

LID AND LEED  
AT  
WETLAND STUDIES AND SOLUTIONS, INC.

FOR THE PRINCE WILLIAM REGIONAL CHAMBER OF COMMERCE

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# HOW IS LID IMPLEMENTED AT THE WSSI BUILDING?



Green Roof



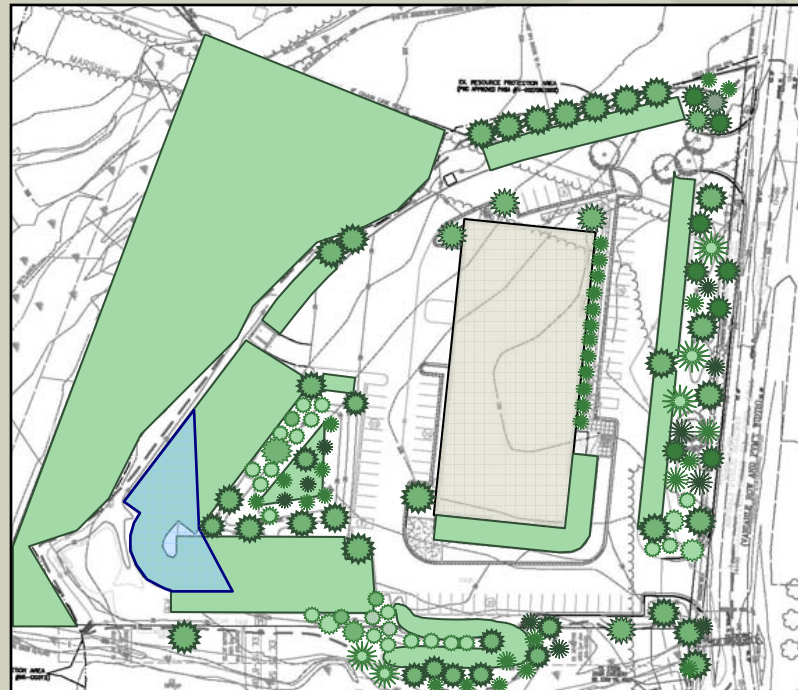
Native Vegetation



Pervious Parking



Cistern



Rain Garden

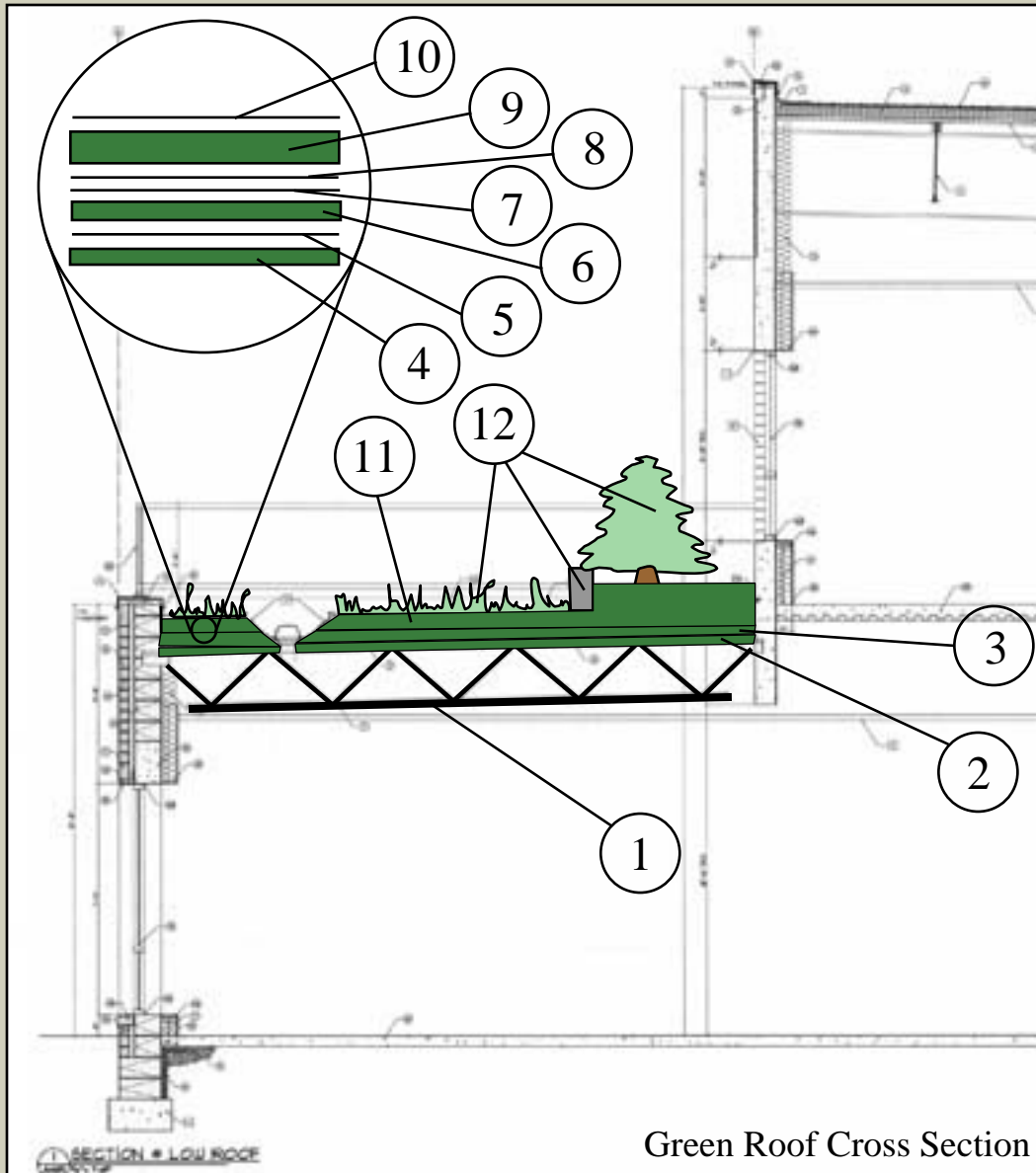


Gravel Detention



Bio-swale

# THE GREEN ROOF

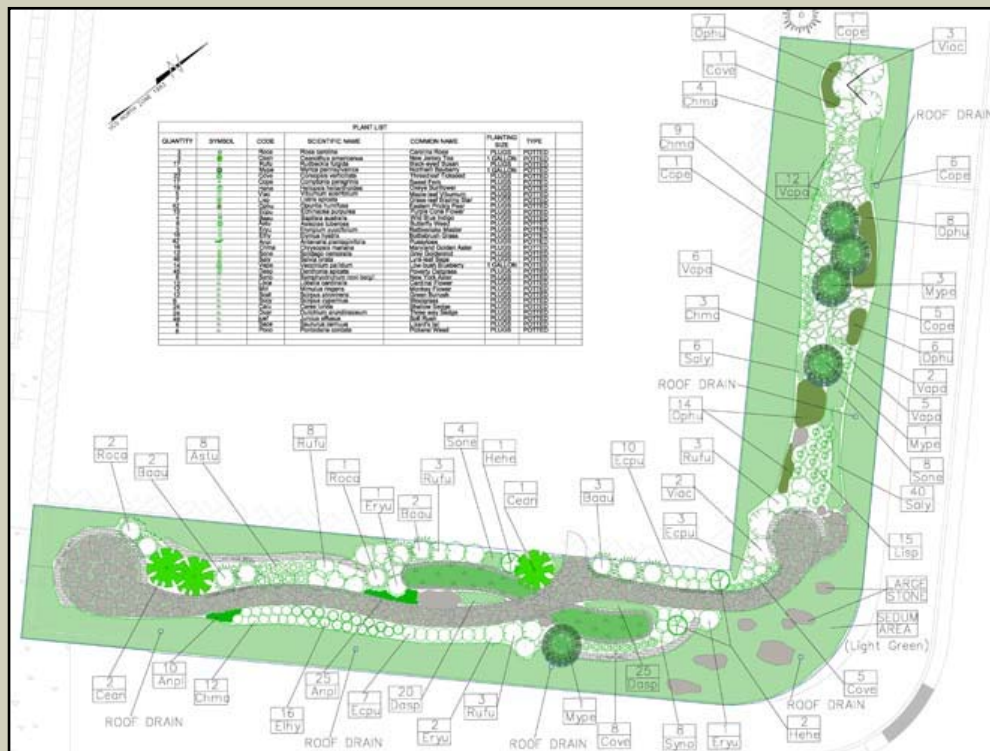
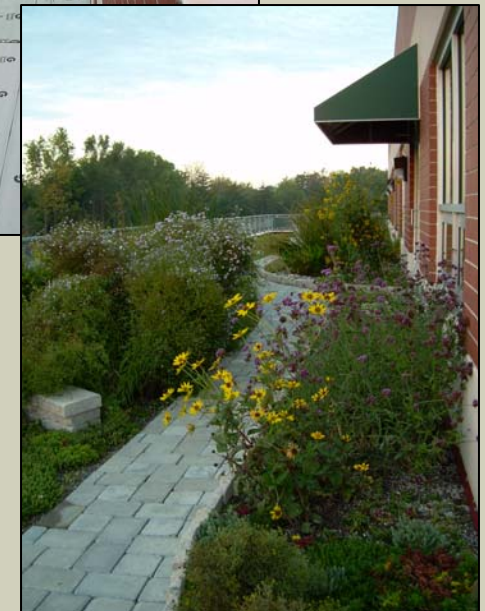


Green Roof Cross Section

1. Steel joist
2. Metal roof deck
3. 5" R-30 foam insulation
4. 1/2" gypsum protection board
5. 75 mil ethylene propylene diene monomer (EPDM) membrane
6. 1/2" foam protection board
7. 40 mil high-density polyethylene (HDPE) root barrier
8. Protection fabric
9. 1" drainage layer
10. Filter fabric
11. 3-9" lightweight growing medium
12. Stone features, sedum, and native perennials and shrubs

# THE GREEN ROOF

- ∞ Combination of extensive (3-4" soil) and intensive (4-9" soil) planting areas
- ∞ Reduces impervious area by 3,626 sf
- ∞ Reduces roof runoff
- ∞ Engineered to support 62 lbs/sf
- ∞ Increases green area and provides amenity
- ∞ Cost: \$31.80/sf installed



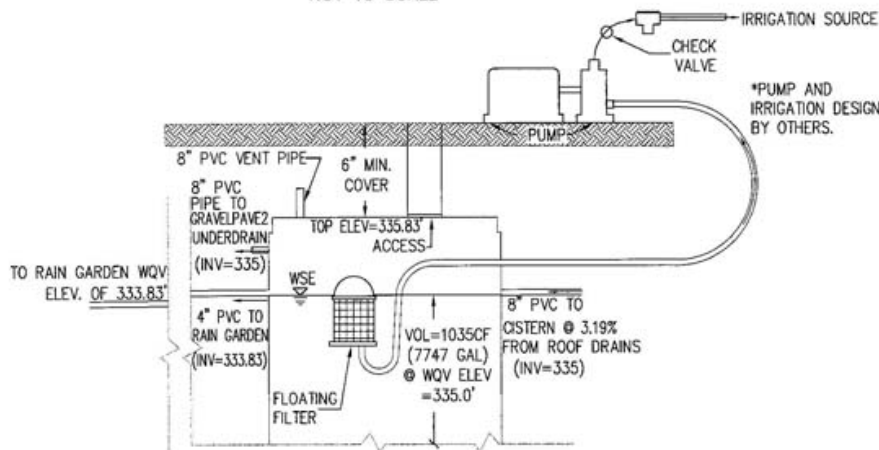
# 8,000 GALLON CISTERN

- ☞ Collects the “first flush” of roof runoff (1/2”)
- ☞ Provides irrigation water
- ☞ Overflows to rain garden and gravel bed detention
- ☞ Cost: \$3.88/gal installed  
\$1.23/ sf impervious area treated  
(Cistern material only cost: \$2.88/gal)



## ILLUSTRATIVE RAIN GARDEN CISTERN DETAIL

NOT TO SCALE



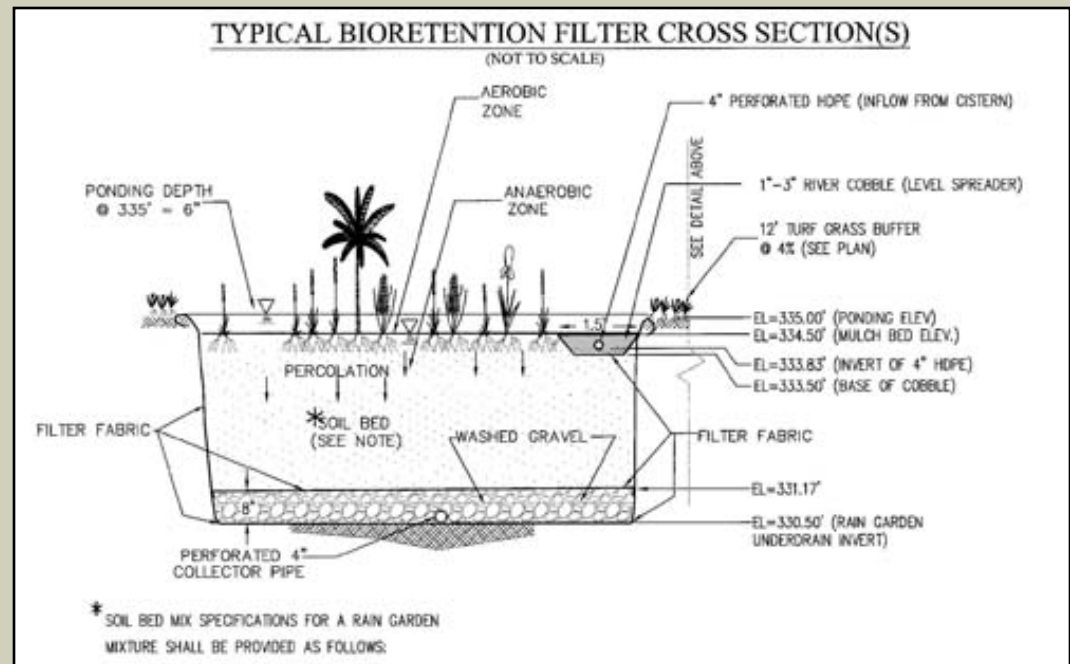
### CISTERN NOTES:

1. THE ABOVE NOT TO SCALE CISTERN DETAIL IS INTENDED TO BE USED FOR ILLUSTRATIVE PURPOSES ONLY.
2. ACTUAL CISTERN [TYPE AND] DESIGN TO BE DETERMINED BY CONTRACTOR AND TO BE REVIEWED AND APPROVED BY OWNER AND ENGINEER PRIOR TO CONSTRUCTION.
3. ILLUSTRATIVE DESIGN ON SITE PLAN SHOWS A 30'X15' NOMINAL 8,000 GALLONS BELOW PIPE OUTLET TO RAIN GARDEN.
4. TANK IS DESIGNED FOR THE STORAGE OF WATER OR LESS AGGRESSIVE CHEMICALS.
5. THE PROPOSED UNDERGROUND CISTERN IS FOR STORING RAIN WATER COLLECTED FROM THE ROOF DRAINS.
6. A PROPOSED FLOATING INTAKE TAKES WATER FROM A CISTERN BELOW ANY FLOATING SCUM AND ABOVE ANY DIRT THAT HAS SETTLED TO THE BOTTOM.
7. THE CISTERN HAS BEEN SIZED DETAIN THE FIRST 1/2 INCH OF RAINFALL WITHOUT OVERFLOWING.
8. AFTER CONSTRUCTION OR ANY MAINTENANCE, FLUSH THE CISTERN TO REMOVE ANY SEDIMENT.
9. CISTERN ANCHOR/TIES ARE REQUIRED TO ADEQUATELY PREVENT AGAINST FLOATATION.

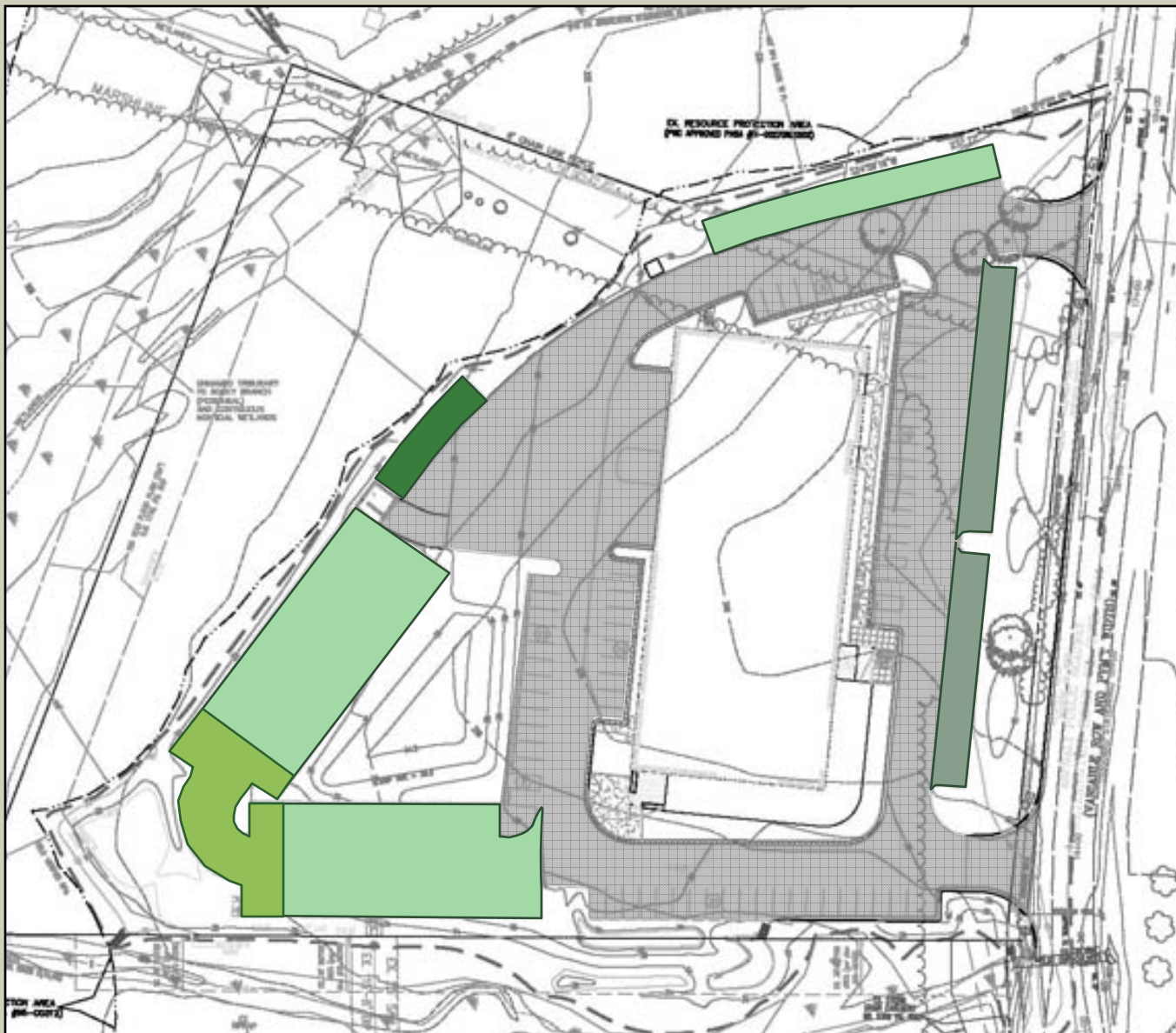
# THE RAIN GARDEN



- ☞ Treats 34,660 sf of impervious roof and parking lot area
- ☞ 1,536 sf bed; 11,693 sf grassed buffer
- ☞ Drains to gravel bed detention
- ☞ Cost: \$2.60 /sf impervious area treated



# PERVIOUS PARKING



Pervious Concrete

3,342 sf



GravelPave2

19,862 sf



Gravel Paving

1,273 sf



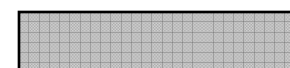
Concrete Pavers

5,502 sf



Asphalt

55,896 sf



# PERVIOUS CONCRETE

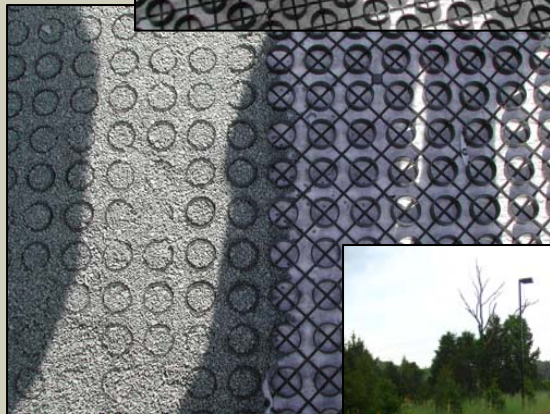


- ☞ Reduce impervious area by 3,342 sf. (3.9% of total parking area)
- ☞ Drains to gravel bed detention
- ☞ Approximate cost: \$6.00/sf installed (Asphalt cost: \$2.56/sf)

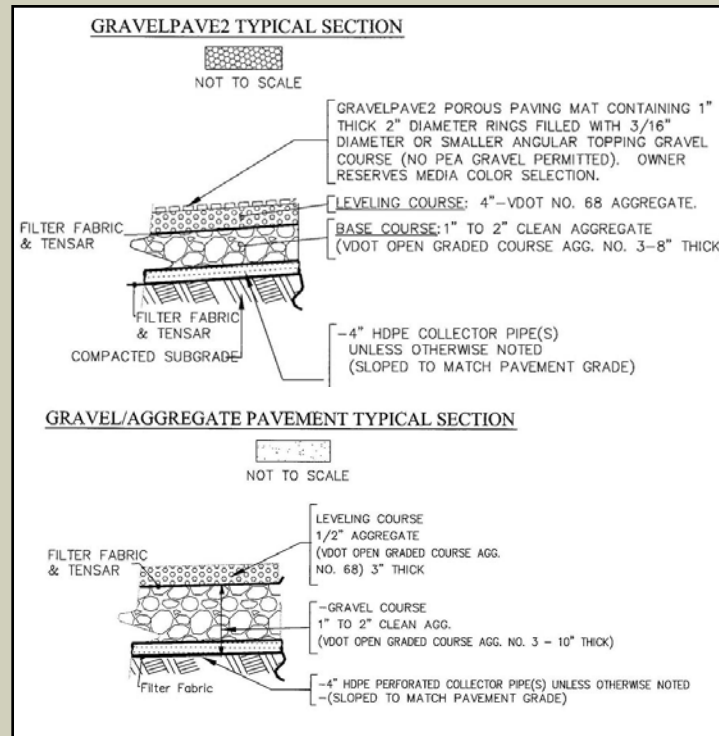




# GRAVELPAVE2 AND GRAVEL PAVING



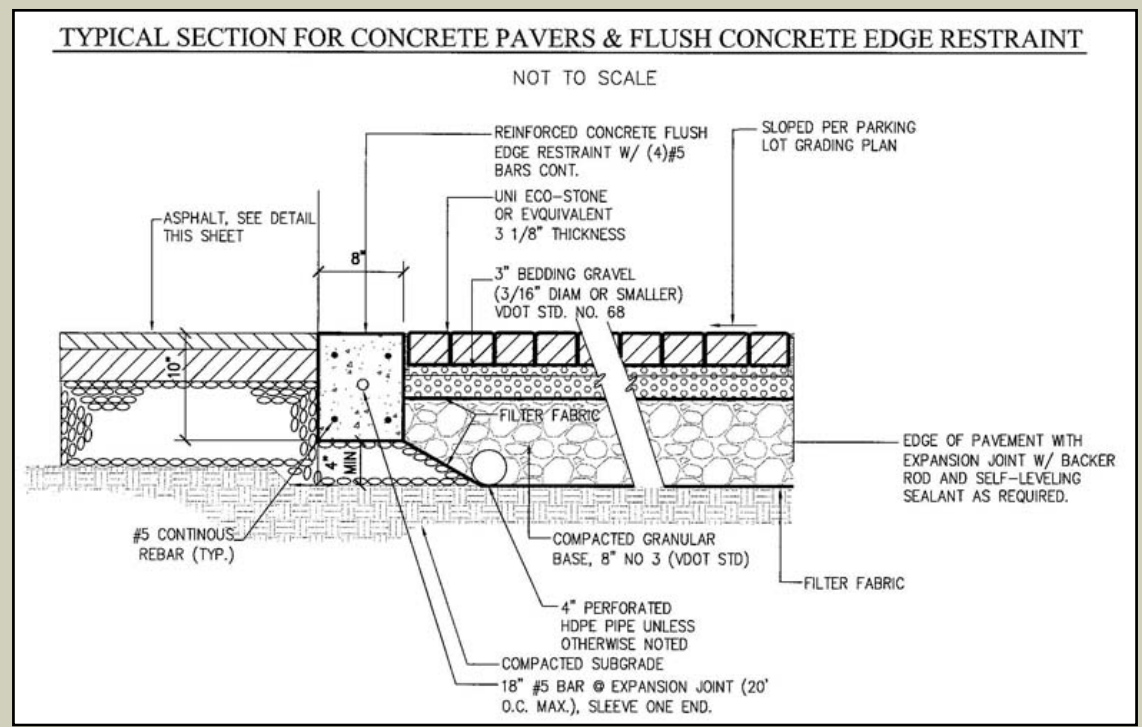
- ∞ Reduce impervious area by 21,135 sf (24.6% of total parking area)
- ∞ Drains to gravel bed detention
- ∞ GravelPave2 cost: \$6.00/sf installed  
Gravel paving cost: \$4.32/sf installed (Asphalt cost: \$2.56/sf)  
(GravelPave2 materials only cost: \$3.20/sf)



# CONCRETE PAVERS

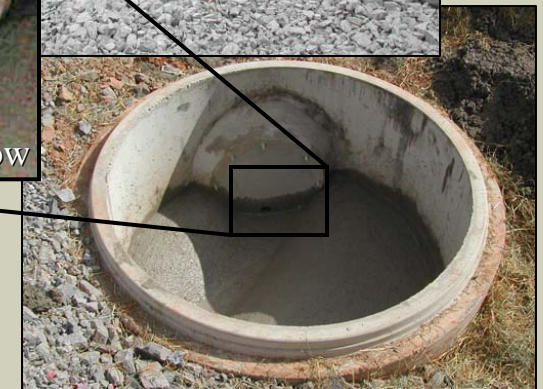
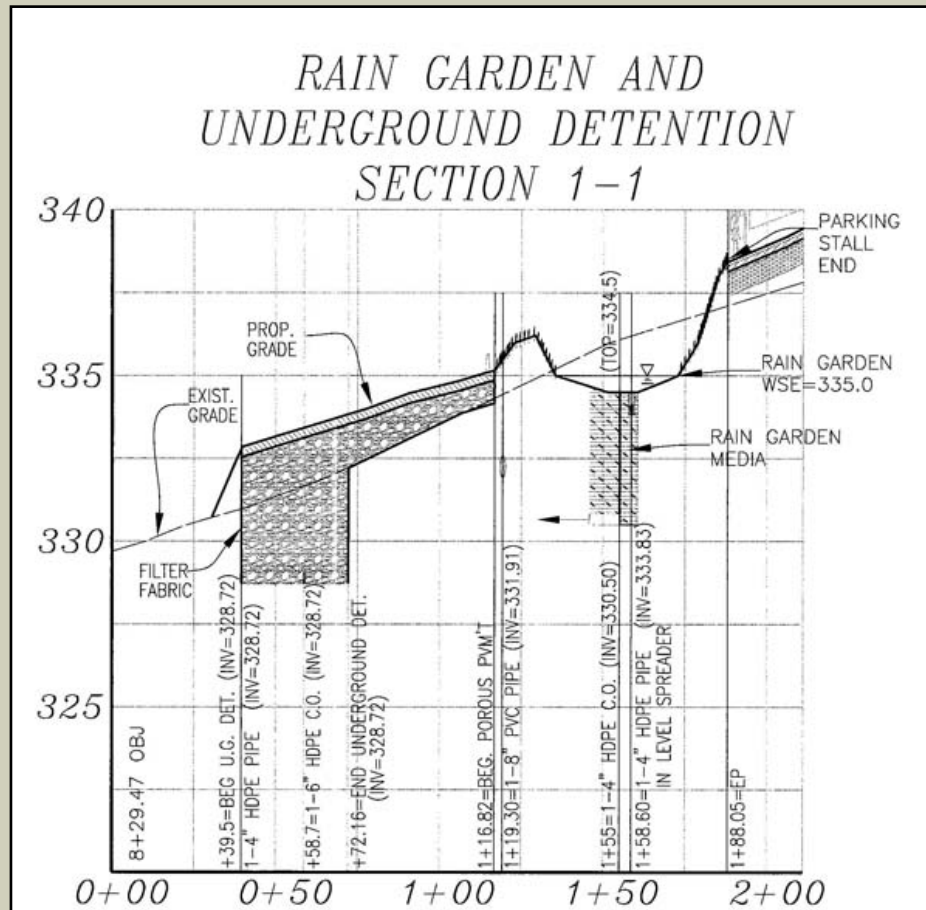


- ☞ Reduce impervious area by 5,502 sf.  
(6.4% of total parking area)
- ☞ Drains to existing vegetated floodplain
- ☞ Cost: \$7.10/sf installed + \$0.80/sf header curb  
(Asphalt cost: \$2.56/sf)  
(Paver material only cost: \$2.55/sf)



# GRAVEL BED DETENTION

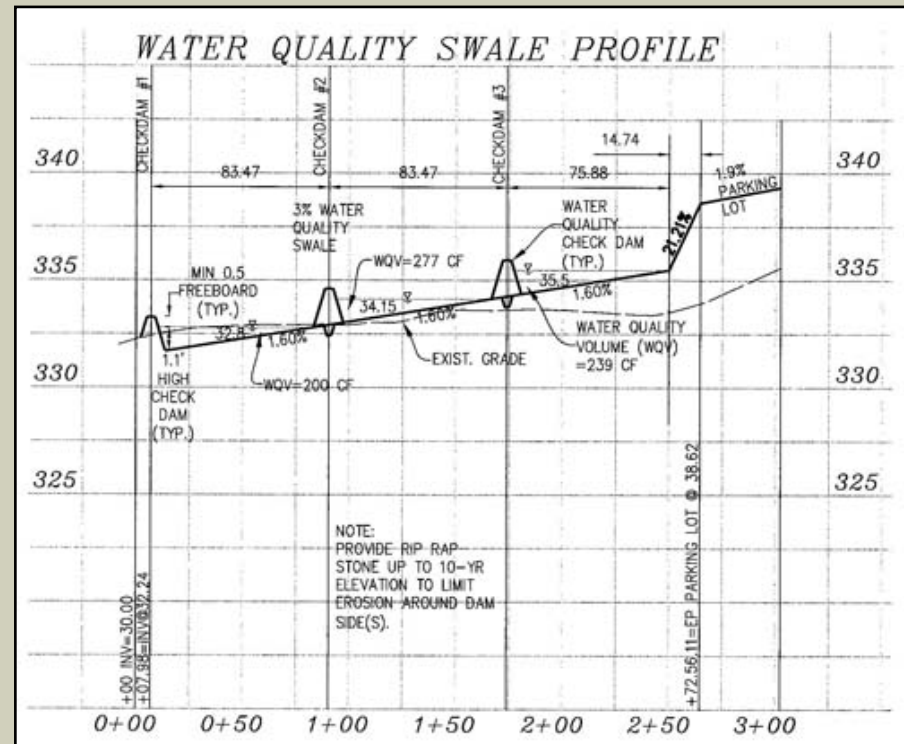
- Orifice controlled- drains to existing stream system
- Detains the 1-yr storm over 24 hours.
- Cost: \$2.28/cf treatment volume installed  
\$0.32/sf impervious area treated



# WATER QUALITY SWALE

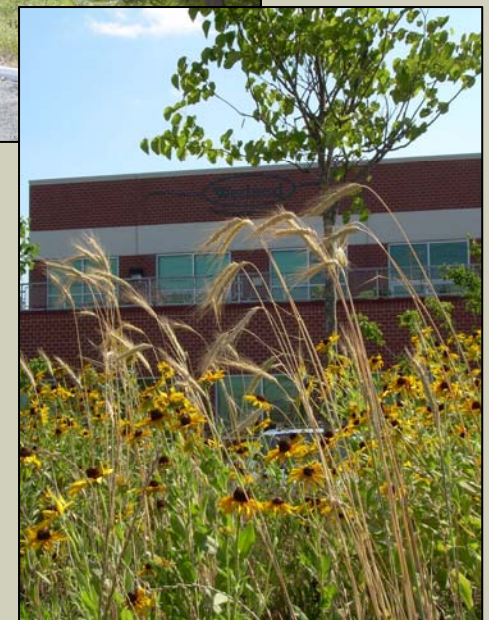
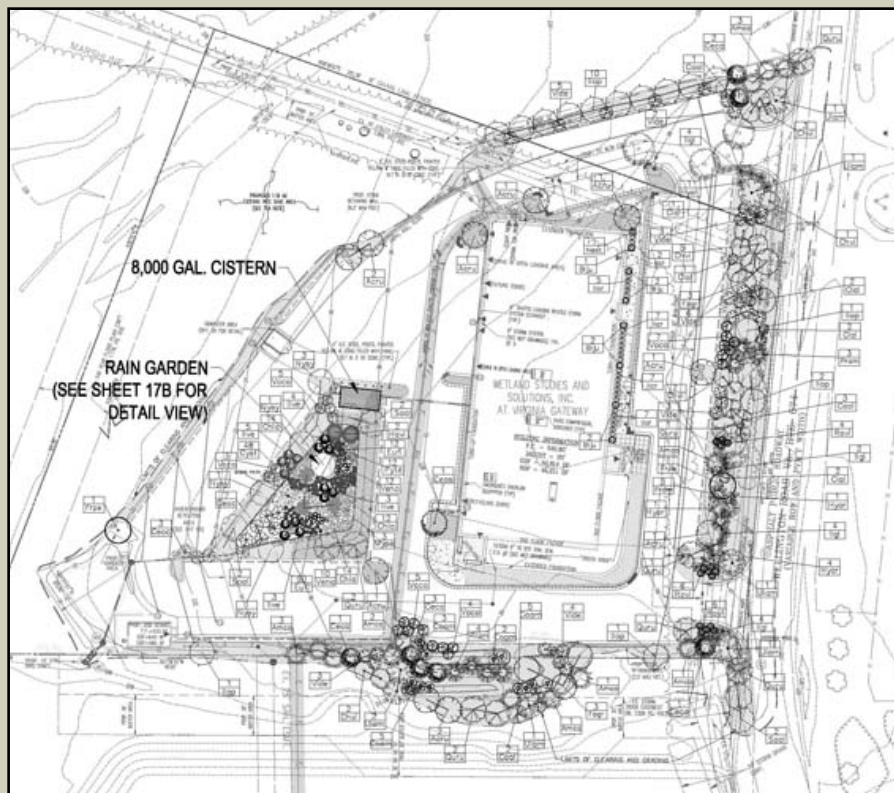


- ☞ Collects runoff from 12,650 sf of impervious parking surfaces
- ☞ Slows runoff
- ☞ Water quality volume filters through check dams
- ☞ Cost: \$3.68/sf impervious area treated



# NATIVE VEGETATION

- ☞ Maintains habitat
- ☞ Decreases water consumption
- ☞ Uses a drip irrigation system and captured rainwater
- ☞ Landscape and drip irrigation cost: \$125,864  
(Typical landscape and irrigation cost: \$80,000)



# HOW MUCH DID THE SITE COST?

Item	\$/sf impervious	Cost
Rain Garden	\$2.60	\$90,000
Cistern	\$1.23	\$31,000
Green Roof	\$31.80	\$115,316
Pervious Concrete Pavers	\$7.90	\$39,000
Gravel Pavement	\$4.32	\$5,500
GravelPave2 System	\$6.00	\$143,500
Pervious Concrete	\$6.00	N/A
Gravel Bed Detention	\$0.32	\$24,000
Swale	\$3.68	\$46,525
Native Landscaping and Drip Irrigation	N/A	\$125,864
<b>Total</b>		<b>\$620,705</b>
Standard Asphalt / Curb and Gutter Estimate		\$360,115



# HOW DID WSSI ACHIEVE LEED GOLD?



# SUSTAINABLE SITES AND WATER EFFICIENCY

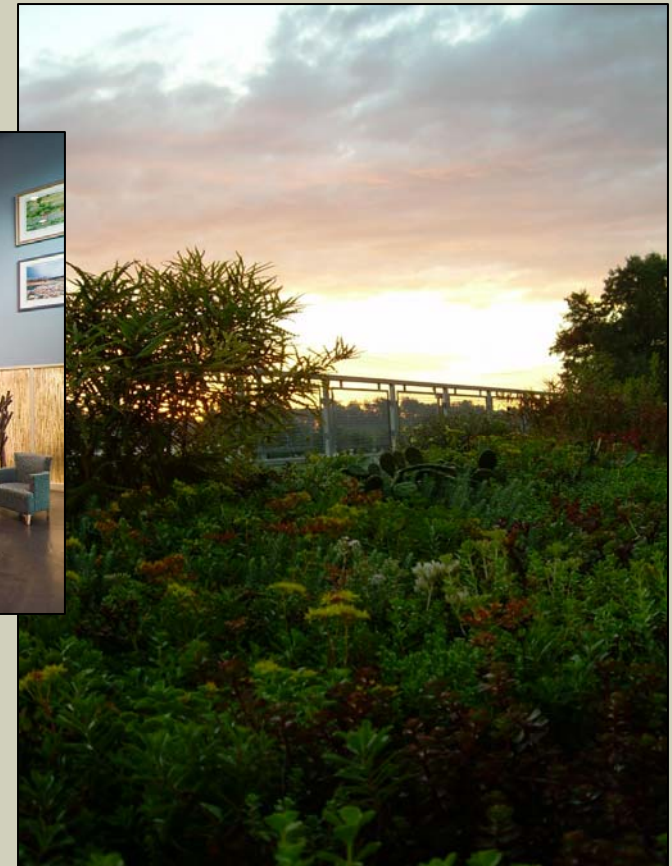
- ☞ Heat island and light pollution reduction
- ☞ Low-impact development
- ☞ Native landscaping and water-efficient irrigation
- ☞ Bicycle storage and changing rooms
  
- ☞ Low-flow sinks, toilets, and showers
- ☞ Motion-based faucet controls
- ☞ Waterless urinals
- ☞ 50% reduction in potable water use





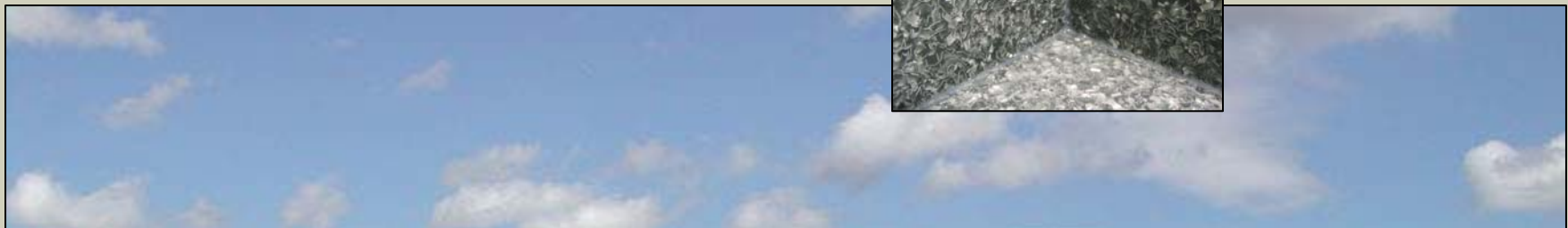
# ENERGY AND ATMOSPHERE

- ☞ Daylight- and motion-responsive lighting
- ☞ Light density of 0.9 Watts/square foot
- ☞ Energy Star appliances
- ☞ Green power credits for 100% of electricity used
- ☞ 25% lower energy usage than a typical building of WSSI's size
- ☞ No CFC's used in HVAC or refrigeration

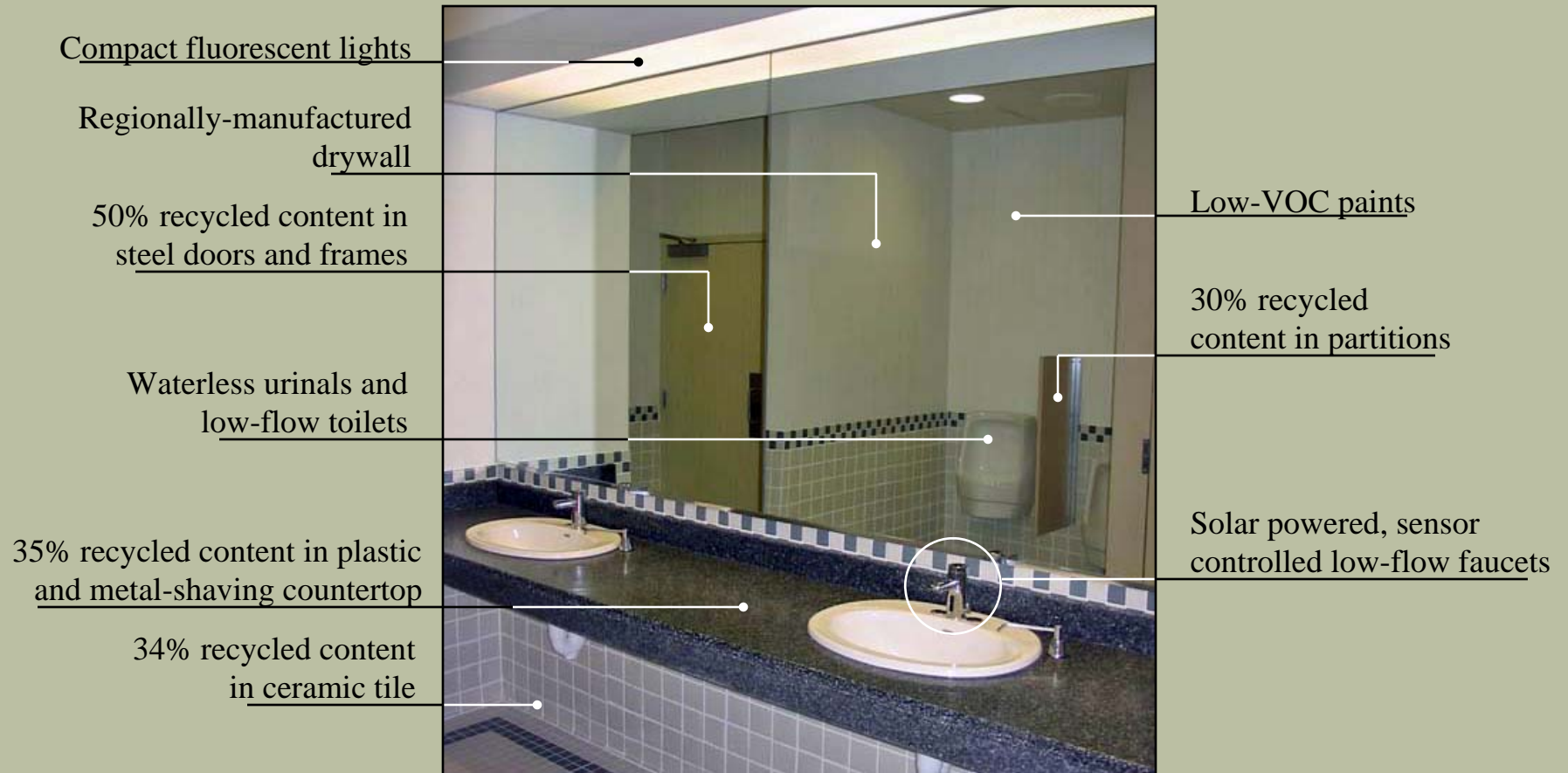


# MATERIALS, RESOURCES, AND INDOOR AIR QUALITY

- ☞ 26% recycled content throughout building
- ☞ 35% regional materials throughout building
- ☞ 11% rapidly-renewable materials throughout building
  
- ☞ Low-VOC paints, coatings, carpeting, and furniture
- ☞ 62 thermal zones
- ☞ Access to direct daylight and views
- ☞ Carbon dioxide sensors to deliver fresh air
- ☞ 3 times more ventilation than required by code



# INNOVATIONS AT WSSI



THE REST ROOMS

# INNOVATIONS AT WSSI

Rapidly-renewable,  
95% recycled  
wheatboard cabinets

35% recycled content in  
metal-shaving countertop

Low-VOC paint

11% recycled content  
in carpeting



Compact fluorescent lights

High-efficiency  
appliances

Rapidly renewable  
linoleum flooring  
(made with linseed oil  
and wood flour/cork dust)

THE KITCHEN

# INNOVATIONS AT WSSI

Parabolic, reflective  
light fixtures

Low-VOC paint

Motion sensor  
light control

Rapidly-renewable,  
95% recycled  
wheatboard



Daylight-responsive  
lighting control

Low U-value glass

Operable windows

11% recycled carpeting  
with low-VOC adhesive

THE CONFERENCE ROOMS

# WHAT IS THE COST BREAKDOWN?

<b>Hard Cost</b>	<b>Credits</b>	<b>Premium</b>	<b>\$ / Credit</b>
Sustainable Sites	4	\$312,080	\$78,020
Water Efficiency	3	\$6,100	\$2,033
Energy and Atmosphere	8	\$92,085	\$11,511
Materials and Resources	6	\$43,895	\$7,315
Indoor Environmental Quality	11	\$127,750	\$11,614
Innovation and Design Process	2	\$3,250	\$1,625
“Hard Costs” Subtotal	34	\$585,160	\$17,210
<b>Total Building Cost</b>	<b>\$5,696,100 -- (10.3% Premium)</b>		
<b>Soft Cost</b>			
Documentation, Paperwork, and Consulting Fees	34	\$111,900	\$3,290
Total Non-LEED Design Cost (Civil = \$141,754; Architecture = \$96,544; Interior Design = \$134,663)	\$372,960 -- (30.0% Premium)		
<b>Total LEED Premium (Hard Cost + Soft Cost)</b>	<b>34</b>	<b>\$697,060</b>	<b>\$20,500</b>

<b>Total LEED Certification Premium</b>	<b>\$697,060</b>
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# WHAT WILL THE BUILDING SAVE IN UTILITY COSTS?

Utility Type	Annual Use	Rate / Total Cost	Savings
<b>Potable Water</b>		<b>\$6.55 / 1,000 gal<sup>1</sup></b>	\$813 / year
Typical Estimated Potable Water Use	245,214 gal	\$1,606	
WSSI Estimated Potable Water Use	121,095 gal	\$793	
Total Cost of LEED-Related Items (Waterless and low-flow water fixtures)			\$6,100
<b>Capitalized Value of Savings (at 6%)</b>			<b>\$13,550</b>
<b>Payback</b>			<b>7.5 years</b>

1. Total estimated water cost = water (\$2.35 / 1,000 gal) + sewer (\$4.40 / 1,000 gal) per PWC Service Authority

# WHAT WILL THE BUILDING SAVE IN UTILITY COSTS?

Utility Type	Annual Use	Rate / Total Cost	Savings
<b>Irrigation Water</b>		<b>\$2.35 / 1,000 gal<sup>1</sup></b>	
Typical Estimated Irrigation Water Use	2,600,000 gal	\$6,110	\$6,110 / year
WSSI Estimated Irrigation Water Use	200,000 gal	\$0	
Total Cost of LEED-Related Items (Drip irrigation and native landscape)			
<b>Capitalized Value of Savings (at 6%)</b>			<b>\$101,833</b>
<b>Payback</b>			<b>7.5 years</b>
<b>Stormwater</b>		<b>\$0.84 / 1,000 sf<sup>2</sup></b>	
Typical Estimated Stormwater Utility Cost	115,586 s.f.	\$1,165	\$674 / year
WSSI Estimated Stormwater Utility Cost	--	\$491 <sup>3</sup>	
Total Cost of LEED-Related Items (Low Impact Development plan)			
<b>Capitalized Value of Savings (at 6%)</b>			<b>\$11,233</b>
<b>Payback</b>			<b>387 years</b>

1. Irrigation water cost = water (\$2.35/1,000 gal) per PWC Service Authority
2. Stormwater utility fee = \$0.84 / 1,000 s.f. impervious, per PWC Stormwater Management Program
3. Fee reduction is proportionate to site impervious area + an additional 40% storm water fee discount for LID control



# WHAT WILL THE BUILDING SAVE IN UTILITY COSTS?

Utility Type	Annual Use	Rate / Total Cost	Savings
<b>Electricity</b>		<b>\$0.0505 / kWh<sup>1</sup></b>	
Typical Estimated Annual Electric Use	968,100 kWh	\$48,900	\$14,700 / year
WSSI Estimated Annual Electric Use	677,658 kWh	\$34,200	
<b>Gas</b>		<b>\$1.30 / therm</b>	
Typical Estimated Annual Gas Use	15,600 therms	\$20,280	\$6,084 / year
WSSI Estimated Annual Gas Use	10,920 therms	\$14,196	
<b>Total Energy Savings</b>			\$20,784 / year
Total Cost of LEED-Related Items (Green power certificate, metering equipment, reflective roof, HVAC equipment, operable windows, lighting equipment, insulation, Energy Star appliances, and task lighting)			\$114,735
<b>Capitalized Value of Savings (at 6%)</b>			<b>\$346,400</b>
<b>Payback</b>			<b>5.5 years</b>

1. Estimated energy cost per NOVEC 3R LP (for large power service)



# WHAT ELSE HAS WSSI DONE?



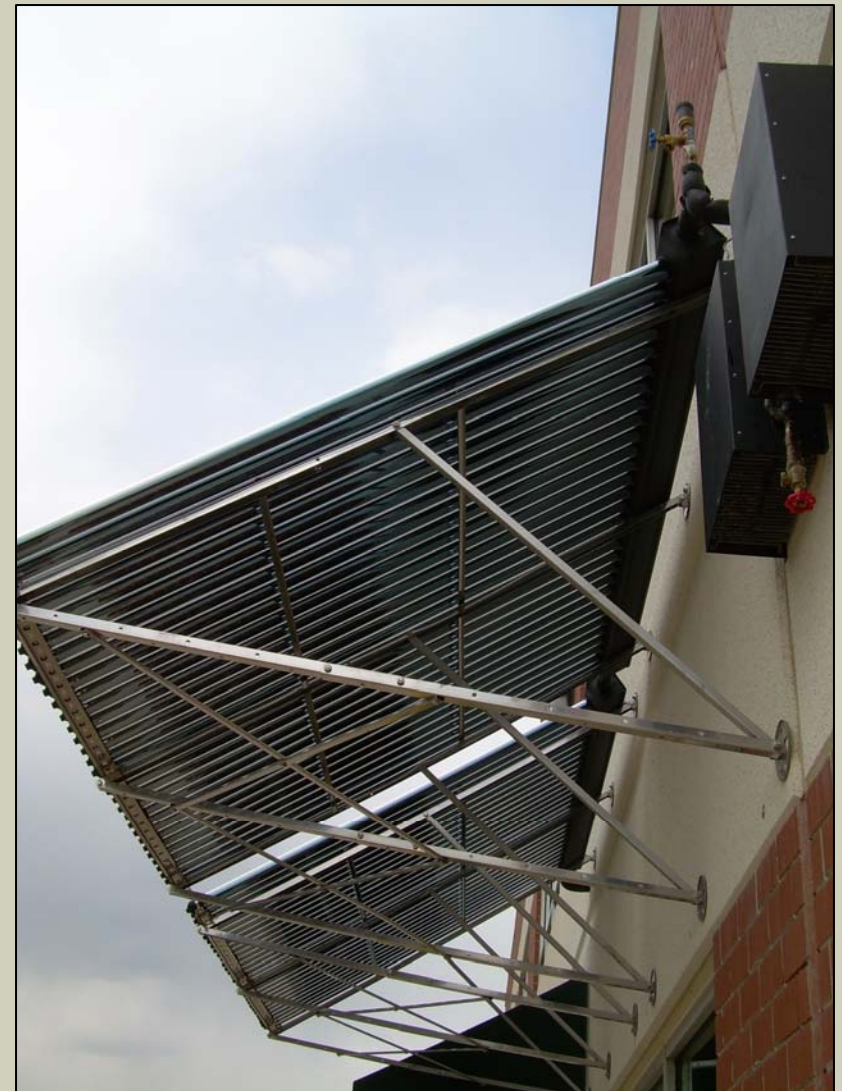
# EMPLOYEE HEALTH AND HAPPINESS

- ☞ Gym for employee use
- ☞ Trainer-led workouts four times per week
- ☞ Cardio and weight machines and volleyball net
- ☞ Weight Watchers weekly meetings
  
- ☞ 6-room kennel for employee use



# ADDITIONAL GREEN UPGRADES

- ☞ Solar hot water
- ☞ Full-spectrum fluorescent lighting
- ☞ Additional cistern for non-potable rainwater reuse (project underway)
- ☞ Living wall (project underway)
- ☞ Solar electricity (possible future project)



# THANKS TO THE WSSI PROJECT TEAM

- ☞ User – Wetland Studies and Solutions, Inc.
- ☞ Project Management – The Peterson Companies
- ☞ LID Concept Plan – Wetland Studies and Solutions, Inc.
- ☞ Civil Engineering – Urban Engineering and Associates, Inc.
- ☞ Architecture – W.A. Brown & Associates, P.C.
- ☞ Mechanical, Electrical, Plumbing – Potomac Energy Group, Inc.
- ☞ Interior Design – Bartzen + Ball
- ☞ Building Commissioning – Advanced Building Performance, Inc.
- ☞ General Contracting – EEReed Construction, LP
- ☞ Site Work – S.W. Rodgers
- ☞ Green Roof Installation – The Furbish Company
- ☞ Pervious Concrete – Virginia Ready-Mixed Concrete Association
- ☞ Photos – Ron O. Blunt Photography