CITY OF TUCSON

RESIDENTIAL GRAY WATER

INFORMATION GUIDE

Developed By:

Justin Cupp
Owner, Arizona Rain Gardens

C. Alan Nichols, PE, CEM, LEED AP
Owner, Alan Nichols Engineering, Inc.

On behalf of the City of Tucson
Developed June 2010
Revised April 2011

Edited By:

Clayton Trevillyan
Planning & Development Services
City of Tucson

Beverley J. Hester, P.E.
Environmental Engineer
Planning and Development Services
City of Tucson

Ilene Grossman
Tucson Water
Conservation Program Manager

CITY OF TUCSON RESIDENTIAL GRAY WATER

INFORMATION GUIDE

SmartScape
4210 N. Campbell Avenue
Tucson, AZ 85719-1109
Phone: (520) 626-5161
Fax: (520) 626-5849

Tucson Water
310 W Alameda
Tucson, AZ 85701
Phone: (520) 791-4331
tucsonaz.gov/water/conservation

City of Tucson
Planning and Development Services
201 N Stone Avenue
Tucson, AZ 85701
Phone: (520) 791-5550
tucsonaz.gov/dsd

City of Tucson Office of Conservation and Sustainable Development
255 W Alameda (4th Floor) ~ Tucson, AZ 85701
Phone: (520) 791-4675
tucsonaz.gov/ocsd

If you require material in an accessible format or in another language other that English, call Tucson Water at (520) 791-4331 or City of Tucson TDD (520) 791-2639

“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

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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.

PLANNING AND DEVELOPMENT SERVICES DEPARTMENT
Residential Plan Review

GRAY WATER ORDINANCE

On October 14, 2008, Mayor and Council unanimously voted to require all new residences to be built with gray water capabilities. Starting June 1, 2010, all new single family homes and duplexes must include, on the plans, plumbing for future gray water distribution.

These new rules are part of Tucson's effort to promote water conservation and efficient use of water resources by the City and its residents. Gray water is water previously used by the interior of the house, from clothes washers, bathtubs, showers, or bathroom sinks and reused for outdoor irrigation. Using this recycled water can save a typical household 13,000 gallons of potable water a year.

The code changes for Residential Gray Water are now in place.

Here's what the rules require:

1. On all new residential plans for single family and duplex dwellings, show either a separate multiple pipe outlet or a diverter valve and an outside "stub-out" installation on clothes washing machine hook-ups.

2. For all new single family dwellings, show a building drain(s) for lavatories, showers, and bathtubs, separate from all other plumbing fixtures, with a connection a minimum of three (3) feet from the edge of the foundation.

3. All gray water systems need to be designed and operated according to the provisions of permits authorized by ADEQ under the Arizona Administrative Code, Title 18, Chapter 9.
   http://www.azdeq.gov/environ/water/permits/download/graybro.pdf

CITY OF TUCSON ORDINANCE 10579 STATES

ADOPTED BY THE MAYOR AND COUNCIL

September 23, 2008
ORDINANCE NO. 10579

RELATING TO BUILDINGS, ELECTRICITY, PLUMBING AND MECHANICAL CODE; CREATING THE "RESIDENTIAL GRAY WATER ORDINANCE" 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, the State of Arizona's Department of Environmental Quality instituted a general permit for homeowners whose gray water systems meet the Best Management Practices; and

WHEREAS, gray water systems constructed and operated according to these Best Management Practices provide a safe method of reducing water demand; and

WHEREAS, gray water is a valuable resource as it makes "double use" of water that otherwise goes down the drain. Gray water systems divert some interior water from clothes washers, bathtubs, showers or bathroom sinks (but not from a kitchen sink, dishwasher or toilet) for use in outdoor irrigation; and

WHEREAS, gray water systems – which recycle household water to a spot where it can be used outdoors—can save a typical household 13,000 gallons of potable water per year; and

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 herby 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 pursuance 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 and City Council of Tucson, Arizona, September 23, 2008.

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/kr
9/17/2008 10:16 AM

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 clothes 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 a 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.

SUMMARY ORDINANCE GOALS:

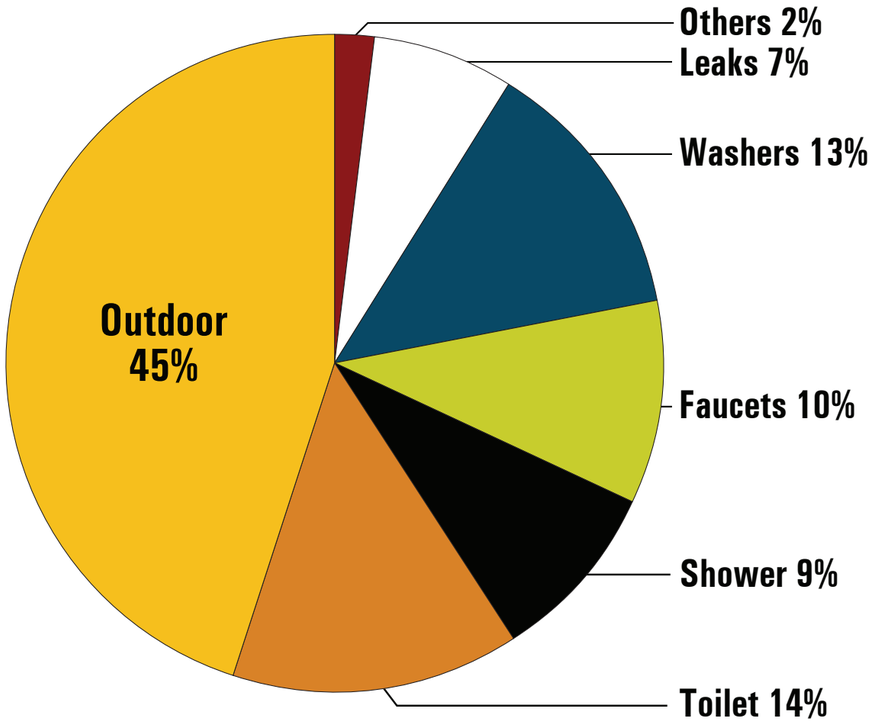
- ✓ Conserve the desert's most precious resource.
- ✓ Reduce using potable water for outdoor watering.

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.

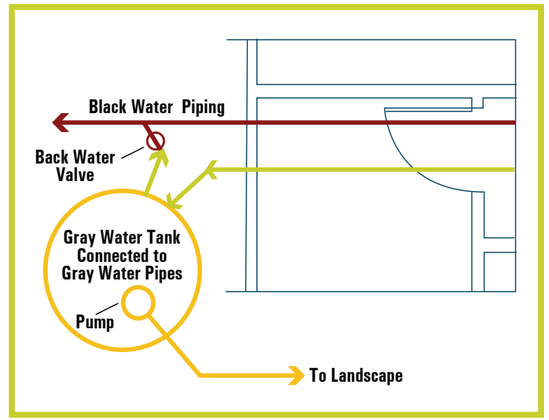
When all gray water sources are being used, that water can replace the 45 percent of the landscape irrigation needs of an average single family home. This number varies widely based on irrigation efficiency, local climate, household occupancy, occupants habits, lot size and extent of landscaping.

AVERAGE TOTAL WASTE WATER PRODUCED IN A RESIDENTIAL HOME



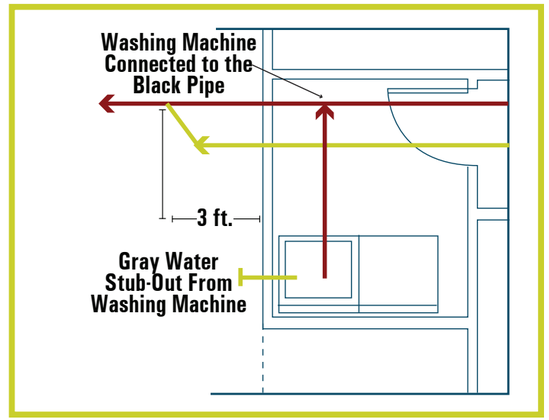
KEY DETAILS OF THE GRAY WATER ORDINANCE IMPLEMENTATION

- 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.

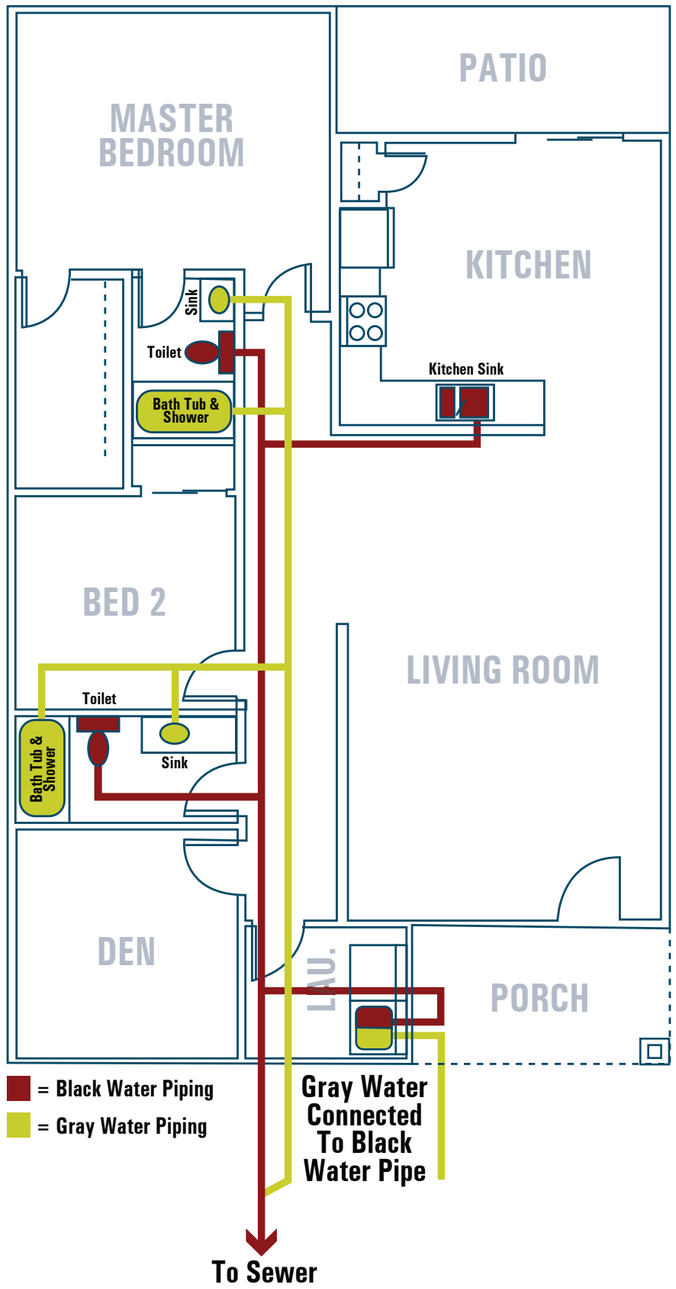
- All new single family and duplex dwellings shall include either a separate multiple pipe outlet or a diverter valve, and an outside "stub-out" installation on clothes washing machine hook-ups, to allow separate discharge of gray water for direct irrigation.



- 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.

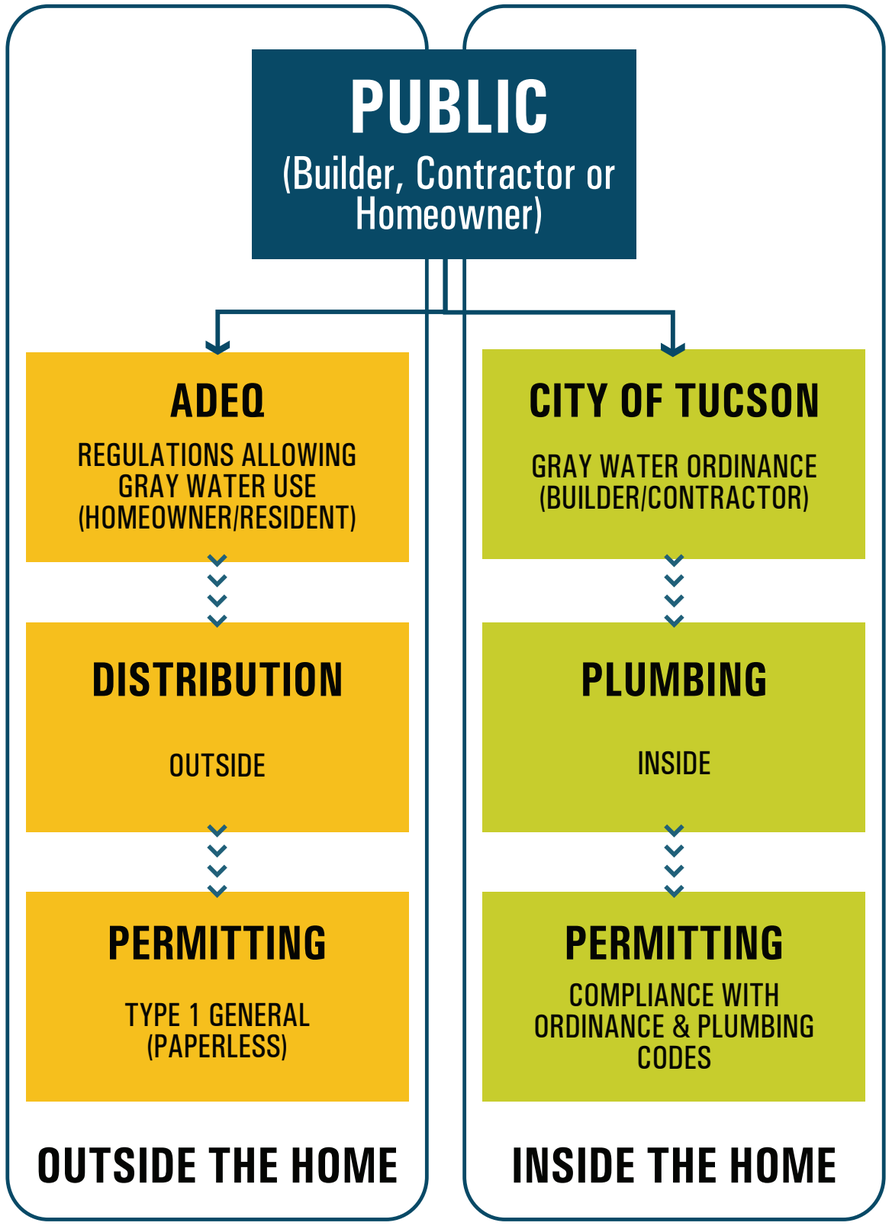
- Contact the City of Tucson Planning & Development Services Department at (520) 791-5550 to find out if a permit is needed.
  - A permit is not required to tap into a pre-existing gravity stub-out from the washing machine.
  - A permit is required to modify drainage plumbing/piping from any fixture.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

GRAY WATER & BLACK WATER



REGULATIONS FOR GRAY WATER USE WITHIN THE CITY OF TUCSON

- 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.



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

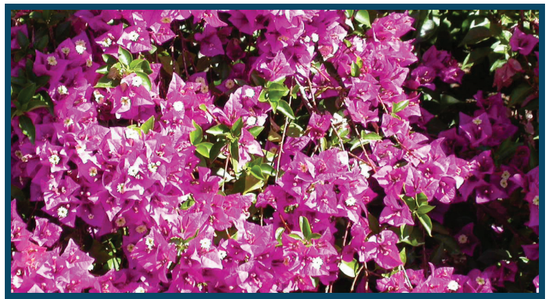
- ✔ You want to conserve water.
- ✔ You want to lower your water bill.
- ✔ Your landscape design can accomodate the amount of gray water your home produces. See Page 16 to determine the quantity of gray water you will be producing.
- ✔ You have enough plants to use it all!

CITRUS TREE

WOOLLY PAPER FLOWER

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.



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

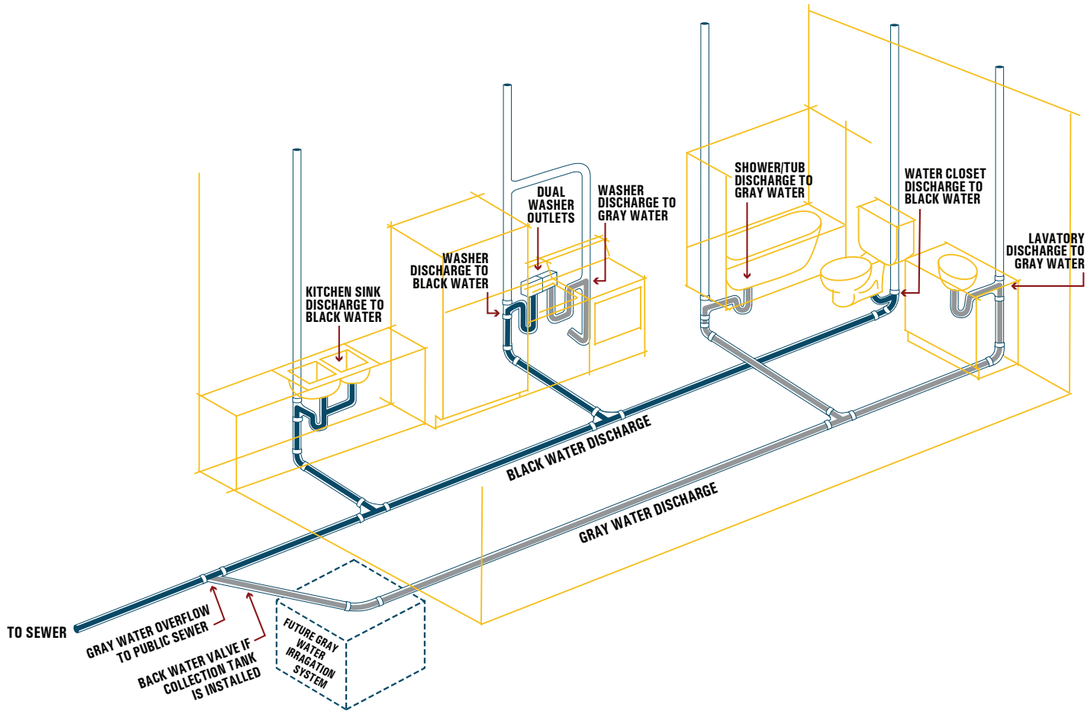
Estimated gray water flow = 5 x 15 = 75 gpd

AVERAGE GRAY WATER AMOUNTS:

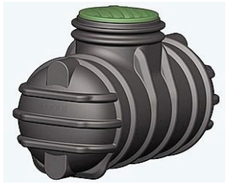
- ✓ 32% of the typical household wastewater generated is gray water.
- ✓ The average is 28 gallons/person/day.

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:

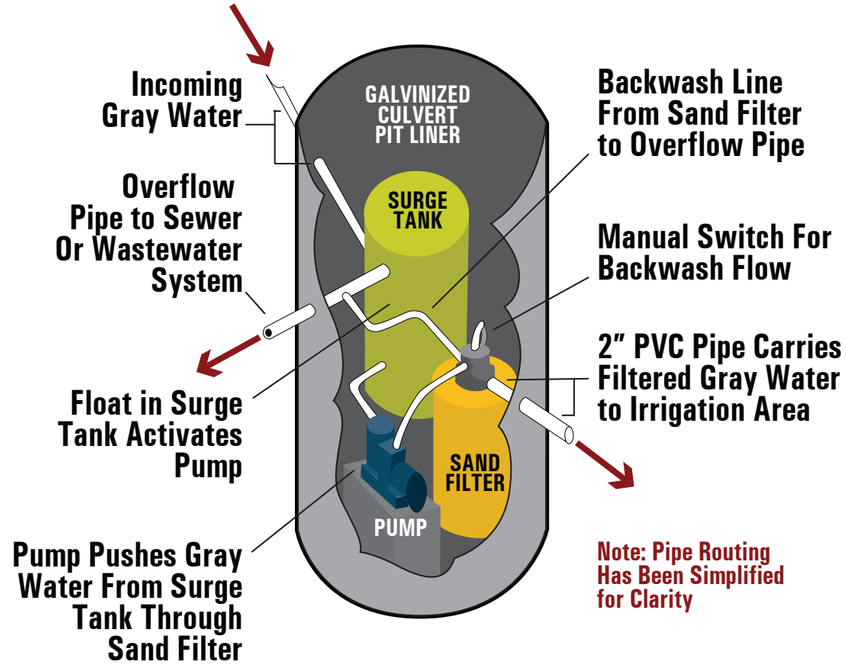
- ✔ 3-waydiverter valve
- ✔ Double Elbow fitting may be best for the gravity splitter
- ✔ PVC Ball/Valves/ Pipes may be used for pressure/pumped systems

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



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, dicentra, 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.

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

*** SOURCE: "Grey Water and Your Detergent"** by Tucson Water, copyright 1993

THE #1 RULE WHEN UTILIZING GRAY WATER:

✓ Do Not Spray Gray Water

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)

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.

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.

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.

LANDSCAPE DESIGN EXAMPLE

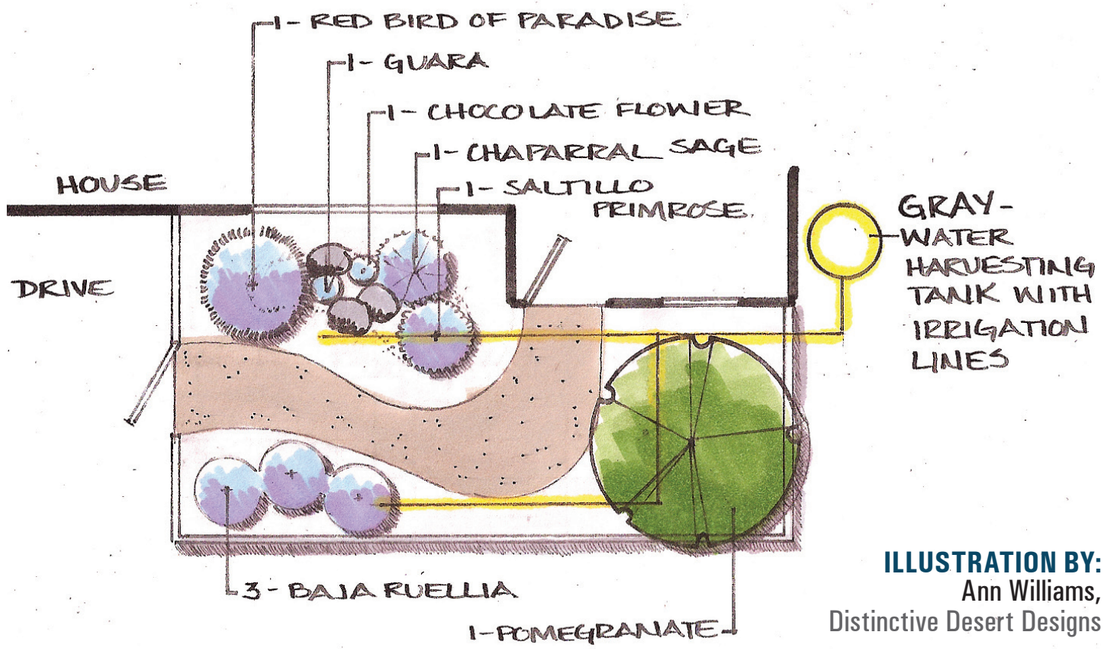


ILLUSTRATION BY:
Ann Williams,
Distinctive Desert Designs

RED BIRD OF PARADISE = CAESALPINIA PULCHERRIMA

SALTILLO PRIMROSE = OENOTHERA STUBBEI

CHAPARRAL SAGE = SALVIA CLEVELANDII

DAMIANITA DAISY = CHRYSACTINIA MEXICANA

LITTLE LEAF CORDIA = CORDIA PARVIFOLIA

POMEGRANATE

PSILOSTROPHE TAGETINA = WOOLLY PAPERFLOWER

CHILE PEQUIN = CAPSICUM ANNUUM

DESERT GLOBEMALLOW = SPHAERALCEA AMBIGUA

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,"**
  by Art Ludwig, copyright 1994 Art 1994-2005.

NOTES:

CITY OF TUCSON

RESIDENTIAL GRAY WATER

INFORMATION GUIDE

Tucson Water
P.O. Box 27210
Tucson, AZ 85726-7210