

Designing/Engineering for Low Impact Development

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Innovation in Stormwater Design

- Low Impact Development practices (LID) seek to mimic predevelopment hydrologic functions utilizing natural site features.
- A few examples:
 - Bioretention (rain garden)
 - Porous pavement
 - Vegetated roof (green roof)
 - Rainwater reuse systems
 - Clustering/open space
 - Narrow pavements

Bioretention (rain garden)

- Shallow, depressed landscaped area with amended soil that retains stormwater runoff for infiltration
- Stormwater Design Application
 - Flow control
 - Water quality treatment



Bioretention (rain garden)

➤ Design Considerations

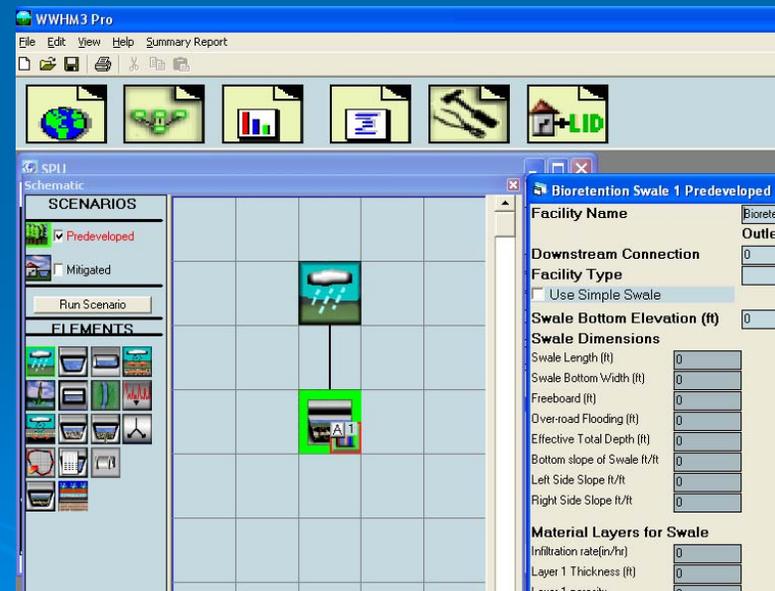
- Typically small contributing area
- Permeability of surrounding soil
- Dual use for water quality and flow control
- Flexibility in aesthetics and location specific to the site
- Local water table elevation

➤ Typical Applications

- Landscaped parking lot islands
- Within right-of-way
- Common landscaped areas in commercial or residential developments

Hydrologic Analysis

- WWHM – Western Washington Hydrologic Method
- Continuous Modeling approved by DOE.
- Bioretention Element





Project Example



➤ PCC Markets – Edmonds



➤ Existing site information

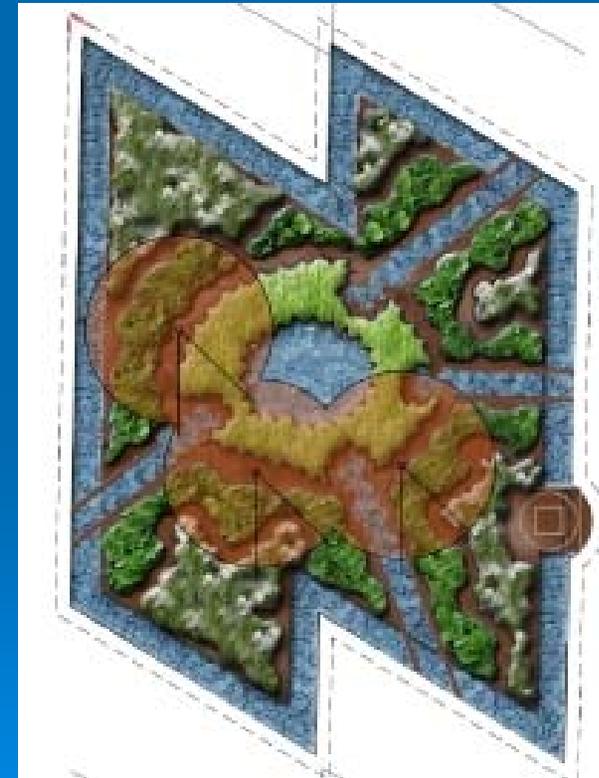
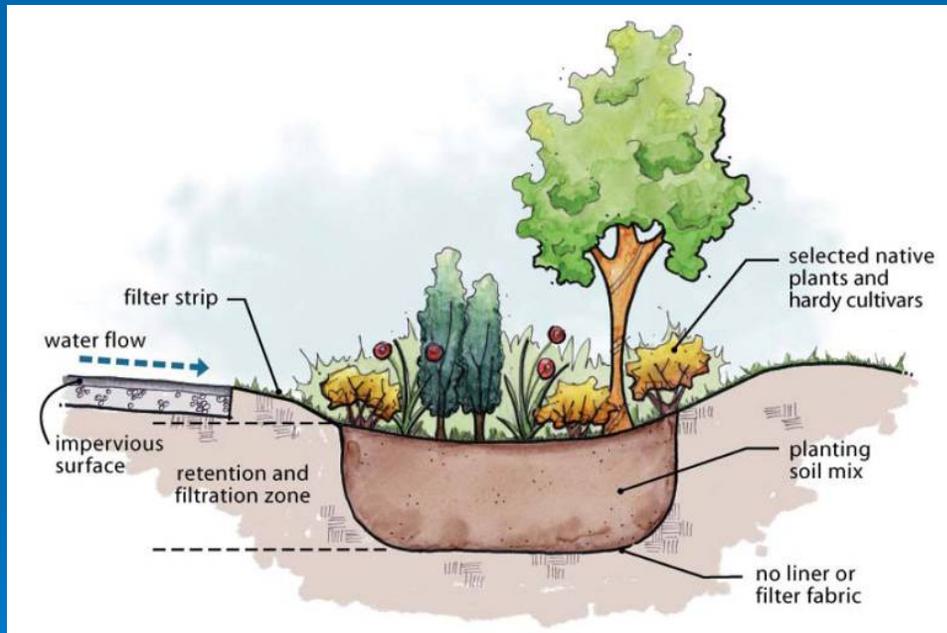
- Redevelopment site
- Discharges to Puget Sound
- Local code does not trigger stormwater treatment

Project Example



➤ Proposed site improvements

- Replacing 10-15 existing parking stalls with bioretention cells to achieve Salmon Safe accreditation.



Bioretention Project Example





Green Roof

- Growth medium, vegetation and drainage layers promote stormwater retention and evapotranspiration.
- Stormwater Design Application
 - Flow control
 - Reduce Peak Runoff (6-79%)
 - Reduce runoff Volume (65-94%)



Vegetated Roof Project Example

Project benefits

- The reduction in surface runoff provided by the green roof and porous pavements will eliminate the need for an underground detention facility on the project site
 - Replaced 70' of 48" diameter pipe (\$15,000-\$20,000)
- Approximate green roof cost (\$35,000 - \$40,000)

Cost Comparison

➤ Added Benefits/Long Term Savings

- Longer Roof Life (30 – 50 years)
- Heating(1%)/Cooling(6%) Costs
- Increase Property Value

➤ Incentives

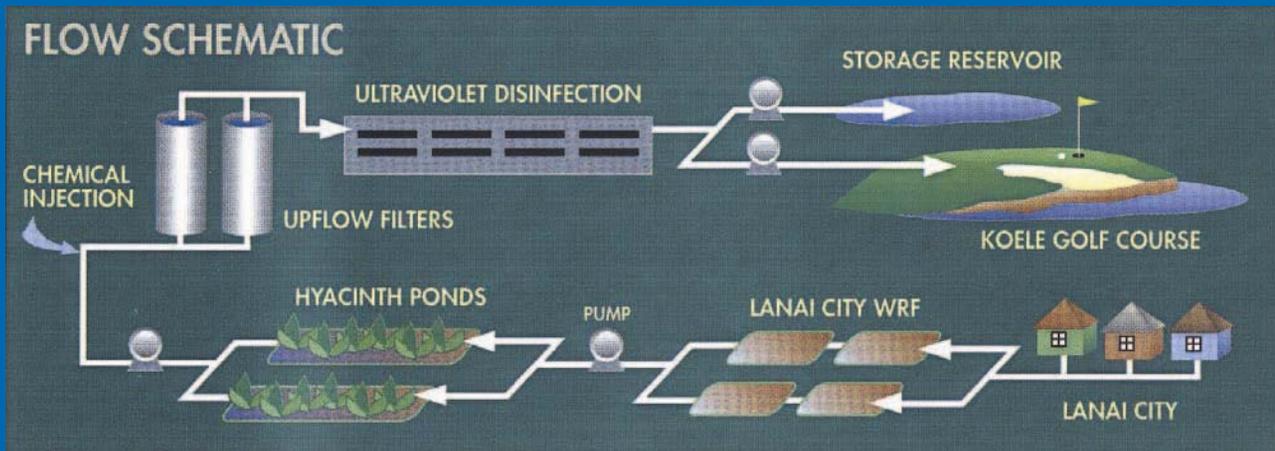
- King County – Incentives for Built Green
www.greentools.us
- Seattle – Green Factor Requirements
- Portland – Floor to Area Ratio Increase
- NYC - \$4.50 /sf tax incentive = 25% of cost
- Germany - Able to compete with traditional roofing

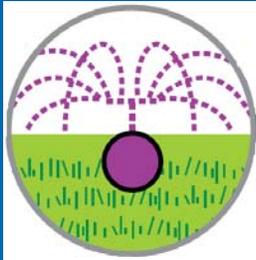
Effluent Reuse

- Class A Water – high quality recycled water for landscape, agriculture and golf course irrigation.
- Can save a significant amount of drinking water.
- Proven technology that has been used for over 40 years.

Effluent Reuse Examples

➤ Lanai and Manele WWTPs





King County

Department of
Natural Resources and Parks
Wastewater Treatment Division

King County WW Reuse



- Reclaimed Water Program
- Currently reusing ~260 MGY at the South and West Point Treatment Plants
- Plans to increase WW Reuse around the region.
- Willows Run Golf Course – Example of future project

Thank You



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