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Urban Watershed Mentors

Bureau of Environmental
Services

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Agenda

- Urban Stormwater background
- Stormwater retrofits
- Site assessment
- Design considerations
- Maintenance considerations
- Resources/programs
- Wrap up and questions



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A. Urban Stormwater Background



Then



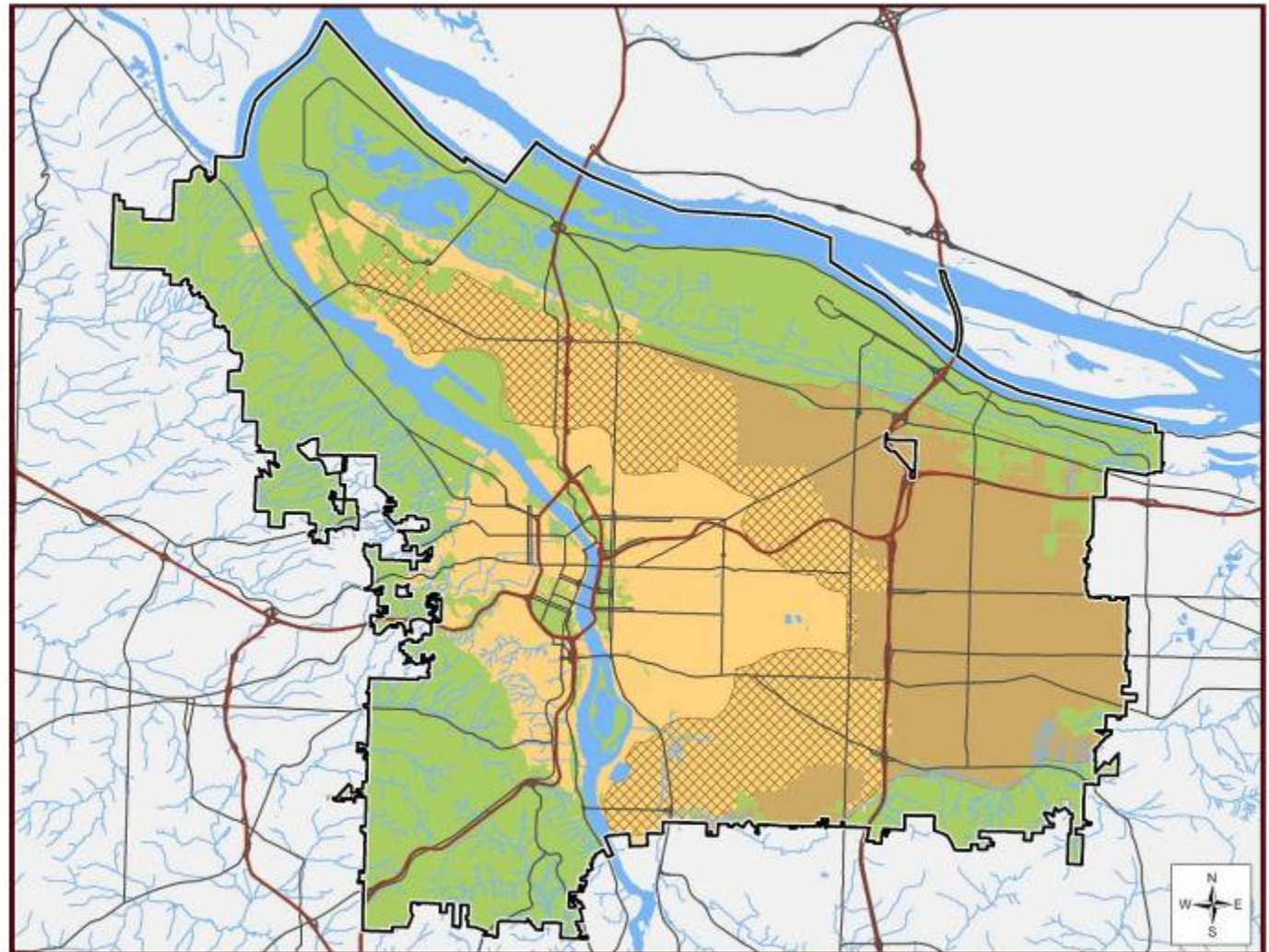
Now



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Portland stormwater drainage systems

-  Natural Waterways
-  Combined Sewer
-  Sumps/dry wells
-  Combined sewer with sumps





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Development and Stormwater Impacts

Improper management of stormwater runoff causes...

- In-stream impacts like erosion, pipe exposure, and habitat destruction
- Pollution movement into streams and groundwater
- Millions of dollars to build and maintain pipes, ditches, sumps, and other stormwater systems and provide treatment





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New Construction

Must follow the City of Portland's 2008 Stormwater Management Manual.

Stormwater Infiltration and Discharge Hierarchy

Onsite Infiltration

Category 1: Requires total onsite infiltration with vegetated infiltration facilities. Examples include infiltration swales, planters and basins.

Category 2: Requires total onsite infiltration with vegetated facilities that overflow to subsurface infiltration facilities. Examples of subsurface infiltration facilities include drywells, soakage trenches and sumps. These facility types are underground injection control structures (UICs) and must be registered with DEQ. Roof runoff is exempt from pollution reduction requirements and may drain directly to a UIC.



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New Construction

Offsite Discharge

Catagory 3: Requires onsite detention with vegetated facilities that overflow to a draingeway, river, or storm-only pipe. Vegetated facilities (lined or unlined) must meet pollution reduction and flow control requirements to the maximum extent feasible prior to offsite discharge.

Catagory 4: Requires onsite detention with vegetated facilities that overflow to the combined sewer system. Vegetated facilities (lined or unlined) must meet pollution reduction and flow control requirements to the maximum extent feasible prior to offsite discharge.



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B. Stormwater Retrofits as part of the solution

Stormwater retrofits mimic the natural hydrologic cycle in a manner that is safe and effective for the site and neighboring properties

Basic stormwater management components:

- Collect and convey
- Slow or detain
- Evaporate, transpire & infiltrate
- Safe overflow & escape route

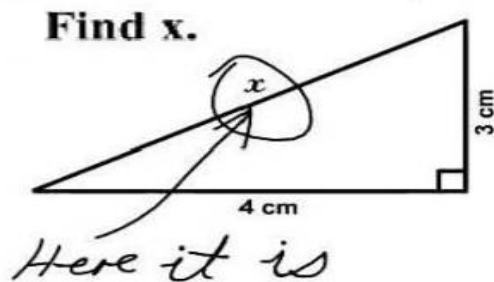




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Benefits of Stormwater Retrofits

- Simplest solution



- Watershed benefits

- Community engagement



- Reduced costs





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Benefits of Stormwater Retrofits

Rain garden wildlife





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Stormwater Retrofit Options

Residential Retrofit



Commercial Retrofit



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Reducing Stormwater Runoff

Plant trees:

- Trees help intercept rain and reduce stormwater reaching the ground
- Friends of Trees is a great community resource
(503) 248-TREE (8733)
www.friendsoftrees.org

Remove Impervious Area:

- Reduces stormwater runoff
- Provides pervious areas for stormwater management





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Downspout disconnection

- Simple disconnection of roof downspouts to landscaped infiltration area





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Rain barrels/cisterns



- Not disposal systems! Great for stormwater detention and conveyance
 - On average, one rain barrel will fill up with < 0.2 inches of rain
- Where's the overflow going?





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Rain gardens

- Vegetated depression to contain and infiltrate stormwater





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Rain gardens





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Rain gardens

Dry creek bed swale





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Subsurface facilities

Drywell – stormwater piped to an underground *vertical* storage chamber

Soakage trench – stormwater piped to an underground *horizontal* rock trench



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Subsurface facilities

Mini-drywell

- < 500 ft² of roof area





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Subsurface facilities

Residential-scale trench



Infiltrator trench





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Commercial-Scale Vegetated Facilities

Basins



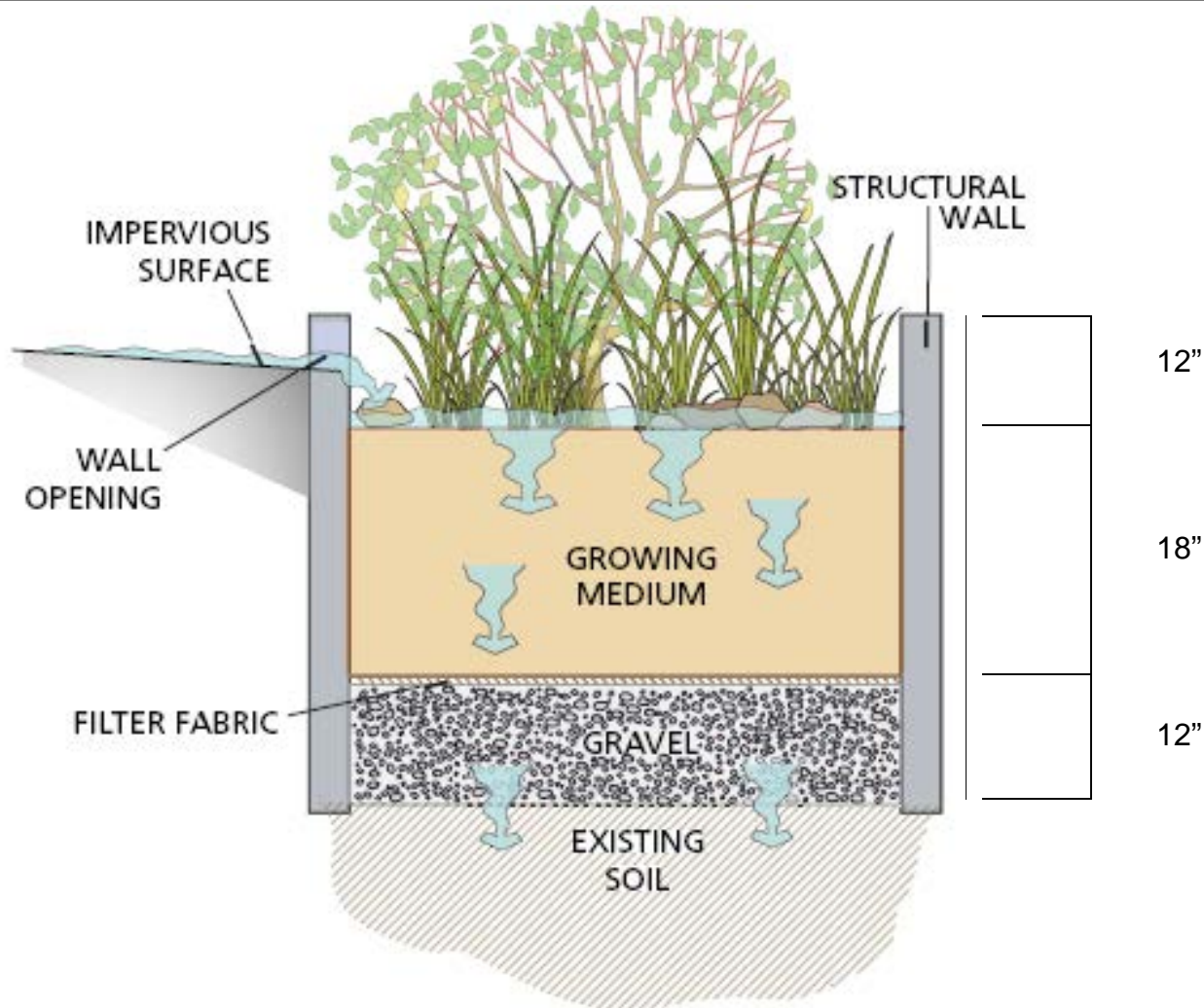
Swales





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Infiltration Planters





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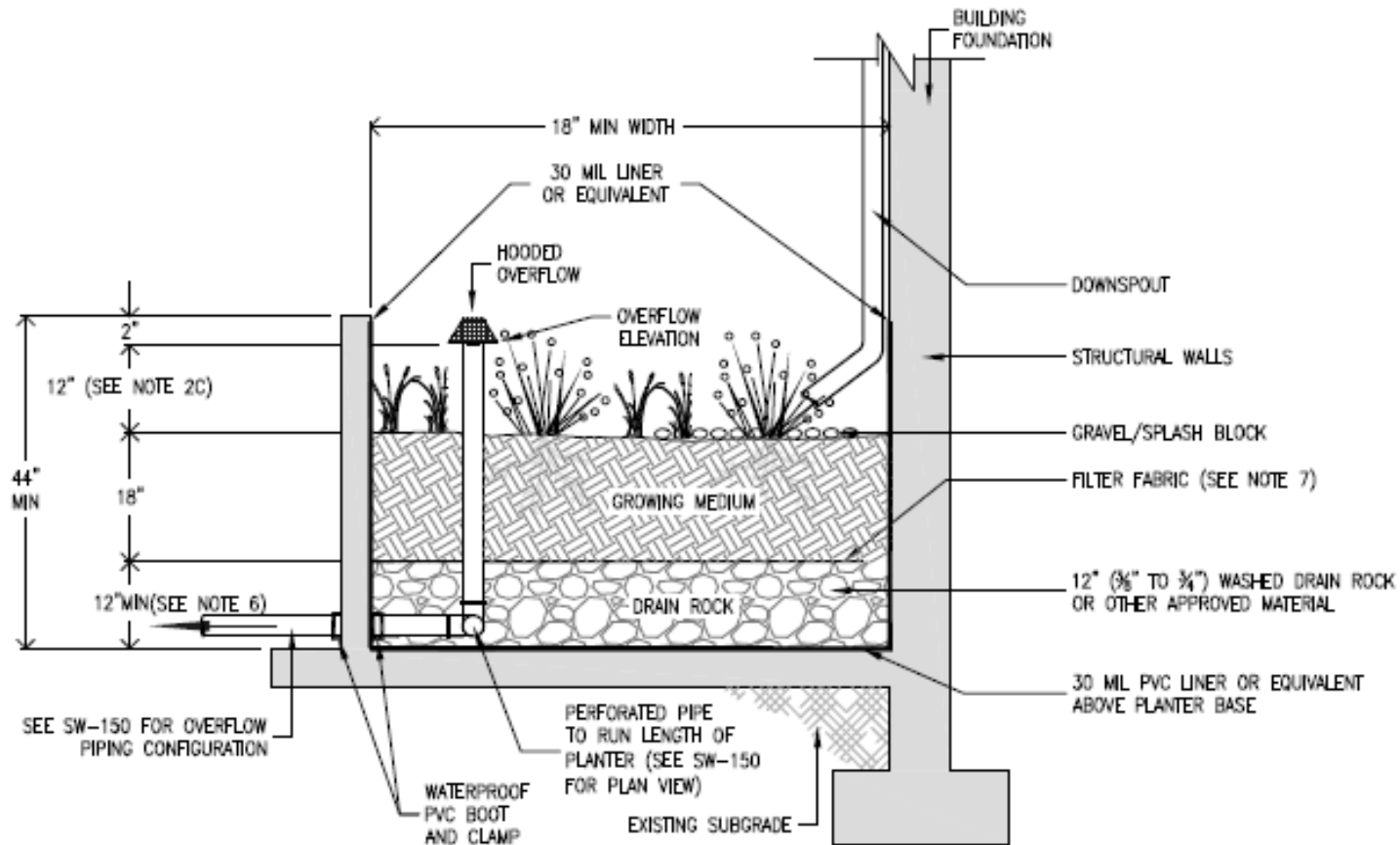
Infiltration Planters





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Flow-through planters





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Flow-through planters





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Ecoroofs

Considerations:

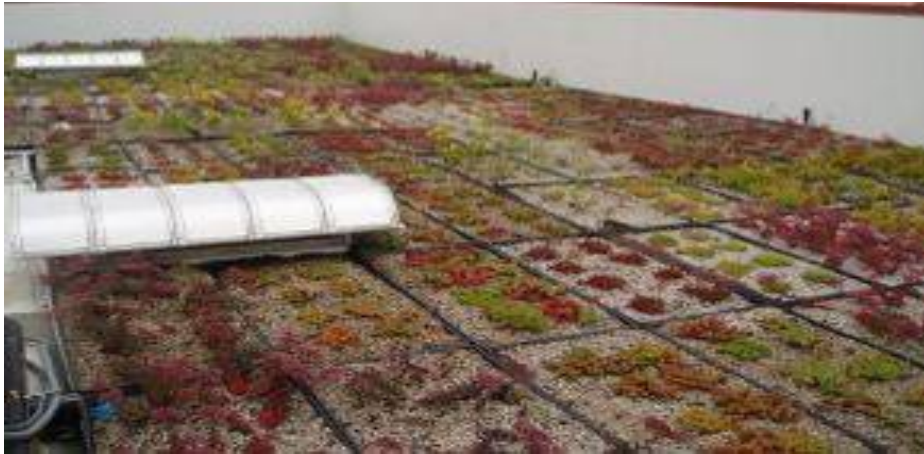
- Rooftops with less than 25% slope (generally flat roofs)
Building must meet structural requirements for additional weight





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Ecoroofs





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Pervious Pavement



Pavers



Concrete



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C. Site Assessment

Site Assessment Steps:

1. Site records research
2. Walk the site
3. Map existing conditions
4. Identify site constraints
5. Identify project opportunities
6. Create a site plan

Site assessment guide:

- <http://www.portlandonline.com/shared/cfm/image.cfm?id=144648>



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1. Utilize available records

- Portland Maps www.portlandmaps.com
 - Historic plumbing records
 - Hazard information (slopes, earthquake)
- Soil Maps (NRCS soil survey)
<http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm>
 - Slope information
 - Soil drainage information
- Know local code standards
 - Parking standards, setbacks, stormwater regulations
- Other online/documented resources as available
 - Google street view?



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2. Walk the site

- Map existing conditions
 - Either create your own map or utilize an aerial photo
- Identify the basics
 - Downspout locations, roof and paved areas (estimate sf of these)
 - Where does runoff go now? (sewer, creek, landscape, drywell)
 - Pervious or landscaped areas
- Identify site constraints
 - Hazards (steep slopes, retaining walls), areas of ponding, property lines
 - Access points and walkways, utilities, areas of heavy use
- Conduct an infiltration test
 - Once a facility type and location is determined

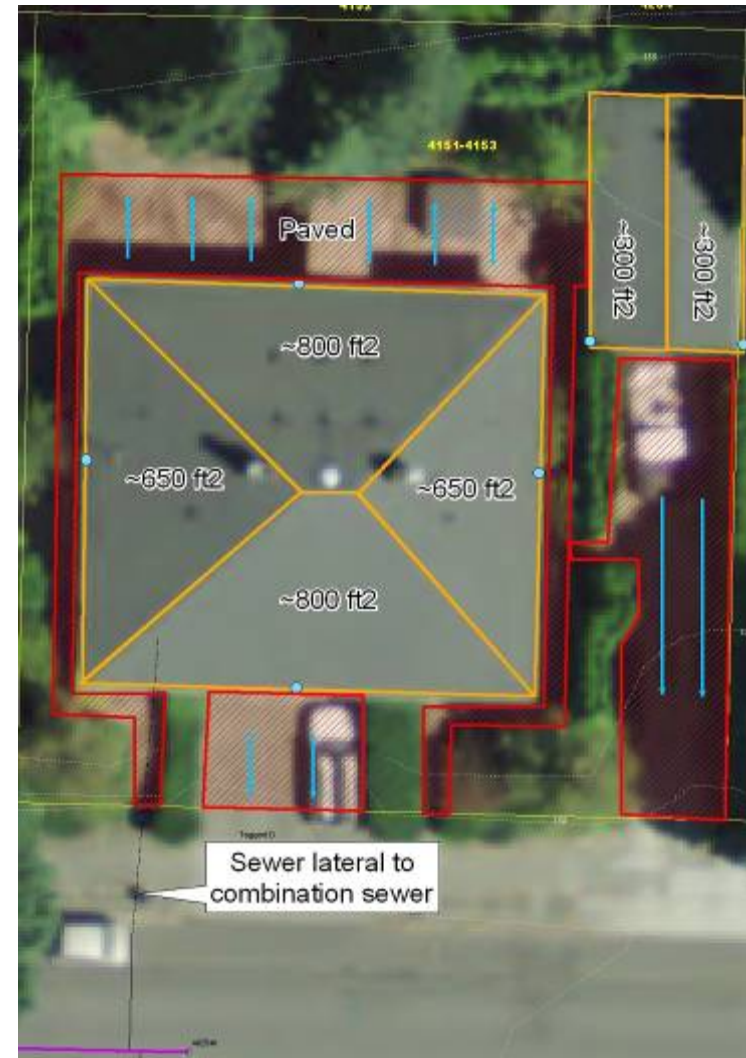


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3. Map Existing Conditions

Identify on site plan:

- Existing roof and paved areas
- Existing stormwater collection and convey (gutters, downspouts, flow direction, etc.)
- Existing stormwater destination (public sewer, creek, lawn, drywell, etc.)





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4. Identify Site Constraints

Identify site constraints:

- Slopes
- Setbacks/property lines
- Utilities
- Access/Walkways
- Foundation type
- Utilities
- Oil tanks/cesspool
- Soil infiltration rate





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Infiltration Testing

Testing Infiltration capacity:

- In the location of your planned stormwater facility, dig a hole at least 24" deep and 24" wide
- Fill the hole to the top with water and allow it to drain. This "primes" the system
- Fill the hole to the top with water a second time and mark the top of the water surface
- Wait 1 hour and measure how far the water level has dropped. A 2" drop in 1 hour indicates good infiltration for stormwater management



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Things to look for onsite

- Clogged standpipes
- Curb outlets
- Broken downspouts
- Standpipe material (ABS, cast iron, concrete etc.)
- Erosion/sediment patterns
- Ponding water
- Seeps/springs
- Water/moisture in basement
- Disconnection tags
- Rat holes
- Funky disconnections
- Smiling/frowning gutters
- Roof drainage offsite





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To Infiltrate, or not, that is the question

- Safe and effective stormwater management can be difficult in West Portland
 - Poorly draining soils are typical
 - Steep slopes, landslide hazards, and erosion concerns abound
 - Seeps/springs and other existing issues indicate poorly draining soils/high groundwater
 - Utilize public drainage systems when safety is a concern



Photo courtesy of Oregon Department of Geology and Mineral Industries



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5. Identify Project Opportunities

Stormwater retrofit locations:

- Pervious areas for stormwater management
- Stormwater management may not be feasible for all sites!





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Private Property vs. Right-of-Way

Retrofits must be on private property!

ROW:

- Sidewalks, planter strips, curbs, and street
- Must be maintained by property owner but cannot generally be used to manage runoff from private property

Private property:

- Property on house-side of the sidewalk
- May generally be used to manage runoff from that property only



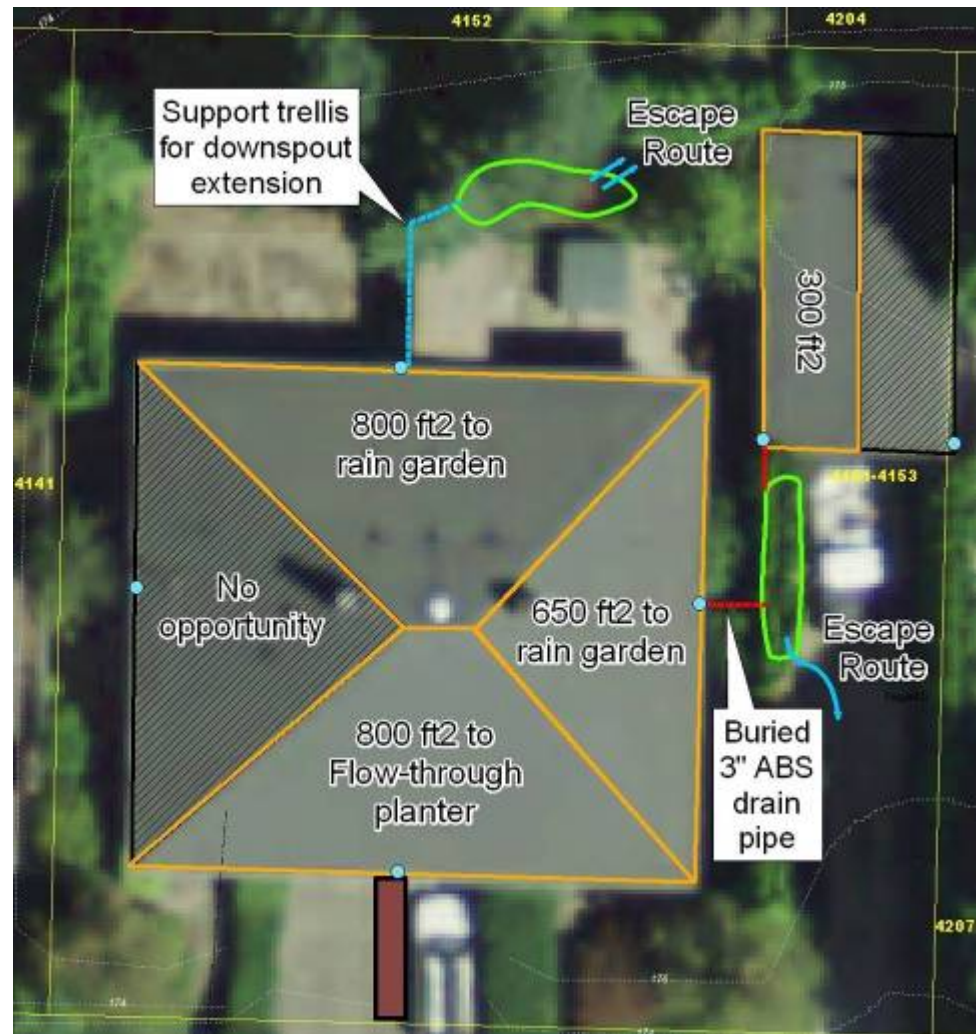


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6. Create Project Site Plan

Clearly identify:

- Property lines and dimensions
- North arrow
- Impervious area dimensions and destinations
- Existing and new conveyance methods
- Stormwater facility location and dimensions
- Pertinent project materials and specifications





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D. Design Considerations

Safety

- Facilities must be designed and located so that it doesn't cause a hazard for safety or to property
- All water must discharge to a safe location where it will not drain back to buildings or off property



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Design

Location considerations take away message:

- No infiltration on or uphill of steep slopes
- West hills typically has poor infiltration and weak soils (some exceptions)
- Other slopes in Portland prone to slope creep, raveling, erosion problems
- If in doubt, call an engineering geologist or geotechnical engineer



Just because you can, doesn't mean you should!



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Design

Facility Sizing

- Disconnections and rain gardens: 10% of roof area if infiltration > 2"/hour
- Infiltration basins/swales/planters: sizing varies by specific infiltration rate and design – generally 6-9% of drainage area
- Subsurface facilities: sizing varies by drainage area, specific infiltration rate, and design
- Flow-through facilities: 6% of drainage area
- Ecoroofs and pervious pavement: 1 : 1 ratio, no treatment of additional drainage



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Design

Setbacks

- Disconnection: discharge point 2' from slab foundations, 6' from basements, 5' from property lines
- Rain gardens: same above, plus deepest point 10' from any foundations
- Infiltration Basins/swales/planters: 10' from buildings, 5' from property lines
- Flow-through planters: no setbacks
- Ecoroofs/pervious pavement: no setbacks



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Design

Permits

- No permit required for residential disconnections, rain gardens, and rain barrels that meet safety and design standards
- Permit likely required for all other retrofits



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Design

Conveyance methods:

- Water must be conveyed to facility across setback area
- Conveyance can be aerially, on surface, or underground to accommodate site uses and aesthetics





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Design





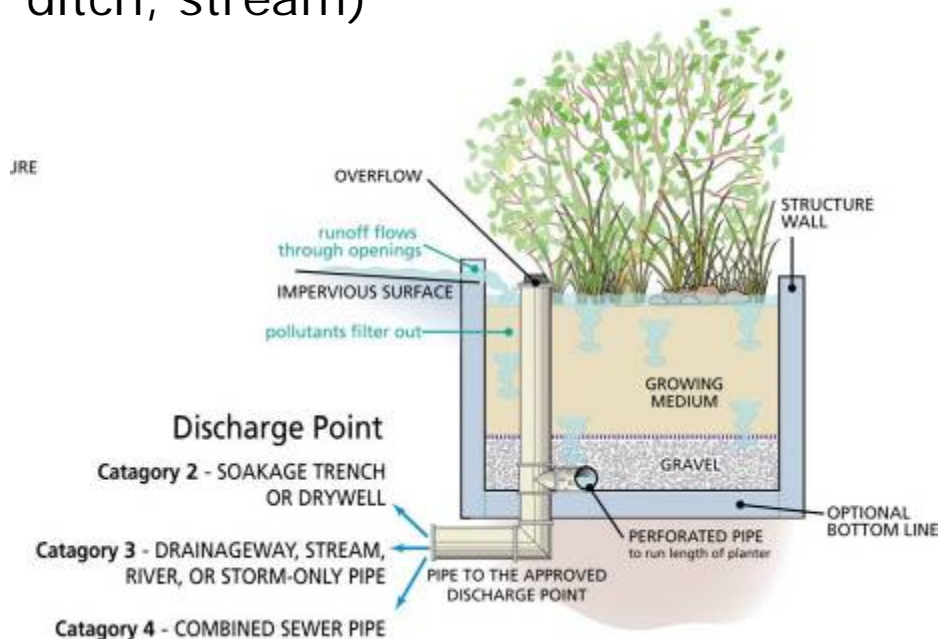
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Design

Identify overflow/escape route

Overflow:

- Approved disposal point for excess flow
- Other facilities or offsite disposal (sewer, ditch, stream)



Escape route:

- Directs excess runoff away from buildings during extreme rains
- Low point in berm
- Dry creekbed



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Design

Identify materials and plants:

- Stormwater-facility- appropriate species greatly increase evapotranspiration and infiltration
- Listed in 2008 Stormwater Management Manual Appendix F, or in Plant Choices flyer at: <http://www.portlandonline.com/Bes/index.cfm?a=129060&c=43110>
- Plant sheet handout

Mississippi commons plant choices:

- | | |
|---------------------------|----------------------------------|
| ① Grooved rush | <i>Juncus patens</i> |
| ② Red twig dogwood | <i>Cornus sericea</i> |
| ③ American cranberry bush | <i>Viburnum trilobum</i> var. |
| ④ Camas lily | <i>Camassia leichtlinii</i> |
| ⑤ Yellow-eyed grass | <i>Sisyrinchium californicum</i> |
| ⑥ Sword fern | <i>Polystichum munitum</i> |
| ⑦ Hardstem bulrush | <i>Scirpus acutus</i> |





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E. Maintenance Considerations

- Property owners responsible for maintaining stormwater systems
- Proper maintenance is key to facility function
 - Inspect and maintain stormwater facilities just like you do your gutters, downspouts, and internal pipes
 - Remove sediment and trash, repair cracks, check for leaks
 - Inspect and maintain landscaping just like you would existing landscaping
 - Weed, prune, mow, remove invasives, replace dead plants
 - No pesticides or herbicides!



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F. Incentives and resources

- Treebate program
www.portlandonline.com/bes/index.cfm?c=51399
- Ecoroof Incentive Program
www.portlandonline.com/bes/ecoroof
- Clean River Rewards
www.CleanRiverRewards.com
 - Technical assistance page has many more resources



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Community Programs

East Multnomah Soil and Water Conservation District
Partners in Conservation

www.emswcd.org/grants-cost-share/for-organizations

Small Projects and Community Events

www.emswcd.org/grants-cost-share/small-projects-and-community-events

West Multnomah Soil and Water Conservation District
Financial Incentives for Sustainable Habitats

www.wmswcd.org/content.cfm/Grant-Opportunities/WMSWCD-Grants

Metro Nature in Neighborhoods Grants

www.oregonmetro.gov/index.cfm/go/by.web/id=18203



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Other Resources

Oregon Smart Guide: Rainwater Harvesting

<http://www.bcd.oregon.gov/pdf/3660.pdf>

Portland Ecoroof Guide

<http://www.portlandonline.com/bes/ecoroofguide>

Presumptive Approach Calculator

<http://www.portlandonline.com/bes/index.cfm?c=47958>



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Wrap up

- Questions?