1 Introduction and Overview
2 Sustainability Goals and Zero Energy Design
03 Site Design Development
04 Building Design Development
05 3D Visualization
06 Next Steps
07 Q & A
03 Site Design Development
- Moving the building closer to the parking lot
- Classroom space that opens into a larger conference/rental room
- Separating exhibit space with classroom space
1 Main Entry
2 Group Entry
3 Bus Drop-Off
4 Service Entry
5 Paved Parking Lot (69)
6 Overflow “Green” Parking
7 Picnic & Play
8 Parking Lot Prairie
9 “Threshold” Prairie
10 Forest “Threshold”
11 Turtle Pond Connection
12 Bird Watching
13 Primary Trail Connections
14 Landscape Classroom
“Threshold” Prairie
Overflow Parking
02 Sustainability Goals and Zero Energy Design
Overarching Sustainability Goals for the WHNC

“In sum, the goal of this Green Building Policy is to promote buildings that are energy efficient, economical to operate, environmentally responsible, and healthy places to live and work to further enhance the quality of life in St. Louis Park.”

Three main objectives:
1- Holistic approach sustainability (addresses responsible water, energy and material use, treatment and reduction of waste, energy, site, occupant wellness, resiliency).

2- Creation of a building which embodies environmental appreciation and works as a teaching tool.

3- Zero Energy Building Certification (ZE) as standard and third party verification system which aligns with this project’s goals.
WESTWOOD HILLS NATURE CENTER SITE RESOURCES

- Solar Exposure in Winter
- Solar Shading in Summer
- Wind Exposure in Summer
- Wind Buffer in Winter
- Water/Geothermal Resources
Pathway to Zero Net Energy

- Net-Zero Energy is a Balancing Act
  - How much will the building/site use in a given year?
  - How much can the site generate?
1) Zero Energy Buildings:
Have achieved ZE for at least 12 months, the total consumption of energy from all sources has been fully balanced by onsite renewable energy generation on an annual basis and NBI has verified performance data. The St. Paul Science House is in this database, but there are no non-residential projects yet certified.

2) Zero Energy Emerging Buildings;
have a publically stated goal of reaching ZNE but have not yet demonstrated achievement. There are 2 MN buildings in this category.

3) Ultra-Low Energy Verified Projects:
Documents energy performance dramatically better than industry average. The City of St. Louis Park Fire Station #2 is listed in this category.

AN ONGOING EFFORT AND STORY...
Establish target performance metrics for minimizing resource use (energy, water, waste, materials)

Maximize passive systems (solar thermal energy and mass, high performance greenhouse envelope, natural ventilation, passive heating+cooling, natural light)

Right-sizing of ‘active’ mechanical systems for the region’s seasonal change

Building commissioning, Staff/occupant training + Monitoring building performance data

Analyze renewable energy opportunities
climate analysis:
which specific passive strategies have the highest potential impact?

A more detailed look at when each potential passive strategy is most effective helps to identify the 3-4 strategies that have the greatest potential impact on mechanical energy reductions:
solar radiation analysis

summer radiation

winter radiation
wind analysis
SECTION STUDIES:

Passive solar heating + Occupant Thermal Comfort
Daylight Harvesting
Air Flow
Renewable Energy
Connection to Nature
section study:
PASSIVE SOLAR HEATING + OCCUPANT COMFORT

Example of a typical building:

- warm air rises to ceiling
- cold areas next to windows
section study:
PASSIVE SOLAR HEATING + OCCUPANT COMFORT

thermally massive wall absorbs solar heat and slowly dissipates it through the space

shading blocks radiation from reaching the wall in summer

triple element glazing limits cold drafts next to windows

radiant floor slabs increase occupant comfort
RADIATION HITTING THERMAL MASS WALL OVER THE YEAR

<table>
<thead>
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<th>WINTER</th>
<th>SPRING</th>
<th>SUMMER</th>
<th>FALL</th>
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<td>december</td>
<td>march</td>
<td>june</td>
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<td>january</td>
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<td>february</td>
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section study:
DAYLIGHT

angled roof allows for light to wash and reflect into space

classrooms receive even, indirect north light
section study: DAYLIGHT

angled roof allows for light to wash and reflect into space

25 fc 30 fc 25 fc 15 fc 12 fc classrooms receive even, indirect north light

13-20 fc

70+ fc
direct light is limited to corridor area

highest sun angle
(summer: 66 degrees)

average sun angle
(equinox: 43 degrees)

lowest sun angle
(winter: 19 degrees)
DAYLIGHT STUDIES:
A look at the range of light

LEAST LIGHT
dec 21 9am

TYPICAL
spring/fall 9am

MOST LIGHT
june 21 12pm
wind direction, frequency and speed

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<th>Winter</th>
<th>Spring</th>
<th>Summer</th>
<th>Fall</th>
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<tr>
<td>December</td>
<td>March</td>
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<td>May</td>
<td>August</td>
<td>November</td>
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</table>

**Legend:**
- mph
- 30.00<
- 27.00
- 24.00
- 21.00
- 18.00
- 15.00
- 12.00
- 9.00
- 6.00
- 3.00
- <0.00
wind direction, frequency and temperature

December

January

February

March

April

May

June

July

August

September

October

November
Energy Target: 40 EUI
66% roof usability factor
(amount of roof needed to use to achieve the system rating)

system rating: 160 kW
produces 182,876.3 kWh/year
- Building energy model estimates that Zero Net Energy performance is achievable.
- Significant portions of the roof must be covered to achieve this PV production.
- Shading from trees will reduce PV generation – need survey to estimate extent.
04 Building Design Development
Enlarged Floor Plan - West

CLASSROOM ENTRY
RAPTOR CARE
ELECTRICAL
VESTIBULE
UTILITY/
CAGE - CAGE CAGE CAGE CAGE - CAGE -
EAGLE -OWL -HAWK SMALL PORC.
MEW - MEW - MEW - WARM MEW -
EAGLE - OWL - HAWK - PORC.

HALLWAY T/R RECEIVING

PROGRAM STORAGE

HALLWAY

SERVICE ENTRY

VESTIBULE
Envisioning Westwood Hills Nature Center

EDUCATION

‘Project as a teaching tool’
- Exhibit
- Classrooms

EXPERIENCE

‘A threshold to nature’
- Indoor/Outdoor
- Natural materials

PERFORMANCE

‘Utilizing site resources’
- Solar resources
- Water resources
EDUCATION
‘Project as a teaching tool’

CLASSROOM IN NATURE

Multipurpose Classroom is Connected to the Landscape
Outdoor Deck Expands Exhibit
Main Exhibit Gathering Space is Connected to the Landscape
EXPERIENCE
‘Threshold to nature’
INDOOR/OUTDOOR CONNECTION

Classroom Deck

Lounge/Birdwatch
Lounge Space Faces the Woods
EXPERIENCE

‘Blending in with the Site’

NATURAL COLORS, PATTERNS, AND TEXTURES
Harvesting solar energy through a thermally massive feature wall in the hallway
PERFORMANCE
‘Project as a teaching tool’

WATER RESOURCES

Roof and Landscape Water Features
Resilience

The ability to prepare and plan for, absorb, recover from, and more successfully adapt to adverse events.
SHADING

RAIN GARDEN
WITH NATIVE LANDSCAPING

SECURITY GUARD STATION

GARDENING

WATER LOOP

REGENERATION

HEALTHY MATERIALS

INSULATION

CLIMATE

SECURITY

NATURAL DISASTER

INFRASTRUCTURE

ASSESS RISKS

LIKEHOOD

SEVERITY

IMPACT

PLAN & IMPLEMENT RESILIENT STRATEGIES

FORECAST RISKS
Project Implementation

1. Future Climate Data
2. Resilience Assessment Workshop
3. Resilience Report
Thank You!