“A desert community should do everything possible to conserve water and promote efficient use of water resources.”

- City of Tucson Ordinance 10579
  September 2008
  Effective as of June 1, 2010
WHAT IS GRAY WATER?

- Gray water is the water that flows from the drains of hand-washing lavatories, showers, bathtubs and clothes washing machines.
- Gray water is NOT the water that comes from toilets, dishwashers, laundry sinks* or the kitchen sink.

Gray Water
Graywater
Grey Water
Greywater

* Laundry sinks tend to be used for chlorine bleach and other chemicals not suitable for gray water use.
CITY OF TUCSON ORDINANCE 10579 STATES

ADOPTED BY THE
MAYOR AND COUNCIL

September 23, 2008
ORDINANCE NO. 10579

REQUIRING INSTALLATION OF Gray Water
“STUB-OUTS” IN RESIDENTIAL CONSTRUCTION;
REQUIRING THAT GRAY WATER SYSTEMS
COMPLY WITH APPLICABLE REGULATIONS;
AMENDING TUCSON CODE CHAPTER 6, ARTICLE
III DIVISION I BY AMENDING SECTION 6-38
AND ADDING SECTION 2602.1.2, “GRAY WATER
STUB-OUTS”, AS A LOCAL AMENDMENT TO
THE INTERNATIONAL RESIDENTIAL CODE; AND
DECLARING AN EMERGENCY.

WHEREAS, installation of stub-outs at the time of
constructions greatly facilitates the use of gray water
in residences; and

WHEREAS, a desert community should do everything
possible to conserve water and promote efficient use
of water resources.

BE IT ORDAINED BY THE MAYOR AND COUNCIL
OF THE CITY OF TUCSON, ARIZONA, AS
FOLLOWS:

SECTION 1. This ordinance shall be known and
referred to as the “Residential Gray Water Ordinance.”

SECTION 2. The Tucson Code Chapter 6, Buildings,
Electricity, Plumbing and Mechanical Code, Article
III, Buildings, Division 1, Building Code, Section 6-38,
Residential code adopted, International Residential
Code 2006 as adopted by Ordinance 10417 with
amendments, is hereby amended by adopting a new
section 2602.1.2 as set forth in Attachment A to this
ordinance incorporated here as if fully set forth herein.

SECTION 3. The Director of Development Services is
authorized to adopt appropriate rules, regulations and
Development Standards necessary to implement the
provision of this ordinance.

SECTION 4. The provision of this ordinance may
be modified or waived when it can be satisfactorily
demonstrated to the Building Official that compliance
with these regulations is impractical due to
construction or other physical constraints and an
acceptable alternative method of compliance that
allows gray water usage is proposed.

SECTION 5. The provisions of Sections 1 through 4 of
this ordinance apply to construction built pursuant to
permits issued after June 1, 2010.

SECTION 6. The various City officers and employees
are authorized and directed to perform all acts
necessary or desirable to give effect to this ordinance,
including, but not limited to, providing an instructional
pamphlet setting forth in plain language the
requirements of this ordinance.

SECTION 7. If any of the provisions of this
ordinance of the application thereof to any person or
circumstance is invalid, the invalidity shall not affect
other provisions or applications of this ordinance
which may give effect without the invalid provision
or circumstance, and to the end the provision of this
ordinance are severable.

SECTION 8. WHEREAS, it is necessary for the
preservation of the peace, health and safety of the
City of Tucson that this ordinance becomes
immediately effective, an emergency is hereby
declared to exist and this ordinance shall be effective
immediately upon its passage and adoption.

PASSED, ADOPTED AND APPROVED BY the Mayor

MAYOR: Robert Walkup
ATTEST:
CITY CLERK: Chief Deputy City Clerk Deborah Rainone
APPROVED TO FORM:
CITY ATTORNEY: Mike Rankin
REVIEWED BY:
CITY MANAGER: Mike Letcher

LK/rk
9/17/2008 10:16 AM

SUMMARY ORDINANCE GOALS:

✓ Conserve the desert’s most precious resource.
✓ Reduce using potable water for outdoor watering.

ATTACHMENT A TO ORDINANCE 10579

2602.1.2 “Gray Water Applications”

1. All new single family and duplex residential
dwelling units shall include either a separate
multiple pipe outlet or a diverter valve,
and outside “stub-out” installation on
coats washing machine hook-ups, to allow
separate discharge of gray water for direct
irrigation.

2. All new single family residential dwelling
units shall include a building drain or
drains for lavatories, showers, and
bathtubs, segregated from drains for all
other plumbing fixtures, and connected
minimum of three (3) feet from the limits
of the foundation, to allow for future
installation of a distributed gray
water system.

3. All gray water systems shall be designed
and operated according to the provisions of
the applicable permit authorized by ADEQ
under the Arizona Administrative Code, Title
18, Chapter 9.
**TUCSON RESIDENTIAL USE OF WATER**

Using Gray Water can have an impact on the City of Tucson’s overall water usage. Of the total amount of waste water produced in a typical home, 13 percent is from the washers, 10 percent is from faucets and 9 percent is from showers totalling 32 percent that can be re-used as gray water for landscape plants.

When all gray water sources are being used, that water can replace the 45 percent of the landscape irrigation needs of an average single family home. This number varies widely based on irrigation efficiency, local climate, household occupancy, occupants habits, lot size and extent of landscaping.

### Average Total Waste Water Produced in a Residential Home

<table>
<thead>
<tr>
<th>Category</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outdoor</td>
<td>45%</td>
</tr>
<tr>
<td>Toilet</td>
<td>14%</td>
</tr>
<tr>
<td>Shower</td>
<td>9%</td>
</tr>
<tr>
<td>Faucets</td>
<td>10%</td>
</tr>
<tr>
<td>Washers</td>
<td>13%</td>
</tr>
<tr>
<td>Others</td>
<td>2%</td>
</tr>
<tr>
<td>Leaks</td>
<td>7%</td>
</tr>
</tbody>
</table>

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**KEY DETAILS OF THE GRAY WATER ORDINANCE IMPLEMENTATION**

- All new single family dwellings will be plumbed to collect gray water with a separate outflow pipe for you to attach your gray water irrigation system. Although the home will be preplumbed for gray water use, it is up to the homeowner to install an irrigation system to use the gray water. A permit is required from the City of Tucson Planning and Development Services Department in order to tap the building drain or gray water line and divert the gray water to an irrigation system.

- The washing machine stub-out should be above grade to allow for gravity flow.

- All new single family and duplex dwellings shall include either a separate multiple pipe outlet or a diverter valve, and an outside “stub-out” installation on clothes washing machine hook-ups, to allow separate discharge of gray water for direct irrigation.

- The gray water outflow pipe should be connected to the black water pipe a minimum of 3 feet from the limits of the foundations to allow future installation of the gray water irrigation system.

- Contact the City of Tucson Planning & Development Services Department at (520) 791-5550 to find out if a permit is needed.
  - A permit is not required to tap into a pre-existing gravity stub-out from the washing machine.
  - A permit is required to modify drainage plumbing/piping from any fixture.
  - Homeowners may perform plumbing work on their own residence. Otherwise, licensed contractors must be used.
The Arizona Department of Environmental Quality governs gray water use OUTSIDE the home. The City of Tucson Regulations cover gray water plumbing INSIDE the home.

**REGULATIONS FOR GRAY WATER USE WITHIN THE CITY OF TUCSON**

- **PUBLIC** (Builder, Contractor or Homeowner)
  - **ADEQ**
    - REGULATIONS ALLOWING GRAY WATER USE (HOMEOWNER/RESIDENT)
  - **CITY OF TUCSON**
    - GRAY WATER ORDINANCE (BUILDER/CONTRACTOR)

**DISTRIBUTION**
- OUTSIDE

**PERMITTING**
- TYPE 1 GENERAL (PAPERLESS)
- COMPLIANCE WITH ORDINANCE & PLUMBING CODES

**OUTSIDE THE HOME**

**INSIDE THE HOME**
GRAY WATER USE MUST ABIDE BY ADEQ REQUIREMENTS

TYPE 1 GENERAL PERMIT BMPs
Follow these best management practices to comply with Arizona’s rules for gray water use.

- First and foremost, avoid human contact with gray water, or soil irrigated with gray water.
- You may use gray water for household gardening, composting, and lawn and landscape irrigation, but use it in a way that does not run off your own property.
- Do not surface irrigate any plants that produce food, except for citrus and nut trees.
- Use only flood or drip irrigation to water lawns and landscaping. Spraying gray water is prohibited.
- When determining the location for your gray water irrigation, remember that it cannot be in a wash or drainage way.
- Gray water may only be used in locations where groundwater is at least five feet below the surface.
- Label pipes carrying gray water under pressure to eliminate confusion between gray water and drinking water pipes.
- Cover, seal, and secure surge tanks to restrict access by small rodents and to control disease carrying insects, such as mosquitoes.
- Gray water cannot contain hazardous chemicals such as antifreeze, mothballs or solvents. Do not include wash water from greasy or oily rags in your gray water.
- Surface accumulation of gray water must be kept to a minimum.
- Gray water from washing diapers or other infectious garments must be discharged to a residential sewer or other wastewater facility, unless it can be disinfected prior to its use.
- Should a backup occur, gray water must be disposed into your normal wastewater drain system. To avoid such a backup, consider using a filtration system to reduce plugging and extend the system’s lifetime.
- If you have a septic or other on-site wastewater disposal system, your gray water use does not change that system’s design requirements for capacity and reserve areas.

USE YOUR GRAY WATER IF

- You want to conserve water.
- You want to lower your water bill.
- Your landscape design can accommodate the amount of gray water your home produces. See Page 16 to determine the quantity of gray water you will be producing.
- You have enough plants to use it all!

DON’T USE YOUR GRAY WATER IF

- You have a water softening system that uses sodium. Sodium, as part of sodium chloride used in softening systems, is harmful to plants. Potassium chloride can also be used in water softeners and has found to be easier on the plants. However, it may increase the total dissolved solids (TDS) of the water that could accumulate in the soils causing plant health problems in the future.
- There is a resident who has an infectious disease. Since the gray water from many systems is not treated, bacteria and viruses from infected people may get into the gray water system and cause further contamination. If there is someone in the household who is sick, the gray water system should be bypassed.
- You are washing diapers that are not disinfected. Diapers contain fecal matter that would not get treated in the gray water system. Water from the washing machine used to clean diapers should be bypassed to the sewer system to prevent contaminating the gray water system.

CITRUS TREE

WOLLLY PAPER FLOWER

BOUGAINVILLEA
DESIGNING THE GRAY WATER SYSTEM

HOW TO DETERMINE THE AMOUNT OF GRAY WATER THAT MAY BE PRODUCED.

There are a number of methods to determine the amount of flow generated from gray water. This is important to know so that the irrigation system is designed properly along with the landscaping. The estimate may be calculated using the bedroom count to estimate the number of possible occupants.

The bedroom count formula may be used to determine the amount of gray water that may be produced in a household. The estimations are in gallons per person, per day, also known as gallons per capita per day (gpcd).

1. The first thing you need to determine is the number of occupants there are in the dwelling. One common method utilized is by bedroom count. For example, the first bedroom has 2 occupants, and each additional bedroom has 1.

2. Next calculate the estimated gray water flow for each occupant. It can be assumed that showers, bathtubs and wash basins use 25 gpcd and 15 gpcd is used from laundry.

3. Then multiply by the total number of occupants.

**Example A:**
A single family dwelling that has 3 bedrooms with the showers, bathtubs, wash basins and a washing machine all connected to the gray water system:

Total number of occupants = 2 + 1 + 1 = 4

Estimated gray water flow = 4 x (25 + 15) = 160 gallons per day (gpd).

**Example B:**
A single family dwelling that has 4 bedrooms with only the washing machine connected to the gray water system:

Total number of occupants = 2 + 1 + 1 + 1 = 5

Estimated gray water flow = 5 x 15 = 75 gpd

**AVERAGE GRAY WATER AMOUNTS:**

- 32% of the typical household wastewater generated is gray water.
- The average is 28 gallons/person/day.

**DETERMINE THE TYPE OF SYSTEM NEEDED**

- Graywater systems may be (a) pressurized with a pump, or (b) gravity fed. Either method can be used. A major limiting factor of a gravity fed system is sufficient slope on the property to allow proper gray water flow.

- A common and easy gravity design that doesn’t have slope limitations is just connecting the irrigation system to the washing machine only.
COMPONENTS OF A GRAY WATER SYSTEM

SURGE TANKS
Surge tanks are not a mandatory part of all gray water systems, but use of a surge tank allows the water to surge into the tank and be slowly released into the landscape without causing soil erosion.

FILTERS
Filters are a recommended component of gray water systems. The filter will catch clothes fibers that are in the clothes washing machine water.

PUMPS
When a tank is used to capture the gray water leaving the home, a pump will be necessary. A pump allows the system to be pressurized and improves the efficiency of the irrigation system by allowing greater control of water distribution.

SPECIAL FITTINGS
Special fittings may be required for gray water systems to function properly. These fittings may be:
- 3-way diverter valve
- Double Elbow fitting may be best for the gravity splitter
- PVC Ball/Valves/Pipes may be used for pressure/pumped systems

BACKFLOW
If a pump is used to distribute the Gray Water, a reduced pressure backflow assembly needs to be installed on the potable water meter connection to protect the public potable water system.

CULVERT SYSTEM
GRAY WATER FILTRATION AND PUMP SYSTEM TO IRRIGATION

- Incoming Gray Water
- Overflow Pipe to Sewer or Wastewater System
- Float in Surge Tank Activates Pump
- Pump Pushes Gray Water From Surge Tank Through Sand Filter
- Backwash Line From Sand Filter to Overflow Pipe
- Manual Switch For Backwash Flow
- 2” PVC Pipe Carries Filtered Gray Water to Irrigation Area

Note: Pipe Routing Has Been Simplified for Clarity
GRAY WATER DISTRIBUTION METHODS

SURFACE OR SUB-SURFACE IRRIGATION:
Drip irrigation is the most efficient method of landscape watering with gray water. If this method is chosen, it is recommended that a filter is used to prevent clogging of smaller lines and emitters. Gray water drip emitters should have a larger opening to prevent clogging.

SURFACE IRRIGATION
Direct water from the outlet onto the plants can be used. Additionally, through surface grading modifications channels, basins, berms and check dams can be utilized.

SUB-SURFACE IRRIGATION
Drip irrigation is the most efficient method of landscape watering with gray water. Connect the gray water to a buried irrigation delivery system such as drip lines or bubblers that do not spray.

WHAT CAN I IRRIGATE?

Many plants that are on the Arizona Department of Water Resources Low Water Use Plant List can be watered with gray water. The entire list can be found at www.azwater.gov/AzDWR/Watermanagement/AMAs/LowWaterUsePlantList.htm#Tucson

Gray water can be used to irrigate fruit trees, groundcovers, ornamental trees and shrubs and some bedding plants, such as: begonias, petunias, impatiens and geraniums. Salt-tolerate plants such as oleander, bermuda grass, date palms, and native desert plants, excluding cacti, are well suited to irrigation with gray water.

Do not surface irrigate any plants that produce food except for citrus and nut trees.

Avoid using gray water on plants that are salt sensitive or need acidic soils. The water chemistry of graywater is alkaline and has a higher salt concentration.

Avoid using gray water on plants that prefer acid conditions such as: ash, azalea, dicaentra, foxglove, gardenia, hibiscus, philodendron, primrose, rhododendron, hydrangea, oxalis, violet, camelia, xylosma, and ferns.

Sandy soils are less vulnerable to damage than clay soils because they drain better. In very low rainfall areas, apply fresh water occasionally to leach out accumulated salts. Be aware that some harmful effects are not always visible immediately and take one or two years to appear. In any case, you should always pay attention to the health of the plants being irrigated and discontinue using gray water if signs of stress are observed.

WHAT CAN I IRRIGATE?

Do Not Spray Gray Water

THE #1 RULE WHEN UTILIZING GRAY WATER:

A FEW DETERGENT CHOICES:

Most detergents contain high levels of dissolved salts and boron. Dissolved salts in the irrigation system can devastate the plants root system.

Select a low sodium, no boron, no chlorine, low alkalinity detergent. Examples of detergents* that may work for your home are:

✔ Alfa Kleen
✔ All Regular
✔ Bold
✔ ERA Plus
✔ Oasis
✔ Shaklee
✔ Yes

MAINTENANCE NEEDS

■ All gray water systems require maintenance. The amount and type of maintenance will be dependent on the system. Installation of a filter that is maintained by routine washing will prevent the system from clogging with lint and debris.

■ Gray water flow may be blocked for a number of reasons (i.e., plant roots, build-up of silt and lint), the irrigation pipes will need routing flushing and/or replacement. A properly built gray water system will direct the overflow back into the sewer system rather than onto the ground.

■ The gray water system should be routinely flushed, about once a year or if you notice a foul odor. An easy and safe way to flush the system is by running water from the bathroom or the clothes washer rinse cycle (no detergents). While doing the flushing, watch to make sure everything is working properly. Routine flushing with rainwater or potable water also washes accumulated salts.

■ Gray water tanks utilizing pumps will need to be monitored for water levels to prevent pump damage. For example if the water level is too low and the pump continues to run, it will fail.

■ The gray water system should be checked on a monthly basis to ensure all the components are properly functioning:
  1. Inspect the tank to ensure that it is not housing vectors such as mosquitoes or rats!
  2. Check that the pump is working properly and the float switch has free movement.
  3. Indications of possible system malfunctions:
      ✔ Surfacing water accumulation from subsurface irrigation systems, OR
      ✔ Water that is ponding too long (more then 12 hours)

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FREQUENTLY ASKED QUESTIONS

This is a new ordinance that combines both City of Tucson and Arizona Department of Environmental Quality rules with Uniform Plumbing Codes (UPC). Some details in the implementation of this ordinance are in the gray area. The City of Tucson understands that some components may have to be adjusted over time. Please contact City of Tucson Planning and Development Services at (520) 791-5550 for additional guidance. For backflow questions, contact Tucson Water at (520) 791-2650.

■ WILL THE STUB-OUT BE MARKED?
No. Each home will have two gray water stub-outs. The gray water line coming from the bathtubs, showers and lavatories will be located underground near the building’s main waste clean-out. The gray water line coming from the washing machine will be located on an exterior wall above grade near the washing machine. Call Tucson Water at (520) 791-4331 for gray water sign information.

■ WHAT PLUMBING DEVICES ARE APPROVED FOR CONNECTIONS?
Only bathtubs, showers, lavatories (and hand sinks) and washing machines are permitted to be used for gray water collection.

■ CAN FITTINGS THAT ARE NOT SPECIFICALLY APPROVED FOR GRAY WATER USE BY THE UPC BE USED?
Non-listed fittings and fittings used in non-listed fashion will be reviewed by the Building Official on a case-by-case basis under an appeal process.

■ WHAT IS...?
Potable Water
Water that is suitable for drinking, cooking and personal bathing.

Black Water
Wastewater containing fecal matter and urine.

Reclaimed Water
Wastewater that has been treated to remove solids and certain impurities, and then used for landscape irrigation or to recharge groundwater aquifers.

Gray Water
Wastewater that is collected from the drains of hand-washing sinks, showers, bathtubs and clothes washing machines.

■ DO GRAY WATER SYSTEMS REQUIRE SIGNS?
Yes. If the building’s gray water is used for irrigation purposes, a sign must be posted to identify the water is for non-potable use. The City of Tucson will provide the initial sign. Replacement signs are the responsibility of the gray water user.

■ IS THERE A COLOR DESIGNATED FOR GRAY WATER SYSTEM COMPONENTS?
Yes. All non-potable water distribution lines must have purple markings. The gray water drain lines under the building are not required to be specifically marked.

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Water that is suitable for drinking, cooking and personal bathing.

Black Water
Wastewater containing fecal matter and urine.

Reclaimed Water
Wastewater that has been treated to remove solids and certain impurities, and then used for landscape irrigation or to recharge groundwater aquifers.

Gray Water
Wastewater that is collected from the drains of hand-washing sinks, showers, bathtubs and clothes washing machines.
**LANDSCAPE DESIGN EXAMPLE**

ILLUSTRATION BY:
Ann Williams,
Distinctive Desert Designs

**RED BIRD OF PARADISE** = **CAESALPINIA PULCHERRIMA**

**CHAPARRAL SAGE** = **SALVIA CLEVELANDII**

**SALTILLO PRIMROSE** = **DENOTHERA STUBBER**

**GRAY-WATER HARVESTING TANK WITH IRRIGATION LINES**

**DAMIANITA DAISY** = **CHRYSANTHEMUM MEXICANA**

**LITTLE LEAF CORDIA** = **CORDIA PARVIFOLIA**

**POMEGRANATE**

**POMEGRANATE**

**CHEF POBNO** = **CAPSICUM ANNUUM**

**DESERT GLOBEMALLOW** = **SPHAERALCIA ARBORECA**

**SILOSTROPHE TAGETINA** = **WOOLLY PAPERFLOWER**
RESOURCES

ONLINE:
- Tucson Water
  www.tucsonaz.gov/water/conservation
- Tucson Water Backflow Questions
  www.tucsonaz.gov/water/backflow
- Arizona Department of Environmental Quality
  www.azdeq.gov
- Rainwater Harvesting for Drylands and Beyond
  www.harvestingrainwater.com
- Oasis Design
  www.oasisdesign.net
- ReWater® System Inc.
  www.rewater.com
- Water Environment Research Foundation
  www.werf.org/AM

LITERATURE:
- “Branched Drain Greywater Systems,”
  by Art Ludwig, copyright 2000.
- “Builder’s Greywater Guide,”
  by Art Ludwig, copyright 1995.
- “Create an Oasis with Greywater,”