

Cistern Project Examples, and the Water Rights Issue

presentation to
Green Roofs and Cisterns
A Practical Design Workshop
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Paul Dedyo, PE, LEED, Associate
Tom von Schrader, PE, LEED, Principal

SvR Design Company, Seattle, WA
Civil Engineering, Landscape Architecture, Restoration

www.svrdesign.com



Presentation

- Case Studies
 - Miscellaneous
 - Kitsap County
- Legal Issues



SvR Design Experience

- City Hall / Civic Center, City of Seattle, WA
- Growing Vine Street Cistern Steps, Seattle, WA
- Camp Muir, Mt. Rainier, WA
- Pantages Apartments, Seattle, WA
- Merrill Hall, University of Washington, WA
- Kitsap County Administration Center, Kitsap County, WA



City Hall / Civic Center, Seattle, WA



- Underground cistern
- 28,000 cubic feet storage capacity
- Six-foot depth on average
- Water uses include: irrigation and toilets
- Mechanics tied into fountain system



City Hall / Civic Center



City Hall / Civic Center Drawing & Calculations



- Collection Area = 57,865 sf
- Water Demand = 138,129 cf/year
- Storage Volume = 28,092 cf
- 88% Water Reduction



Growing Vine Street



- Part of a multi-block planned green street
- Provides irrigation and water to Belltown P-Patch



Camp Muir, Mt. Rainier, WA



- Snow-harvesting system
- Snow melted on HPDE tray into potable water for toilets
- Water piped to cistern and filtered



Pantages Apartments, Seattle, WA



- Low-income housing
- Conservation minded
- Roof-water runoff collection
- Single downspout
- Cistern is an eight-foot-tall corrugated pipe
- Shut-off valve for spring and summer irrigation



Pantages Drawing & Calculations



- Collection Area = 5,050 sf
- Water Demand = 1,564 cf/year
- Storage Volume = 157 cf
- 95% Water Reduction



Kitsap County Administration Building



Drawing courtesy of Miller/Hull



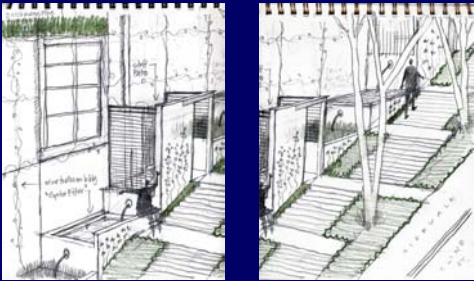
Initial Site Conditions



- Project improves one city block
- 3 acre total area
- County Inspector's office, parking lot and single family residences occupied site
- 54-foot elevation drop from south to north



Landscape Design



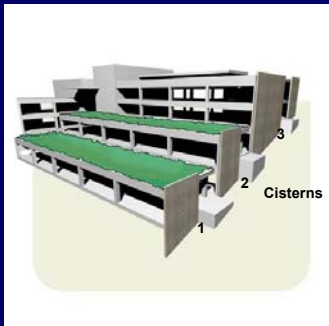
Drawings courtesy of Site Workshop



Site Layout



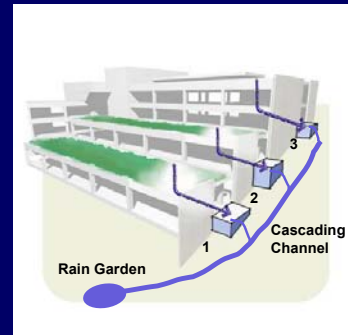
West Cisterns



Cisterns



Rain Collection and Overflow



Rain Garden

Cascading Channel



Cistern Discharge to Channel



Drawing courtesy of Site Workshop

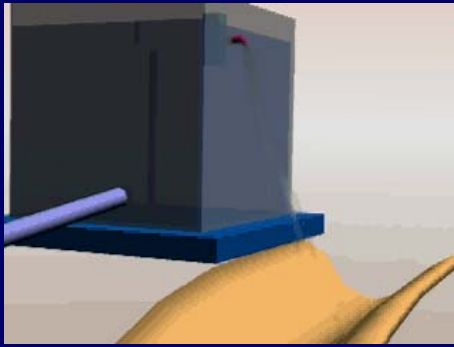


Site Plan

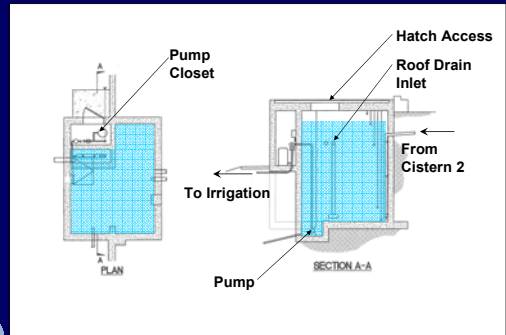




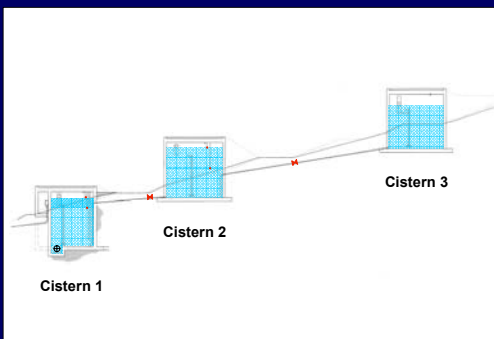
Cisterns Discharge to Rain Garden



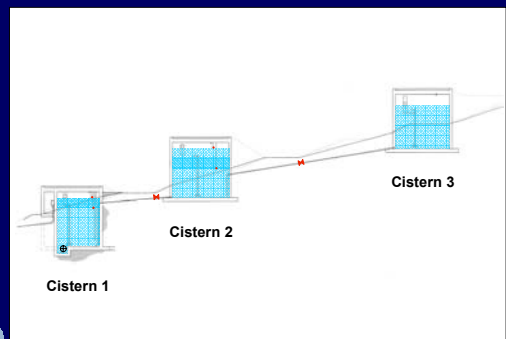
Cistern 1 Detail



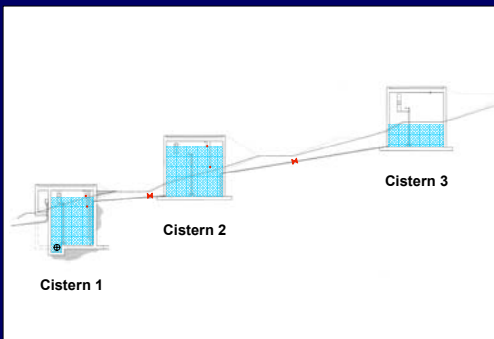
Cistern Elevation View



Cistern Elevation View



Cistern Elevation View



Design Criteria

- 39,250 sf (0.90 acres) roof area
 - 11,500 sf of green roof
 - 27,750 sf of conventional roof
- Mean annual rainfall is 54 inches
 - Generates 134,000 cf (1 million gallons) of annual runoff to fill the cisterns
- Total annual drip irrigation demand is 74,000 cf (553,500 gallons)
 - 11,500 sf of green roof landscape
 - 22,500 sf of on-grade landscape
- Total cistern capacity of 11,850 cf (88,500 gal)
 - 7,000 cf (52,300 gallons) capacity for cisterns 1, 2 & 3
 - 4,850 cf (36,250 gallons) capacity for cisterns 4 & 5



Benefits Summary

- 54% reduction of water use for irrigation
 - 39,750 cf (300,000 gallons) of rainwater used for irrigation
- Valves for RWH system supplied from cisterns 4 & 5 can be changed to redirect supply from green roof to on-grade irrigation main
 - Can supplement on-grade landscape irrigation after establishment of green roof vegetation
 - 100% reduction of water use for irrigation could then be achieved
- Cistern 1 and Cistern 5 have the same size and model pump
 - Simplifies maintenance and storage of parts for repair
- Dual use of cisterns as detention facility
 - Costs offset by deleting detention facility



Legal Issues

- House Bill 1735
- Rainwater Runoff & Use
 - New process to govern collections over 1,000 gallons
 - Removes permit requirements for collections less than 1,000 gallons
- Pilot projects will be required
- DOE restrictions will apply
- Second Substitution bill, revisit in 2007
- Advocacy needed
- For more information see: <http://apps.leg.wa.gov/billinfo>



Drawing courtesy of Miller/Hull

Owner: Kitsap County, Karen Ross

Architect: Miller/Hull
Craig Curtis, Sian Roberts, Rob Misel, Tim Politis

Civil Engineer: SvR Design Company
Tom von Schrader, Paul Dedyo, Erich Ellis

Landscape Architect: Site Workshop

Structural Engineer: AHBL

Mech/Elec: Abacus Engineered Systems

Accoustical/AV: BRC Acoustics, Inc.

VE/Cost Est: Roen Associates

Contractor: Swinerton Builders



DESIGN COMPANY