

Appendix 1. Domestic Water Demand Survey

Middle School Domestic Water-Demand Survey

The survey inventoried the number and types of toilets (high, low, and ultra-low flow), shower heads (high and low flow), faucets (high and low flow), clothes-washing machines (horizontal or vertical axis), and dishwashing machines. The survey also included a series of questions about current water-use habits, such as how and when lawns and gardens were irrigated and if faucets were kept on (1) until the water became cold or hot, (2) to keep pipes from freezing, or (3) during dishwashing. Lastly, the survey included questions about why families may limit water use, such as to keep water/electric bills down, to conserve water resources, or because of perceived insufficient capacity in the household well or septic system.

A data-collection sheet was used to document daily indoor water demand for showers, toilets, laundry, dishwashing, and kitchen and bathroom sinks for a period of 1 to 4 weeks. The data-collection activity was during the spring (part of the school year) when outdoor demand is minor. A water-demand rate table was created that listed each type of appliance with a water-use-per-minute rating (like showers) or per event (like toilet flushes) (table 1) based on information obtained from Mayer and others (1999); a website maintained by the Maryland Department of the Environment (<http://www.mde.state.md.us/assets/document/ResAudit.pdf>), last accessed September 26, 2006; and a website maintained by the Orange Water and Sewer Authority in North Carolina (<http://www.owasa.org/pages/WaterCalculator.html>), last accessed September 26, 2006. By multiplying the number of times a certain activity occurred, (such as toilet flushing, using the clothes-washing machine, or noting shower duration), the amount of water used during the day could be estimated. The daily household water demand was then divided by the number of people in the household to develop an approximate daily per capita demand. Although this approach was qualitative in nature, it was sufficient for comparing per capita demand for households on public supply to households that were self-supplied.

Table 1. Typical water demand by fixture or domestic appliance.

[Values obtained from the following sources: Maryland Department of the Environment, 2006; Mayer, P.W., and others, 1999; Orange Water and Sewer Authority, 2006]

Fixture or appliance	Water-demand rate
Non low-flow toilet	6 gallons per flush
Low-flow toilet	3.5 gallons per flush
Ultra-low-flow toilet	1.6 gallons per flush
Regular shower head	3.8 gallons per minute
Low-flow shower head	2.3 gallons per minute
Bathtub filling	3.0 gallons per minute
Clothes washer	40 gallons average load
Dishwasher	15 gallons average load
Faucet	3 gallons per minute

Appendix 1A. Residential Water-Use Survey Form

Residential Water-Use Project

Survey 1

Residential Water-Use Survey

To help better assess current water needs and plan for the future, please answer each of the following questions. This information is being collected for **research purposes** by the U.S. Geological Survey. Results of this survey will be reported only in **anonymous summary form**. Thank you for taking time to help us compile this important information.

PLEASE CHECK (✓) OR PROVIDE YOUR MOST APPROPRIATE RESPONSE FOR EACH AND EVERY QUESTION. When you have answered all of the questions, please return to your teacher no later than May 1, 2004.

Street Address _____ **Town** _____

School _____ **Grade** _____ **Teacher** _____ **Lot size** _____ **acres**

Source of water

<input type="checkbox"/> Town water supply	<input type="checkbox"/> Housing Development supply	<input type="checkbox"/> Own Private wells
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Disposal of wastewater

<input type="checkbox"/> Town sewer	<input type="checkbox"/> Housing Development septic system	<input type="checkbox"/> House septic system
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Name of town water supplier or housing development _____

Number of private wells at this address _____

If you have town or development-supplied water, who pays for your water?

<input type="checkbox"/> Family	<input type="checkbox"/> Landlord
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Is your water use metered?

<input type="checkbox"/> No	<input type="checkbox"/> One meter for indoor and outdoor water use	<input type="checkbox"/> One meter for indoor use and a second meter for outdoor use
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Number of people living in your household

Over 19 years of age _____ **From 4 to 12 years** _____
From 13 to 18 years _____ **Less than 4 years** _____

What type of residence do you live in?

<input type="checkbox"/> Single family house (1-4 bedrooms)	<input type="checkbox"/> Single family house with shared walls between units (townhouse or townhouse-style condominium)	<input type="checkbox"/> Mobile home
<input type="checkbox"/> Single family house (5+ bedrooms)	<input type="checkbox"/> Two-family house	<input type="checkbox"/> Apartment or apartment-style condominium

INDOOR USE

In your home, how many of the following do you have?

Non-low-flow toilets? (6 gallons—pre-1980 toilets that take a long time to flush)

<input type="checkbox"/> None	<input type="checkbox"/> One	<input type="checkbox"/> Two	<input type="checkbox"/> Three	<input type="checkbox"/> More than three
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Low-flow toilets? (3.5 gallons—manufactured during 1980's and 1990's)

<input type="checkbox"/> None	<input type="checkbox"/> One	<input type="checkbox"/> Two	<input type="checkbox"/> Three	<input type="checkbox"/> More than three
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Ultra low-flow toilets? (1.6 gallons)

<input type="checkbox"/> None	<input type="checkbox"/> One	<input type="checkbox"/> Two	<input type="checkbox"/> Three	<input type="checkbox"/> More than three
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Bathtubs with shower?

<input type="checkbox"/> None	<input type="checkbox"/> One	<input type="checkbox"/> Two	<input type="checkbox"/> Three	<input type="checkbox"/> More than three
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Bathtubs only?

<input type="checkbox"/> None	<input type="checkbox"/> One	<input type="checkbox"/> Two	<input type="checkbox"/> Three	<input type="checkbox"/> More than three
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Showers only?

<input type="checkbox"/> None	<input type="checkbox"/> One	<input type="checkbox"/> Two	<input type="checkbox"/> Three	<input type="checkbox"/> More than three
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Whirlpool bathtubs with jets?

<input type="checkbox"/> None	<input type="checkbox"/> One	<input type="checkbox"/> Two	<input type="checkbox"/> Three	<input type="checkbox"/> More than three
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Indoor utility/basement/garage sinks?

<input type="checkbox"/> None	<input type="checkbox"/> One	<input type="checkbox"/> Two	<input type="checkbox"/> Three	<input type="checkbox"/> More than three
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Low-flow faucets or showerheads?

<input type="checkbox"/> None	<input type="checkbox"/> One	<input type="checkbox"/> Two	<input type="checkbox"/> Three	<input type="checkbox"/> More than three
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How many of the following water-using appliances are used in your home?

<input type="checkbox"/> Garbage disposal	<input type="checkbox"/> Dishwashing machine
<input type="checkbox"/> Top-loading clothes washing machine	<input type="checkbox"/> Front-loading clothes washing machine

On average, how many times a week is a load of dishes *hand* washed in your home?

<input type="checkbox"/> None	<input type="checkbox"/> 1-4	<input type="checkbox"/> 5-9	<input type="checkbox"/> 10-14	<input type="checkbox"/> More than 14
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Residential Water-Use Project

Survey 3

WATER-USE HABITS**Do you limit how much water you use for any of these reasons?** *(Please check all that apply)*

<input type="checkbox"/> Not sure well has enough water	<input type="checkbox"/> Not sure septic system can handle all wastewater
<input type="checkbox"/> Keep electrical bill down	<input type="checkbox"/> Want to conserve water to protect the resource
<input type="checkbox"/> Keep water bill down	<input type="checkbox"/> Other (Please specify) _____

Have you done any of these actions to conserve water? *(Please check all that apply)*

<input type="checkbox"/> Take shorter showers	<input type="checkbox"/> Water outdoors during early morning or evening
<input type="checkbox"/> Installed low-flow plumbing fixture(s)	<input type="checkbox"/> Installed a water efficient irrigation system
<input type="checkbox"/> Reduced landscape area irrigated	<input type="checkbox"/> Other (Please specify) _____

How do you deal with running or leaky toilets and faucets? *(Please check all that apply)*

<input type="checkbox"/> Never had the problem	<input type="checkbox"/> Fix leaks within one week
<input type="checkbox"/> Repair running toilet immediately	<input type="checkbox"/> Fix leaks eventually
<input type="checkbox"/> Call a plumber immediately	<input type="checkbox"/> Close the door and turn up the TV
<input type="checkbox"/> Try to remember to jiggle toilet handle	<input type="checkbox"/> Other (Please specify) _____

Do you run water continuously for any of these reasons? *(Please check all that apply)*

<input type="checkbox"/> Until it's cold	<input type="checkbox"/> While using garbage disposal
<input type="checkbox"/> Until it's hot	<input type="checkbox"/> While hand-washing dishes
<input type="checkbox"/> To keep pipes from freezing	<input type="checkbox"/> Other (Please specify) _____

Are you concerned about the quality of your water? *(Please check all that apply)*

<input type="checkbox"/> No	<input type="checkbox"/> Yes, we look at the water quality report sent by our water company
<input type="checkbox"/> Yes, we drink only bottled water	<input type="checkbox"/> Yes, we have our own treatment system
<input type="checkbox"/> Yes, we have had our well water tested during the past year	<input type="checkbox"/> Other (Please specify) _____

Residential Water-Use Project

Survey 4

OUTDOOR USE**How much of your lot area is watered (irrigated)?**

<input type="checkbox"/> None	<input type="checkbox"/> One quarter	<input type="checkbox"/> Half	<input type="checkbox"/> Three quarters	<input type="checkbox"/> All
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During a typical summer season, how frequently do you irrigate?

<input type="checkbox"/> Less than once a week	<input type="checkbox"/> Once a week	<input type="checkbox"/> Every other day	<input type="checkbox"/> Daily
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When do you irrigate?

<input type="checkbox"/> Early morning	<input type="checkbox"/> Late morning	<input type="checkbox"/> Afternoon	<input type="checkbox"/> Evening
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How do you irrigate? (Please check all that apply)

<input type="checkbox"/> By hand (hose or bucket)	<input type="checkbox"/> In-ground sprinkler
<input type="checkbox"/> Manual sprinkler (one you move around)	<input type="checkbox"/> Other (please specify)

How is the sprinkler activated?

<input type="checkbox"/> By hand
<input type="checkbox"/> Automatic timer without soil moisture or rain sensor
<input type="checkbox"/> Automatic timer with soil moisture or rain sensor

Do you use any additional sources for irrigation water? (Please check all that apply)

<input type="checkbox"/> No	<input type="checkbox"/> Rain barrel
<input type="checkbox"/> Nearby surface water (stream, pond, river, lake)	<input type="checkbox"/> Purchase water

How were you affected by last year's drought?

<input type="checkbox"/> No problem	<input type="checkbox"/> Couldn't irrigate at all
<input type="checkbox"/> Not enough water to irrigate as much as I wanted to	<input type="checkbox"/> Well(s) went completely dry

Do you have any of the following pools or gardens?

<input type="checkbox"/> No	<input type="checkbox"/> Inside swimming pool	<input type="checkbox"/> Fountain
<input type="checkbox"/> Outside above-ground pool	<input type="checkbox"/> Hot tub/whirlpool	<input type="checkbox"/> Water garden
<input type="checkbox"/> Outside in-ground pool	<input type="checkbox"/> Greenhouse	<input type="checkbox"/> Other?

Where do you get the water to fill your pool?

<input type="checkbox"/> Well	<input type="checkbox"/> Delivered by tanker truck	<input type="checkbox"/> Public water supplier
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Do you wash your

<input type="checkbox"/> sidewalks	<input type="checkbox"/> driveway	<input type="checkbox"/> vehicles
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Thank you – your participation is appreciated!

Please return to your teacher no later than May 1, 2004.

Appendix 1B. Student Data-Collection Activities Form

Residential Water-Use Project

Student Data Collection Activities

Student Data Collection Activity

Directions:

1. Make a record of how much water your *family* uses each day for **4 weeks** (they do not have to be 4 consecutive weeks. One week minimum is needed for this research). To do this, make a **Data Collection Sheet** on graph paper (like the examples below) for each bathroom, kitchen, and utility room in your house. Place a new copy of the **Data Collection Sheet** in the room every day. Ask your family to write down each time they

- Task 1.** flush the toilet,
- Task 2.** run the clothes washer or dish washer,
- Task 3.** turn on and off the shower or bathtub, or
- Task 4.** turn on and off sink faucet for drinking, cooking, teeth brushing, hand dish washing, or filling containers for washing or watering plants.

2. Figure out how many minutes each shower or faucet activity took by subtracting the time-on from the time-off and enter into the **Data Collection Sheet**. At the end of each day, take down the old sheet and put up a new one. At the bottom of the sheet in the **Total for Day** row, add up the number of toilet flushes, dishwasher loads, and clothes washer loads, and the total number of minutes the showerhead, bathtub, or sink faucet was turned on. Transfer the **totals** (→) for the day from each of the columns to the **Summary Sheet**.

Example of Bathroom Data Collection Sheet for 1 day

	Number of toilet flushes	Showerhead			Bathtub faucet			Bathroom Sink Faucet		
		Time On	Time Off	Minutes	Time On	Time Off	Minutes	Time On	Time Off	Minutes
	x x	7:01	7:10	9						
	x	7:30	7:50	20						
→ Total for day	3			29						

Example of Kitchen and Utility Room Data Collection Sheet for 1 day

	Clothes washer loads	Dish washer loads	Sink Faucet			Purpose 😊
			Time On	Time Off	Number of Minutes	
			8:00	8:15	15	hand washing dishes
		x				washing load of dishes
	x					washing clothes
→ Total for day	1	1			15	

😊 **Optional, but helpful:** Fill in the purpose (like dish washing, or filling watering can). If you fill in the purpose, then send in your data collection sheets along with your Summary sheets.

Summary Sheet

School _____ Grade _____ Teacher _____

Your Street Address _____ Town _____

Week 1: Begin Date _____

Task	Total Water-use Activity	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
1	Number of non low-flow (old) flushes							
	Number of low-flow (new) toilet flushes							
	Number of ultra low-flow toilet flushes							
2	Number of loads done in clothes washing machine							
	Number of loads done in dish washing machine							
3	Minutes used for shower with regular (old) showerhead							
	Minutes used for shower with low flow (new) showerhead							
	Minutes used in filling bathtub							
4	Number of minutes of faucet use (drinking, cooking, teeth brushing, hand dish washing, or cleaning)							

Summary Sheet

Week 2: Begin Date _____

Task	Water-use Activity	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
1	Number of non low-flow (old) toilet flushes							
	Number of low-flow (new) toilet flushes							
	Number of ultra low-flow toilet flushes							
2	Number of loads done in clothes washing machine							
	Number of loads done in dish washing machine							
3	Minutes used for shower with regular (old) showerhead							
	Minutes used for shower with low flow (new) showerhead							
	Minutes used in filling bathtub							
4	Number of minutes of faucet use (drinking, cooking, teeth brushing, hand dish washing, or cleaning)							

RETURN this sheet to your teacher as soon as you have completed it.

Summary Sheet

School _____ Grade _____ Teacher _____

Your Street Address _____ Town _____

Week 3: Begin Date _____

Task	Water-use Activity	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
1	Number of non low-flow (old) flushes							
	Number of low-flow (new) toilet flushes							
	Number of ultra low-flow toilet flushes							
2	Number of loads done in clothes washing machine							
	Number of loads done in dish washing machine							
3	Minutes used for shower with regular (old) showerhead							
	Minutes used for shower with low flow (new) showerhead							
	Minutes used in filling bathtub							
4	Number of minutes of faucet use (drinking, cooking, teeth brushing, hand dish washing, or cleaning)							

Summary Sheet

Week 4: Begin Date _____

Task	Water-use Activity	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
1	Number of non low-flow (old) flushes							
	Number of low-flow (new) toilet flushes							
	Number of ultra low-flow toilet flushes							
2	Number of loads done in clothes washing machine							
	Number of loads done in dish washing machine							
3	Minutes used for shower with regular (old) showerhead							
	Minutes used for shower with low flow (new) showerhead							
	Minutes used in filling bathtub							
4	Number of minutes of faucet use (drinking, cooking, teeth brushing, hand dish washing, or cleaning)							

RETURN this sheet to your teacher as soon as you have completed it.

