HARVEST VILLAGE

SOLAR DECATHLON - U.S. DEPARTMENT OF ENERGY - ATTACHED HOUSING
2019 STUDENT DESIGN COMPETITION - DIVISION PRESENTATION
BY THE NEW RURALISTS
**PROJECT DATA**

- **Location:** 3260 Oxford Millville Rd, Oxford, OH 45056
- **County:** Butler
- **Development Details:** Community housing development of 1, 2 and 3 bedroom attached homes
- **Total Number of Units:** 108
- **Maximum Density:** 12 units/acre
- **Proposed Density:** 4.7 units/acre

**Unit Sizes (Leaseable SF):**
- 1-Bedroom (12): 722 SF
- 1-Bedroom Accessible (12): 839 SF
- 2-Bedroom (60): 1,632 SF
- 2-Bedroom Accessible (12): 1,394 SF
- 3-Bedroom (12): 1,726 SF
PROJECT INTRODUCTION
ENERGY PERFORMANCE
ENGINEERING
FINANCIAL FEASIBILITY AND AFFORDABILITY
RESILIENCE
ARCHITECTURE
OPERATIONS
MARKET POTENTIAL
COMFORT AND ENVIRONMENTAL QUALITY
INNOVATION

TEAM MEMBERS

BEN ARIAS
Zoology Major
Architecture Minor
4th-Year Student
Team Leader

MAITREY PRAJAPATI
Architecture Major
Passive House Consultant
3rd-Year Student
Team Leader

IVAN DYE
Architecture Major
Student-Athlete
3rd-Year Student

AMY FERRIS
Architecture Major
Sustainability Major
3rd-Year Student

EMMA HOY
Engineering Major
Spanish Linguistics Minor
4th-Year Student

BLAKE KEM
Architecture Major
Spanish Major
3rd-Year Student

KARI KRUSE
Architecture Major
Management Minor
3rd-Year Student

YUE SHI
Architecture Major
Interactive Media Studies
4th-Year Student
FACULTY AND INDUSTRY PARTNERS

MARY ROGERO
Dept. of Architecture
Associate Professor
Licensed Architect
CPHC, LEED AP

JOHN RICHTER
Dept. of Mechanical and Manufacturing Engineering
Clinical Faculty

HUMAN NATURE

Heapy Engineering
Nationally Recognized Leader in Sustainability

MIAMI UNIVERSITY
DOUG HAMMERLE
Director of Energy Systems

Butler Rural Electric Cooperative, Inc.
CLIMATE DATA

Climate Zone: 5A
Annual Precipitation: 41.67 inches
Annual Average Sunrise: 177 days, 2,124 hours
Annual Average Solar Radiation: 4.39 kWh/m2/day or 1604.41 kWh/m²/year
Elevation: 928 feet
Average Heating Degree Days (68 Degree): 5,931
Average Cooling Degree Days (68 Degree): 977
ASHRAE 99.6% Heating DB: -18.1 F
ASHRAE 99% Heating DB: -14.9 F
ASHRAE 0.4% Cooling DB/MCWB: 32.5/22.5 F
ASHRAE 1% Cooling DB/MCWB: 31.3/22.8 F
Extrapolated EPA Radon Zone: 1

AVERAGE TEMPERATURE AND PRECIPITATION

Source: Meteoblue
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CONTEXT

AREA PLAN

THE CITY

THE NEIGHBORHOOD

THE SITE

CONTEXT PLAN
PHIUS+ 2018 DESIGN PARAMETERS

- **Annual Heating Demand:** 9.0 kBTU/ft² yr
- **Annual Cooling Demand:** 10.3 kBTU/ft² yr
- **Peak Heat Load:** 5.7 BTU/ft² hr
- **Peak Cool Load:** 5.2 BTU/ft² hr
- **Annual Primary Energy:** 3,840 kWh/p/yr
- **Air Tightness:** 0.06 CFM/ft² @ 50 Pa

**TECHNICAL SPECIFICATIONS**

- **Wall Insulation:** R-34
- **Foundation Insulation:** R-20
- **Roof Insulation:** R-43
- **Window Performance:** Klearwall AluClad Passiv triple pane window units, 0.125 U-value, SHGC: 0.6
- **Door Performance:** Alpen Clear Performance Tyrol Series
- **Wall System:** BuildSMART Multi-Story System w/ Rainscreen
- **Roof System:** Wood Raised-Heel Truss

**MEP SYSTEMS**

- **Ventilation System:** Ultimate Air ERV
- **Cooling and Heating:** Mitsubishi Electric Horizontal ducted Mini-Split
- **Water Heater:** Rheem (30 - 50 gal.) Electric Water Heater
- **Electrical System:** LED Fixtures
- **Photovoltaics:** Sunflower 4kW - 6kW system
- **Appliances:** Samsung Energy Star, High Efficient Appliances
- **Plumbing:** Low flow, WaterSense certified fixtures

**TECHNICAL HIGHLIGHTS**

**EUI ESTIMATE AT PH STANDARD**

- **1-Bed:** 17.29 kBTU/ft² yr
- **1-Bed Accessible:** 16.32 kBTU/ft² yr
- **2-Bed:** 12.86 kBTU/ft² yr
- **2-Bed Accessible:** 11.09 kBTU/ft² yr
- **3 Bed:** 14.63 kBTU/ft² yr

**HERS SCORES**

- **1-Bed:** 67 before PV, 0 after PV
- **1-Bed Accessible:** 49 before PV, -6 after PV
- **2-Bed:** 64 before PV, -1 after PV
- **2-Bed Accessible:** 58 before PV, -14 after PV
- **3 Bed:** 61 before PV, -6 after PV

**CONSTRUCTION TIMELINE**

**SUMMER 2019**

- Creation of Critical Path Schedule
- Contractor and PHIUS+ Water

**FALL 2019**

- Site Preparation and Excavation
- Landscape Architect Consultation, Pollinator Prairie Work Begins
- Delivery of BuildSMART Wall Systems
- Foundation Pours
- PHIUS+ Water Visit - Blower Door Tests

**SPRING 2019**

- Concrete Base Slab Placement
- Frame for Walls and Trusses, Building Enclosure Completion
- Electrical, Plumbing and Mechanical Work
- PHIUS+ Water Verification - Blower Door Test and Ventilation Balancing
- Construction of Community Spaces

**SUMMER 2020**

- Completion of Cladding and Site Work
- Installation of PV Systems
- First Residents Move Home

**FALL 2020**

- PHIUS Certification
- Final Landscaping
Sowing Seeds Academy
Pollinator Prairie
Harvest Village Attached Homes
SITE ANALYSIS

Wind
Topography
Sun Path

Paths and Nodes
Parking and Hardscapes
Community Spaces
STACY AND REBECCA | UNIT TYPE “A”: 2 BEDROOM

LAWRENCE AND ETHEL | UNIT TYPE “B”: 1 BEDROOM

RICARDO | UNIT TYPE “C”: 1 BEDROOM

THE MITCHELL FAMILY | UNIT TYPE “D”: 3 BEDROOM
PROJECT GOALS

PASSIVE HOUSE

ECOLOGICAL REGENERATION

PERSONAL ENERGY USE MONITORING

SYMBOISIS BETWEEN EDUCATION AND LIVING

EFFICIENT, MARKET-READY HOUSING

DYNAMIC AND UNIVERSAL DESIGN
UNIT TYPE “1”
1 BEDROOM, 1 1/2 BATH
722 SF

UNIT TYPE “2”
2 BEDROOM, 2 1/2 BATH
1,632 SF

UNIT TYPE “1A”
1 BEDROOM, 1 BATH ACCESSIBLE
839 SF

UNIT TYPE “2A”
2 BEDROOM, 2 1/2 BATH ACCESSIBLE
1,394 SF

First Floor Plan
Second Floor Plan

First Floor Plan
Second Floor Plan

First Floor Plan
Second Floor Plan

First Floor Plan
Second Floor Plan
UNIT TYPE “3”
3 BEDROOM, 3 1/2 BATH ACCESSIBLE
1,726 SF

First Floor Plan
Second Floor Plan
SEFAIRA

3-Bedroom Unit Total Floor Area
1,917 gsf

WUFI PASSIVE

*Based solely on direct sunlight, excluding interior ambient light
REM/RATE AND HERS ANALYSIS

<table>
<thead>
<tr>
<th>ROW</th>
<th>UNIT TYPE</th>
<th>HERS BEFORE PV</th>
<th>HERS AFTER PV</th>
<th>COOLING LOAD (MMBtu)</th>
<th>HEATING LOAD (MMBtu)</th>
<th>ANNUAL COST ($)</th>
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</thead>
<tbody>
<tr>
<td>A</td>
<td>3</td>
<td>61</td>
<td>-6</td>
<td>8.7</td>
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<td>-39</td>
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<td></td>
<td>2</td>
<td>64</td>
<td>-1</td>
<td>7.1</td>
<td>4.2</td>
<td>53</td>
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<tr>
<td>B</td>
<td>1</td>
<td>67</td>
<td>0</td>
<td>4.7</td>
<td>3.2</td>
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<td></td>
<td>2</td>
<td>64</td>
<td>-1</td>
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<td>4.2</td>
<td>53</td>
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<tr>
<td></td>
<td>2A</td>
<td>58</td>
<td>-14</td>
<td>6.9</td>
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<td>C</td>
<td>1A</td>
<td>49</td>
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<td></td>
<td>2</td>
<td>64</td>
<td>-1</td>
<td>7.1</td>
<td>4.2</td>
<td>53</td>
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<tr>
<td>D</td>
<td>1</td>
<td>67</td>
<td>0</td>
<td>4.7</td>
<td>3.2</td>
<td>62</td>
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<tr>
<td></td>
<td>1A</td>
<td>49</td>
<td>-6</td>
<td>3.1</td>
<td>2.6</td>
<td>-11</td>
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<tr>
<td></td>
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<td>64</td>
<td>-1</td>
<td>7.1</td>
<td>4.2</td>
<td>53</td>
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</table>

UNIT TYPE ARRANGEMENTS:

- Existing Homes
- Standard New Home
- Net Zero Energy Home
- Our homes with PV
PLUMBING AND WATER USAGE

SCHEMATIC HOT WATER PLAN

First Floor Plan

Second Floor Plan

LEGEND:
- Hot
- Cold

Rain
Downspout
Rain Head
First-flush diverter
Tank
Air-relief vent
Overflow
Water to landscape

Legend:
- Hot
- Cold
SCHEMATIC MECHANICAL PLAN

First Floor Plan

Second Floor Plan

LEGEND:
- Exhaust
- ERV Supply
- Mini-Split Supply

ERV AND VENTILATION
## CONSTRUCTION COST SUMMARY

<table>
<thead>
<tr>
<th>Construction Element</th>
<th>Baseline</th>
<th>Harvest Village</th>
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<tbody>
<tr>
<td>Site Work</td>
<td>$ 9,890</td>
<td>$ 9,349</td>
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<tr>
<td>Foundations</td>
<td>$ 15,966</td>
<td>$ 14,173</td>
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<tr>
<td>Framing</td>
<td>$ 25,562</td>
<td>$ 32,830</td>
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<tr>
<td>Exterior Finishes</td>
<td>$ 20,367</td>
<td>$ 26,465</td>
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<tr>
<td>Major Systems Rough-Ins</td>
<td>$ 20,367</td>
<td>$ 18,897</td>
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<tr>
<td>Interior Finishes</td>
<td>$ 42,235</td>
<td>$ 43,822</td>
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<tr>
<td>Final Steps</td>
<td>$ 10,321</td>
<td>$ 3,749</td>
</tr>
<tr>
<td>Other</td>
<td>$ 2,934</td>
<td>$ 20,650</td>
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<tr>
<td><strong>Total 3 Bed Constr. Cost</strong></td>
<td><strong>$ 147,642</strong></td>
<td><strong>$ 169,935</strong></td>
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<tr>
<td>1 Bed</td>
<td>$ 61,760</td>
<td>$ 98,835</td>
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<tr>
<td>1 Bed Accessible</td>
<td>$ 70,998</td>
<td>$ 112,974</td>
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<tr>
<td>2 Bed</td>
<td>$ 139,601</td>
<td>$ 139,976</td>
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<tr>
<td>2 Bed Accessible</td>
<td>$ 119,243</td>
<td>$ 132,659</td>
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</table>

## SALES PRICE SUMMARY

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<thead>
<tr>
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<th>Baseline</th>
<th>Harvest Village</th>
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<tbody>
<tr>
<td>Finished Lot Cost</td>
<td>$ 44,636</td>
<td>$ 28,292</td>
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<tr>
<td>Financing Costs</td>
<td>$ 3,282</td>
<td>$ 3,559</td>
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<tr>
<td>Overhead and General Expenses</td>
<td>$ 10,388</td>
<td>$ 11,264</td>
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<tr>
<td>Marketing Cost</td>
<td>$2,552</td>
<td>$ 2,767</td>
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<tr>
<td>Sales Commission</td>
<td>$ 8,528</td>
<td>$ 9,247</td>
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<tr>
<td>Profit</td>
<td>$ 22,318</td>
<td>$ 21,210</td>
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<tr>
<td><strong>Total 3 Bed Constr. Sales Price</strong></td>
<td><strong>$ 239,346</strong></td>
<td><strong>$ 253,094</strong></td>
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### MONTHLY COST OF LIVING SUMMARY

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<th></th>
<th>Baseline</th>
<th>Harvest Village</th>
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<tbody>
<tr>
<td>Total Sales Price</td>
<td>$239,346</td>
<td>$253,094</td>
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<tr>
<td>Monthly Household Debt</td>
<td>$315</td>
<td>$315</td>
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<tr>
<td>Operations and Maintenance</td>
<td>$196</td>
<td>$300</td>
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<td>Monthly Utility Costs</td>
<td>$160</td>
<td>$88</td>
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<td>Property Taxes</td>
<td>$332</td>
<td>$316</td>
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<tr>
<td>Insurance</td>
<td>$79</td>
<td>$80</td>
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<tr>
<td>Mortgage</td>
<td>$1,283</td>
<td>$624</td>
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<tr>
<td><strong>Total Monthly Cost</strong></td>
<td><strong>$2,365</strong></td>
<td><strong>$1,724</strong></td>
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<tr>
<td><strong>Estimate Target Family Income</strong></td>
<td><strong>$63,000</strong></td>
<td><strong>$63,000</strong></td>
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<tr>
<td>Debt to Income Ratio</td>
<td>45%</td>
<td>31%</td>
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</table>

### 30-YEAR COST TO OWN AND OPERATE

<table>
<thead>
<tr>
<th></th>
<th>Normal Construction</th>
<th>Affordability Rate</th>
<th>Net Zero Construction</th>
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<tr>
<td><strong>Total</strong></td>
<td>$800,000</td>
<td>$600,000</td>
<td>$200,000</td>
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<tr>
<td>Mortgage Payments</td>
<td></td>
<td></td>
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<tr>
<td>Insurance</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Property Tax</td>
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<tr>
<td>Monthly Utility Costs</td>
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<tr>
<td>Operations and Maintenance</td>
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<tr>
<td>Monthly Household Debt (0.5% MFI)</td>
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</table>
# COMMUNITY PV ARRAY SUMMARY

<table>
<thead>
<tr>
<th>Unit</th>
<th>Angle</th>
<th>Effective EUI</th>
<th>Load (kWh/yr)</th>
<th>System Size for year 1 (Panels)</th>
<th>System Size for Year 25 (Panels)</th>
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</thead>
<tbody>
<tr>
<td>1B</td>
<td>30</td>
<td>17.29</td>
<td>4525</td>
<td>3.45 kW (10)</td>
<td>3.725 kW (11)</td>
</tr>
<tr>
<td>1BA</td>
<td>30</td>
<td>16.32</td>
<td>4825</td>
<td>3.725 kW (11)</td>
<td>3.81 kW (11)</td>
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<tr>
<td>2B</td>
<td>30</td>
<td>12.86</td>
<td>6500</td>
<td>4.83 kW (14)</td>
<td>5.175 kW (15)</td>
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<tr>
<td>2BA</td>
<td>30</td>
<td>11.09</td>
<td>8150</td>
<td>6.21 kW (18)</td>
<td>6.555 kW (19)</td>
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<tr>
<td>3B</td>
<td>30</td>
<td>14.63</td>
<td>8400</td>
<td>6.21 kW (18)</td>
<td>6.55 kW (19)</td>
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</tbody>
</table>
3-BEDROOM PV ARRAY

8,407 kWh/Year

System output range from 7,702 to 8,332 kWh per year this location.

<table>
<thead>
<tr>
<th>Month</th>
<th>Solar Radiation (kWh/m²/day)</th>
<th>AC Energy (kWh)</th>
<th>Value ($)</th>
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</thead>
<tbody>
<tr>
<td>January</td>
<td>3.02</td>
<td>482</td>
<td>40</td>
</tr>
<tr>
<td>February</td>
<td>4.18</td>
<td>593</td>
<td>49</td>
</tr>
<tr>
<td>March</td>
<td>4.48</td>
<td>694</td>
<td>58</td>
</tr>
<tr>
<td>April</td>
<td>5.64</td>
<td>802</td>
<td>66</td>
</tr>
<tr>
<td>May</td>
<td>5.89</td>
<td>843</td>
<td>70</td>
</tr>
<tr>
<td>June</td>
<td>6.22</td>
<td>846</td>
<td>70</td>
</tr>
<tr>
<td>July</td>
<td>6.26</td>
<td>875</td>
<td>73</td>
</tr>
<tr>
<td>August</td>
<td>6.29</td>
<td>873</td>
<td>72</td>
</tr>
<tr>
<td>September</td>
<td>5.59</td>
<td>767</td>
<td>64</td>
</tr>
<tr>
<td>October</td>
<td>4.61</td>
<td>670</td>
<td>56</td>
</tr>
<tr>
<td>November</td>
<td>3.47</td>
<td>524</td>
<td>43</td>
</tr>
<tr>
<td>December</td>
<td>2.72</td>
<td>438</td>
<td>36</td>
</tr>
</tbody>
</table>

ANNUAL

4.86  8,407  $697

LOCATION:
Weather Data Source: Lat, Lon: 39.49, -84.7 (1.4mi)
Latitude: 39.49 N
Longitude: 84.7 W

PV SYSTEM SPECIFICATIONS:
DC System Size: 6 kW
Module Type: Standard
Array Type: Fixed (Open Rack)
Array Tilt: 30°
Array Azimuth: 180°
System Losses: 12.74%
Inverter Efficiency: 96%
DC to AC Size Ratio: 1.2

ECONOMICS:
Average Retail Electricity Rate: 0.083 $/kWh

PERFORMANCE METRICS:
Capacity Factor: 16.0%

PANEL:
Sunflower X21 345
Size: 41.2" x 61.3", 19.11 W/ft²
Efficiency: 91.75% after 25 years
POLLINATOR PRAIRIE

NATIVE AND POLLINATOR-FRIENDLY VEGETATION

- Black-eyed Susan
- Ohio Spiderwort
- Milkweed
- Lavender
- Sunflower
- Ohio Goldenrod
- Flowering Dogwood
The tornado index value is calculated based on historical tornado data using USA.com algorithms. It is an indicator of the tornado level in a region. A higher tornado index value translates to a higher risk of a catastrophic event.

### Tornado Index Value

<table>
<thead>
<tr>
<th>Location</th>
<th>Index Value</th>
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<tbody>
<tr>
<td>Oxford</td>
<td>241.78</td>
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<tr>
<td>Ohio</td>
<td>156.02</td>
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<tr>
<td>USA</td>
<td>136.45</td>
</tr>
</tbody>
</table>

### Wind Zone Map

- **Zone I** (130 mph)
- **Zone II** (160 mph)
- **Zone III** (200 mph)
- **Zone IV** (260 mph)
TORNADO-RESISTIVE CONSTRUCTION

- Rafters to top plates
  - Trusses
  - Uplift
  - Shear
  - Framing anchors with uplift and shear capacity
  - Double top plate

- Sheathing to studs
  - 8d common nails at 4” o.c. at panel ends and edges

- Bottom plates to found.
  - BuildSMART sheathing
  - Double stud bottom plate
  - 1/2” anchor bolts at 32” o.c. embedded in concrete foundation
  - 8d common nails at 6” o.c. at intermediate supports
STORM MITIGATION

TORNADO SHELTER

- Existing Gym (2,616 SF)
- Cafeteria (2,616 SF)
- Music Room (872 SF)
- Media / Art Rooms (2,655 SF)
- Mechanical (1,808 SF)
COMMUNITY ALLEY

1. Main Thoroughfare
2. Limestone Entry Enclosure
3. Private Fenced Back Patio

KEY PLAN
COMMUNITY ALLEY

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ENERGY PERFORMANCE
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INNOVATION

KEY PLAN
COMMUNITY BARN

KEY PLAN

1. Grassed Lawn
2. Farmers Market
3. Community Barn
4. Apple Orchard
5. Walnut Orchard
6. Path to BCRTA Bus Stop
COMMUNITY BARN
UNIVERSAL DESIGN

ACCESSIBILITY PLAN

- Accessible exit and entry
- Non slip wet area tile
- Adjustable height cooktop and sink, drawer style dishwasher
- Roll in shower
- Toilet and shower grab bars
- Wall-mounted closet for easy access to hanging clothes
- Ample 5'-0” turning radius
- Sufficient entry and exit clear space
- Accessible exit and entry
HARVEST VILLAGE COMMUNITY APP
TYPICAL WALL TYPE DETAIL

LEGEND:
- BuildSMART wall panel
- BuildSMART component
- Air Barrier

PASSIVE HOUSE CRITERIA:
- Foundation Insulation: R-20
- Wall Insulation: R-34
- Roof Insulation: R-43
- Tightness: 0.06 cfm/ft² @ 50 Pa

CONTINUOUS EXTERIOR 4" RIGID INSULATION - FULLY ADHERED, TERMITE TREATED EPS (R-20 MIN.)
7/16" ZIP SYSTEM WATER-RESISTIVE BOARD - FULLY ADHERED TO EPS
TWO (2) ALT. LAYERS 1x3 FURRING STRIPS @ 24" O.C. VERT. AND HORIZ.
HARDIEPANEL VERTICAL BOARD AND BATTEN SIDING
EXTERIOR
2x6 WOOD STUDS @ 16" O.C.
5 1/2" DENSE PACKED CELLULOSE
1/2" SHEETROCK ECOSMART GYPSUM BOARD PANELS
1/2" AIR BARRIER STRUCTURAL SHEATHING - MECH. FASTENED TO FRAME, ADHERED AND SEALED WITH PROSOCO JOINT & SEAM
INTERIOR
BUILD SMART PANEL
AIR BARRIER
OHIO VALLEY RECLAIMED WOOD BARN SIDING (BOARD AND BATTEN)
HARDIEPANEL VERTICAL BOARD AND BATTEN SIDING
ENVELOPE AIR SEALING STRATEGY

LEGEND:
- BuildSMART wall panel
- BuildSMART component
- Air Barrier

PASSIVE HOUSE CRITERIA:
Foundation Insulation: R-20
Wall Insulation: R-34
Roof Insulation: R-43
Tightness: 0.06 cfm/ft² @ 50 Pa
UNIT SEPARATION AIR SEALING STRATEGY

CORNER PLAN DETAIL

LEGEND:
- BuildSMART wall panel
- BuildSMART component
- Air Barrier

PASSIVE HOUSE CRITERIA:

Foundation Insulation: R-20
Wall Insulation: R-34
Roof Insulation: R-43
Tightness: 0.06 cfm/ft² @ 50 Pa
UNIT SEPARATION AIR SEALING STRATEGY

LEGEND:
- BuildSMART wall panel
- BuildSMART component
- Air Barrier

PASSIVE HOUSE CRITERIA:
Foundation Insulation: R-20
Wall Insulation: R-34
Roof Insulation: R-43
Tightness: 0.06 cfm/ft² @ 50 Pa
PROJECT INTRODUCTION

ENERGY PERFORMANCE

ENGINEERING

FINANCIAL FEASIBILITY AND AFFORDABILITY

RESILIENCE

ARCHITECTURE

OPERATIONS

MARKET POTENTIAL

COMFORT AND ENVIRONMENTAL QUALITY

INNOVATION

MARKET ANALYSIS

RENT VS OWN ANALYSIS

COMMUTER ANALYSIS

PROPERTY VALUE
INCOME

HOUSEHOLD INCOME PERCENTILES

<table>
<thead>
<tr>
<th>Percentile</th>
<th>Butler County</th>
<th>Oxford Township</th>
</tr>
</thead>
<tbody>
<tr>
<td>95th</td>
<td>$206.9K</td>
<td>$102.4K</td>
</tr>
<tr>
<td>80th</td>
<td>$102.4K</td>
<td>$51.7K</td>
</tr>
<tr>
<td>60th</td>
<td>$35.4K</td>
<td>$24.5K</td>
</tr>
<tr>
<td>Median</td>
<td>$6.5K</td>
<td>$24.5K</td>
</tr>
<tr>
<td>40th</td>
<td>$24.5K</td>
<td>$102.4K</td>
</tr>
<tr>
<td>20th</td>
<td>$102.4K</td>
<td>$51.7K</td>
</tr>
</tbody>
</table>

Source: Statistical Atlas

MEDIAN HOUSEHOLD INCOME

- Highest
- Lowest

WAGE BY GENDER

- Registered Nurses
- Driver/Sales Workers
- Secretaries and Administrative Assistants
- Customer Service Representatives
- Cashiers

5-Year Estimate, Source: Census Bureau
DEMOGRAPHICS

AGE STRUCTURE

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>75+</td>
<td>12%</td>
</tr>
<tr>
<td>61 - 75</td>
<td>4%</td>
</tr>
<tr>
<td>46 - 60</td>
<td>6%</td>
</tr>
<tr>
<td>31 - 45</td>
<td>8%</td>
</tr>
<tr>
<td>16 - 30</td>
<td>10%</td>
</tr>
<tr>
<td>0 - 15</td>
<td>12%</td>
</tr>
</tbody>
</table>

Source: Statistical Atlas

MARITAL STATUS

<table>
<thead>
<tr>
<th>Status</th>
<th>Female</th>
<th>Male</th>
</tr>
</thead>
<tbody>
<tr>
<td>Never Married</td>
<td>45%</td>
<td>55%</td>
</tr>
<tr>
<td>Married</td>
<td>29%</td>
<td>71%</td>
</tr>
<tr>
<td>Separate/Divorced</td>
<td>6%</td>
<td>94%</td>
</tr>
<tr>
<td>Widowed</td>
<td>4%</td>
<td>96%</td>
</tr>
</tbody>
</table>

Source: Statistical Atlas

HOUSEHOLD TYPE

<table>
<thead>
<tr>
<th>Household Type</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Married</td>
<td>22%</td>
</tr>
<tr>
<td>Single Female</td>
<td>31%</td>
</tr>
<tr>
<td>Single Male</td>
<td>1%</td>
</tr>
<tr>
<td>One-Person</td>
<td>7%</td>
</tr>
<tr>
<td>Other Non-Family</td>
<td>20%</td>
</tr>
</tbody>
</table>

Source: Statistical Atlas

HOUSE TYPE MAP

Source: ACP Visioning + Planning
### DEMOGRAPHICS

<table>
<thead>
<tr>
<th>Single-Family</th>
<th>Pros</th>
<th>Cons</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• More privacy</td>
<td>• Additional costs and upkeep</td>
</tr>
<tr>
<td></td>
<td>• More space</td>
<td>• Unsustainable density and inefficient</td>
</tr>
<tr>
<td></td>
<td>• Independence</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Consistent resale value</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Multi-Family</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Ideal real estate investment</td>
<td>• Smaller, less private</td>
</tr>
<tr>
<td></td>
<td>• Multi-generational living</td>
<td>• Large building envelope compared to</td>
</tr>
<tr>
<td></td>
<td></td>
<td>square footage</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Attached Homes</th>
<th>Pros</th>
<th>Cons</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Stellar envelope performance</td>
<td>• Smaller units</td>
</tr>
<tr>
<td></td>
<td>• Enhanced privacy</td>
<td>• Generally lack sufficient common spaces</td>
</tr>
<tr>
<td></td>
<td>• Most affordable</td>
<td>for social interaction</td>
</tr>
</tbody>
</table>

Pros and Cons of Single-Family, Multi-Family, and Attached Homes...
LOCALIZATION OF SUSTAINABLE MATERIALS

EXTERIOR MATERIALS

STANDING SEAM METAL ROOF
- Cool Colored Roof
- 95% Recycled Aluminum Cans
- Locally Sourced

HARDEIPANEL VERTICAL SIDING
- Moisture and Rot-Resistant
- Enhanced Durability
- Locally Sourced

TRIPLE PANE WINDOW
- Increased Insulation Value
- Low-Emissivity

LIMESTONE ENTRY ENCLOSURE
- Low Carbon Footprint
- Durable
- Locally Sourced

DETAIL ELEVATION
LIVING ROOM

Berber Carpets
Forbo Marmoleum Tiles
Lisbon Cork Flooring
INTERIOR DESIGN

LIVING ROOM

Sherwin Williams Interior Latex Paint
“Carmine” Polyfiber Fabric
Walnut
Minimo Peel and Stick Backsplash
Paperstone Gun Metal Countertop
REFRIGERATOR
SAMSUNG RS22HDHPNSR 22 cu. ft. Counter Depth Side-By-Side Refrigerator
Price: $1800
- ENERGY STAR - compliant (646 kWh/yr)
- ADA - compliant
- LED Tower Lighting
- Six Temperature Sensors

RANGE
SAMSUNG NE58F9710WS Flex Duo™ Slide-in Electric Range
Price: $1800
- Auto Shut-Off Option
- Slide-In Universal Design
- Large Capacity Oven
  - Hidden Bake Element: 3,000 W
  - Convection Element/Heater: 1,250 W

DISHWASHER
SAMSUNG DW80M2020US Dishwasher
Price: $480
- ENERGY STAR - rated (249 kWh/yr)
- ADA - compliant
- Digital Water Leakage Sensor

WASHER
SAMSUNG WW6800 2.2 cu. ft. 24” Front Load Washer with Super Speed
Price: $800
- ENERGY STAR - rated (90 kWh/yr)
- CEE Tier 1
- IMEF 2.25, IWF = 4.0

DRYER
SAMSUNG DV6800H 4.0 cu. ft. 24” Heat Pump Dryer with Smart Care
Price: $800
- Ventless Heat-Pump Dryer
- ENERGY STAR - rated (148 kWh/yr)
- Smart Care Mobile Device Synchronization
THE HOME ENERGY RATING SYSTEM

BuildSMART as the primary build solution with a HERS Index standard significantly lower than the average national home.

THE SOUND OF A TRAIN HORN OUTSIDE WOULD BE THE EQUIVALENT OF A DISHWASHER RUNNING INSIDE!

50% Quieter

35 HERS Index

QUANTIFIABLE AND RIGOROUS

BuildSMART system, coupled with Passive building principles, significantly reduces overall energy usage.

70% Less Energy Usage

ENERGY EFFICIENCY MADE SIMPLE

Huber Liquid Flash by Contractor

Furred down ceiling

OSB or plywood vapor/air barrier sealed with PROSOCO R-Guard Joint & Seam™

PROSOCO R-Guard Joint & Seam™ all around panels for a continuous vapor/air barrier

BuildSMART Roof Band, sealed to wall panels with PROSOCO R-Guard Joint & Seam™

Huber Liquid Flash by Contractor

Furred down ceiling

OSB or plywood vapor/air barrier sealed with PROSOCO R-Guard Joint & Seam™

PROSOCO R-Guard Joint & Seam™ all around panels for a continuous vapor/air barrier

BuildSMART Wall Panel with windows and doors installed and air-tightened

Sub-floor

BuildSMART Floor Band, sealed to wall panels top and bottom with PROSOCO R-Guard Joint & Seam™

Floor truss, TJI’s or wood joists

Vapor/Air Barrier wrapped over edge and sealed at concrete and sill plate

Concrete slab on grade (or basement, not shown) with underslab waterproofing membrane

PROSOCO R-Guard Joint & Seam™ at sill plates and bottom plates

BuildSMART J-Form with fiberglass and EIFS parging

BuildSMART underslab termite treated EPS insulation

Frost protected shallow foundation of compacted gravel or another configuration meeting the SEI/ASCE 32-01 standard

Perforated foundation drainpipe

BuildSMART provided components are green. PROSOCO products provided by BuildSMART are orange. Builder responsibilities are gray.

Source: buildsmartna.com
CONSERVATION ZONE

SITE IMAGE

SITE LOCATION

<table>
<thead>
<tr>
<th>Annual Weeds</th>
<th>Perennial Weeds and Grasses (1-2 years)</th>
<th>Shrub (3-4 years)</th>
<th>Aspen, cherry and young pine forest (5-150 years)</th>
<th>Beech and maple broadleaf forest (150+ years)</th>
</tr>
</thead>
</table>
| TIME
POLLINATOR PRAIRIE

POLLINATORS

Birds

Monarchs

Butterflies

Bees

BEE GARDEN
POLLINATOR PRAIRIE

MONARCH GARDEN