9 Nestles Avenue

Detailed Circular Economy Statement

Meadow Partners

Project name and address:

9 Nestles Avenue, Hayes

UB3 4SA

Issue:	01
Date:	15/06/2023
Reference:	P18-117

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ISSUE

Issue No.	Date of issue	Purpose of issue	Prepared by	Checked by	Changes
01	15/06/2023	GLA	Shivani Kothari	Youssef Safadi	-

Contents

1. EXECUTIVE SUMMARY

The London Plan (Publication London Plan, December 2020), policy SI 7 requires a Circular Economy Statement to be submitted for all referable applications at planning stage. This report is intended to respond to the policy SI 7 requirements and outlines how 9 Nestle Avenue development incorporates the principles of the circular economy to fulfil the following questions:

1) *How all materials arising from demolition and remediation works will be re-used and/or recycled.*
2) *How the proposal's design and construction will reduce material demands and enable building materials, components and products to be disassembled and re-used at the end of their useful life.*
3) *Opportunities for managing as much waste as possible on site.*
4) *Adequate and easily accessible storage space and collection systems to support recycling and re-use.*
5) *How much waste the proposal is expected to generate, and how and where the waste will be managed in accordance with the waste hierarchy.*
6) *How performance will be monitored and reported.*

The development is a new residential development in a building up to 11 storeys and associated landscaping, access, car parking and cycle parking. The developer is Meadow Partners a dynamic property company with a worldwide portfolio of properties and projects in Europe and the United States.

This circular economy strategy is produced by engagement and inputs from the project team and approach toward the key commitments agreed across the key design team members:

- Developer – Meadow Partners
- Structural engineers – BWP
- Architects – Tate Hindle
- MEP engineers – Mecserve
- Sustainability Consultants- Mecserve
- Planning Consultant – Daniel Watney

The design team's approach is to follow waste hierarchy to reduce, re-use and recycle. In order to meet the project's circular economy objectives the design team have taken the following steps:

- Design for longevity
- Design for adaptability
- Design for flexibility
- Design for disassembly and recoverability
- Design to facilitate circular economy principles during operation and municipal waste

The above steps were taken considering the 'building in layers' concept implemented to:

- Site
- Structure
- Services
- Space plan and
- stuff
- Minimise the quantities of materials used

Strategies proposed for each layer to support:

- Minimising the quantities of other resources used (energy, water, land)
- Sourcing materials responsibly and sustainably
- Design to eliminate waste during the construction, demolition and excavation
- Design to support operational waste management

Implementing the circular economy principles require short term and long term inputs from all parties and stakeholders from the developer, design team, contractors, building users and building managers. Inputs from the design team and contractors may seem to be limited to short to medium term actions and implications, however the impacts of the approach taken by the team will last to the end of building life and also will facilitate the actions which can be taken during the operation in the long term by the building managers and residents.

2. INTRODUCTION

2.1 DESCRIPTION OF THE DEVELOPMENT

Meadow Partners propose to redevelop the site at 9 Nestles Avenue to provide a building up to 11 storeys comprising residential accommodation, associated landscaping, access, car parking and cycle parking.

The site is located on Nestle Avenue, close to Hays town centre and Hays and Harlington Railway station. The site currently occupies single storey building with a two storey block in an art deco style. It is a part of a larger industrial zone including the former Nestle Factory.

The proposed scheme is concrete frame building, which comprises103no private and affordable homes in 717m2 of private amenities space, including and affordable units. 10% of units will be wheelchair user adaptable.

Residential development comprises 59 No. 1 bed flats, 32 No. 2 bed flats and 12 No. 3 bed flats including 9No. ground floor duplex flats with dedicated entrances.

A high level features of the development are:

- The design proposes communal space for residents including:
  - Communal roof terraces, children's play space and private balconies or terraces for every unit.
  - 4 accessible car parking spaces, and 10 standard car parking spaces allocated to 3 bed units.
  - 178 internal cycle parking spaces plus visitor spaces, in accordance with London Plan standards
- The building steps back gradually from Nestle Avenue, which created the opportunities to propose communal roof terraces in different levels as it is presented in the architectural drawings (Figure 1).
- The structure of the building is proposed to be on concrete framework and flat slabs for the upper floors.
- The heating and cooling are provided via Air Source Heat Pumps (ASHP), backed up with gas boilers and PVs are also installed on the roof to generate electricity.

Figure 1 - Axonometric view of proposal showing east elevation with Garden Walk and the roof terraces – From DAS report

2.2 CIRCULAR ECONOMY ASPIRATIONS

This section reviews the principles of circular economy as defined in draft London Plan. Meadow Partner's organisational strategies, and strategies applied to the 9 Nestle Avenue development will be reviewed to demonstrate the principles of circular economy will be implemented.

The New London Plan sets policies to reduce waste and support the Circular Economy. These are set out in policy SI 7.

Policy SI7 Reducing Waste and supporting the Circular Economy -
Resource conservation, waste reduction, increases in material re-use and recycling, and reductions in waste going for disposal will be achieved by the Mayor, waste planning authorities and industry working in collaboration to:

1) *Promote a more circular economy that improves resource efficiency and innovation to keep products and materials at their highest use for as long as possible.*
2) *Encourage waste minimisation and waste prevention through the reuse of materials and using fewer resources in the production and distribution of products.*
3) *Ensure that there is zero biodegradable or recyclable waste to landfill by 2026.*
4) *Meet or exceed the municipal waste recycling target of 65 per cent by 2030.*
5) *Meet or exceed the targets for each of the following waste and material streams:*
    a. *Construction and demolition – 95 per cent reuse/recycling/recovery*
    b. *Excavation – 95 per cent beneficial use*
6) *Design developments with adequate, flexible, and easily accessible storage space and collection systems that support, as a minimum, the separate collection of dry recyclables (at least card, paper, mixed plastics, metals, glass) and food.*

Referable applications should promote circular economy outcomes and aim to be net zero-waste.

Circular Economy – Principles

According to the Ellen MacArthur foundation, '*The Circular Economy, in a circular economy economic activity builds and rebuilds overall system health. The concept recognises the importance of the economy needing to work effectively at all scales – for big and small businesses, for organisations and individuals, globally and locally'.*

It is based on three principles:

- *Design out waste and pollution*
- *Keep products and materials in use*
- *Regenerate natural systems*

The diagram below from the Ellen MacArthur Foundation*, tries to capture the flow of materials, nutrients, component and products whilst adding an element of financial value.*

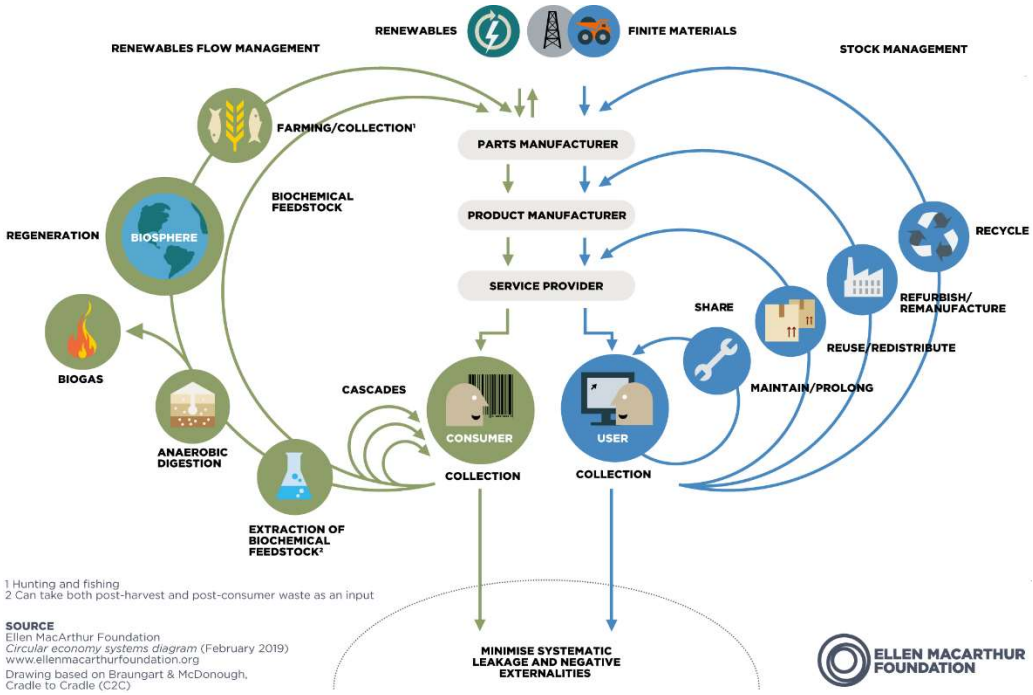


Figure 2 Ellen MacArthur foundation Circular Economy Statement

Policy SI7 defines Circular Economy *'as one where materials are retained in use at their highest value for as long as possible and are then reused or recycled, leaving a minimum of residual waste'.*

The London Plan promotes Circular Economy principles in developments which should be applied from the top to down in line with waste hierarchy.

Principle 1 - Conserve resources and source ethically

- Minimise the quantities of materials and other resources used
- Specify responsibly sourced amaterials

Principle 2 - Design to eliminate waste (and for ease of maintenance)

- Design for longevity, adaptability or flexibility
- Design out waste

Principal 3 - Manage waste sustainably and at the highest value

- Manage demolition, excavation and construction waste
- Manage municipal waste

UKGBC has produced guidance for the construction industry to incorporate Circular Economy principles in their projects at each RIBA stage. The following diagram demonstrates actions to be taken at each stage.

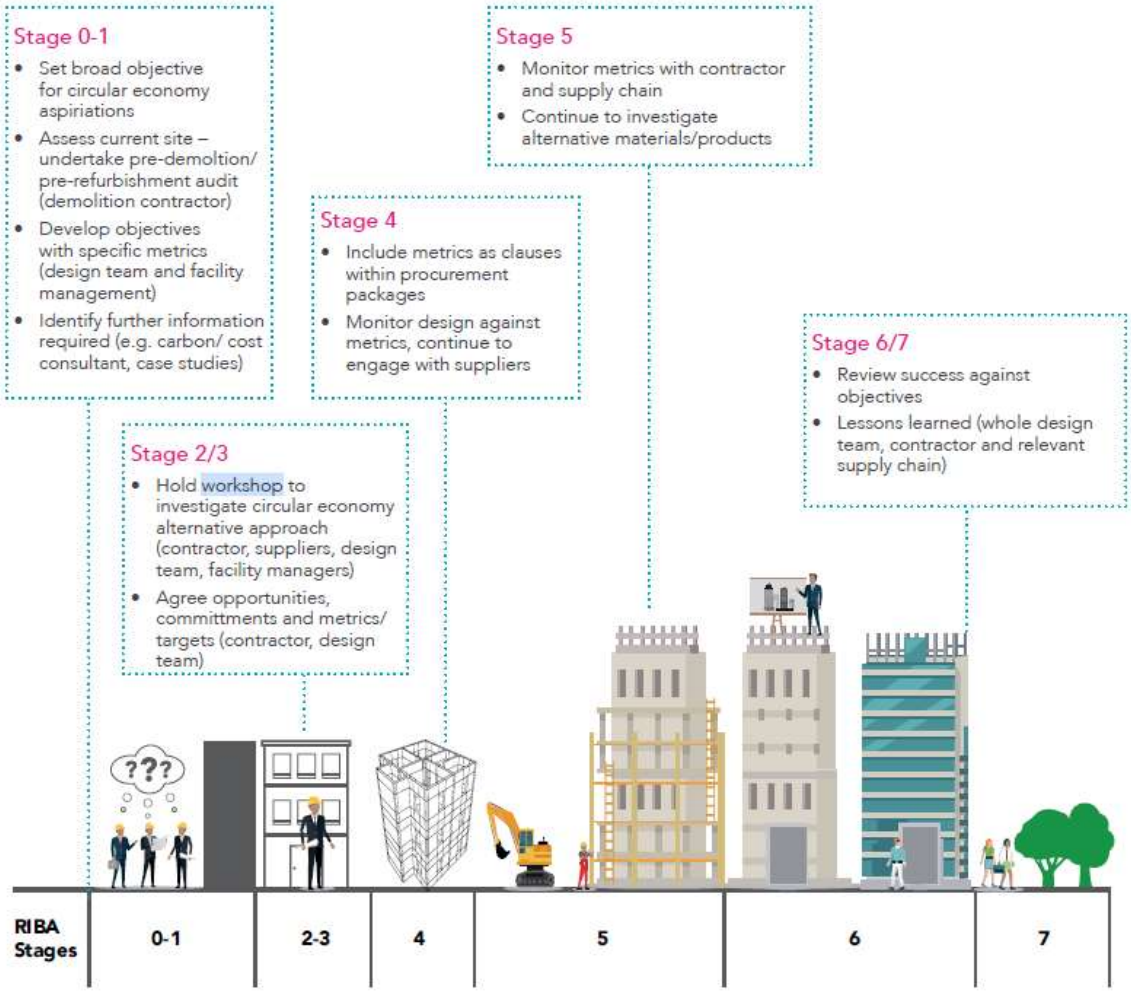


Figure 3- Circular economy guidance for construction clients – UKGBC April 2019

9 Nestle Avenue

In line with Meadow Partner's vision and policies in the London Plan, the development at 9 Nestle Avenue will be of a high standard, sustainable development which will contribute to environmental, and social values of the Hays, Hillingdon community.

The Circular Economy at the 9 Nestle Avenue is based on 'building in layers' principles (see the figure below) and consideration is given to long life and short life components of the building. The approach and method of principles implemented in the development are described in detail in the following sections.

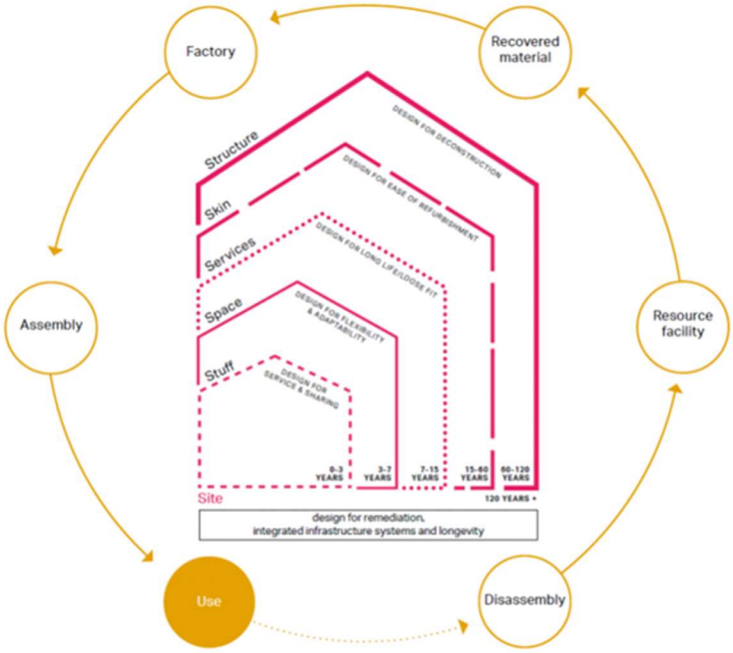


Figure 4 Building in layers diagram - Circular Economy Statement Guidance – Draft for consultation, September 2020

2.3 METHOD STATEMENT

This section summarises method and approach taken by the project team to address Circular Economy policy requirements. It summarises outcomes of the workshop, followed up by emails and correspondence with the wider project team, as explained in more detail in the following sections.

Circular Economy workshop-outcome statement

The project is at RIBA stage 2 and a workshop has been held with the design team (February 2021) to investigate circular economy alternative approaches and agree opportunities and commitments, and to set targets for the project.

Attendees include representatives from:

- Architects – Tate Hindle
- MEP engineers – Mecserve
- Structural engineers – BWP
- Sustainability consultants – Mecserve

The outcome of the workshop and key commitments is detailed in section 4.1- table 2. In summary, the design team aim to 'design out waste' and incorporate the following strategies:

- Design adaptable and flexible building, specifically the development will be designed to last and be adapted for the residents aging or other type of residential use.

- Flexible design and durable materials to improve longevity is met in forms of framed structure and modular design.
- Design out the need for the component or material, for example the brick façade is selected which is a durable material with no need for painting and minimum maintenance. The brick façade benefits from modular design so that only standards whole bricks are specified which reduces off cuts from brick.
- Reusing materials from demolition were discussed, there is an opportunity to use graded materials from demolition for the piling mat.
- Reducing other resources were discussed to reduce embodied carbon. The design team set a target to specify products with recycled content, and with lower carbon footprint.
- The building envelope shall have a high thermal performance, HVAC systems will be high efficiency ASHP and PVs are installed to produce electricity on site.
- Targets for reducing water and energy during the construction was discussed, which shall be included in the employer requirements for the contractors to commit to.
- The target for waste management discussed and target set. However, for waste targets to be met a transparent communication and cooperation is needed across the construction including the principal contractor. Therefore, the task is set for the developer to ensure the requirements will be included in ER.
- Targets for municipal waste are set to help design in the right size recycling space and correct access. More details of layouts and policies are described in the following sections and in the DAS documents.

Supporting documents

This statement is prepared inline with the outcomes from the workshop and the following documents issued as part of the planning:

- Draft Construction Management Plan Draft Construction Management Plan dated 07 August 2020
- Design and Access Statement dated August 2020 Design & access statement
- Design & Access Statement Addendum Design & Access Statement Addendum dated November 2020
- FRA and Drainage Flood risk assessment
- Energy and Sustainability Statement Energy and Sustainability Statement dated July 2020

3. CIRCULAR ECONOMY GOALS AND STRATEGIC APPROACH

The guidance states that outline and full application statements must provide a completed Table 1 with additional rows for different phases, buildings or areas, if and where a different strategic approach is proposed

Table 1- CIRCULAR ECONOMY GOALS AND STRATEGIC APPROACH

Aspect	Steering Approach	Explanation	Target	Support/Analysis/Studies/Surveys/Audits
Circular economy approach for the new development	A. Design for longevity	The development is a residential building. It is intended, designed and going to be built to have a long life span. Following strategies are therefore followed: • Design for durability against operational wear and tear • Designed for climate change resilience		• Design for durability is planned and will be part of the tender • Risk register against climate change factors will be completed and will be used to inform the detailed design. • Ensuring the design for durability strategies will not change during construction stage and will not be value engineered.
	B. Design for adaptability	The building is designed to be adaptable to the future uses and the future demands of the occupants that maybe different to today through following strategies: • It was discussed in the design workshop that, it is unlikely that the main use of development would change even in long run to another type of use such as commercial. However, the building is designed such that the structure could support other type of residential uses such as student accommodation, care homes and/or hotel. • The envelope can be separated and replaced independently which will allow the structure to support other similar future uses for a very long time.		• The proposed envelope allows for the envelope to be fully replaced independently from the structure; this will be part of design which forms the specifications of the project for builders. • The propose structure allows full flexibility and this will be implemented as part of specification and required in employer requirement.
	C. Design for flexibility	The building is designed to be flexible for the occupants as below: • The design team considered the adaptability of the residential units for disable access in design. • The structure of the building is proposed such that none of the internal partitions are load bearing therefore giving full flexibility to the occupants to change the layouts		• The design for fully flexible layout is considered. This will need to continue through the detailed design so opportunities can be sought for mechanical fixing for partitions. • The apartments are already designed to be accessible in future. see DAS report.
	D. Design for disassembly and recoverability	The following strategies are followed to make the building reusable and recoverable at the end of life: • Prefabricated SFS frame to infill walling in external envelope is proposed. • During the detailed design and specification, attention will be given to end of life purpose for each element including those	at least 95% diversion from landfill at end of life. At least 10% fully reusable in the same format with designed for disassembly principle;	

Aspect	Steering Approach	Explanation	Target	Support/Analysis/Studies/Surveys/Audits
		items that would be difficult to demolish (due to difficulty in segregation the materials)		
Circular economy approach for municipal waste during operation	A. Space allowance for recyclable waste.	The refuse areas are designed to have enough space for segregating recyclable waste from general waste.	80% diversion from landfill is possible with the current design. The council accommodates higher recycle rate and the bins could be allocated accordingly. Higher rate can be hit with occupant behaviour change.	According to a study in August 2019, Hillingdon had the highest recycling facilities approval rate at 81%, as well as the highest resident recycling frequency at 94%.[1]
	B. Easy access to refuse area for ease of recycling.	The access to recyclable waste bin is easy and straight forward, labels will be provided in the refuse area to identify the correct recycling procedure.		

[1] https://www.thisislocallondon.co.uk/news/17867685.hillingdon-leads-way-london-recycling/

4. CIRCULAR ECONOMY COMMITMENTS

4.1 KEY COMMITMENTS

A circular Economy workshop was held with the design team on 17/08/2020 and key commitments were discussed as listed below in the table.

Table 2 – Key commitments

	Site	Substructure	Super-structure	Shell/Skin	Services	Space	Stuff	Construction Stuff	Summary	Challenges	Counter-Actions + Who + When	Plan to prove and quantify
	SECTION A: CONSERVE RESOURCES											
Minimising the quantities of materials used	The exiting site is occupied by a single storey building with a 2 storey block to the south in an art deco style. Both buildings are industrial and cannot be re-used due to the changing functional use of the development. The design proposes a multi- storey building using the site efficiently using stacking strategy.	The proposed structure for the building is piling which uses less concrete and Reinforcement compared with other systems. Some of the unusable brick and concrete from demolition are proposed to be graded and used for constructing the piling mat.	The proposed super structure is flat slab which is optimised through Finite element analysis. This allows the floor slabs to be thinner and an optimised form of structure, and with more rational reinforcement. The columns are also optimised which again gives a more economical frame therefore, less concrete is needed. The columns are lined up which allows a more consistent slab construction through out and	The external envelope and detain of the building are designed and standardised so only whole brick is needed. This will reduce the need for cut offs and hence optimises the use of brick. Only standard brick is proposed, and special bricks are avoided.	The development will have central HVAC system which allows diversification of loads and therefore the plant will have smaller carbon footprint than having individual plants. Exposed ceiling in proposed for plant room also minimises the use of materials.	Some apartments are proposed to be open plan which minimises the use of partitions and maximises space size and living areas. The partitions are all stud wall and aligned with the columns which allows for future adaptability.	Not within the scope of this project	The contractor will be required to develop a logistics strategy to minimise waste. This will include using “just in time” deliveries where possible to reduce reliance on storage. Off-site manufacturing of infill walling of external envelope will only help with reducing packaging	Design team have explored opportunities to minimise materials use and rationalise the design.	It is a challenge to use the worn steel framed industrial building parts within the new proposed development in original format; therefore, some materials will be downcycled and reused on site and some will be recycled.	The Finite Element (FE) analysis by the structural engineers will help with reducing the size of structure and reinforcements. Rational design of the external envelope to optimise the use of bricks throughout the project.	The strategies to reduce the materials used and thus the embodied carbon will be carried forward to stage 4 and will be included in the detailed design. The tender documents will include the relevant targets for the contractor.

	Site	Substructure	Super-structure	Shell/Skin	Services	Space	Stuff	Construction Stuff	Summary	Challenges	Counter-Actions + Who + When	Plan to prove and quantify
			reduces concrete use.					and equipment needed on site. When selecting the supplier those with better packaging strategies (take back and reuse) will be prioritised.				
Minimising the quantities of other resources used (energy, water, land)	The proposal makes a much better use of the abandoned single/two storey building, by reusing it with a suitable density for the urban environment and proposing 103 apartments. Site is within a good distance to public network (Harlington Railway station),	Proposing Piling system will mean reducing excavation and the time required for foundation and some resources. Using responsibly sourced concrete and steel will mean the manufacturing process is	Site and embodied energy/carbon reduction: Concrete will be responsibly sourced from certified suppliers. Operational energy reduction: Concrete frame's thermal mass helps to reduce operational energy. Consideration to this section will	Site and embodied energy reduction: Use of partially prefab façade systems, i.e. SFS for the will reduce the energy consumption associated with its installation. Operational energy reduction: The building fabric is of high thermal performance to reduce energy demand.	On site energy and embodied energy: one communal HVAC system instead of individual systems in each apartment will reduce the embodied energy associated with HVAC. Operational energy reduction: The use of air source heat	Specifying water efficient sanitary ware and white goods. The design proposed blue roof and utilised the blue roof storage for irrigation purposes. The design proposed rainwater harvesting	Specify energy efficient A rated white goods. No other item is within the scope.	The energy and Water consumption will be monitored by the contractor and targets for reducing water and energy will. be set on site.	Good reuse of Abandoned Nestle factory in the urban Environment. Reducing the energy and water associated with construction materials. Reducing operational energy and water though energy efficient measures to reduce energy demand and generate clean energy. Blue roof and Rainwater harvesting for less reliance on	TBC	Liaising closing with the contractor and setting targets for use of responsibly sourced materials, Monitoring energy and water consumption on site and reducing the consumption. Undertaking a Life Cycle Assessment to ensure energy consumptions and carbon emissions are reduced for the	Reporting the energy consumption and water consumption on site and benchmarking against Construction Excellence

	Site	Substructure	Super-structure	Shell/Skin	Services	Space	Stuff	Construction Stuff	Summary	Challenges	Counter-Actions + Who + When	Plan to prove and quantify
	and town centre. Sustainable transport measures shall be considered such as electric car charging points and cycle storage.	more environmentally friendly.	be given in more details at detailed design stage.		pumps (ASHP) to reduce the carbon Emissions associated with heating and hot water. PV panels will produce renewable energy. Efficient systems, lighting and control has reduced operational energy.	which means reducing operational water consumption.			drinking water; Water efficient. sanitary ware and white goods		life span of the building	
Specifying and sourcing materials responsibly and sustainably	N/A	Target 40%-50% recycled aggregate for the concrete used on site. In addition, the concrete and steel will be responsibly sourced with relevant certification	Concrete used for flat slabs and frames to be responsibly sourced, with relevant certification of BES6001 or ISO 14001. A high recycled content concrete will be specified for the building.	Metsec is proposed for Internal envelope, which has a very high recycled content and is also responsibly sourced. Outer layer of envelope is proposed to be brick which also has high recycled content.	Building services materials such as cabling, plumbing and insulation to be sustainably procured with EMS (e.g., ISO 14001) certificates.	Partitions will be from British Gypsum or similar suppliers with high recycled content and BES 6001/ISO 14001 certification. Finishes and ceilings will be responsibly sourced from supplier with minimum e.g.	White goods are the only relevant items, these will be procured responsibly.	All the timber used during construction will be responsibly sourced and will be required to have FSC/PEFC certification. Other construction stuff will need to be reused or	While specification of reused or recycled building elements could be challenging, the building materials will be specified with high recycled content and from supplier with right environmental certifications, in line with Sustainable. Procurement principles.	Specifying reused or recycled material for a development of this description is very challenging, due to lack of a stablished supply chain and lack of testing and standards for reused materials that would enable the design team to specify such item reliably.	A sustainable procurement plan to be prepared for the project. The design team will specify responsibly sourced materials with high recycled content and will include the requirements in the tender document.	The percentage recycled material within the materials used in the building will be calculated and compared with the design stage. In addition, the percentage

	Site	Substructure	Super-structure	Shell/Skin	Services	Space	Stuff	Construction Stuff	Summary	Challenges	Counter-Actions + Who + When	Plan to prove and quantify
		of BES6001 or ISO 14001.		All timbers to be FSC/PEFC Certified. Windows and glazing to be BES 6001 or ISO14001 Certified. All the insulations are proposed from the manufacturers with BES 6001 or ISO 14001 certifications. The majority of insulation is Rockwool which has a high level of recycled content.		ISO 14001 certification and at least 20% recycled content.		responsibly sourced.				of responsibly sourced materials will be calculated and reported. BREEAM Mat03 format could be used to report the latter.
	SECTION B: DESIGN TO ELIMINATE WASTE (AND FOR EASE OF MAINTENANCE)											
Designing for reusability / recoverability / longevity / adaptability / flexibility	The proposal will allow the site and the building to be reused in long term.	The piling system will last for a long time by nature and could support the building with the same use or other uses.	Framed structure as opposed to cellular design increases flexibility and functional adaptability of the apartments. The structure is designed to be resilient against flood risk and wind loading.	The building envelope is selected for longevity. SFS system for the building envelope is designed to be durable against climate change factors as well as local wear and tear and last as	Central plant with modular heating units that could be replaced independently from the distribution system after their end of life. The building services are designed to be	There is no internal load bearing walls in the apartments, therefore they will be adaptable to the need of future occupants and flexible in the layout.	White goods of high quality and with warranty will be specified Nothing else within the scope	The contractor will be required to ensure any temporary structures or equipment will be fully reusable and adaptable for future use on other sites.	The building is designed for a long-life span. Flexibility has been considered in design which allows the occupants to change the layout of their apartments during the time to match their need. In addition,	The proposed concrete frame structure will be difficult to disassemble in original format. Therefore, consideration has been given to separating the frame from other layers, and ensuring the frame itself is	Design is already in progress which includes the strategies for designing for adaptability and reusability. Further consideration will be given to opportunities to implement strategies for easing	The thought process and principles of design is recorded for future use. This includes transferring the building model and all its associated digital records to the future

	Site	Substructure	Super-structure	Shell/Skin	Services	Space	Stuff	Construction Stuff	Summary	Challenges	Counter-Actions + Who + When	Plan to prove and quantify
			While the concrete frame cannot be easily disassembled, its designed to provide future flexibility for the development with no load bearing partitions inside apartments.	long as building life span. Outer envelope is all brick with long durability and is a resilient material against climate change.	accessible through services. cupboards, the roof access, and risers such that they could be replaced easily.	The partitions are aligned with the columns which gives more flexibility in the layout.			the layouts and the structure allow future functional adaptability. This allows the development to be able to be modified and used for other uses such as student accommodation and care home.	designed for longevity.	disassembly of the building elements.	building owners and operators.
Designing out construction, demolition, excavation, industrial and municipal waste arising	Demolition on site is inevitable due to the conditions of the existing building, however waste hierarchy strategies will be in place to minimise demolition waste to landfill be re-using and recycling the materials arisen from demolition.	The proposed piling system will reduce the waste generated from excavation	The super Structure will not have significant construction waste associated to it. Pre-cast concrete sheer holds can be considered which will also have positive impact on cost & and programme and material storage on site. Staircases are to be precast.	Design for offsite construction and prefabricated materials such as SFS will reduce construction waste significantly. Modular design of envelop to use standard whole brick minimises waste from brick cut offs. Modular window frames, and prefabricated windows will reduce construction waste for the element.	Cables, ducts and pipes will be measured carefully in 3D models to ensure it's not overestimated.	The proposed development has a single storey basement to accommodate plant room and water attenuation systems. Optimisation of the space layout will reduce excavation. Bathroom pods and utilities cupboards are designed modular to allow for prefabrication. Modular layout to	The kitchen design will allow enough space for multiple bins for recycling. Nothing else within the scope of this project.	N/A	Follow WRAP waste hierarchy strategies have been followed to design out waste.	Limited number of take back schemes by suppliers and at additional capital cost. lack of practical knowledge across the industry specially in site work force.	Modular design by architect/structural engineers at detailed design; SFS is incorporated in the design, to be confirmed in detail at the next stage. Take back schemes and package recycling to be include in the tender pack and be requested of the contractor.	Lower level of waste generated on site will prove the success of the strategies implemented.

	Site	Substructure	Super-structure	Shell/Skin	Services	Space	Stuff	Construction Stuff	Summary	Challenges	Counter-Actions + Who + When	Plan to prove and quantify
						reduce the construction waste associated with off cut of internal walls/partitions, and other finishes. Allocate central waste storage for municipal waste and recyclable materials in line with Hillingdon waste management guidance						
	SECTION C: MANAGE WASTE											
Demolition waste (how waste from demolition of the layers will be managed)	Pre- demolition audit will be carried out before commencement of construction on site. Contractor to consider demolition waste in their SWMP with	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Pre-demolition Audit and SWMP to be produced by the contractor	The existing building is steel frame, which can be recycled very effectively. In addition, some graded aggregates will be used for piling mat. Other than that, opportunities to re-use demolition	Targets to minimise demolition waste to landfill shall be included in the Tender documents.	The details of site waste management plan as completed should provide quantities to prove the level of success.

	Site	Substructure	Super-structure	Shell/Skin	Services	Space	Stuff	Construction Stuff	Summary	Challenges	Counter-Actions + Who + When	Plan to prove and quantify
	opportunities to recycling. Contractor will have SWMP in place and record waste arising from demolition. Minimum 90% of waste from demolition shall be diverted from landfill.									waste is very limited		
Excavation waste (how waste from excavation will be managed)	The site is reasonably flat and there is no need for levelling or filling. The site is either occupied by the existing building or of hard landscaping, therefore there is no topsoil.	Excavation for piling and basement. The basement area is optimised to accommoda te plant room and rainwater harvesting system. Contractor will have SWMP in place and record waste arising from excavation. The	N/A	N/A	N/A	N/A	N/A	N/A	The SWMP to have a separate section for excavation waste, especially topsoil and require this to be treated separately to the general waste. The topsoil should not end up in landfill.		Include in the employer's requirements in the Tender documents Include in the SWMP to report on.	The details of site waste management plan as completed should provide quantities to prove the level of success.

	Site	Substructure	Super-structure	Shell/Skin	Services	Space	Stuff	Construction Stuff	Summary	Challenges	Counter-Actions + Who + When	Plan to prove and quantify
		excavation waste should not be mixed with the general waste and recovered separately										
Construction waste (how waste arising from construction of the layers will be reused or recycled)	N/A	The concrete and steel for the piles and pile heads should be ordered correctly to avoid surplus. Any waste from this stage could be stored to be used in hard landscaping or superstructure. Additional waste will need to be sorted and recycled in waste management facilities	Similar to piling, the material should be ordered based on the accurate estimation of what is needed. Any additional concrete or steel could be recycled at 100% rate offsite.	SFS will have very little waste as a result of off-site manufacturing. The façade brick should be ordered correctly based on the accurate estimation of needs. Any off-cuts from insulation panels should be used to fill other parts. Using off-cuts should be prioritised to ordering new materials. All packaging, remaining of bricks, insulation panels, etc. that cannot be reused elsewhere in the building should be	All packaging should be recycled off site responsibly or by the supplier. Not ordering additional material should help reducing the waste from building services. Take back schemes should be used for any remains of building services where possible.	Any remaining of partitions should be sent back to Manufacturer via take back scheme where possible as the material can be fully recycled. Other internal finishes including carpets should be ordered the right size to avoid generating waste. Plastering should be minimised. The contractor will aim to recycle more	N/A	The contractor will be made responsible to reduce the waste from their own activities and recycle and reuse on site or where possible for use on future sites.	SWMP to be produced by the contractor	Commitment from the contractors to meet targets	Include in the employer's requirements in the Tender documents	Monitoring the waste generated, set a target for maximum amount of waste generated on site for the contractor. Report on the waste generated on site (separately for demolition, excavation and construction)

	Site	Substructure	Super-structure	Shell/Skin	Services	Space	Stuff	Construction Stuff	Summary	Challenges	Counter-Actions + Who + When	Plan to prove and quantify
		due to lack of space on site.		recycled in the waste facility.		than 95% of the waste through waste management facilities.						
Municipal and industrial waste (how the design will support operational waste management)	N/A	N/A	N/A	N/A	N/A	N/A	Central Waste Storage shall be allocated for municipal waste in line with Hillingdon Local Authority waste collection. A space shall be allocated and Eurobins shall be specified for recyclable waste, a space shall be allocated for bulk waste	N/A	Allocation of facilities for recyclable waste. Have a waste management policy for the development	The site area limited, however enough space is allocated in line with council collection frequency and recycling strategy.	This shall be given a thorough consideration at detailed design stage and opportunities for more frequent collections will be sought in long term to achieve the recycling target based on Circular Economy Target. Achieving higher recycling rate will also depend on the council's efficiency of recycling. According to a study in August 2019, Hillingdon had the highest recycling facilities approval rate at 81%, as well as the highest resident recycling frequency at 94%.	

4.2 REPORTING FORMS FOR NUMERICAL TARGETS AND COMMITMENTS:

Applicants must demonstrate that they have considered opportunities to conserve resources by applying lean design principles and source materials sustainably. This information is captured in the ‘Bill of Materials’ form

TABLE 3 - BILL OF MATERIALS

Layer	Element	Material Quantity tonnes	Material Intensity kg/m² Gross Internal Area	Recycled Content (% By Value)	Reused Content (% By Value)	Estimated Recyclable Materials (kg/m²)	Estimated Reusable Materials (kg/m²)	Source of Information Examples Are Given Below)
Foundation	Piling	15,000	21	100%	0%	21	0	The building weight calculation is received from the structural engineers (see Appendix B). 100% of the steel in the structure and in the SFS will be from recycled content. The Reinforced concrete will be specified to have at 100% recycled content. Bricks can be taken away without breaking and used as reclaimed bricks. The pre-cast concrete will be recyclable.
	Excavated soil	2,250,000	3,138	100%	0%	3,138	0	
	4-Pile Pile Caps	138,950	194	100%	0%	194	0	
	3-Pile Pile Caps	121,600	170	100%	0%	170	0	
	Basement Slab	190,250	265	100%	0%	265	0	
	Liner Walls	91,125	127	100%	0%	127	0	
	Bases	164,445	229	100%	0%	229	0	
Floor Slabs	Ground floor – Eleventh floor	5,886,640	8210	100%	0%	8210	0	
Roof Slabs	Forth, Sixth and Ninth roof	404600	564	100%	0%	564	0	
External Walls	Facade	639,925	893	100%	0%	893	0	

Layer	Element	Material Quantity tonnes	Material Intensity kg/m² Gross Internal Area	Recycled Content (% By Value)	Reused Content (% By Value)	Estimated Recyclable Materials (kg/m²)	Estimated Reusable Materials (kg/m²)	Source of Information Examples Are Given Below)
Internal walls and Partitions	Core Walls	274,000	382	100%	0%	382	0	
Windows and Doors	Windows	445	1	100%	0%	1	0	
	Doors	300	0	100%	0%	0	0	
Frame	RC Columns	148750	207	100%	0%	207	0	

4.3 RECYCLING AND WASTE REPORTING FORM

The table below summarises the waste generation and recycling targets arising from the construction and operation of the building. The development is on a site with minimal demolition of hard landscaping at the car park. Majority of waste during the construction will be the on-site construction waste as defined in BREEAM 2018. The construction waste targets are based on those targeted for BREEAM assessment and has been agreed with the project team. The SmartWaste report and SWMP shall be provided by the contractors on site.

The municipal waste targets are based on the available benchmarks, and local authorities statistics with reference to WRAP and DEFRA guidelines.

Table 4 - RECYCLING AND WASTE REPORTING FORM

Category	Total Estimate	Of Which						Source of Information
	t/100m² Gross Internal Area (GIA)	Reuse		Recycle		Other disposal		
		% Reuse onsite	% recycled offsite	% Recycle onsite	% Recycle offsite	To Landfill (%)	To other management (%)	
Excavation Waste	17.88	100%	0%	0%	0%	1%	1%	The only excavation relates to piles, and basement. We have calculated the weight of the excavation waste using clay density of 1500/m3 for average of London clay and topsoil. This is a high-level estimation only.
Demolition	1236	0%	100%	0%	0%	0%	0%	The demolition includes the existing two storey building. The building is steel frame and shall be partially reused on site once crushed and partially recycled off site. The weight of the demolition will be calculated in the pre-demolition audit.
Construction	11	0%	95%	0%	0%	2%	3%	We are using BREEAM 2018 targets for construction waste as discussed in the Design team workshop.
	t/annum	Reuse		Recycle		Other disposal		
		% Reuse onsite	% recycled offsite	% Recycle onsite	% Recycle offsite	To Landfill (%)	To other management (%)	
Municipal Waste	135	0%	80%	0%	0%	10%	10%	0.43 t/person (residential). a total of 23,100 litres is provided in 21no 1100 litres eurobin for both recycled and general waste for residential units. BS5906:2005 Waste management in buildings - Code of Practice (Ref 16.10) DEFRA - Statistics on waste managed by local authorities in England in 2016/17 *Note: According to a study in August 2019, Hillingdon had the highest recycling facilities approval rate at 81%, as well as the highest resident recycling frequency at 94%. According to Statistics on waste managed by local authorities, Department for Environment Food and Rural Affairs, circa 10% of the food gets incinerated for producing energy from waste.
Industrial Waste (if applicable)	N/A	N/A	N/A	N/A		N/A	N/A	

4.4 CIRCULAR ECONOMY NARRATIVE – STRUCTURED AROUND NINE CE PRINCIPLES

The design team follow DEFRA guidelines and consider the Waste Hierarchy introduced by DEFRA to manage waste arising from the building. As shown in the figure below (Guidance on applying the Waste Hierarchy – DEFRA 2011).

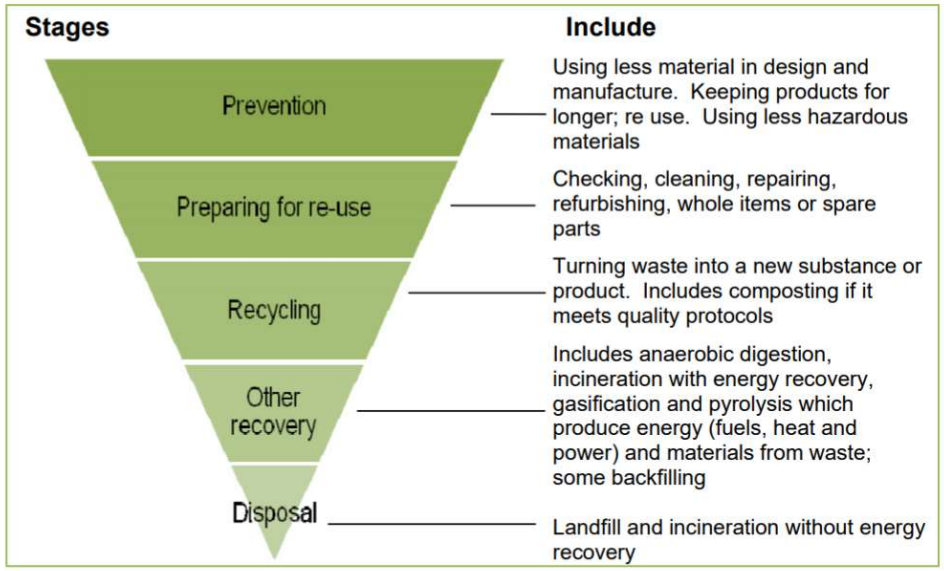


Figure 4 - Guidance on applying the Waste Hierarchy – DEFRA 2011

In line with the waste hierarchy, the design team took the following principals and sought opportunities towards materials efficiency and use less materials and reduce waste. The principals are included in the tender documents for the principal contractors to implement on site when appointed.

Table 5 - Circular Economy Narrative

Principle	Develop commitments to.
1. Conserve resources, increase efficiency and source sustainably	**1.1 Minimise the quantities of materials used** In line with WRAP and Defra guidance, the development will design-out waste through consideration of materials to promote reduce, re-use, and recycle of materials and resources and reduce waste to landfill. The design team considered opportunities from concept design stage and suggested the following solutions by adopting Design Out Waste and DEFRA guidelines. **Site Use and space efficiencies**- The proposal makes a more efficient use of the land by reusing it with a suitable density for the urban environment. The exiting site is occupied by a single storey building with a 2 storey block to the south in an art deco style. Both buildings are industrial and cannot be re-used due to the changing functional use of the development. The design proposes a multi- storey building using the site efficiently using stacking strategy. **Building Form** The proposed building form allows: • a modular design and flexible layout which optimises the use of materials. • optimise the footprint of the building compatible with the building's residential function. **MEP design** • The use of centralised plant to reduce use of materials. • The use of centralised plant reduces the total size required by accommodating a load diversity resulting in the use of less materials required to be Installed. This also reduces the number of maintenance visits to the property. • The use of centralised power distribution to reduce the quantity of cables (copper) required within the Installation due to the shared load and diversity.

Principle	Develop commitments to.
	Building Elements - **Foundations** - • The building foundation is on piling system. The right specification for piles result in a smaller volume of excavation waste arisings from the building and lower volume of concrete needed in comparison with other foundation solutions. • Using responsibly sourced concrete and steel will mean the manufacturing process is more environmentally friendly. • Using recycled aggregates from demolition on piling mat. **Structural frame –** The design team could use the incentive to optimise the substructure by undertaking Finite Element analysis, which helps with reducing the size of structure and reinforcements . **External walls and Facade –** • External building envelope was rationalised to provide structural continuity and more flexible floor lay out, also reducing additional material for structure. • SFS has been selected for the internal layer of façade based on benefits in weight, disassembly, and speed of construction. SFS façade (which is partially prefabricated) also means the use of materials and waste during the construction Is minimised. • Rational design of the external layer of façade to optimise the use of bricks throughout the project.

Principle	Develop commitments to.
	Roof – • The roof and roof terraces are proposed as the communal terraces which enables provision of green and communal spaces for the residence while optimising the use of land. • Setbacks of the floors to create communal terraces Is based on the modular grid which allows the continuity the structure and reduces the need for additional columns or structures. **Construction -** The contractors will have a sustainable procurement policy in place to procure construction products locally, and in a manner to need less deliveries. The contractor will have a Site Waste Management Plan (SWMP) in place to reduce waste and hence reduce delivery of waste to landfill. **1.2. Minimise the quantities of other resources used** **Operational consumption** - Measures are incorporated into design to minimise the use of operational energy and water consumption: • Site is within a good public network, sustainable transport measures suggested such as electric car charging points and cycle storage. This will encourage the building occupants to reduce carbon emissions from transport. • The form of the building is developed to take into account requirement for daylight and sunlight, whilst maximising the potential for sustainable interventions such as green roofs and communal gardens. The layout of the building allows for good use of solar gain, while provides a level of shading to avoid risk of requiring cooling in future.

Principle	Develop commitments to.
	• The proposed concrete frame has high thermal mass which reduces operational energy. A steel frame has no thermal mass, unlike a concrete frame. It is also more demanding in terms of fire protection and requires a significant amount of material to protect It, unlike a concrete frame which has inherent fire protection. Flat slab design selected to avoid downstands and hence additional mass. To use this feature consideration has been given to exposed concrete in some areas such as Plant rooms, this strategy will be more developed at stage 4. • SFS systems proposed for the external walls not only benefits in weights and materials efficiency, it also contributes to the waste reduction In construction (as a prefabricated material), hence reducing using of the resources on site. • The development will have central HVAC system which allows diversification of loads and therefore the plant will have smaller carbon footprint than having individual plants. The use of air source heat pumps will reduce the carbon Emissions due to better COP compared with other sources. • The proposed Photovoltaic panels will help in energy generation and reduction In grid energy consumption. • Water efficient sanitary ware shall be Installed, where whitegoods are to be Installed by the developer, water efficient dish washer and washing machines will be Installed to reduce the operational water consumption. The scheme Includes rainwater harvesting which is used as grey water recycling to serve the WCs within the building. **Construction consumption -** Materials are designed responsibly to have less impact on the environment. The contractor will source materials from EMS holder suppliers. Materials with lower carbon footprint will be prioritised so the impacts on embodied carbon emission from the construction is minimised. The principal contractor will implement procedures in place for water and energy management on site. Targets will be set for water and energy consumptions from the site activities; consumptions will be monitored and reported via reporting tools such as smartwaste.

Principle	Develop commitments to.
	Contractors will monitor CO_2 emissions arising from the site deliveries. And measures will be considered to reduce the number of deliveries to and from site. **1.3. Specify and source materials and other resources responsibly and sustainably** A sustainable procurement plan will be produced which includes sustainability aims, objectives and strategic targets to guide procurement activities. The Plan will include policies to procure construction products locally where feasible. The contractors will be appointed in a manner to ensure they have organisational environmental management system certificates such as ISO 14001, and they have policies in place to procure materials which are covered by Environmental Management System (EMS) or a recognised responsible sourcing certification scheme (RSCS). The development is aimed to have at least 10% of the superstructure and 20% of substructure and internal finishes to be responsibly sourced and suppliers will be asked for means of certificates as listed below: • BES6001(General) • CARES Sustainable Constructional Steel Scheme (Metals) • Eco Reinforcement Responsible Sourcing Standard, Steel Products for the Reinforcement of Concrete (Metals) • FSC, PEFC, SFI (Timber only) • Environmental Management Systems (EMS) certified to ISO14001 for key process and supply chain process or for supply chain process only (General) The following materials are considered as a minimum: • All temporary timber used on site (e.g. formation and scaffolding) will be legally sources. • All timber used for the project will be responsibly sourced and will be required to have FSC/PEFC certification • Floor concrete slabs are procured from suppliers with the BES 6001 certification

Principle	Develop commitments to.
	• Partitions will be from British Gypsum with BES6001 certification of from suppliers with ISO14001 certification as the minimum. • Brickwork and clay-based materials will be procured from suppliers with ISO14001 certification as the minimum. • Windows and glazing to be BES 6001 or ISO14001 certified.
2. Design to eliminate waste (and for ease of maintenance)	**2.1. Design for longevity, adaptability or flexibility and reusability or recoverability** The design team have incorporated measures in the design to limit degradation due to environmental factors. This includes designing the roof and façade to prevent water damage, ingress and detrimental ponding. Also, measures will be implemented to protect the vulnerable areas from damage, e.g. protection from damage from any vehicle or trolley movements in corridors, delivery and storage areas; and façade protection measures in the car park area. Water attenuation system will be installed to limit risk of damage from flooding. The brick construction used for the external walls, as a durable material with low maintenance needs. 9no. apartments are allocated to accessible flats and all other apartments are designed based on a modular system with no load bearing partitions, this allows all units to be easily changed to meet the requirements of a wheelchair user, becoming a fully accessible flat. In order to provide flexibility with regards to future changes in use, a framed structure is proposed. Reinforced concrete frame adopted as preferred solution to achieve flexible layout with large spans, thus facilitating future changes in use and/or layout of the building. Mechanical connection intervals proposed for internal walls to promote ease of disassembly and functional adaptability of the building.

Principle	Develop commitments to.
	2.2. Design out construction, demolition, excavation, and municipal waste arising In line with the benchmarks, the 103-flats residential development at 9 Nestle Avenue would have generated 23,100 litres. 21no 1100 litres eurobin is allocated in 2 zones (circa area of 50sqm) to accommodate for the waste generated and frequency of collection by the council. The bins will be labelled clearly for recyclable waste and refuse for occupants use The waste strategy is in accordance with West London Waste Plan..
3. Manage waste sustainably and at the highest value	**3.1. Manage demolition waste** Demolition accounts for demolition of the existing two storey building and hard landscaping. Strategies are in place and opportunities are sought to re-use the waste from demolition as the recycled aggregate on site where it is feasible. The developer has taken advice and information on the waste targets from CField Construction. All waste to be accumulated to the skip bin provided by POWERDAY. Recycling to be done mainly offsite and at Powerday facilities. And powerday to sort all construction waste for recyclables, then process the residuals to be used as renewable fuels. On this basis, the target for diversion from landfill for demolition is set at 95%.

Principle	Develop commitments to.
	3.2. Manage excavation waste Procedures are in place to reduce waste from excavation and Piling solution has been proposed for the foundation which reduced the generated waste as typically piles result in a smaller volume of arisings than other foundation solutions and also requires smaller volume of concrete and steel reinforcement. The arisen waste from excavation will be managed by the waste contractor responsibly. There is no topsoil as the current site is fully covered either by building or hard landscaping. On this basis, the target for diversion from landfill for excavation is set at 95%. **3.3. Manage construction waste** Waste management will be at the heart of material efficiency of the project. The Tender documents will state all the contractors and bidders shall provide a Resource Management Plan to promote resource efficiency and to prevent illegal waste activities. The contractors are asked to have a sustainable procurement plans in place to ensure all materials and resourced are sourced in a sustainable manner. The developer has reached the contractors who tend to work with - CField Construction, with regards to help with their waste management plan and provided a copy of their SWMP template, they will work with Powerday to collect and recycle waste. In line with the market standards and good practice construction, at least 95% of the construction waste shall be diverted from landfill.

Principle	Develop commitments to.
	3.4. Manage municipal waste The municipal waste is managed in line with Hillingdon policies. The London Borough of Hillingdon currently provides weekly refuse collection services for residents living in purpose-built flats, with separate collections of recycling undertaken on a weekly basis. The current design can accommodate target of 80% waste recycling based on the council performance on recycling and the allocation of bins to general or recycled waste within the refuse area. Occupants training and behavioural change may be needed to hit this target. Communal waste storage has been allocated for the residential part with Eurobins in line with the Councils guidelines. Separate containers are used for recycling. These communal Eurobin containers are sited around bin storage areas or other appropriate locations and are clearly labelled to distinguish them from refuse containers. The following items can be put into the recycling bins: • Mixed paper and card • Plastic bottles • Food tins and drink cans • Glass bottles and jars A wide range of other items can be taken to the West Drayton waste weekends centre, this free facility is available at weekends for Hillingdon residents.

4.5 PLANS FOR IMPLEMENTATION:

Building a project to implement all the circular economy principles is complex which requires inputs from all sectors within the industry, from developers, investors, design team, contractors and building users. A list of actions has been listed below for the project team to achieve targets and deliver towards a circular built environment.

The actions are split into two sections, short- and medium-term targets, and long term targets.

Short and medium term targets need actions from the project team; in order to ensure targets are met and actions are taken, the developer shall appoint a sustainability champion for the project to monitor the following actions and report to the developer.

Long term actions would require inputs from building managers, building users and policy makers.

SPECIFIC PLANS FOR SHORT- AND MEDIUM-TERM TARGETS

Table 6 - SPECIFIC PLANS FOR SHORT- AND MEDIUM-TERM TARGETS

Targets / Commitments	Who	What	When	How
Designing out waste and minimising the quantities of materials use	Developer	Selection of a Brownfield site	Project feasibility and business case	The site is an abandoned and worn industrial site which is being developed for residential purposes and to give life to the area.
	• Tate Hindle Architects • BWP	Flexible design	RIBA stage 2-4	Seek opportunities and methods to optimise the use of materials at each project ‘s key stages. Report targets and methods at each stage. Examples of opportunities currently discussed are:

	• Mecserve			• Modular design is considered at RIBA stage 2 – shall be followed throughout the project as the detailed design progresses. • Internal walls and partitions to be specified at detailed design stage. The internal walls shall have the mechanism to be disassembled. • Specification of prefabricated façade (SFS) • Propose central plants as oppose to separate systems for individual flats to reduce the use of space and materials.
	Contractor	Reduce energy and water consumption during construction	RIBA stage 5	• Set consumption targets and record and monitor water and energy consumption • Set procedures in place for materials delivery to the site, in a manner to reduce the number of site deliveries • Set procedures in place or minimise waste transportation from the site
Design for longevity and resilience	• Tate Hindle Architects • BWP • Mecserve	Resilience against climate change and design for durability	RIBA stage 4	• Undertake a risk assessment to identify impact of climate change and consider measures to protect external elements • Risk assessment to be undertaken to identify vulnerable areas against extreme weather and high traffic areas. Specify durable materials and/or specify protection measures to the vulnerable areas. • Durable electrical and mechanical services e.g. LED lighting and low maintenance HVAC systems to be designed at detailed design stage

	• Contractor	• Commissioning • Soft Landing and training	• Handover • Early Occupation	• The contractor shall put in place commissioning schedule to ensure the building performs as it was designed. Any defects shall be rectified. • Provision of training sessions for the building management team so that the building is run and performs as it's purposed for. • Seasonal commissioning for the first year of building occupation to ensure the systems perform to their capacity and therefore the systems last longer
Reuse/Recycle materials	• Tate Hindle Architects • BWP • Mecserve	20% of construction materials are responsibly sourced	RIBA stage 4	The design team to include commitments listed above in their specifications. A summarised example includes: • Re-use of recycled aggregates from demolition and excavation waste • Specify materials with high recycled contents • Specify materials from responsibly sourced suppliers
	Contractor		RIBA stage 5-6	Pre-demolition audit shall be undertaken prior to commencement of construction on-site and any opportunities to re-use materials shall be considered Principal contractor to have a project specific sustainable procurement plan. In line with the Plan: • Materials shall be sourced from suppliers with EMS certificates- priorities shall be given to BES 6001 • Materials shall be supplied locally where feasible

				• Re-use materials on-site or off-site where possible • Consider send-back materials with all their sub-contractors and suppliers
Waste Management	• Tate Hindle Architects •	Municipal waste to be recycled by 65%	RIBA stage 2-4	Allocate a dedicated space for recyclable waste, sufficiently sized and labelled for recyclable waste
	Contractor	Waste generated from: • Excavation: 17.88 t/100m^2 • Demolition: 1236 t/m2 • Construction: 11 t/m^2	RIBA stage 5	The contractor to generate a Site Waste Management Plan with targets and procedures to: • Minimise waste generation during construction • Re-use/recycle minimum 95% waste from excavation and demolition • Re-use/recycle minimum 95% waste from construction

PROGRAMME / METHOD FOR LONGER-TERM TARGETS

The longer-term targets are considered to be of those which will see the building through its life cycle and also those to be used for the descendant projects. It shall include but not be limited to the following:

- The building mangers are expected to implement measures to ensure maintenance of the building is undertaken regularly in a manner to help longevity of building systems.
- The municipal waste shall be managed, training sessions shall be organised for the residents to follow waste stream separations to increase waste recycling.

- The estate management to cooperate with the local authority with regards to recycling waste collection, and/or appoint waste companies to increase the level of waste recycling
- The building management and facilities management teams shall have circular economy principles embedded into their management and maintenance strategies. Resource efficiency and re-use/recycling shall be considered during maintenance and refurbishment of the building
- Building Management team shall monitor and record of all the targets and actions made for the project throughout the lifecycle of the building.
- Meadow Partners shall produce an organisational circular economy strategy which would include lessons learned of the project and all their future projects as an incentive to move the targets forward.
- Lessons learned shall be shared with the council to assist with the development and improvement of the Hillingdon policies in line with the London Plan and Circular Economy principles.
- A maintenance and accessibility strategy shall be provided for the building to set out strategies for maintenance and replacement of those building components which have shorter life expectancies. This shall include but not limited to windows replacement, internal walls, and services. i.e. Mechanical connection intervals proposed for internal walls to promote ease of disassembly and functional adaptability of the building. The plant rooms are designed and located in a place to give ease of accessibility and maintenance when the building is in operation.
- A building User Guide shall be provided to the residents with sections for internal refurbishment to follow the Circular Economy Principles.

4.6 END-OF-LIFE STRATEGY

Where possible, at the end of the life of the building, refurbishment of the building including either a light refurbishment or a major refurbishment needs to be considered. Where at the end of the life, the building is expected to be disassembled and demolished, following strategies are expected to be followed.

It is important that the building elements and materials will have materials passport so they can be identified and correctly disassembled for reuse elsewhere. The materials passports could be included in the building models for completeness and handed over to the new building operators /owners as needed.

There are however challenges that may prevent the strategy from being implemented for example:

- Some elements which are bonded together are difficult to be recycled, e.g. insulated plasterboards are difficult to segregate on site, or aerated concrete blocks are bonded with mortar and not suitable for recycling into concrete aggregate. Flooring systems are often one of the mostly intractable problems when designing for deconstruction, as they are often composite systems using steel and concrete to span large distance.

- There is additional cost and time associated with deconstructing buildings, rather than simply demolishing them. Therefore, it may go through value engineering at the time of demolition.
- Limited market for refurbished Mechanical & electrical items such as boilers, therefore services will rarely be re-used. There may be more possibilities to recycle them.

The following diagram suggests strategies for the end of life of the project.

Stuff	•soft strip out should take place carefully, sending the materials directly for re-use by the specialist strip-out companies.
Space	•Partitions will be disassembled and either sent to be reused on other projects, or sent back to the manufacturer to be recycled. • carpets and false ceiling should be treated in the same manner.
Services	•services would have changed every 20-30 years. it is important to complete a survey for the services to see if they can be reused in their original format depending on when last they were replaced. •When building services are to be removed, the metal part which normally constitute the majority of building services can be recycled. the plastic will need to be considered for reuse before recycling.
Skin	•The skin of the building should be disassmbled and the steel frame should be considered for reuse in its original form in another development. the windows could also be disassembled for reuse. alternatively both of these elements could be fully recycled. The insulation can be reused in place in the same format, alternatively they could be sent direclty to insulation manufacturing facility to be recycled in the process. Briks could be reused in the same format if demolished carefully, or used as aggregate.
Structure	•The building structure could be used in-situ if the building is to have a major refurbishment.

APPENDIX A:

A1: SITE WASTE RESOURCE MANAGEMENT PLAN

The template site waste management plan is sourced from CField Construction, who is working as the principal contractor with Meadow Partners on some other projects.

Site Waste Management Plan

(Insert Project Name)

Rev.	Author	Reviewed By	Approved By	Issue Date	Status

Record of Amendments

Revision No.	Page / Reference	Description of Amendments	Issued By:	Issue Date:

Contents

1.0 Introduction to the Site Waste Management Plan

Declaration for Waste Management

This Site Waste Management Plan (SWMP) is prepared with reference to the following UK Acts and Regulations:

- The Site Waste Management Plans Regulations 2008
- The Joint Municipal Waste Management Strategies (Disapplication of Duties) (England) Regulations 2007
- The Waste Electrical and Electronic Equipment (Waste Management Licensing) (England and Wales) Regulations 2006
- The Waste Management Licences (Consultation and Compensation) Regulations 1999
- The Waste Management Regulations 1996

There are various different waste management regulations in place for the UK. All relevant regulations will be in place, for the jurisdiction in which CField are working.

We confirm that we will take all reasonable steps to ensure that all waste from the site is dealt with in accordance with the waste duty of care as stated from the above mentioned Environmental Protection Act and Regulations, and materials will be handled efficiently and waste managed appropriately.

This SWMP attempts to identify the waste generated during the construction of this project and identifies what materials can be:

- Re-used on site
- Re-used off site
- Recycled on site
- Recycled off site
- Disposed off site to a Waste Transfer Station or approved facility
- Disposed in a approved land fill site

Any waste which cannot be Reused or Recycled on or off site will be removed by a registered waste collector to a Transfer Station or approved facility to be sorted or disposed off in the correct manner either by recycling or where all other options are exhausted dispatched to an approved land fill site.

The Pre-Construction SWMP have been previously prepared, and now further developed by CField Construction Ltd for inclusion within the Construction Phase Plan where it will be reviewed and maintained throughout the duration of the contract.

This plan will be held on site in the Project Manager's (PM) office during the construction phase of this project where it will be available for inspection.

Once the contract has been completed a copy shall be presented to the client with the O&M Manuals and a further copy will be retained by CField Construction.

The appointed contractor will within 3 months of the completed contract summarise the contents of the plan and confirm that the plan has been monitored, reviewed and updated with any conclusions made annotated at the end of the document.

2.0 Project Details

Site Address	Project Name and Address
Description of Works	
Enabling Works	
Client	
Client's Agent	
Project Manager	
Principal Contractor	CField Construction Tower Bridge Business Centre, 46-48 East Smithfield, London E1W 1AW Contact: Michael Bohan 0207 078 4364 Contact – name / email
Architect	
Quantity Surveyor	
Structural Engineer	
Principal Designer	

3.0 Description of Project

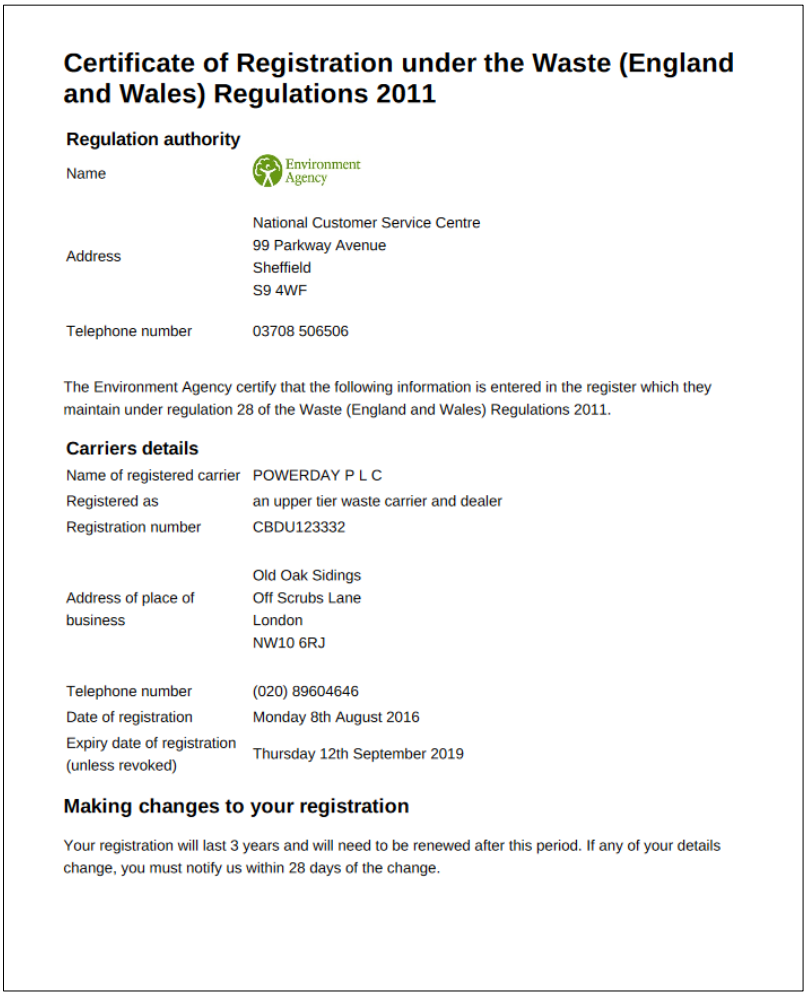
Description of project.

The main areas of the works include

The following areas have been assessed and specific considerations have been given:

4.0 Waste Management on Site

- All waste to be accumulated to the skip bin provided by POWERDAY.
- Recycling to be done offsite and at Powerday facilities. And powerday to sort all construction waste for recyclables, then process the residuals to be used as renewable fuels.



Certificate of Registration under the Waste (England and Wales) Regulations 2011

Regulation authority

Name	Environment Agency
Address	National Customer Service Centre 99 Parkway Avenue Sheffield S9 4WF
Telephone number	03708 506506

The Environment Agency certify that the following information is entered in the register which they maintain under regulation 28 of the Waste (England and Wales) Regulations 2011.

Carriers details

Name of registered carrier	POWERDAY P L C
Registered as	an upper tier waste carrier and dealer
Registration number	CBDU123332
Address of place of business	Old Oak Sidings Off Scrubs Lane London NW10 6RJ
Telephone number	(020) 89604646
Date of registration	Monday 8th August 2016
Expiry date of registration (unless revoked)	Thursday 12th September 2019

Making changes to your registration

Your registration will last 3 years and will need to be renewed after this period. If any of your details change, you must notify us within 28 days of the change.

POWERDAY
Innovative - Recycling - Solutions

Separate collections and the application of TEEP

Regulations requiring separate collections of paper, plastic, metal and glass except where it is not 'technically environmentally and economically practicable' (known as TEEP') came into force on 1st January 2015. The aim of this legislation is to increase the quantity of material presented for recycling and to increase the quality by reducing contamination.

Under the new legislation, waste collectors are required to collect paper, plastic, metal and glass separately from general waste, offering their customers separate collections for each individual material unless it is not TEEP to do so. Commingled collections are permissible providing the TEEP test is applied and materials are 'appropriate to meet the necessary quality standards for the relevant recycling sectors'. Once these materials have been collected separately it is not permissible to mix them with other wastes. If waste collectors decide it is not TEEP to offer separate collections, they need to retain evidence to support the rationale for their decision.

The Waste Framework Directive 2008 which sets out this requirement was transposed into UK law in the Waste (England and Wales) (Amendment) Regulations 2012. For more information, visit www.legislation.gov.uk/uksi/2012/1889/introduction/made.

Meeting the legislative requirements

Waste collectors need to be able to demonstrate that they are taking reasonable measures to meet the new requirements and to produce evidence in the way of an audit trail if requested by the Environment Agency who is responsible for enforcement of the new legislation in the UK.

To meet these requirements, Powerday offers separate collections of paper, plastic, metal and glass to customers where practical to do so, this may include separate collections for one or multiple materials or commingled collections. In reviewing whether to offer separate collections, we take into account factors including your site location and constraints, the cost of different collection methods and the volume of individual materials that you produce.

Where it is not TEEP to offer separate collections, our high quality recycling and recovery processes ensure that materials that are collected together and separated at our Materials Recycling Facilities are 'appropriate to meet the necessary quality standards for the relevant recycling sectors'.

The site set-up information pack that you receive from Powerday prior to the introduction of our services will contain information regarding the decision made in relation to separate collections for your site. We periodically review our collection methods to ensure that they meet the TEEP and necessary quality tests and that we remain compliant with the legislation.

If you have questions relating to the TEEP regulations, please contact us at info@powereday.co.uk.

5.0 Forms and Check Lists

Site Waste Management Plan Check Sheet

Refer to the Site Waste Management Plan Check Sheet – Appendix A

Site Waste Management Data Sheet

Refer to the Site Waste Management Data Sheet – Appendix B

Skip Removal Form

Skip removal forms to be maintained by the project team on site.

CField will employ a registered waste collector – to remove the waste from site.

Where appropriate the carrier will transport the waste to their depot for sorting or dispose of unrecyclable material to a registered disposal sites or facility as listed in appendix B of the permit.

SWMP Finding and Conclusions

To be completed by the Project Manager on completion of the project and included in the projects Health and Safety File information for onward transmission to the Principal Contractor and Client.

Appendix A SWMP checklist

Project Stages		Questions to consider	Tick if 'Yes'	Comment: If 'yes', what action have you taken/do you propose to take? - If 'no', why not?
Policy	1	Has your organisation adopted a waste management policy?	√	Yes, our waste management policy is part of our company Environmental Management System (EMS), which is certified to ISO 14001:2004.
	2	Has the client signed the Site Waste Management Plan?	☐	The client will sign the SWMP as per agreed date (To be agreed with client) due to completion of the SWMP.
	3	Have relevant sub-contractors producing significant wastes steams been identified?	☐	This will be developed as packages are awarded.
	4	Have the identified sub-contractors signed the Site Waste Management Plan?	☐	This will be developed as packages are awarded.
Procurement	5	Has a careful evaluation of materials been made so that over-ordering and site wastage is reduced?	☐	This is to be developed as work progresses.
	6	Has full consideration been given to the use of secondary and recycled materials?	☐	Yes, there is little scope to use recycled material at this stage.
	7	Is unwanted packaging to be returned to the supplier for recycling or re-use?	√	Yes, and this will be developed with more details as packages are awarded.
	8	Can unused materials be returned to purchaser or used on another job?	√	Yes, where possible all excessive materials are to be returned to manufacturer.
Project Planning	9	Has responsibility for waste management planning and compliance with environmental legislation been assigned to a named individual at both main contractor and identified sub-contractors?	√	Project Manager / Site Manager will be overall responsible for waste on site. Each subcontractor Forman will be responsible for their companies waste.
	10	Has a project programme been developed to include likely waste arising (how much, when, and what types)?	☐	Not at Present due to the procurement route of this contract and some aspect of designs to be yet finalised.

	11	Has an area of the site been designated for waste management, including segregation of waste?	√	Yes, as per our site layout plan.
	12	Have targets been set for the different types of waste likely to arise from the project?	√	Yes, industry standard targets have been set for each material.
	13	Have measures been put in place to deal with expected (and unexpected) hazardous waste?	√	Yes, fuel clean up kits / spill kits are on site. Our skip company is licensed to carry certain hazardous waste.
	14	Has disposal of liquid wastes such as wash-down water and lubricants been considered?	√	Yes, no wash-down permitted on site, lubricants will be disposed off in the recommended manner.
	15	Where relevant, has a discharge consent been obtained from the Agency?	□	N/A
	16	Has agreement been sought from the sewerage company for trade effluent discharge?	□	N/A
	17	Have opportunities been considered for re-use of materials on site?	√	Yes, some parts of the excavated soil is to remain on site for landscaping subject to final approval from client's representative.
	18	Have opportunities been considered for on-site processing and re-use of materials?	√	Yes, where practicable material arising will be reused within the project including crushing of bulk material and backfill to formation subject to final approval from Engineer. Some material will be surplus to requirements and transported off site for reuse or ultimate disposal.
	19	Have opportunities been considered for reprocessing materials off-site?	□	We are unaware of opportunities at this time, more analysis and evaluation will be conducted later to determine this.
	20	Have you considered what are the most appropriate sites for disposal of residual waste from the project?	□	To be developed by the appointed contractor.
	21	Are there opportunities for reducing disposal costs from waste materials which may have a commercial value?	□	This is to be developed as the work proceeds.
	22	Has the information been provided by the design team indicating materials and	√	Waste management proposals provided by the design team:

		methods adopted to reduce on site Waste		1. Brick & concrete from demolished buildings to be crushed on site and used for site roads, piling mat and fill 2. Cut and fill section of building designed to minimise volume of material needing to be removed from site 3. Concrete specifications include cement replacement product and use of recycled aggregates for non visual concrete 4. Structural timber, steel; and joinery elements prefabricated off site 5. Ample contractor's site compound provided to allow for effective site waste management processes. 6. Foundations and substructure are designed around existing land profiles to minimise the volume of excavated material produced
Site Operations	23	Has responsibility for waste management on site and compliance with environmental legislation been assigned to a named individual?	√	Project manager and Site manager will be overall responsible for the site waste.
	24	Have toolbox talks been planned for all site personnel about waste management on site?	√	Yes, included in site induction.
	25	Are selected waste materials segregated to allow best value to be obtained from good waste management practices?	□	This will be developed as the project progresses.
	26	Are containers/skips clearly labelled to avoid confusion?	√	Yes, skips are to clearly labelled.
	27	Are Duty of Care procedures complied with, including provision of transfer notes and checking authorisation of registered carriers, registered exempt sites and licensed waste management facilities?	√	Yes, we have environmental procedures in place to ensure compliance.
	28	Are any checks made that excavation waste is received at the intended site?	□	Random checks will be adopted as and when necessary.

	29	Is implementation of agreed waste management procedures monitored?	☐	Reviews required monthly.
	30	Are reports regularly produced regarding waste quantities and treatment/disposal routes, and on costs incurred?	☐	To be reviewed monthly.
	31	During site operations, are barriers to good waste management practice considered and noted for incorporation into the post-completion review?		To be developed as contract progresses.
Post Completion	32	Has a final report of use of recycled and secondary materials, waste reduction, segregation, recovery and disposal, with costs and savings identified, been completed?	☐	Not yet at this stage, will be developed later.
	33	Has the final report been signed by the relevant sub-contractors and the client?	☐	Not yet at this stage.
	34	Have key waste management issues been considered for action at future projects?	☐	Not yet at this stage.

Appendix B SWMP Forms

Project Name:	
Address:	
Main Contractor:	CField Construction Ltd
Responsible person:	

Types of waste arising from the works forecast during design phase -- -- Quantity in M^3							
Material	**Reused**		**Recycled**		**Sent to**		
	On site	**Off site**	**On site**	**Off site**	**Recycling facility**	**WML exempt site**	**Disposal to land fill**

INERT							
ACTIVE							
- Rubbles							
- Scrap metal / steel							
- Timber pallets							
- Plastics							
HAZARDOUS							
Design forecast total							

Appendix C SWMP Findings and Conclusions

To be completed by the Project Manager and signed at the end of the project

We confirm that this plan has been monitored and updated throughout the contract duration to ensure the work has been progressed in accordance to this plan

Signed: - **Name printed**

Dated: -

See also the attached report indicating the quantity of waste material produced against that envisaged during the design phase of the project

(LIST ANY FINDINGS WITH ANY EXPLANATION)

APPENDIX B:

B1: BUILDING WEIGHT CALCULATION (LOAD TAKE-DOWN)

Below is the calculation of building weight completed by structural engineers, BWP.

Bellamy Wallace Partnership
Consulting Structural Engineers

Grange House Bearsted Green Business Centre
The Green, Bearsted, Maidstone Kent ME14 4DZ

Tel:01622 630675

job No.
K1890

9 Nestles Ave, Hayes
Bill of Quantities

WORK ELEMENT	MATERIAL VOL (m^3)	MATERIAL QUANTITY (kg)	AREA m^2
DECONSTRUCTION			
DEMOLITION	123	1,238,000	1300
EXCAVATIONS			
PILING MAT	2250	2.250.000	1300
FOUNDATIONS			
4 PILE CAPS	55.58	138950.00	
3 PILE CAPS	48.64	121600.00	
BASEMENT SLAB	76.10	190250.00	217
LINER WALLS	36.45	91125.00	
BASES	65.78	164445.00	
FLOOR SLABS			
GRD	244.54	611342.50	865.8
FIRST	495.28	1238200.00	1100.63
SECOND	252.93	632325.00	1011.73
THIRD	252.93	632325.00	1011.73
FOURTH	206.34	515850.00	825.39
FIFTH	205.73	514325.00	822.92
SIXTH	143.34	358350.00	537.38
SEVENTH	146.16	365400.00	584.66
EIGHTH	143.84	359600.00	575.38
NINTH	91.32	228300.00	365.3
TENTH	90.54	226350.00	362.17
ELEVENTH/ROOF	81.71	204272.50	326.83
ROOF SLABS			
FOURTH ROOF	46.11	115275.00	186.44
SIXTH ROOF	64.34	160850.00	257.37
NINTH ROOF	51.39	128475.00	205.58
CORES AND WALLS	365.57	913925.00	
COLUMNS	59.50	148750.00	
TTOTAL kg		8060285.00	
TOTAL TONNES		8060.29	

APPENDIX C: APPENDIX C:

C1: WHOLE LIFE CARBON ASSESSMENT SUMMARY

EXECUTIVE SUMMARY

Mecserve Ltd have been appointed by Healey Development Solutions (Hayes) Ltd to carry out the Whole Life-Cycle Carbon (WLC) assessment at RIBA Stage 2 for the proposed redevelopment of 9 Nestles Avenue, in the London Borough of Hillingdon.

The development proposal planning application seeks the demolition of the existing building and redevelopment to provide a building up to 11 storeys, comprising 103 residential units, with associated landscaping, access, car parking and cycle parking. The site forms part of the wider masterplan for mixed use residential led redevelopment.

This report outlines the scope of the WLC assessment, summarises the key input data and presents the analysis outcome in terms of both embodied and whole life-cycle carbon emissions, in line with Policy SI2 'Minimising greenhouse gas emissions' of the Publication London Plan (December 2020) and following GLA's WLC assessment guidance. Finally, the study explores opportunities to reduce the environmental impact of the proposed scheme at different stages throughout its life. This report should be read in conjunction with the WLC assessment template submitted to the GLA.

The WLC has been carried out in line with the RICS Professional Statement 'Whole Life Carbon Assessment for the built environment' (November 2017) and is consistent with the BS EN 15978:2011 'Sustainability of construction works. Assessment of environmental performance of buildings. Calculation method' principles and methodology.

The assessment was carried out using the One Click LCA (OCL) calculation tool for performing whole life-cycle carbon assessments (WLC) and life-cycle cost (LCC) analyses, which is fully compliant with EN 15978 standard and approved by BRE as IMPACT-compliant.

This RIBA Stage 2 WLC sets the embodied carbon baseline for 9 Nestles Avenue and explores opportunities to reduce carbon emissions. The key findings of the RIBA Stage 2 WLC are summarised in the below table in terms of both Embodied Carbon and Whole Life Carbon.

Table 1 RIBA Stage 2 Embodied Carbon & Whole Life Carbon

Summary	$kgCO_2e$/sqm GIA
Embodied carbon to practical completion [PC-CO2e], stages [A1-A5]	439
Embodied carbon over the life cycle [LC-CO2e], stages [A]-[C], excl. [B6-B7]	754
Whole life carbon [WL-CO2e], embodied [LC] & operational [B6-B7]	1,637

According to the WLC results (Figure 2), the key driver of the development's whole life cycle carbon footprint is operational energy use [B6] by 53%, followed by the superstructure materials (19%) and MEP systems (12%), when the impact of sequestered carbon is not considered. MEP systems and superstructure frame are identified as the most carbon intensive building elements, followed by facades and finishes (Figure 3).

The WLC calculation results show that a 5.8% reduction has been achieved in embodied carbon due to the following key actions implemented in the design proposal:

- Targeting 40% cement replacement for concrete elements of the substructure;
- Use of rockwool insulation having low embodied carbon.

Additional savings – a further reduction of 3.5% – can be also achieved by implementing all the saving opportunities identified in Section 6 of this report. For more information, please also refer to the GLA WLC assessment template submitted together with this report.

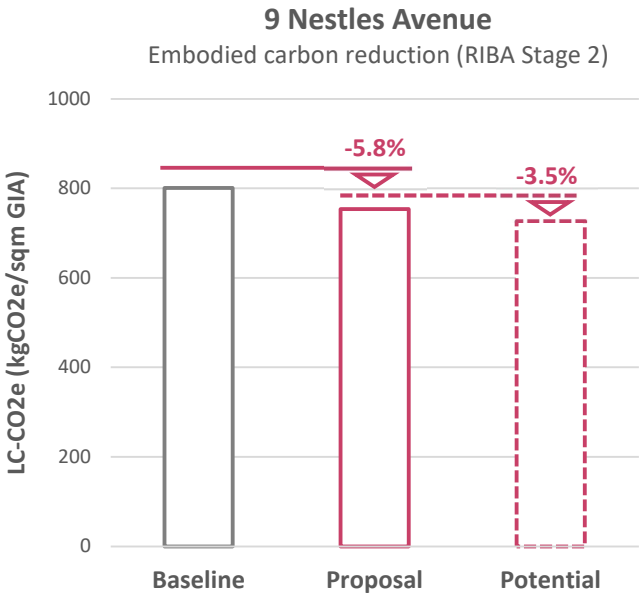


Figure 1 RIBA Stage 2 Baseline vs Potential embodied carbon

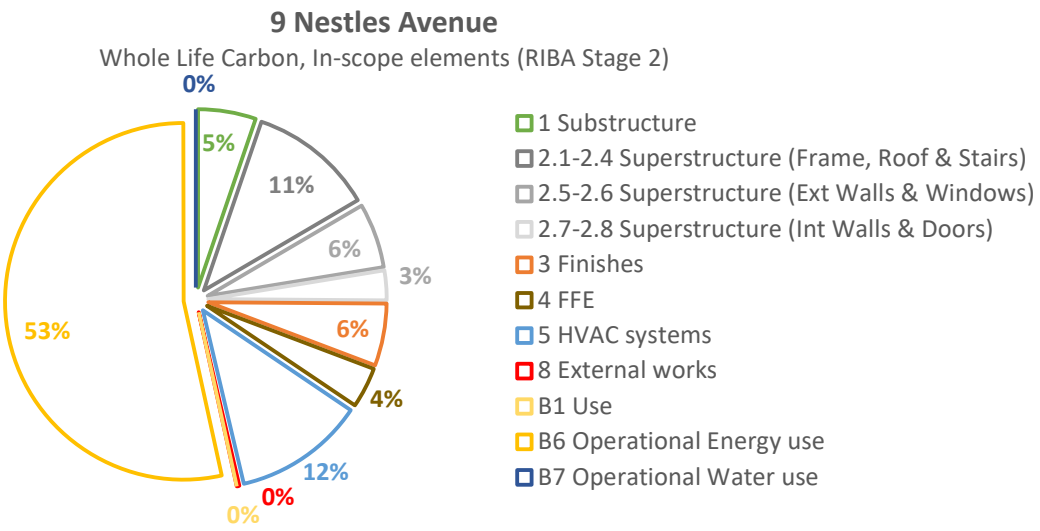


Figure 2 RIBA Stage 2 Whole Life Carbon; In-scope elements breakdown (excl. biogenic carbon)

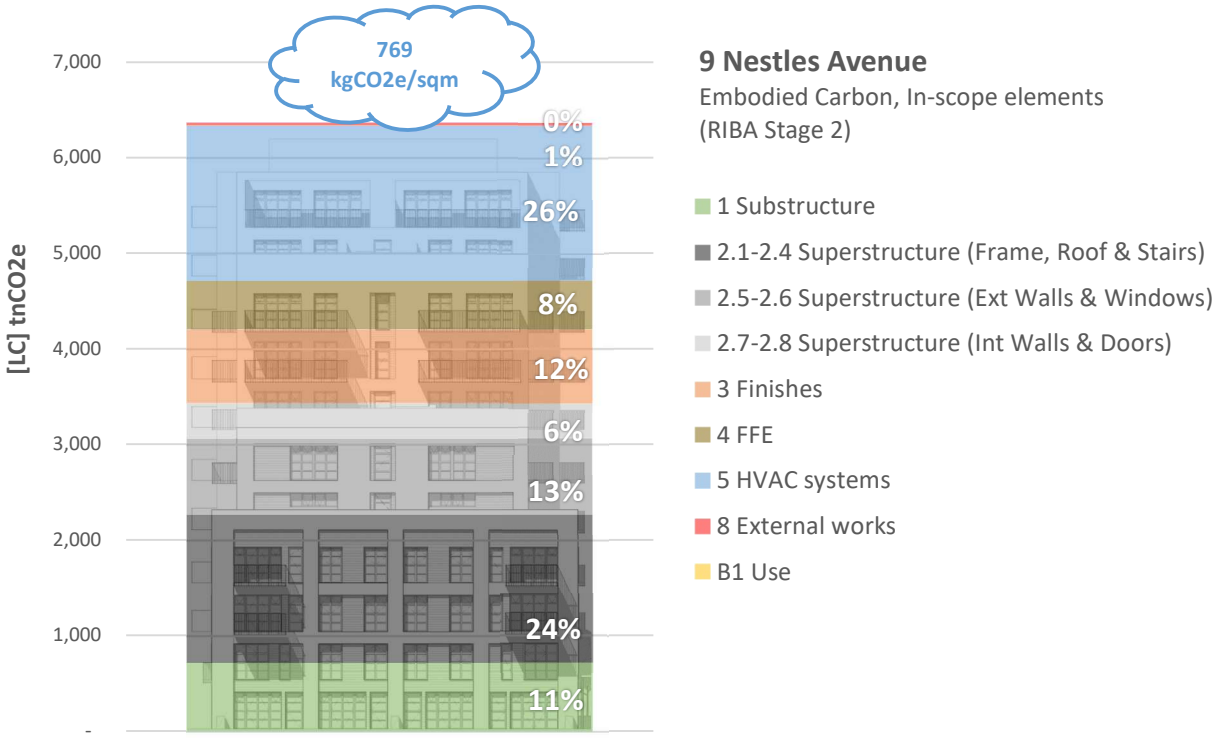


Figure 3 RIBA Stage 2 Life Cycle Carbon; in-scope elements breakdown (excl. biogenic carbon)