

## Facilitating and promoting the use of residential greywater

### Proposed interpretations of Appendix G of the California Plumbing Code designed to clarify and standardize the interpretation of residential greywater use in the city of Oakland

The Greywater Alliance<sup>1</sup>

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#### Summary

With an uncertain water future in California, greywater use is an easy, simple, and effective way to use our water resources more efficiently. This document outlines an Ordinance that will define an interpretation of the existing California Graywater code Appendix G so that homeowners can easily obtain permits for simple, safe, cost effective greywater systems. The code gives the Administrative Authority (AA) great freedom of interpretation and this ordinance specifically states ways in which the AA shall interpret the code.

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<sup>1</sup> <http://www.greywateralliance.org>

## Facilitating and promoting the use of residential greywater

There are a number of environmental and economic reasons why a reinterpretation of the California Greywater code is necessary and would benefit the city of Oakland.

### Relative and Actual risks associated with greywater use

Greywater is water from tub/showers, lavatory sinks, and washing machines. It is not water that has come into contact with feces, either from the toilet or from washing diapers. The current code excludes kitchen sink water.

Many authorities cite health risks as the reason why the greywater code is so stringent and also why there has not been a lenient interpretation of the existing code. Yet, **there has been no case of documented illness due to greywater**, even with the plethora of systems built with no knowledge of basic health and safety precautions. Also, in Arizona which has a much more lenient code, there has been no documented case of illness. In contrast, there are annual documented cases of illness due to imperfections in our current water treatment infrastructure, mainly from sewer overflows<sup>2</sup>.

Also during times of drought and water rationing, people will install greywater systems regardless of permitting, and without guidance from their city. In these situations they will inevitably install lower quality systems with more chance of runoff or other potential negative aspect of greywater. We believe it is in the best interest of cities that homeowners can easily obtain permits for greywater systems and have clear guidelines to follow to assure continued success with safe greywater systems.

### The rationale for increasing residential greywater use

#### *Drought emergency*

We are currently in a drought. East Bay Municipal Utility District (EBMUD), has declared a severe water shortage and instituted mandatory water rationing. The Governor of California declared a state-wide drought on June 4, 2008, the first time in 17 years, calling for a twenty percent reduction in water use by the year 2020. Greywater can provide a significant percentage of water for outdoor irrigation<sup>3</sup>.

#### *Prior city commitments to green practices*

Oakland has made many commitments to becoming a more ecological city. The city has signed on to the Urban Environmental Accords, supports the U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED), and has a chapter in the the Oakland Municipal Code (Chapter 15.35) which includes green building requirements for city building projects.

In addition the City of Oakland has already developed the infrastructure to support green

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[http://www.americanrivers.org/site/PageServer?pagename=AR7\\_RighttoKnow\\_Issu#healtheffects](http://www.americanrivers.org/site/PageServer?pagename=AR7_RighttoKnow_Issu#healtheffects), The EPA estimates that there are between 23,000 and 75,000 sanitary sewer overflows annually in the United States, with 3-10 billion gallons of untreated sewage discharged. The most recent report from the Center for Disease Control and Prevention (2006) found nearly 3,000 people were infected with waterborne diseases. From Testing the Waters 2008. Natural Resource Defense Council, pages 15, 20.

<sup>3</sup> <http://www.sfgate.com/cgi-bin/article.cgi?file=/c/a/2008/06/05/MNF5113OBN.DTL>

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building components, including greywater, with the Green Building Resource Center. Also the Oakland General Plan Policy C0-4.1 (Water Conservation) emphasizes water conservation and recycling strategies in efforts to meet future demand.

### *Environmental impacts*

Accessing new sources of water is very costly and can negatively impact the environment. Conservation and reuse is more cost effective with less negative impact on the environment. The Governor of California proposes spending 5 billion dollars on new dams to meet urban water use<sup>4</sup>.

Dams have already contributed to the loss of 95% of salmon habitat, 95% of wetlands, and 90% of riparian habitat, and contributed to the extinction or decline of 69% of native fish populations. Conservation has shown to be fifty times more cost affective than building new dams.<sup>5</sup>

Our state government is in a budget crisis and currently lacks funds to pay for all necessary services. Dams further tax the state's monetary resources, while conservation and reuse of greywater will save money, be better for the environment, and create a new sector of green collar jobs.

Widespread use of greywater provides many environmental benefits aside from conserving water. Greywater can be used to irrigate our landscapes; grow trees which make the air cleaner, provide shade, beauty, and even fruit. There are also additional environmental benefits such as reducing flow into sewage treatment plants, saving energy and chemicals. Greywater reuse also helps prevent sewage overflows during the times when greywater is diverted from the sewer.

### **The need to reinterpret Appendix G of the California Plumbing code**

#### *Why permits aren't currently accessible*

To date, there are only a handful of permitted greywater systems in Oakland. A contributing factor is that the specific guidelines in the current code are complicated and require expensive systems that are not efficient at irrigation.

Greywater's actual benefits and risks are not well understood among public officials, permitting departments, and much of the general public. Because of the difficulty obtaining permits it has not been possible to showcase a simple, safe, economical, effective permitted system for others to use as a guideline. Public demonstration systems, such as the Berkeley EcoHouse, required an engineer to design the system-- not an affordable option for most people.

Most greywater systems in operation in Oakland are unpermitted. Many of these systems follow the basic health and safety guidelines from Arizona's greywater regulations, and would be legal if they were in the state of Arizona.

#### *Greywater regulations in Arizona*

In Arizona the greywater regulations follow a tiered approach, with the lowest tier being residential greywater of under 400 gallons per day. Houses usually fall in the lowest tier and

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<sup>4</sup> <http://www.friendsoftheriver.org/site/PageServer?pagename=WaterWars>

<sup>5</sup> <http://www.friendsoftheriver.org/site/PageServer?pagename=FORDamLiesArticle> (10. Dams v. Conservation, Friends of the River, October 2007)

then the greywater system must follow 10 basic design guidelines to make the system automatically “legal” under a general permit. This approach to regulation has dramatically increased the number of systems in compliance with the code<sup>6</sup>.

### **The economic benefits for an ordinance reinterpreting Appendix G of the California Plumbing Code**

#### *Cost savings for residents*

Currently any greywater system that is permissible is expensive and unaffordable for most people. Because of the rising cost of water, low-cost options should be available to all people, especially low income people.

#### *Green Collar Jobs*

If legal greywater systems are more accessible, a new job market will be created for designers and installers. Installing low-tech greywater systems requires only basic landscaping and plumbing skills. A new green collar job market could be created that could serve many people, similar to trends in the solar industry. The potential greywater green collar job market could be very large since the components for systems are typically low in cost.

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<sup>6</sup> <http://watercasa.org/brochure.php>

**Proposed interpretations of Appendix G of the California Plumbing Code designed to clarify and standardize the current interpretation for residential greywater use in the city of Oakland**

If greywater use is to be a feasible water conservation strategy for residents of Oakland, the process for obtaining permits needs to be simplified and streamlined. We are asking the city to redirect the Administrative Authority's (AA) historical interpretation of the CA Plumbing Code Appendix G. We have identified sections in the code that have language which allows for alternative methods. These alternative methods could encourage and support permitting of simple, safe, and affordable low-tech greywater systems.

**Ord. 12843 § 3 (part), 2007: powers of the Administrative Authority.**

*(15.04.435 CPC Section 301.4.5) The Building Official may approve the system, method, or device when determined to be equivalent or superior.*

Oakland amendments to the California Plumbing Code (CPC): In Section 301.4.5 of the California Plumbing Code, replace the first sentence in its entirety with the following:

“The Building Official may approve an alternative engineered design of a plumbing system when determined to conform with the intent of this Code.”

**Comment:** This revision already adopted by Oakland will give the Administrative Authority greater flexibility in interpreting the California Plumbing Code Appendix G.

**General: use of the phrase “engineered stamped details”**

*Engineered stamped details*

Proposal: That “an alternative engineered design” include engineered stamped details illustrating greywater distribution methods that comply with the intent of the code. The specific details would be designed by the engineer and a diagram/template would be made available to the general public. This template would provide the installer specific guidelines and eliminate the need to hire an engineer for each individual system design.

**G-1 Graywater Systems General**

*Existing Code: (a) The graywater system shall not be connected to any potable water system without an air gap (a space or other physical device which prevents backflow) and shall not result in the surfacing of the graywater.*

Proposed interpretation: This airgap can be an autovent when used in a drumless laundry system.

Comment: An autovent is a type of vent that acts as an air gap. It is less expensive and simpler to install than extending a vent pipe to above the roof of the house. It is used typically in island sink installations.

#### **G-4 Drawings and Specifications**

*Existing code: The Administrative Authority may require any or all of the following information to be included with or in the plot plan before a permit is issued for a graywater system:*

Proposed interpretations: The AA will only require a simple plot plan.

Comment: The drawings for the system should be an easy task for the homeowner, providing relevant information to the city.

#### **G-5 Inspection and Testing**

*Existing code: (a) (3) Surge tanks shall be installed on dry, level, well compacted soil, if in a dry well, or on a level, 3-inch (76 mm) concrete slab or equivalent, if above ground.*

Proposed interpretation: A 3-inch gravel bed be considered equivalent to a concrete slab for above ground surge tanks.

Comment: This would make the installation easier and more ecological than using concrete.

#### **G-6 Procedures for Estimating Graywater Discharge**

*Existing Code: (a) Single Family Dwellings and Multi-Family Dwellings*

*The Administrative Authority may utilize the graywater discharge procedures listed below, **water use records, or calculations of local daily per person interior water use.***

Proposed interpretation: The AA will use water use records or calculations of local daily per person interior water use supplied by EBMUD if requested.

Comment: The calculations for water use in Appendix G 6 are typically much higher than the actual greywater produced. Greywater systems that are designed based on accurate water use will be smaller and cheaper to install than over engineered systems based on generic water use estimates for hypothetical occupancy.

#### **G-7 Required Area of Subsurface Irrigation**

*Existing code: Each irrigation zone shall have a minimum effective irrigation area for the type of soil and infiltration rate to distribute all greywater produced daily, pursuant to Section G-6, without surfacing. The required irrigation area shall be based on the estimated graywater discharge, pursuant to Section G-6, size of surge tank, or a method determined by the Administrative Authority.*

Proposed revision: The AA will allow for use of an engineered stamped detail to supply the irrigation area for the type of soil and infiltration rate.

Comment:

*Existing code: No irrigation point shall be within five vertical feet of the highest known seasonal groundwater nor where graywater may contaminate the groundwater or ocean water. The applicant shall supply evidence of ground water depth to the satisfaction of the Administrative Authority.*

Proposed interpretation: The AA use groundwater depth maps; or proof by digging a 5 ft. hole

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(with no requirement that this be done at a particular time of year) if groundwater information is unavailable. In areas with high seasonal groundwater the greywater should be diverted to the sewer by use of a 3-way valve during seasons of high groundwater.

Comment: We suggest proving that the ground water table is NOT within five feet of the surface, rather than proving where it actually is. The latter could be prohibitive if the groundwater were particularly deep, as is often the case. If the water table rises during heavy rainfall the greywater should be sent back to the sewer with the 3-way diverter valve.

### **G-8 Determination of Irrigation Capacity**

*Existing code: (a) In order to determine the absorption quantities of soils other than those listed in Table G-2, the proposed site may be subjected to percolation tests acceptable to the Administrative Authority or determined by the Administrative Authority.*

Proposed interpretation: Allow for use of percolation tests performed by homeowner or greywater installer which follow local percolation test guidelines. Accept photographs for documentation.

Comment: Soil percolation tests are relatively easy to perform. With clear guidance a homeowner could easily do their own, saving cost, and with photo documentation the city could be assured the test was performed.

*Existing code: (c) The irrigation field size may be computed from Table G-2, or determined by the Administrative Authority or a designee of the Administrative Authority.*

Proposed interpretation: Allow for engineered stamped details for irrigation size using mulched basins.

Comment: A template that gives irrigation size for a variety of discharge quantities would give clear guidance for appropriate size of mulched basin to prevent any runoff or pooling of greywater.

### **G-9 Surge Tank Construction**

*Existing code: (a) Plans for surge tanks shall be submitted to the AA for approval. The plans shall show the data required by the AA and may include dimensions, structural calculations, and bracing details. Note: G (1) (b) clarifies that the system “may include surge tanks”.*

Proposed interpretation: Allow for use of engineered stamped details for surge tank plans using readily available local materials, or a specified company/brand of tank. This would only be done when a surge tank is requested in the plans, not for all greywater systems.

Comment: Having a standardized surge tank that is easily obtainable by the homeowner will streamline this process.

### **G-11 Irrigation Field Construction**

*Existing code: The AA may permit subsurface drip irrigation, mini-leach field or other equivalent irrigation methods which discharge greywater in a manner which ensures that the greywater does not surface.*

Proposed interpretation: Allow “other equivalent irrigation methods” to include engineered stamped details with specific depths, widths, and mulch materials for mulched basins.

Comment: Mulch basins are effective at preventing surfacing of greywater, less costly to

construct, and the material, mulch, is more ecological than gravel. Mulch does decompose over time and so the mulch basins will need to be maintained. A maintenance guide will be included in the engineered detail.

### **G-12 Special Provisions**

*Existing code: (a) Other collection and distribution systems may be approved by the AA as allowed by Section 310.0 of the UPC*

Proposed interpretation: Allow “drumless laundry” systems to use a 1” PVC pipe inside the house and 1” HDPE tube for outside distribution.

Comment: This would allow for the most practical, safe, and effective of the low-tech greywater systems. The 1” diameter allows the system to stay pressurized by the internal pump of the washing machine, but does not unduly restrict the flow or risk damage to the internal pump.

### **G-13 Health and Safety**

*Existing code: (d) Graywater shall not be used for vegetable gardens*

Proposed interpretation: Herb plants, fruiting shrubs, and fruit trees are acceptable uses.

Comment: The potential health risk from irrigation of vegetable gardens is through direct oral contact with greywater. Consider the following hypothetical situation: a person with a fecal transmitted disease could wash fecal matter off their body into the greywater system. If the water landed on a vegetable, such as a carrot, the pathogen could be ingested by someone else who adequately clean the carrot. Many edible plants, like fruit trees, have the edible portion far from the soil (where greywater is distributed). There is no risk of contamination from this situation.

### **Table G-1 Location of Graywater Systems.**

*Existing code: Minimum Horizontal Distance (in feet) - Buildings or Structures from Surge tank 5ft (may be reduced to zero feet for above ground tanks if approved by the AA)*

Proposed interpretation 1: The AA should always approve zero feet if requested.

Comment:

*Existing code: Minimum Horizontal Distance (in feet)- Buildings or Structures to Irrigation Field 8ft (may be reduced to two feet)*

Proposed interpretation: The AA should approve two feet when requested (Footnote 3).

*Existing code: Minimum Horizontal Distance (in feet) for drip irrigation: Property Line adjoining private property Irrigation field 5 ft (may be reduced to 2 feet)*

Proposed interpretation: The AA should allow 2 feet when requested.