



LEED[®] Workshop and Design Charrette Report



Shaver's Creek Environmental Center Petersburg, PA

09-10 July 2007



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Project Summary

Shaver's Creek Environmental Center

The Shaver's Creek facility, located in the Stone Valley Recreation Area of the Penn State Experimental Forest serves as Penn State's nature center by providing a mix of educational and recreational opportunities, including Discovery Rooms, a Raptor Center, a network of trails, a boardwalk over the wetlands at the inflow of Lake Perez, gardens, bird feeder areas, a bookstore and a gift shop that focuses on Pennsylvania nature. In June 2007 it was determined that a new building with multiple rooms for classes and visitors groups at the site was needed.



7group was contacted to help guide a process for creating a high performance LEED® certified project. 7group recommended two “charrettes” with the project stakeholders in order to provide green building and LEED education, to set project goals in terms of LEED, and to collectively produce conceptual design solutions related to green design principles. 7group was hired to facilitate these workshops in order to solicit valuable input from the project team.

The first of these charrettes, or workshops, was held on 09 July 2007 at the Shaver's Creek site to establish the project's LEED goals. An educational session about LEED and integrated design was lead by 7group, followed by a “Core Values” exercise that identified and prioritized stakeholders' goals and aspirations for the project. The team then engaged a comprehensive review of the project as it relates to each credit of the USGBC's LEED Green Building Rating System. This charrette concluded that LEED Platinum level certification may be possible and could positively impact the project's fund-raising activities. The second charrette was held on the following day, 10 July 2007, when members of the project team gathered to discuss, produce, and evaluate conceptual design solutions and green design strategies for the project.



This report documents the key findings and highlights from both of these charrettes.

Summary of the Charrette Process & Agenda

Shaver's Creek Environmental Center

09-10 July 2007

A Summary of the Charrette Process:

A successful high performance building is a solution that is greater than the sum of its parts. It is a system of integrated processes and products that increases the efficiency of the building systems and helps to reduce overall costs. A building that conserves energy alone does not constitute a high performance building. In the same respect, adding or overlaying environmental systems will not truly help the building benefit from the connections and interdependencies of an integrated, or "whole systems", design approach. This is the fundamental challenge of high performance building design and LEED Certification.

High performance buildings are most effectively developed through a design process that invites the client, building designers and consultants, a consulting general contractor/cost estimator, and other appropriate stakeholders to participate from the very beginning of the project. This is done in a focused and collaborative design effort, or brainstorming session(s), known collectively as a design "charrette" process. The purpose of this composite design team and design process is to encourage the exchange of ideas and information, thereby allowing truly integrated solutions to take form. A forum and methodology is provided where every team member is encouraged to cross fertilize with all others in order to identify solutions to problems that may relate to, but are not typically addressed by any one team member's specialty. The objective is to have every member of this composite design team understand the issues that the other members need to address. Thus more thorough and integrated solutions can result.

The charrette method is very important when the Owner is not one person but consists of a number of interested people. This is a successful way to educate all the participants: architects, engineers, community stakeholders, and the client team. There are many advantages to this approach: The client's staff members are invited to participate throughout the process. Participants are educated about the issues and participate in the team's investigations in order to "buy in" to the solutions. The educational process is accelerated, decisions are verified, adversity is diminished, the nuances of organizational issues are learned, and the design process is expedited. Final resolutions are not necessarily produced in the charrette, but most of the issues are explored with all the involved parties present.

Most buildings have great potential for incorporating the most advanced green building design techniques and systems. Part of the team's job is to find an acceptable balance between the economic, cultural, ecological components of sustainability that will meet the Client's objectives and yet allow for future adaptation of new technologies and interactions with the community.

7group's approach targets common sense applications of thoughtful and integrated solutions. Market transformation in this area will occur only if environmentally responsible buildings can be built at conventional construction cost. The integrated design process is the key to producing high performance green buildings within budget.

Goal-Setting Workshop & Design Charrette Objectives:

1. Gain an understanding of the process required to realize high performance LEED goals.
2. Establish preliminary LEED performance goals.
3. Familiarize participants with the importance of this approach.
4. Develop design concepts and strategies.
5. Establish next steps.

Charrette Agenda:

Day 1: Monday, 09 July 2007

9:00am – 5:00pm

Welcome

- Introduction of participants
- Overview of the day

Integrated Design: The Key to Producing High Performance LEED Buildings within Budget

- What it is - How to do it - Examples of its effects
- Changes to the standard design process
- LEED Overview

Project Overview: Owner and/or AE Design Team

- Opportunities and constraints, infrastructure issues, program concerns
- Overview of current project status

Core Values Exercise

BREAK

High Performance Green Buildings: Credit-by-Credit Review of LEED

- Using the LEED rating system as a framework for discussion, we will review the many items that can compromise a high performance LEED building. Special emphasis will focus on the process and methodologies needed to achieve LEED credits. Specific project examples will demonstrate many of the concepts, techniques and technologies.

Sustainable Site Credits

Water Efficiency Credits

LUNCH: 12:30 – 1:15 pm

Energy & Atmosphere Credits

Materials & Resources Credits

Indoor Environmental Credits

Innovation & Design Credits

Next Steps

ADJOURN: 5:00

Charrette Agenda:

Day 2: Tuesday 10 July 2007

9:00 am – 5:00 pm

Welcome

- Introduction of participants
- Overview of the day
- Review Core Values

Project Overview:

- Review of Day 1 results
- Review of site opportunities and constraints, infrastructure issues, program concerns
- Overview of current design ideas and/or program

Site Issues: Site Forces Exercise

- Climatic Issues
- Regenerative/Restorative Design
- Integration of project into the site/community
- Sustainable site opportunities created by this project

Building Design

- Explore potential conceptual design solutions:
 - Primary site components (storm water, utilities, circulation, parking, etc.)
 - Orientation
 - Functional relationships
 - Massing
 - Daylighting design

LUNCH: 12:30 – 1:15

Breakout Sessions

- Focused small groups to explore performance parameters and specific design solutions:
 1. Site and Building Design Issues
 2. Energy and Indoor Environmental Quality Issues
- Report results from the small group sessions.

Integration of Performance Parameters

- Review and integrate various performance metrics and design ideas from the breakout groups, targeting holistic solutions.
- Consider budget, environmental efficacy, achievability, core values and project mission.
- Establish specific performance goals for the project.

Next Steps

- Application of integrated, whole-system design process
- Schedule & Milestones

ADJOURN: 5:00

Charrette Participants

Shaver's Creek LEED Goal-Setting Workshop & Design Charrette

Location:

Shaver's Creek Environmental Center
 3400 Discovery Road
 Petersburg, PA 16669

Day One: 09 July 2007

Name	Entity	E-Mail
Mark McLaughlin	Shaver's Creek Environmental Center	mxm51@psu.edu
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Charrette Participants

Shaver's Creek LEED Goal-Setting Workshop & Design Charrette

Location:

Shaver's Creek Environmental Center
3400 Discovery Road
Petersburg, PA 16669

Day Two: 10 July 2007

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Core Values Exercise

Shaver's Creek Environmental Center
LEED Goal-Setting Workshop – 09 July 2007

A brain-storming session was initiated to list the core values of the group, or “touchstones”, that would define success. The values listed were identified as the most important design considerations for the project team. Once the list was generated, each project team member was asked to vote for their ten most important values or issues. The results of the exercise are listed in the table below.

Design Elements/Issues & Characteristics	# of votes
1. Building as a Teaching & Research Tool	32
2. Connection to the Outdoors	24
3. Energy Efficiency & Reduced Emissions Footprint – (off the grid ASAP)	22
4. Reflects the Magical Quality of the Place	20
5. Site Integration with Context – Organic	20
6. Playful / Whimsical / Inviting Character	11
7. Pre-eminent Source of Environmental Knowledge in PA	10
8. Iconic Imagery	8
9. Vehicular & Pedestrian Flow / Safety	8
10. Responsive to Multiple Users	7
11. Promotes and Inspires Learning	6
12. Serves as a Destination Place	5
13. Integrates Functionally with Existing Buildings	5
14. Indoor Air Quality	4
15. Flexibility	3
16. Water Efficiency	3
17. Benign and Adequate Parking	2
18. Measurement & Verification of Building Performance	2
19. Functionality and Consolidation	2
20. Resource / Materials Efficiency	1

LEED Review

Shaver's Creek Environmental Center
LEED Goal-Setting Workshop – 09 July 2007

At the LEED Goal-Setting Workshop, the project team conducted a comprehensive review of the project as it relates to each credit of the LEED Green Building Rating System. Each credit was discussed and assigned a preliminary status according to the following criteria:

- Yes these credits will be implemented on this project
- Maybe . . . these credits will require further investigation
- No these credits are not feasible for this project.

Accordingly, the determination of each credit's status was recorded on a summary preliminary LEED scorecard for the project, which is included in the Appendix, along with a complete scorecard that indicates comments and assigned tasks.

The results of this LEED review indicated a total of 50 "Yes" points targeted as feasible with nine additional points listed as "Maybe". As a result, the project team determined that the targeted LEED certification level should Platinum, since this requires achievement of 52 points. Accordingly, at least two of the "maybe" points pursued, but initially, at least 55 points should be targeted, since a couple of points may be lost during the design and construction process.

LEED® Targeted Credits

Shavers Creek Environmental Center

Yes	Maybe	No
50	9	10



Building Program

The building's program was discussed. Following a lengthy discussion that identified all of the of the building's functional needs, the group reached consensus that the project's program elements would best be organized on two floors, consisting the spaces and approximate areas listed in the Program Summary and Detailed Program Elements below. Additionally, the group identified the following general characteristics that the project should possess:

General Concerns and Components:

- An overlook tower with views of the lake
- Potentially a raptor sculpture and totem pole
- Blend into site as if it grew out of the site
- Small human scale architecture, elements, and components – “Not a monument”
- Multiple access to exterior spaces
- “Sprites” and playful elements
- Use building to create figural exterior spaces
- Incorporate water element(s)
- Use natural indigenous elements
- A village-like character



Program Summary:

First Floor:

Classroom	2,300 SF
Wet Lab	750
Storage	300
Kitchenette	200
Mud Room	120
HC Toilet	60
Janitor's Closet	40
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Subtotal Net Area	3,770 SF
gross/net ratio	x 1.5
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Gross Area – 1 st Floor	5,655 SF

Second Floor:

Shared Offices (6@ 200 SF)	1,200
Private Offices (2@ 120 SF)	240
Conference Room.	300
Work Room.	200
Unisex Toilet Rooms (2 @ 40 SF)	80
Janitor's Closet	40
<hr/>	
Subtotal Net Area	2,020 SF
gross/net ratio	x 1.5
<hr/>	
Gross Area – 2nd Floor	3,030 SF
Total Building Floor Area	8,685 SF



Detailed Program Elements:

1. Classroom: 2,300 SF

- Accommodate 100 people
- Flexible and reconfigurable
- Perhaps not rectangular
- Divisible into three smaller spaces with tack boards in each of these three spaces
- White boards as well – perhaps electronic tablet boards instead of whiteboards
- Connections to the outdoors – both physically and visually with lots of glass
- Not “over-scaled” – spatial layering with “spaces within spaces”
- Primarily functions as teaching space, secondarily for visitors
- Adjacent outdoor roofed space to promote expansion to an outdoor classroom
- Adjacent storage (300 SF) for 100 chairs and tables with large access doors
- Display cases – both horizontal and vertical
- Bookcases and specimen cases as teaching tools and storage
- Base cabinets – 72 feet in length
- Capability for darkening to allow video presentations and star lessons
- Good acoustics
- Copious daylighting
- A/V capability as a “smart classroom” to include ceiling-mounted projectors, screens, audio, and wireless access
- Functions also as multi-purpose room for dinners, banquets, rental space
- Adjacent to kitchen/catering space

2. Wet Lab: 750 SF

- Accommodate 20 people
- This space can get really messy, so appropriate materials required
- “Rough and tumble” room
- Functions both as field teaching space for kids and also college-level research
- Could be a separate structure connected by an outdoor space
- Adjacent mud room for kids arriving from creek with drain and hose just outside
- Mud room (120 SF) should include storage for waders, boots, nets, H₂O testing kits
- Attached greenhouse with potting area
- Base cabinets and bookshelves at perimeter
- No fume hoods needed, but “elephant trunk” ventilation unit at perimeter
- No chemical mixing required
- Refrigerator required
- Adjacent to mechanical equipment space
- Four lab benches as islands (at 30” A.F.F., but adjustable height) for smaller groups with remaining half as open space for instruction
- A/V projection with ceiling-mounted projection in open ½ of space
- Sinks and compressed air (40 psi) at lab benches
- Split task/ambient lighting and copious daylighting
- Ground floor location with direct access to exterior

3. Shared Offices: 1,200 SF

- Six office spaces at 200 SF each to accommodate 24 people total
- 3-4 people per office – vertically integrated with interns and staff together
- These offices will allow for vacating two existing “E” sheds and Nature Center so it can function as the Visitors Center
- Decentralized location of these offices is preferable
- Workroom (200 SF) for copiers, office supplies, 4' x 8' work table, laminator, paper cutter, and mail room functions
- Daylighting and operable windows
- Perhaps “whimsical” spaces

4. Private Offices: 240 SF

- Two private offices at 120 SF
- One for the Director, one for the Admin. Assistant
- Admin. Assistant also functions as HR/payroll
- These need to be quiet spaces
- Adjacent to conference room and public areas
- These offices should be visible – no “ivory tower”

5. Conference Rom: 300 SF

- Accommodate small group meetings for 12 people
- Contemplative space with copious views
- Access to outdoors – perhaps onto green roof

6. Kitchenette: 200 SF

- Functions as catering kitchen and staff lunch/break area
- Accommodate light food preparation and food storage
- Appliances to be Energy Star, including: refrigerator, microwave, range/warming oven
- Adjacent to classroom
- Proximity to conference room
- Ground floor location with service access for caterers
- Composting will occur

6. Toilet Rooms: 140 SF

- Two unisex toilet rooms on second floor with composting toilet
- Plus HC toilet room on first floor with rainwater harvesting to flush toilet – 60SF
- Adjacent 40 SF Janitor’s Closet for cleaning supplies storage

7. Mechanical Equipment Space:

- Likely adjacent to Wet Lab
- Green design components throughout the building should be visible to serve as teaching tools for instruction during walk-throughs

8. Lobby: Welcoming and Inviting – perhaps also serve as gallery space

PROGRAM SUMMARY: (10)

FIRST FLOOR

CLASSROOM	2,300
STORAGE	300
KITCHENETTE	200
WET LAB	750
HC TOILET	60
MUD RM.	120
JC	40
<hr/>	
NET =	3,770 x 1.5
<hr/>	
= 5,655	

END FLOOR

6 SHARED OFFICES @ 200 SF	1,200
2 PRIVATE OFFICES @ 120	240
CONF. RM.	300
2 UNISEX TOILET RNS. @ 40	80
WORK RM.	200
<hr/>	
NET =	2,020 x 1.5
<hr/>	
= 3,030	

TOTAL = 8,685 SF = 3,030

Site Issues

A site forces exercise was undertaken to determine design criteria and context. Solar access, prevailing winds, views, car and pedestrian traffic flows, utilities, user access, service access, parking, existing vegetation, topography, existing functions, and other issues were discussed and mapped in the sketch below. Several conclusions about the site were reached:

- Existing native vegetation and intact tree canopy to the west and south should be maintained.
- View opportunities towards the lake to the west should be exploited.
- Exterior connections to the raptor amphitheater and bats habitat area should be made.
- Existing classroom building could be demolished if necessary.



Four different locations on the site were identified as primary potential candidates for the new building, as indicated in the sketch to the right with the letters A, B, C, and D. After further discussion, it was concluded that site C would be best, with the building located approximately in the square zone depicted. The building could then minimize habitat impacts and perhaps take advantage of the slope.



Breakout Sessions and Building Design

The team broke into two separate breakout sessions to begin investigating design solutions, focusing mainly on architectural and site design issues. The sketch to the right indicates one group's solution, indicating a two-level "crescent" scheme embedded into the slope with the smaller crescent at the upper level and larger crescent on the lower level. The concave side of these crescent forms would be oriented to optimize solar orientation, while creating an exterior space to the south.



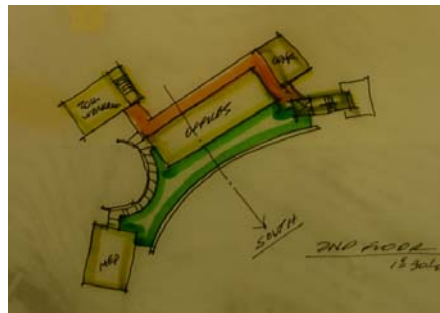
The second group also utilizes two overlapping forms, one at the upper and one at the lower level, with a "tower" entry connecting the two forms (depicted as the dark orange circular form in the sketch to the right). This scheme too maximizes solar exposure with an amphitheater on the slope to the south. Pedestrian entry sequence connects through the raptor amphitheater. Both schemes utilize a loop road through the site for vehicular access.



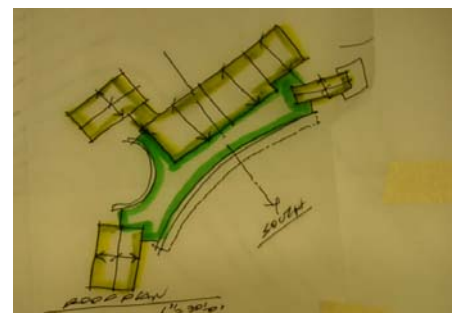
After further discussion of the merits of each scheme, the sketch to the left was generated. This scheme includes an exterior "rotunda" entry space that connects two building wings and links to the bats habitat and meadow space (depicted as the large green circle). A south-facing amphitheater embedded into the slope is included, along with the potential for an entry "tower" element. The group agreed that this scheme should be developed further and explored in terms of how the program elements might fit within it and how best a configuration such as this might best integrate into the existing site. The group also agreed that the scheme works best if shifted higher up the slope than the location indicated in either of the two prior sketches.

The team developed this scheme, producing the sketch below, which includes a circular arrival space oriented to receive pedestrians arriving from the east along a trail to the south of an expanded meadow adjacent to the bats habitat that connects to the visitors' center and raptor court. Entrance then occurs into a curving gallery/lobby space facing south onto an exterior terrace and amphitheater cascading down the slope. This one-story gallery space (depicted in red) connects a two-story classroom wing to the northwest, the wet lab space separated to the south, and a kitchen/storage/service wing to the northeast. This configuration proposes closing the loop road with a dead end service area to the northeast that is screened from pedestrians with landscaping to the north of the meadow. Other attributes of this scheme include:

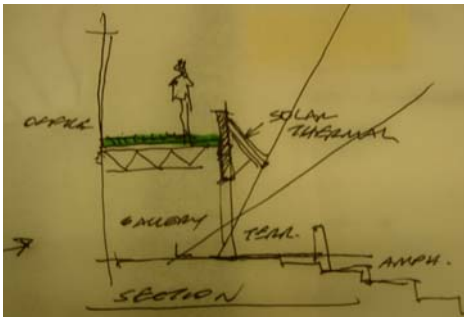
- A tower at the stair to the west creates a look-out space at the top for views over the trees to the lake.
- This tower also extends past the top of the slope which allows access to a "cave-like" space beneath the building at the west end of the classroom wing with views to the lake as well.
- Elevator and toilet room core at the southeast end of the classroom wing adjacent to lobby entry.
- Offices are located on the second floor of the classroom wing with access to the green roof over the gallery.
- A conference room at the west end with views and a workroom above to the northeast.



Second Floor Plan



Roof Plan



The section sketch to the left was developed to indicate that the gallery space on the first floor is primarily glass with many doors accessing a terrace (that might be covered) which in turn provides access to the amphitheater built into the slope. The green roof above could then be accessible from the west end of the second floor with solar thermal panels integrated as solar shading devices for this south-facing glazing.

Results

The larger group then reconvened to discuss the scheme's attributes. After presentation and discussion, the group reached consensus on the following conclusions:

Components and ideas that should be kept and developed:

1. Outdoor terrace outside classrooms
2. Kitchen location with views north to the boardwalk
3. Second floor mechanical space above the wet lab
4. "Cave" overlook space at west end
5. Tower with tree canopy and lake views to the west
6. Tower "crow's nest" as usable "whimsical" and accessible unique architectural space
7. Central outdoor arrival space linking lobby with bat meadow and pathway through existing site spaces
8. Preserve and expand this meadow east of the bat boxes
9. South-facing exterior space
10. Solar orientation
11. Bi-lateral daylighting
12. Integration with natural grade
13. Amphitheater on slope
14. Hidden service area at the northeast
15. Low profile, small scale, village-like character
16. Embracing organic forms – not just rectangular boxes
17. Living roof accessible from the second floor
18. Closing of road loop to allow restoration of this area

Things that should be avoided:

1. Excessive excavation and "digging in" to become too dark or buried, as opposed to being light and airy
2. Dark, cold, tunnel-like corridors and passageways
3. Clearing trees outside of current ring road

In conclusion, the charrettes resulted in the education of the design and owner team, as well as the creation of a preliminary LEED scorecard, a list of actions and responsibilities relating to the project's LEED pursuits, recommendations for site placement and development, and the creation of conceptual floor plans and building configuration.

Next Steps:

Prepare documents that can be used for fund-raising and development

Appendix

Larger scale conceptual sketches

