Ryder

Seaton Valley Trust **Net Zero Carbon Opportunities**	Project number Date Author Checked by	**10089** **12 October 2021** **Richard Wise** **Andra Antone**

1.0 Introduction

This report sets out the opportunities that we will explored as part of the Seaton Valley Trust (SVT) schools amalgamation project to achieve Net Zero Carbon (NZC).

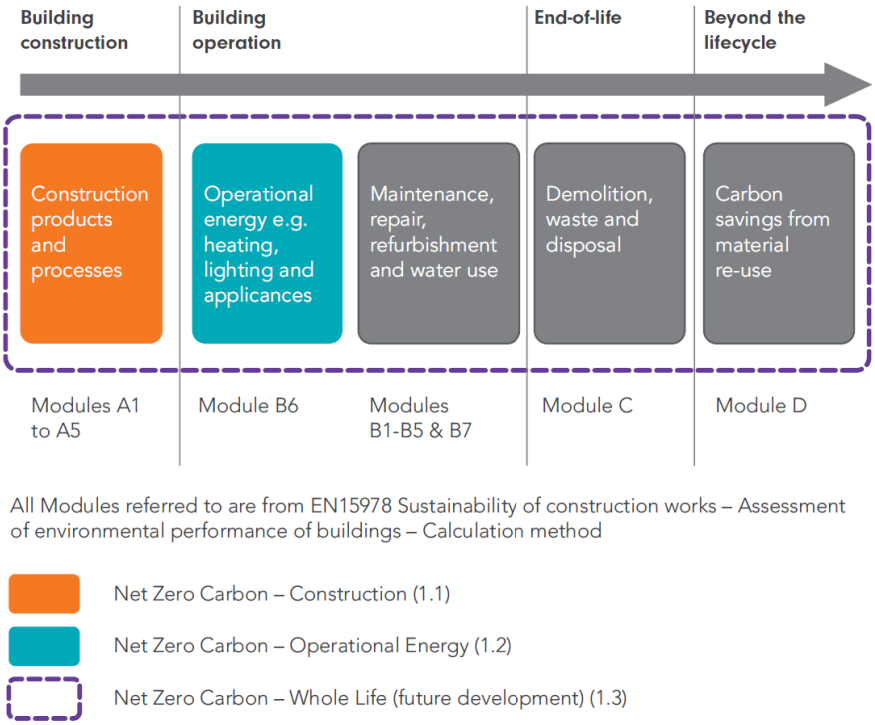
The UK Green Building Council (UKGBC) "Building the Case for Net Zero" provides a methodology for achieving NZC and provides a road map on how to achieve NZC in construction and operation.

2.0 Definitions

2.1 NZC **construction** (embodied carbon) is achieved if "the amount of carbon emissions, associated with a building's product and construction stages up to practical completion, is zero or negative through design, material choice and offsets or the net export of onsite renewable energy."

2.2 NZC **operational energy** (in use) is achieved: When the amount of carbon emissions associated with the building's operational energy on an annual basis is zero or negative. A net zero carbon building is highly energy efficient and powered from on site and / or off site renewable energy sources, with any remaining carbon balance offset.

Figure 1 – UKGBC's diagram summarising the above source UK GBC feasibility study Building the Case for Net Zero**:**



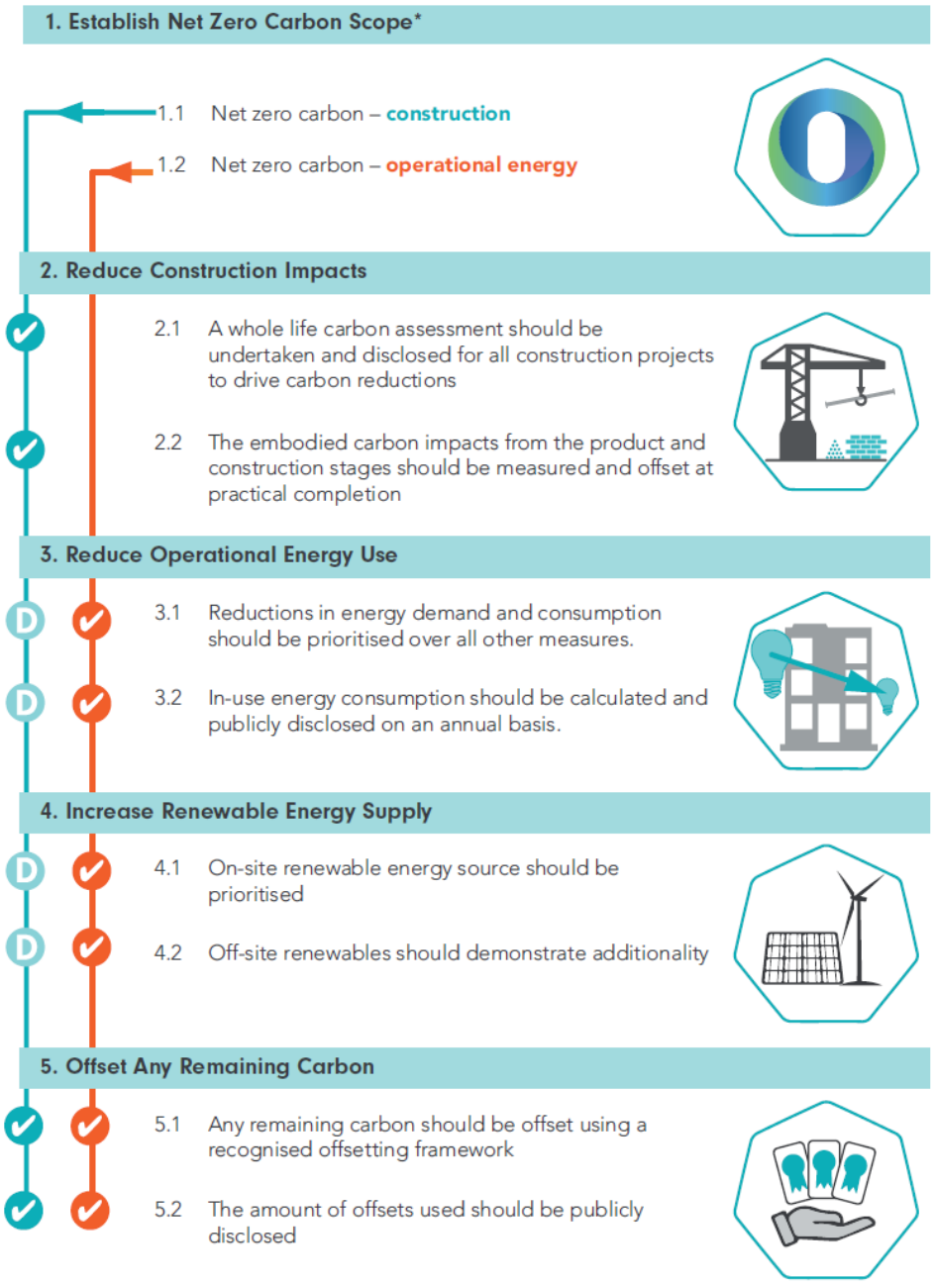
3.0 Opportunity

In simply terms we need to focus on:

- Reducing construction impacts
- Reducing operational energy use
- Increase renewable energy supply
- And, as the last resort, offset remaining carbon

This is well summarised below and specific considerations explored overleaf.

Figure 2 Steps to achieving net zero carbon buildings source UK GBC feasibility study Building the Case for Net Zero**:**



3.1 Reduce Construction Impacts

- Take a fabric first approach and reduce construction U values
- Control the amount of glazing to reduce heat loss and solar gain
- Reduction reliance on steel and concrete and utilise a CLT for primary frame and floor.
- Where concrete is used, utilise thermal mass and look to deploying recycled aggregates where there are no appropriate arisings expected on site.
- Minimise hard surfaces and associated subbases in the landscape
- Get a cut and fill balance so there is no cart-off soil
- Select materials that are A or A+ in the BRE Green Guide to Specification, including consideration of reclaimed materials
- Consider using phase change material (PCM)

3.2 Reduce Operational Energy Use

- Mandated no onsite fossil fuel use (other than for science).
- Maximise building orientation particularly the noise source from The Avenue A190
- Prioritises passive measures, natural ventilation, daylight and beneficial solar gain in winter months
- Agree natural vent strategy openable vents to the façade is an optimum solution.
- Look at the efficacy of light shelves reducing reliance on artificial light and provide shading to reduce solar gain in summer months, orientation dependant.
- Specify high efficiency mechanical ventilation with inbuilt PCM (cool - phase) to provide background ventilation in winter months when windows are closed and to mitigation overheating in summer months providing 'peak lopping'
- Consider benefits of additional building thermal mass and provide energy recovery to incoming external air
- Deploy high efficiency LED lighting with daylight / DALI lighting controls system
- Investigate air source or ground source heat pumps to provide building heating source
- Consider thermochromic glass or electrochromic glass to provide glare and solar gain management both alternatives to external shading and blinds
- Consider power consumption in the landscape restricted to lighting, where and when necessary deploying low energy systems and fittings.
- Minimise light pollution
- Minimise the requirement for manual watering in the landscape and consider rainwater capture for planting on the podium
- Minimise the requirement for power usage in long term maintenance.

3.3 Increase Renewable Energy Supply

- Use photovoltaic (PV) modules at roof level and in the landscape, optimum orientation south facing at a 35-40° angle to max energy capture. This is likely to be our primary renewable energy source to offset any regulated energy usage?
- Consider integrating PV modules to the external façade to increase electrical energy generation – the sports hall could be utilized to good effect
- Any potential external shading could have a PV module mounted within it e.g. cloisters – sheltered walkways etc.
- Can the water element of the masterplan be deployed for water source heat pump

3.4 Offset Remaining Carbon

- Northumberland County Council (DCC) to confirm the electrical supply agreement is/will be wholly supplied from a renewable energy source
- Maximise planting for carbon sequestration and considering species that absorb more carbon

4.0 Next Steps

4.1 We recommend that the above proposals are reviewed in the context of the UKGBC design scenarios and LETI guidance. UK GBC feasibility study Building the Case for Net Zero and the DFE Sustainability Annex

4.2 Agree embodied carbon targets with stretch targets between the LETI 2020 and 2030 targets as tabulated below. establish 'on costs' from the baseline position(business as usual) for achieving the agreed outcomes.

		Baseline scenario	Intermediate scenario	Stretch scenario
Office	**Operational energy** (kWh/m^2 (GIA)/year)	225 (RIBA – business as usual)	90 (UKGBC – 2025 target)	70 (UKGBC – 2030 target)
	Upfront embodied carbon (LCA module A kgCO_2e/m^2)	1,000 (LETI – business as usual)	600 (LETI – 2020 target*)	350 (LETI – 2030 target)

4.3 Agree Net Zero in use definition and establish fabric standard for airtightness and thermal performance – assisted natural vent strategies and impact on floor plates and over all area and establish 'on costs' from the baseline position (business as usual) for achieving the agreed outcomes. See below expected

4.4 Typical NetZero envelope performance on recent DFE compliant proposals:-
Roof U-Value: 0.12 W/m2K
Wall U-Value: 0.15 W/m2K
Ground Floor U-Value: 0.12 W/m2K
Glazing U-Value: 1.1 W/m2K
Air tightness: 3 m3/h.m2
Glazing G-Value (to vertical): <0.35
Glass LTV north facing: 73%
Glass LTV east, west and south facing: 69%
G-Value to roof lights: ~0.3
Thermal bridging value to be 0.04 W/(mk) or less