ENVIRONMENTAL EDIFICATION

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I would like to thank my wife Jackie; without your patience and persistent reminders I'm not sure if I could have made it through this year. I would also like to thank all of my friends and family for your help, even if sometimes that help was only to distract me so I could get my mind off of my project every once in a while.

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ABSTRACT

With the national economy on the fall many have questioned the future of the country. The State of Michigan in particular has come into a very trying time in its economic history. With the future of the automotive companies in crisis the state requires a new strategy in order to survive.

Michigan's government has suggested that the state has all the assets to become the country's leader in "green" technology. Governor Jennifer Granholm has said that the state's "great W's - wind, wood, water, workforce, wheels from the automotive industry, and even waste - Michigan is better positioned than perhaps any other state in the nation to turn our country's need to preserve the environment and reduce energy costs into jobs and economic growth."[1]

At this time the State of Michigan must now convince out of state or even foreign companies that work in the field of environmental technologies to move at least part of their companies to the state. The first step this thesis proposes in successfully accomplishing this plan is to instate a public education system in order to spur interest in the field and create a more educated workforce. This could result in a more desirable region for companies to call their home.

1 Governor Jennifer Granholm, www.michigan.gov/gov/0,1607,7-168--190099--,00.html

The world that Americans have grown up knowing is quickly evolving into something incredibly different. Yet it seems that the country is unprepared to advance into the future. The country has become exceptionally dependent on ideas from the past and how its citizens have always lived and worked. Each day jobs are being contracted out to other countries in order for American companies to remain competitive in an economy that is becoming increasingly weak due to the outsourcing used to remain profitable in the first place. Creating a reciprocating environment that is destined to continue its descent.

At present, the national unemployment rate is 8.5%[1] which is the highest the country has seen it in more than ten years. Unlike many cases in history, this economic crisis has been exacerbated by the credit and mortgage issues that have been prevalent in the news media. The combination of these problems has put the nation on edge about its financial future.

In order to move through this recession, plans must be laid out and systems must be instated that will assist the country in reaching goals for each region. States, or groups of states, must identify their positive attributes and identify an advancing field that has the possibility of thriving within that region's prevalent skill set and geographic setting.

In the State of Michigan, unemployment has now reached 12.6%[2], a rate more than four percent above the national average. The explanation for this

1 March statistic http://www.bls.gov/news.release/empsit.nr0.htm

2 March statistic http://www.milmi.org/

is relatively simple; the industry that once powered the state's economic success is in a crisis situation. Michigan has always relied heavily on its automotive industry, which since the early twentieth century has established Detroit as the automotive capitol of the United States and, for the majority of that century, the world. In the last decade, a decrease in profits and an increase in competition from the foreign automotive companies have continued to compound issues and spur anxieties about the industry and the state's economic future. For now, the automotive industry has been temporarily bandaged and conditionally saved from bankruptcy by the National Government's bailout loan passed on December 19, 2008, which lent the car companies a total of 17.4 billion dollars[3]. At that time, the companies were warned that this was a short-term fix and that they would only continue to receive help if each of the "Big Three" could present feasible plans for their company's revival to the new administration that would take office in January 2009. Since then, Ford has been the only company not to take the Bailout Loan and has also been the only company not to come across major issues. GM has been forced to name a new CEO and Chrysler has been advised that the company is no longer financially viable and unless they merge with another automaker they will be forced into bankruptcy.

Without a guarantee for the success of the automotive industry, or as the case seems to be, any industry in Michigan; a

3 News article http://www.msnbc.msn.com/id/28311743/

contingency plan is required and should be carried out without delay. If the automakers were to fail without the plan in place and already in action, the region may be doomed to an economic collapse unlike any previously seen in this area of the country. This thesis is an exploration into the requirements of this contingency plan as already laid out by the state government so that its success can be facilitated.

On April 18, 2008 Governor Jennifer Granholm gave a weekly address where she expressed the state legislature's interest in this contingency plan. Asserting her intensions for the forward motion of the state she has been leading:

> We are in the early stages of a green industrial revolution. Everywhere across this nation and the globe, companies are racing to meet the demand for products that save energy and reduce use of foreign oil. This is a unique opportunity for Michigan, and it couldn't come at a better time, given the challenges our manufacturing sector has faced. And that's why I am working hard to make sure that Michigan is ready to capitalize on it. Thanks to all of our great W's - wind, wood, water, workforce, wheels from the automotive industry, and even waste - Michigan is better positioned than perhaps any other state in the nation to turn our country's need to preserve the environment and reduce energy costs into jobs and economic growth.[4]

4 Transcript http://www.michigan.gov/gov/0,1607,7-168--190099--,00.html

To accomplish the goal that the Governor has set in front of the state, steps need to be taken to make the region more enticing for prominent green technology companies to relocate to the area. At this point, the extent of the effort has been bidding to out-of-state companies, and even foreign companies, in the environmental technologies field. Without an interested workforce to possibly seek out an education in the field, these companies would still be required to import employees, not only making the relocation less desirable but also limiting the beneficial effect that the new industry would have on Michigan's current residents.

In order to create the local interest level required for success, this thesis proposes that a new public education program must be put in place. Since the effect is required to be both in the short term and in the long term the program needs to be tailored so that it involves residents in all age groups. The most effective way to cater to the education of this wide of a range of citizens, a building program comparable to that of a science center would be advised. This allows the education center to be utilized by people of any age; from elementary school children on an educational field trip, to local college students involved in a cooperative environmental technologies program set up between the two facilities, or 45 year old factory workers interested in getting into a manufacturing industry with a brighter future, and elderly citizens who might just be interested in the subject.

This facility should allow for a range of educational activities so that it does not exclude any members of the public. The most important part of the program is the exhibition space; this space would be used to present many different examples of environmental technology and green design practices. The area must be designed to accommodate citizens of all abilities and to function much like a science center with opportunities for written and visual displays as well as the capacity to present hands-on exhibits.

Another important piece of this educational program would be a seminar space. The lectures given at the facility could be organized through the education center but would not necessarily need to be run by the program. This provides inclusion to the public and allows for the chance to have members of green industries or professors and specialists from local colleges to run their own public presentations that could draw large numbers from the community. To work in unison with the lecture space designed for large groups, another required space would be designed to accommodate small groups such as grade school classes or college/adult groups. Varying types of rooms should also be made available so as to provide spaces that will accommodate different groups, such as lab spaces for high school or college level classes that may explore activities that require more advanced equipment.

The goal of this thesis project and the proposed educational facility is to serve as a prototype for a statewide program that would expand to population nodes and establish new environmental technology education centers. This education program would become the first step in the process that would allow the state to manufacture its own environmental technology workforce; all started by creating an environment designed to spur interest in the field. With this growing public interest, increasing numbers of colleges and universities within the state would fund programs in environmental technologies in order to meet the demand of students interested in earning a degree within the subject. With the promise of an expanding workforce for worldwide companies to draw from, Michigan would become a coveted location for any business, either those breaking into the field or the ones experiencing an expansion and just looking to relocate to a more profitable region. Environmental technology is the way of the future and if the State of Michigan can achieve its goal of becoming a leader in the field, the economy of the region will benefit for many years to come.

RESEARCH

PROGRAM PRECEDENTS

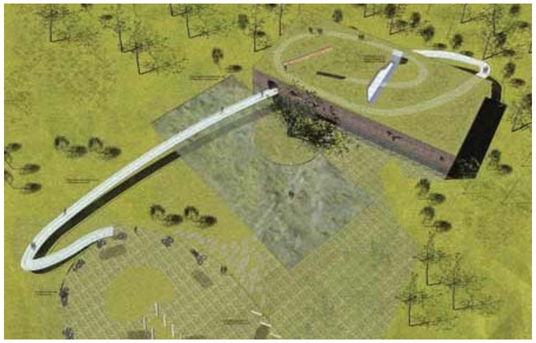
Ford Calumet Environmental Center
    Hegewisch, IL
    Studio Gang

Adam Joseph Lewis Center for Environmental Studies
    Oberlin, OH
    William McDonough + Partners

Pocono Environmental Education + Visitor Center
    Dingmans Ferry, PA
    Bohlin Cywinski Jackson

FORD CALUMET ENVIRONMENTAL CENTER

Hegewisch, IL/Studio Gang



All images taken from the official competition website, http://www.architecture.org/BG/ford_port.html

Calumet, Illinois is a small city on the far south side of Chicago, where it has for years been one of the region's principal manufacturing areas. It is also home to the 4,000-acre Calumet Open Space Reserve of marshes, wetlands, and prairies.

The City of Chicago has created two initiatives intending to reconcile Calumet's industrial economy and natural resources. First new landscaping guidelines are being recommend to future private developments which now must incorporate native plants and grasses that grow in the reserve, and second the City has partnered with the Ford Motor Company and the State of Illinois to realize an environmental center at the reserve.

"The Ford Calumet Environmental Center will educate the public about the industrial, cultural, and ecological heritage of the Calumet area; it also will provide an operational base for research activities, volunteer stewardship, environmental remediation, and ecological rehabilitation."[1]

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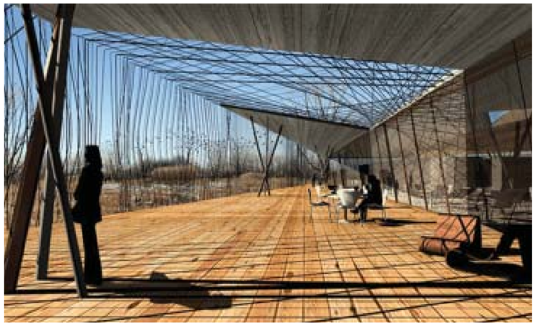
1 Official Competition Website http://www.architecture.org/BG/ford_port.html

The design for the environmental center, which the City intends to use as a model for the innovative use of green building practices, was chosen in April of 2008 through an international competition.

The images seen on these pages are just some of the designs chosen as finalists.



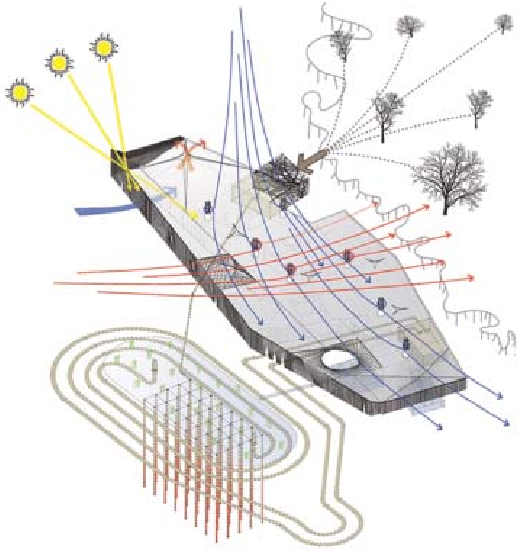
The competition-winning design for the Ford Calumet Environmental Center, by Chicago architects Studio Gang, takes its inspiration from birds' nests. This project re-conceptualizes the way the building is constructed in order to educate visitors on the past and present of the Calumet region's unique patchwork of industrial and natural areas.[1]

Like a nest, materials for the building are being collected from things abundant, nearby, and discarded. The design is composed of salvaged steel from the Calumet industrial region and other discarded recyclable materials such as slag. In highlighting these materials, the building demonstrates the sustainable principle of re-use.

The south facing porch enclosed within a basket like mesh of salvaged steel protects the migrating bird population from collisions with the glass that they cannot see. 97 million birds die annually in the U.S. from collisions with glass. At the same time it creates an outdoor classroom for visitors and becomes a

1 Official Competition Website
http://www.architecture.org/BG/gang.html

All images taken from the official competition website, http://www.architecture.org/BG/ford_port.html



blind for observing wildlife.

Geothermal heat pumps, earth tubes, a bio mass boiler, wind turbines, and water collection systems are integrated into the overall building design and become part of the educational component of the center and its site.[2]

When opened, the museum will serve as an educational resource on the area's industrial, cultural and ecological heritage and as an operational base for research activities, environmental remediation and ecological rehabilitation. The facility also will provide a base for the about 100 volunteers who will be actively using the facility to promote stewardship for the area's environment.[3]

I looked at this project and its connection to the landscape that it is set in as an example of the integration of a facility and a wetland.

2 Studio Gang's website http://www.studiogang.net/site/projects_b4.htm

3 Andrea Holecek http://www.nwi.com/articles/2008/02/08/business/business/doca6f8308c13123945862573e8005e5eb6.txt

ADAM JOSEPH LEWIS CENTER FOR ENVIRONMENTAL STUDIES

Oberlin, OH/William McDonough + Partners

All images taken from AIA Top Ten website, http://www.aiatopten.org/hpb/images.cfm?ProjectID=18

The Center for Environmental Studies at Oberlin College is a shining example of green design with an educational focus. I studied this project for its educational spaces as well as the living machine that is housed on site.

The living machine collects and treats the wastewater from the bathrooms and kitchen. It is housed in a greenhouse attached to the atrium, the living machine combines conventional wastewater treatment technology with the natural purification processes of a wetland ecosystem to remove contaminants from wastewater.

The classrooms feature large exterior and interior windows for daylighting combined with computer controlled light sensing fixtures to ensure adequate lighting in the public spaces. FSC-certified wood was used in the ceilings and doors and all of the desks, chairs, and carpeting are made of recycled materials. Low-VOC or no-VOC materials are used in combination with natural ventilation to provide a healthy indoor environment. In the auditorium space special attention was payed to the material choices. The fabric on the chairs

is biodegradable, the carpet is made of a product that can be cycled back into carpet when it is replaced, all the wood is FSC-certified, and the acoustical panels are made of agricultural waste products.[1]

1 AIA Top Ten Website, http://www.aiatopten.org/hpb/overview.cfm?ProjectID=18

POCONO ENVIRONMENTAL EDUCATION + VISITOR CENTER

Dingmans Ferry, PA/Bohlin Cywinski Jackson

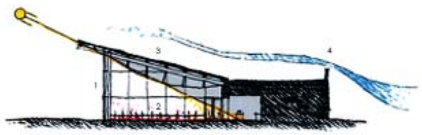
I studied the Pocono education and visitor center for its use of materials and the design of its section.

The project team chose materials for their durability, low maintenance, and low environmental impact. Reused, recycled, or recyclable materials were chosen whenever they would not compromise the materials' performance. Many of the building's materials (including the exposed concrete floor slab and structural frame, concrete block, wood structural system, and north wall cladding) will not require refinishing through the life of the building, reducing initial and operational costs and improving indoor air quality. The wall, roof, and glazing systems were carefully designed to maximize energy efficiency. Some materials, such as the recycled-tire cladding on the north wall, were selected for their ability to serve as visible examples of environmental design, which served to enhance the building's mission as a teaching tool for its users.

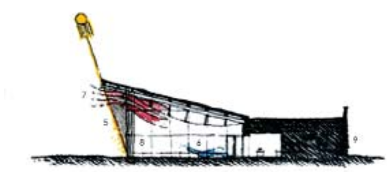
The design of the building section paid close attention to daylighting, natural ventilation, and passive solar and used them as the primary illumination and conditioning systems for the building, with mechanical and electrical systems serving as backup. The building's long

All images taken from AIA Top Ten website, http://www.aiatopten.org/hpb/images.cfm?ProjectID=1016

southern face maximizes solar gain in the winter, and the floor slab serves as thermal mass, storing heat and slowly releasing it. A large roof overhang protects the southern face from the summer sun and a light-colored roof minimizes the building's contribution to the heat island and lowers cooling bills.[1]



SECTION AT WINTER SOLSTICE



SECTION AT SUMMER SOLSTICE

1 AIA Top Ten Website, http://www.aiatopten.org/hpb/overview.cfm?ProjectID=1016

Because of the nature of my project and the size and location of the site I spent time researching the design and construction of wetlands.

Wetland Facts:

- Wetlands are some of the most biologically productive natural ecosystems in the world, comparable to tropical rain forests and coral reefs in their productivity and the diversity of species they support.[1]
- An acre of wetland can store 1–1.5 million gallons of floodwater.[1]
- Up to one-half of North American bird species nest or feed in wetlands.[1]
- Although wetlands cover only about 5 percent of the land surface in the lower 48 states, they are home to 31 percent of plant species.[1]
- Two thirds of all fish consumed worldwide are dependent on coastal wetlands at some stage in their life cycle.[1]
- Half of the United States original 197 million acres of wetlands has been lost.[2]

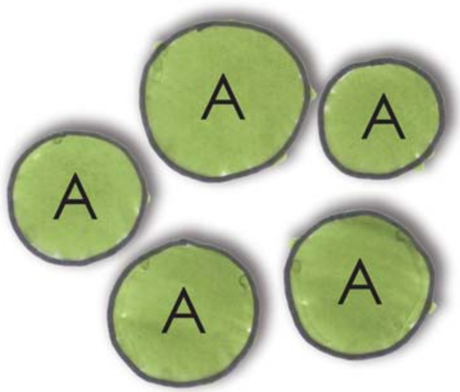
1 EPA Wetland Website, http://www.epa.gov/OWOW/wetlands/facts/contents.html

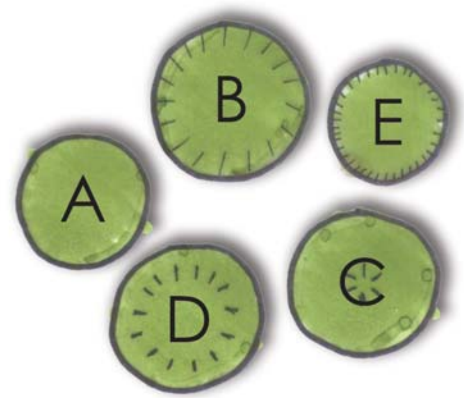
2 Wetland Design, Robert France

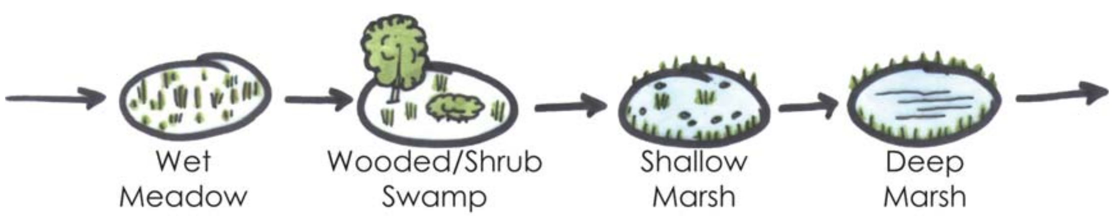
"Design less, understand more. Plan for self-design, self-regulation, and self maintenance."[1]

Designing islands within deep and shallow marshes provides safe havens for wildlife.[1]

Designing for a diverse set of wetlands allows wildlife to expend less energy in searching for and locating a diversity of habitats.[1]



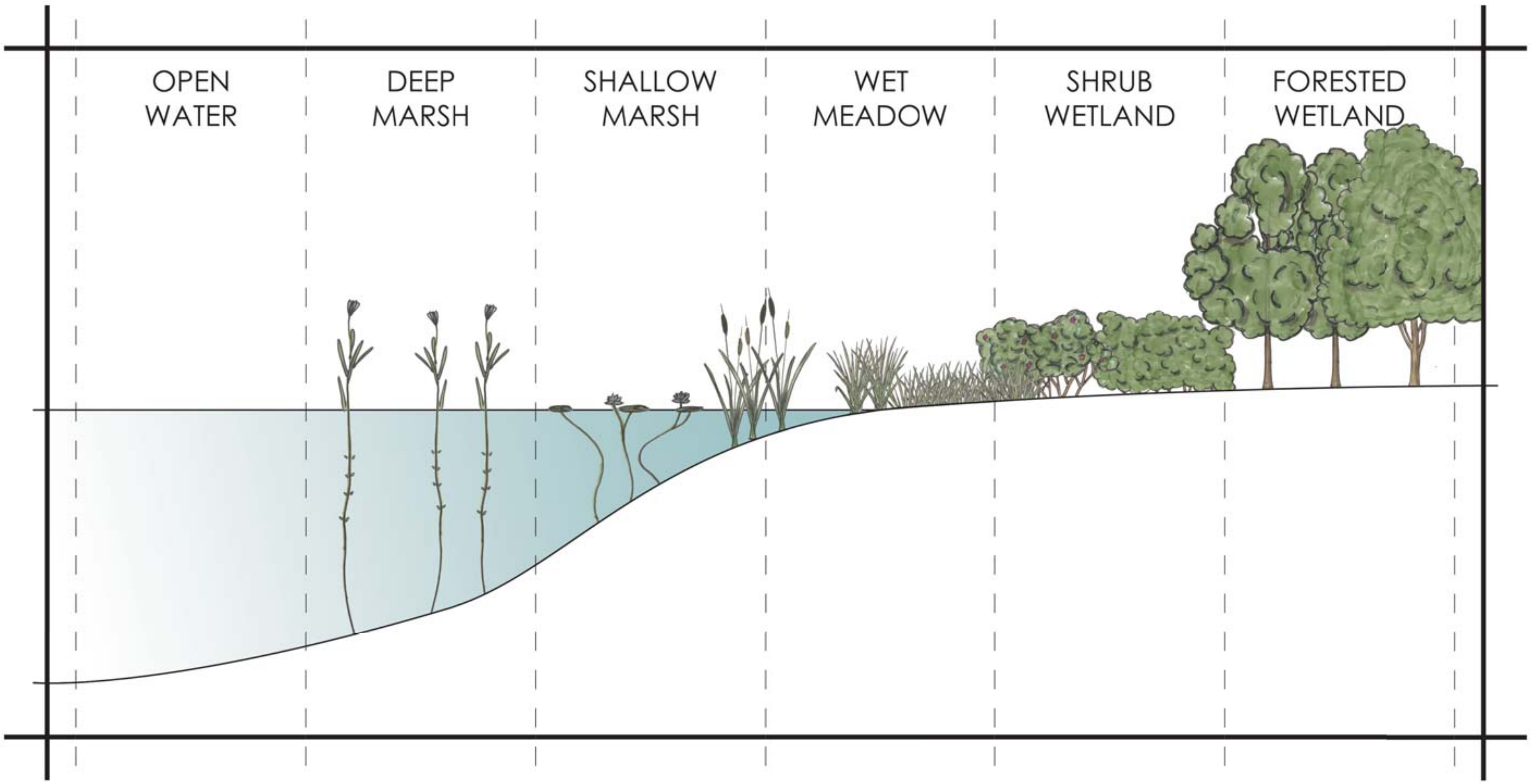




Changing water depths by utilizing multiple types of wetlands increases the diversity of both plants and animals.[1]

1 *Wetland Design*, Robert France

Six major planing zones exist with direct correlation to normal water levels in any wetland habitat.[1]



Submersed and Floating Leafed Plants:

Common Bladderwort
Elodea
Slender Naiad
Floating Leaf Pondweed
Water Shield
Water Meal
Spatterdock
Nodding Smartweed
Coontail
Eurasian Milfoil
Water Stargrass
Curly Leaf Pondweed
Lesser Duckweed
White Water Lily
American Lotus
Dotted Smartweed
Muckgrass
Wild Celery
White Crowfoot
Sago Pondweed
Star Duckweed
Fragrant Water Lily
Water Smartweed
Lady's Thumb

Rushes, Sedges, and Grasses:

Baltic Rush
Flowering Rush
Hardstem Bulrush
Needle Spikerush
Lakebank Sedge
Bull Sedge
Strawcolored Flatsedge
Fowl Meadow Grass
Smooth Sawgrass
Broad-Leaf Cattail
Alpine Rush
River Bulrush
Chairmaker's Rush
Creeping Spikerush
Fox Sedge
Fragrant Flatsedge
Rattlesnake Grass
Reed Canary Grass
Narrow-Leaf Cattail
Soft Rush
Softstem Bulrush
Blunt Spikerush
Squarestem Spikerush
Tussock Sedge
Slender Flatsedge
Cut Grass
Reed Grass

Herbaceous Wetland Plants:

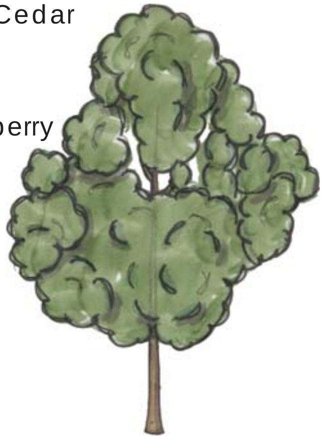
Arrow Arum
Cardinal Flower
Blue Vervain
Boneset
Swamp Milkweed
Great Water Dock
Bittercress
Marsh Cinquefoil
Swamp Rosemallow
Whitefield Aster
Pitcher Plant
Blueflag
Giant Burweed
Marsh Fern
Purple Loosestrife
Stick-Tight
Watercress
Silverweed
Calico Aster
Canada Goldenrod
False Nettle
Pickerel Weed
Sweetflag
American Bugleweed
Scouring Rush
Spotted Touch-Me-Not
Marsh St. John's Wart

Shrubs and Vines:

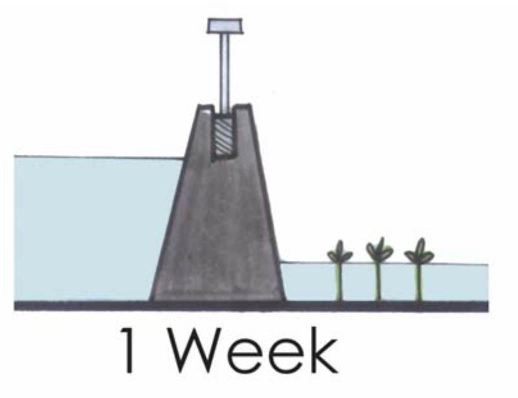
American Elder
Buttonbush
Gray Dogwood
Riverbank Grape
Speckled Alder
Water Willow
Slender Willow
Shining Willow
Raspberry
Meadow Sweet
Chokecherry
Red Osier
Virginia Creeper
Swamp Rose
Heartleaf Willow
Sandbar Willow
Sheepberry
Blackberry
Steeplebush
Winterberry
Silky Dogwood
False Grape
Sweet Gale
Salix Cordata
Pussy Willow
Ninebark

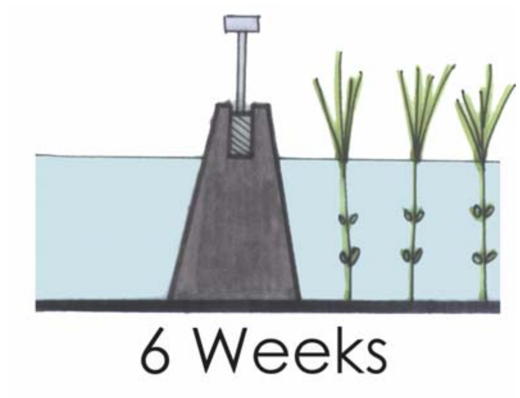
Trees:

American Elm
Red Ash
Cottonwood
White Birch
Silver Maple
Pin Oak
Eastern Hemlock
Peach Willow
Slippery Elm
Black Ash
Balsam Poplar
Yellow Birch
Ash-Leaf Maple
Swamp White Oak
Northern White Cedar
Weeping Willow
Basswood
Common Hackberry
Sycamore
Red Maple
Bur Oak
Tamarack
Black Willow[1]



1 All native vegitation information found in, *A Naturalist's Guide to Wetland Plants*, Donald Cox



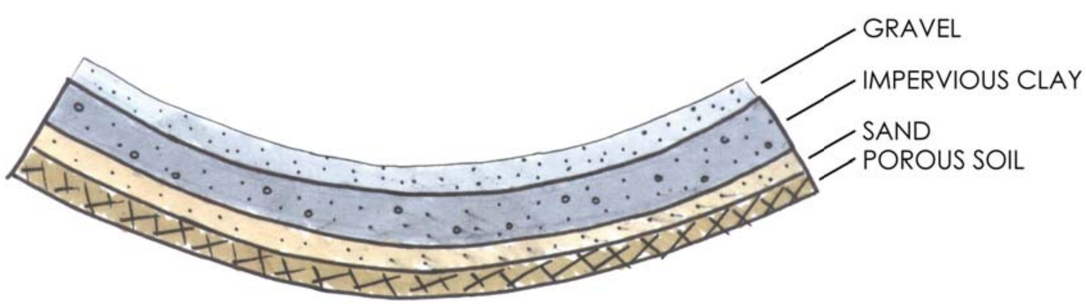


Gradual flooding protects the liner and allows plants to become acclimatized as they begin to grow.[1]

After the topography has been shaped and graded the compacted soil should be broken up so that the soil can be allowed to settle into a level bed.[1]

"One of the most important factors affecting wetland success is the creation of precise elevations. Attention should be paid to site-sensitive design where pools, basins, and channels are shaped and blended into the natural contours."[1]

Because surface pooling of contaminated water poses a threat to groundwater resources, care must be exercised in sealing the bottoms of constructed wetlands intended for treating contaminants.[1]



The use of a live cribwall in place of the existing crushed concrete barrier is not only more aesthetically pleasing but also creates a friendly environment for fish and other wildlife along the river's shoreline.[2]

1 *Wetland Design*, Robert France

2 *Soft Engineering of Shorelines*, Greater Detroit American Heritage River Initiative

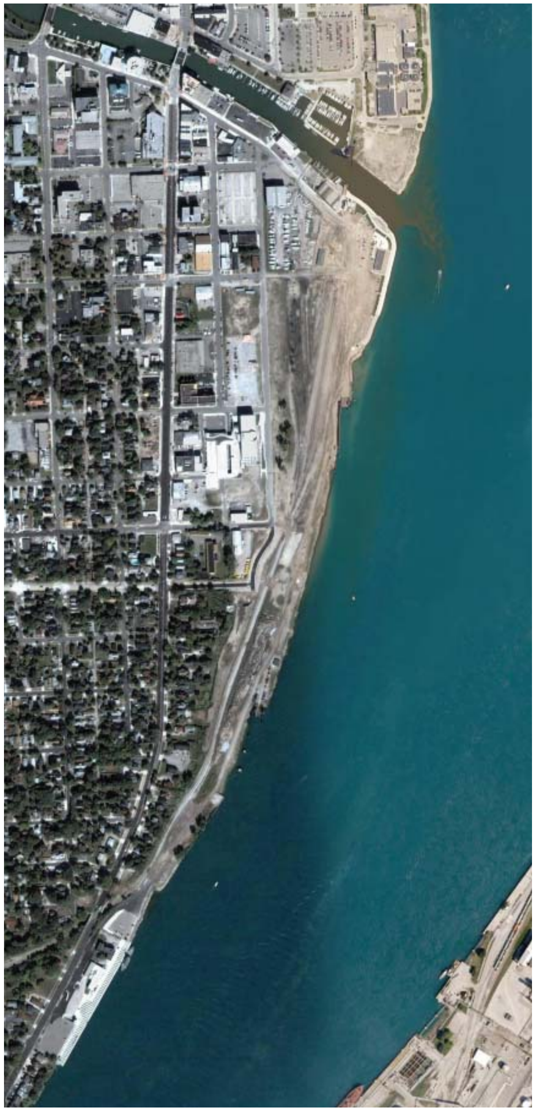
DESIGN PROCESS


Black River
St. Clair River
WATER
3RD ST.
COURT
SEE SHEET No. 3
SEE SHEET No. 2
PINE ST.
WALL ST.
COURT ST.
COOLEY & CAMPBELL PLANING MILL
FARMERS ELEVR
J. HILL LUMBER YARD
EXCELSIOR ELECTRIC LIGHT WKS
Slack Coal Pile
ROUND HO.
Wood Pile
Mach. Shop
Car Repair Shop
Coach Shed
WET MARSH
Cooper Shop
Barrel W.Ho.
Feed W.Ho.
Flour W.Ho.
Coal Pile
FLOUR MILL
Grain Elevator
Wharf
MC MORRAN & CO
FLOUR MILL, ELEV, COOPER SHOP & W.HOS.
Slip
No exposure
DOCK
76
77
90
91
92

SITE ANALYSIS

The site that my thesis project is on is in Port Huron MI, on the shoreline of the Saint Clair River just to the south of the mouth of the Black River. Since the 19th century the site has been used primarily as a rail yard and Ship loading hub.

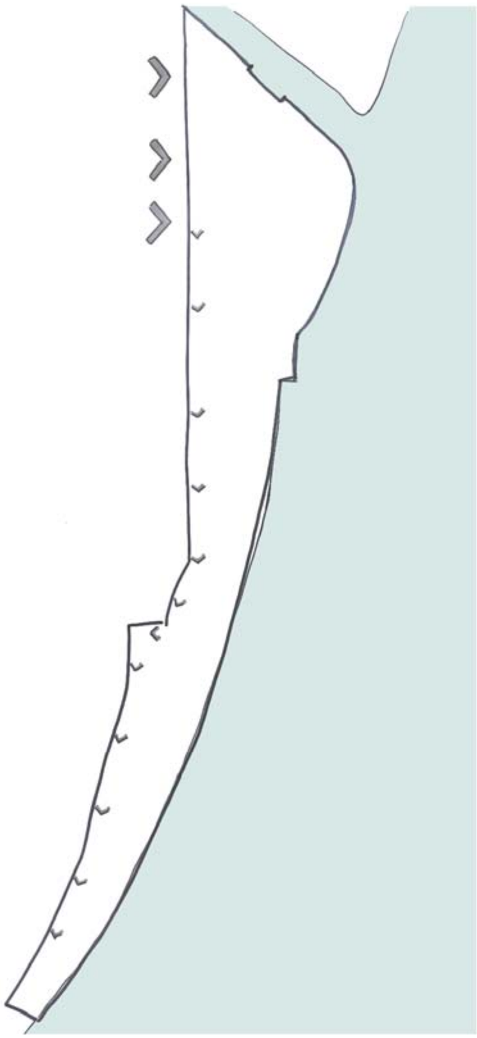
As seen in the Sanborn Map on the opposite page, by 1887 almost all of the wetland that originally covered the cost line on this stretch of the St. Clair River had been filled in and used for development. For the next century the City of Port Huron continued to grow and the rail yard was an important catalyst for that development.



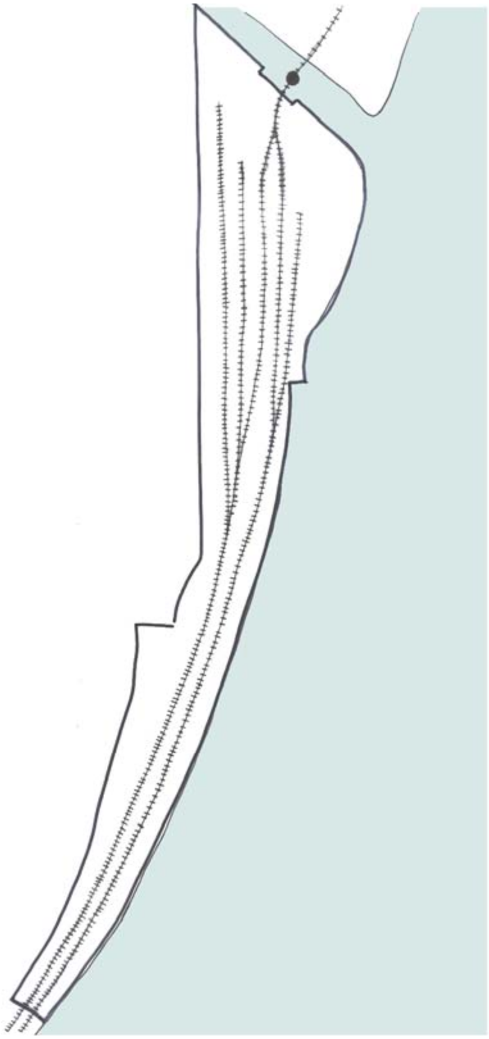
Presently the site sits abandoned with very little of its historical infrastructure still remaining. At this time the only hint at its original use are the two decaying wooden docks, previously used for loading the ships with the rail car's payload, that are gated off for safety reasons.

The site itself is a leveled off gravel plane with no distinguishing features. The site borders both the central business district and a residential zone to the West. At the Southern end of the site there is a 20 foot elevation change at the property line creating a physical separation between the site and the residential neighborhood.

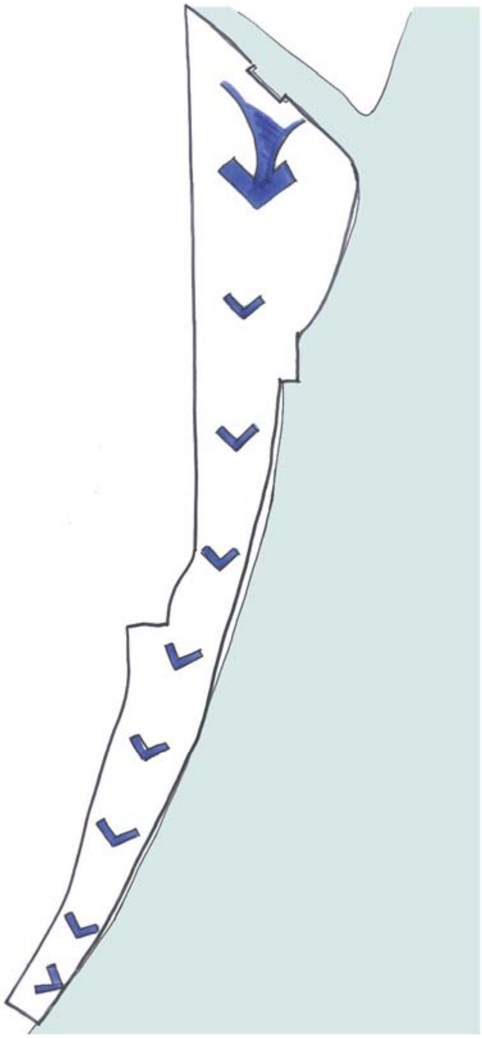
Entry to site and vehicle circulation



Historical railroad layout



Existing topography + water flow



LOCAL SCHOOLS + COLLEGES

A:Port Huron Northern High School

B: Woodrow Wilson Elementary School

C: Harrison Elementary School

D: Garfield Elementary School

E: Port Huron High School

F: Crull Elementary School

G: Roosevelt Elementary School

H: Central Middle School

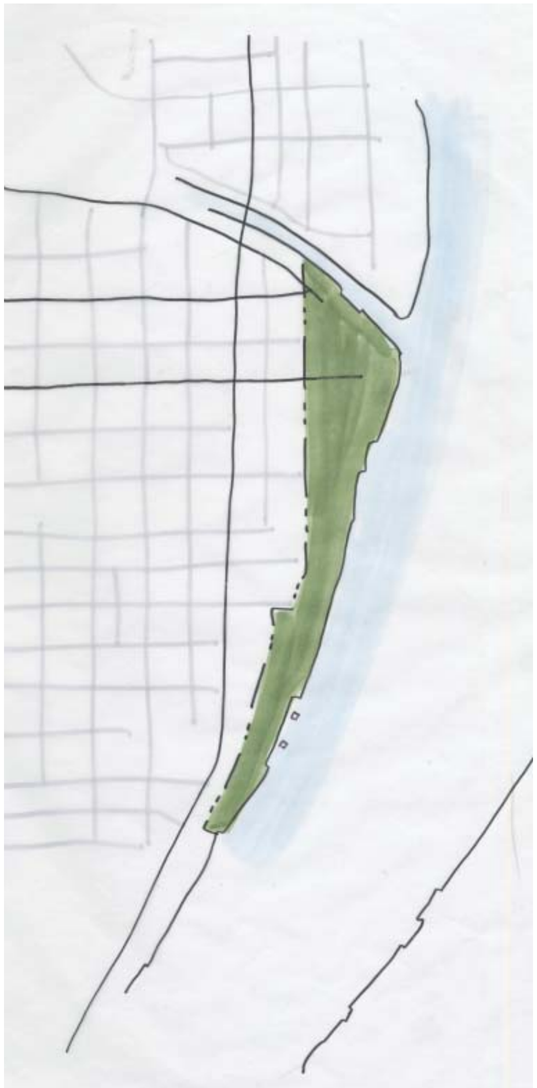
I: Chippewa Middle School

J: Holland Woods Middle School

K: Port Huron South High School

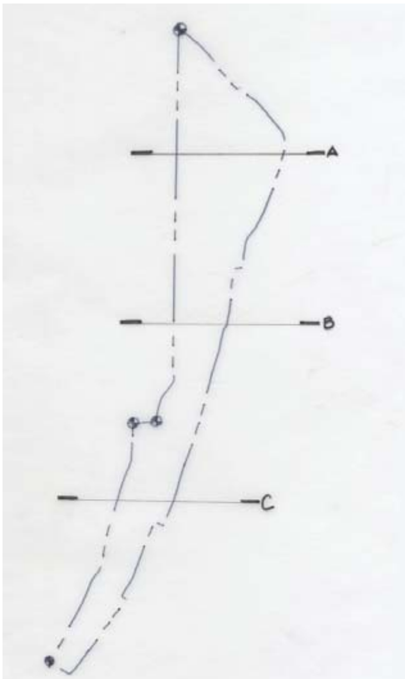
L: St. Clair County Community College

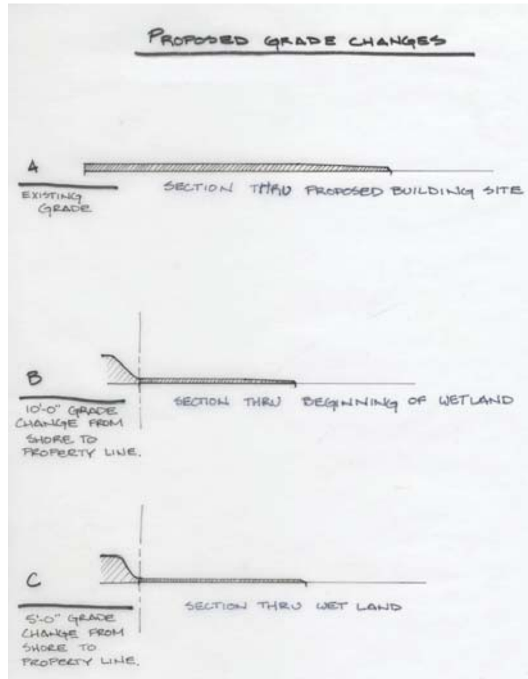
M: St. Mary Catholic Academy



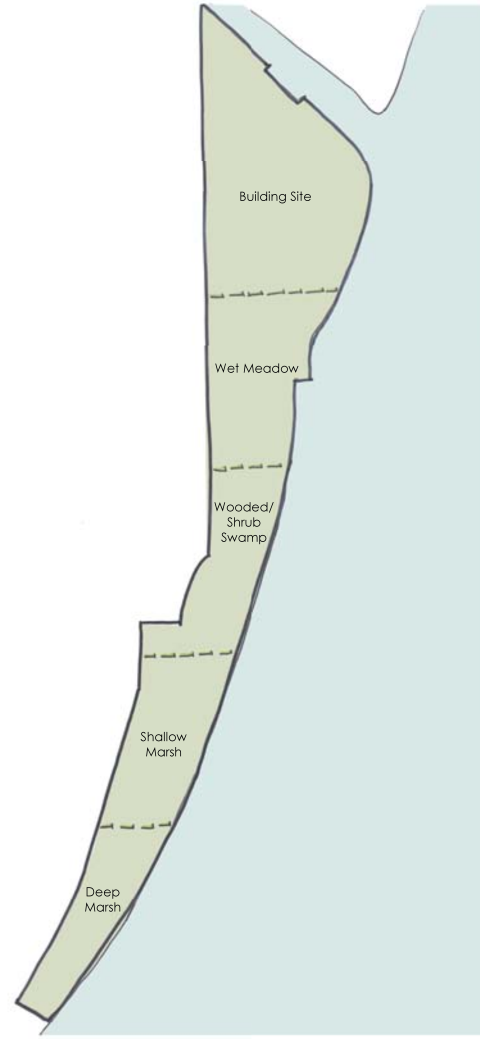
After my site analysis it was clear that the site lacked any interesting features. I felt that in order to successfully complete this project I had to first develop a strategy for the site.

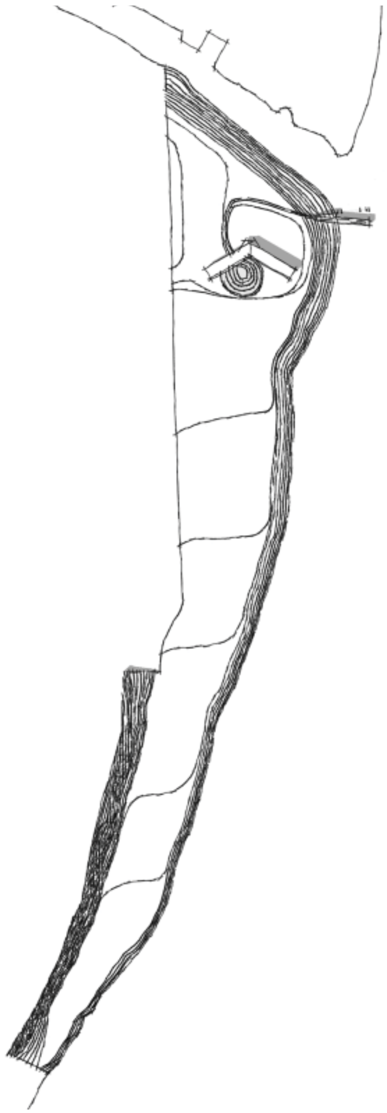
Historically the site was a wetland and my first major decision was that in order to use the site respectfully I would reconstruct the natural habitat on the Southern portion of the site and design my education facility to be located on the Northern end.





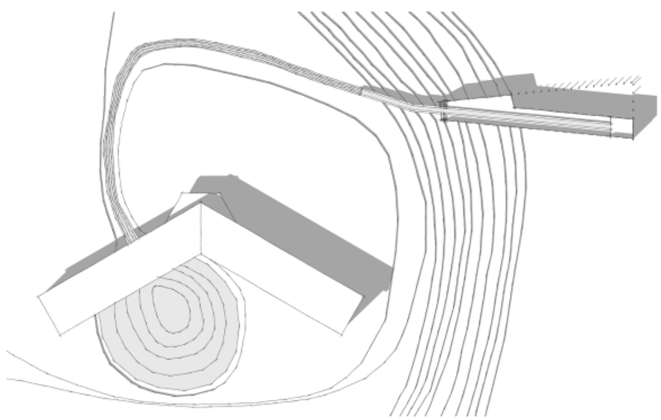
With my first attempt at designing the wetland I started to divide the site into sections from North to South stepping the grade down with each section to utilize what little natural topography I had.

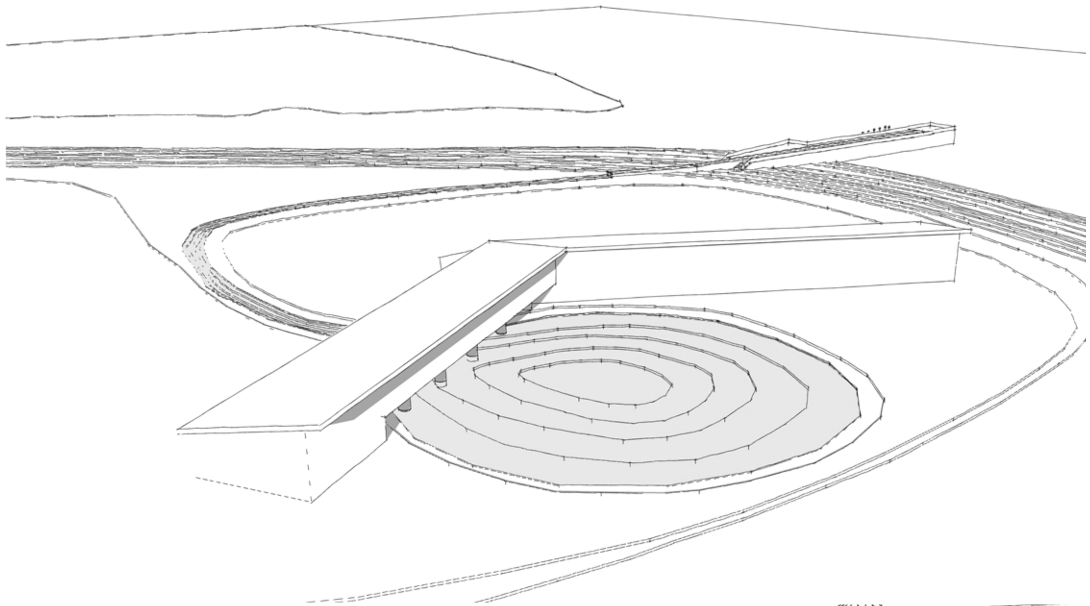




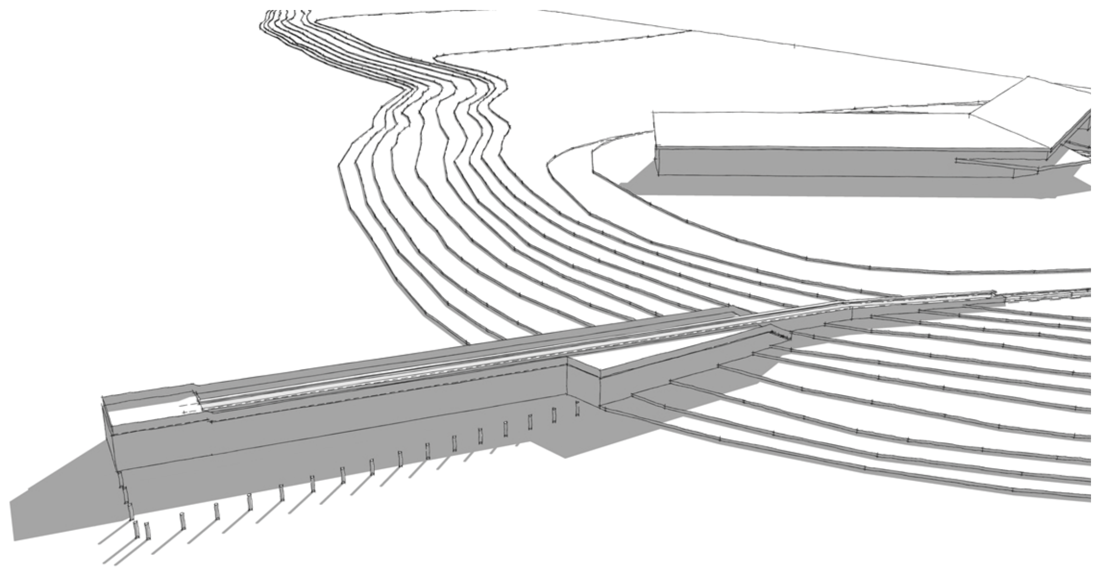
This was a first attempt at site usage. As stated before the facility is located to the North and the topography was used to allow for the natural flow of water through the constructed wetland.

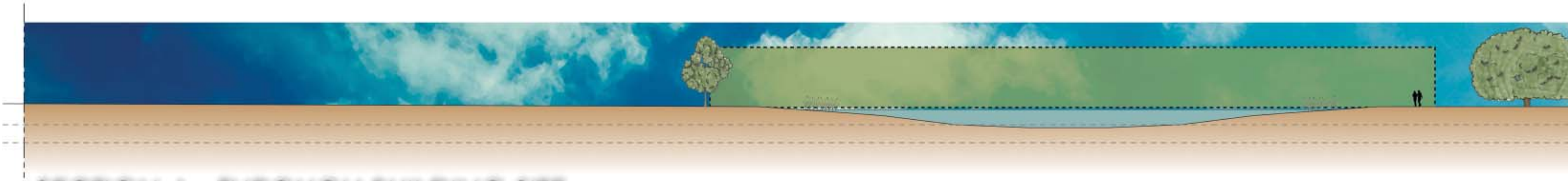
Because the wetland is not naturally occurring and the watershed that historically fed the natural habitat has been disrupted by the development of the city, a pump that could retrieve water from the river and a reservoir could help to hold it was included in the site design. The building form in this sketch problem was not a design intention it was only included so as to provide a placeholder for where the facility would be located in the future.



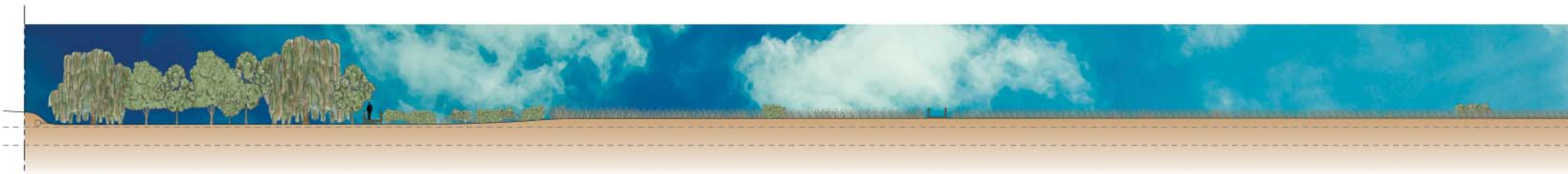


My intention with the pier was to not only house the pump required to supply the site with water but to provide the public with a new way to observe the St. Clair River.

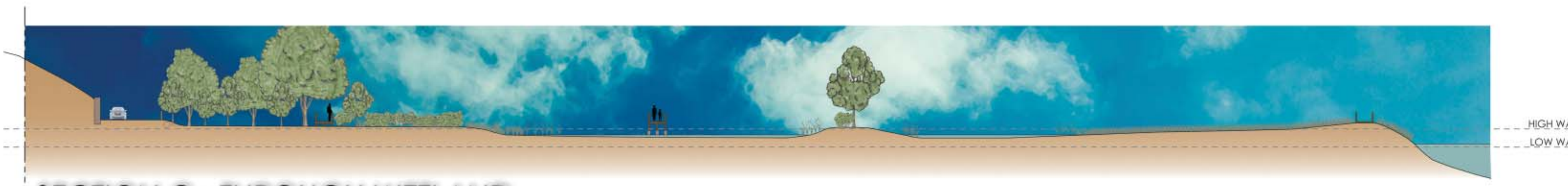




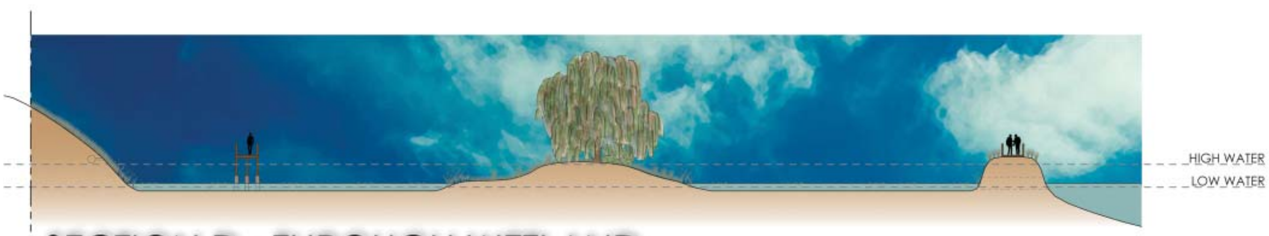
SECTION A - THROUGH BUILDING SITE



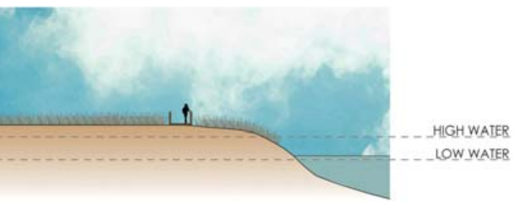
SECTION B - THROUGH WETLAND

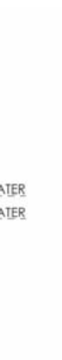


SECTION C - THROUGH WETLAND



SECTION D - THROUGH WETLAND





Site Division Legend

1: Wet Meadow

2: Forested/Shrub Swamp

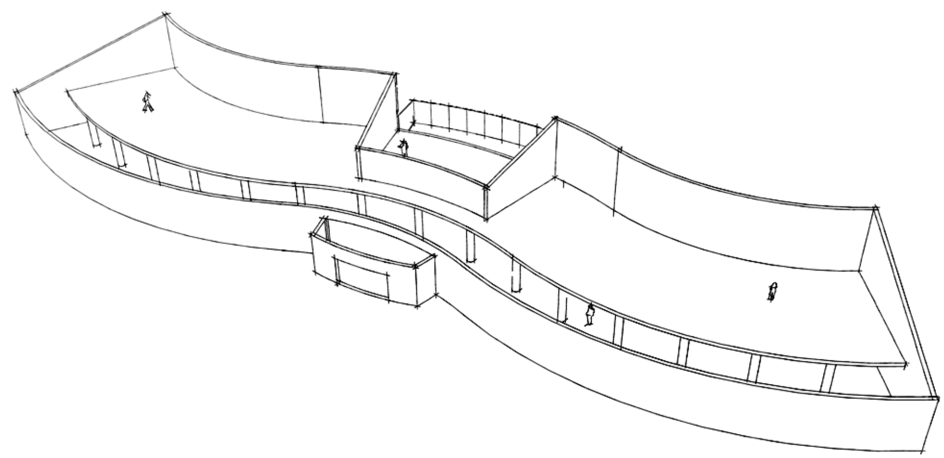
3: Shallow Marsh

4: Deep Marsh

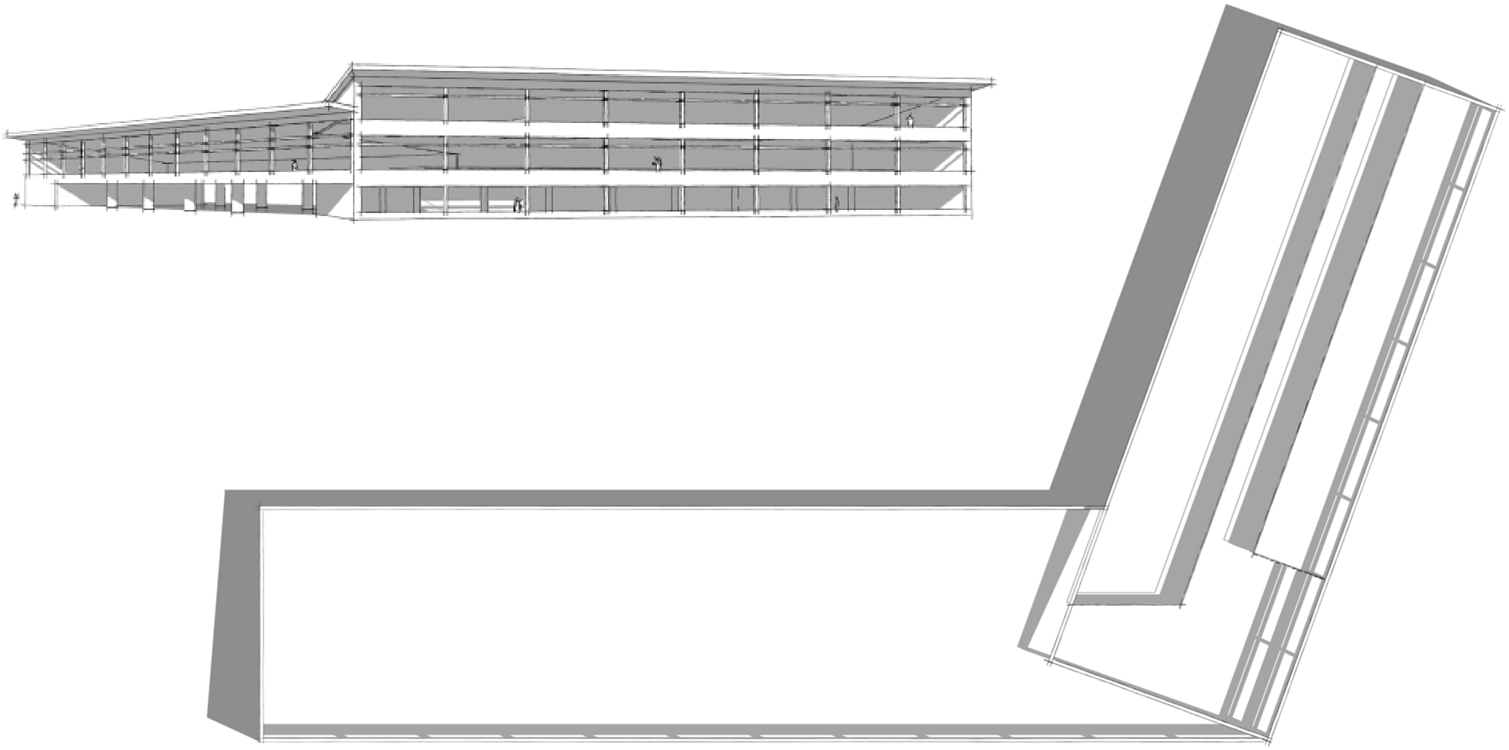
After preforming more adequate wetland research I found that the site layout required another look. The final product of this exercise was very successful. It ended with a site plan that remained constant through the rest of the project with only a few minor changes after this.

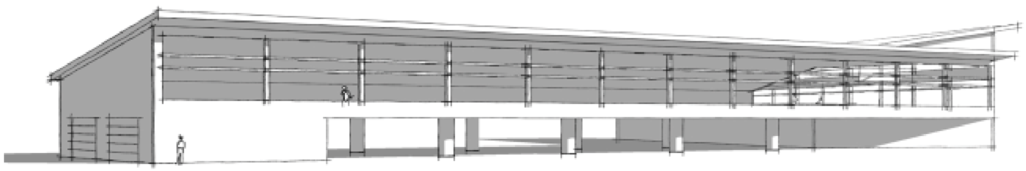
The design and construction guidelines that I discovered in my wetland research were employed to create a functioning wetland that includes four specific wetland habitat types.

BUILDING DEVELOPMENT

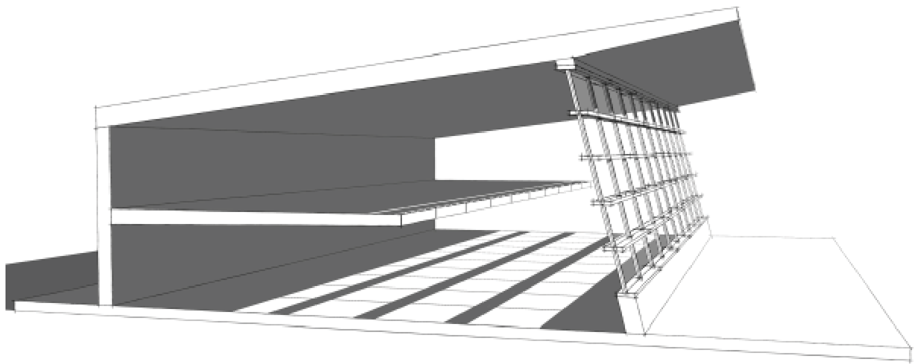


With the site layout almost completely developed the design of the education center had fallen behind.

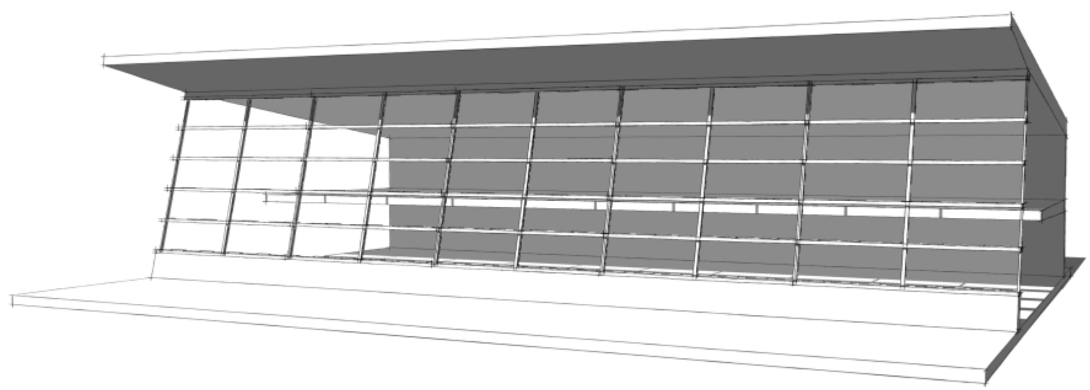




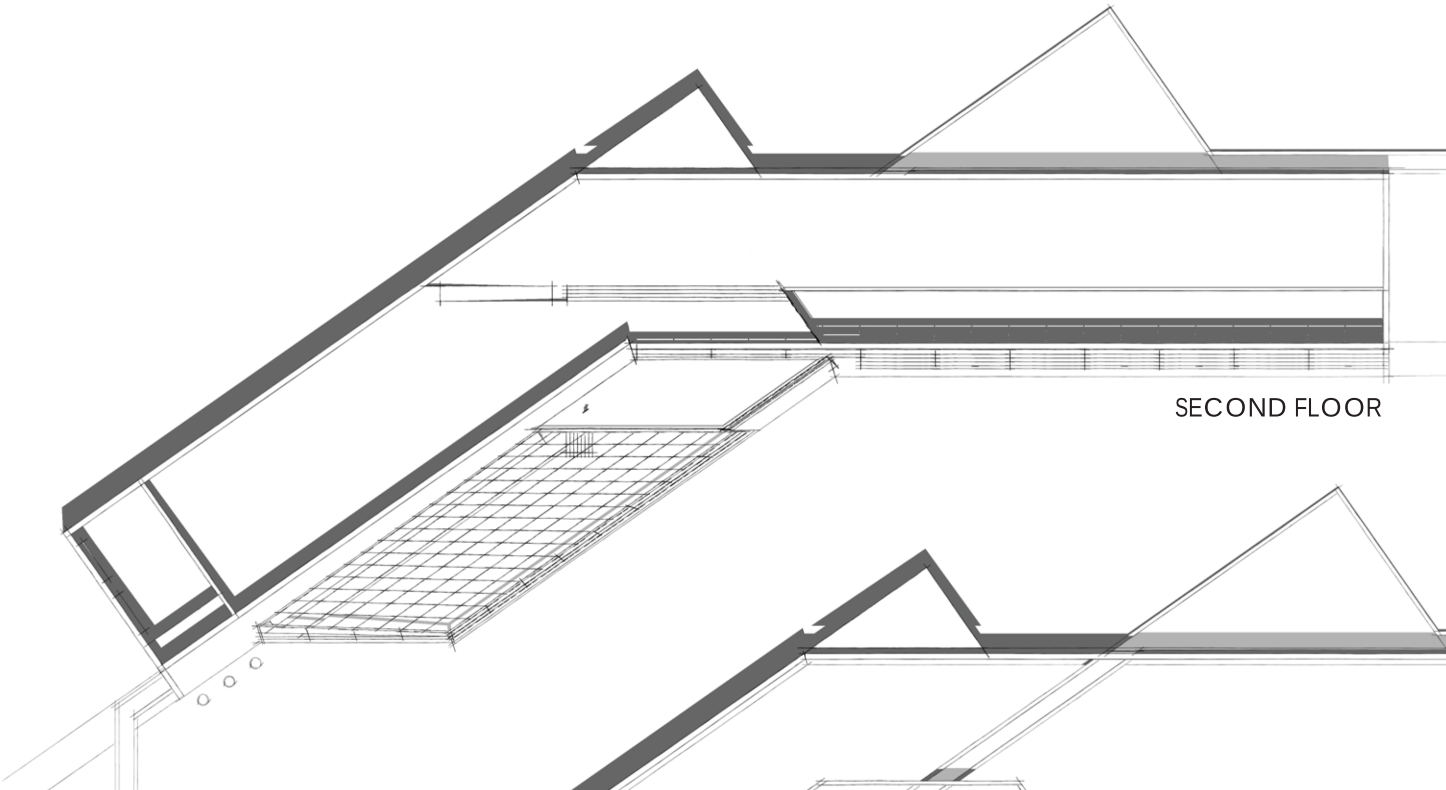
This attempt featured site lines to the wetland and the river. The West half of the building is raised and is positioned over the reservoir that is used to irrigate the site



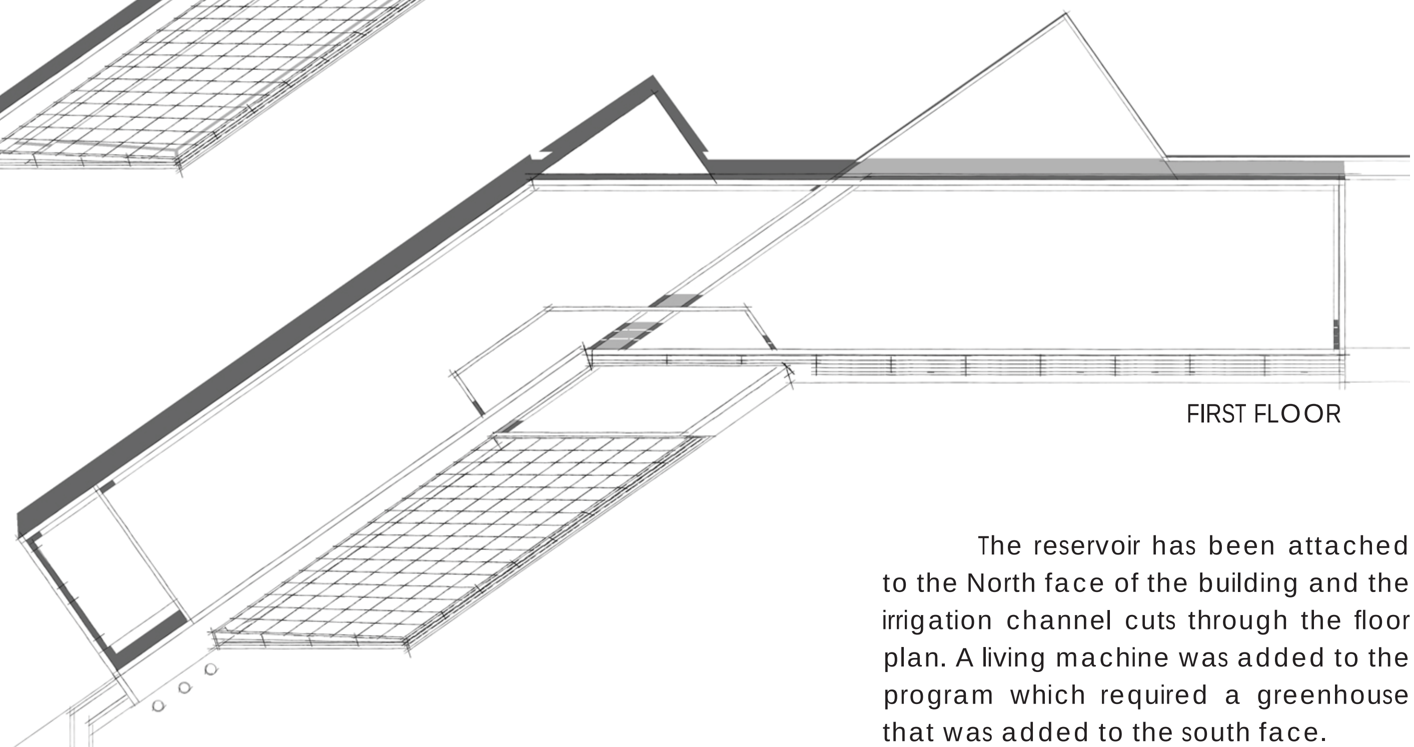
This is a study of a more ecological section for future attempts at the project's form. It is designed specifically so that the section protects the glass from the summer sun while allowing the winter sun to penetrate deep into the building providing for passive solar heating.



BUILDING FORM STUDY 2

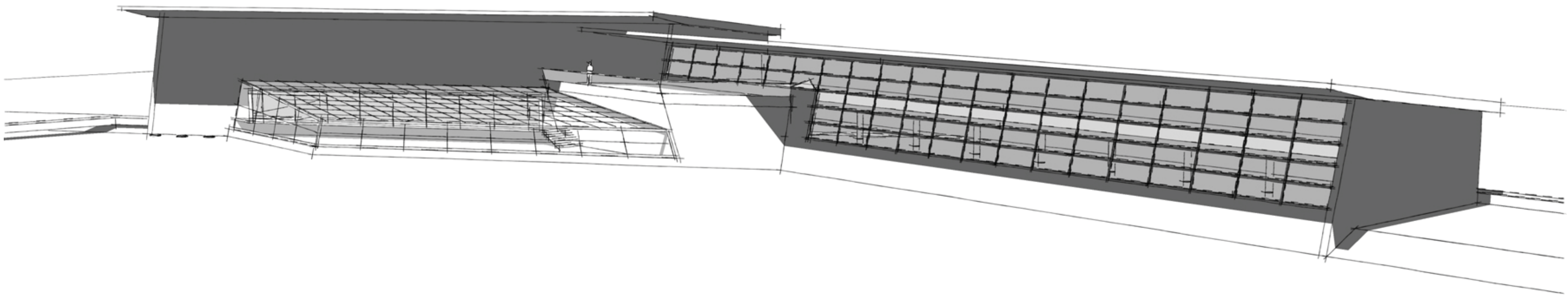


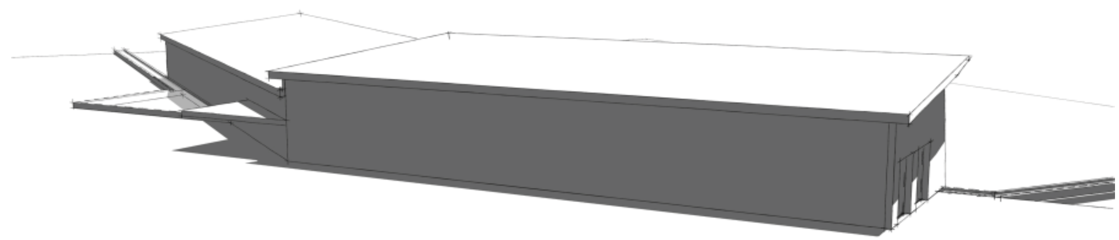
SECOND FLOOR

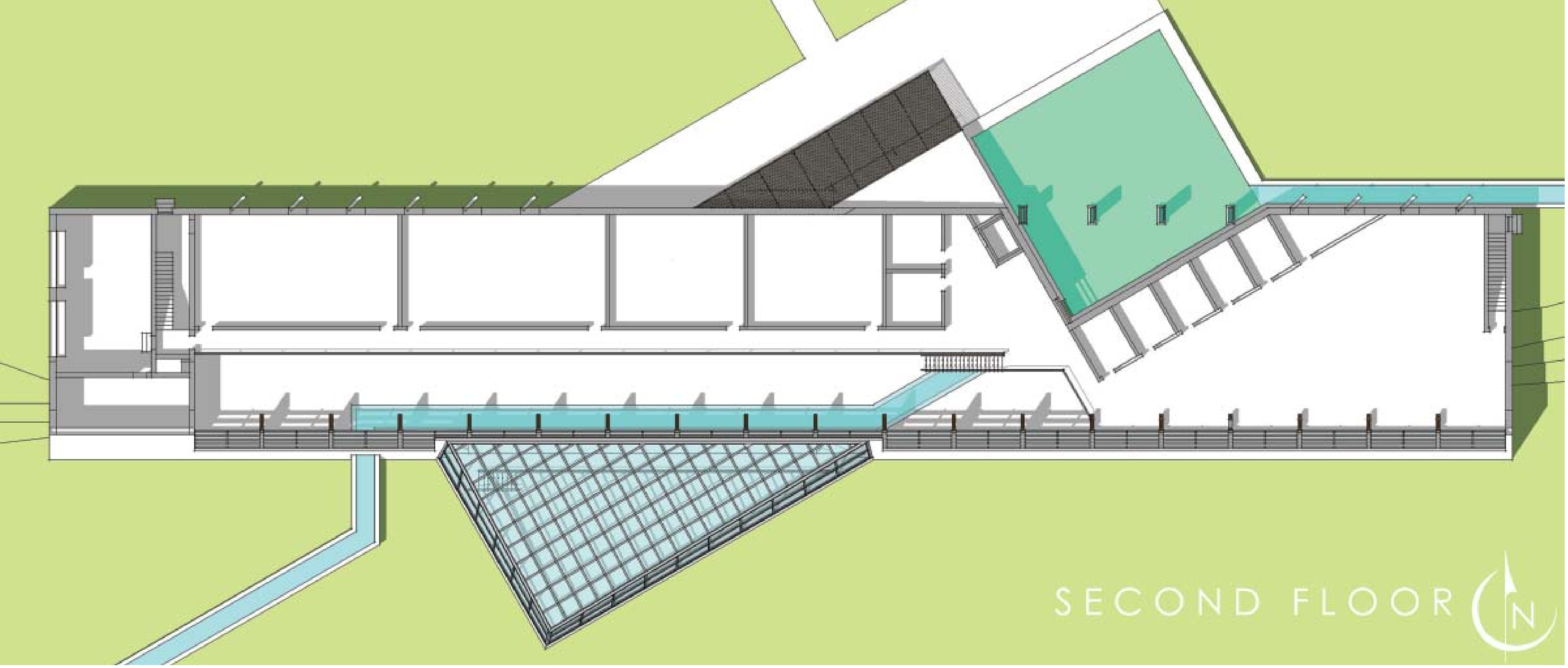


FIRST FLOOR

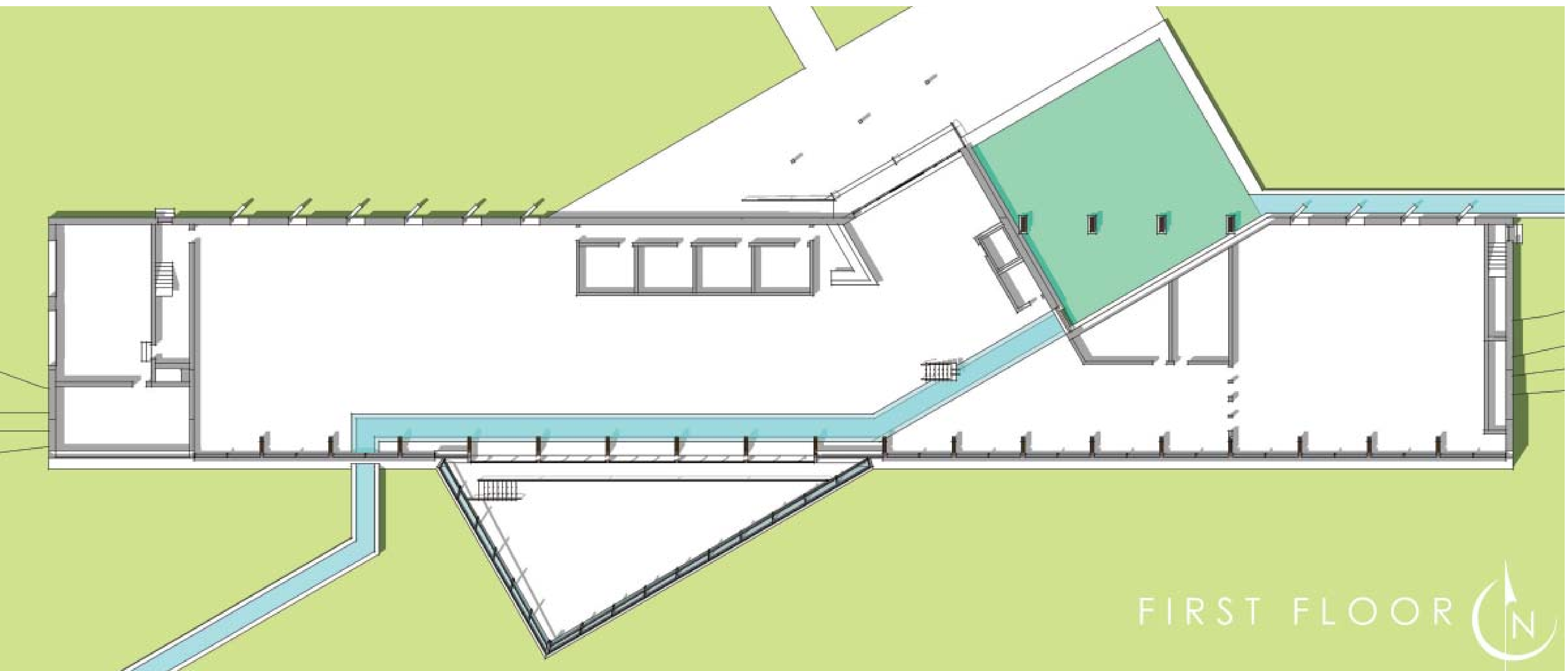
The reservoir has been attached to the North face of the building and the irrigation channel cuts through the floor plan. A living machine was added to the program which required a greenhouse that was added to the south face.







SECOND FLOOR

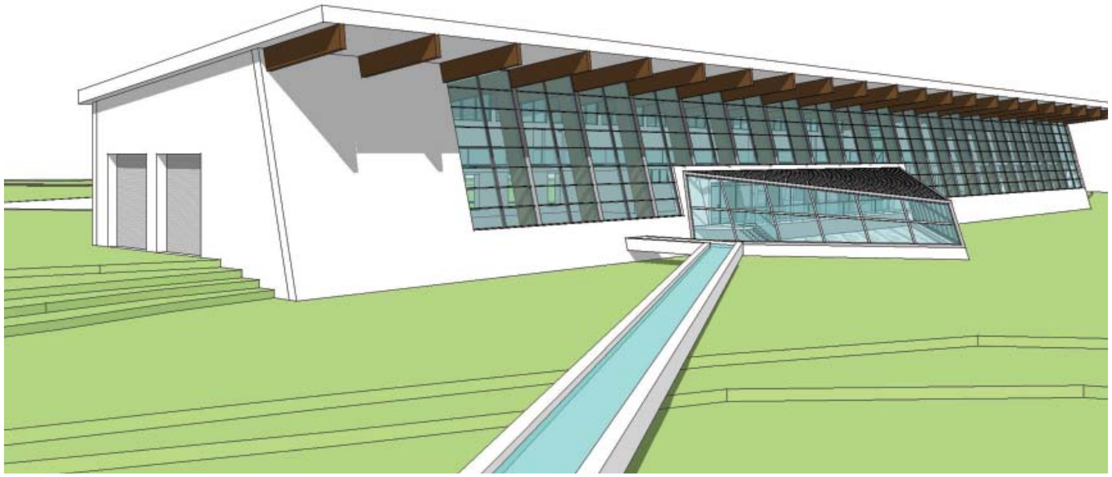


FIRST FLOOR

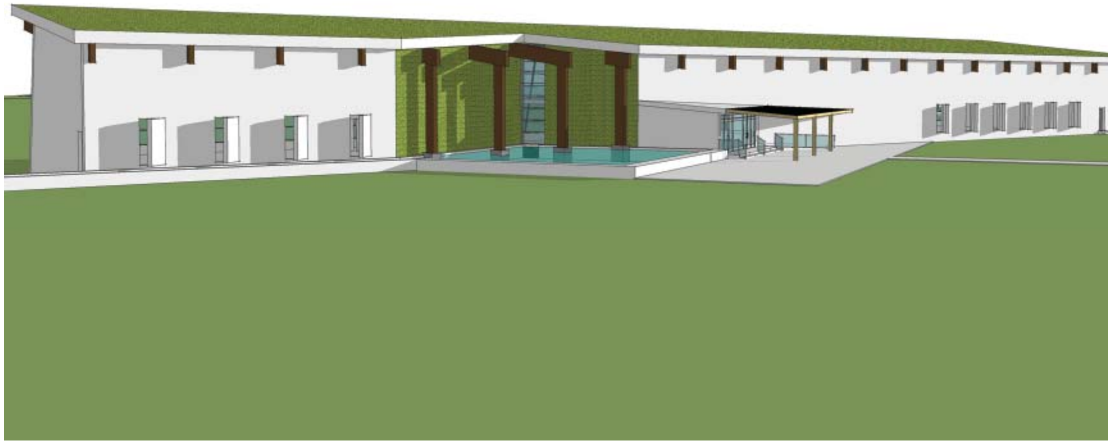
BUILDING DESIGN

This design utilizes both the constructed reservoir on the north face of the building and the addition of the living machine from the last form study. The water from the reservoir punctures through the building and on the other side the living machine green house uses that water to help with its processes.

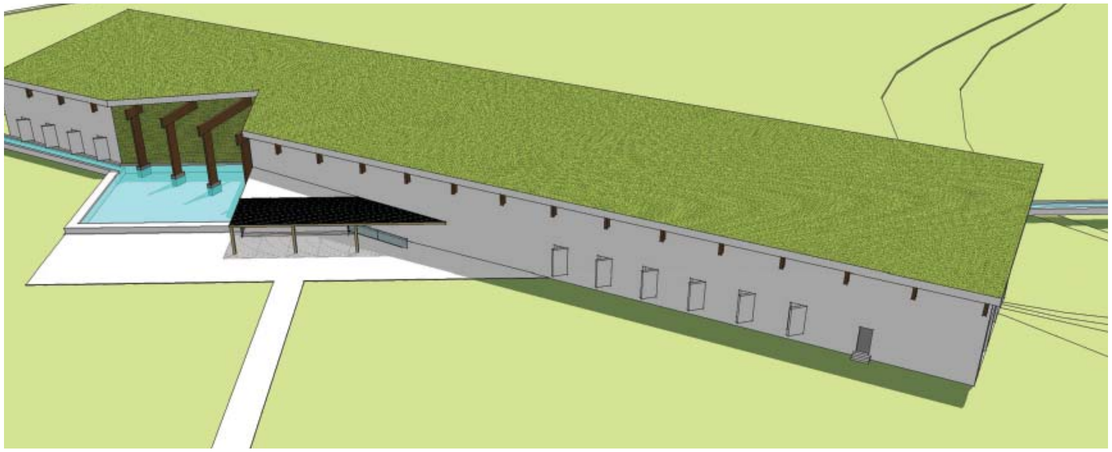
With this design another programmatic element was added in the form of a self contained permanent research department on the east end of the second floor with its own small staff.

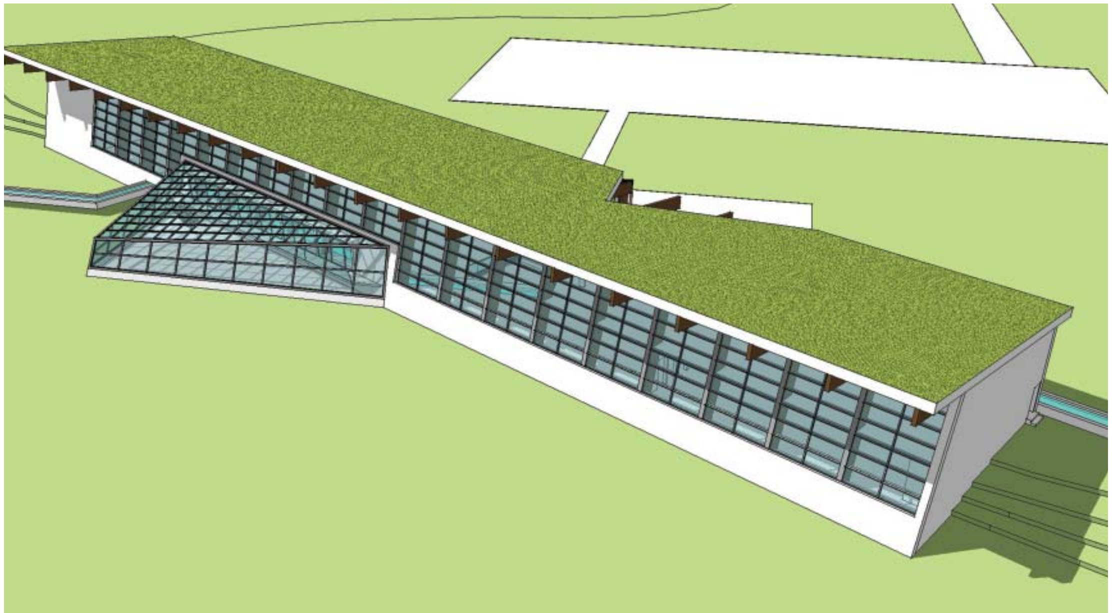


The building uses the section from the earlier study adding the benefit of operable windows on the south facing glazing. On the north wall there are opaque insulated panels that open to allow for natural ventilation.



Where the reservoir cuts into the North face of the building the glu-lam structure remains to be exposed and the two angled walls that form the cut are to be build as vegetated living walls to contrast with the pieces of the building that are unaffected.



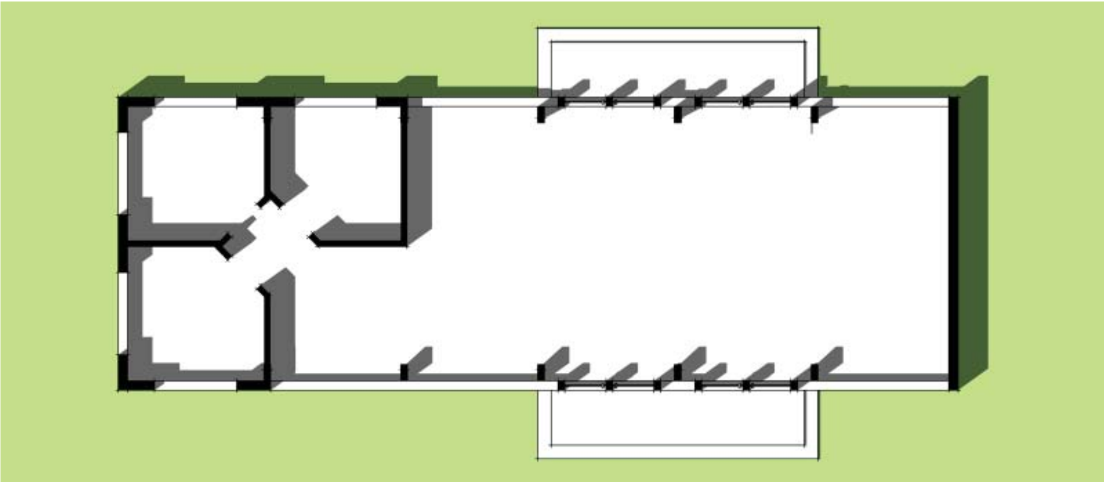


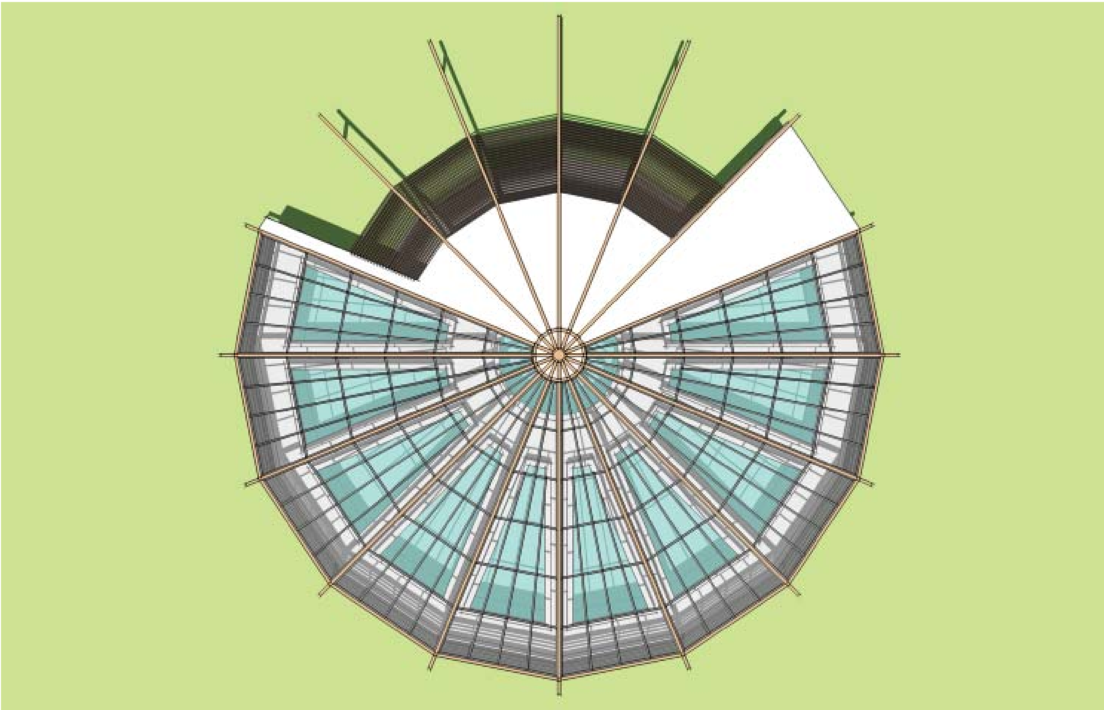
Up until this point in the design process I was adamant about keeping the educational center separate from the constructed wetland. This was because I felt that integrating the two would remove the focus from the environmental technology and create what would seem more like a nature center.

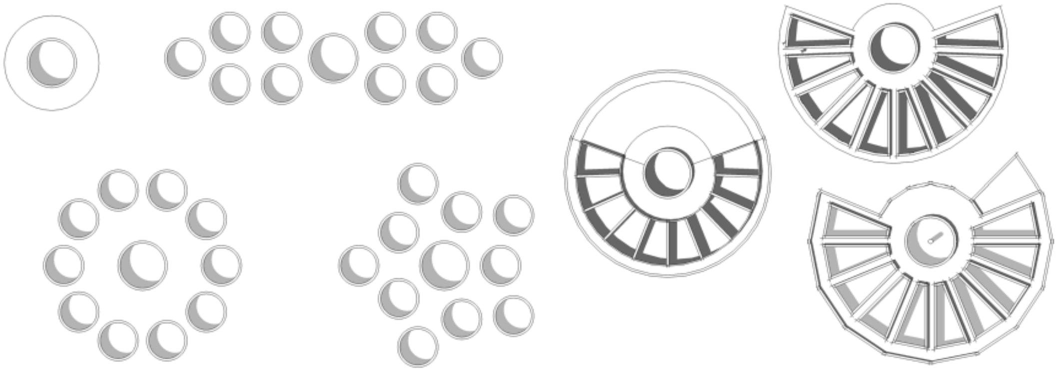
During a critique of the design on the previous four pages it was brought to my attention that the project seemed too divided. I was asked “why can’t it include education about the natural environment?” I had no answer.

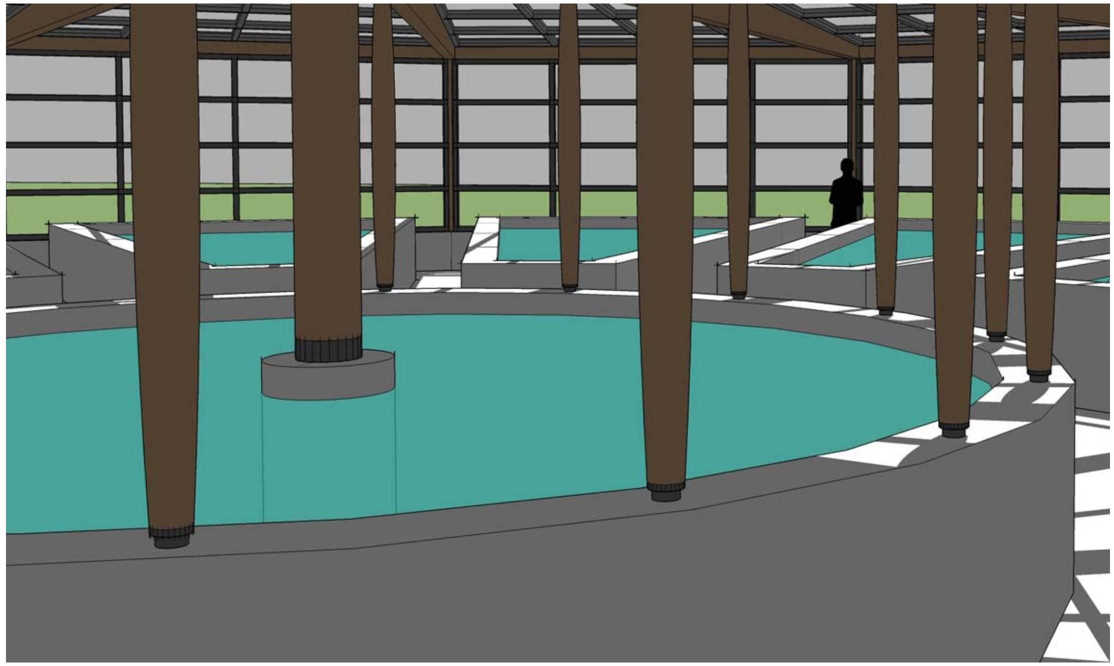
At that point I realized that only developing the Northern portion of the site was a mistake and that in order to intertwine the education facility and the constructed wetland the program had to be split into smaller clusters and spread throughout the site. This would allow the public to experience both the technology and the natural habitat that had been reconstructed.

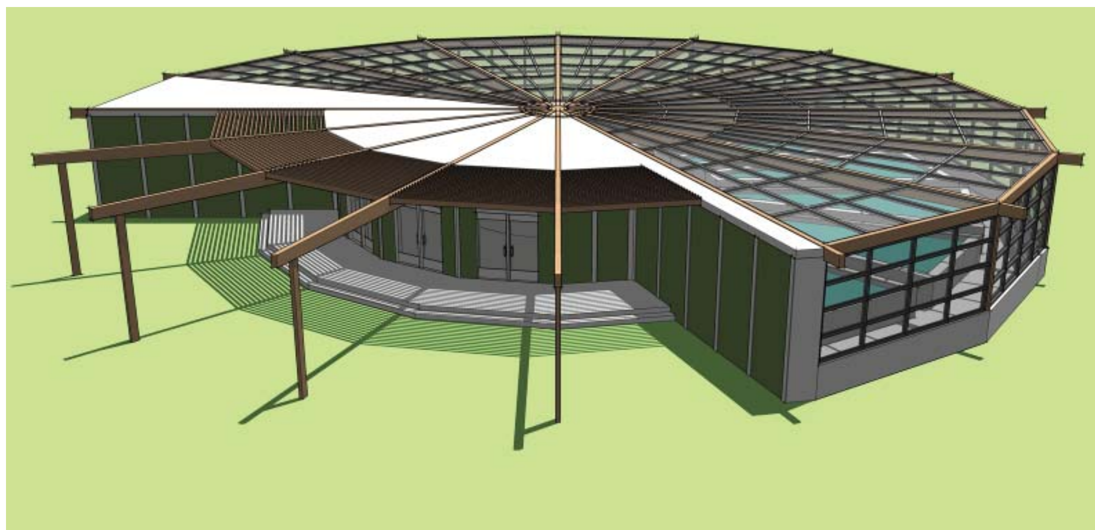
The following pages demonstrate the initial design steps that I took for this seperation of the progam into multiple elements.

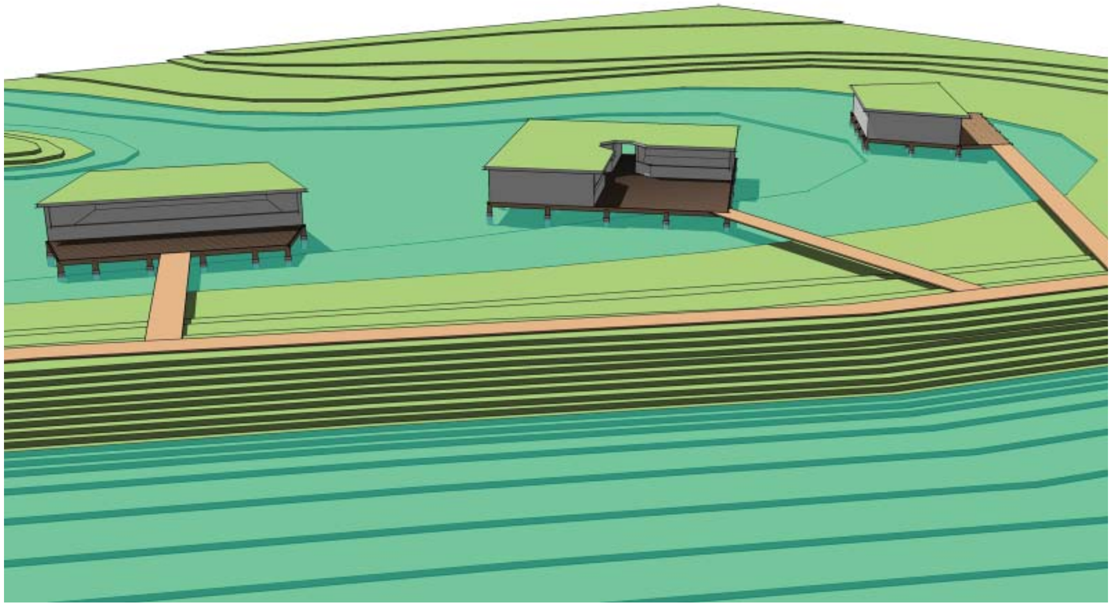


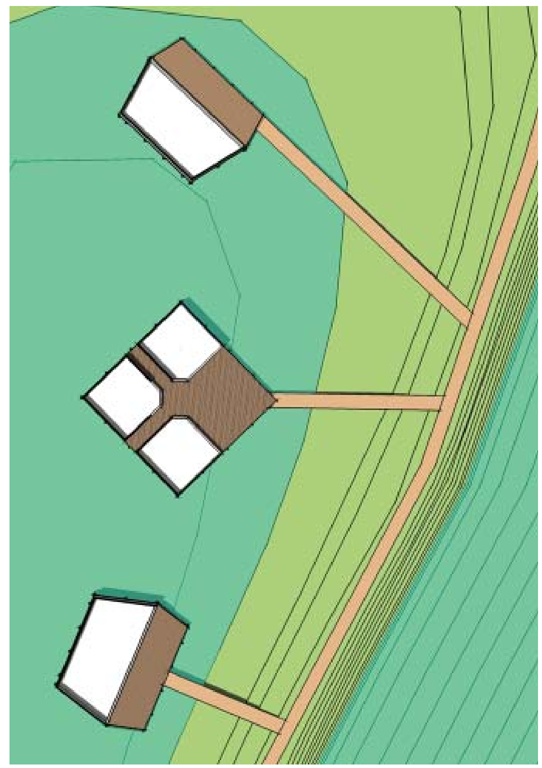






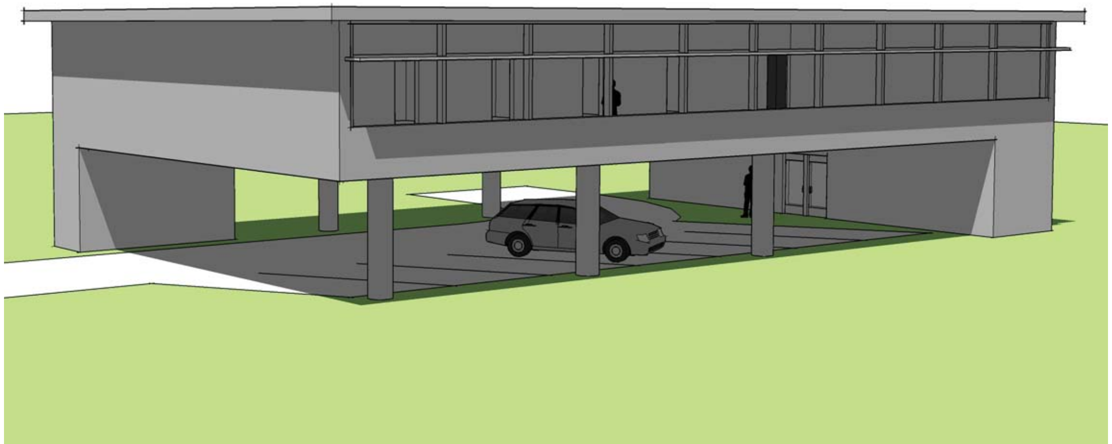


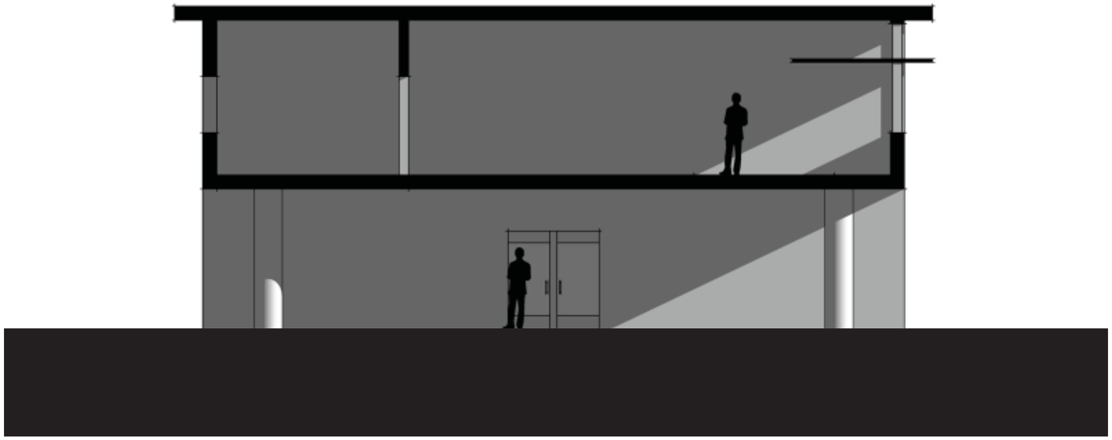


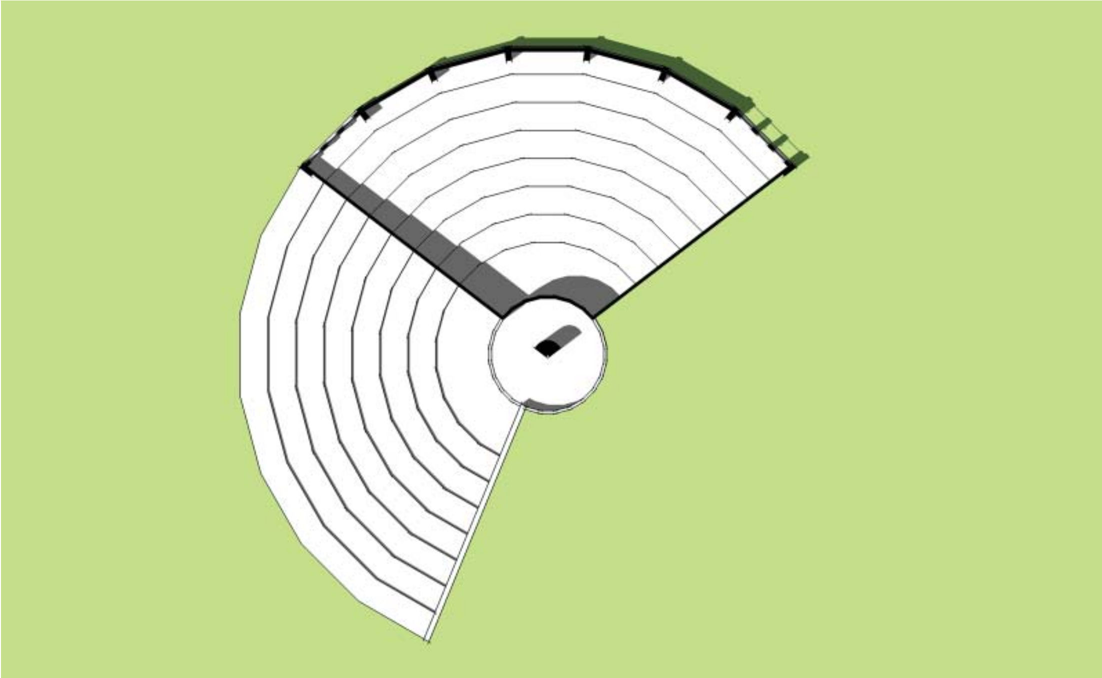


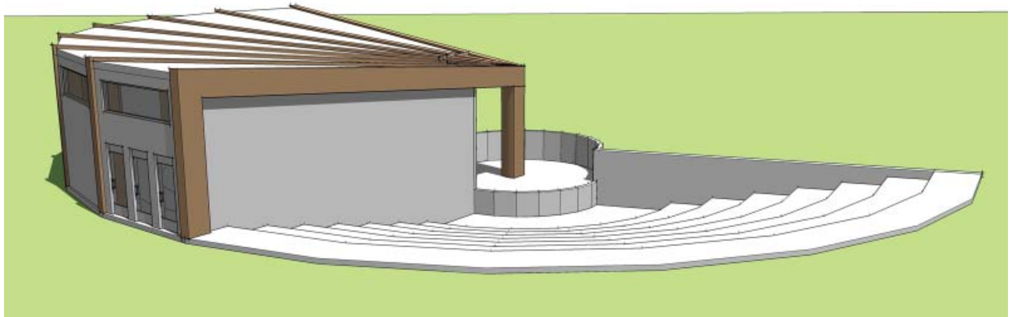
RESEARCH BUILDING

PRELIMINARY DESIGN









FACILITY PROGRAMMING

Quantitative Summary

INTERIOR SPACES	SIZE IN SQ FT	QUANTITY	TOTAL SQ FT
ENTRY/LOBBY	1,000	1	1,000
ADMINISTRATIVE OFFICES	115	3	345
EXHIBITION SPACE	2,250	1	2,250
EDUCATIONAL ROOMS	3x600/2x1,000	5	3,800
PUBLIC SEMINAR SPACE	2,500	1	2,500
LIVING MACHINE	6,000	1	6,000
RESEARCH LAB	3,000	1	3,000
RESEARCH OFFICES	160	5	800
STORAGE	As Needed	X	As Needed
RESTROOMS	As Needed	X	As Needed
	TOTAL GROSS SQ FT		**19,700**
	CIRC. & MECH. ALLOWANCE + 20%		**3,940**
	TOTAL INTERIOR SQ FT		**23,640**
EXTERIOR SPACES			
PARKING LOT (107 spaces)	39,500	1	39,500
EXHIBITION SPACE	2,250	1	2,250
	TOTAL GROSS SQ FT		**41,750**
	CIRC. & BUFFER ALLOWANCE + 20%		**8,350**
	TOTAL EXTERIOR SQ FT		**50,100**
	TOTAL SQ FT		**73,740**

A. Area required
1,000 Square Feet

B. Purposes/Functions
Entry and lobby space for public access to the facility. Enough space to accommodate at least 2 classes arriving from local schools must be provided.

C. Activities
Entering and exiting the building as well as meeting space for groups using the facility.

D. Spatial Relationships
Must be located near the administrative offices.

E. Special Considerations
Seen as the entry to the site, must consider way finding material such as maps and brochures

F. Structural Systems
Glu-Lam Structure

G. Mechanical/Electrical Systems
Radiant Slab Heating/Cooling System

ADMINISTRATIVE OFFICES WELCOME CENTER

Space Detail Summary

A. Area required
Three offices @115 Square Feet Each

B. Purposes/Functions
To be used as office space for the administration of the Education Center.

C. Activities
Typical office tasks for daily upkeep of the education center

D. Spatial Relationships
Located near the entry for use when groups would like to book a space such as an educational room or public seminar building.

E. Special Considerations
Meant to service the welcome center

F. Structural Systems
Glu-Lam Structure

G. Mechanical/Electrical Systems
Radiant Slab Heating/Cooling System

A. Area required
2,250 Square Feet

B. Purposes/Functions
The space will be utilized to give viable examples of green technology and its benefits to humanity and the rest of the planet. Exhibits to be organized in a way to use the design of the building as an educational tool.

C. Activities
Exhibition of green technology

D. Spatial Relationships
Should be located near the welcome center

E. Special Considerations
Including a intensive green roof would accommplish both the exhibition of a green building technology but also provide an elevated viewing platform.

F. Structural Systems
Glu-Lam Structure
Pre-cast Concrete Slab

G. Mechanical/Electrical Systems
Radiant Slab Heating/Cooling System

 EDUCATIONAL SPACES

Space Detail Summary

A. Area required

5 total

-3 typical classrooms @ 600 square feet

-2 science labs @ 1000 square feet

B. Purposes/Functions

These rooms will be specifically designed for small groups (such as local elementary school classes) to perform environmental experiments. A number of these rooms need to be tailored to specific age groups that will be using the facility.

C. Activities

Used for small group lectures, experiments, and activities.

D. Spatial Relationships

Located furthest from the North end of the site, being the least used program included in the project.

E. Special Considerations

Both Exterior and Interior spaces for a variety of small group activities

F. Structural Systems

Post and Beam on a Pier foundation

G. Mechanical/Electrical Systems

Forced air heating

H. Site/Exterior Environment

Located on pier foundations placed above the shallow and deep marshes

A. Area required
2,500 Square Feet
B. Purposes/Functions
Space for organized lectures to be held.
C. Activities
Lecture space for medium to large size groups.
D. Spatial Relationships
Should be located near the welcome center
E. Special Considerations
Should be able to expand into exterior space when weather permits
F. Structural Systems
Glu-Lam Structure
G. Mechanical/Electrical Systems
Radiant Slab Heating/Cooling System

LIVING MACHINE LIVING MACHINE

Space Detail Summary

A. Area required
6,000 Square Feet

B. Purposes/Functions
Used to process all of the sewage created in the facility and 200 residential units in the neighborhood to the west.

C. Activities
On top of the sewage processing space must be reserved for the public to pass through the space and observe the living machine.

D. Spatial Relationships
Located near the exhibition space

E. Special Considerations
The space must function as an educational experience. Thought must be put into layout for this purpose

F. Equipment/Furnishings
Ten 15,000 Gallon Aerobic Tanks
One 30,000 Gallon Clarifier Tank

G. Structural Systems
Glu-Lam Structure

H. Mechanical/Electrical Systems
Radiant Slab Heating/Cooling System

I. Site/Exterior Environment
Located at the edge of the shallow marsh for the discharge of the processed effluent.

A. Area required
3,000 Square Feet
B. Purposes/Functions
Space allotted for both full time researchers and local college students using the facility for cooperative class work.
C. Activities
The researching of environmental technologies.
D. Spatial Relationships
As the research building is a self-contained program it must be located near entrance to the site and available parking
E. Equipment/Furnishings
Lab equipment
F. Structural Systems
Post and Beam, and Precast Concrete Slab
G. Mechanical/Electrical Systems
Radiant Slab Heating/Cooling System

Space Detail Summary

A. Area required
   5 Offices @ 160 square feet each

B. Purposes/Functions
   To provide a space for permanent staff members.

C. Activities
   Office related tasks.

D. Spatial Relationships
   Located adjacent to the research lab.

H. Structural Systems
   Post and Beam
   Precast Concrete Slab

I. Mechanical/Electrical Systems
   Radiant Slab Heating/Cooling System

FINAL DESIGN

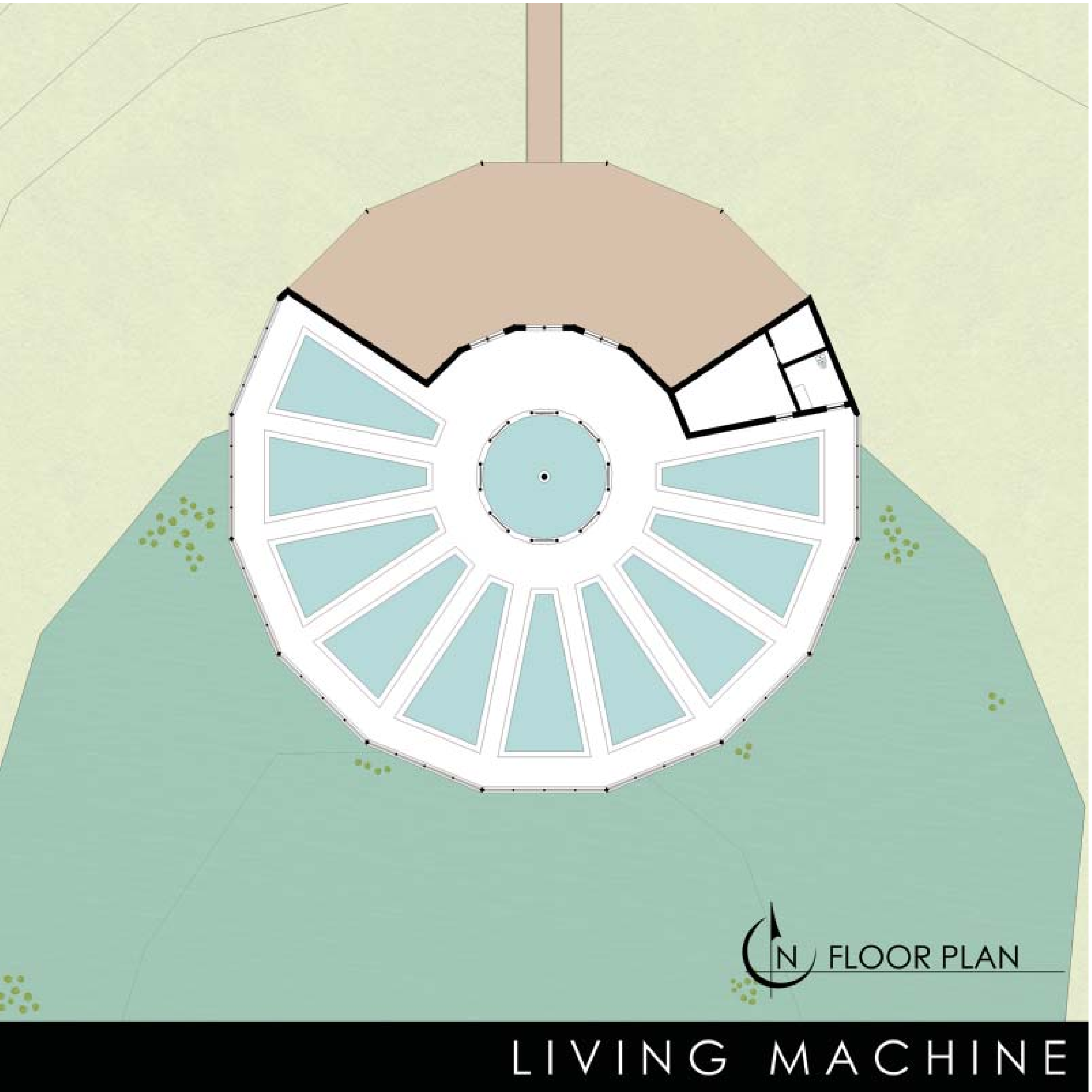
MICHIGAN
ENVIRONMENTAL
TECHNOLOGY
EDUCATION
CENTER

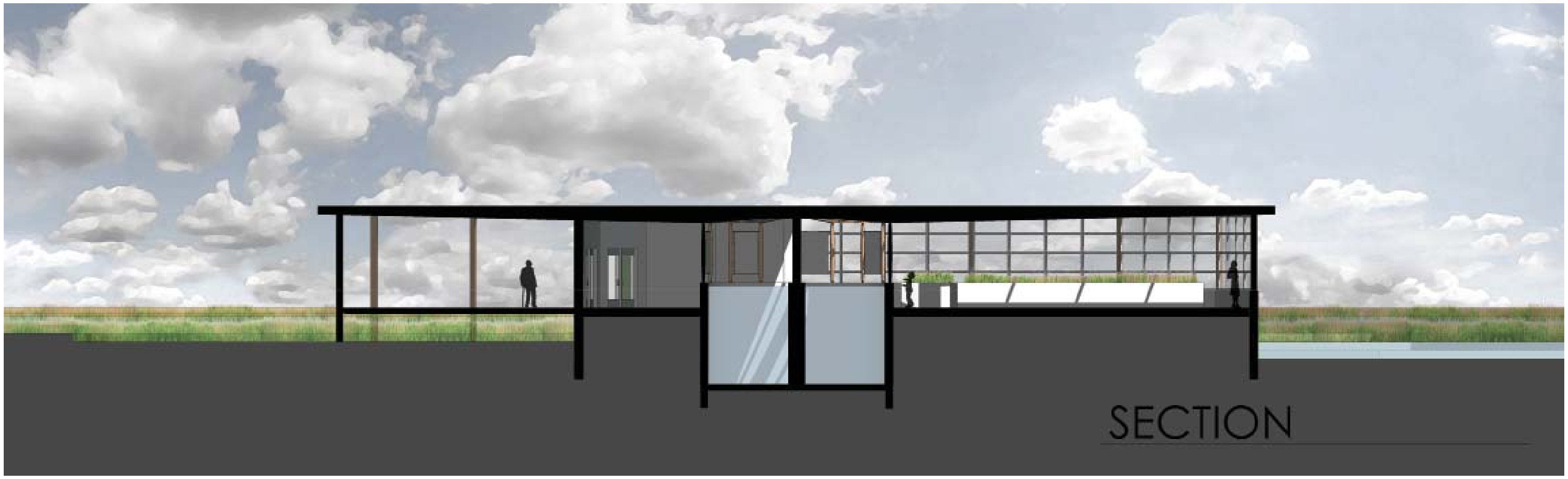
SITE PLAN

Final Design

The public enters through the Northern end of the site and begins to circulate from there. The facility is spread throughout the site connected by a system of elevated trails that originate at the welcome center.

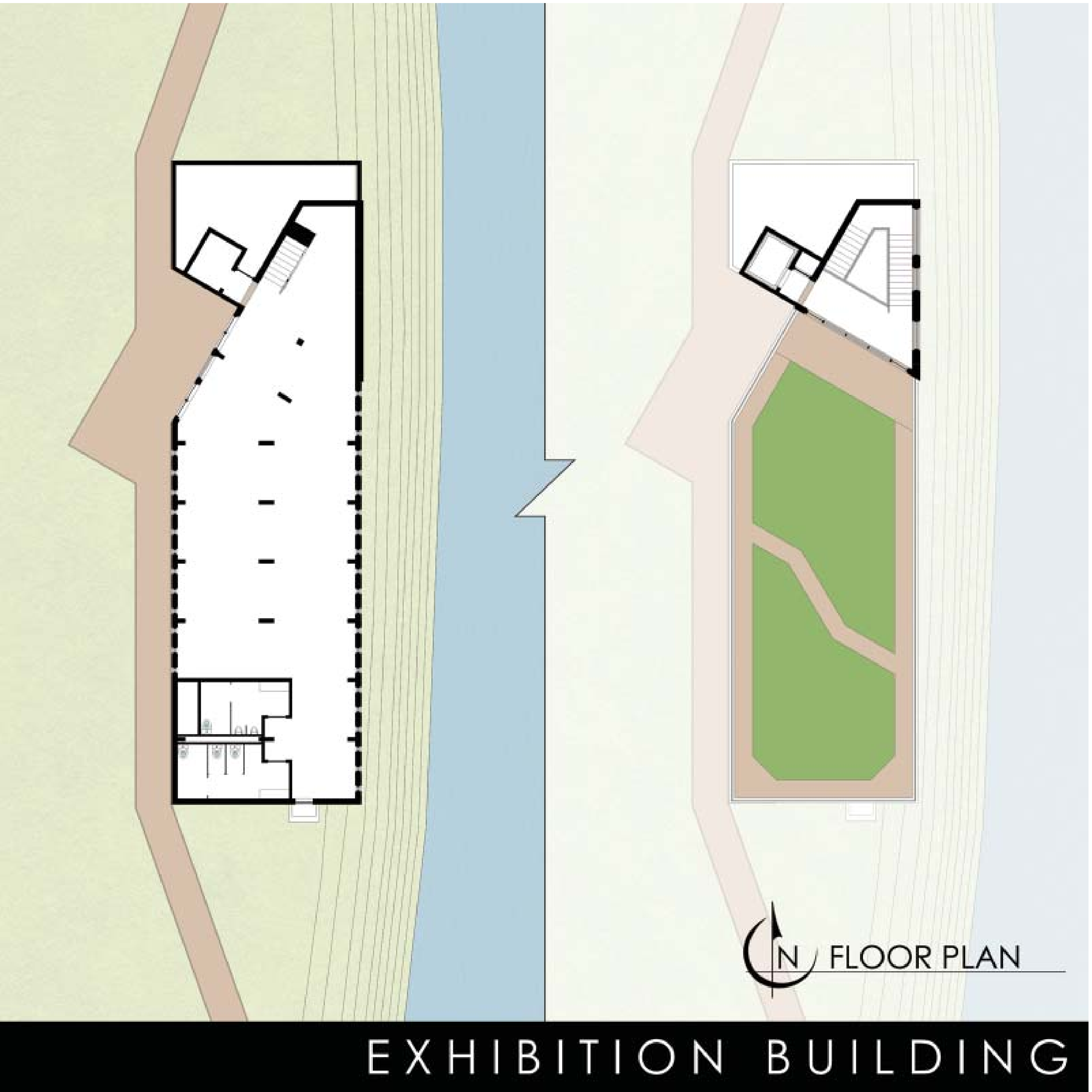
The irrigation system that in previously started in a reservoir at the northern end of the site is now connected to the city storm drain system to gain access to the watershed area that historically would have naturally irrigated the area. The system is located below grade along the Western site line and allows for natural cleaning and flood protection for the water without having to rely on the currently used industrial facilities.

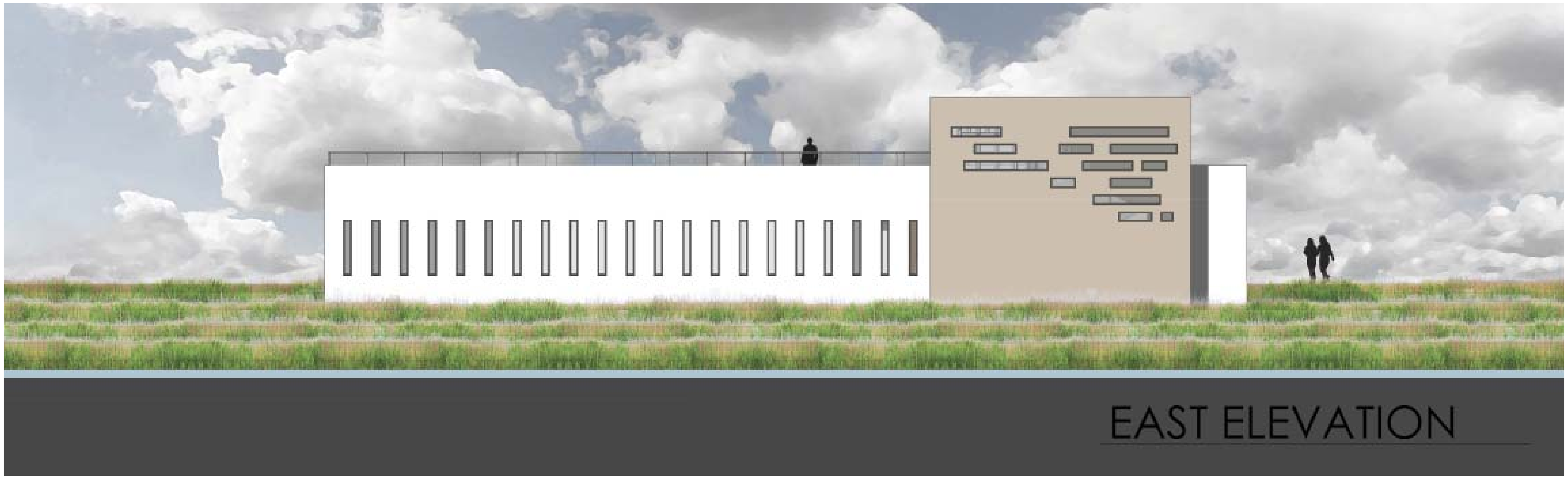

N
FLOOR PLAN
LIVING MACHINE



The living machine processes 100,000 gallons of sewage per day. It serves the education center as well as 200 residential units from the neighborhood to the West of the site. This area is called out on the site plan by the green dashed line.

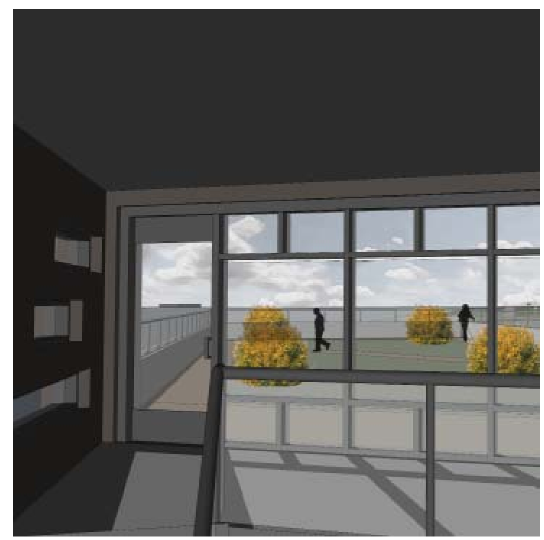
An added benefit of the living machine is that, within its process, plants are grown on the tops of the aerobic tanks. These plants can be harvested and transplanted into the wetland. This will be very helpful throughout the first few years as the wetland matures.

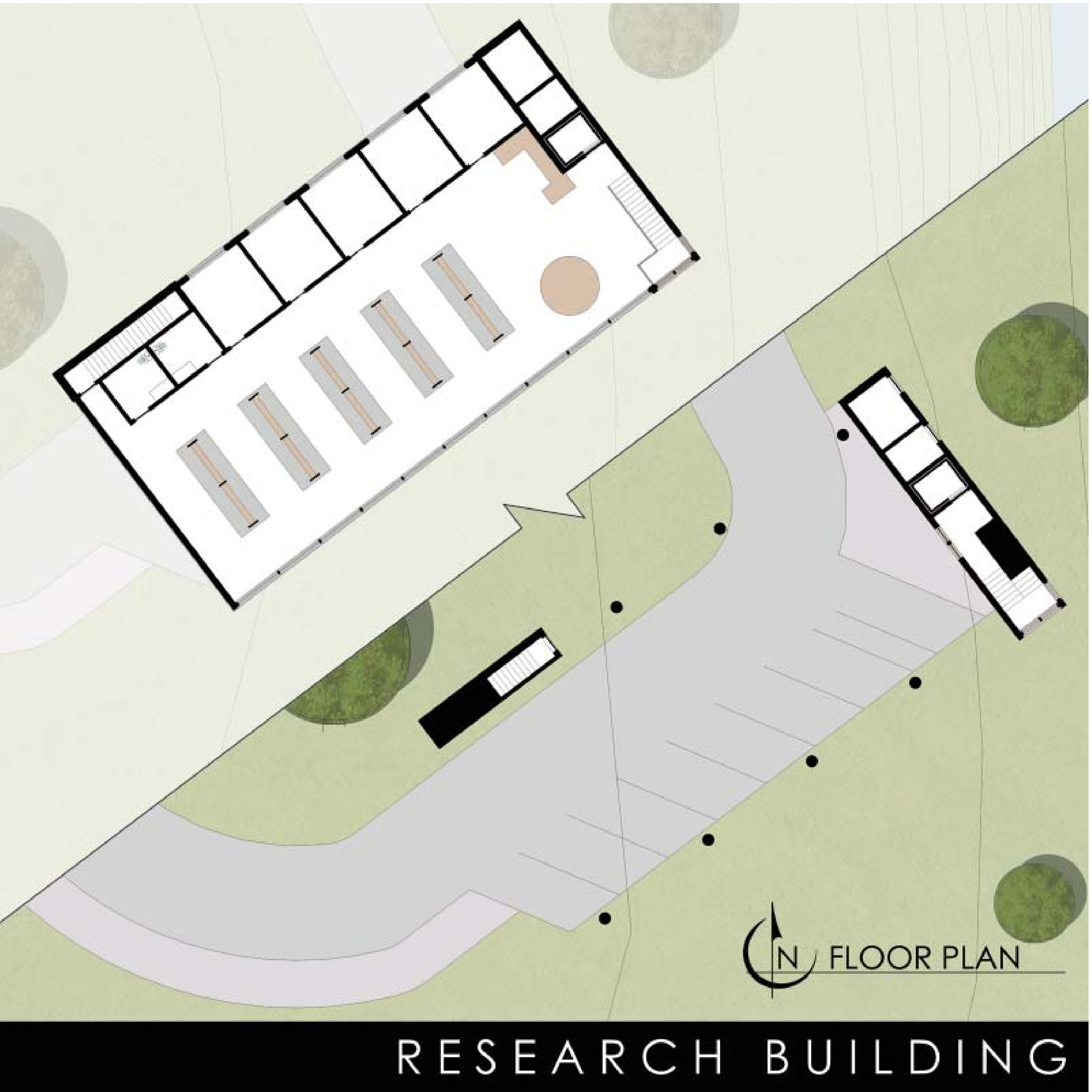

N
FLOOR PLAN
EXHIBITION BUILDING



The exhibition space was designed to provide floor and wall space to display information on environmental technology.

An intensive green roof was included in the design to provide not only an example of green design but also to create an elevated viewing platform to get a different view of the wetland.




N
FLOOR PLAN
RESEARCH BUILDING

The research building houses a small permanent staff that would work along side with St. Clair County Community College to further an environmental technology program.

The lab space located in the building was elevated so as to provide parking for the building within its original footprint


N
FLOOR PLAN
WELCOME CENTER

The welcome center is the origin of the facility. Designed to accommodate groups as they meet at the education center.

Maps and pamphlets as well as other way finding and educational material would be available at this location for the public to have access to it before entering the rest of the site. The building would also house the small administrative staff that would be on hand to help groups that have set up activities.


N
FLOOR PLAN
SEMINAR BUILDING

The seminar building is space allotted for lectures within the site. It is designed so that during the summer months a glass track wall can be opened to allow for a larger lecture space when weather permits.


N
FLOOR PLAN
EDUCATION SPACES

Two different plans were designed for the educational spaces so as to facilitate a larger variety of small group activities. The small pavilion structures are designed for grade school groups that do not require any advanced equipment and they allow for an simple and apparent connection to the natural environment surrounding them. The enclosed lab spaces are designed to accommodate a higher level of education and provide space for year round programs.

CONCLUSION

Looking back at the last 8 months of work I am happy with where I ended. I do admit that I wish that I could have made the decision to split the program between multiple buildings and utilize the entire site much earlier on than I did.

I sincerely believe that the Environmental Technology Education Center would greatly contribute to the forward progress of the State of Michigan. The project as it has concluded is getting very close to success in my opinion although I do find myself desiring another semester to continue work on the project and to focus on the building design and materiality. I believe that with this extra work and development the project would be a complete success while at this time I find it to be lacking a sense of reality.

American Institute of Architects. (2008, April 22). *The American Institute of Architects :: Top Ten Green Projects*. Retrieved October 18, 2008, from http://www.aiatopten.org/hpb/overview.cfm?projectid=1016

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