

Laundry-to-Landscape (L2L) Graywater Systems Presentation Slides

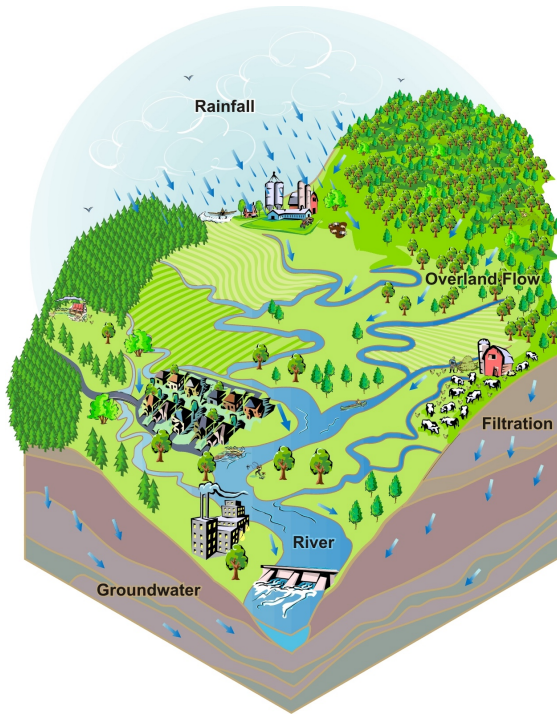
San Francisco Public Utilities Commission

Welcome!

This L2L training presentation has 3 sections that detail the following:

- Graywater Basics
- L2L indoor portion
- L2L outdoor portion

Natural Watershed



Urban Watershed



We live in a watershed, we just don't know it.

Being water conscious starts with **WATER CONSERVATION**

3 most water intensive activities in our homes:

- **Toilet flushing** – get low-flow toilet (SFPUC rebate)
- **Laundry** – front loading washers use half the water of top loaders
- **Landscaping** – watering outdoor plants is 1/3 of residential water use
- **Re-using water in the garden is important!**

What is Graywater?

It's water from...

- Showers and baths
- **Clothes washing machines**
- Bathroom sinks
- *Water from kitchen sinks is not considered graywater in CA*

It's NOT from...

- Toilets or diaper wash water

Graywater Can...

- Reduce water use by 16-40%
- Save energy used to transport, clean, and treat water
- Reduce strain on **SF's combined sewer system**
- Encourage healthy product choices
- Connect people to their backyards and show the benefits of re-using water
- Facilitate local food production

Graywater Basics

- Graywater systems are not meant to be installed and then forgotten.
- They should be connected to your water use and plant needs.
- No ponding or runoff
- Cannot be stored more than 24 hours
- No spray
- Minimize contact
- Outlets must be 2” below surface

Other Graywater Systems

Graywater systems that require a PERMIT:

- Graywater systems that collect graywater from showers, sinks and baths
- Plumbing is altered (cut into to drainage plumbing to access graywater)
- System includes a pump
- Building is larger than 1-2 units
- **L2L systems do NOT require a permit!**

Down to Earth - Your Soil

How quickly will water infiltrate your soil?

- Dig a 1-ft hole to see if groundwater seeps in
- Fill hole with water and measure how much will drain in 1 hour (must drain 1"/hr)
- Percolation test done after soil is saturated
- Protect groundwater – graywater should happen 3 ft above water table
- Jar Test

Estimate Graywater flow

Top Loading washing machine

- 30 – 50 gallons per load

Front Loading washing machine

- 15 – 25 gallons per load

How many loads per week?

Laundry habits - all at once on the weekends or spaced throughout the week?

Soaps and Products

Things to avoid for happy plants

- Salt (sodium compounds)
- Boron (borate)
- Chlorine bleach (hydrogen peroxide bleach okay)

Recommended products (salt and boron free)

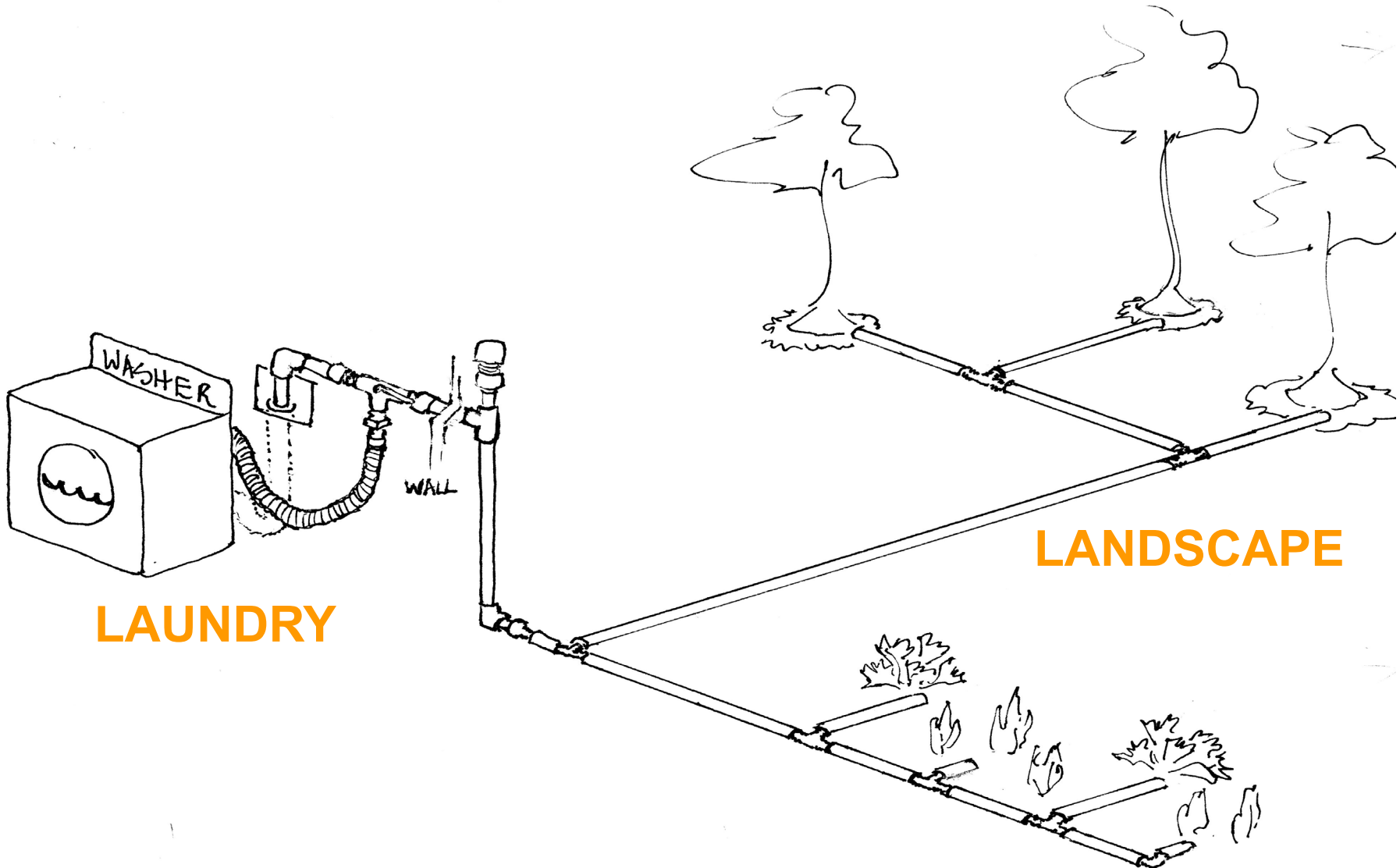
- Liquid laundry detergent - Oasis, ECOS, soap nuts
- No powdered detergents!

Guiding Questions for your Design



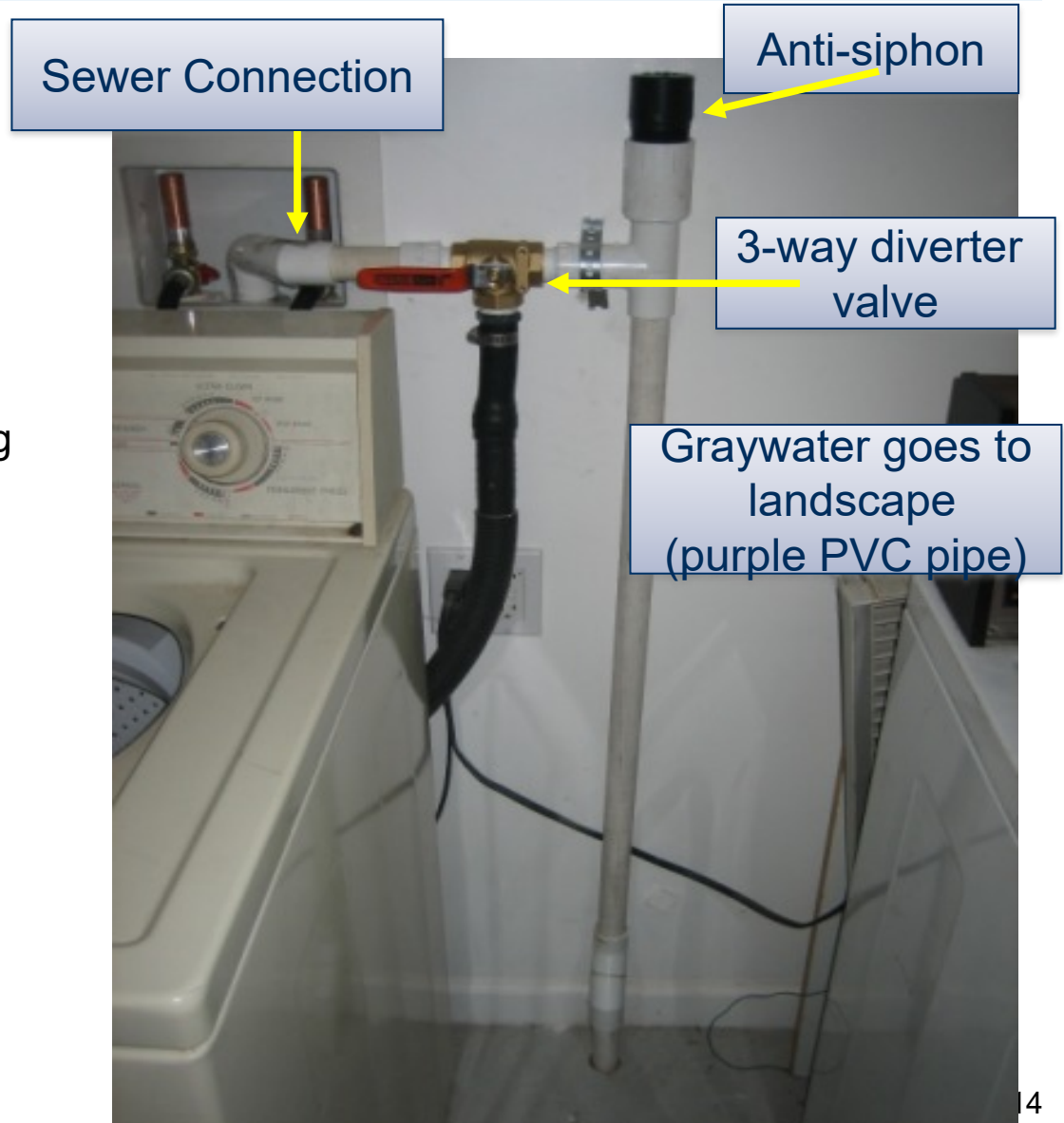
- How can you maximize water savings with your graywater system?
- How can you increase the ecological productivity of your landscape?
- What do you want to irrigate?

Laundry-to-Landscape (L2L)



L2L System Essential Components

- 3-Way Diverter Valve
- Anti-Siphon valve
(Prevents a siphon from draining machine as it tries to fill)
- PVC pipe for conveyance to landscape

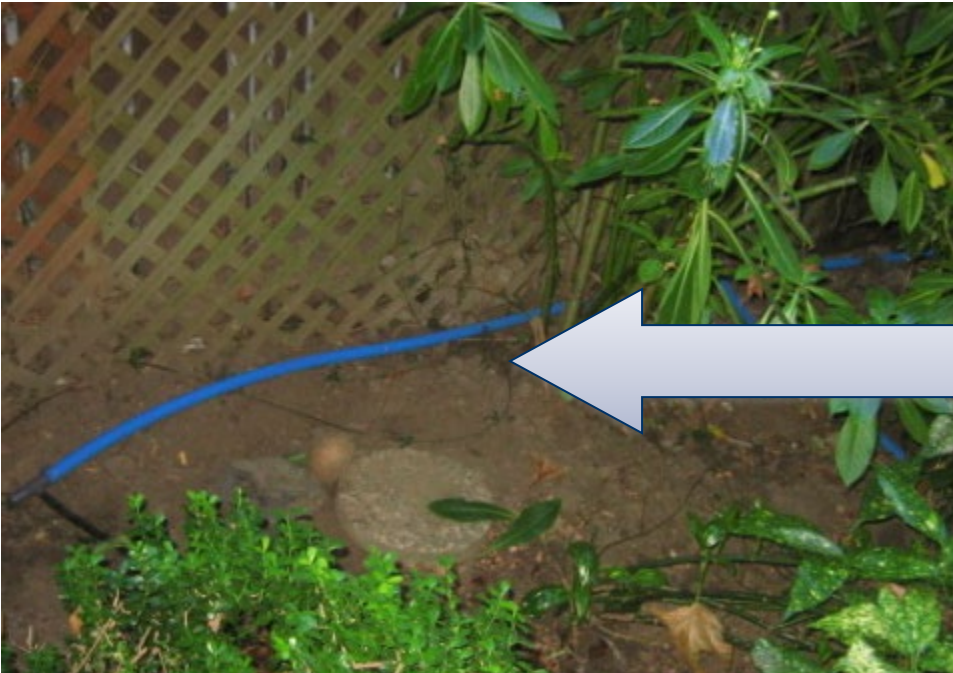


In the Landscape

Trench, stake and bury
tubing



or run tubing along
walls or fences.
Try to keep out of sun.



Distribution Points



Code requires that you discharge graywater under 2 inches of mulch

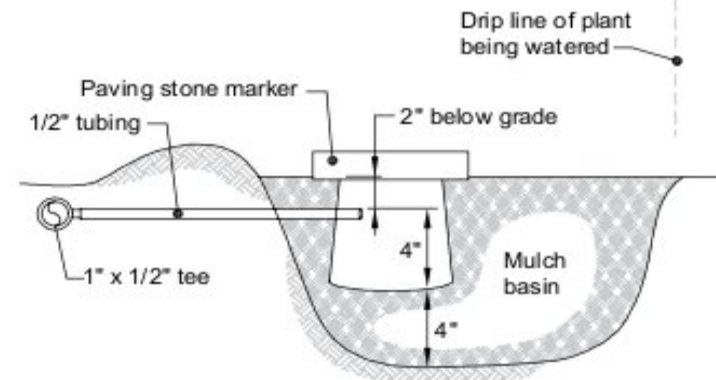
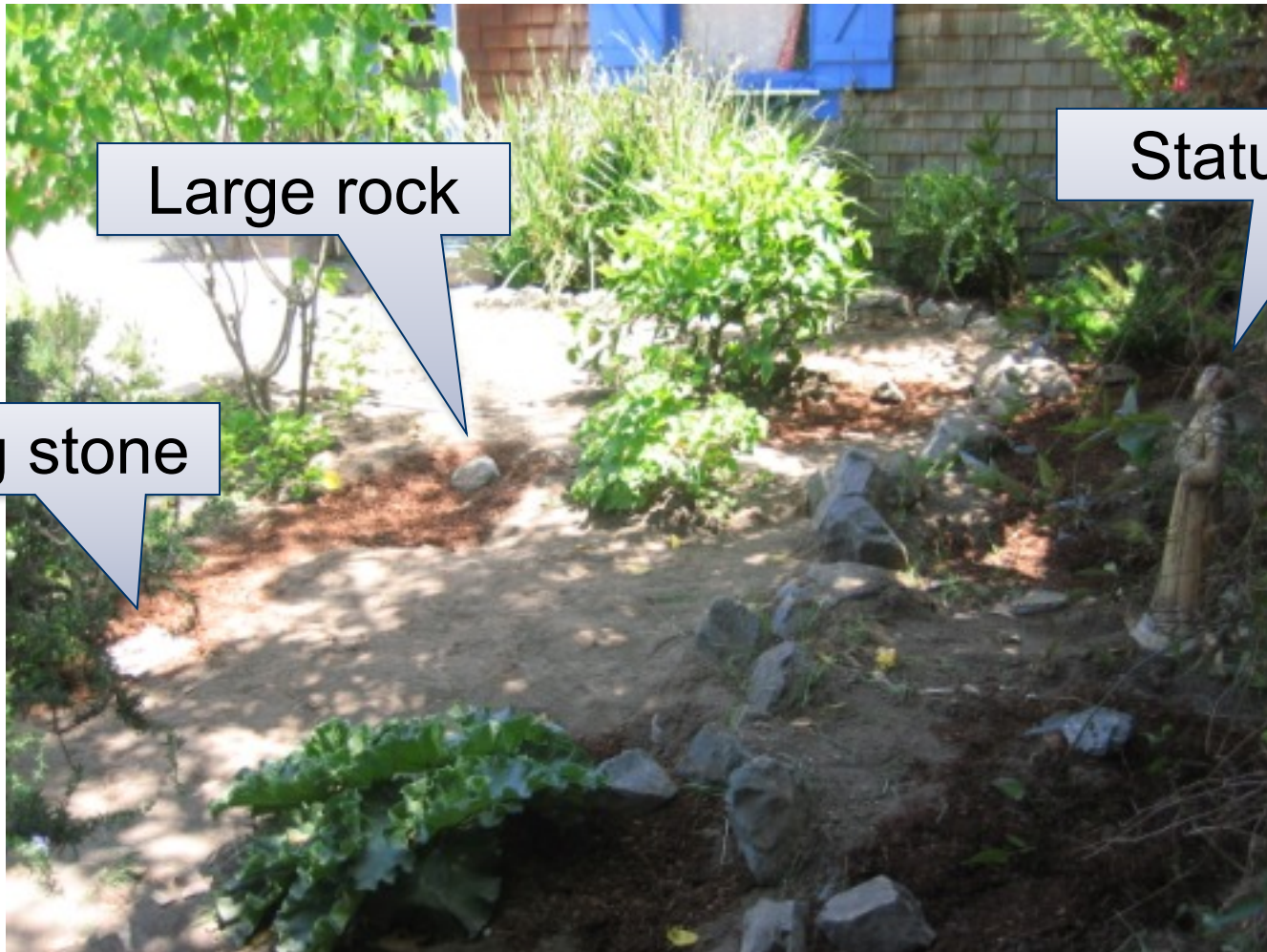


Figure 4. Mulch shield placement.



1/2 inch lines irrigate from the 1-inch mainline

Hidden Outlets

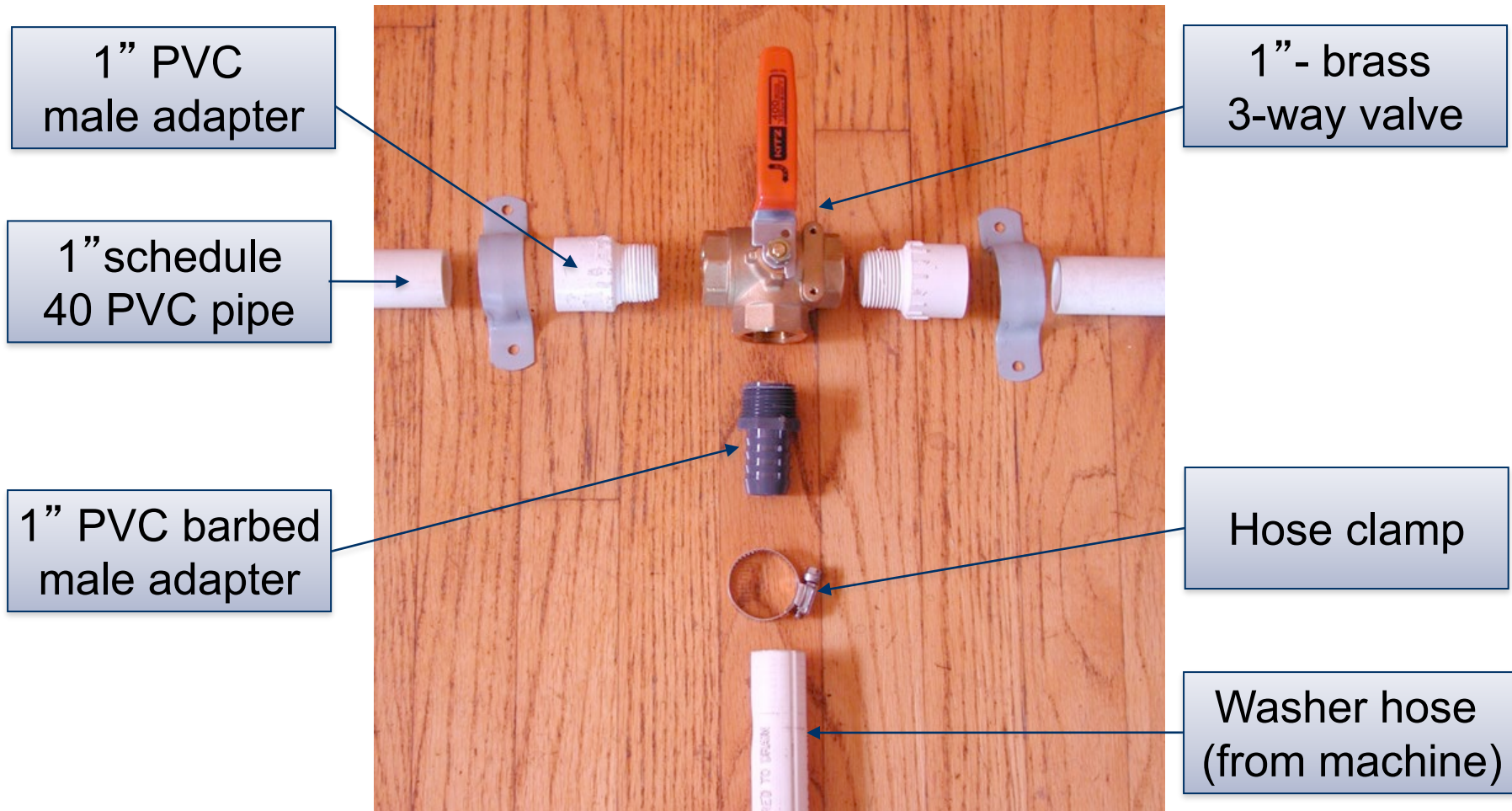


Any Questions?

**Review time for Section 1 - Graywater
Basics**

**The next section will focus on the indoor
portion of the L2L installation...**

Step 1: Connecting the 3-way valve



Teflon tape threaded fittings

Teflon tape helps prevent leaks.

- Wrap tape **CLOCKWISE** around threads.
- Wrap several times over threads.
- Don't “cross-thread” when screwing fitting into 3-way valve.
- Tighten with channel locks, but do not overtighten!



3-way Valve Configurations



1. 3-way Valve must be above **“flood rim”** of machine
2. Washer hose must connect to middle port
3. Use teflon tape on threads and glue on slip connections to make water-tight connections



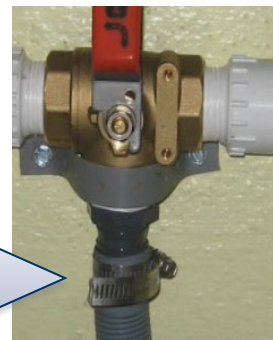
For Tricky Sewer Connection



Clothes washer hose used to
make connection into
sewer standpipe

Tips for Connecting Washer Hose

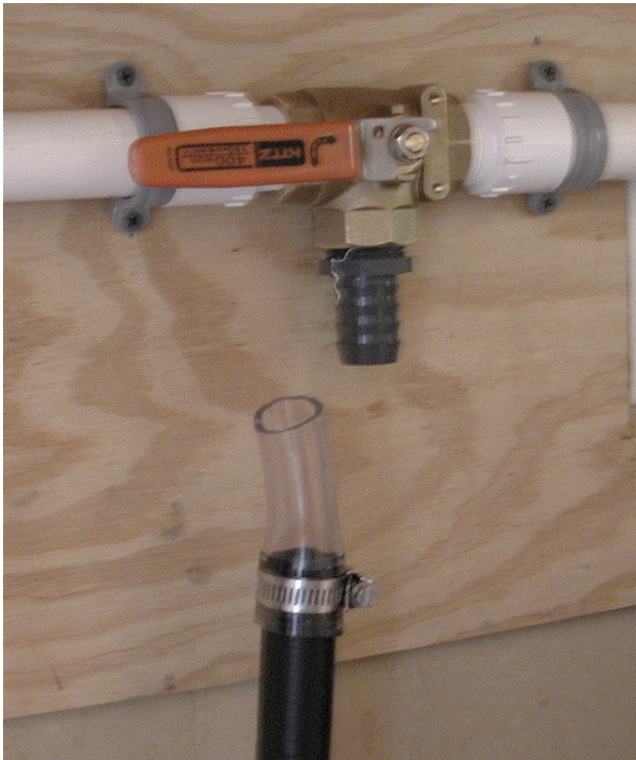
1. Select correct size adapter to fit the washer's hose (usually 1" but sometimes 3/4" and very rarely 1.25")
2. If difficult to slip hose over barb, heat hose with hair dryer or hot water, then forcefully push on
3. Secure with hose clamp



Troubleshooting Tips for Connecting Washer Hose

If washer hose connection leaks (rigid hose)

- Connect with piece of vinyl tubing
- Tighten hose clamp, add 2nd hose clamp



Step 2: Strap Pipe / 3-way Valve

- Use 2-hole straps or plumbers tape
- Add wood blocking as necessary (**screw into studs**)
- Strap so 3-way valve is secure

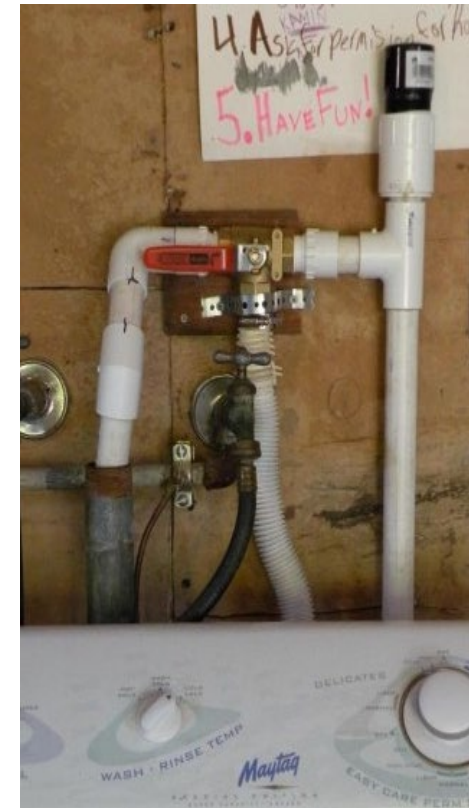
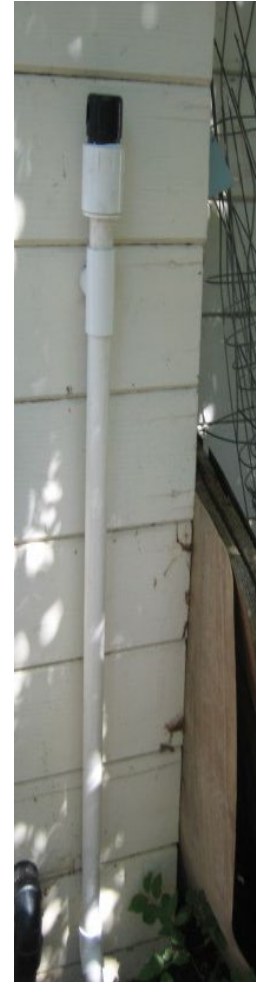


Step 3: Drilling Hole for PVC Pipe to Exit (through the wall / floor)

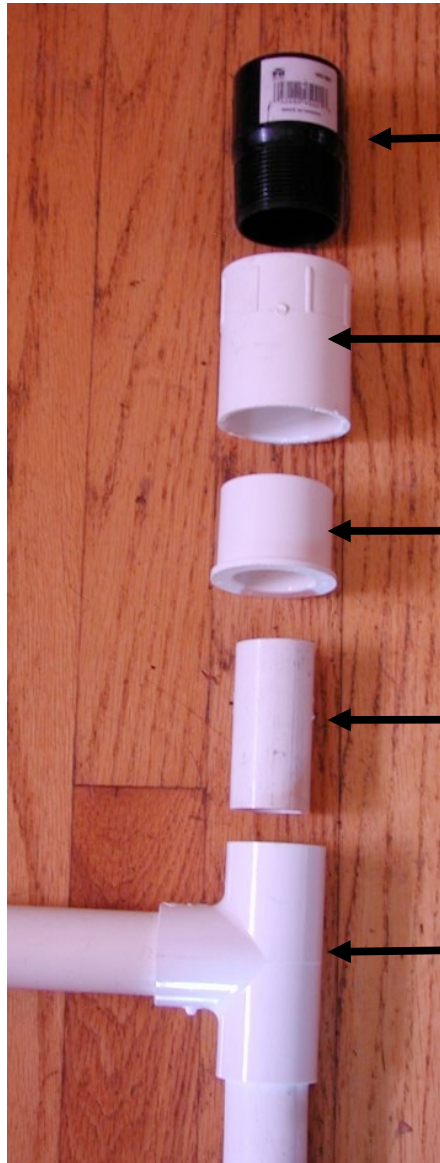
- Look for potential issues (electrical lines, gas pipes, etc.)
- Drill a 1/4" pilot hole
- If no obstructions, drill hole for 1" PVC with 1½" holesaw (drill from outside in and inside out for a clean looking hole)
- Use proper bit for your wall / floor (wood bit, stucco bit, etc.)

Step 4: Anti-siphon Component

- An **anti-siphon** is used to prevent a potential siphon from forming and draining the machine as it tries to refill.
- Must be at **high point** of system **on pipe going to landscape**
- Must be accessible in case of leaks and for replacement
- Auto-vent is included in your L2L kit



Assembling the Anti-siphon Component (purple PVC pipe)



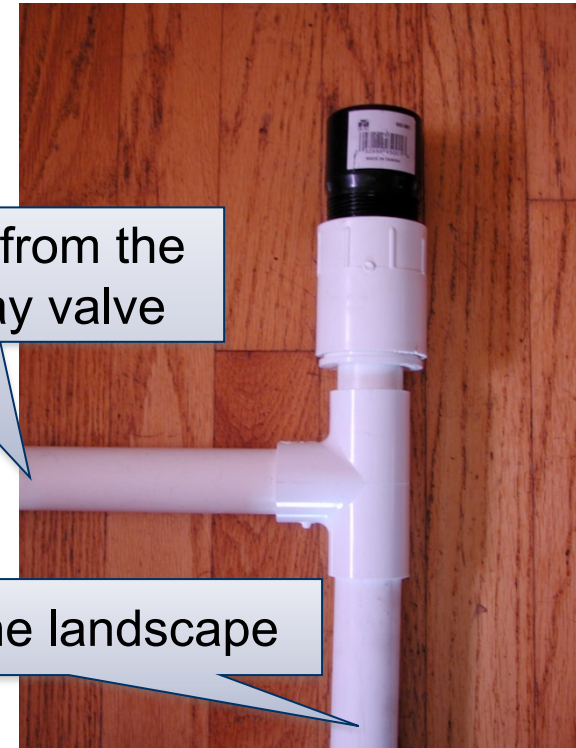
← Autovent (1 ½" threads)

← 1 ½" FPT (female pipe threads) by slip coupling

← Reducing bushing 1 ½" x 1" slip

← 1" schedule 40 PVC pipe

← 1" PVC tee



Flow from the
3-way valve

Going to the landscape

Placement of Anti-siphon Valve

- High point
- Accessible / visible
(not behind a wall)



Step 5: Plumb to Hole

Cutting PVC pipe:

- Use PVC cutters or handsaw
- Remember to calculate the length of pipe that will “slip” into the fitting when figuring your measurements
- Use as few fittings as possible to minimize friction
- Use **purple pipe** to indicate graywater

Step 6: Plumb to Sewer Connection

Gluing PVC pipe:

- Clean and dry pipe
- Apply glue to the inside of the fitting “hub” first
- Then apply glue to the outside of the pipe
- Push together quickly, inserting all the way. Twist and hold a second as it will try to push out



Step 7: Label Pipe and 3-way Valve

- **Label pipe:** “Caution: Non-potable water, do not drink”
- **Label valve:** show/diagram direction of graywater



A tight fit!

- Stacked washer in closet - limited space



Tricky Exits...



Outside Portion of a L2L System

- Determine graywater production
- Calculate plant water requirements
- Identify which plants you want to irrigate
- Plan the path of travel
- Prepare the landscape
- Comply with the code

Estimate Graywater Production

1. Number of loads of laundry done each week?
2. Number of gallons per load?
 - Top loading machine uses ≈ 40 gallons/load
 - Front loading machine uses ≈ 20 gallons/load
3. Future changes?
 - New machine? Change in usage? Change in landscape?

Weekly graywater produced = loads per week x gallons per load

Plant Water Requirements

In San Francisco...

- A small-medium sized **tree needs about 10-20 gallons per week**
- A small-medium sized **shrub needs about 5-10 gallons per week**
- A drought tolerant shrub needs about 2-4 gallons per week

These are very rough estimates. Plant water requirements are affected by microclimate, sun and wind exposure, size and type of plant, ground water depth, etc. Get to know your plants!

Plant Water Requirements

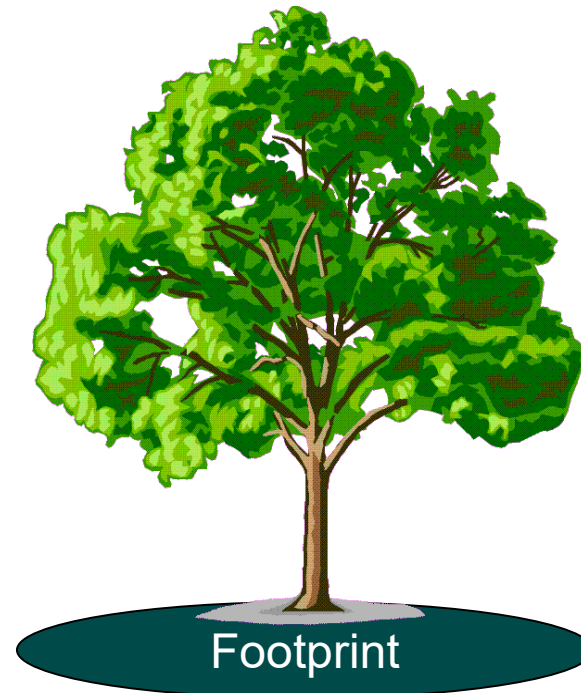
In San Francisco, a general rule of thumb:

- For each **square foot** of the plant's **footprint**; assume a weekly need of **1/4 gallon** water per week.

This rule of thumb number is for peak irrigation time.

You don't need to irrigate this much most of the year.

Try and stay within 30% of this number.



The footprint is the area beneath the canopy

Finding Plant Water Requirements

How many gallons per week would a fruit tree need during peak irrigation season if it had a **4 foot radius**?

Footprint = Area of a Circle

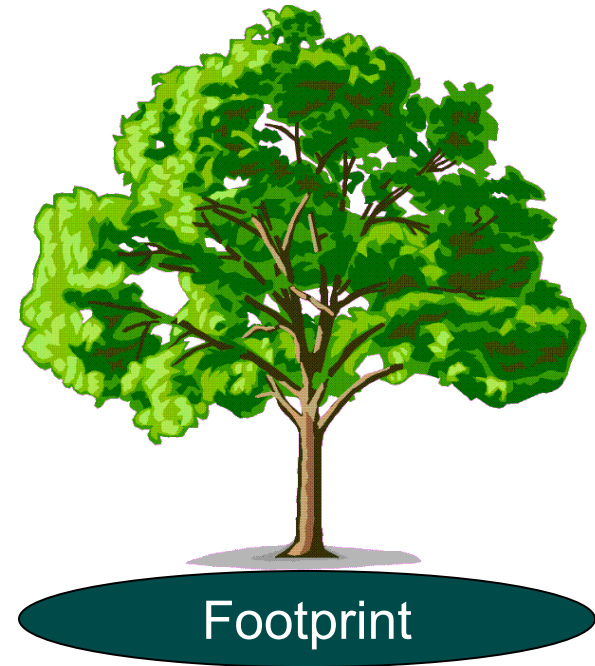
$$\pi r^2$$

$$3 \times 4 \times 4 = 48 \text{ square feet}$$

Divide by 4 (1/4 gallon of water per square foot of footprint)

$$48 / 4 = \mathbf{12 \text{ gallons per week}}$$
 during peak irrigation months

If it's a drought tolerant plant, divide by 2 again = 6 gallons per week



Easiest and Hardest Plants to Water

Easiest:

1. Trees (fruit trees are the best!)
2. Shrubs and bushes
3. Vines
4. Perennials
5. Large annuals

Note about food crops: *graywater can't touch the edible portion, so*
NO root crops

Hardest:

1. Lawns (no spray)
2. Drought established (eg. never irrigated)
3. Small plants
4. Sensitive plants (eg. ferns)
5. Raised beds

Plants with **larger root zones** do better with irrigation from the washer
i.e. stay happy with laundry water use patterns

Best plants for GW?

Which of the following types of plants are best suited for graywater?

Potted Plants



Pear Tree



Meyer Lemon Tree



Graywater to Vegetable Garden?



Landscape Considerations

- Irrigate areas closest to the washer and **NOT uphill**
- Irrigate larger plants (trees, shrubs, perennials)
- Washer type:
 - Top-loading machines: up to 16 outlets possible (or less!)
 - Front-loading (or top high-efficiency) machines: 8 outlets possible (or less)
 - **You may only have 3 or 4 zones to irrigate**

Setbacks for Irrigation Fields

- 2 ft from buildings
- 18-inches from property lines
- 100 ft from wells or creeks
- 5 ft from septic tank
- 4 ft from leach field
- 3 ft above groundwater table

What Plants Will You Irrigate?

Consider:

- Gallons per week of graywater
- Plant water requirements
- Choose what plants you'll irrigate
- For those with existing irrigation systems, try and find a zone you can shut off and replace with graywater

Piping to the Landscape

- Pipe around obstacles
- Try to maintain a downward slope whenever possible



Hardscape

Go under it
Go around it
Remove it
Cut a strip of it



Slope Considerations

Be mindful of the washing machine pump!

- In a **flat yard**, distribution should be within **50 feet**
- If site slopes downward to distribution points, no rule on distance
- Serpentine tubing to slow graywater flow on downhill slopes
- **Leave a 1" open end to protect the machine's pump**

If the distribution points are uphill, a L2L graywater system is NOT recommended.

Dig Trench and Lay Tubing to Basins



Keep tubing out of the way, and out of sunlight. Stake down as needed

Downward Slope

Serpentine the tubing on a downward slope, to slow water flow.

Irrigate on upper side of plant

Don't plug the end!



Cut in 1½-inch Tees Add ½-inch Tubing as Needed



Tips for working with tubing:

- *No kinks (cut them out)
- *Dip end of tube in hot water to soften plastic
- *Minimize ½ inch tubing

Mulch Basins

- Size basins so all graywater soaks in with **no ponding**.
- Dig in “**drip line**” of plant - where branches (& roots) end
- **Size depends on quantity of graywater and soil type**
- In **clay soil**, approximately **1 square foot of basin** is needed **per 1 gallon of graywater (daily)**
- In **sandy-loam** approximately **1/2 square foot of basin** is needed **per 1 gallon of graywater (daily)**



Mulch Basins

- Basins can be any shape, typically they are:
 - circular (around tree)
 - semi-circle (around 1 side of plant)
 - trench (in front of plants)
 - star (radiate out from the middle)
- Clay soils require larger mulch basins
- Sandy soils can have smaller mulch basins
- Place them where it's convenient
- Put basins between plantings so plants can share irrigation water

A Point of Clarification

- Use WEEKLY graywater production to decide how many plants to water.
- Use DAILY MAXIMUM FLOW and soil conditions to determine size of mulch basins.

Mulch Basin Construction

Example: Clay-rich soil, circular basin
3 loads of laundry (on Saturdays)
Lots of graywater in one day
(clay soil needs 1 sq ft basin / gal)

20 gallons per load to water 6 trees.
3 loads x 20 gal / load = 60 gallons
60 / 6 trees = 10 gallons per tree

Each tree needs at least 10 square feet of basin.

This example basin is BIG - 24 sq feet
For clay soil with weekend laundry use

(circumference = $2\pi r$) $2 \times 3 \times 4 = 24$ sq ft



Mulch Shield: Prevents Roots from Clogging Outlets

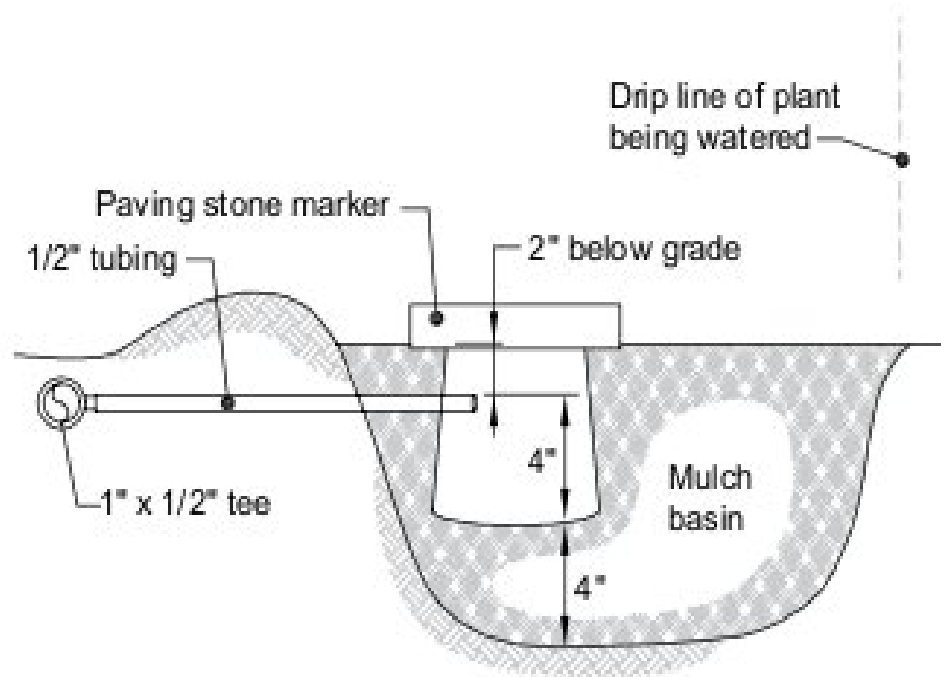


Figure 4. Mulch shield placement.

Image from SFPUC Graywater Design Manual

Mulch Shields

Use small “valve box”

Drill hole for graywater
tube 2” below top

Basin should be 3-4” deeper than
mulch shield so graywater falls
through air onto mulch



Or ready-made round shield



Avoid Clogs

- **Use full port valves** (that have large orifice inside)
- Minimize use of ball valves
- Open outlet is best
- Check for clogs when valves are used



Follow-up

- Bury tubing
- Check for leaks inside
- Paint exposed PVC pipe
- Caulk holes
- **Post sign / diagram**
- Post maintenance manual
- Get graywater friendly soap
- Finally, do laundry and water plants!

Ch. 16A in CA Plumbing Code

Do's

- Have a **3-way valve**
- **Label system**
- **Discharge under 2"**
mulch/rock/cover
- Direct water to irrigation
or disposal field
- Minimize contact
- Document set-up
- Create a maintenance
manual

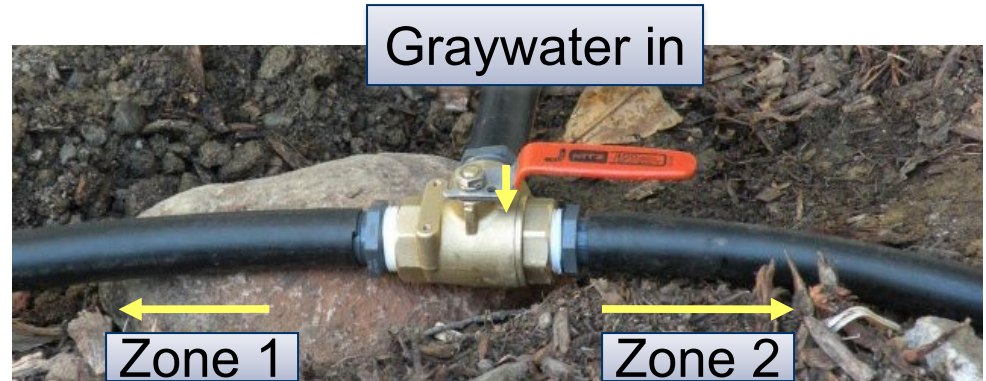
Dont's

- Ponding or runoff
- Discharge into neighbor's
yard (follow setbacks)
- Connect to potable water
supply
- Include a pump
- Alter existing plumbing
- Use diaper wash water or
hazardous chemicals (oily
rags, etc.)
- Violate codes/laws

Two-zone Graywater System

For a house that produces lots of graywater...

- A 2nd 3-way valve in the landscape creates zones.
- Must be switched manually.
- Additional 1" line can be controlled with 1" ball valve to shut off or reduce flow.



Key Points for L2L System

- From washing machine only
- 3-way valve installed above flood rim of washer
- Needs 1" PVC pipe (purple), 1" and 1/2" flex tube
- Anti-siphon used (auto-vent) at high point *on landscape side*
- No graywater storage
- Use large, chunky woodchips (mulch) in basins
- 1" open end in systems
- No additional pump

Sketch the Outside Portion of your L2L System

Write down materials you'll need and lengths of pipe and tubing:

Will you need any extra 1" x 1" x 1" tees?

How many 1" x 1/2" tees will you need?

Remember, the end of the tubing will be fully open and located in a mulch basin to irrigate a plant



Current Services & Incentives

Indoor Assistance

- Free water-wise evaluation phone consultations
- Water-saving device distributions (showerheads, shower timers, aerators, hose nozzles, toilet parts, pre-rinse spray valves, etc.)
- Free toilet & urinal replacement program
- Commercial & resi clothes washer rebates
- Commercial equipment rebates

Education & Outreach

- School curriculum, presentations, field trips
- Gardening, plumbing and leak guidebooks
- Social media and regular outreach

Outdoor Assistance

- Landscape plan review and certification
- Free irrigation & landscape phone consultation evaluations
- Rain barrel and cistern rebates
- Laundry-to-landscape rebates
- Large landscape tech assistance & grants
- Community garden irrigation grants

Water Use Tools & Resources

- Check your water use - [MyAccount Webpage](#)
- Leak alerts
- Water waste alerts and follow up

Technology and Tools

- Expanded Leak alert program
 - Account holders, occupants and property owners of single family, multi-family, and irrigation customers now notified by email, text, robo call, and letter about constant water use over 7.48 gallons for 3 days or more.
 - [MyAccount online portal](#) – hourly water use data now available!
 - Customers can now apply online for some conservation programs, more coming soon!



SFPUC 1of4: ** SFPUC LEAK ALERT - NOTICE #1 ** Our data shows nonstop water use of at least 15 gal/hr at 221 3rd Av. This may mean you have a

2of4: plumbing leak. Log onto [MyAccount.sfwater.org/?ID=9710400580170802](https://myaccount.sfwater.org/?ID=9710400580170802) to check for unusual increases in water use and visit

3of4: sfwater.org/homeleaks/?ID=9710400580170802 for tips. For questions call (415) 551-3000 weekdays 8-5 or email

4of4: customerservice@sfwater.org. Thank you.

Wed 3:08 PM

Thank you for Participating!

**For follow-up questions contact us at
waterconservation@sfwater.org or by calling
415.551.4730**

**When you are ready to apply for your
Laundry-to-Landscape Rebate, visit
[Save Water Outdoors | SFPUC](#)**