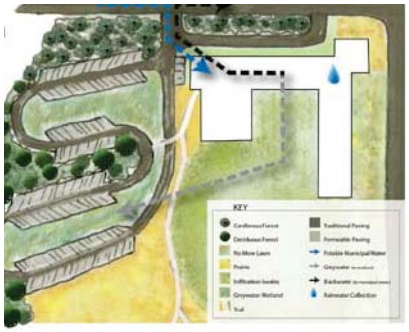
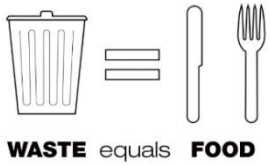
ARCH 5550 • Zero+DESIGN

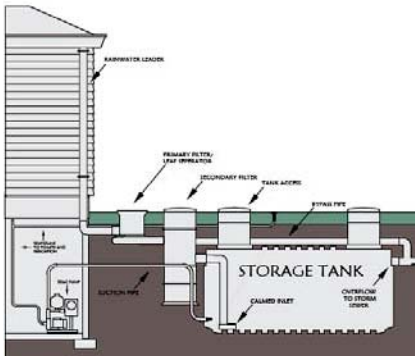
Envisioning the Sustainable Campus

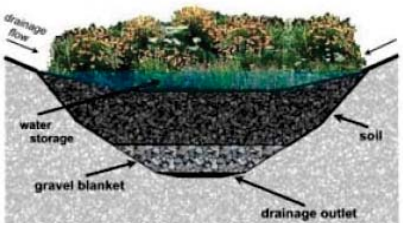
Integrating carbon, energy, and water management strategies toward zero- and net-positive design



Cross-section of typical rain garden







Water Management at the New Bell- Presentation for Arch 8567 Building and Site Inte Sustainable Design by Josh Grenier, Elizabeth Turner, Elizabeth Laurie, Kurt McIntire.

Waste to energy solutions: Babcock & Wilcox Vølund and TAS I/S have signed a contract for the delivery of one hot water waste-fired boiler for their existing waste-to-energy facility in Kolding, Denmark.

Water, the Hub of Life. Water is its mater and matrix, mother and medium. Water is the most extraordinary substance! Practically all its properties are anomalous, which enabled life to use it as building material for its machinery. Life is water dancing to the tune of solids. - Albert Szent-Gyorgyi (1972)

Water is the driver of Nature - Leonardo da Vinci

We forget that the water cycle and the life cycle are one. - Jacques Cousteau

Well, if waste equals food, then there's no such thing as waste. If there's no such thing as waste, and everything is food, then food are nutrients and therefore they are nutrients of metabolisms.
- William McDonough, author of Cradle to Cradle

Exercise 3: Calculating water, runoff and waste

Step A: In Process Wed. Mar. 30, 3:15 PM In-Studio Desk Crits
Steps A and B: Due Friday Apr. 8, 1:30PM: informal presentation; Room 71

Phase Grade weighting: 10% total grade (100 points); team grade

Reading: Read two of the following* (see course Moodle site)

- *Achieving Water Independence in Buildings, www.cascadiagbc.org , March, 2009 http://ilbi.org/education/Resources-Documents/Reports-Docs/WaterDocs/Achieving_Water_Independence_in_Buildings.pdf*
- *McDonough, William and Michael Braungart, Cradle to Cradle: remaking the way we make things, North Point Press, 2002: Read Chapter 4: Waste Equals Food (hardcopy provided)*
- *Edwins, Andrew, H2O Cycles and (re)Cycles: A Site Based Water-Balance Model For Design Impact Evaluation, August 2009*
- *Grenier, Turner, Laurie, McIntire, Water Management at the New Bell- Presentation for Arch 8567 Building and Site Integration in Sustainable Design, December, 2010.*

** Suggestion: have a member of your team read the ones you do not plan to read.*

OBJECTIVES

- To gain an understanding of the general water and waste supply and demand attributes of your project and begin to explore strategies that seek a balance, moving towards Zero+ Water and Waste Performance Goals.
- To create a preliminary water and waste "supply and demand" model for your site.
- To identify the opportunities for synergy with the surrounding campus buildings and landscape regarding water and material flows.
- To begin to identify the various water capture, reduction and reclamation systems for your project and to be able to model (calculate) and balance them.
- To continue to formulate an holistic approach to integrated living building design towards net-zero and zero+ performance goals.
- To arrive at a final site layout concept for your design that considers the above analysis.

STEP A: WATER AND WASTE RESEARCH AND ANALYSIS

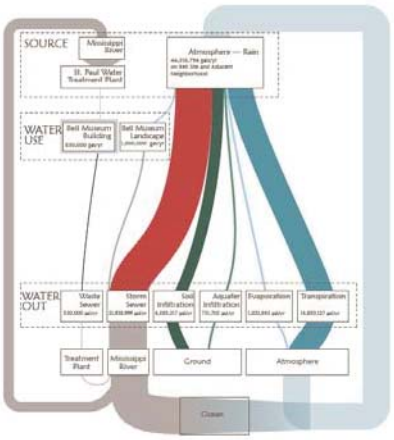
Continue gathering information on your project. As a team, investigate the usage characteristics regarding water and wastewater produced. Perform the following studies:

1. Calculate the total estimated water use and resulting waste-water effluent for your project if built to typical University standards.

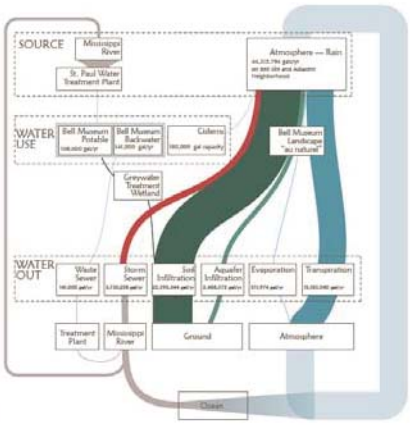
   Note: Use water use data provided in the Water Calculator Tools available or based on your own research.

2. Calculate the estimated annual precipitation and resulting stormwater runoff for your site if no attempt was made to intercept or capture rainfall. Include the stormwater from the roof areas and all impermeable surfaces.

3. Create a *graphic Water Balance (Supply and demand) analysis of your building and site. This is your Baseline Analysis to be used for proposed design comparison.*
   • Present: Baseline water balance model



Building A Water Balance Diagram



Building B Water Balance Diagram

4. Research precedents and innovative approaches to managing water and waste and identify at least four water management strategies and four waste management strategies that you feel are relevant to your project and evaluate them for suitability, performance and cost effectiveness.

   • Present: description and pros and cons of your preferred water and waste management strategies.

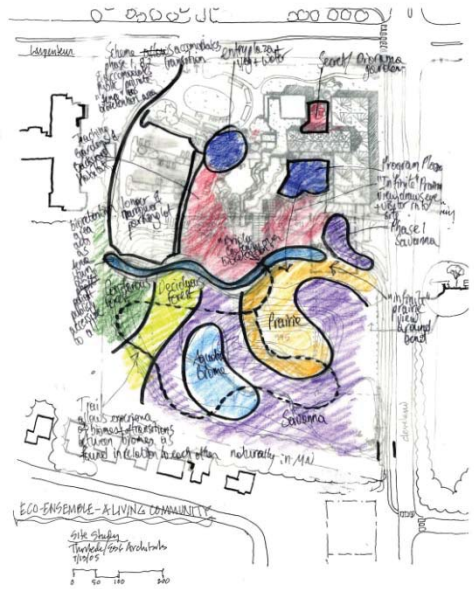
5. Calculate the probable size of a cistern that would be required to meet a significant portion (state the % goal) of the potable water demand for your project?

   • Present: graphic analysis of a possible rainwater harvesting approach and calculations for size of cistern to meet demand. State any assumptions made or caveats, e.g., lab water use unknown.

STEP B: PROPOSED SITE DESIGN

Due: Friday, April 8, 1:30 p.m. Rapson Room 71; Informal Review

Develop at least one conceptual design proposal for building and site layout based on your "RESEARCH AND SITE ANALYSIS" from Step A and from Exercise 2 Site Analysis. Show conceptual location of building footprint, impervious and pervious surfaces, planted areas, rainwater gardens, ponds, recreational and other amenities as required in the program provided or your own stipulated design intent. Show building entrance locations, service access and loading areas, curb cuts for surface drainage, infiltration beds, underground or above ground cisterns, transportation facilities (i.e., bike storage, bus stops, pedestrian and bike paths, etc. Show other landscape and ecological features such as trees and tree canopies, planting beds, ecological corridors, habitat construction, wetlands and ponds, etc.



For your informal review on *Friday, April 8* please include the following:

1. 1/16" Rendered Site Plan (at least one concept - see above description for elements to show)
2. Pervious vs. impervious cover analysis
3. Estimated runoff analysis (use your water calculator of choice)
4. Other Topographical and relevant water features
   - *Drainage - direction and slope*
   - *Rainwater capture strategies and cistern locations*
   - *Infiltration areas (including capacity)*
5. Illustrations of proposed integrated water and zero waste strategies and systems
   - Show images as required to illustrate your intended strategies for integration of innovative water systems and to balance supply and demand budgets on your site.
   - Show images and or diagrams of any proposed innovative resource (waste) management and materials flows strategies for your site.

pathways through a glacial landscape

NORTH HALF MASTER PLAN DRAFTS 08.19.05

GRADING CRITERIA - Exercise Two: *10% total of ARCH 5550 grade (100 pts)*

- Depth and appropriateness of water and waste research
- Clarity and accuracy of quantitative analysis charts, graphs and annotated drawings
- Craft and quality of Site Design Drawings