



GO GREEN WITH
Graywater

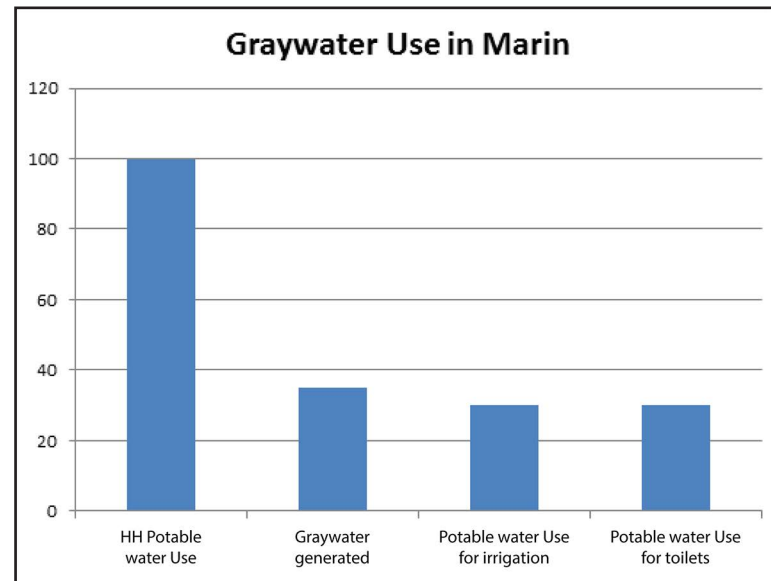
From Laundry to Landscape

GO GREEN WITH GRAYWATER

“WATER, WATER EVERYWHERE AND NOT A DROP TO DRINK...”

Samuel Coleridge

Marin County and the rest of California are experiencing record-breaking drought. Mr. Coleridge’s quote is particularly relevant because Marin County is surrounded on three sides by non-potable water. The government and water agencies may conserve and try to find more water sources, but ultimately it is up to individuals to reduce water use and conserve the potable water supply.



We don’t know if water conservation will be sufficient but we do know that graywater reuse saves fresh water. Of the 100 gallons of fresh water used daily by the average American, more than one-third exits the house as graywater. It is estimated that 25-30% of the graywater generated in Marin households can be used for landscape irrigation.

WHAT IS GRAYWATER?

Graywater is water from bathtubs, showers, bathroom sinks, washing machines, and laundry tubs. Graywater does not include waste water from toilets, urinals, kitchen sinks, dishwashers, photo lab sinks, or water from soiled diapers. It is not reclaimed water distributed through “purple pipes.”

Graywater can be used for

landscape irrigation, constructed wetlands, and can be diverted to leach fields or disposal fields. Graywater is purified naturally in soil by microorganisms that break down salts, hair, suspended solids, and bacteria. Graywater, when handled properly, should not present any health issues or soil contamination.

WHAT DOES REUSING GRAYWATER ACCOMPLISH?

Reusing graywater impacts more than water use in your garden. Graywater reuse may also:

- Decrease household sewage bills.
- Decrease costs for sewage/water treatment plants by decreasing use and future demand.

- Decrease use of water treatment chemicals.
- Decrease addition of harmful and toxic chemicals to soil and to water table.
- Decrease costs/energy used to move water around California.
- Recharge ground water and add nutrients to soil.
- Decrease water pollution. (Soil-building nutrients in graywater become pollutants in fresh water sources.)
- Facilitate LEED certification (graywater irrigation system =1 point).
- Enable more trees and plantings with no increased fresh water use/costs.

IS GRAYWATER REUSE RIGHT FOR ME?

- Conserve first! Determine if you are doing everything you can to conserve. It is the first step when considering a graywater system. See some great ideas on our website.
- If you produce a lot of graywater and have a very small garden, a graywater system may not be appropriate.
- If you live very close to a fresh water source, graywater use is not appropriate.

WHERE CAN I USE GRAYWATER?

Owner Occupied 1-Family Homes:

- Outside irrigation
- Indoor (on-site) toilet/urinal flushing if using an approved system that meets NSF350 standard.

In 1- or 2-Family Homes, Commercial, and Multi-family Units

- Outside irrigation
- Indoor (on-site) toilet/urinal flushing if using an approved system that meets Title 22 standard.

ARE THERE DIFFERENT TYPES OF GRAYWATER SYSTEMS? WHAT PERMITS ARE REQUIRED?

The 2013 California Plumbing Code (CPC) classifies graywater systems based on construction and volume. Different requirements govern each system. The graywater system notification or permit requirement from Marin County Environmental Health Services (EHS) and Marin County Building and Safety (B&S) is noted with each system below. The city building department in your community may require a permit.

Laundry-to-Landscape System (also called L2L or Clothes Washer System):

A graywater system using discharge water only from a single domestic clothes washing machine in a 1- or 2- family dwelling that distributes it to the yard for subsurface irrigation of landscape plants. Notification or permit is not required by EHS or B&S.

Simple System:

A graywater system serving a 1- or 2-family dwelling with a discharge of 250 gallons (947L) per day or less. Simple systems include discharge water from a single clothes washing machine as well as water from showers, bathtubs, and bathroom sinks. A notification form must be filed with EHS; a permit is required by B&S.

Simple Isolated System:

A simple system that is not connected to any potable water supply system and does not require substantial modification to an existing drain, waste and/or venting system. A notification form must be filed with EHS; a permit is not required from B&S provided there is no substantial alteration to building systems. This classification is in addition to the CPC, for residents

of Unincorporated Marin County. Not all jurisdictions acknowledge this type of graywater system.

Complex System:

A graywater system that discharges over 250 gallons (947L) per day. A permit is required by both EHS and B&S.

EHS Permit Fees for Graywater Systems (March 2014)

- More information on graywater, notifications and permits can be found on the EHS website.
- Laundry to Landscape (L2L): No notification or permit required.
- Simple System (including Simple Isolated): A notification is required and there is no fee.
- Complex Residential System: A permit is required at \$880.
- Complex Commercial/ Multi-family System: A permit is required at \$2,354.

GRAYWATER SYSTEM REQUIREMENTS

- Graywater systems must be constructed to meet the regulations as defined in the CPC, Chapter 16. In Unincorporated Marin County, graywater systems must also conform to Marin County Code.
- The graywater system must not be connected to any potable water system without an air gap or other physical device that prevents backflow.
- The entire graywater system must be located on the parcel. All graywater generated must be discharged and contained within the property boundary.
- The graywater system must meet all site and waterway setback requirements (see table).
- Graywater must be discharged under a minimum of two (2) inches of cover material.



- Graywater shall not “pool” or run off-site.
- The graywater system must include a dedicated plumbed line with an air gap (See Second Standpipe Method) or a diverter valve (See 3-Way Valve System) to allow the user to direct the flow to the building sewer or irrigation or disposal field. The valve shall be clearly labeled and readily accessible.
- Graywater shall be diverted to the sewer or septic system when:
 - ↪ Water is used to wash diapers or similarly soiled or infectious linens and garments;
 - ↪ Water is used to dispose of hazardous chemicals such as those derived from cleaning car parts, washing greasy or oily rags, home photo labs or other like activities;
 - ↪ During saturated soil conditions.
- Graywater shall not be used to irrigate root crops or edible parts of food crops that touch the soil.
- Specific signage is required. All pipes must be labeled “Caution: Non-potable water, do not drink.”
- The system must have an operation and maintenance manual for the homeowner and it shall be provided to any new homeowner and/or occupant at the time of sale or transfer.
- The water supplier requires an approved backflow prevention device (BFPD) for any graywater system that does not have an air gap or connects directly to the municipal water supply. The BFPD

prevents water from reversing its flow direction and contaminating the drinking water supply. A BFPD is not required in L2L systems that meet CPC. To learn more:
 Marin Municipal Water District – (415) 945-1488;
 North Marin Water District – (415) 897-4133.

Setback Requirements in Feet

Minimum Horizontal Distance Required From:	Tank	Irrigation Field	Disposal Field
Building Structures ¹	5	2	5
Property Line adjoining private property	5	1.5 ²	5
Water supply wells ³	50	100	100
Stream and lakes ³	50	100 ⁴	100
Sewage pits or cesspools	5	2	5
Sewage disposal field	5	4 ⁵	4 ⁵
Septic Tank	0	5	5
Onsite domestic water service line	5	0	0
Pressurized public water main	10	10	10

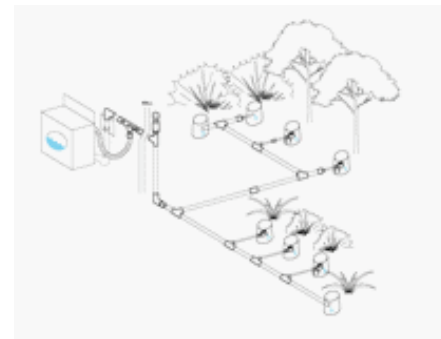
¹ Building structures do not include porches and steps, whether covered or uncovered, breeze ways, roofed porte cocheres, roofed patios, carports, covered walks, covered driveways, and similar structures or appurtenances.
² Environmental Health Services recommends a 5-foot minimum setback.
³ Where special hazards are involved, the distance required shall be increased as directed by the Enforcing Agency.
⁴ These minimum clear horizontal distances shall also apply between the irrigation or disposal field and the ocean mean higher high tide line.
⁵ Plus two (2) feet for each additional foot of depth in excess of one (1) foot below the bottom of the Septic Leach Line.

LAUNDRY-TO-LANDSCAPE SYSTEMS (L2L)

Laundry-to-Landscape graywater systems are the “lowest hanging fruit” of graywater reuse. They use clothes washer discharge water for irrigation only and are the easiest way to repurpose graywater to save potable water. L2L systems are generally the most simple and least expensive graywater system to install and maintain. They are also well suited for do-it-yourselfers (DIYers).

L2L system considerations include:

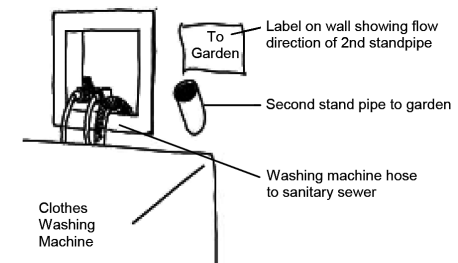
- Low cost, simple to install, require little maintenance, and offer great flexibility for irrigation.
- System installation does not alter existing plumbing or other systems.
- Ideal for on-slab construction when other graywater fixtures are not accessible for collection.
- Irrigation zone should be downhill from the laundry machine. If you need to push water uphill, L2L is not the appropriate graywater system.
- Plantings should be no more than 50 feet from washer pump to avoid excessive strain.
- Costs range from a few hundred dollars (DIY materials) to \$1,000 to \$2,000 (materials and professional installation).



Laundry-to-Landscape System
 Drawing by WaterSprout

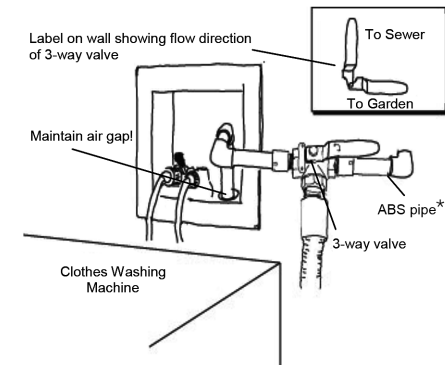
There are two L2L methods to divert graywater to either the sewer or garden, Second Standpipe and 3-way Valve. Both methods direct the washer discharge water from the house to the external irrigation system piping and plantings via single line or multi-trunk lines.

The **Second Standpipe Method** utilizes a second standpipe installed adjacent to the sewer standpipe in the wall or through the floor before it goes to the garden. The clothes washing machine hose is moved by hand from the normal sewer standpipe to the irrigation system standpipe. Neither a 3-way valve nor an auto vent is needed because this system contains an air gap. This method may not be as efficient as a 3-way Valve System and can only be used if the path to the irrigation zone is completely flat or lower in elevation than the washing machine. It is a great option if there is concern that a 3-way Valve System may be too demanding for the washer’s internal pump.



Second Standpipe Method
 City of Berkeley Publication - *Guide to Conserving Water Through Rainwater Harvesting & Graywater Reuse for Outdoor Use*

The **3-Way Valve System** directs the washer discharge water through a 3-way valve to either the sewer or the garden. The washer’s internal pump moves the discharge water from inside the house to the external irrigation system. A vacuum breaker (auto vent) or backflow prevention device is required.

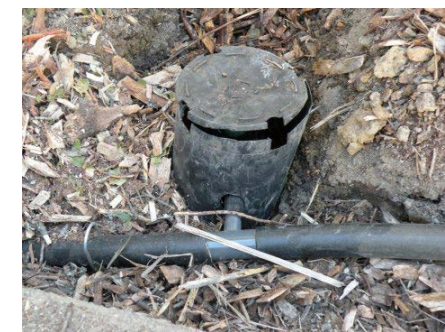


3-way Valve System
 City of Berkeley Publication - *Guide to Conserving Water Through Rainwater Harvesting & Graywater Reuse for Outdoor Use*

WHAT IS INVOLVED IN INSTALLING A 3-WAY VALVE SYSTEM?

The washing machine discharge hose is connected to an easily accessible, clearly labeled 3-way valve that can divert graywater to the sewer/septic system or the downhill irrigation zone.

An easily accessible auto vent must be installed at the highest point of the graywater line. This prevents accidental siphoning of water from the washing machine and possible contamination of the municipal potable water supply. If possible, locate the air vent outside the building. A hole drilled in the exterior wall allows 1-inch PVC pipe* used for the internal plumbing to exit the house and connect to 1-inch polypipe* used for the outside irrigation system.



Mulch shield assembly installation in process.
 Photo by Greywater Action

Graywater moves through the polypipe to irrigation zones, where smaller tubing and tees distribute water to individual plantings. Graywater is directed into the soil in trenches, mulch basins dug to specification, and “mulch shields” (also known as “emitter boxes”). One or more irrigation zones may be created. Paver stones, ornamental fountains, statues, etc. may be used to enhance aesthetics.



Mulch basin view.

Before installing a graywater system, you will need to know the volume of graywater your household generates and the volume your landscape can absorb. These calculations must be integrated into your plans to help ensure that graywater does not pool on the surface. To learn more about these calculations, see our website or the *San Francisco Graywater Design Manual*.

* 1-inch pipe is the industry standard and is approved for use by the Environmental Health Director in 3-way Valve systems. 1-inch pipe may impact washing machine pump longevity. 2-inch pipe is required by the CPC for Second Standpipe systems.

NOTE: All content in this pamphlet is intended for informational purposes only and does not constitute the County’s endorsement or recommendation regarding design, materials or installation methods.





L2L tubing and mulch shields in place.

Photo by Josh Lowe



Completed L2L Installation.

Photo by Josh Lowe

DO I HAVE TO USE SPECIAL SOAPS AND PERSONAL CARE PRODUCTS?

Plant-friendly products are essential when using graywater. All products should be biodegradable and non-toxic, and free of salt (sodium), boron (Borax), and chlorine (most bleaches are chlorine).

Water containing these and other harmful products should be directed to the sewer or septic via graywater diversion. Choose soap rather than detergent and liquid rather than powder (less sodium). The *SF Graywater Design Manual* indicates that most hand and dish soaps and shampoos will not damage plants at low residential concentrations.

WHAT CAN I GROW?

Graywater irrigation is best for ornamental and fruit trees, bushes, and shrubs. It may also be used to irrigate berry patches (except blueberries), large annuals, large perennials, some deciduous plants and trees, and certain vegetables. Stick to plants with fruit that grows well off the ground, e.g., tomatoes. Do not irrigate leafy greens or root crops with graywater.

Graywater is best suited for trees and close groupings. Lawns can be irrigated through subsurface drip irrigation provided emitters are at least two (2) inches subsurface. Because lawns are used so heavily by humans and pets, it is important to ensure that water does not pool and that your system remains in compliance with *CPC*.

GRAYWATER DOS:

- Minimize contact with humans and animals.
- Divert graywater to the sewer system when laundering with any toxic or harmful cleaning products.
- Contain all graywater on site.
- Be selective about the graywater you use. Rinse cycle water is preferable to wash cycle discharge.
- Keep it simple. Use the simplest system you can to match your graywater production with your irrigation needs.

GRAYWATER DON'TS:

- Don't connect a graywater source to a potable water source without an air vent or backflow prevention device (BFPD) ... ever!
- Don't discharge graywater near a fresh water source; check setback regulations.

- Don't store graywater for more than a few hours. (Bacteria grows and it smells very bad very quickly). Storing graywater for any period of time requires a BFPD.
- Don't use graywater for spray irrigation. Graywater must be discharged into the soil under two (2) inches of cover material.
- Don't allow graywater to pool anywhere.
- Don't use laundry water when a household member has a communicable disease (e.g., staph infection, hepatitis) or when the water has been used to wash diapers, oily rags, or contains harmful chemicals including dyes, etc.

WHAT SHOULD I DO TO KEEP MY SOIL HEALTHY?

- Irrigate with rainwater or fresh water a few times a year to leach out accumulated salts in the soil. A rainy day counts!
- Add compost to your soil.
- Use mulch.
- Don't use chemical pesticides or fertilizers.
- Use plant-friendly products. Salts and chlorine bleach can harm soil and plants.

WHAT MATERIALS DO I NEED? WHERE DO I FIND THEM?

All L2L systems use the same method to divert water to the garden, but each installation design is unique and materials will vary. The information below is intended to help you prepare for your DIY project. The *SF Graywater Design Manual* offers more about parts and tools.

Basic Materials for a Standard L2L System

The following list does not include pipe sizes. Check the size of your washer's discharge hose size and shop accordingly. This list is a general overview and does not include everything you will need.

- A 3-way valve (if applicable)
- Auto vent (if applicable)
- 1-inch PVC pipe
- 1-inch HDPE tubing
- ½-inch poly tubing (for irrigation system)
- Various adapters, elbows, tees
- "Green or purple back" ball valve (as needed)
- Additional 3-way valve for irrigation zone (as needed)
- Mulch Shields ("Emitter Boxes")
- Mulch
- Hose clamps
- Pipe clamps
- Garden staples
- Label indicating the flow direction to sewer or garden
- Operation and maintenance manual

WHERE DO I FIND MATERIALS?

The following resource list is not inclusive, nor is it an endorsement by Marin County.

More information about sourcing supplies is available from Greywater Action at greywateraction.org.

Retail stores that may have L2L materials:

- Garden Centers
- Hardware
- Home Improvement
- Irrigation Supply
- Lumber Yards
- Plumbing Supply
- Sustainable/Green Product Merchants

Pre-Assembled L2L Kits

- Gray-2-Green – www.gray-2-green.com/index.php
- The Urban Farmer Store, Mill Valley – (415) 380-3840

Online Parts/Irrigation Systems

- DripWorks – www.dripworksusa.com
- Ewing – www.ewing1.com/general/ews_prd_products.htm
- Fairfax Lumber – (415) 453-4410
- Gray-2-Green – www.gray-2-green.com/index.php
- Just Water Savers USA – www.besthomewatersavers.com/categories/Graywater-Irrigation/
- Oasis Design (for 3-way valves and flow splitters) – oasisdesign.net/graywater/divertervalves.htm#laundry
- The Urban Farmer Store, Mill Valley – (415) 380-3840

Manufactured Residential Irrigation Systems

- Aqua2Use – www.aqua2use.com/products/gwdd.html GWDD Model only
- Just Water Savers USA – <http://www.besthomewatersavers.com/categories/Graywater-Irrigation/>
- ReWater Systems – <http://rewater.com/>
- Water Recycling Systems – <http://reusegraywater.com/residential-system/>
- WaterSprout – <http://watersprout.org/>

I DON'T WANT TO DO IT MYSELF!

If you do not want to install the system yourself, hire someone with water efficiency experience. Plumbers, landscape designers, architects, and contractors (Green Certified and conventional) may be familiar with graywater systems. You may need to find a different person for the interior plumbing than for the irrigation system.

What Should I Ask An Installer?

- What knowledge/experience do they have with graywater systems? What is their experience with water use efficiency?
- Traditional plumbers have the skills to do the inside portion of your graywater system. Make sure they understand the ins and outs of L2L.
- Be sure to discuss the following regarding internal plumbing:
 - ↪ Maintain elevation and keep the graywater pipes as high as possible so they exit the house over the foundation.
 - ↪ Install the second stand-pipe or 3-way valve in a readily accessible place. Use diagrams/illustrations to explain.
 - ↪ If you want an easy-to-use system, tell the contractor. There may be a tendency towards an overly complicated system that probably won't work as well, will take more maintenance, and cost more.

The following resource list is not inclusive or guaranteed, nor is it an endorsement by Marin County.



Graywater Installers

- QWEL (Qualified Water Efficiency Landscaper) Training Program Graduates – www.qwel.net/graduates
- Greywater Action Installer Training Program Graduates – <http://greywateraction.org/installers>
- Certified Green and other Landscape Designers/Architects
- DIG Cooperative – (510) 316-3620 www.dig.coop/content/greywater-systems
- Go To The Garden – Christopher Reamer www.gotothegarden.com
- WaterSprout/John Russell – (510) 541-7278 <http://watersprout.org/>
- Certified Green Plumbers – <http://www.greenplumbersusa.com/consumers/find-a-green-plumber/>

Marin Green Business Directory

www.greenbusinessca.org

OTHER GRAYWATER SYSTEMS

L2L is not the best system for every site and may not be appropriate at all in some situations. Other frequently-used graywater system options are listed below with approximate material and installation costs. The costs listed are general estimates and should not be considered accurate for any specific installation. It is advised to research costs for your specific site in planning your budget. Note that these systems may require permits and/or BFPDs.

Branched Drain Systems

Branched drain systems use gravity (no pumps) to move graywater from washers, showers and/or bathroom sinks through branching pipes to mulch basins. The distri-

bution system must have a continuous, minimum 2% downward slope. They can be used in L2L, Simple and Complex Systems. Estimated costs: (average 2-3 BR house) materials \$200 – \$500; full installation \$2,000 – \$3,000.

Pumped Systems

If you cannot use gravity to transport the graywater (your yard is flat or is uphill, or the plantings are more than 50 feet from your washer) you will need a pump-based system. Pumps add cost, maintenance, and use electricity. Estimated costs: Materials only \$1,000 – \$2,000; full installation \$3,000 – \$6,000.

Sand-Filter-To-Drip Irrigation

Sand filter graywater systems filter graywater for use in drip irrigation systems. These systems can be complex and costly, but are more efficient than any other system and can irrigate any size plant at elevations above the house. Estimated costs: \$7,000 – \$15,000 plus \$1,500 and up for the drip irrigation system. Oasis Design indicates that an average break-even point is near 300 gallons of graywater generated daily.

Additional Systems

Other manufactured systems use different purification methods. Not all conform to *CPC*. In addition to high-tech systems, simple “Constructed Wetlands” can accommodate excess graywater while irrigating beautiful, water loving wetland plants. Estimated costs: \$5,000 and up.

SEE OUR WEBSITE FOR DETAILS AND RESOURCES

www.marincounty.org/ehs

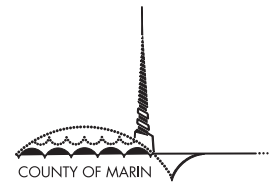
Other resources:

<https://law.resource.org/pub/us/code/bsc.ca.gov/gov.ca.bsc.2013.05.pdf>
(2013 California Plumbing Code)

<http://sfwater.org/modules/showdocument.aspx?documentid=55>
(*SF Graywater Design Manual*)

Many thanks for resources and assistance:

Art Ludwig/Oasis Design
Chris Reamer/Go To The Garden
San Francisco PUC/*San Francisco Design Graywater Manual*



Marin County
Environmental Health Services
3501 Civic Center Drive, Room 236,
San Rafael, CA, 94903
(415) 473-6907
www.marincounty.org/ehs

All County publications are available in alternative formats (Braille, Large Print, or CD), upon request. Requests for accommodations may be made by calling (415) 473-4381 (Voice), (415) 473-3232 (TDD/TTY) or by e-mail at disabilityaccess@marincounty.org. Copies of documents are available in alternative formats, upon request.