Sustainability Practices in Design & Construction of County Buildings

Wake County Growth & Economic Strength Committee

Mark Forestieri, Facilities Design & Construction

June 3, 2024

Presentation Topics

- Site Fundamentals – The Starting Point
- Building Design Considerations
- Building Systems
- Representative Projects
- Future Considerations

Site Fundamentals

The Starting Point

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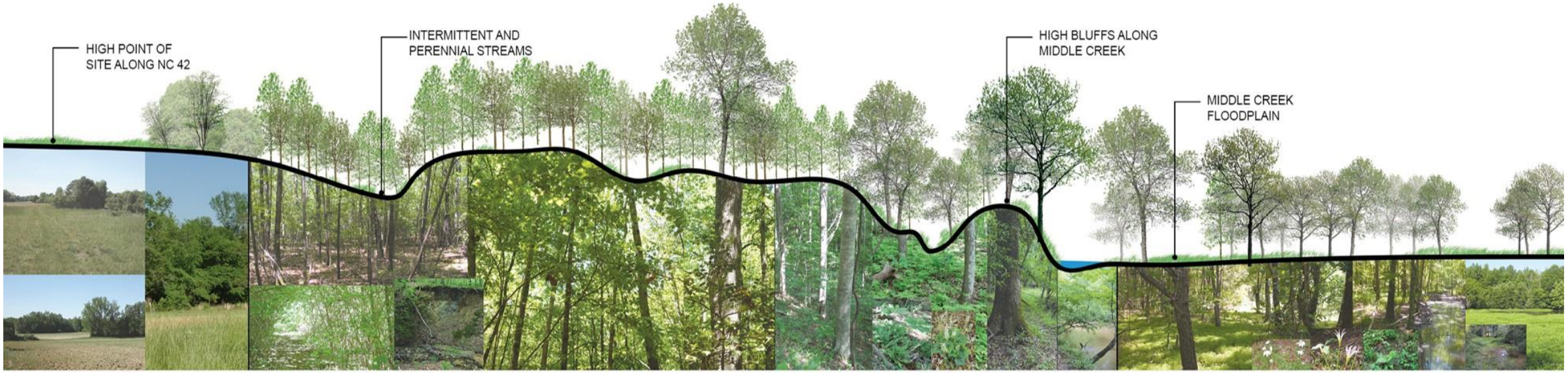
Site Fundamentals – The Starting Point

- Foundational textbook in design education
- Approach to design that considers Pre-existing Ecology, Geography and Geology
- Promotes Comprehensive Site Analysis
- Identifies the Character of a Site and then how to work within it

Site Analysis



Beech Bluff Land Cross Section Analysis

Green Stormwater Infrastructure (GSI)

Sandy Pines Preserve
Constructed Wetlands

Willow Springs Fire Station
Rain Garden

Middle Creek Library
Rain Garden

Native Plants

NOW THEREFORE, BE IT RESOLVED THAT THE WAKE COUNTY BOARD OF COMMISSIONERS, in an effort to protect our natural resources Wake County will review and revise the Wake County Unified Development Ordinance and the Wake County Design Guidelines and Standards ensuring that Wake County Government projects utilize Native Plants to the greatest extent possible; and that the County Commission does hereby authorize the County Manager to support efforts toward the increased use of native plants on Wake County Government projects.

ADOPTED this 15th day of October 2018.

Native Plants/Drought Tolerance

Native Species:

- Celebrate natural diversity
- Provide food and shelter for wildlife
- Restore native / regional landscapes
- Reduce water and maintenance needs
- Withstand regional weather extremes
- Create a Sense of Place

Sustainable SITES Initiative

"Creating ecologically resilient communities"

- Rating System for Sustainable Land Development
- Administered by Green Building Council
- SITES has synergy with LEED strategies
- North Carolina certified projects
- Pursuing SITES certification at Beech Bluff Park

American Society of Landscape Architects

Lady Bird Johnson Wildflower center The University of Texas at Austin

United States Botanic Garden

Charlotte Brody Discovery Garden

Horseshoe Farm Nature Preserve

Building Design Considerations

Materials-Finishes-Retrofitting

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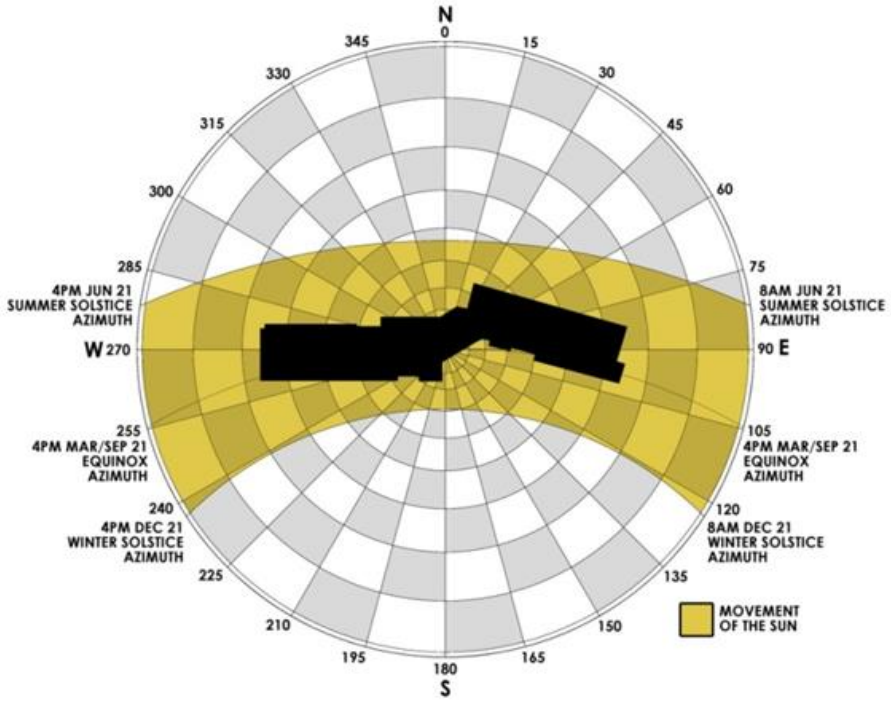
Building Orientation & Topography



Ideal orientation is east/west.....

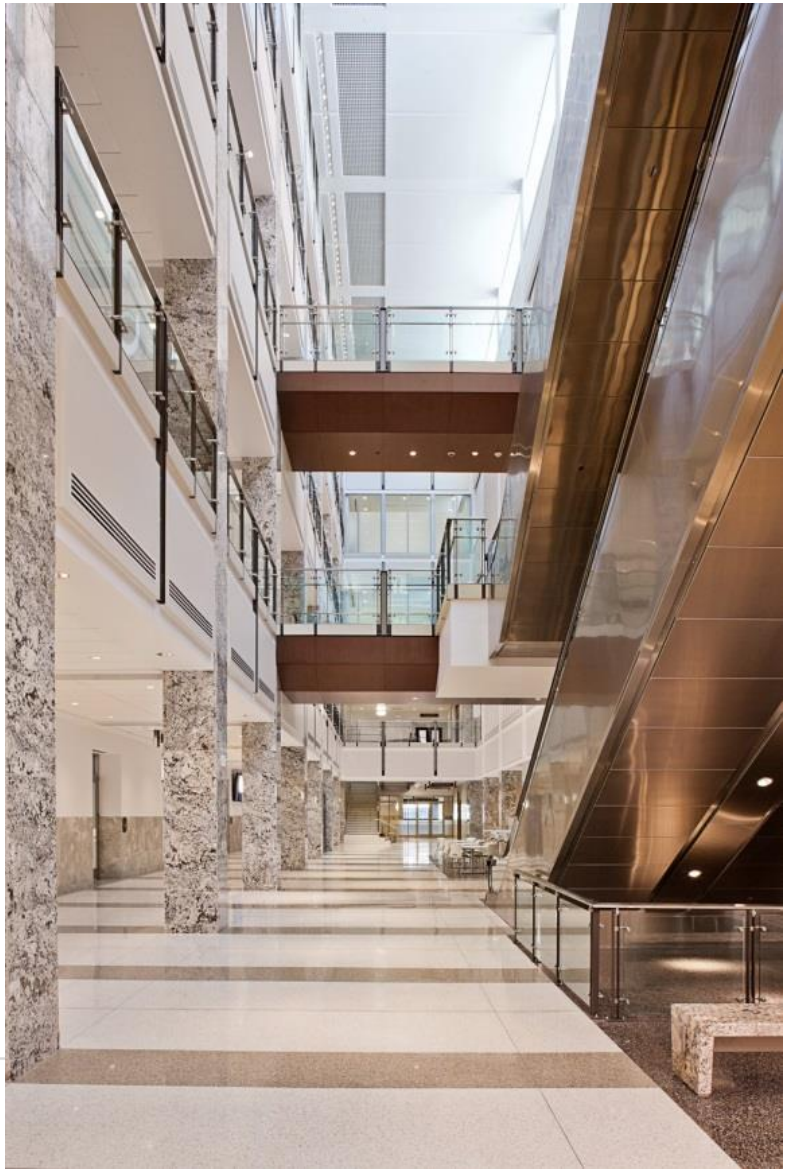
.....but that often is not possible

Building Orientation & Topography

Northeast Regional Library

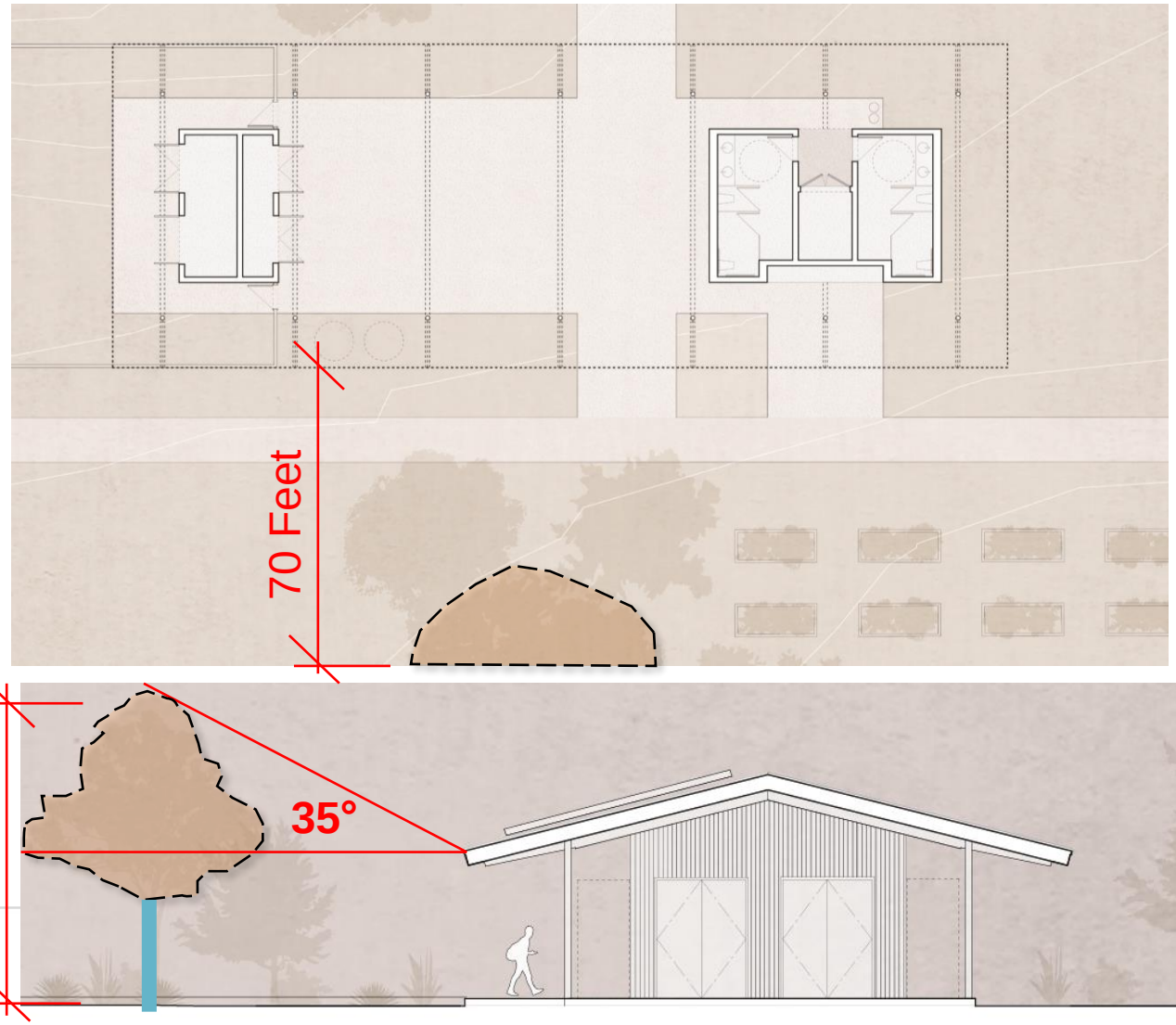
Building & Finish Materials

- Masonry Exterior Walls
- Terrazzo/Tile/Stone Floors (high traffic areas)
- Metal Roofing (sloped)
- Zinc Siding
- Protected Exterior Metal
- Low VOC Paints/Carpet



Sun Control

Shade – Tree to Building Proximity



Ultimate Recycle & Reuse – Whole Bldgs

Vernon Malone College & Career Academy

Oak City Multiservices Center

Building Systems

Standard Sustainable Practices for Mechanical-Plumbing-Electrical/Lighting

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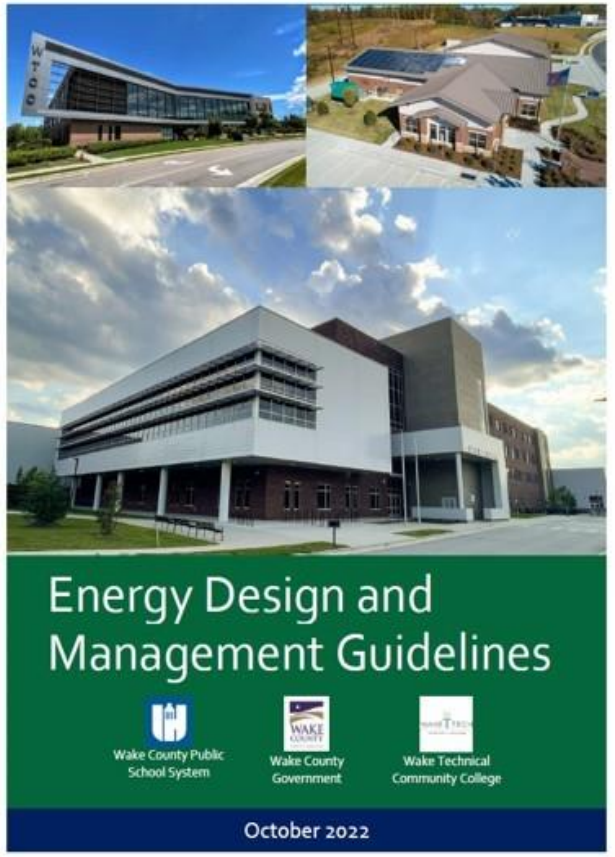
Wake County Energy Design Guidelines

Outgrowth of Board's 1992 Energy & Management Policy in order to:

- Transform energy performance of Facility inventory
- Require greater energy efficiency & water conservation
- Deploy emerging technologies wherever feasible
- Balance building performance w/occupant comfort, health, safety and productivity
- 2022 Update connects Board initiatives w/Clean Water & Green Stormwater Infrastructure



Mechanical Systems

Energy Efficient HVAC Systems

- Variable Speed Centrifugal Chillers
- Condensing Boilers
- Variable Air Volume (VAV) Systems
- Heat Pumps – Small Facility Applications

Optimize HVAC Usage

- Variable Frequency Drives (VFD)
- Direct Digital Controls (DDC)
- Time of Use and Metering
- Refrigerant Management

Indoor Air Quality

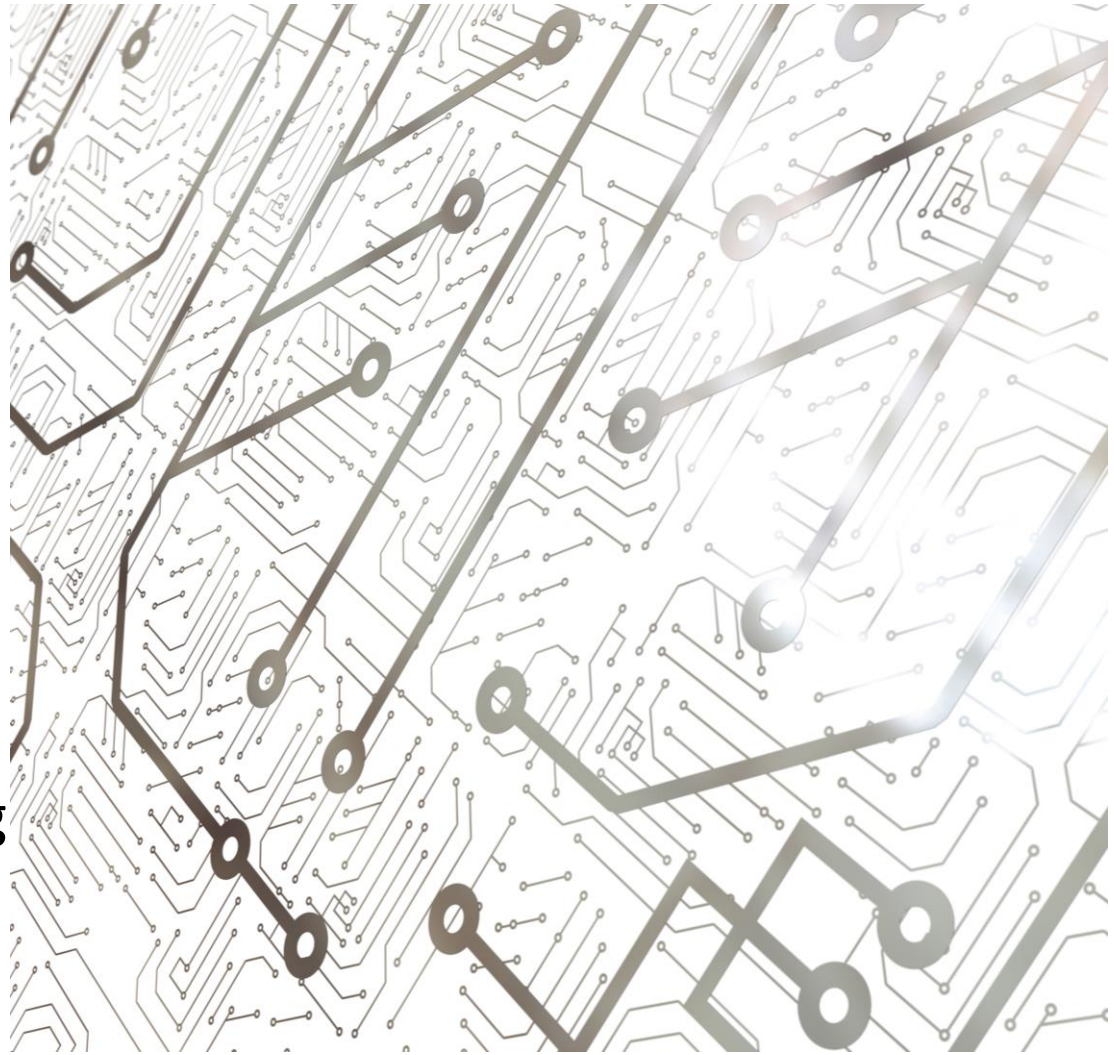
- Economizer
- Minimum Outside Air Based on Occupancy
- Filtration Media

Plumbing Systems

- High Efficiency Water Heaters
- Point of Use Tankless Water Heaters where applicable.
- Low Flow Sensor Operated Toilet Fixtures
- High Efficiency Toilets
- Recirculating Pumps

Lighting Strategies

- LED Light Fixtures
- Lighting control panels
- Occupancy sensors
- Daylight harvesting for open areas with sufficient window exposure.
- Photo-Cells and timers for exterior Lighting
- Photo-Cells and timers for Parking Deck Lighting



Representative Projects

Sustainable Features

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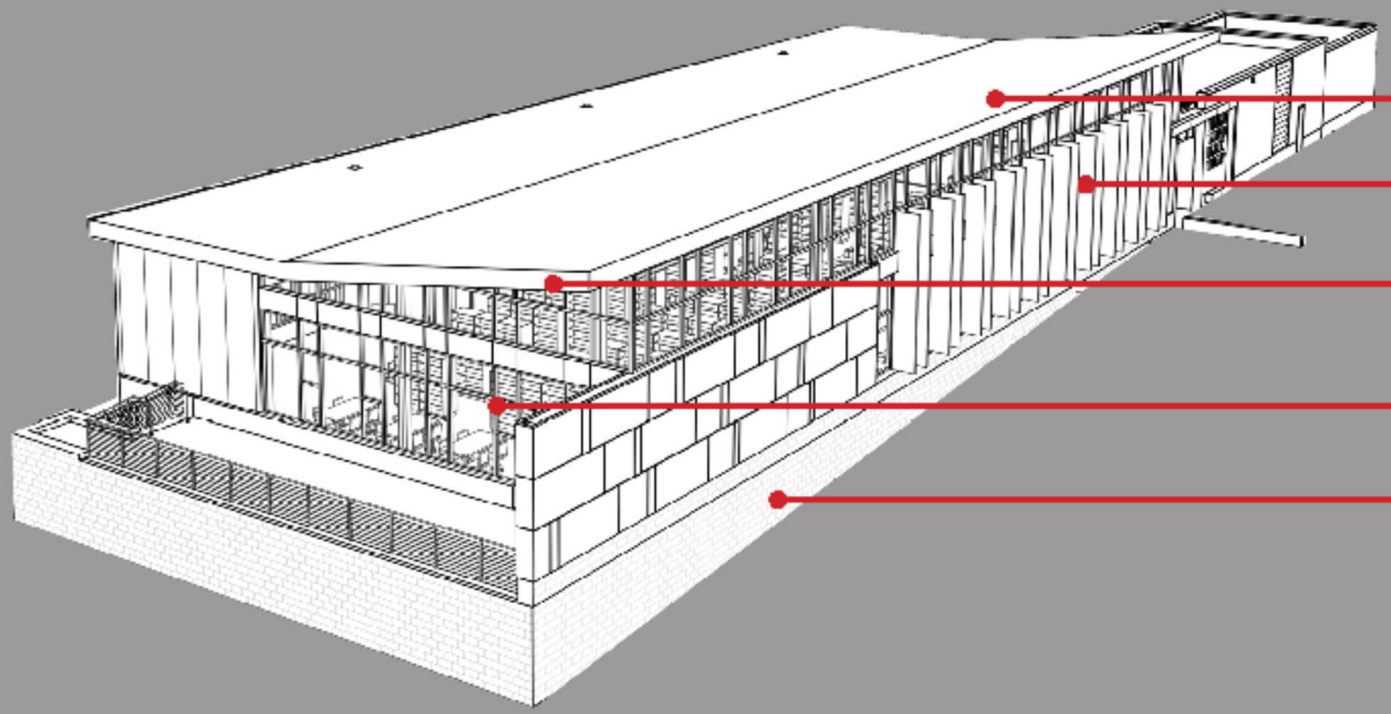
Fuquay-Varina Library



GREEN BUILDING FEATURES:

- HI-SRI WHITE ROOFING
- SOLAR SHADING “FINS” ON EAST & WEST FACADES
- DEEP ROOF OVERHANGS FOR EXTERIOR SOLAR SHADING
- LOW-E GLASS WITH EMPHASIS ON VIEWS & DAYLIGHT
- LOCALLY-SOURCED MASONRY

GREEN SITE FEATURES:

- NATIVE & DROUGHT TOLERANT PLANT SPECIES
- BIORETENTION STORMWATER MANAGEMENT
- SHADE TREES IN PARKING AREA – REDUCE HEAT ISLAND EFFECT

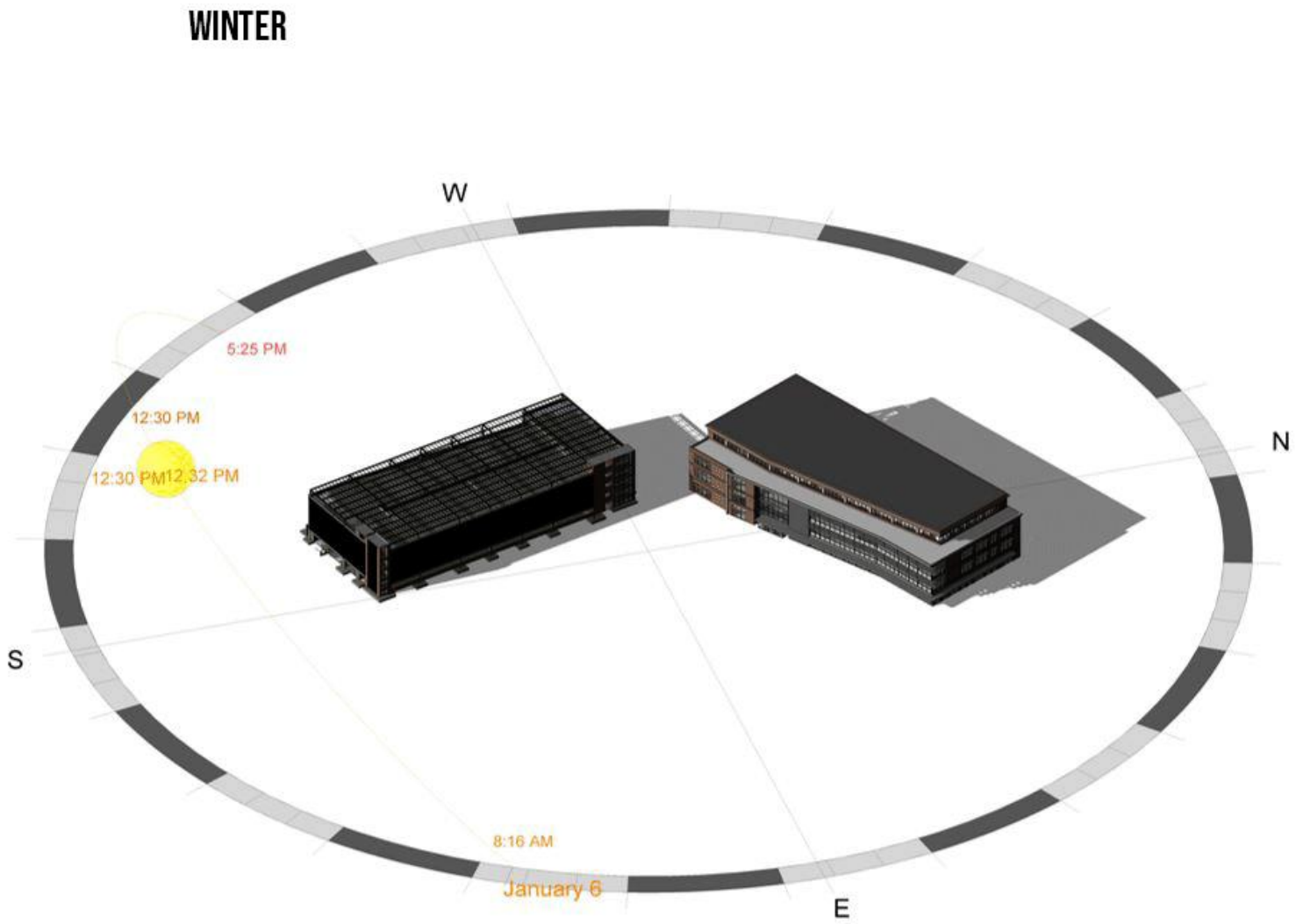
Fuquay-Varina Library

Oak City Center – Solar PV Retrofit

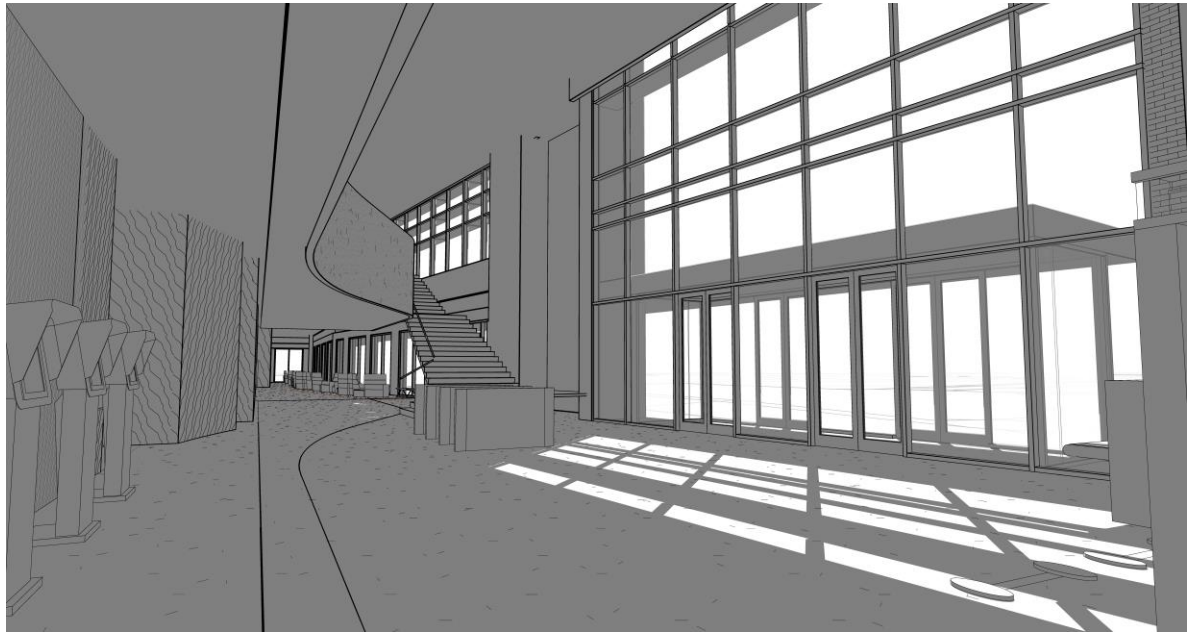
Garner Main EMS
Sustainable Design Strategies

Public Health Center – Site Preservation

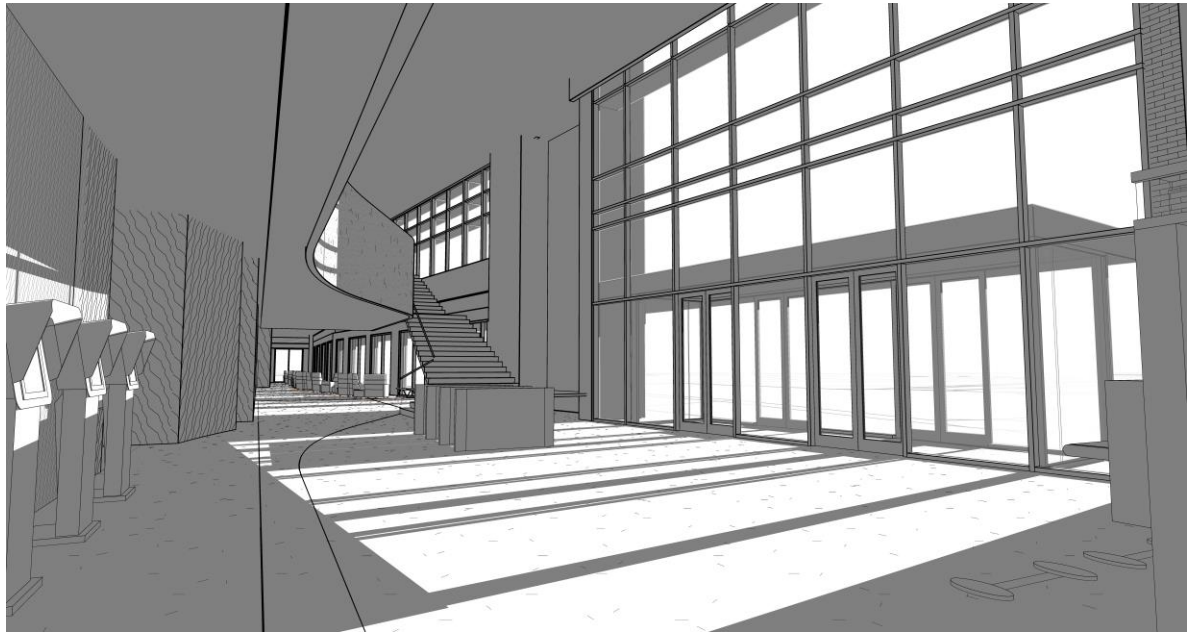
Public Health Center – Sun Path Projection



Public Health Center – Solar Studies



Summer Solstice: 10 AM



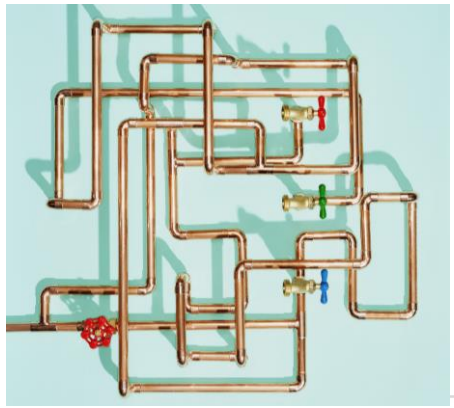
Winter Solstice: 10 AM

Public Health Center – Building Envelope

Design Strategies:

- Horizontal solar shades
- Low E high performance fritted glazing/ thermally broken window framing
- Deep oversized canopies

Public Health Center – Building Systems

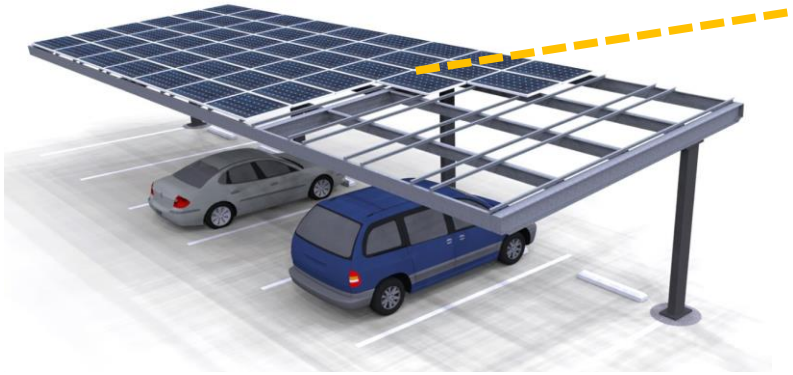


- Centralized Chilled & Hot Water Plants
- Cooling Tower
- Water Usage Metering
- Sensor Operated; Low Flow Fixtures
- Daylight Harvesting
- LED Light Fixtures Throughout
- Occupancy Sensors

Public Health Center – Solar Design

Integrating Solar Photovoltaics in Design

- Prepare electrical infrastructure for solar PV on parking deck and building's roof.
- Photovoltaic panels on parking deck



Public Health Center – Additional Features

Electric Vehicle (EV) Charging Stations

- Level 2 Chargers
- 8 public parking spaces
- 6 private parking spaces
- BEV Charging Time (0-80%) 4 to 8 Hrs.
- PHEV Charging Time 1-2 Hrs.

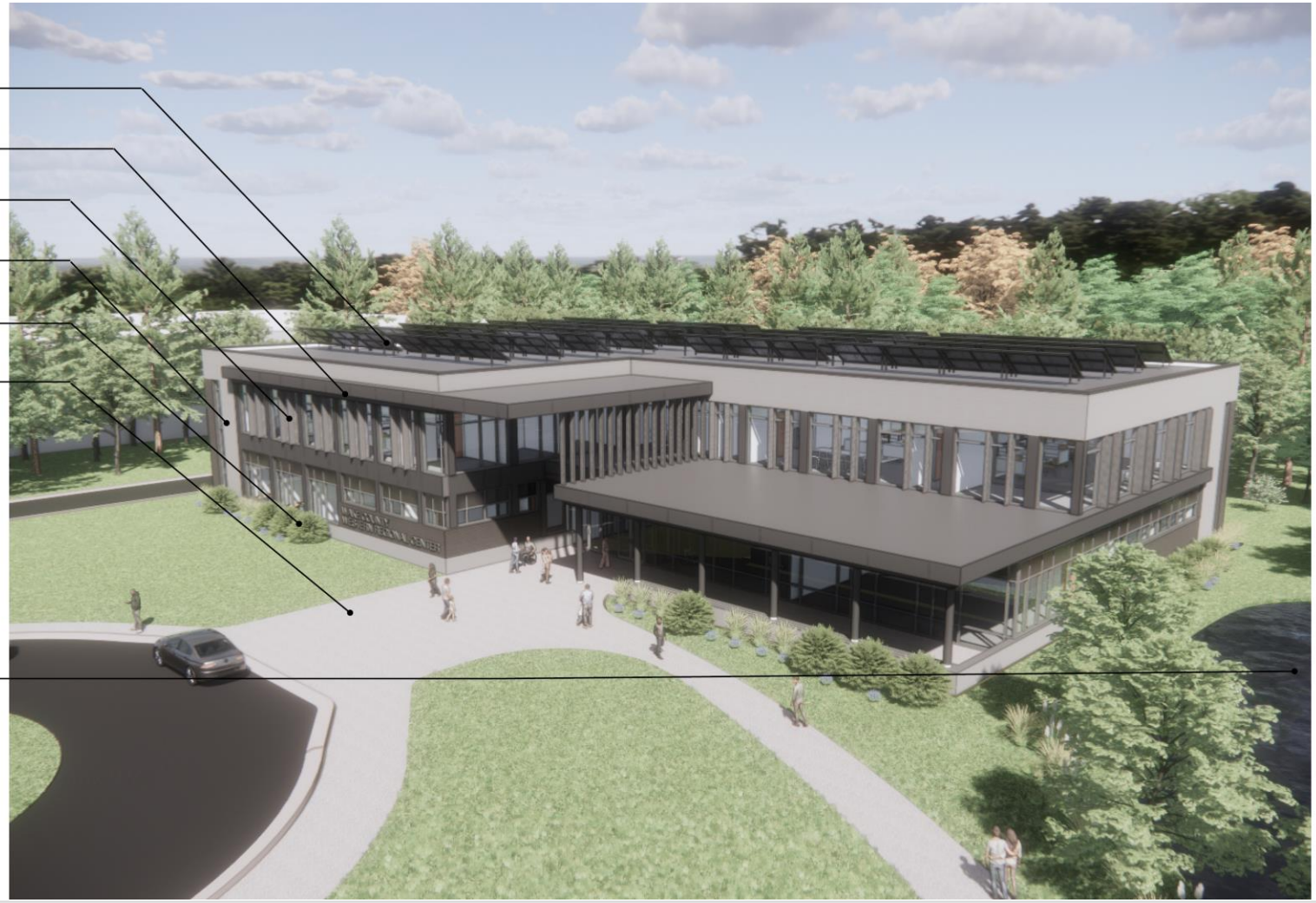
Carbon-cure Concrete

- Converts CO2 into embedded mineral
- Produces stronger, harder concrete

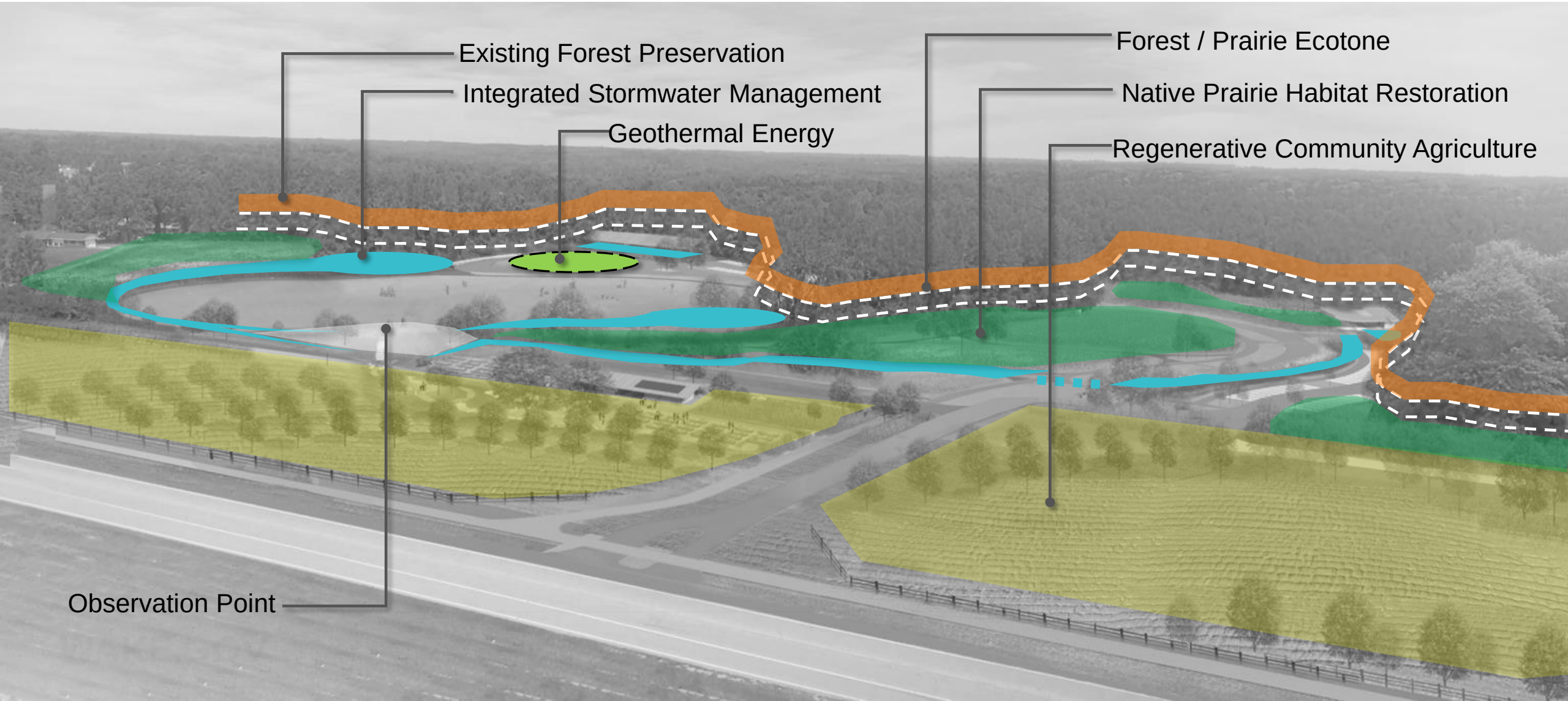
Western Regional Center

Sustainable Design Opportunities

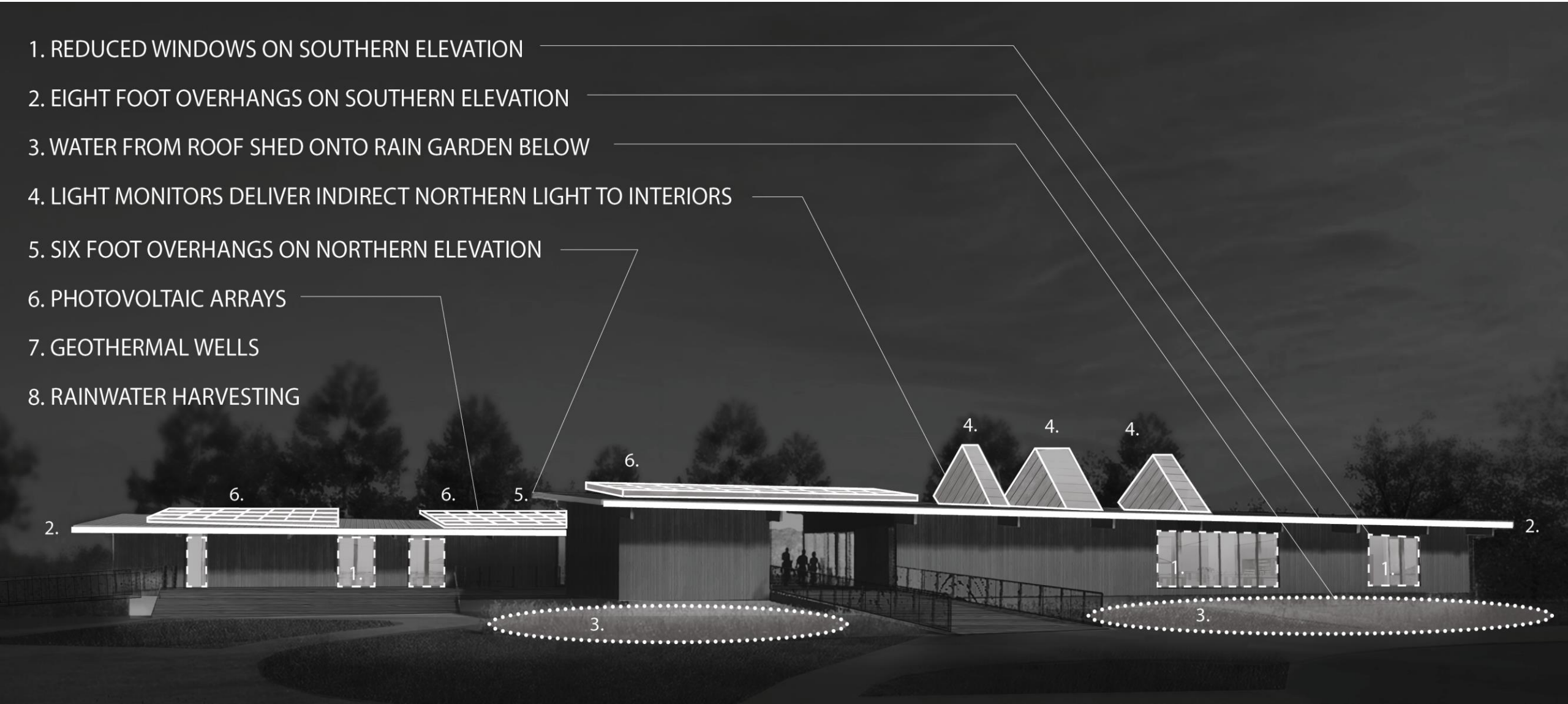
- PV Solar Panels on Roof
- Efficient Envelope System
- Vertical Shading Devices
- Locally Sourced Masonry
- Native & Drought Resistant Planting
- High Reflectance Concrete Paving
- Electric Vehicle Charging Stations
- LED Lighting
- Low-Flow Plumbing Fixtures
- Occupancy & Daylight Sensors
- Stormwater Measures
- Tree protection/replanting/tree buffers
- Minimize light pollution



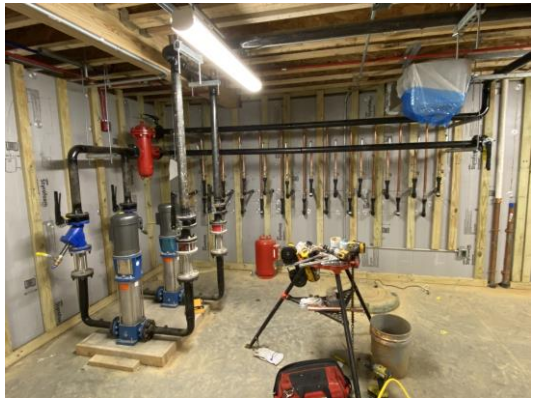
Beech Bluff Park – Site Sustainability



Beech Bluff Park – Building Sustainability



Beech Bluff Park – Geothermal Wells



Beech Bluff Park – Additional Features

Rainwater Harvesting

Solar PV

EV Charging Stations

Beech Bluff Park – Recycle & Reuse

Trees to Mulch

Trees to Benches

Future Project Considerations

- Coordination with Green Stormwater Infrastructure Committee
- Carbon – Cure Concrete (Public Health is first project)
- Solar Water Heating
- Geothermal (where appropriate)
- Battery Storage for PV (as that technology is developed)

Questions?

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