U.S. Environmental Protection Agency. "Using Water Efficiently: Ideas for Residences." *EPA*, Apr. 2000, https://www.epa.gov/sites/default/files/2017-03/documents/ws-ideas-for-residences.pdf April 2000.

[38] Biermeier, Deane. "How Many Gallons in a Bathtub." *Sanitary Supply*, June 30, 2025, https://sanitarysupply.org/how-many-gallons-in-a-bathtub/.

[39] Schneemann, *"Framework for Estimating Water and Energy Savings."*