Stormwater and GSI - Setting the Stage

and

Rain garden and cistern sizing

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Trainings for contractors, 11/3/2011

www.seattle.gov/util/rainwise

Seattle's Drainage System

- Pink – separated
- Green – partially separated
- Yellow – combined

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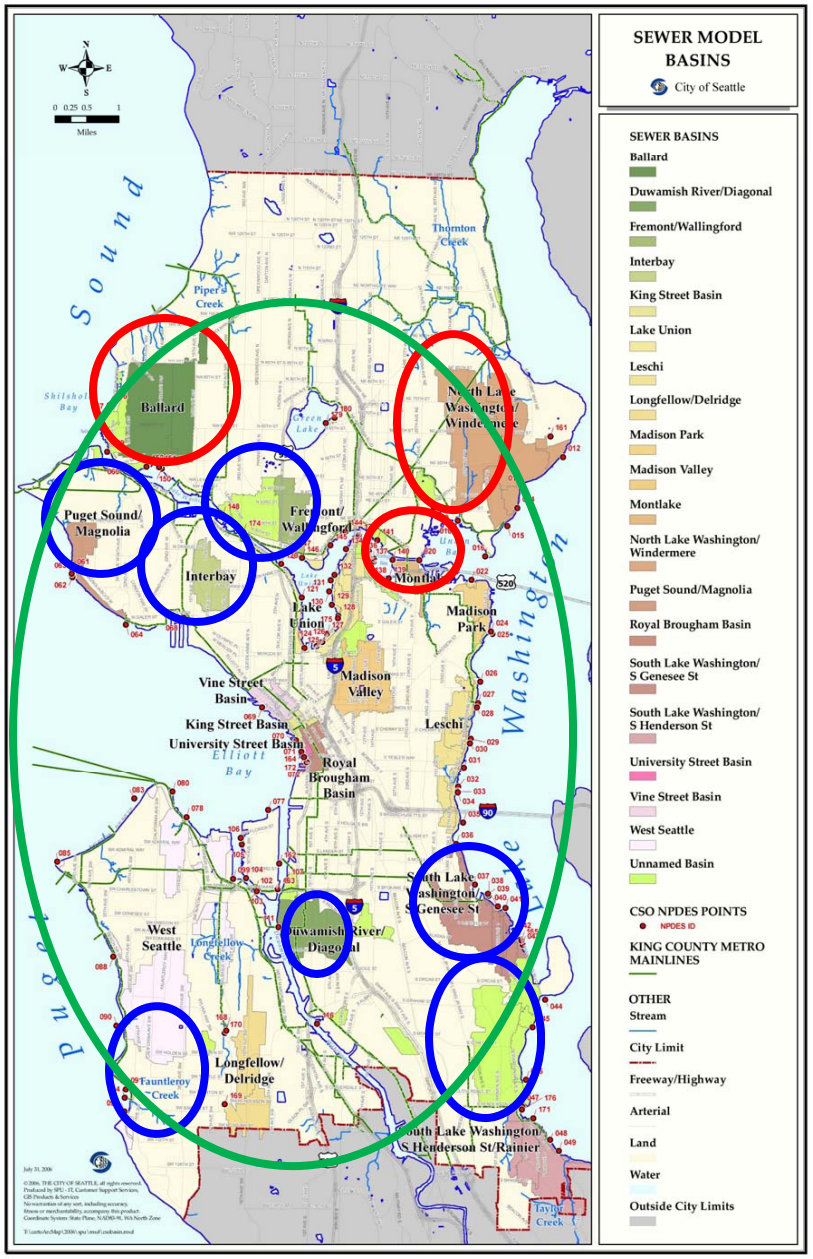
Green Stormwater Infrastructure for Creek Goals

Green Stormwater Infrastructure for Combined Sewer Overflow control

- Ballard
- North Union Bay
- Interbay
- Evaluating additional basins (blue circles)
  - *Barton (lead by King County)*
  - *Magnolia (lead by King County)*
  - *Genesee*
  - *Henderson*
  - *Montlake*
  - *Lake Union*
  - *West Seattle*
  - *Fremont/Wallingford*



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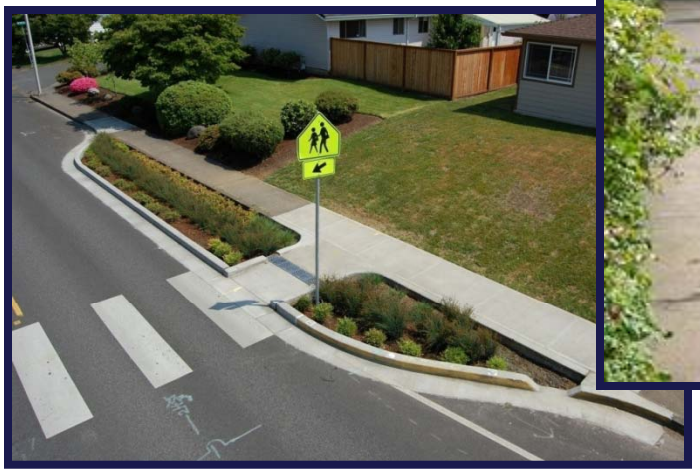
Next steps- Green Stormwater Infrastructure for Climate Adaptation? (Evaluating)

Stormwater Code: Green Infrastructure to the Maximum Extent Feasible



Stormwater Code: Green Stormwater Infrastructure to Maximum Extent Feasible (MEF)

- All new projects that trigger stormwater code, which generally includes projects that involve:
  - Grading >7,000 SF
  - New and replaced impervious surface >2,000SF
  - New single family residential dwellings
- Green Stormwater Infrastructure (GSI) to MEF required on ALL projects that trigger stormwater code
- GSI to MEF limited only by:
  - Engineering Design Feasibility
  - Physical Limitations of the Site
  - Economic Feasibility

Bioretention Sizing Factors for Stormwater Code Prescriptive Flow Control Standard

BMP	Design Infilt. Rate (in/hr)	Creek Standard	Capacity Standard	Treatment Standard
Bioretention Cell				
2 inch ponding depth	0.25	23.0%	--	--
	0.5	15.8%	--	--
	1.0	9.3%	--	--
6 inch ponding depth	0.25	14.6%	33.1%	5.0%
	0.5	9.9%	20.5%	2.9%
	1.0	6.4%	10.6%	1.6%
12 inch ponding depth	0.25	8.9%	19.3%	3.0%
	0.5	6.5%	13.4%	1.7%
	1.0	4.1%	6.7%	0.9%

Bioretention Sizing Factors for Rainwise

BMP	Design Infilt. Rate (in/hr)	Rainwise Sizing, bottom area
Bioretention Cell		
6 inch ponding depth	0.25	7.4%
	0.5	4.6%
	1.0	2.8%

E.g.. Site with 0.25”/hr infiltration rate.
500 SF roof area X .074 = 37 SF bottom swale area

To convert to top swale area, add slope grading for 8” minimum depth (the 6-inch ponding depth plus 4 inch minimum freeboard). At 2.5H:1V side slope, swale footprint will need (10”x2.5=25”)=~ 2 feet around swale bottom area.

Areas that we do NOT want raingardens

Infiltration Restriction Zones

- Not in Steep Slope Critical Areas
- Not within 300-feet of uphill setback of steep slope (projects for stormwater Code: geotechnical evaluation required and infiltration could be allowed)
- Not within 100-feet of known contaminated site or abandoned landfill

(all above part of screening by Rainwise Tools)

Infiltration Setbacks Screened by designer

- (will be covered by next presentation)

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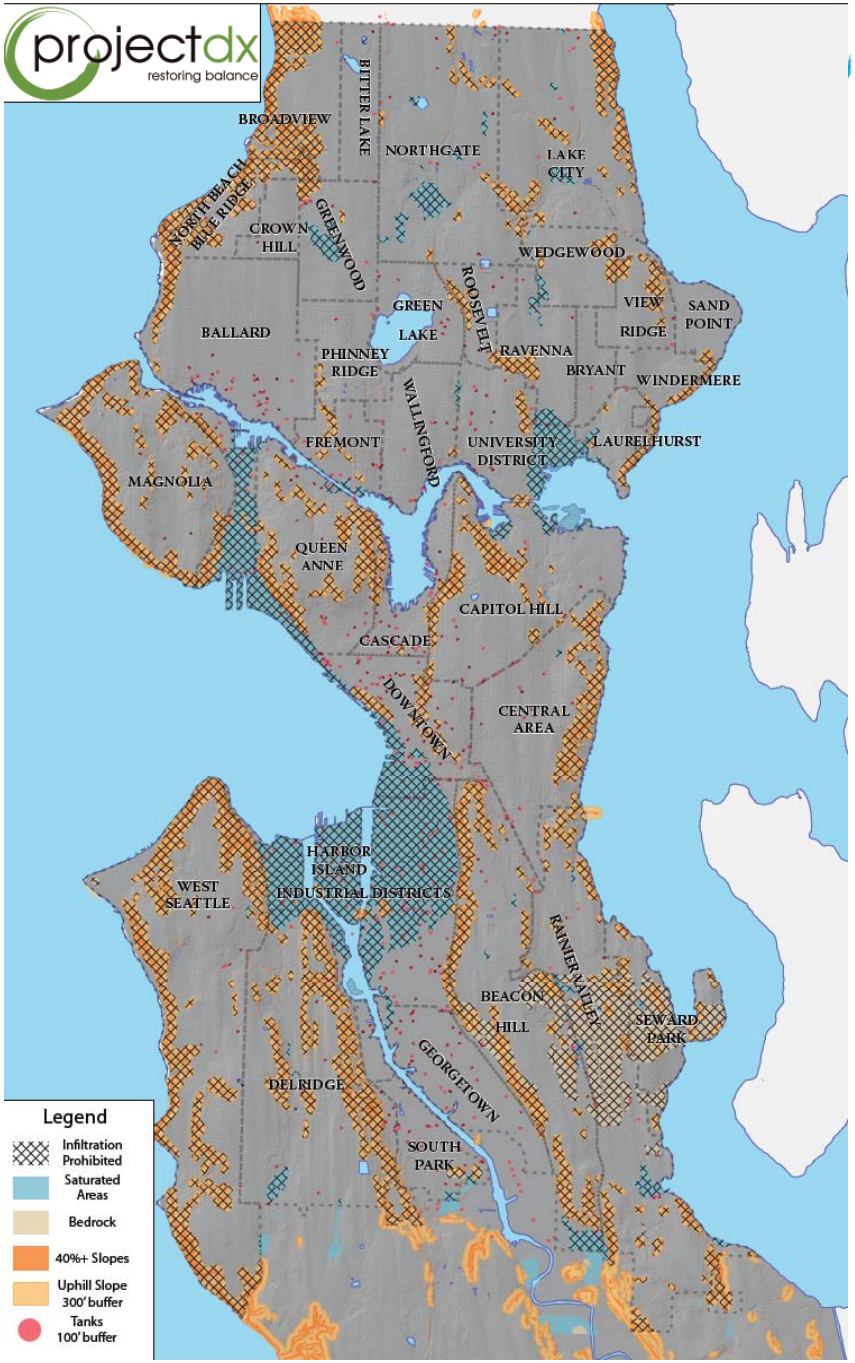
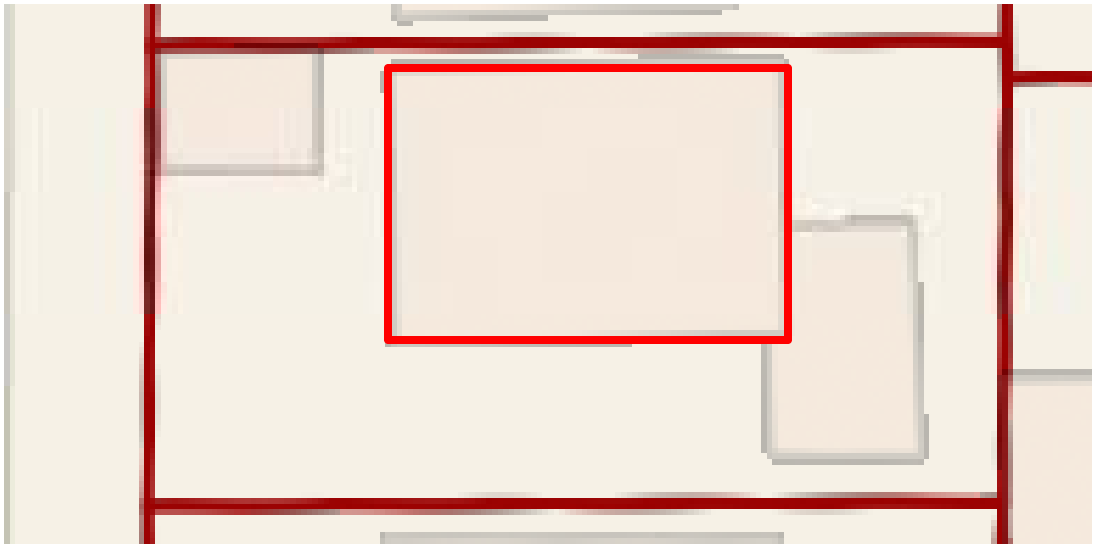
Where we DO NOT want Raingardens: Infiltration Restrictions



Site Scale: Determining Roof Area



Paved Area/ Garage roof

Roof

Paved area/Patio

Yard

Rainwise tools area estimates:

Roof Area: 2138 sf

Paved Area: 1313 sf

Yard Area: 1970 sf

Lot Area: 5421 sf

Site Scale: Determining Roof Area

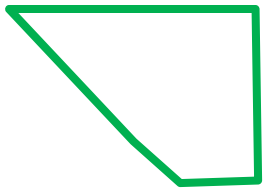
Roof Area (red box) = 47’ x 35’ = 1,645 SF
House has only 2 downspouts
Roof area to raingarden (green)
=25’x35’=875 SF

Goal: plan view area (aka footprint assuming flat roof)

1. Review aerial photo of site (program such as Google Earth)
2. Determine what areas feed to downspout (measuring tool in Google Earth)
3. Measure from ground
4. Calculate contributing Impervious area

Site Scale: Determining Roof Area, Example #2

Roof Area (red box) = approx. 32’ x 32’ = 1,024 SF
House has 4 downspouts
House has chimney, which dictated gutter design on west side of house



Roof area to raingarden (green) =
½ x16x15
+ ½ x16x15
+ ½ x 16x15
+ ½ x6x4
+9x4=408 SF

RainWise Sizing Specifics

1. You must mitigate a minimum of 400 square feet of roof area to qualify for a rebate.
2. No more than 1000 square feet of contributing impervious surfaces may be directed to flow across the sidewalk or into the street from any system.

3 Main Types of Systems

- Rain gardens: 100% rebate
- Cistern to rain garden: 100% rebate
- Cistern to conveyance furrow or side sewer: variable % rebate depending on sizing factors

Getting to eligibility

- ***You must control a minimum of 400 square feet of roof area using one or more rain gardens. You may direct multiple areas to one or several rain gardens to reach the 400 square foot minimum requirement*.**

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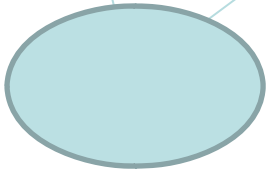
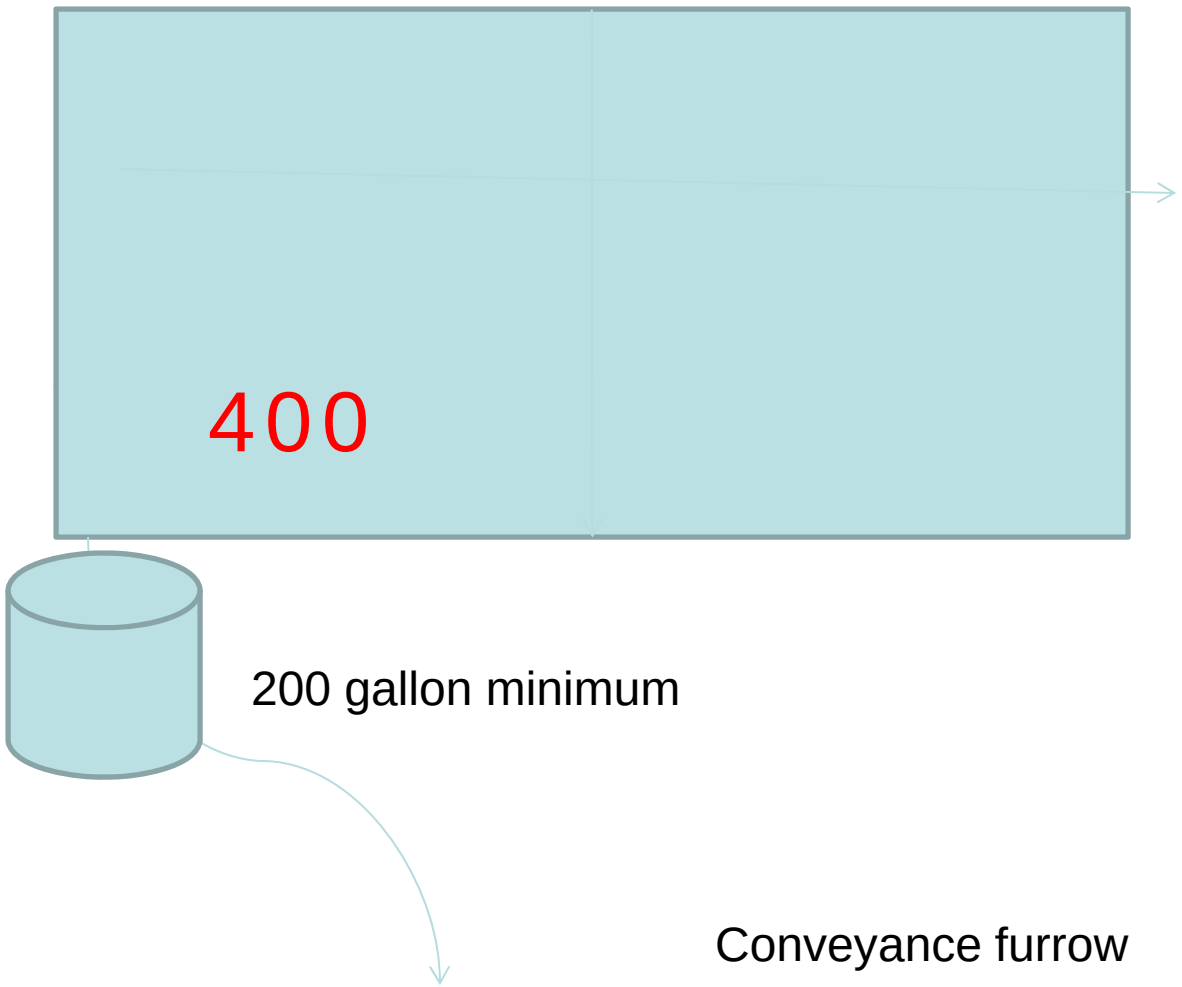
200 + 200 =400



Getting to eligibility

- ***Each cistern installation directing flow to the sewer or a conveyance furrow must control a minimum of 400 square feet of runoff. You may not add roof areas directed to separate cisterns to meet the 400 square foot minimum***
- ***A minimum of 400 square feet of roof area must be directed to one cistern facility of 200 gallons or greater.***
- ***If cistern flows go to a receiving rain garden, roof areas may be added to achieve the 400 square foot minimum***

Getting to 400 with cisterns



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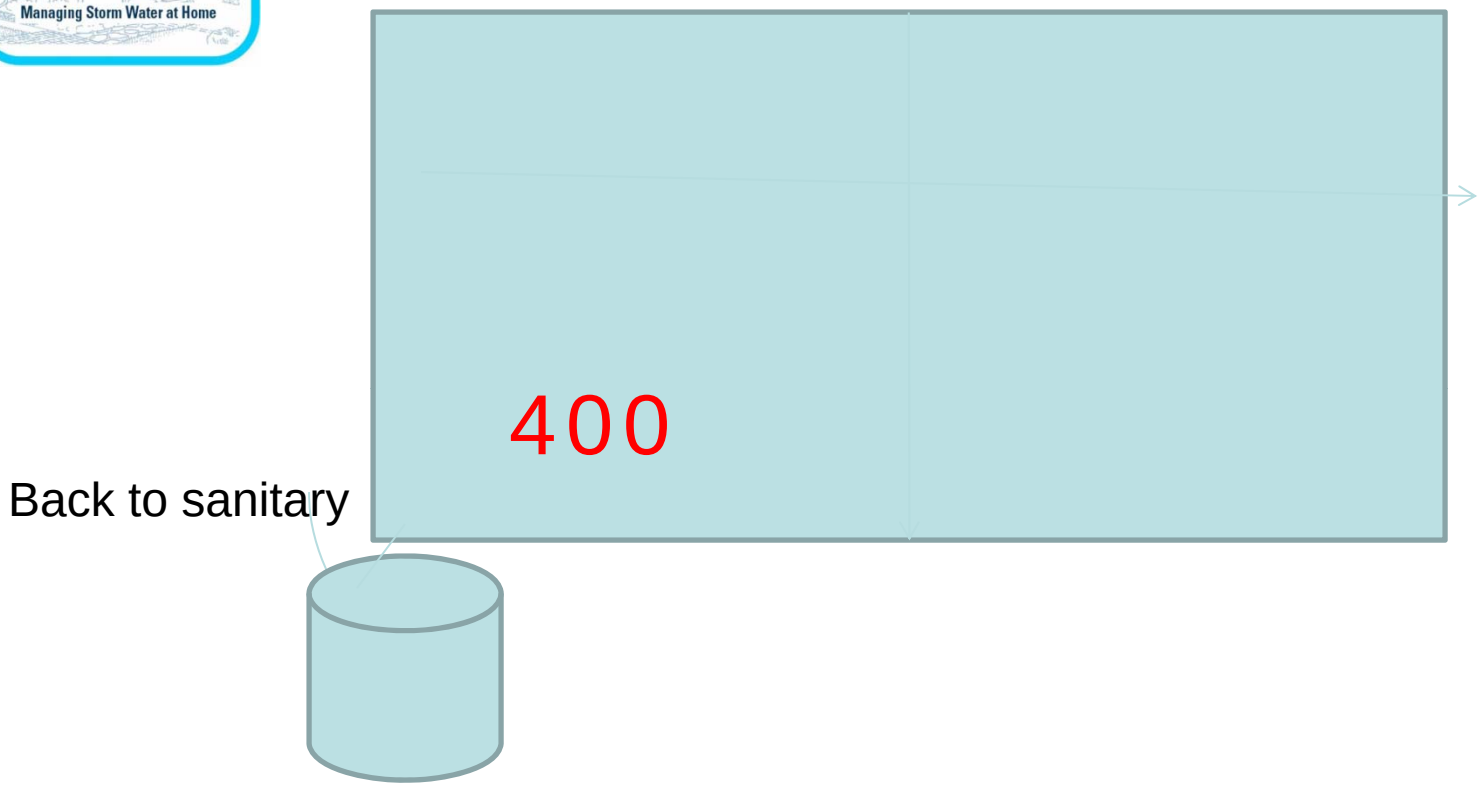
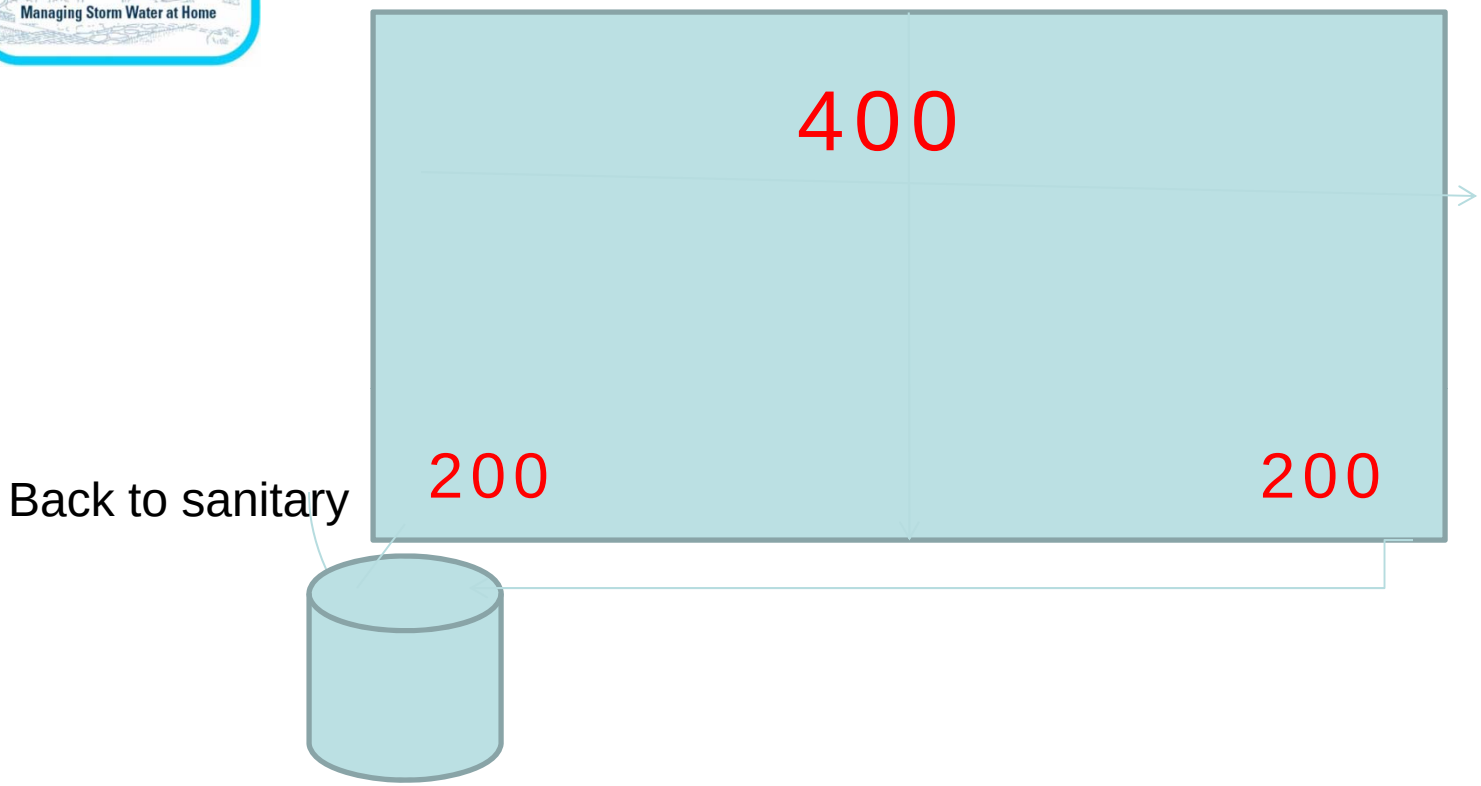
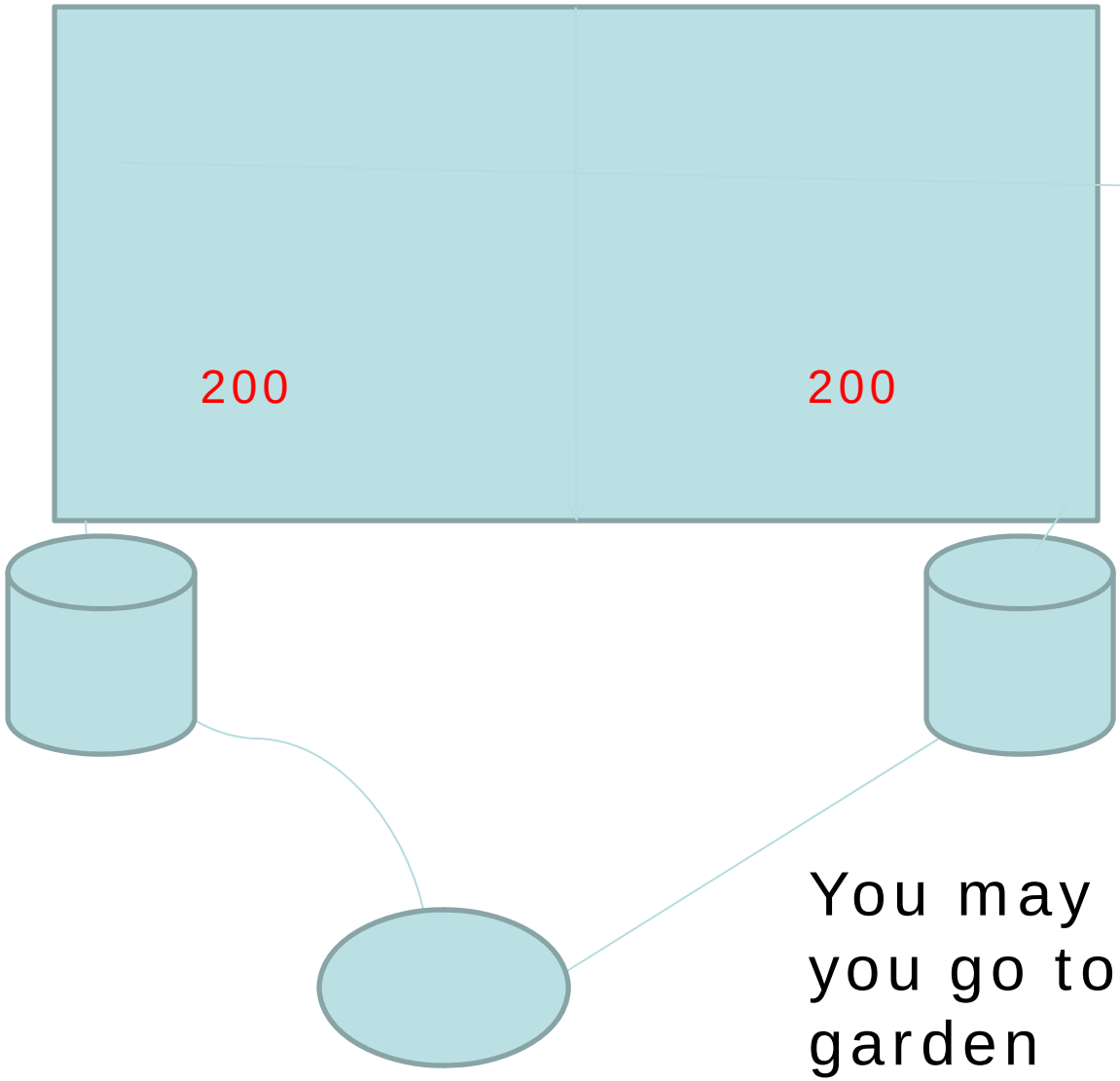


Getting to 400 with cisterns



By changing gutters or piping across house to same cistern

Getting to 400 with cisterns



You may add IF you go to a rain garden