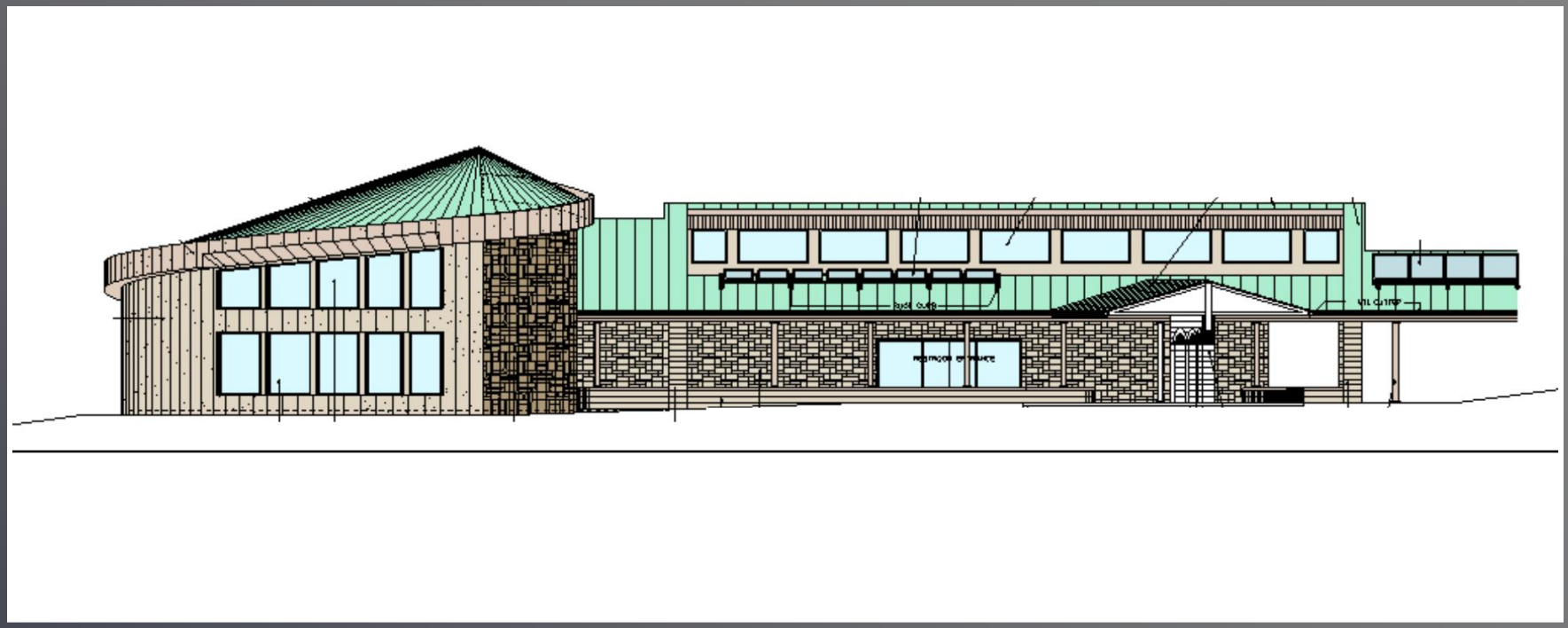
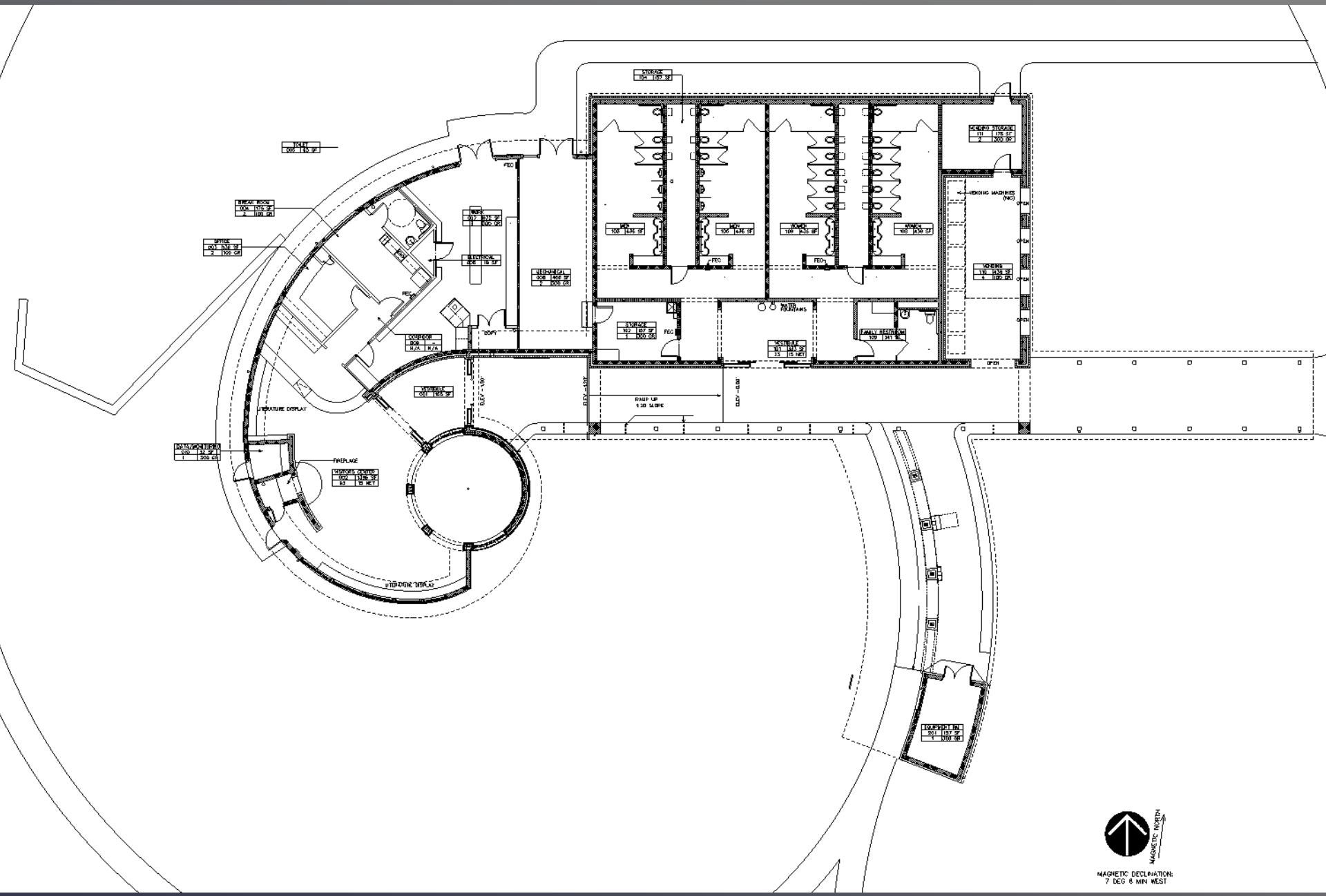
Sustainable Rest Area Design in North Carolina

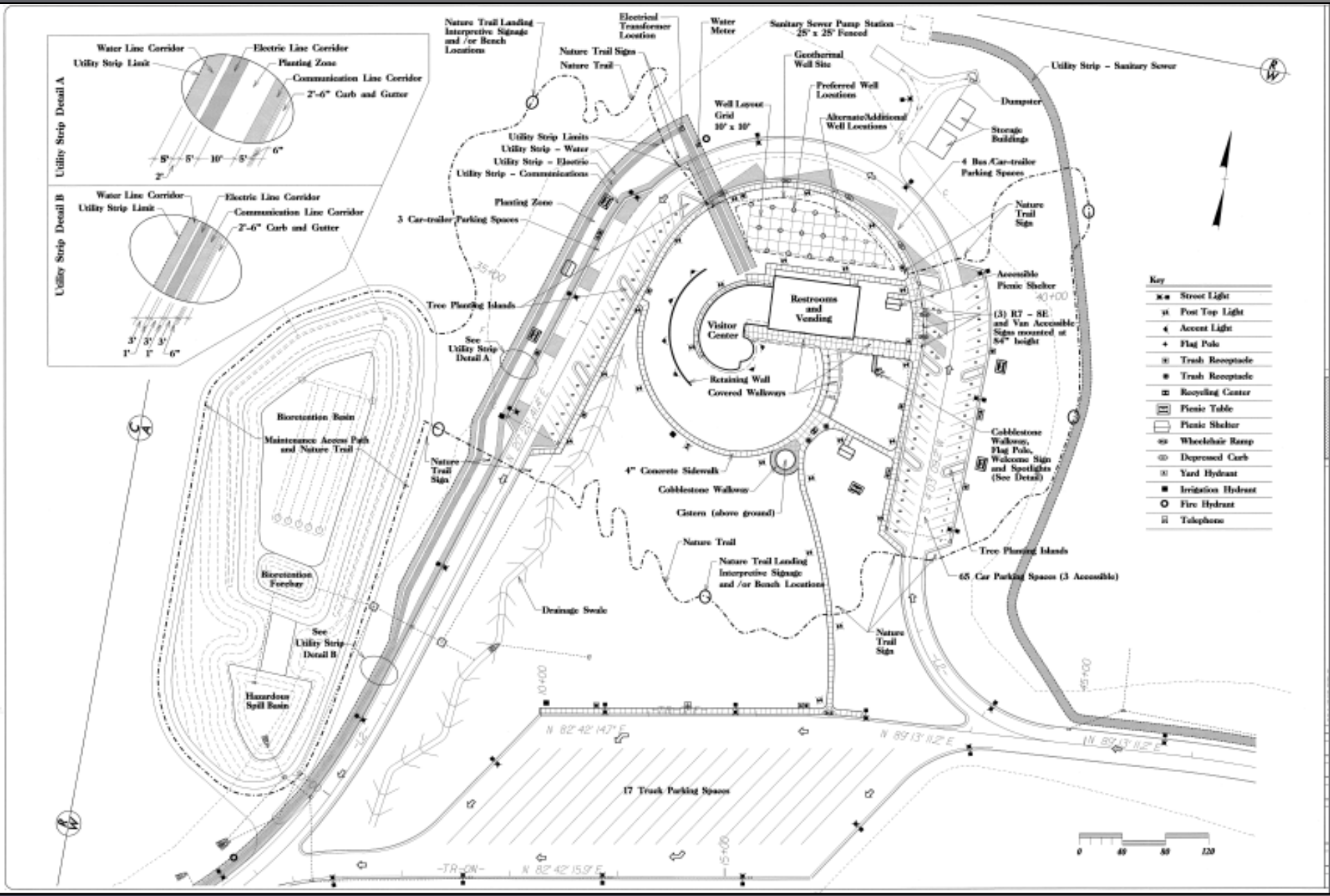
History

- North Carolina's rest area program started in 1948.
- Today there are 59 rest areas in N.C.
  - 39 Interstate sites
  - 20 Primary sites
  - 9 Welcome Centers
  - 9 Visitor Centers
- Almost 27 million visitors in 2007.
- 3 new rest areas are under construction.
  - I-73/74 - Randolph County - Pair of rest areas/visitor centers
  - US 421 - Wilkes County - Single rest area/visitor center



Wilkes County US 421


STORAGE
104 107 SF
TOILET
005 135 SF
FEC
BREAK ROOM
006 176 SF
2 100 GP
OFFICE
003 136 SF
2 100 GP
WORK
007 274 SF
1 300 GP
ELECTRICAL
008 16 SF
MECHANICAL
009 464 SF
1 1000 GP
MEN
108 436 SF
MEN
106 436 SF
WOMEN
109 436 SF
WOMEN
105 436 SF
SENIORS STORAGE
111 178 SF
2 300 GP
VENDING MACHINES (NIC)
OPEN
SEATING
110 438 SF
4 150 GP
STORAGE
102 157 SF
1 300 GP
FEC
WATER FOUNTAINS
VESTIBULE
101 435 SF
33 15 NET
FAMILY RESTROOM
109 141 SF
CORRIDOR
004 1
N/A N/A
VESTIBULE
001 165 SF
ELEV. -10'0"
ELEV. -8'0"
RAMP UP
1:20 SLOPE
LITERATURE DISPLAY
FIREPLACE
VISITOR'S LOUNGE
100 1,176 SF
83 15 NET
INTERPRETIVE DISPLAY
EQUIPMENT RM
201 157 SF
1 1000 GP
MAGNETIC NORTH
MAGNETIC DECLINATION:
7 DEG 6 MIN WEST


Utility Strip Detail A
Water Line Corridor
Utility Strip Limit
Electric Line Corridor
Planting Zone
Communication Line Corridor
2'-6" Curb and Gutter
8'
5'
10'
5'
6"
2'
Utility Strip Detail B
Water Line Corridor
Utility Strip Limit
Electric Line Corridor
Communication Line Corridor
2'-6" Curb and Gutter
3'
3'
3'
1'
1'
6"
Nature Trail Landing Interpretive Signage and /or Bench Locations
Nature Trail Signs
Nature Trail
Electrical Transformer Location
Water Meter
Sanitary Sewer Pump Station 25' x 25' Fenced
Geothermal Well Site
Preferred Well Locations
Alternate/Additional Well Locations
Well Layout Grid 10' x 10'
Utility Strip - Sanitary Sewer
Dumpster
Storage Buildings
4 Bus /Car-trailer Parking Spaces
Utility Strip Limits
Utility Strip - Water
Utility Strip - Electric
Utility Strip - Communications
Planting Zone
3 Car-trailer Parking Spaces
Nature Trail Sign
Accessible Picnic Shelter
Restrooms and Vending
Visitor Center
Retaining Wall
Covered Walkways
(3) R7 - 8E and Van Accessible Signs mounted at 84" height
Tree Planting Islands
See Utility Strip Detail A
Bioretention Basin
Maintenance Access Path and Nature Trail
Nature Trail Sign
4" Concrete Sidewalk
Cobblestone Walkway
Cobblestone Walkway, Flag Pole, Welcome Sign and Spotlights (See Detail)
Cistern (above ground)
Nature Trail
Nature Trail Landing Interpretive Signage and /or Bench Locations
Tree Planting Islands
65 Car Parking Spaces (3 Accessible)
Drainage Swale
Nature Trail Sign
Bioretention Forebay
See Utility Strip Detail B
Hazardous Spill Basin
17 Truck Parking Spaces
N 82° 42' 15.9" E
N 89° 13' 11.2" E
-TR-ON-
35+00
40+00
45+00
10+00
15+00
Key
Street Light
Post Top Light
Accent Light
Flag Pole
Trash Receptacle
Trash Receptacle
Recycling Center
Picnic Table
Picnic Shelter
Wheelchair Ramp
Depressed Curb
Yard Hydrant
Irrigation Hydrant
Fire Hydrant
Telephone
0
40
80
120

Why build a sustainable site?

- In 2001, the Governor's office requested that N.C. DOT investigate the feasibility of building a "Green" rest area.
- A request for proposal was advertised and DOT settled on 5 firms to make presentations.
- In 2003 – Innovative Design in Raleigh was chosen as designer for the Wilkes County US 421 Rest Area / Visitor Center project.

What does sustainable mean?

- Sustainable Designs aim to produce places, products, and services in a way that improves energy efficiency, reduces use of non-renewable resources and minimizes environmental impacts.

Objectives

- To build a rest area/visitor center that features advanced and recognizable sustainable practices that are available in today's market.
- To build a Safety Rest Area that will serve the traveling public with rest rooms and a place to "recharge" and to build a Visitor Center to serve Northwestern N.C. with tourism promotion activities.
- Construct a LEED certified site for public education but also for NC DOT staff to learn more about these strategies and how we can integrate them into other construction and renovation projects.
- To build this project as economically as possible and on time.

Sustainable Strategy Highlights

- The Wilkes County visitor center will feature a “Green data monitoring system” that will collect data on key sustainable strategies and display it via screen monitors to visitors.
- The software managing this data will allow public interaction with information displayed, creating an educational experience showcasing sustainable building systems.
- By implementing a data monitoring system the building acts as an intelligent entity that allows for interaction between people, the building and the natural environment.

Key Design Strategies

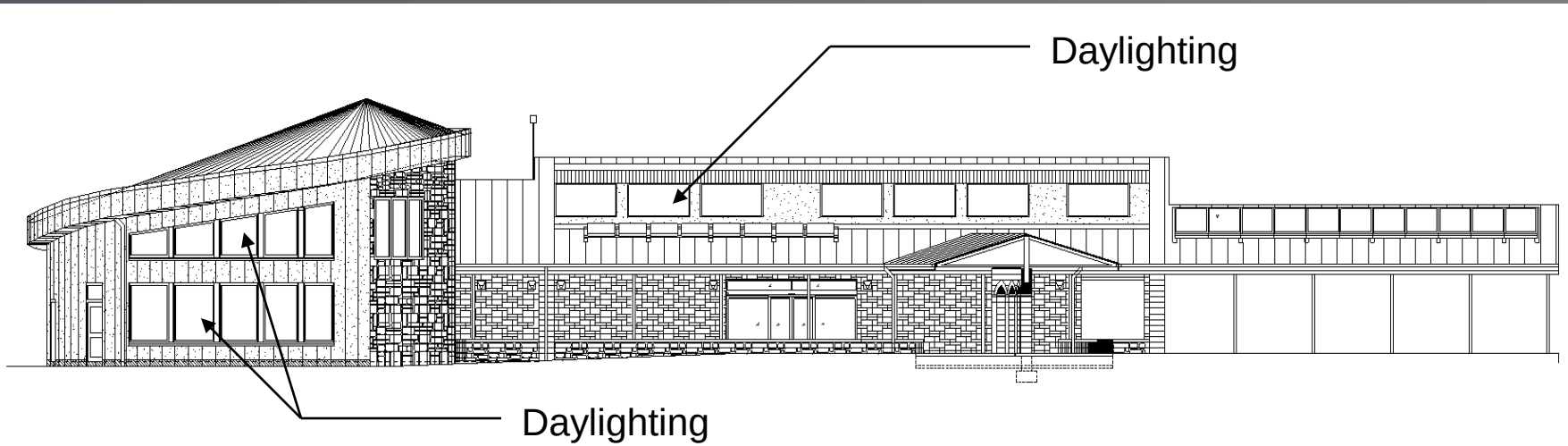
Daylighting

- The main building areas have been situated and designed to allow for the maximized use of natural light during the day.

Key Design Strategies

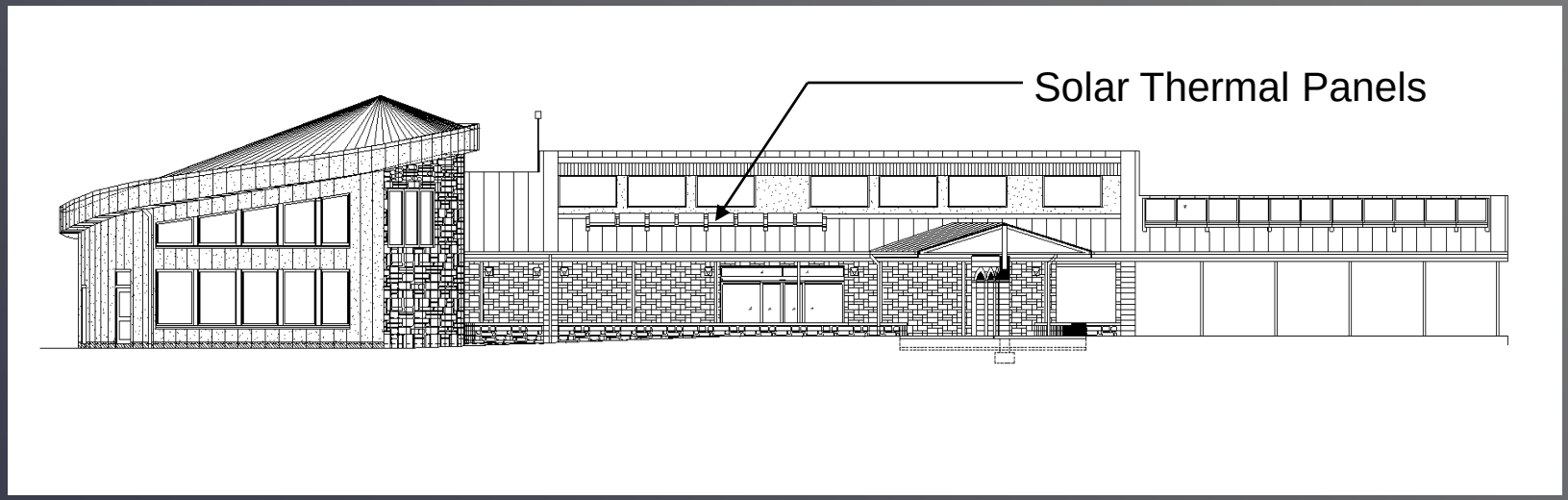
Daylighting

- Less cooling cost because of less heat generated by electrical lights.
- The lighting system will have daylight sensors that can dim or reduce the amount of electric light required.
- A monitoring device on the roof will convert data to compute energy savings from daylighting.


Daylighting
Daylighting

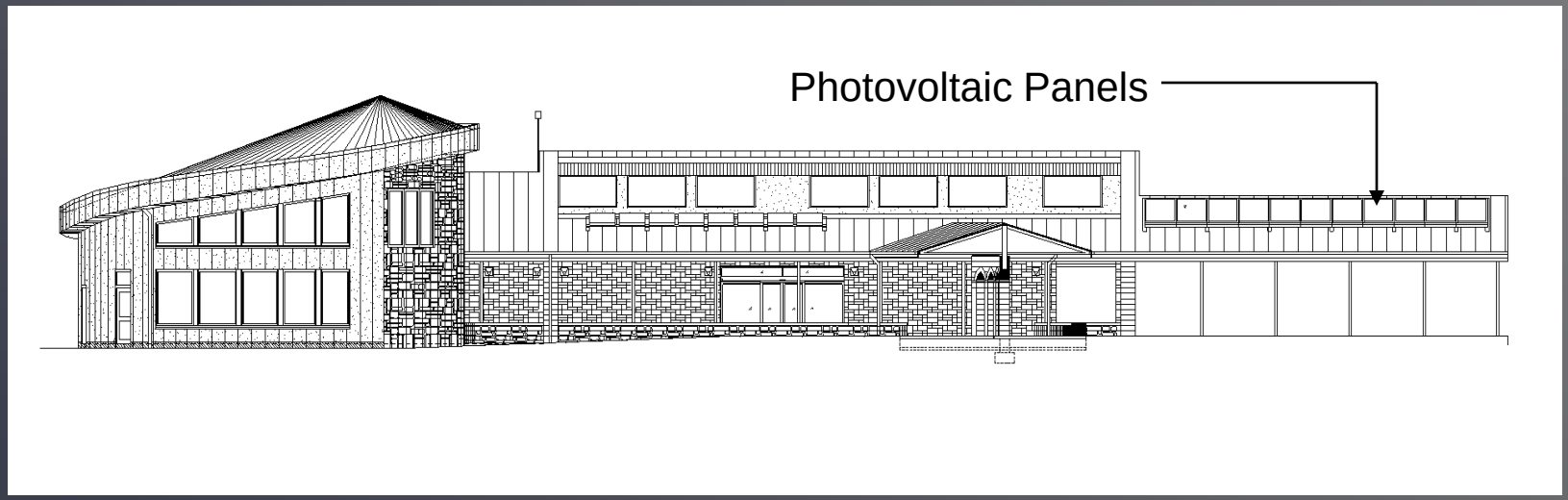
Domestic Solar Hot Water

- A total of 8 solar panels above the entrance canopy will preheat the hot water for the restrooms.
- Monitoring of the sun's intensity and energy data input and output from the thermal system will allow calculation of system efficiency.



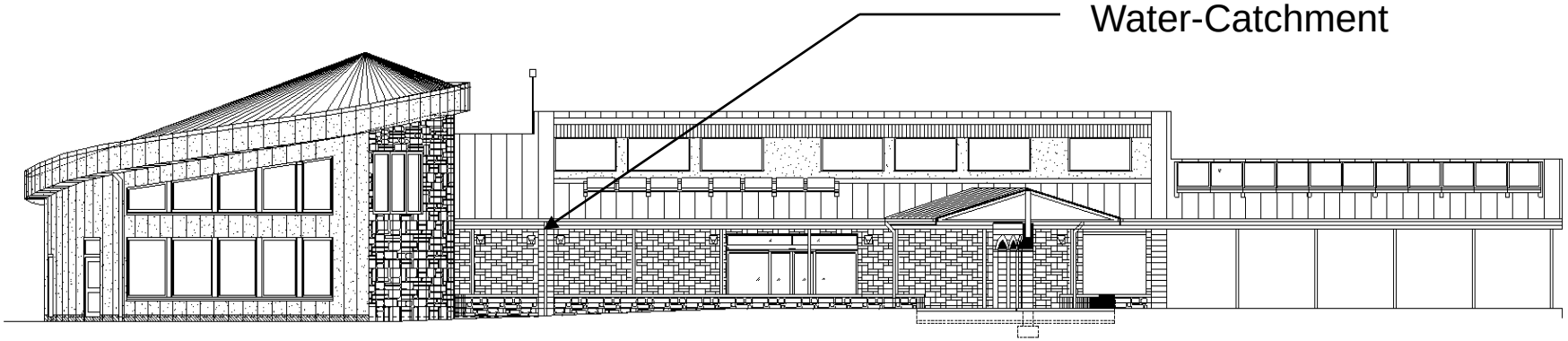
Photovoltaic Panels

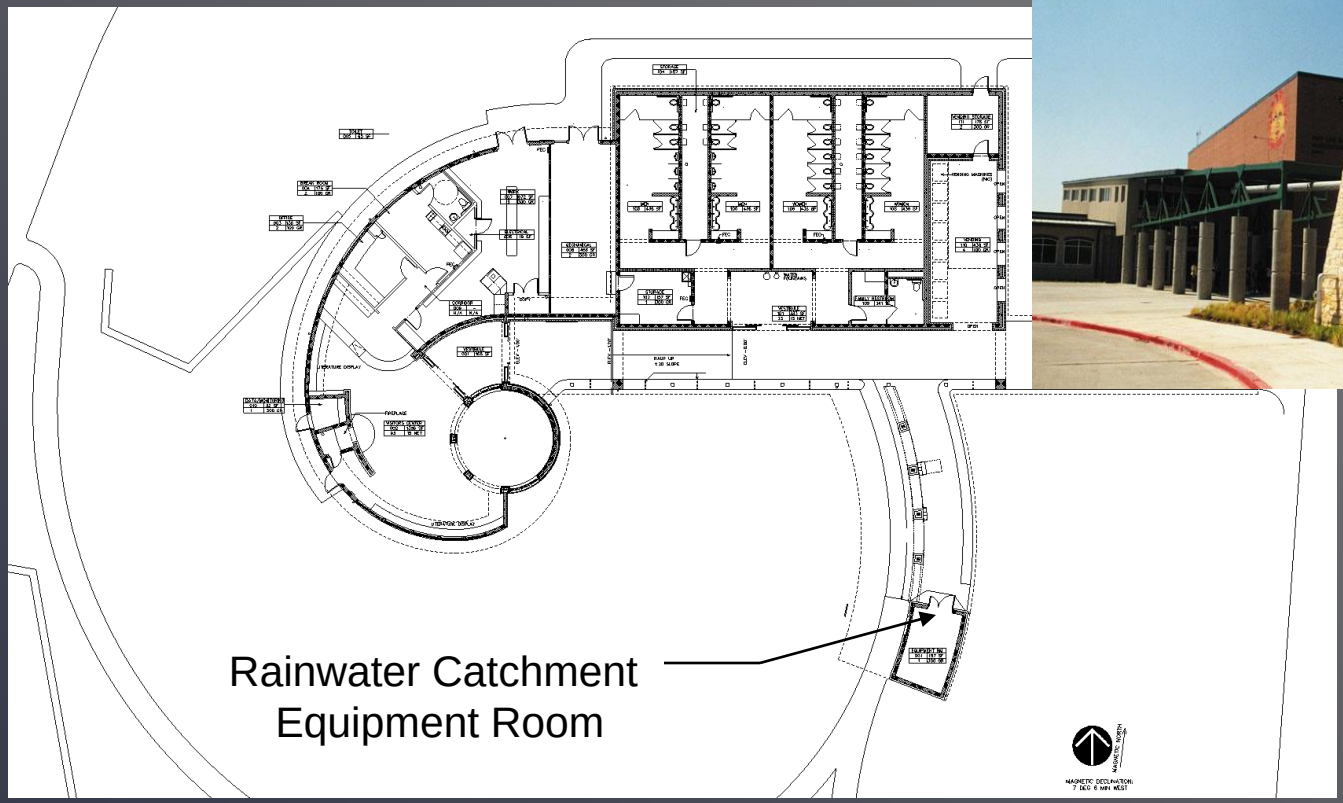
- 11 panels are located on the walkway canopy to convert solar energy into DC electricity and through an inverter into AC power, which the building can use.
- The data monitoring system will calculate the PV energy system efficiency.



Rainwater Catchment

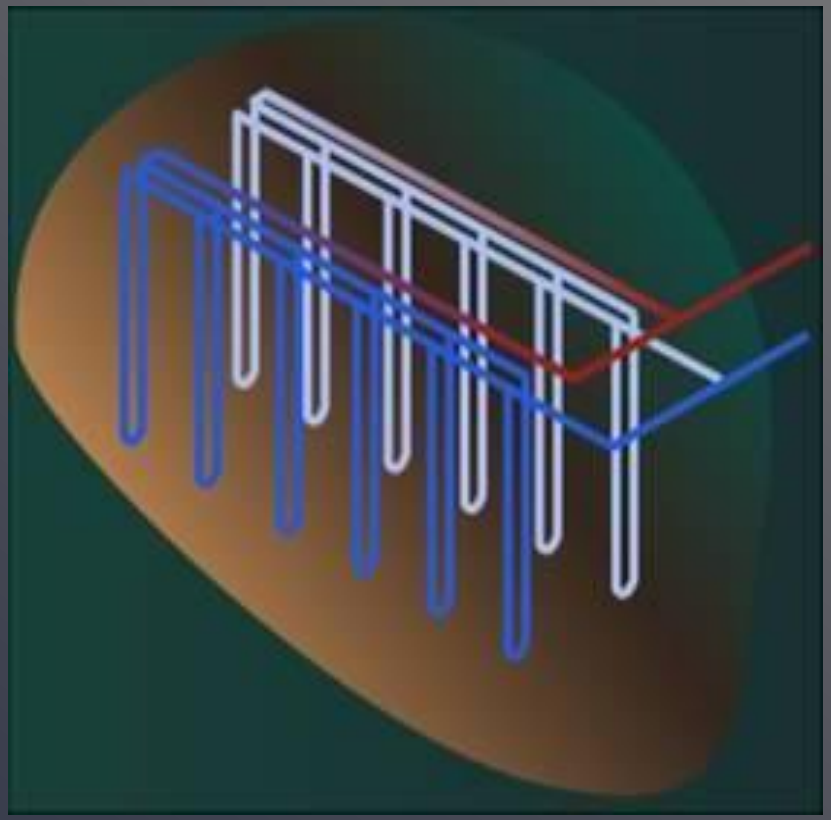
- Rainwater is collected off the roof and piped to a 26,000 gallon cistern where it is treated with chlorine to be used for toilet flushing.
- Data will be collected from the roof top weather station to monitor water savings.
- Calculations show that with normal Wilkes County rain fall 300,000 gallons of rain will be harvested annually.

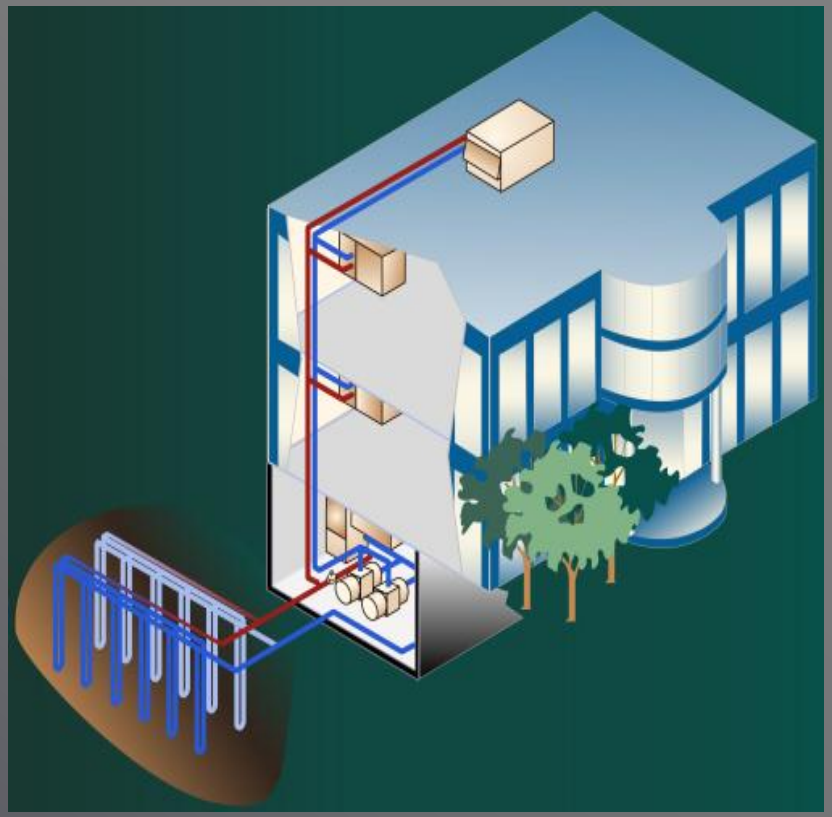

Water-Catchment


Rainwater Catchment
Equipment Room

Geothermal Heat Pump

- Thirteen – 300 foot wells are designed as part of the system to heat and cool the building.
- This is done by a closed loop system in which water flows through, either being heated or cooled by the constant temperature of the ground itself.
- Returning to the surface, the liquid passes through the heat pump's heat exchanger and either heats or cools the building.
- Sensors will monitor total BTU's generated.





Energy Efficient Shell

- The building shell is designed so that high amounts of insulation values can be obtained in the exterior walls and roof.
- The roof is a smooth Energy Star rated membrane that looks similar to standing seam metal and has a light color, reducing heat gain during hotter seasons. This membrane allows for more efficient collection of rain water.

“Green” Building Materials

- Materials with recycled content used on this project- carpeting, ceiling tiles, countertops, concrete, masonry, guardrail, asphalt.

- Local and regional (within 500 miles) materials will be used as a critical LEED element.

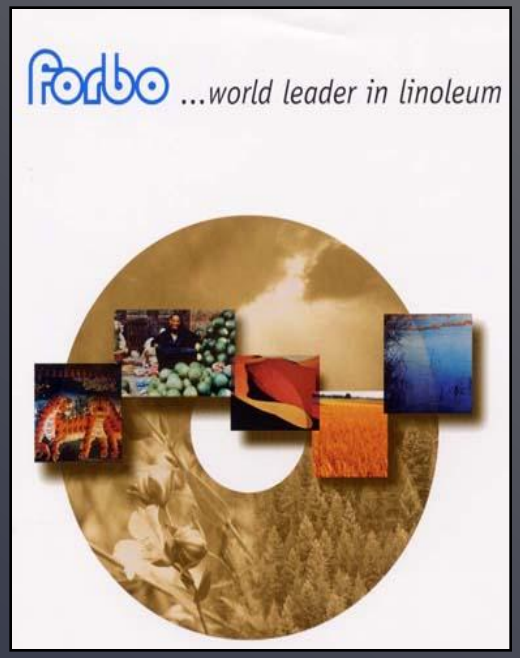
- 50% of the wood used on the project will be from a source certified with the Forest Stewardship Council.

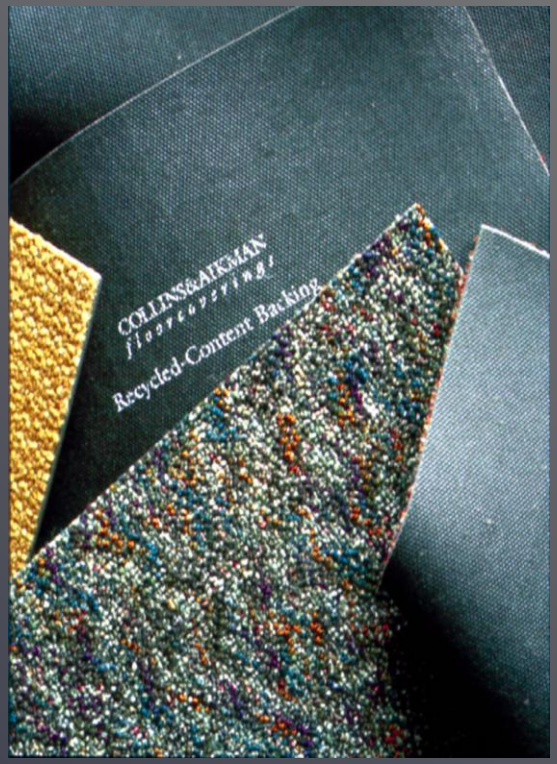
Constructed Hazardous Spill Basin and Bio-Retention Basin

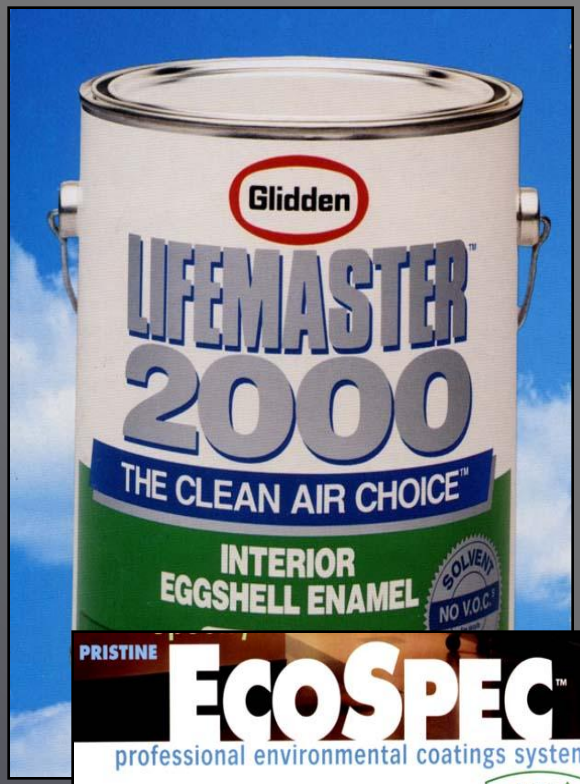
- Designed for sustainable stormwater management. All site stormwater is captured for on-site infiltration, through the hazardous spill basin and bio-retention basin.

Indoor Air Quality

- Preferred products have low or no pollutants - Volatile Organic Compounds (VOCs)
- No smoking will be allowed inside the building





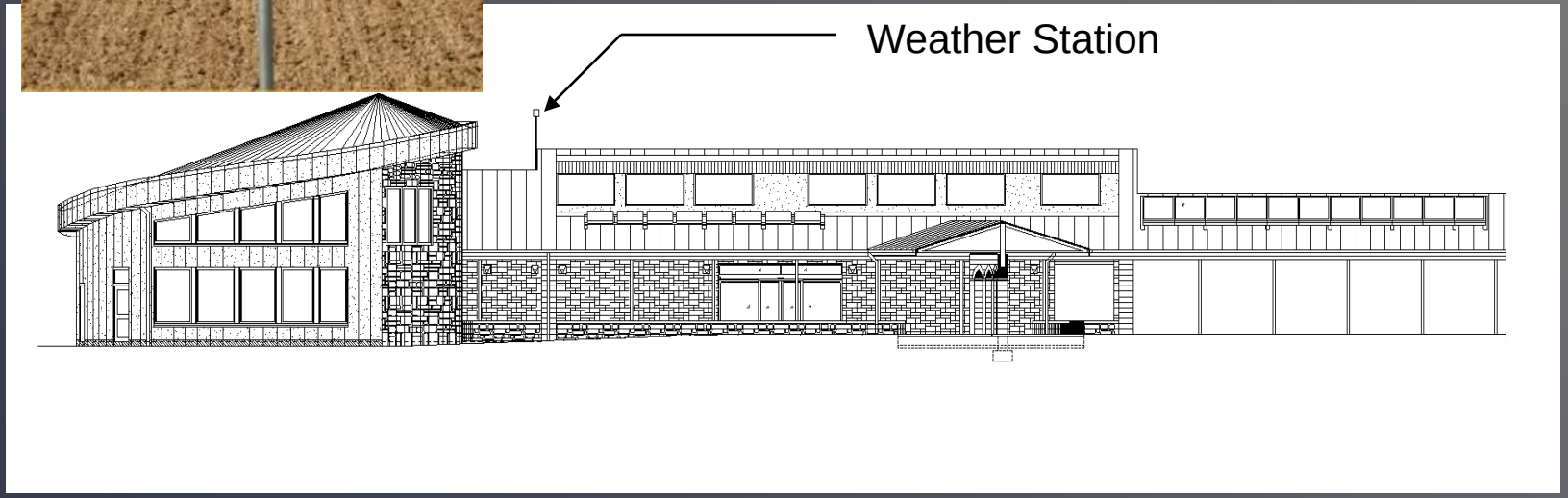


Water Conservation

- Incorporate native and drought tolerant plants.
- Water conserving fixtures are specified.

Weather Station

- Located on the roof to collect data on barometric pressure, relative humidity, temperature, rain precipitation, wind direction and speed.



Recycling Systems and Waste Management

- Incorporate recycling systems and waste management strategies.
- Construction Recycling –
  - Metal Banding
  - Cardboard

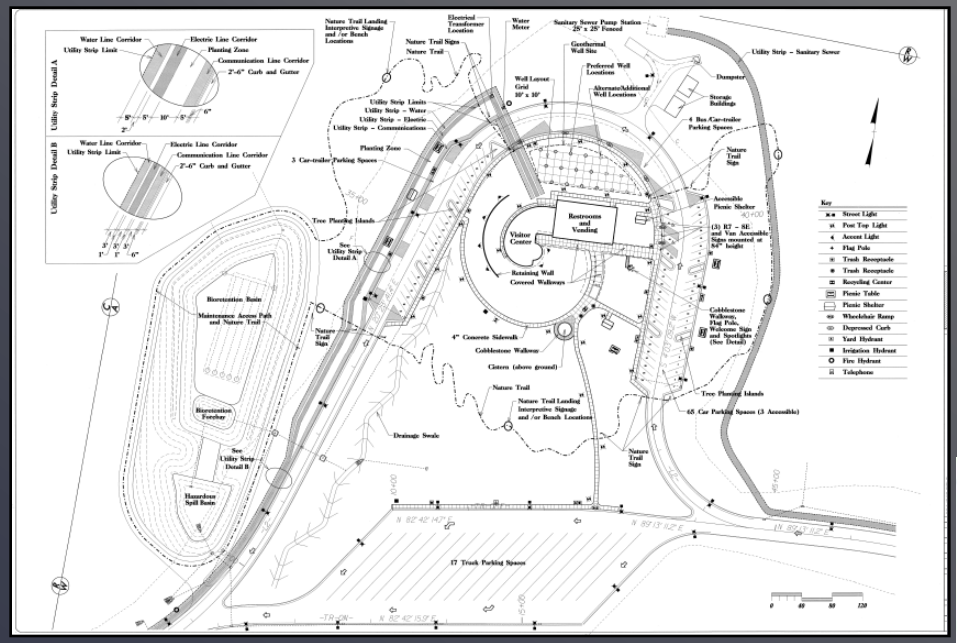
Our goal for the project is to divert at least 50% of the construction waste from the landfill.

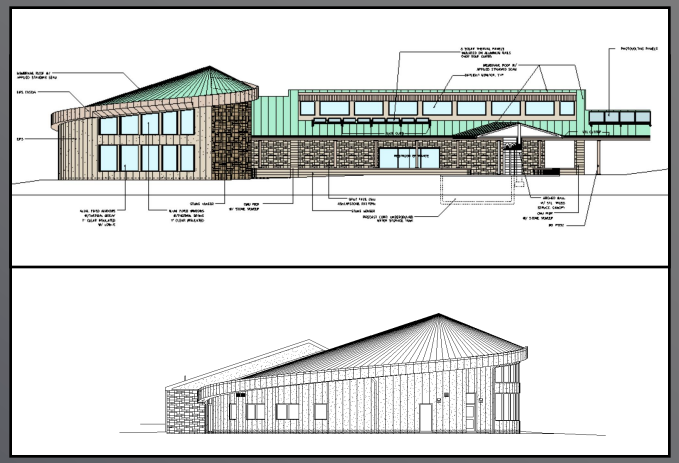
Quick Facts

- The design team is striving for a Gold LEED rating on this project – 46 LEED points are earmarked as viable possibilities.
- Completion will be early fall of 2009
- Contract price of construction including grading, paving, curb and gutter, and buildings is: $9,985,699.00
  - Land was purchased by others.
  - Water and sewer to the site by others.

In Conclusion

- When the project is complete, it should be an educational experience in sustainable design for the public and for the Department of Transportation, in addition to its primary purpose of motorist safety and traveler tourism.





LEED
LEADERSHIP IN ENERGY & ENVIRONMENTAL DESIGN