Westwood Public Schools

Hanlon Elementary School Building Project

Sustainability Subcommittee

06.02.2020

Agenda

- Summary – last meeting
- Recent Decisions
- Current Decision Points
- Discussion – PV/NZE/Carbon Reduction
- LEED Checklist Review
- Recommendation to SBC

Summary – Last Meeting

1. **20% above new energy code to achieve 2% points from MSBA – remains priority**
2. **Majority appear in favor of net zero energy approach; aligns with Town priorities – would like to see payback analysis**
3. **Explore Timber to reduce embodied carbon – but focus on operational carbon**
4. **Explore costs of captured water for irrigation**
5. **Full A/C vs. partial A/C and displacement & dehumidification ventilation- would like more info and visit schools**
6. **Daylight Studies: would like more info from work completed**
7. **Review Occupancy Schedule relative to Energy Model**
8. **Town PV Array: 2MW anticipated. Amaresco and D+W to communicate/coordinate**

Recent Decisions

1. LEED v4: Need 20% above new energy code, ASHRAE 90.1-2016 or 35% above current code, ASHRAE 90.1-2010
2. Energy Model Analysis found that: Achieving this in the Baseline project would have been marginal without taking additional measures.
3. As a result, the D+W team has integrated the following elements in the baseline project costs, which were previously included in Tier 2:
    - Electrical: Provide enhanced lighting network controls with feedback mechanisms. Provide plug load sub-metering with additional outlets in each classroom, kitchen, cafeteria, gym, and library that would allow for 75% of outlets to be shut off with occupancy sensor.
    - Infiltration: .08 cfm/sf @75Pa in lieu of .4: Essentially meeting Passive House standards. Will require blower door tests, IR analysis, enhanced scrutiny by exterior envelope commissioning agent during and after construction. While this will be addressed in soft costs, additional specifications and requirements would be included for contractor to ensure super tight envelope.
    - Window to wall ratio: change from 30% to 25%
    - Roof R-value: change from R-40 ci to R-60 ci.

Current Decision Points

Baseline: Natural Gas heating system, displacement ventilation throughout, with A/C in the Admin and Sp. Educational spaces: Using Option 7 as an example: $83M Project Cost Estimate

- **Tier-1:** Fossil Fuel Free: Use Centralized Municipal Water-Source Heat Pump: Add $1.1M

  OR
- **Tier-2:** Fossil Fuel Free: Use Geothermal Heating System: Add $3.5M
- **Alternate Structural Frame Analysis**: Use Timber Frame Construction in lieu of Steel Frame (Carbon)

  Add $300k for partial (Entry, limited corridor, cafeteria)

  Add $2M for classroom wings
- **100% AC:** Add $1.3M
- **Rainwater Harvesting for irrigation:** Add $200k

Max Possible Total: $90.3M

Tier 1 vs. Tier 2 – Heating/Cooling Systems

Tier 1: Municipal Water Source Heat Pump System

Pros

- Aligns with Westwood Resiliency and Sustainability Comprehensive Draft Plan
- Lower upfront cost

Cons

- Less energy efficient than Tier 2 system resulting in:
  - May require increased electrical service capacity
  - More solar energy required for NZE
  - Increased generator size required
- Need supplemental electric boiler due to heat rejection
- More mechanical equipment visible exterior than Tier 2
- Higher HVAC sound levels at building exterior vs. Tier 2
- More maintenance -moving parts, vs. Tier 2

Tier 2: Geothermal Source Heat Pump System

Pros

- Aligns with Westwood Resiliency and Sustainability Comprehensive Draft Plan
- More energy efficient than Tier 1 system resulting in:
  - Likely decrease in electrical service capacity vs Tier 1
  - Less solar energy required for NZE
  - Smaller generator size required
- Less mechanical equipment visible at building exterior
- Lower HVAC sound levels at building exterior vs. Tier 1
- Less annual maintenance: fewer moving parts vs. Tier 1

Cons

- Higher upfront cost
- Requires test wells and mini-study to confirm feasibility

Discussion – PV / Net Zero Energy/Carbon

Annual savings from Westwood PV array could help offset cost of Tier 1 or Tier 2, net zero energy/fossil fuel free approach

Net Zero Energy: Achievable by accepting either Tier 1 or Tier 2 system

Reducing CO2 Emissions :
- Operational: Fossil Fuel Free / All Electric
- Embodied: Timber Framing

Recommendation to SBC ?

Baseline: Natural Gas heating system, displacement ventilation throughout, with A/C in the Admin and Sp. Educational spaces: Using Option 7 as an example: $83M Project Cost Estimate

- **Tier-1:** Fossil Fuel Free: Use Centralized Municipal Water-Source Heat Pump: Add $1.1M

  OR
- **Tier-2:** Fossil Fuel Free: Use Geothermal Heating System: Add $3.5M
- **Alternate Structural Frame Analysis**: Use Timber Frame Construction in lieu of Steel Frame (Carbon)

  Add $300k for partial (Entry, limited corridor, cafeteria)

  Add $2M for classroom wings
- **100% AC:** Add $1.3M
- **Rainwater Harvesting for irrigation:** Add $200k

Max Possible Total: $90.3M

LEED Checklist Review

LEED v4 for BD+C: Schools
Project Checklist

Project Name: **Westwood Hanlon ES**
Date: **6.1.20**

Y	?	N			
1	0	0	**Integrative Process**		1
1			Credit	Integrative Process	1
3	6	6	**Location and Transportation**		15
		N	Credit	LEED for Neighborhood Development Location	15
1			Credit	Sensitive Land Protection	1
1	1		Credit	High Priority Site	2
1	1	3	Credit	Surrounding Density and Diverse Uses (RP@4)	5
	2	2	Credit	Access to Quality Transit (RP@1)	4
		1	Credit	Bicycle Facilities	1
	1		Credit	Reduced Parking Footprint	1
	1		Credit	Green Vehicles	1
4	7	1	**Sustainable Sites**		12
Y			Prereq	Construction Activity Pollution Prevention	Required
Y			Prereq	Environmental Site Assessment	Required
1			Credit	Site Assessment	1
	2		Credit	Site Development - Protect or Restore Habitat (RP@2)	2
1			Credit	Open Space	1
	3		Credit	Rainwater Management	3
	2		Credit	Heat Island Reduction	2
1			Credit	Light Pollution Reduction	1
		1	Credit	Site Master Plan	1
1			Credit	Joint Use of Facilities	1
3	9	0	**Water Efficiency**		12
Y			Prereq	Outdoor Water Use Reduction	Required
Y			Prereq	Indoor Water Use Reduction	Required
Y			Prereq	Building-Level Water Metering	Required
1	1		Credit	Outdoor Water Use Reduction	2
2	5		Credit	Indoor Water Use Reduction	7
	2		Credit	Cooling Tower Water Use	2
	1		Credit	Water Metering	1
22	9	0	**Energy and Atmosphere**		31
Y			Prereq	Fundamental Commissioning and Verification	Required
Y			Prereq	Minimum Energy Performance	Required
Y			Prereq	Building-Level Energy Metering	Required
Y			Prereq	Fundamental Refrigerant Management	Required
5	1		Credit	Enhanced Commissioning	6
14	2		Credit	Optimize Energy Performance (RP@8)	16
	1		Credit	Advanced Energy Metering	1
	2		Credit	Demand Response	2
3			Credit	Renewable Energy Production (RP@2)	3
	1		Credit	Enhanced Refrigerant Management	1
	2		Credit	Green Power and Carbon Offsets	2

Y	?	N			
3	9	1	**Materials and Resources**		13
Y			Prereq	Storage and Collection of Recyclables	Required
Y			Prereq	Construction and Demolition Waste Management Planning	Required
	5		Credit	Building Life-Cycle Impact Reduction (RP@2)	5
1	1		Credit	BPDO - Environmental Product Declarations	2
	2		Credit	Building Product Disclosure and Optimization - Sourcing of Raw Materials	2
1		1	Credit	Building Product Disclosure and Optimization - Material Ingredients	2
1	1		Credit	Construction and Demolition Waste Management	2
6	10	0	**Indoor Environmental Quality**		16
Y			Prereq	Minimum Indoor Air Quality Performance	Required
Y			Prereq	Environmental Tobacco Smoke Control	Required
Y			Prereq	Minimum Acoustic Performance	Required
2			Credit	Enhanced Indoor Air Quality Strategies	2
2	1		Credit	Low-Emitting Materials	3
1			Credit	Construction Indoor Air Quality Management Plan	1
	2		Credit	Indoor Air Quality Assessment	2
	1		Credit	Thermal Comfort	1
1	1		Credit	Interior Lighting	2
	3		Credit	Daylight	3
	1		Credit	Quality Views	1
	1		Credit	Acoustic Performance	1
4	2	0	**Innovation**		6
1			Credit	Innovation: Resonsible Purchasing - Lamps	1
1			Credit	Innovation: Economic and GHG Analysis of Mechanical Systems	1
1			Credit	Innovation: Pilot - Integrative Analysis of Building Materials	1
	1		Credit	Innovation: TBD	1
	1		Credit	Innovation: TBD	1
1			Credit	LEED Accredited Professional	1
2	2	0	**Regional Priority (max of 4 points) Credit Names have been underlined**		4
		x	Credit	Surrounding Density and Diverse Uses (RP@4)	
	1		Credit	Access to Quality Transit (RP@1)	1
	1		Credit	Site Development - Protect or Restore Habitat (RP@2)	1
1			Credit	Optimize Energy Performance (RP@8)	1
1			Credit	Renewable Energy Production (RP@2)	1
	x		Credit	Building Life-Cycle Impact Reduction (RP@2)	

48	54	8	**TOTAL**	**Possible Points:**	**110**

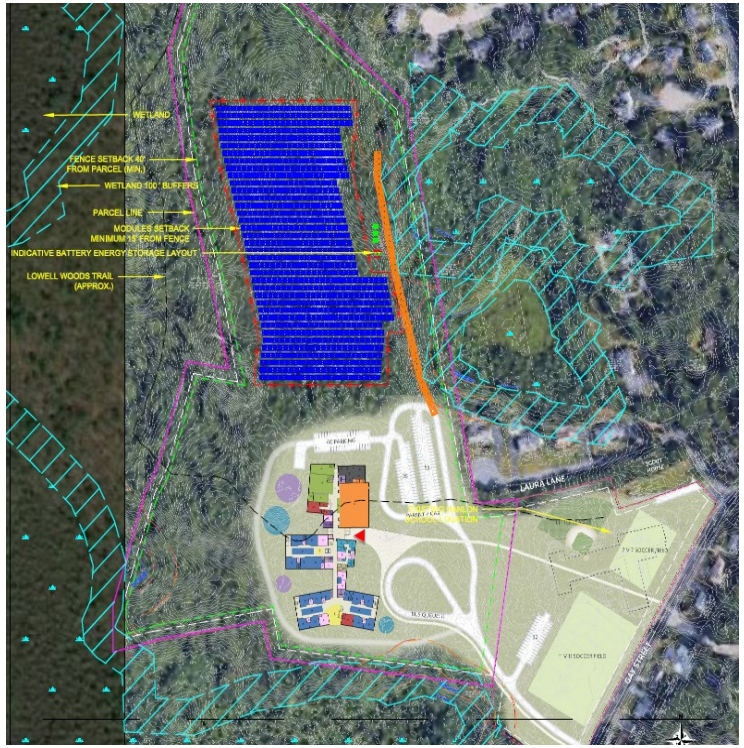
Certified: 40 to 49 points , **Silver:** 50 to 59 points, **Gold:** 60 to 79 points, **Platinum:** 80 to 110

The Green Engineer
Sustainable Design Consulting

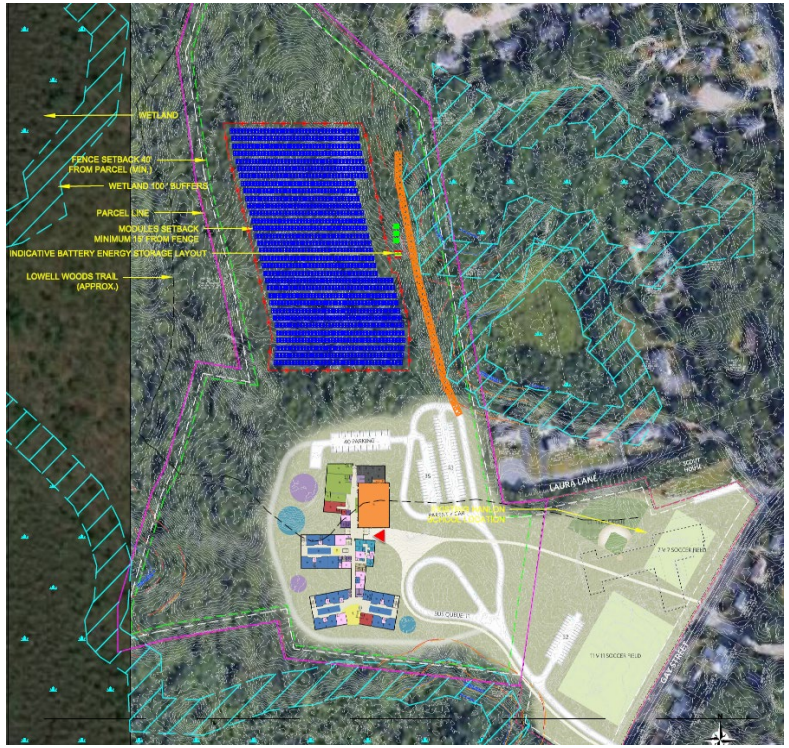
FROM AMARESCO PRESENTATION, Westwood Solar Phase II Draft dated 06.01.20

Layout Sizing Options (Overlaid on Option 7S)

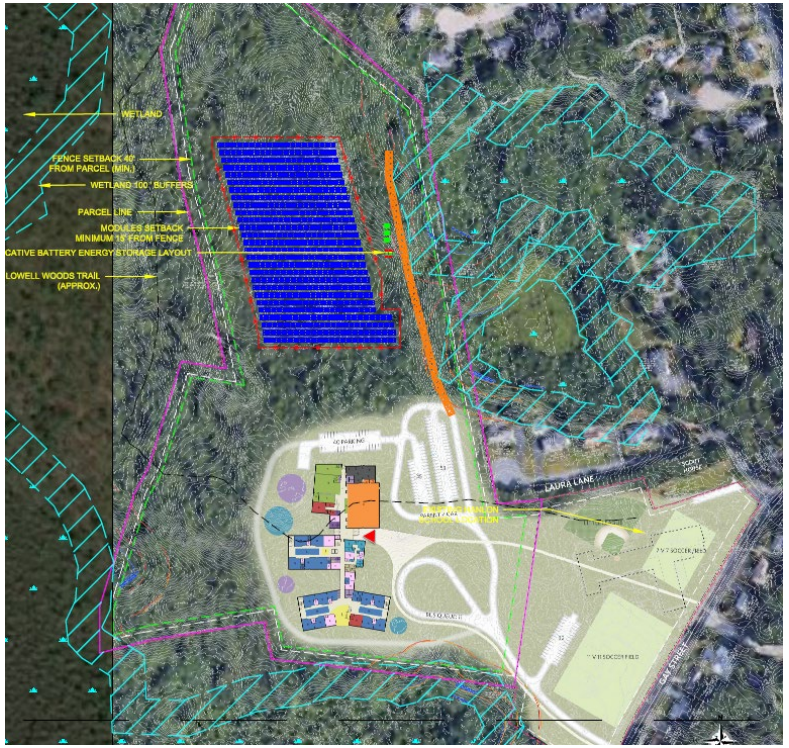
Option 1 – 3MW



Option 2 – 2.5MW



Option 3 – 2MW

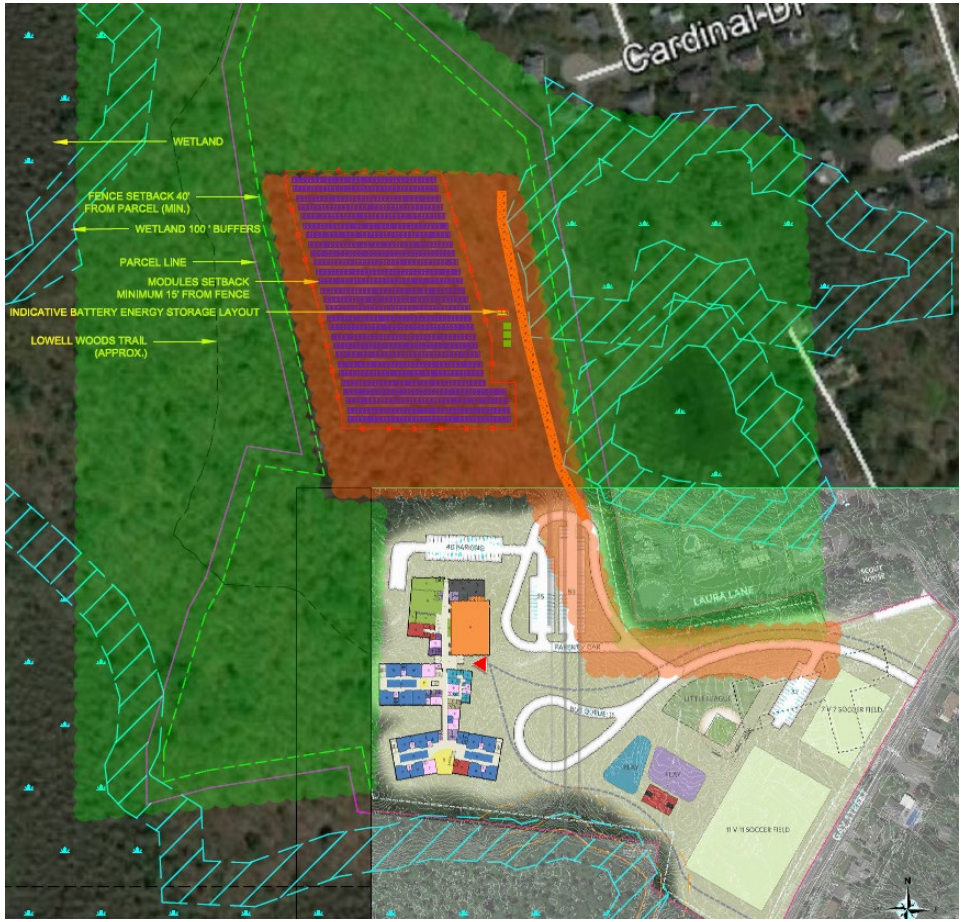


Option	System Size (KWdc)	Tree Clear Required (Acres)
1	3,000.48	12.99
2	2,508.00	11.94
3	2,006.40	11.24

FROM AMARESCO PRESENTATION, Westwood Solar Phase II Draft dated 06.01.20

Shuttleworth Field / Hanlon School – Construction Synergies

- If the Town decides to move forward with a large School/fields/parking project at the Shuttleworth Field location, many construction synergies exist.
- The Proposed System will generate enough electricity on-site to support a Net-Zero designation for the new school. This system is a lower cost alternative to an on-site rooftop or parking canopy design. So, in addition to the annual energy savings, the Town is saving ~$1.5M in construction costs by avoiding the need to install a rooftop solar array.
- Tree clearing from a Solar PV project is shown in the indicative image to the right.
  - Green locations indicate where existing tree and vegetation will not be disturbed.
  - Orange location indicates site impact of Solar PV.
  - 2.3 acres of tree-clearing savings for the new school, an estimated $25,000 in cost-savings
- Similarly, Ameresco will be constructing an access road from Gay Street into the parcel. Approximately 700’ of this road may be also used by the Town’s new school construction team, an estimated savings to the Town of $40,000.



Previous Design

Next Steps

- ❑ June 4th: Community Presentation: Review Options with Cost
- ❑ June 12: School Building Committee: Sustainability Decisions
- ❑ June 19: School Building Committee: Preferred Option and PSR Vote