SUSTAINABILITY OVERVIEW

SUSTAINABILITY OVERVIEW

Energy Strategy – at a glance

Be LEAN

Be CLEAN

Be GREEN

Along delivering a Net Zero Carbon development, the aim is also to ensure that it can adapt through its useful life and can be reclaimed and reused when no longer fit for purpose

Photovoltaic panels, to generate clean on-site energy

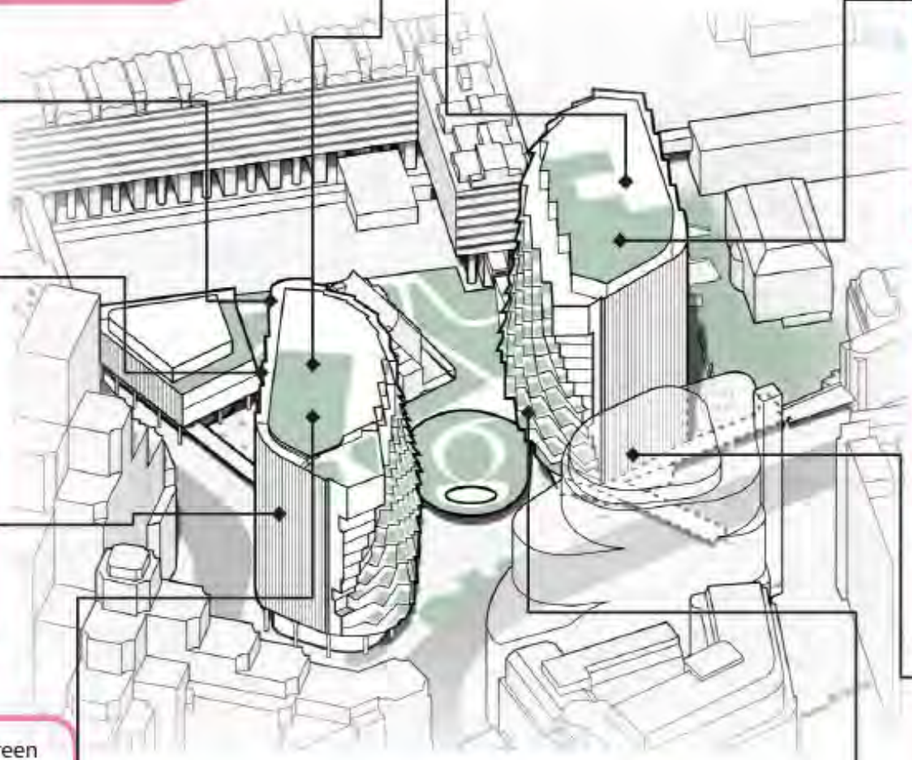
Air Source Heat Pumps are low-carbon systems that can provide both heating and cooling to a building using the air from outside

Mixed mode ventilation based on operable windows linked to central energy management system.

LED lighting with high efficacy and linked to perimeter daylight dimming

Demand control ventilation, based on room temperature and air quality (CO_2 levels), meaning less energy is used

Centralised ventilation
The main buildings have supplementary mechanical ventilation from a centralised ventilation system. Air handling units (AHUs) with 80% heat recovery efficiency.



Façade optimisation
High thermal performance curtain wall system and solar control coating. Reducing the need for addition heating and cooling.

External solar shading to minimise the need for additional cooling, therefore reducing energy consumption and glare discomfort.

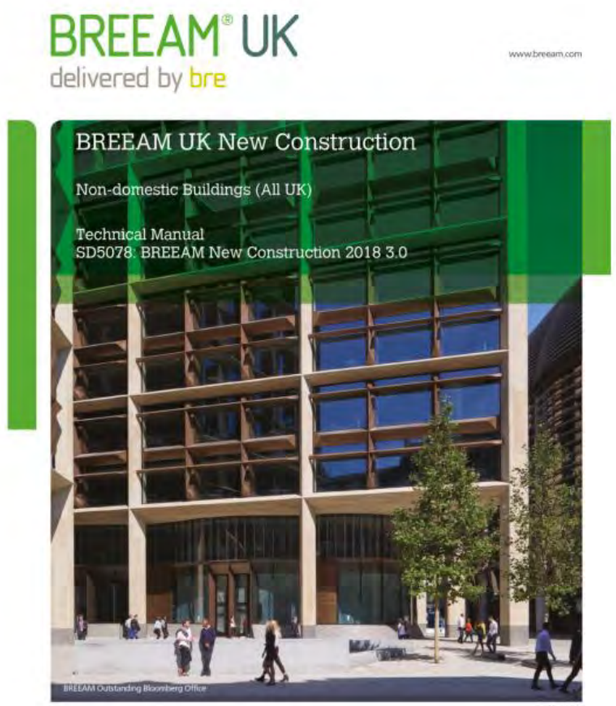
SuDS, to incorporate green roof, rain garden, permeable surfacing, Greenfield discharge Rainwater harvesting.

Connection to the **Citigen** network for both heating and cooling and subject to the further development of the design in collaboration with Citigen.

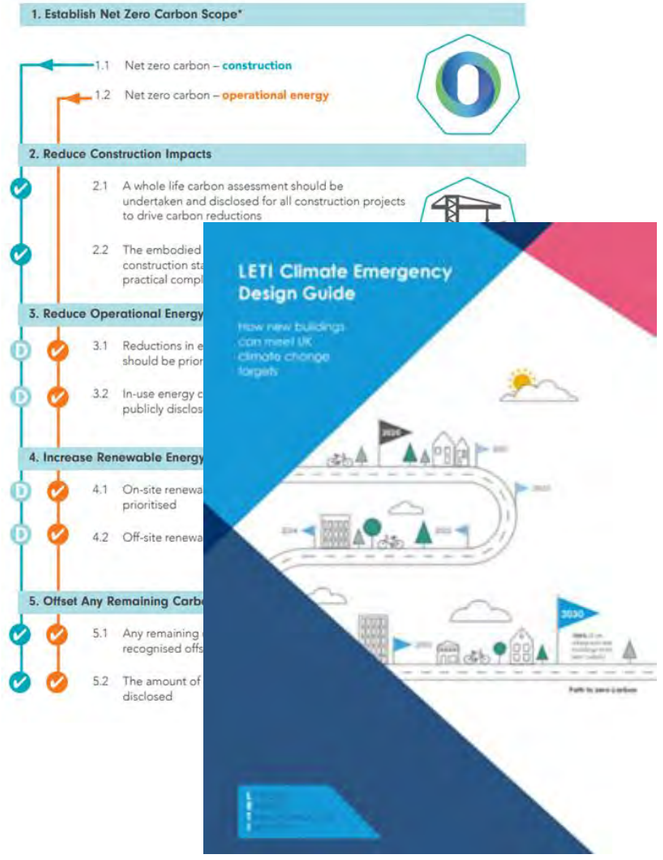
Greening: Enhancement of planting and green space to increase biodiversity, reduce stormwater run-off and create a pleasant environment.

Policies and Framework

London Plan 2021



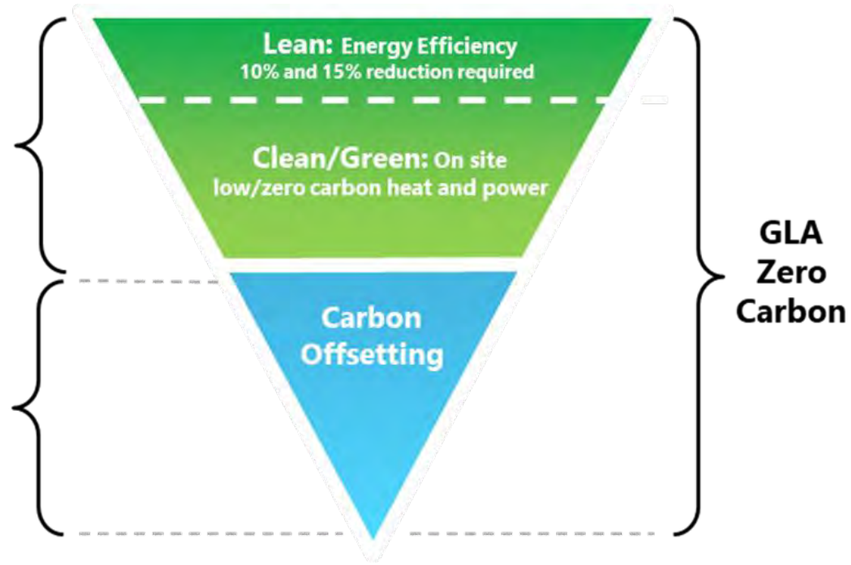
BREEAM Outstanding is currently being targeted through Baseline/ Medium risk credits (81.9%)



Net Zero Carbon
UK GBC and LETI

GLA and Regional Policy

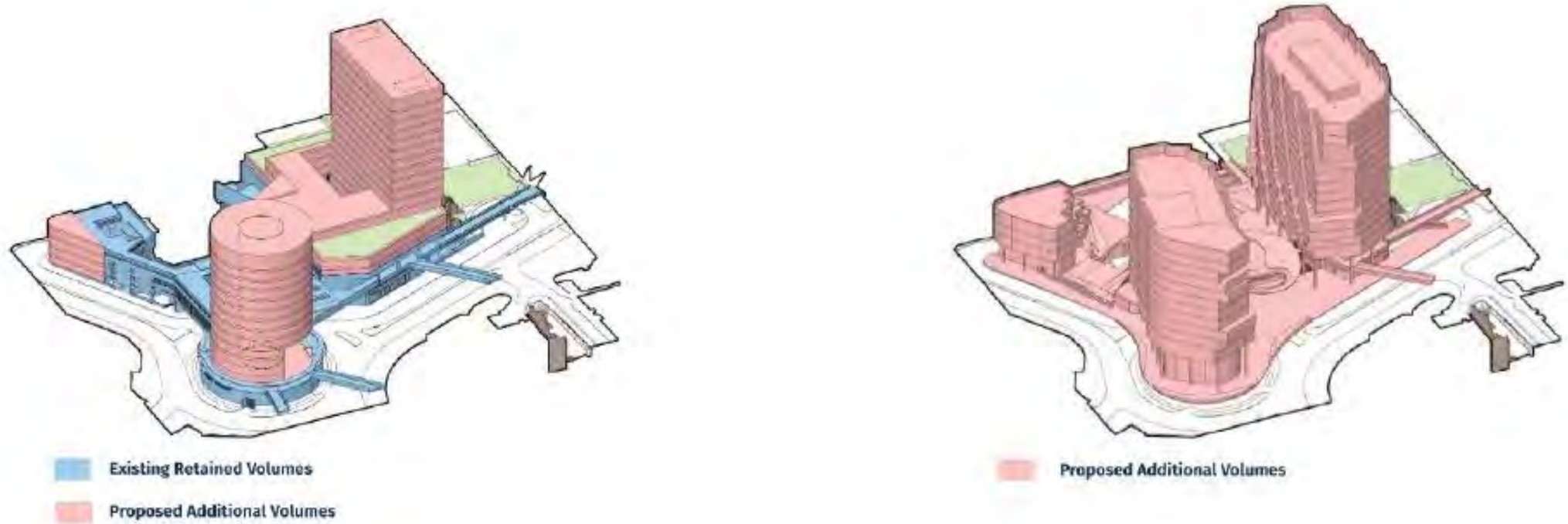
GLA London Plan (2021)	City of London-policies
❑ 10% savings in residential and 15% in non-residential from energy efficiency alone ❑ Following the energy and overheating hierarchy ❑ **35% on-site total carbon savings (using SAP 10 future carbon factors)** ❑ Zero carbon through borough offsets ❑ Minimise/justify the need for cooling ❑ Decentralised heat networks with no net NOx and air quality impacts ❑ **TM54 modelling for the redevelopment**	• **Policy SI2** of the London Plan (2021) relates to the minimisation of greenhouse gases within major developments across London. • **Policy SI7** of the London Plan (2021) relates to the reduction of waste and the increase of re-usable materials to support the circular economy of major developments. Part B of Policy SI7 notes that 'referable applications should promote circular economy outcomes and aim to be net zero-waste • **Core Strategic Policy CS15** of the City of London's Local Plan (2015) requires all development proposals to develop the highest feasible sustainability standards in the design, construction, operation and 'end of life' phases of development. • **Strategic Policy CS16** of the City's Draft Local Plan (2021) relates to overall strategic management of waste at all stages of the development cycle.



Building Regulation Part L2A 2021

RE-USE
OPTIONS

PAST
RE-USE STUDY



PAST
RE-USE STUDY

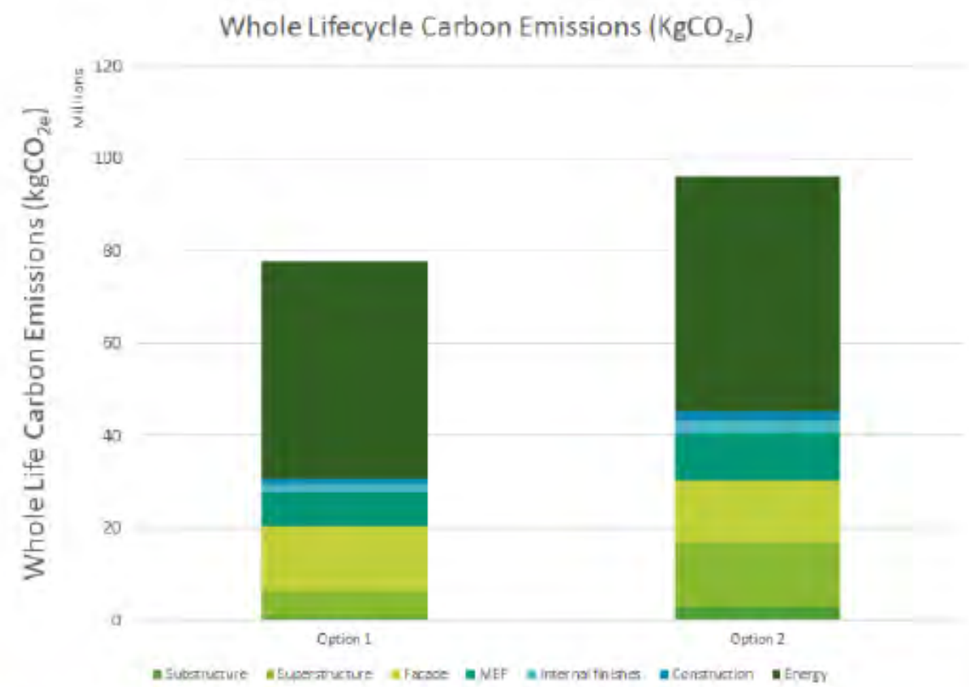


Figure 6—8 Whole Lifecycle Carbon Emissions in millions of kilograms of CO_2 equivalent

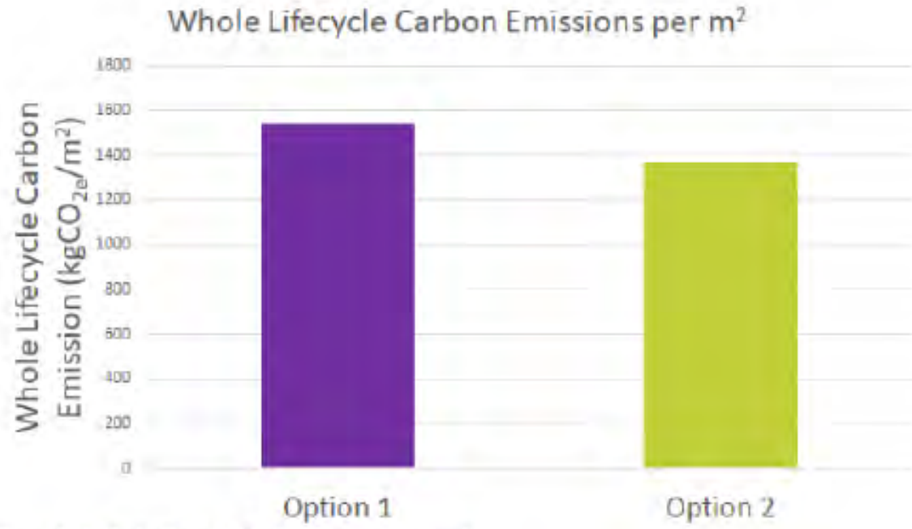


Figure 6—9 Whole Lifecycle Carbon Emissions per m^2

No intervention

Major refurbishment

Minor refurnishment

New build

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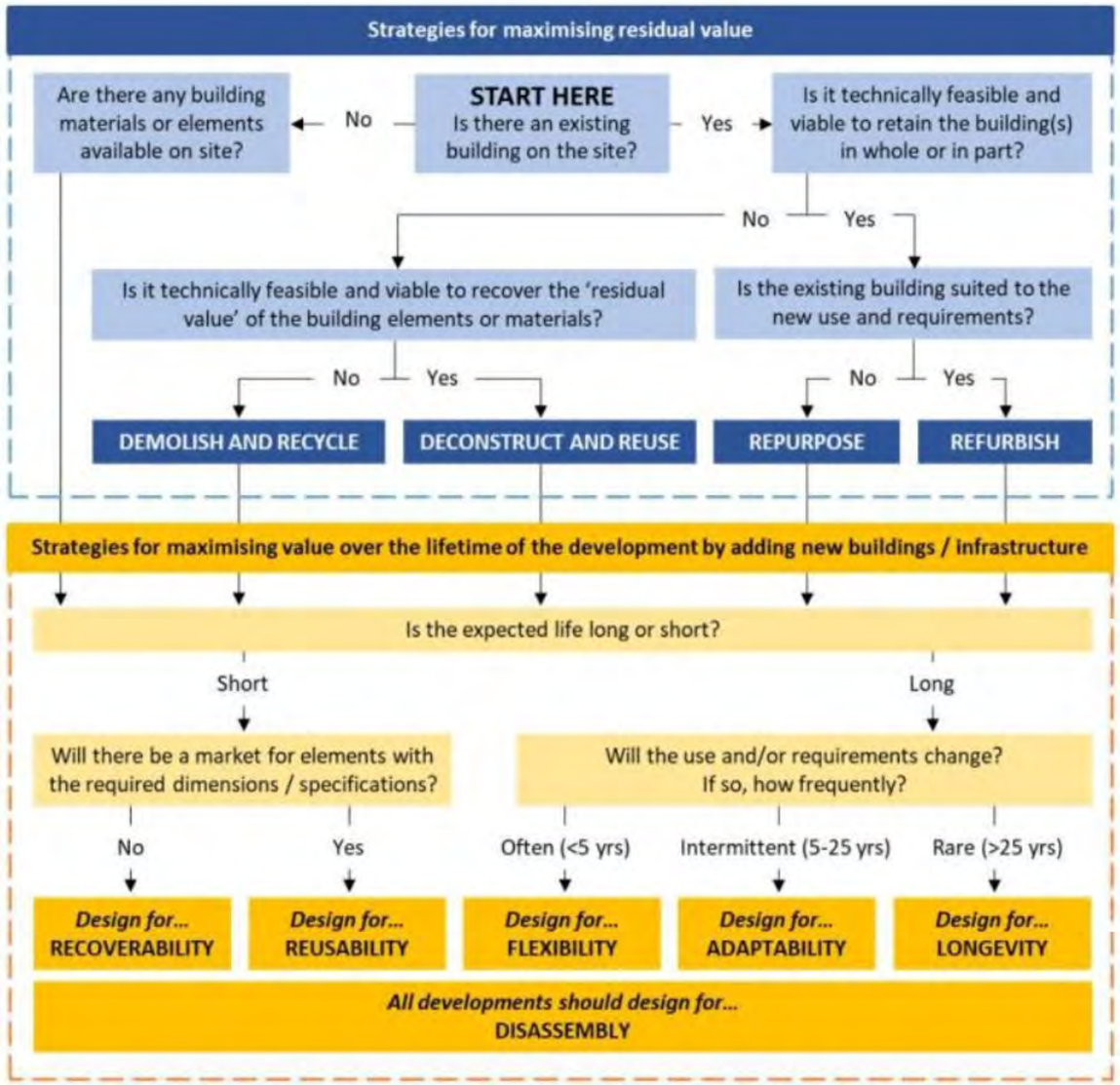
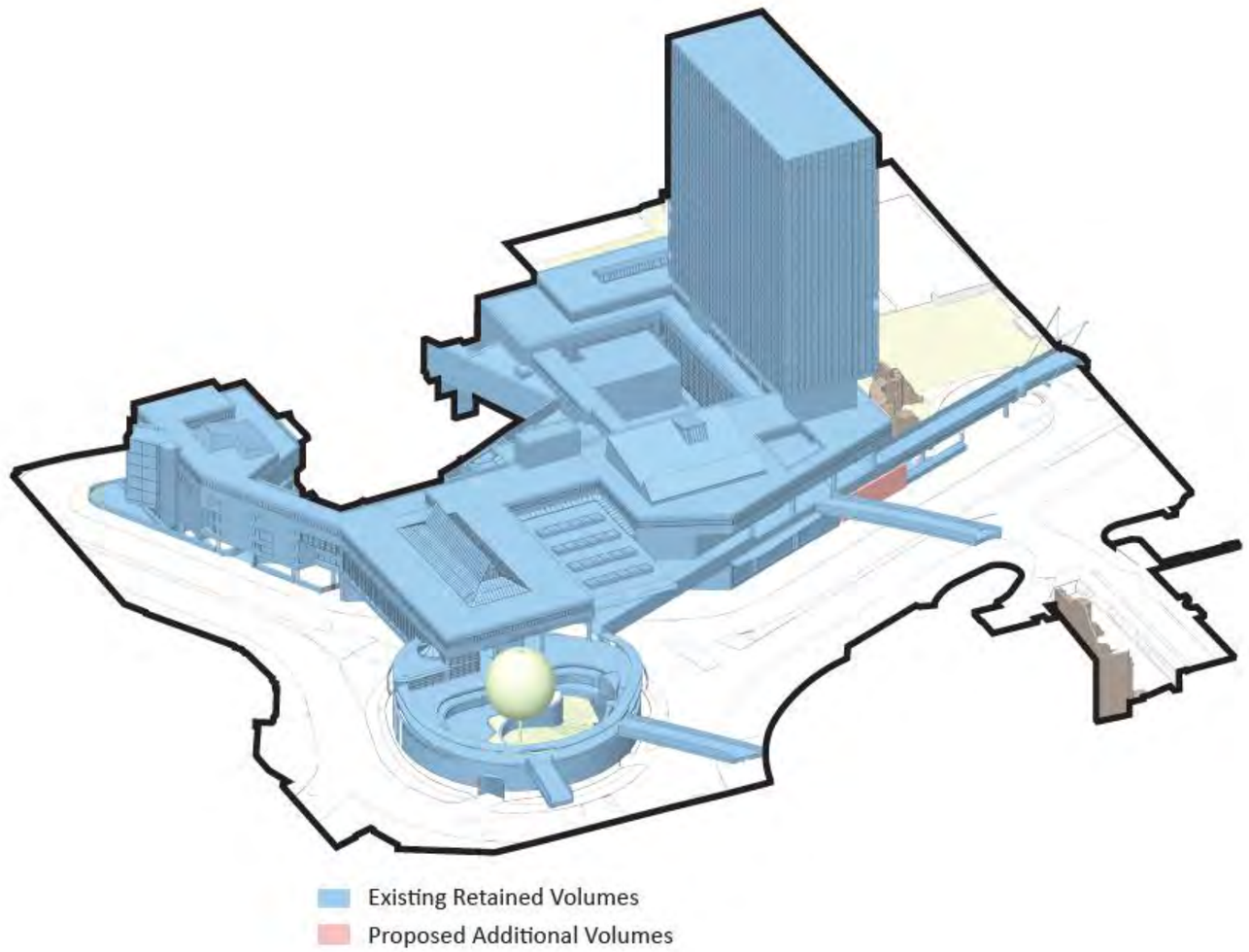


Figure 3.1: Illustration 3

RE-USE STUDY - OPTION 0

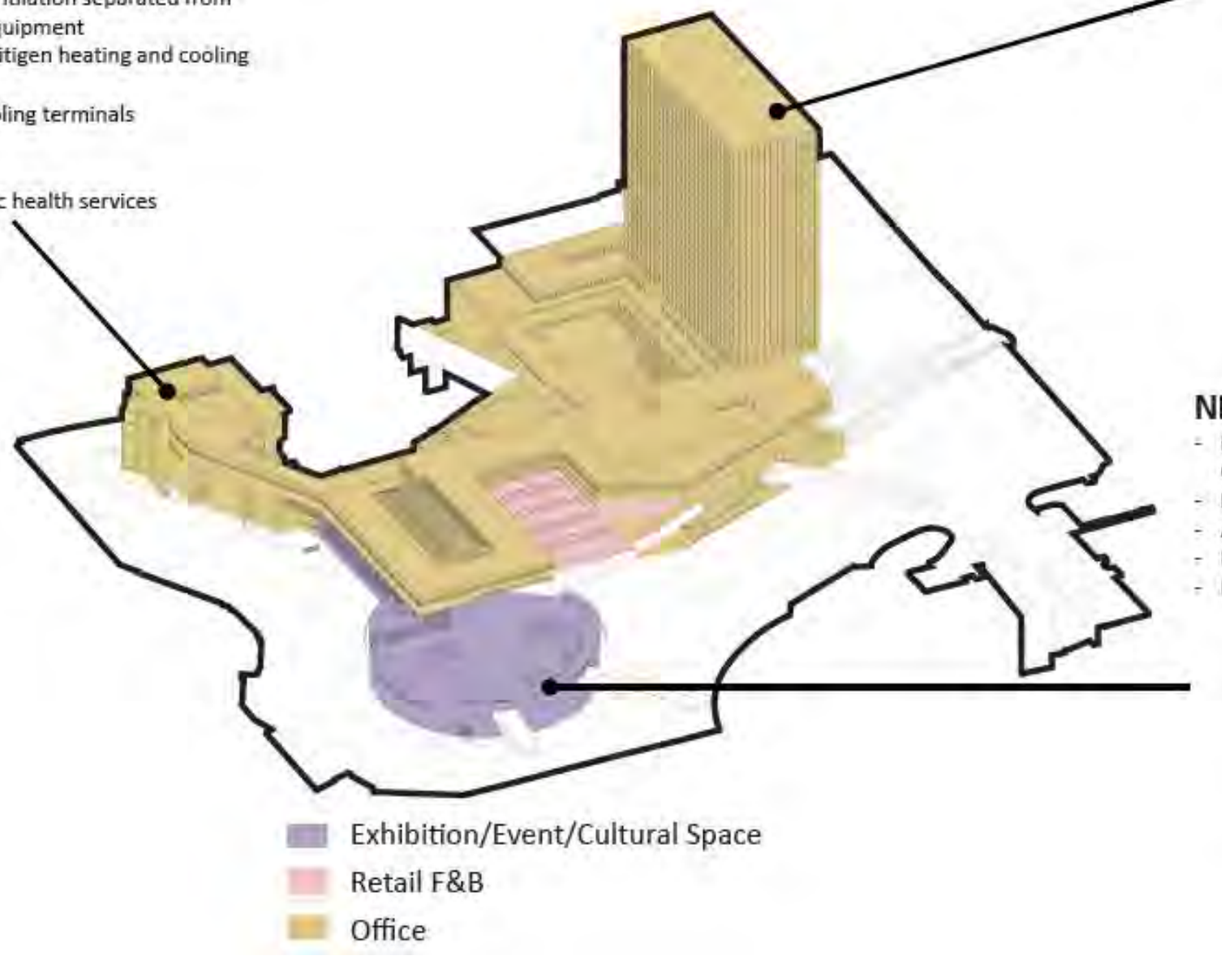


NEW MOL OFFICE SPACE

- Convert suitable museum space to office space
- New cladding, stick façade system, operable windows
- Anti-carbonation treatment to concrete
- Internal insulation to retained solid elements
- New MEP installations:
  - New lift cars and machinery
  - Roof plant for ventilation separated from cultural venue equipment
  - New dedicated Citigen heating and cooling connections
  - New heating/cooling terminals
  - Re-wire
  - Re-lighting
  - Renewal of public health services

BASTION HOUSE

- Refurbished office space
- New cladding, stick façade system, operable windows
- Anti-carbonation treatment to concrete
- Internal insulation to roof and lowest floor
- New MEP installations:
  - New lift cars and machinery
  - Increased roof plant for increased ventilation
  - Retain Citigen heating and cooling connections
  - New heating/cooling terminals
  - Re-wire
  - Re-lighting
  - Renewal of public health services



NEW CULTURAL SPACE

- Refurbish existing Museum of London to whitebox Cultural Space
- Replace glazing
- Anti-carbonation treatment to concrete
- Internal insulation to retained solid elements
- New MEP installations:
  - New lift cars and machinery
  - New ventilation equipment to suit
  - Retain Citigen heating and cooling connections
  - New ducted heating/cooling to FOH areas and heating/cooling terminals to BOH areas
  - Re-wire
  - Re-lighting
  - Renewal of public health services

NEAR FUTURE

DESIGN FOR DISASSEMBLY

Floor Construction

60+ year life span

Option 1
Fire-board mechanically attached to CLT (not glued) to facilitate disassembly

Option 2
Composite concrete slab / metal deck
Hybrid syzstem difficult to re-use

Structural Frame

60+ year life span
Steel Frame with bolted connections for easy disassembly.

Curtainwall

30+ year life span
Unitized curtain wall, w. gasketed connections in lieu of silicone wet-sealed joints

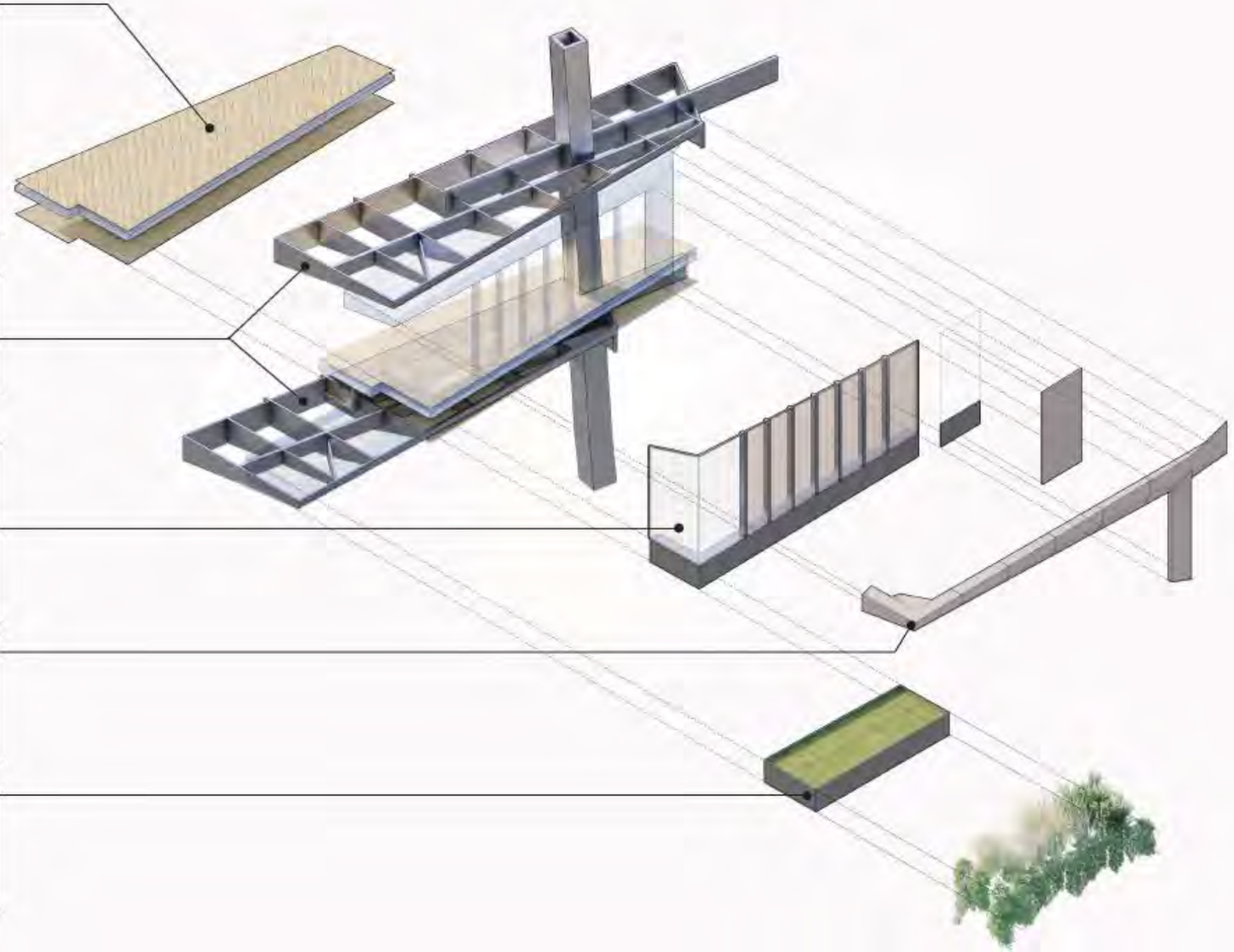
Glazing units able to be detached from frame

FRC Cladding

30+ year life span
Segmented FRC panels with misc metal attachments.
Crushed to become aggregate.

Planter Box

30+ year life span
Metal panels connected using mechanical attachments.
Separated and stacked for re-use

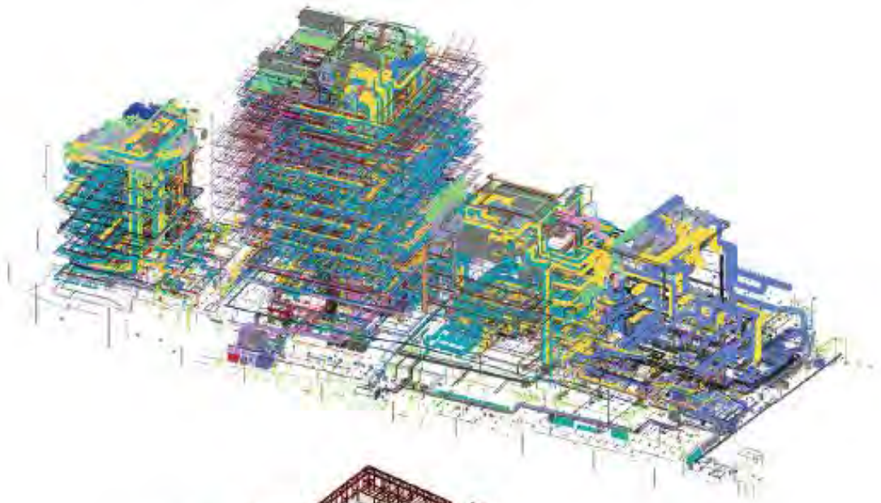


DESIGN FOR DISSASSEMBLY & FUTURE USES OF COMPONENTS/MATERIALS

Circular Economy Principle 2: Design to eliminate waste (and for ease of maintenance)

Principle	Early uptake of ambitious CE ideas	(Pioneer) CES Documentation
2.1 Longevity, adaptability, flexibility, reusability, recoverability	Build to accommodate change • flexible heights • modular partitions Build for longevity • Durable and robust design • long term maintenance plans	• Disassembly study • Replacement and repair estimates • Scenario modelling demonstrating adaptability • Bill of Materials: Estimated reusable materials (kg/m2) Estimated recyclable materials (kg/m2)
2.2 Design out waste: CD&E waste	• Strategies to minimise CD&E Waste • Preservation of topsoil	• Cut and fill calculations • Buildings as Material Banks information

DESIGN FOR DISASSEMBLY

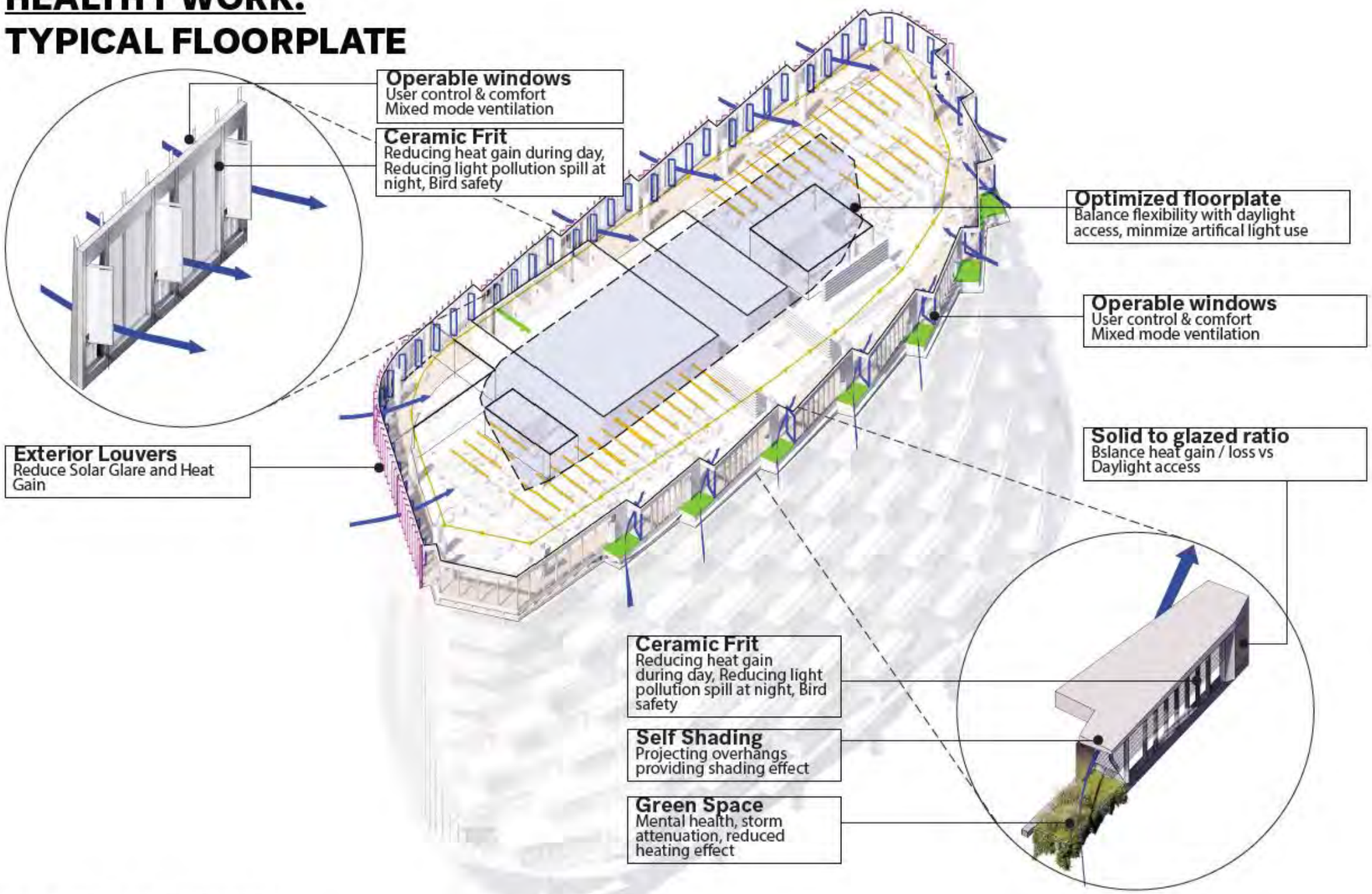


Designed in BIM

- Full inventory of materials
- Traceability of materials
- Materials passport

HEALTHY WORK

HEALTHY WORK:
TYPICAL FLOORPLATE



DILLER SCOFIDIO + RENFRO | SHEPPARD ROBSON

RENEWABLES

Renewable Energy

BREEAM

Minimum Requirements by BREEAM Rating Level

		Step change credits to achieve Excellent	Step change credits to achieve Outstanding
BREEAM Item	**Very Good**	**Excellent**	**Outstanding**
Man 03 Responsible construction practices	None	One credit (responsible construction management)	Two credits (responsible construction management)
Man 04 Commissioning and handover	One credit (commissioning-test schedule and responsibilities)		
Man 04 Commissioning and handover	Criterion 11 (Building User Guide)		
Man 05 Aftercare	None	One credit (commissioning-implementation)	
Ene 01 Reduction of energy use and carbon emissions	None	Four credits (Energy performance or Prediction of operational energy consumption*)	Six credits (Energy performance) and Four credits (Prediction of operational energy consumption*)
Ene 02 Energy monitoring	One credit(First sub-metering credit)		
Wat 01 Water consumption	One credit		Two credits
Wat 02 Water monitoring	Criterion 1 only		
Mat 03 Responsible sourcing of construction products	Criterion 1 only		
Wst 01 Construction waste management	None		One credit
Wst 03 Operational waste	None	One credit	

Influenced by design

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Current BREEAM Strategy

- **Targeted credits - Baseline** – These credits included requirements that are either inherent in the site or align with industry standard practice, as well as those agreed by the project team.
- **Targeted credits – Medium Risk** – To achieve a Outstanding rating all of the additional medium risk credits need to be targeted. These are credits that are recommended for the project but can be technically challenging and require careful management.
- **Potential Credits –** These credits are technically challenging and are currently outside the scope of the development, however some of the credits could be targeted at a later stage.

BREEAM SCORE SUMMARY						
	Offices – Shell & Core		Assembly & Leisure – Shell Only		Retail – Shell Only	
MINIMUM REQUIRED	85.00%	Outstanding	85.00%	Outstanding	85.00%	Outstanding
TARGETED - BASELINE	66.8%	Very Good	66.4%	Very Good	63.2%	Very Good
TARGETED - MEDIUM RISK	89.0%	Outstanding	91.0%	Outstanding	86.0%	Outstanding
POTENTIAL	105.9%	Outstanding	102.0%	Outstanding	102.0%	Outstanding

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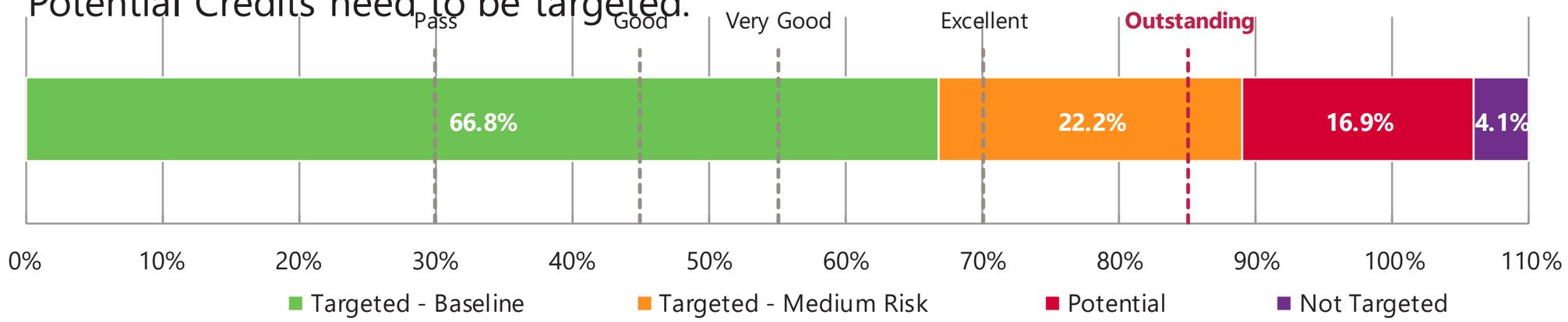
London West Wall- BREEAM NC 2018- Office - Shell and Core

- BREEAM Outstanding is currently being targeted through Baseline/ Medium risk credits (89.4%) for the Assessment 1 (Office Shell and Core).
- A safety margin of 5% is required above the 85% required for an 'Outstanding' rating, to allow for credits lost during construction. Therefore some additional Potential Credits need to be targeted.

BREEAM New Construction Ratings Benchmarks

>30%	**PASS**	★☆☆☆☆
>45%	**GOOD**	★★☆☆☆
>55%	**VERY GOOD**	★★★☆☆
>70%	**EXCELLENT**	★★★★☆
>85%	**OUTSTANDING**	★★★★★



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NABERS UK

NABERS UK – Rating
LWW high-level preassessment

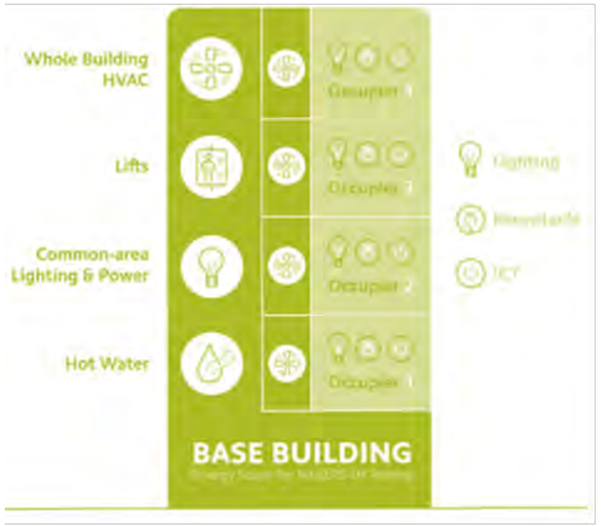


Table 1: Energy performance targets for buildings targeting net zero carbon for operational energy

		Interim Targets			Paris Proof Target
Scope	Metric	2020-2025	2025-2030	2030-2035	2035-2050
Whole building energy	kWh_e/m^2 (NLA) / year	160	115	90	70
	kWh_e/m^2 (GIA) / year	130	90	70	55
	DEC rating	D90	C65	B50	B40
Base building energy	kWh_e/m^2 (NLA) / year	90	70	55	35
	kWh_e/m^2 (GIA) / year	70	55	45	30
	NABERS UK star rating	4.5	5	5.5	6
Tenant energy	kWh_e/m^2 (NLA) / year	70	45	35	35

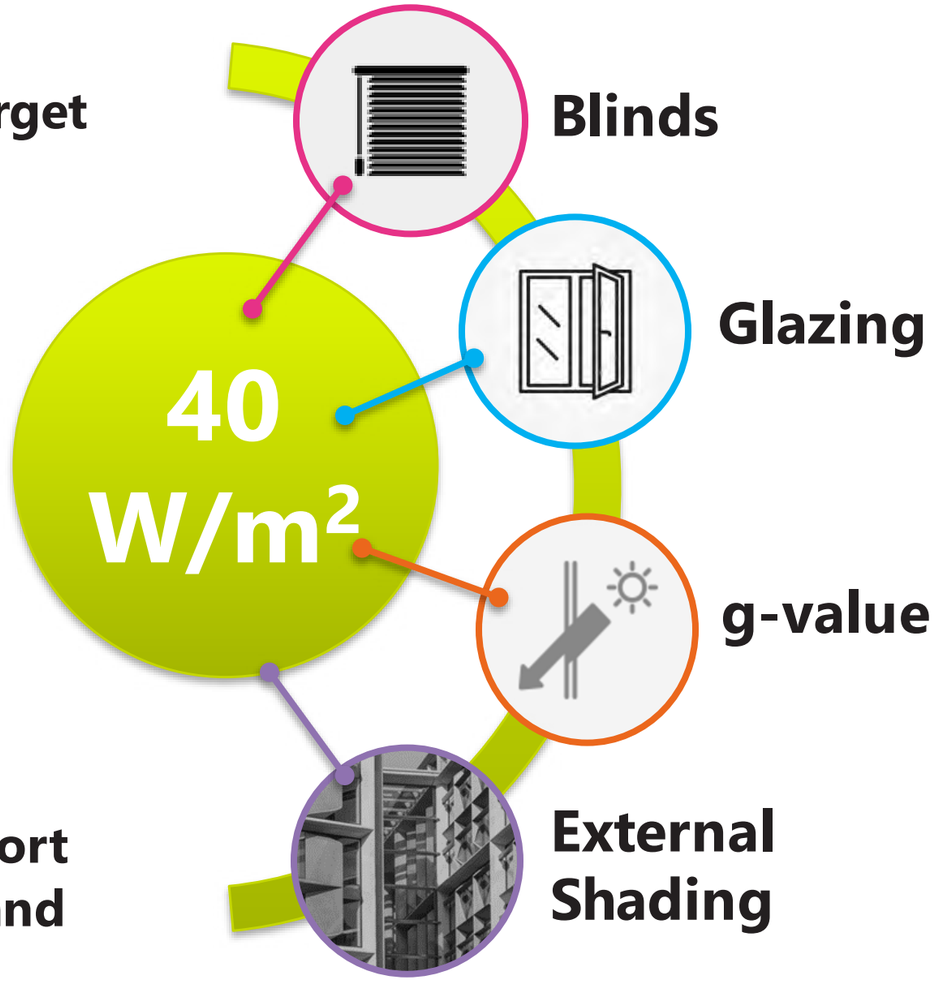
NLA = net lettable area GIA = gross internal area

Architectural Implications

Solar Gain Target

+

Daylighting
View out
Thermal comfort
Heating Demand



Actions:

Design being optimised for compliance with solar gain target of max 40 W/m2.

Strategies being considered:

- **Optimise façade fin rotation**
- **Analyse solar Factor of glass (providing compliance with WELL requirements on VLT)**

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WELL

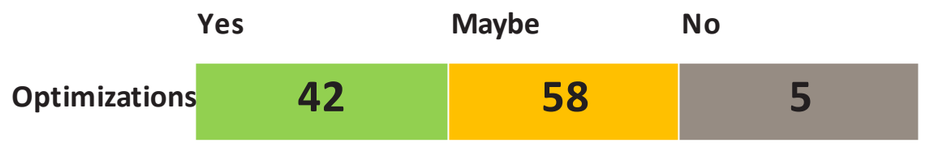
WELL standard

The development aims to achieve a 'WELL-enabled' status through adopting the WELL strategies for the shell and core aspect of the development.

The WELL Standard is a comprehensive scheme that requires intervention at the design, fit-out and operational stages.

As the end user of the office spaces is currently unknown, the development adopts a 'WELL-enabled' approach in aims to be WELL-ready, if the future tenant(s) choose to pursue the full WELL certification. All preconditions and design-inherent strategies that would require early design stage intervention have been assessed

Preassessment status



Level of certification	Total points achieved
Bronze	40
Silver	50
Gold	60
Platinum	80

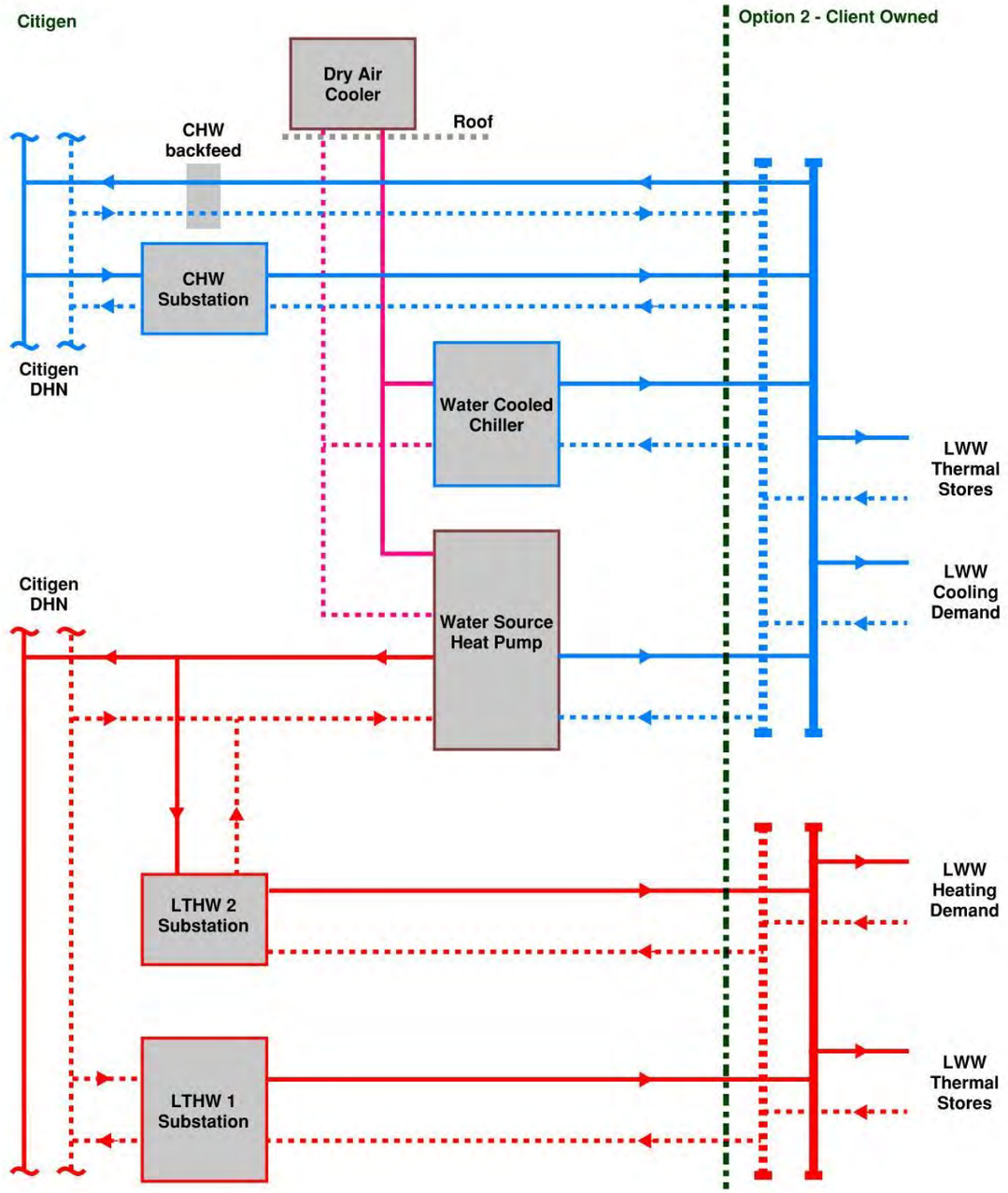
ENERGY STRATEGY

Energy Strategy

Strategic Option

Water source heat pump (WSHP) and water-cooled chiller (WCC) with back-feed to Citigen

- Connection to Citigen for both heating and cooling
- Uses roof space for heat rejection equipment
- Supports de-carbonisation of the Citigen network, initial estimates of up to 3%.
- Development becomes an exporter of heat via the ability to backfeed rather than reject heat from cooling equipment.



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Energy Strategy

Strategic Option

	Current Available Capacities (MW)	Estimated Peak Simultaneous Loads (MW)	Estimated Annual Energy Use (MWh)
Heating	4.8	2.6	1068
Cooling	2.8	2.3	1059

Current Building Load Estimates

Loads will primarily on building environment with some basic assumptions for domestic hot water use.

Option	Backfeeding to Citigen (MWh)	Estimated Carbon Reduction (tCO_2/a)	Citigen Decarbonisation Achieved
Optimum	1680	753	4.2%

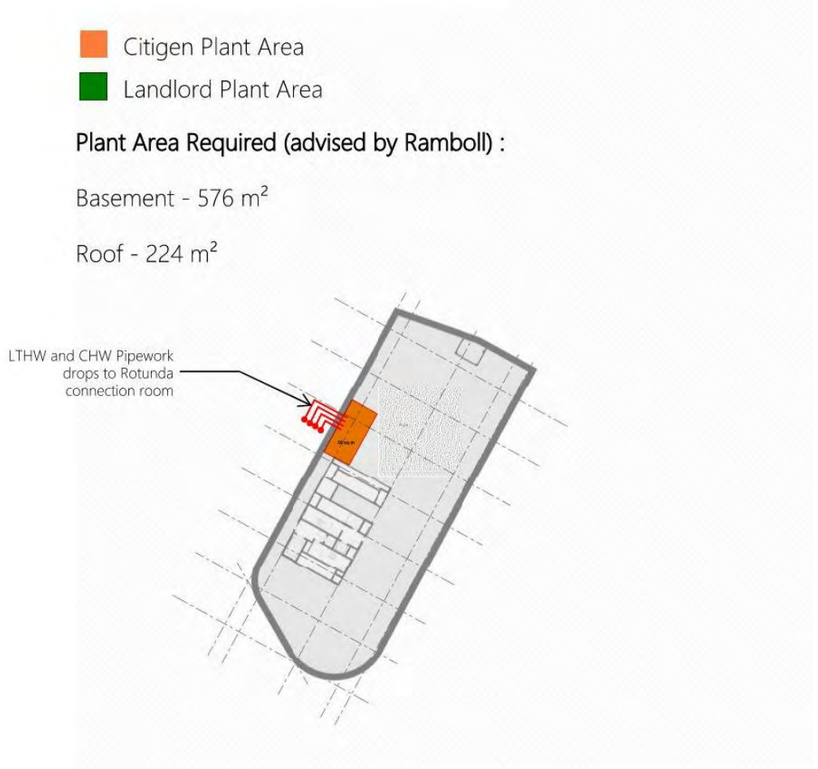
Decarbonisation Metrics

40 GWh/a is approximately the annual heat production of entire Citigen network. Using SAP 10.2 carbon factor 0.448 kgCO2/kWh and the above heat load gives 17938 tCO2/a (tonnes of CO2 per annum) as the total carbon emission from the heat production of the Citigen network.

Energy Strategy

Strategic Option - Centralised

Rotunda Basement Level



Lower Ground & Bastion House Basement

Energy Strategy

Strategic Option - Centralised

Ground Floor

Roof Level