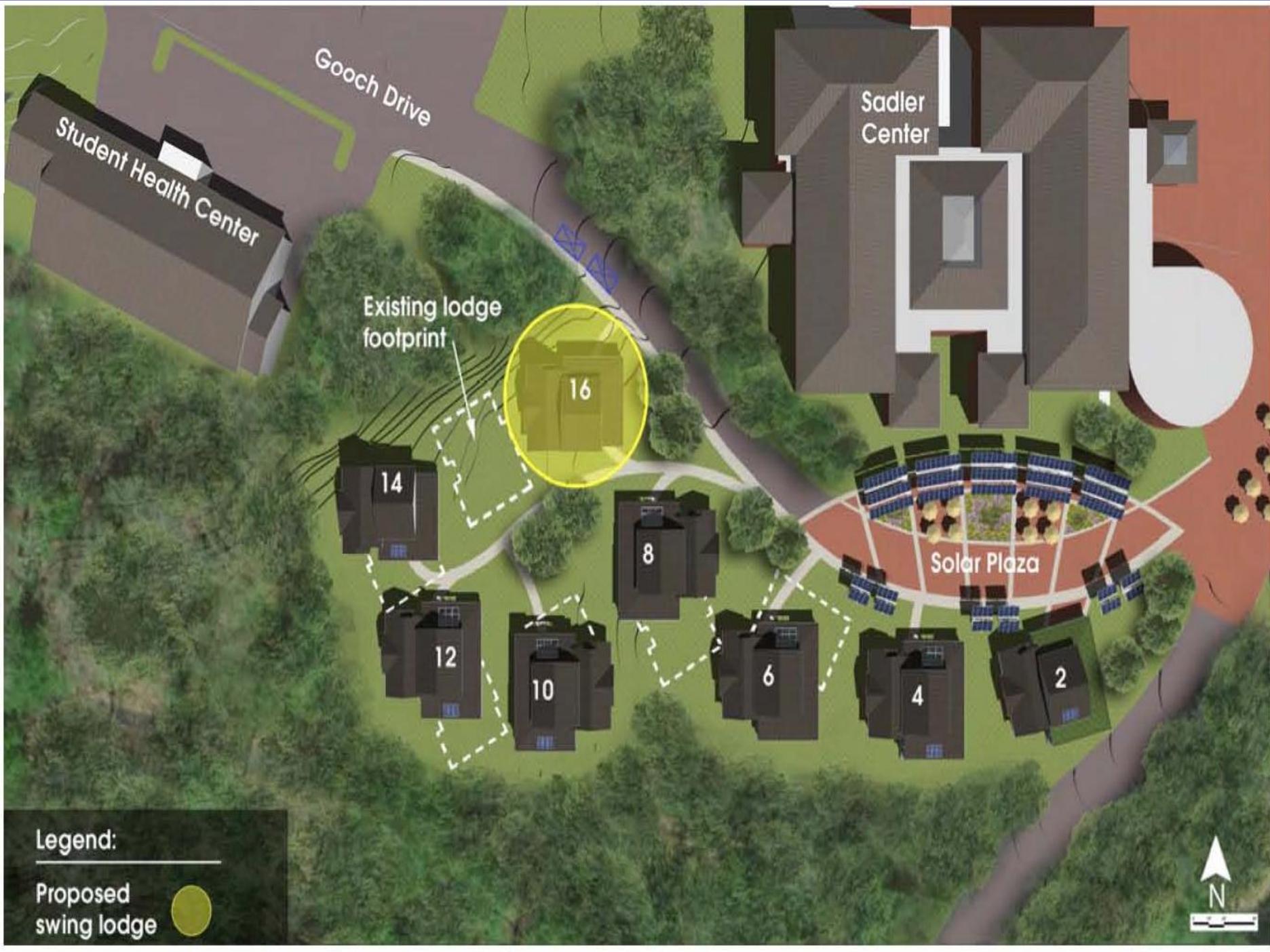


# Buildings and Grounds Committee

# **ECO-VILLAGE FEASIBILITY STUDY**











# College of William & Mary

## Eco-Village Feasibility Study & Site Plan

### Design Matrix

(Final Revisions made 08.18.11)

	All (Lodge 4 -baseline)	Lodge Option 1 (Lodges 10,12,14)	Lodge Option 2 (Lodges 6,8,16)	Specialty Features
<b>Site/Landscaping</b>	<ul style="list-style-type: none"> <li>· Permeable pavement as part of total site stormwater strategy</li> <li>· Native and drought-tolerant landscaping</li> <li>· Simple herb garden</li> <li>· Pollinator garden (native species only)</li> <li>· Fruiting shrubs (possibly also persimmons and pawpaws)</li> <li>· Bird attracting features (feeders/baths/houses) owner furnished</li> <li>· Bat boxes (high in trees) owner furnished</li> <li>· Outdoor patio</li> <li>· Lockups for bikes</li> </ul>			<ul style="list-style-type: none"> <li>· Daily Grind – green roof with irrigation (soaker hoses and moisture sensors) on lower slopes of roof</li> <li>· Daily Grind-solar hot water on portions of the roof that are not green roof</li> </ul>
<b>Water Use and Conservation</b>	<ul style="list-style-type: none"> <li>· Low-flow showerheads (1.5 gpm)</li> <li>· Low-flow bathroom faucets (0.5 gpm)</li> <li>· Traditional kitchen faucets (2-2.5 gpm)</li> <li>· Lodge 4 only to have both rain barrel and root zone irrigation w/ moisture sensor and submetered irrigation water</li> <li>· Whole house water meter reports to dashboard</li> </ul>	<ul style="list-style-type: none"> <li>· Dual-flush toilets (1.1/1.6 gpf) (<i>note, include dual flush in lodge 4, too</i>)</li> <li>· Rain barrel—include gutters.</li> </ul>	<ul style="list-style-type: none"> <li>· Low-flush (1.28gpf) toilets</li> <li>· Root zone irrigation with moisture sensor (<i>note: submeter irrigation water</i>)</li> </ul>	<ul style="list-style-type: none"> <li>· Pick one lodge to include graywater system (flush with handwash water)</li> <li>· Research “Living Machine” to determine if it makes sense to include in one lodge</li> </ul>

# College of William & Mary

## Eco-Village Feasibility Study & Site Plan

### Design Matrix

(Final Revisions made 08.18.11)

	All (Lodge 4 -baseline)	Lodge Option 1 (Lodges 10,12,14)	Lodge Option 2 (Lodges 6,8,16)	Specialty Features
<b>Energy Efficiency</b>	<ul style="list-style-type: none"> <li>PassivHaus design</li> <li>Super-insulated envelope</li> <li>Open up southern exposures</li> <li>Highly efficient two-stage ground source heat pump</li> <li>Energy efficient windows &amp; doors</li> <li>Energy recovery ventilators (ERVs)</li> <li>Energy Star appliances</li> <li>Ceiling fans</li> <li>Programmable thermostats</li> <li>Extensive daylighting</li> <li>Innovative lighting (skylights, SolaTubes, fiber optic)</li> <li>Daylighting controls (to darken skylights)</li> <li>CFL for lodge lighting</li> <li>Heavy window shades for daylight control</li> <li>Smart meters; compatible with smart grid technology</li> <li>Submeter HVAC, site lighting, interior lighting, plug loads; provide portable meters for students to study outlet-by-outlet consumption</li> <li>Recycled content insulation, to the extent applicable</li> </ul>	<ul style="list-style-type: none"> <li>DHW: Solar hot water with de-super heater and electric resistance auxiliary heat</li> <li>No window indicator</li> <li>Daylight sensors/dimming</li> </ul>	<ul style="list-style-type: none"> <li>DHW: Water to water heat pump (no solar hot water)</li> <li>Window indicator tied to HVAC</li> <li>Occupancy sensors</li> </ul>	

**College of William & Mary**  
**Eco-Village Feasibility Study & Site Plan**  
**Design Matrix**  
(Final Revisions made 08.18.11)

	All (Lodge 4 -baseline)	Lodge Option 1 (Lodges 10,12,14)	Lodge Option 2 (Lodges 6,8,16)	Specialty Features
<b>Material Usage/Recycling</b>	<ul style="list-style-type: none"> <li>· Bamboo floors/reclaimed wood floors (note: hard floors preferable to carpet)</li> <li>· Recycled/reused furniture—owner furnished</li> <li>· Recycle construction waste</li> <li>· Composting barrels</li> <li>· Recycled content drywall</li> <li>· EnergyStar appliances</li> <li>· Reused/salvaged building materials</li> <li>· Bird-friendly glass</li> </ul>			
<b>Indoor Air Quality</b>	<ul style="list-style-type: none"> <li>· Zero VOC paint</li> <li>· No carpet</li> <li>· Walk-off mats at entrances</li> </ul>			
<b>Education</b>	<ul style="list-style-type: none"> <li>· Educational signage</li> <li>· House-wide dashboard</li> <li>· Energy end-use monitoring (see submetering above)</li> </ul>			



LEED 2009 for New Construction and Major Renovations

## Project Checklist

2011.11.11

Sustainable Sites			Possible Points: 26	
18	7	1	Y	?
		N		
<b>Y</b>	Prereq 1	Construction Activity Pollution Prevention		
1	Credit 1	Site Selection	1	
5	Credit 2	Development Density and Community Connectivity	5	
1	Credit 3	Brownfield Redevelopment	1	
6	Credit 4.1	Alternative Transportation—Public Transportation Access	6	
1	Credit 4.2	Alternative Transportation—Bicycle Storage and Changing Rooms	1	
3	Credit 4.3	Alternative Transportation—Low-Emitting and Fuel-Efficient Vehicles	3	
2	Credit 4.4	Alternative Transportation—Parking Capacity	2	
1	Credit 5.1	Site Development—Protect or Restore Habitat	1	
1	Credit 5.2	Site Development—Maximize Open Space	1	
1	Credit 6.1	Stormwater Design—Quantity Control	1	
1	Credit 6.2	Stormwater Design—Quality Control	1	
1	Credit 7.1	Heat Island Effect—Non-roof	1	
1	Credit 7.2	Heat Island Effect—Roof	1	
1	Credit 8	Light Pollution Reduction	1	
6	4	<input type="checkbox"/>	Water Efficiency	Possible Points: 10

<b>Y</b>	Prereq 1	Water Use Reduction—20% Reduction	
<b>4</b>	Credit 1	Water Efficient Landscaping	2 to 4
<b>2</b>	Credit 2	Innovative Wastewater Technologies	2
<b>2</b>	Credit 3	Water Use Reduction	2 to 4

22	4	9	Energy and Atmosphere	Possible Points: 35
Y			Prereq 1	Fundamental Commissioning of Building Energy Systems
Y			Prereq 2	Minimum Energy Performance
Y			Prereq 3	Fundamental Refrigerant Management
12	2	5	Credit 1	Optimize Energy Performance 1 to 19
3	2	2	Credit 2	On-Site Renewable Energy 1 to 7
2			Credit 3	Enhanced Commissioning 2
2			Credit 4	Enhanced Refrigerant Management 2
3			Credit 5	Measurement and Verification 3
		2	Credit 6	Green Power 2

5	3	6	Materials and Resources	Possible Points: 14
Y			Prereq 1 Storage and Collection of Recyclables	
	3		Credit 1.1 Building Reuse—Maintain Existing Walls, Floors, and Roof	1 to 3
	1		Credit 1.2 Building Reuse—Maintain 50% of Interior Non-Structural Elements	1
2			Credit 2 Construction Waste Management	1 to 2
	2		Credit 3 Materials Reuse	1 to 2

<b>Materials and Resources, Continued</b>		
Credit 4	Recycled Content	1 to 2
Credit 5	Regional Materials	1 to 2
Credit 6	Rapidly Renewable Materials	1
Credit 7	Certified Wood	1

Indoor Environmental Quality			Possible Points: 15
Y	Prereq 1	Minimum Indoor Air Quality Performance	
Y	Prereq 2	Environmental Tobacco Smoke (ETS) Control	
1	Credit 1	Outdoor Air Delivery Monitoring	1
1	Credit 2	Increased Ventilation	1
1	Credit 3.1	Construction IAQ Management Plan—During Construction	1
1	Credit 3.2	Construction IAQ Management Plan—Before Occupancy	1
1	Credit 4.1	Low-Emitting Materials—Adhesives and Sealants	1
1	Credit 4.2	Low-Emitting Materials—Paints and Coatings	1
1	Credit 4.3	Low-Emitting Materials—Flooring Systems	1
1	Credit 4.4	Low-Emitting Materials—Composite Wood and Agrifiber Products	1
1	Credit 5	Indoor Chemical and Pollutant Source Control	1
1	Credit 6.1	Controllability of Systems—Lighting	1
1	Credit 6.2	Controllability of Systems—Thermal Comfort	1
1	Credit 7.1	Thermal Comfort—Design	1
1	Credit 7.2	Thermal Comfort—Verification	1
1	Credit 8.1	Daylight and Views—Daylight	1
1	Credit 8.2	Daylight and Views—Views	1

1	5	<b>Innovation and Design Process</b>	Possible Points: 6
1		Credit 1.1 Innovation in Design: Specific Title	1
1		Credit 1.2 Innovation in Design: Specific Title	1
1		Credit 1.3 Innovation in Design: Specific Title	1
1		Credit 1.4 Innovation in Design: Specific Title	1
1		Credit 1.5 Innovation in Design: Specific Title	1
1		Credit 2 LEED Accredited Professional	1

<b>Regional Priority Credits</b>		<b>Possible Points: 4</b>
1	Credit 1.1 Regional Priority: Specific Credit	1
1	Credit 1.2 Regional Priority: Specific Credit	1
1	Credit 1.3 Regional Priority: Specific Credit	1
1	Credit 1.4 Regional Priority: Specific Credit	1

71 23 16 Total

**Certified** 40 to 49 points   **Silver** 50 to 59 points   **Gold** 60 to 79 points   **Platinum** 80 to 110

Possible Points: 110



New Construction of Lodge(s)  
Construction Summary

10/5/2011

Donley LLC

1	Solar Park and Solar Panel array(s) (Based upon 183 panels)	\$	1,355,700
<i>Lodges w/o site work ( see below for overall site package)</i>			
2	Lodge #4 (Base Package)	\$	507,300
3	Lodges #10, 12 & 14 (Option #1 including hot water solar)	\$	1,374,700
4	Lodges # 6,8 & 16 (Option # 2 w/o hot water solar)	\$	1,352,600
5	Daily Grind (Shell only w/ green roof, geothermal & solar hot water)	\$	473,100
6	Overall Project Site Work ( incl walks and landscaping)	\$	598,600
7	CONCEPT TOTAL COSTS	\$	5,662,000

# EcoVillage Research & Teaching User Group

- Sarah Stafford; Economics & Public Policy
- Dennis Taylor; VIMS, ENSP, COS
- Lynda Butler; Law, COS
- Michael Luchs; Business
- Rex Holmlin; Business, Facilities Management
- Sharon Zuber; English
- Cheryl Dickter; Psychology
- Brent Kaup; Sociology
- Sarah Hanke; COS
- Kelly Joyce; Sociology, Arts & Sciences
- Scott Gibson; Business
- Randy Chambers; Biology, ENSP, COS
- Annie Davis; Development
- Dylan Reilly '12; Geology
- Corbett Drumme '12; Marketing
- Zander Pellegrino '15; Biology
- Gabbie Names '12; Biology & COS
- Will Douthitt '12; East Asian Studies & ENSP
- Katie Snyder '13; Business & ENSP

# User Group Areas of Interest

- Resource Use/Ecosystem Impacts/Habitat Management/Overall Project Performance
- Human Use and Behavior
- Cost, Cost Sustainability, Feasibility and Policy Issues Related to Sustainable Living
- Documentation and Communication of the EcoVillage Project
- Community Outreach and Engagement

# Sample Projects

- Demolition and construction analysis
  - Physical impacts on the site and cost analysis for recycling materials and habitat restoration.
  - Impacts/costs of renovation vs. new construction.
  - Comparison of sustainability gains in new vs. renovated construction.
- Analysis of resident behavior
  - Analysis of information and training on behavior.
  - Analysis of different feedback mechanisms on resource use and systems interaction.
- Documentation of “life in the lodges”
  - Oral histories from past residents of the Lodges.
  - Blogs and documentaries from students living in the EcoVillage.

# Sample Projects (Continued)

- Projects with a resource use/ecosystem focus
  - Studies of solar panels and siting variables that impact cost effectiveness and performance.
  - Analysis of green roof performance and long-term viability.
  - Studies of landscape management, restoration and native plant re-vegetation, habitat integrity.
  - Stormwater analysis of the site before, during and after construction.
- Engaging the community
  - Sustainable building exposition for local residents.
  - Provision of green building and sustainable living information via videos and other materials on our website and through the EcoVillage Kiosks.
  - Field trips and project engagement at the EcoVillage that tie in with K-12 science SOLs.

# Important EcoVillage Features

- Renovated lodge to compare to new construction
- Carbon dioxide monitor and weather station
- Individual water and electricity meters for key spaces (bedrooms, common rooms, bathrooms, kitchens)
- Water collection and reuse systems (rain barrels, cistern, gray-water use in toilets)
- Multiple green roofs
- Wiring to support cameras in common areas