

LEGAL GRAYWATER DESIGN FOR SMALL SCALE APPLICATIONS IN CALIFORNIA

*A Demonstration of Laundry to Landscape and Branched Drain Systems
At The Occidental Arts and Ecology Center*



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Photographs by and Brock Dolman



TABLE OF CONTENTS

Introduction	3
Project Description	5
Resources	9

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This report was written up by The WATER Institute at The Occidental Arts and Ecology Center (www.oaecwater.org and www.oaec.org) in 2010. It is available for downloading on our website. Please consider giving a donation to support us in continuing this kind of work. Building upon OAEC's many years of work to protect Coastal California's watersheds, the WATER Institute concentrates on four interrelated program components: advocacy and policy development; training and support; education and demonstration; and research. For more information, contact us at (707) 874-1557 ext. 206 or visit us on the web at www.oaecwater.org.

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INTRODUCTION

As energy and water supply and infrastructure challenges continue to amplify in California, the State has identified points of both highest stress and greatest opportunity for change. In June 2008, Governor Schwarzenegger directed the Department of Water Resources (DWR) to take specific action to counter the statewide drought. New and amended statutes (passed through Senate Bill 1258 and effective January 1, 2009) now include requirements directing the Department of Housing and Community Development to propose to the California Building Standards Commission new standards for the construction, installation, and alteration of graywater systems for residential indoor and outdoor uses.

With new legislation approved, The Occidental Arts and Ecology Center (OAEC) is poised as a premier site in the Bay Area to demonstrate safe and effective use of graywater systems. Across California, many people are now looking for replicable models that are in compliance with the new building standards. Additionally, accountability to state enforcement and compliance will be needed to insure that these new regulations are not compromised.

In 2009, OAEC's WATER Institute received a grant from the Dean Witter Foundation to support the installation and demonstration of two styles of legal graywater systems on OAEC's site. Graywater systems re-use water – for landscape irrigation or other purposes – that was previously used for shower, bath sink and laundry wash water. It does not include toilet or kitchen water. Now installed, these systems will substantially improve the drought preparedness of the OAEC site by reducing water demand for irrigation. They will also reduce stress on leach fields and reduce OAEC's carbon footprint through lowered demand for electricity used in pumping “waste” water to leach fields. The benefits of these installations will be shared with the several thousand people that annually come to OAEC for tours, workshops and events, as well as visitors to the WATER Institute's website (www.oaecwater.org).

The installation and use of these graywater systems will support the WATER Institute's ability to speak with the authority of practical experience as we continue participating in public policy processes at the state and county levels.

ABOUT THE OCCIDENTAL ARTS & ECOLOGY CENTER AND OAEC'S CONSERVATION HYDROLOGY ADAPTIVE MANAGEMENT PLAN

The Occidental Arts & Ecology Center (OAEC) was established in 1994 by a group of biologists, horticulturists, educators and artists as a 501(c)3 non-profit organizing and educational center, and organic farm in Sonoma County, California. OAEC's programs combine research, demonstration, education and organizing to develop community-based strategies for positive social change and effective environmental stewardship. For over thirty-five years, our site has been a sustainable agriculture training center, working with thousands of farmers, community and school gardeners, and farming activists.

OAEC has a long-established demonstration site, organizational expertise, and a proven track record of successfully implementing conservation hydrology restoration and demonstration projects. Since 2004, OAEC's WATER Institute has been implementing an on-site Conservation Hydrology

Adaptive Management Plan that employs and demonstrates renewable energy technologies and best management and conservation practices for water, and for the energy associated with its use. These practical solutions include: roof water catchment systems, storm water management practices, a rainwater harvesting pond that supplies 100% of our irrigation needs, a solar thermal hot water system, bio-filtration to improve water quality, and a 10 kilowatt solar photovoltaic system.

WATER Institute Director Brock Dolman was a founding member of the Sonoma County Graywater Working Group. He is also an advisory board member of the Graywater Alliance, which has representatives from all the major graywater advocate groups statewide, all of whom were actively involved in the process of writing and adopting California's new graywater standards code. Brock participated in public testimonial meetings held by the Department of Housing and Community Development in Sacramento for the development and approval of these new graywater code revisions. As a result of this work, Sonoma County adopted the State's graywater standards codes with no further restrictions. This means that anyone in Sonoma County can install a Laundry to Landscape (or Clothes Washer) system with no permit or a Branched Drain system with a plumbing permit (see the following pages for further descriptions of these two systems).

PROJECT DESCRIPTION

In 2010, OAEC installed two types of low-tech and cost-effective graywater system designs that meet the newly passed state and county emergency graywater code regulations. These designs were chosen based on the needs and topography of OAEC’s site, and are in compliance with the new graywater code revisions. We installed three “laundry to landscape” clothes washer systems, and two “branched drain gravity” graywater systems, each supplied by a single fixture shower/bathroom sink. The design for each system met the required guidelines of the new graywater plumbing code (see the Sonoma County graywater brochure at www.co.sonoma.ca.us/prmd/docs/misc/graywater.pdf).

SYSTEM # 1 – THE LAUNDRY TO LANDSCAPE (OR CLOTHES WASHER) GRAYWATER SYSTEM:

An original design (developed by Art Ludwig of Oasis Design - www.oasisdesign.net) is the simplest, least expensive way to get the most graywater out on to the landscape most effectively. Due to its inherent simplicity and low cost, it is a design that promises to be best suited to professional installation, by landscapers and homeowners. The pressure developed by the clothes washer’s own pump effectively distributes graywater throughout the landscape.



LESSONS LEARNED

Overall, these systems are functioning well. The following was observed and necessary adjustments made:

- The end plug on the 1" distribution lines were clogging easily due to the debris in the wash water (lint and hair). They were removed so nothing can obstruct the water when it discharges into the mulch basin shields.
- Originally we used 1-gallon pots (tall and narrow) to create the mulch shields in the mulch basin (see photo above). It turns out that these were getting clogged more easily and not draining well. We replaced these with wider 5-gallon pots that have their tops cut off. The wider circumference increased the surface area of the mulch that receives the debris-laden discharge and improved drainage into the surrounding mulch basin.
- We constructed the mulch basins out of the wood chips we had on hand which were of a fine texture. This sped up the composting process and required that we replace the chips sooner. Had we used coarser wood chips, we would have had to replace them less frequently.
- The decomposition process, aided by volunteer native Inky Cap mushrooms (*Coprinus sp.*), yielded a rich black soil (see above photo).
- This rich soil increased the diversity of the soil food web that became attractive to foraging raccoons. They would unearth the mulch basins and shields in search of worms and other earthly delights. The solution was to affix the shields to large wooden stakes pounded into the mulch basins.



SYSTEM #2 - BRANCHED DRAIN GRAVITY GRAYWATER SYSTEM:

This design offers inexpensive, reliable, efficient distribution without filter cleaning. It utilizes gravity pressure from a shower or sink, and a continuous downhill slope from the points of graywater generation to the points of irrigation need.



LESSONS LEARNED —

- Branched drain systems require a significantly more trenching and careful design work to install. Because they depend on gravity for flow, they require close attention to placement of pipes in relation to the slope.
- Flow splitters must be installed on the level (see photo above) to ensure even distribution of water throughout the system.
- Based on what we learned from the Laundry to Landscape systems, we used the cut-off 5-

gallon mulch shields for the mulch basins (see above Laundry to Landscape Lessons Learned for details).

- It is important to determine which pipe and where to cut into the house's plumbing system to install the three-way valve so that you do not compromise the venting of the existing plumbing nor contaminate your graywater by cutting into the blackwater lines. This is why a plumbing permit is required to modify the drainage system.
- Always make sure you have adequately identified any underground utilities before digging trenches.



GRAYWATER RESOURCES

This resource list was compiled by the Occidental Arts and Ecology Center's WATER Institute (www.oaecwater.org). Portions of this resource list were excerpted from lists compiled by our colleagues at Rainwater Harvesting For Drylands and Beyond, Wholly H2O, Oasis Design and Graywater Alliance. Please visit their websites for a more exhaustive and internationally representative set of resources. Note: OAEC's WATER Institute provides this information as a potential resource, not an endorsement.

BOOKS/DVDS/WEBSITES

- ***Builder's Greywater Guide*** by Art Ludwig - www.oasisdesign.net/greywater/buildersguide/index.htm
- ***Create An Oasis With Graywater*** by Art Ludwig – www.oasisdesign.net/greywater/createanoasis
- ***Gray Water Use in the Landscape: How To Use Gray Water To Save Your Landscape During Droughts*** by Robert Kourik
- ***Laundry To Landscape Grey Water System*** by Art Ludwig – This webpage is packed with information www.oasisdesign.net/greywater/laundry/index.php . Check out the instructional DVD as well at www.oasisdesign.net/greywater/laundry/video/index.htm.
- ***Rainwater Harvesting for Drylands and Beyond*** – Brad Lancaster's website has a great graywater resources section at www.harvestingrainwater.com/greywater-harvesting
- ***San Luis Obispo Guide To The Use of Gray Water*** by the San Luis Obispo Coalition of Appropriate Technology (SLO-COAT) - www.slogreenbuild.org/Library/documents/general/Graywater_08_20_09.pdf
- ***Sonoma County Graywater Brochure*** - www.co.sonoma.ca.us/prmd/docs/misc/graywater.pdf

CONTRACTORS

- **AP Rainwater Harvesting and Greywater Harvesting Solutions** - (707) 874-9640
www.aprainwaterharvesting.com
- **Artisans Ecological Landscapes and Farms – Erik Ohlsen**, Sebastopol, CA, (707)-332-8100, www.permacultureartisans.com
- **Bill Wilson Environmental Planning**, Mill Valley, CA, (310) 441-3861

- **Design Ecology - Josiah Raison Cain**, Petaluma, CA, (415) 888-8515, www.designecology.com
- **Eldercreek Designs – Rick Taylor**, Sebastopol, CA, (707) 529-3008, www.eldercreeklandscapes.net
- **Green Plumbers USA** offers references for green plumbers familiar with greywater-harvesting systems. www.greenplumbersusa.com/
- **Greywater Action** – Oakland, CA, www.greywateraction.org
- **H2OME** – San Diego, CA, (619) 964-4838, www.h2o-me.com
- **Love Gardens** – Santa Cruz, CA, (831) 471-9100, www.lovesgardens.com
- **Monty’s Plumbing** – San Diego, CA, (619) 823-5662, www.montysplumbing.com
- **Oasis Design Consulting** – Santa Barbara, CA, (805) 967-9956, www.oasisdesign.net
- **Permacopia** – Sonoma County, CA, www.permacopiadesign.com
- **Rain Catchers** - This North Carolina company offers services nationwide. www.rain-catchers.net
- **ReWater Systems Inc.** – Newbury Park, CA, (805) 262-2954, www.rewater.com
- **Sustainable H2O Solutions** – (707)-853-9977, www.sustainableh2osolutions.net
- **WaterSprout – John Russell**, Oakland, CA, (510) 541-7278, www.watersprout.org
- **WhollyH2O** - San Francisco, CA, www.whollyh2o.org

FINANCIAL INCENTIVES/TAX CREDITS

- **City of Santa Rosa Graywater Rebate Program (Sonoma County)** – www.ci.santa-rosa.ca.us/departments/utilities/conserves/Pages/Graywater.aspx
- **North Marin Water District Demand Offset Rebate Pilot Program – Graywater Rebate (Marin County) – MUST BE APPROVED BY DECEMBER 31, 2010** - www.nmwd.com/conservation_exterior.php or download application at www.nmwd.com/pdf/conservation/GraywaterRebateJuly2010.pdf

- **Soquel Creek Water District Graywater Rebate Program (Santa Cruz County)** - www.soquelcreekwater.org/content/graywater-rebate

ORGANIZATIONS -

- **Daily Acts** (Petaluma, CA) – Through creating media, initiating and sharing sustainability models, cultivating community networks and providing hands-on education (including graywater), Daily Acts empowers citizens, strengthens leaders and grows community self-reliance. www.dailyacts.org
- **Greywater Alliance** (Bay Area, CA) - The Greywater Alliance is a group of organizations and individuals whose mission is to make reuse of greywater a critical and integral part of water conservation efforts in the San Francisco Bay Area and beyond. www.greywateralliance.org
- **Occidental Arts and Ecology Center's WATER Institute** (Occidental, CA) – Building upon OAEC's many years of work to protect Coastal California's watersheds, the WATER Institute concentrates on four interrelated program components: advocacy and policy development; training and support; education and demonstration; and research. The WATER Institute offers courses on Graywater Design and Wise Water Use. www.oaecwater.org
- **WhollyH2O** (San Francisco) - This site is a comprehensive information center for efficiency, rainwater, graywater, stormwater and black water management, capture and reuse. www.whollyh2o.org

PRODUCTS

- **AP Rainwater Harvesting & Graywater Gardens**
www.aprainwaterharvesting.com
4488 Stoetz Lane, Sebastopol, CA, USA, 95472
707-874-9460
- **Clean Water Components**
www.cleanwatercomponents.com
- **Jandy Industries**
www.jandy.com
P.O. Box 6101, Novato, CA 94948
Phone: 800-227-1442, Fax: 415-382-0820
Makers of three-way diverter valves
- **Oasis Biocompatible Cleaners**, dist. by Bio Pac, Inc.
P.O. Box 8542, Incline Village, NV 89452
800 225-2855, fax 702 831-9493. Contact: Collin Harris.
Manufacturer of plant and soil biocompatible cleaners. Oasis Cleaners are available by mail from Real Goods Trading Co., Ukiah, CA, 800 762-7325 or in health food stores.