Avondale Drive Estate, Hayes, Hillingdon, London UB3 3PW

Circular Economy Statement, Post-Construction Report

21st November 2025 | Revision 01

APPROVAL FORM AND REVISION SHEET

This document has been prepared on behalf of Higgins Group.

Quality Information

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Revision History

Revision	Date	Details	Authorised	Name
00	17.11.2025	Draft Issue for comments	JC	Jacqui Clarke
01	21.11.2025	Final Issue	JC	Jacqui Clarke

This document is presented by calfordseaden LLP in respect of Phase 1a of the development Avondale Drive Estate, situated in Hayes within the London Borough of Hillingdon and may not be used or relied on by any other person or by the Client in relation to any other matters not covered specifically by the scope of this report.

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This document uses all CO_2 and materials calculations generated by the Circular Economy Assessment (CE) 'One Click' software, and therefore all outputs for the report are based on this data and associated software computation.

The report is completed using the Circular Economy 'One Click' version current at the time of the report.

***NOTE** : Synergy completed the earlier stages and 'detailed planning stages' of the circular economy assessments, the information gathered during those stages was not available to calfordseaden at the time of conducting this post-construction assessment. As a result, several assumptions have been made, and some early-stage targets, presumably established by Synergy, could not be verified or incorporated into this report. Where data gaps exist, industry standard assumptions have been applied and are clearly identified within the relevant sections.*

Contents

9. EXECUTIVE SUMMARY

9.1. SITE DESCRIPTION

This section provides a non-technical summary of the circular economy approach and commitments for the development at Avondale Drive Estate, in the London Borough of Hillingdon (LBH).

The existing site, (approx. grid ref: 51.510516°N, 0.406780°W), is predominantly a residential area and is bordered by residential properties along Avondale Drive to the south, the A312 dual carriageway to the east, and Minet Junior School and its grounds to the north and west. This phase of the development involved the demolition of a small selection of garages. However, the multiphase development involved the demolition of three, thirteen storey suburban tower blocks, accommodating 144 homes and two multi-level carpark structures. The site is situated close to the centre of London Borough of Hillingdon (LBH) and adjoins a number of existing neighbourhoods and a network of green spaces across the Borough [1].

This report will focus on Phase 1a of the Avondale Drive Estate development (Figure 2) and will comprise of 30 residential units, varying from 1 bed to 4 bed dwellings.

Figure 1: *Site Location in Hayes- PTE12)*

9.2. SCOPE OF CIRCULAR ECONOMY STATEMENT

This post-construction Circular Economy Statement (CES) is based on material profiles and specifications obtained directly from the relevant manufacturers and suppliers. Environmental Product Declaration (EPD) data have been input into One Click LCA, incorporating 'real life' transport distances and predicted service life of products in accordance with the RICS guidance.

This assessment provides an 'as-built' verification of the development's Circular Economy performance at RIBA Stage 6. The carbon performance has been carefully monitored throughout the design process by continuously gathering relevant information and data from the contractor, ensuring a comprehensive and accurate representation of the project's circular economy performance.

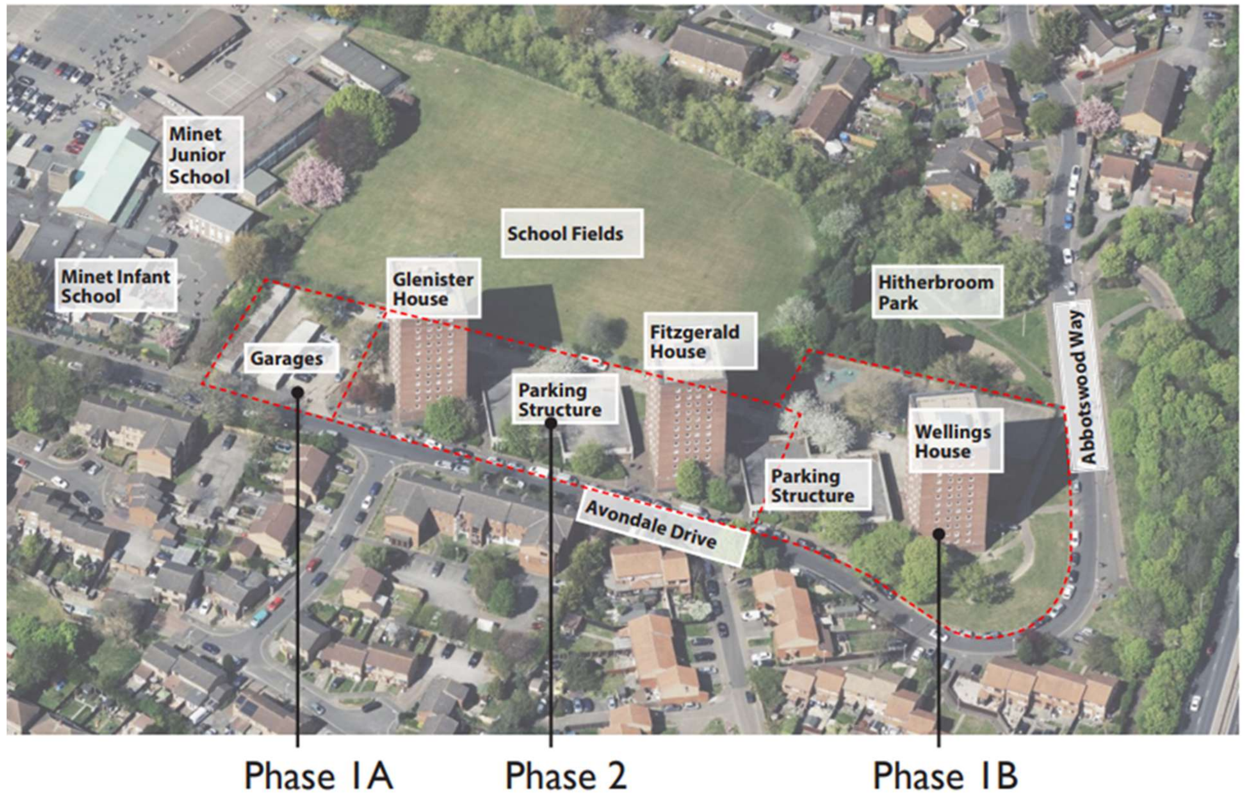

Figure 2*: Labelled phases on the Avondale Drive Estate- PTE [2]*

9.3. SUPPORTING DOCUMENTATION

- Revit Model-AVD-PRP-ZZ-ZZ-M3-A-00111– PTE Architects [3]
- Avondale Drive Estate Design &Access Statement -PRP Architects [1]
- Avondale Drive As Built SAPS- Energist [4]
- Site Waste Management Plan [5]
- Illustrative Demolition and Phasing Strategy [14]
- Outline Construction Logistics Plan [15]
- Pre- Demolition Audit [16]
- Refuse Strategy Block A [17]
- Design & Access Statement [1]
- Post Construction Whole Life Carbon Assessment Report [21]
- Avondale Drive Estate- Circular Economy and WLC [24]

9.4. RELEVANT PLANNING POLICIES

The relevant planning policies are the:

- HM Government National Planning Policy Framework (NPFF), December 2023 [8]
- GLA Authority, London Plan, March 2021 [9]
- Circular Economy Statements, London Plan Guidance, March 2022 [10]
- LBH Local Plan Part 2, Development Management Policies, January 2020 [11]
- The Strategic Climate Action Plan, March 2021 [12]
- West London Waste Plan, 2015 [13]

This CES was completed at the conclusion of RIBA Stage 6 to provide the applicant, design team, and LBH Council with a final evaluation of the circular economy performance of the development: Phase 1a Avondale Drive Estate.

1.5. SUMMARY OF CIRCULAR ECONOMY COMMITMENTS

1.5.1. CONSERVE RESOURCES

The scheme seeks to ensure that material and resource use is minimised as far as possible, in line with the first principle of circular economy: conserve resources, increase efficiency and source sustainably. Focus has been given to minimising the quantities of materials and other resources used, as well as ensuring materials will be sourced responsibly and sustainably during construction.

1.5.2. ELIMINATE WASTE

The scheme seeks to address this second core circular economy commitment by ensuring the design is flexible and adaptable, thereby increasing the building's lifespan. Through considering the design for ease of maintenance, reusability and recoverability the scheme considers the waste elimination focus. This is similarly addressed through the consideration of designing out construction, demolition, and excavation waste arisings.

1.5.3. MANAGE WASTE SUSTAINABLY

The development seeks to implement the third core principle of circular economy by carefully managing demolition, construction, and municipal waste to maximise recycling and reuse and minimise waste sent to landfill.

1.6. CIRCULAR ECONOMY PRINCIPLES

Transitioning to a circular economy offers significant opportunities for meeting the needs of a growing population and reducing the adverse impacts on the environment, by re-thinking the way that we design our homes and buildings and consume resources.

A circular economy is a new economic model that stands in opposition to the current linear economy. Within a linear economy, materials are mined, manufactured used and thrown away. A circular economy seeks to keep resources in use and retain their value as shown in *figure 3.*

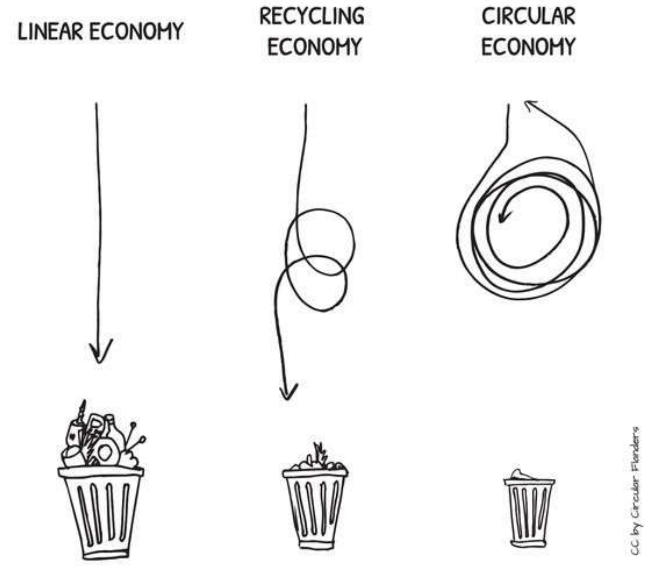

Figure 3: *Linear, recycling and circular economic models-GLA [10]*

The built environment sector is the largest user of materials and generator of waste in the economy. In London alone the sector accounts for 54% of waste and consumes 400 million tonnes of material each year. There are clear environmental benefits to adopting a circular economy approach in the building environment, including sending less waste to landfill and reducing the use of virgin materials. However, there are also social and economic benefits.

By implementing circular economy principles developers can protect their business from against the rising costs of materials and waste disposal. Figure 4 demonstrates how the core principles of circular economy are compared against current practice.

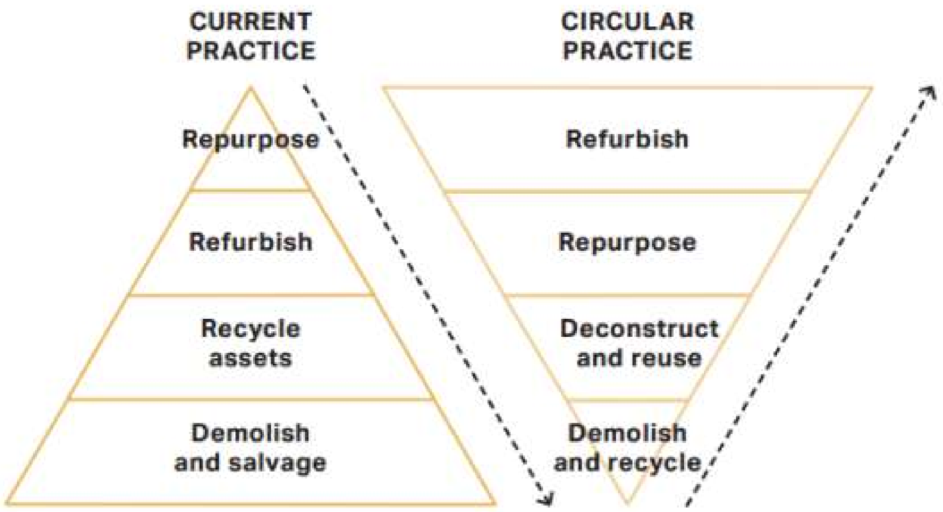

Figure 4*: Current practice versus circular practice [10]*

This report is structured in accordance with the following core guiding principles, as identified in the GLA's 'Circular Economy Statement Guidance, March 2022 [2].

The six circular economy (CE) principles, which should be a fundamental part of the building design process, are:

1. building in layers – ensuring that different parts of the building are accessible and can be maintained and replaced where necessary
2. designing out waste – ensuring that waste reduction is planned in from project inception to completion, including consideration of standardised components, modular build, and reuse of secondary products and materials
3. designing for longevity
4. designing for adaptability or flexibility
5. designing for disassembly
6. using systems, elements or materials that can be reused and recycled.

These core principles are considered alongside the circular economy commitments as illustrated in *figure 3.*

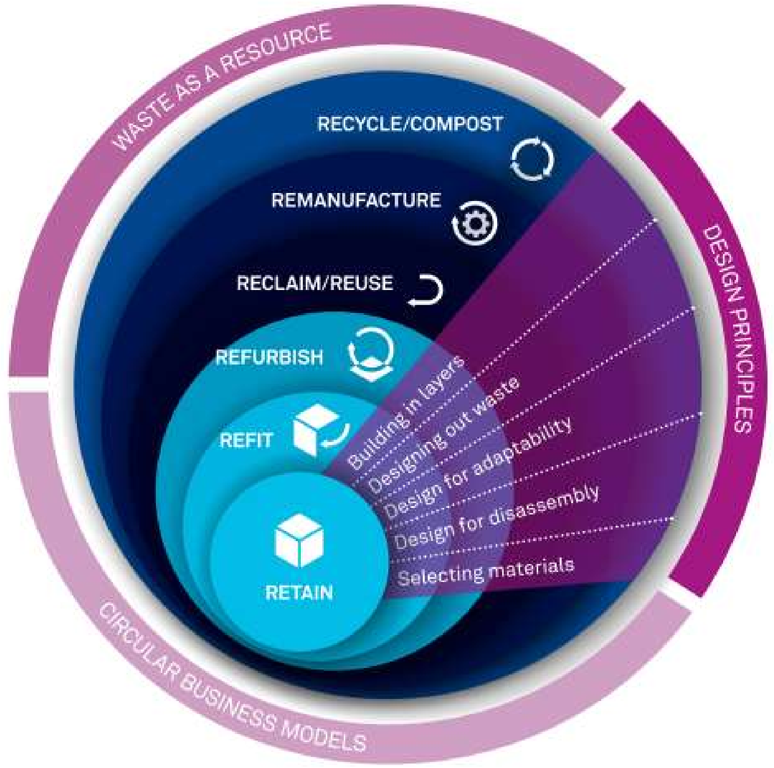

***Figure 5**: Circular Economy hierarchy Source: Building Revolutions (2016) RIBA (10)*

2. INTRODUCTION

This following sections provide a brief description of the development; and introduces the key principles that a circular built environment should adopt; summarises the process followed to produce this document; and outlines the project's circular economy strategy.

2.1. DESCRIPTION OF DEVELOPMENT

This development is a residential new build development designed to complement the built environment surrounding the Avondale Drive Estate site in Hillingdon. Phase 1a of the development includes 30 new social rented residential units, 2 being duplexes. Each block includes a single vertical circulation core with upper floors accessed by internal corridors. The tenure mix of the homes will be as follows:

- 23% one-bedroom homes
- 53% two-bedroom homes
- 17% three-bedroom homes
- 7% four- bedroom homes
- 6% of these homes will be wheelchair accessible

Phase 1a features a green roof, with several PV Panels used as an energy source. Further additions to the development will include new play space for all age groups, disabled parking, sheltered cycle parking spaces, redesigned green space and new pedestrian avenues. The development ensures to maximises the conservation of the neighbouring belt of LBH's green landscapes and blend cohesively with the surrounding urban grain. The total GIA for the development is 2945m^2.

Figure 6: Illustrative view of Phase 1a - PTE (1)

Figure 7: Section of Phase 1a- PTE (1)

All dwellings will meet and exceed the regional policies such as the Greater London Authority (GLA) London Plan 2021 [10]. Furthermore, the development will strictly adhere to local policies set out by LBH which are outlined in section 2. Key features of the residential apartments include [2]:

- 'Fabric First' methodology- set to achieve GLA Net Zero Carbon Targets
- Air Source heat pumps
- 56 cycle parking spaces
- New pedestrian avenues into the estate
- 2 accessible parking bays
- Communal Garden

2.2. POLICY CONTEXT

This report has been produced to address Policy D3 'Optimising site capacity through the design-led approach' and Policy SI 7 'Reducing waste and supporting the Circular Economy', within the adopted London Plan March 2021[2]. In doing so it also address the National Planning policy Framework (NPPF)[1] and the LBH Council local planning policies encompassing: LBH Local Plan Part 2, Development Management Policies 2020, the strategic climate action plan 2021, West London Waste Plan 2015.

A full review of the relevant planning policy framework relating to circular economy can be found within Appendix A.

Circular Economy Statements are required to inform early decisions and must be submitted at the following stages:

1. Draft Circular Economy Statement: submitted at outline/pre-application stage.

2. Detailed Circular Economy Statement: submitted at full planning application stage; and

3. Circular Economy Statement: submitted at post-completion stage

2.3. IMPLEMENTATION APPROACH

This report has been completed at the end of RIBA Stage 6, the following corresponding documents have been reviewed

- Revit Model-AVD-PRP-ZZ-ZZ-M3-A-00111– PTE Architects [3]
- Avondale Drive Estate Design &Access Statement -PRP Architects [1]
- Avondale Drive As Built SAPS- Energist [4]
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- Avondale Drive Estate- Circular Economy and WLC [24]

Progress has been reported against each of the key circular economy commitments.

3. METHODOLOGY

Building circularity into projects can be complex, however the interconnection between various energy and sustainability goals can be a good starting point to drive circularity into building projects. The target of reducing Whole Life Carbon impacts involves consideration of opportunities to reduce material usage and/or use of low impact materials. Additionally, the energy and carbon reduction targets for the proposed development align with the principle of minimising resource usage throughout the life of the development.

The first step in building circularity into the project was to understand the project context, site, building function and the energy and sustainability goals that were set out. The strengths and constraints of the development were also identified, so that specific measures to enhance circularity were implemented. Sustainability and circular economy target goals for the proposed development were also identified and discussed at this stage, in alignment with the current policies.

The post-construction phase provides the opportunity to evaluate how effectively circular economy principles were implemented throughout the project lifecycle. This stage ensures that materials, processes, and operational practices continue to align with resource-efficiency goals and support long-term circular value of the development.

NOTE: *Synergy completed the earlier stages and 'detailed planning stages' of the circular economy assessment, for Phase 1a Avondale Drive. However, the information gathered during those stages was not available to calfordseaden at the time of conducting this post-construction assessment. As a result, several assumptions have been required, and some early-stage targets, presumably established by Synergy, could not be verified or incorporated into this report. Where data gaps exist, reasonable industry standard assumptions have been applied and are clearly identified within the relevant sections.*

3.1. CIRCULAR ECONOMY ASPIRATIONS

The project team have interpreted the circular economy in the following way:

- Source materials responsibly
- Design for durability and resilience
- Implement measures to optimise material use
- Carry out a pre-demolition waste audit
- Implement waste minimisation targets during demolition and construction
- Ensure there is sufficient space for storage and segregation of operational waste
- Design a flexible and adaptable building

The integral team is supportive of the transition from a linear approach to a circular one, led by the GLA's core principles. LBH's aspirations are for a scheme characterised by a highly efficient and economical design, with an emphasis on the integration of engineering and architectural principles to deliver a simple, elegant, and budget-compliant solution. The aim is to consider efficiencies at every level from the foundations, through the structure, cladding, services, dwelling planning and finishes.

3.2. STRATEGIC APPROACH

The previous site consisted of a small group of garages serving a nearby residential development and required no decanting of residents [14]. The demolition generated approximately 58.97 tonnes of inert material, primarily concrete from the structural framework and walls [16]. In addition, around 7.76 tonnes of ferrous metal were recovered. The redevelopment of the site led to a significant increase in the quantities of both materials, largely due to the substantially larger GIA of Phase 1a compared with the original structures.

The project team collaborated during the design process to discuss the sustainability goals and aspirations for the project, which included consideration of the overarching strategy for the project. This was as guided by the relevant section of the Circular Economy Statement Guidance set out by the GLA [10].

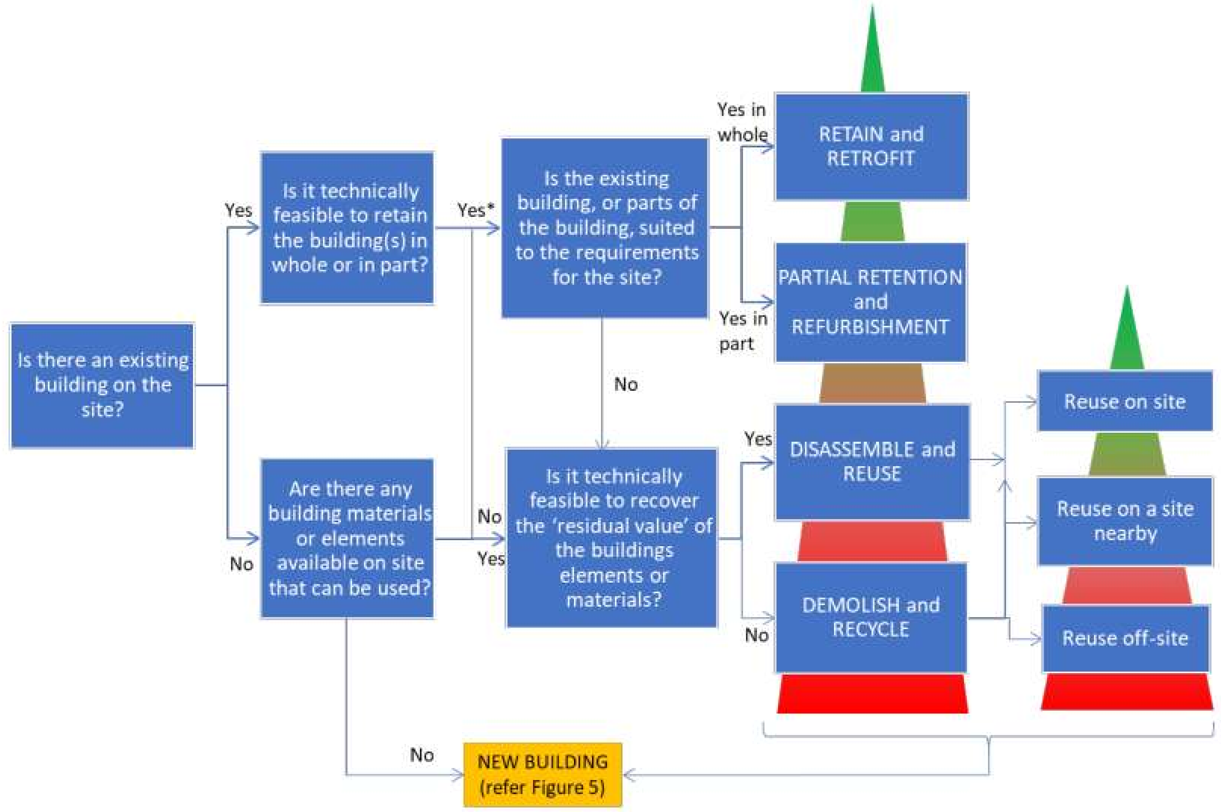

Figure 8: *Circular Economy Decision Tree for existing buildings – Source: London Plan Guidance: Circular Economy Statement* [10]

4. CIRCULAR ECONOMY STRATEGY

4.1. CIRCULAR ECONOMY PRINCIPLES

The Circular Economy principles and sub-principles, as set out by the Circular Economy Statement Guidance (March 2022), have been reviewed by the project team as part of the process of developing the Post- Construction Circular Economy statement. The following Circular Economy Decision Tree (Figure 8) has been utilised to inform the circular economy design approaches and prepare the strategic approach for the development [10].

4.1.1 DESIGNING OUT WASTE

The design was developed to a high level of detail, enabling precise measurement of components and materials and helping to avoid over-ordering. This level of accuracy allowed the contractor to collaborate closely with suppliers and manufacturers to procure materials in exact quantities. A strong commitment to 'just-in-time' delivery further reduced the need for on-site stockpiling, minimising the risk of damage, deterioration, and subsequent disposal as waste.

To minimise the onsite material waste, the design incorporated an early consideration of brick dimensions , aligning with structural coordination to reduce potential discrepancies that could occur when proceeding to construction. Furthermore, the development was adjusted and setup to a standard brick dimension (+10mm mortar joints) to avoid the use of cut bricks / special details where possible. This also accounts for window and door positioning in the external elevations. Window and door types externally have been standardised to brick dimensions to reduce the need for cutting or customising materials.

U-Value requirements for the building were carefully established in collaboration with the M&E Consultant to ensure that the principal wall constructions incorporated the appropriate thicknesses of insulation, avoiding any unnecessary overprovisioning. Brick work and stud walls were set out in accordance with the column thickness to avoid additional joins during the construction process.

Packaged M&E equipment were prefabricated offsite where possible such as HIUs, ASHPs, LED lighting etc. Pipe work, ductwork and cabling lengths have been minimised as much as possible to ensure efficient use of materials. Furthermore, MEP plant and equipment were selected and sized in accordance with the calculated loads and not oversized in line with the MEP consultants' recommendations.

Future considerations:

Future approaches to designing out waste for the remaining phases should continue to focus on choosing materials and construction methods that create less waste from the start. Using modular and standardised components can reduce offcuts, while designing buildings so they can be easily adapted or taken apart helps materials be reused instead of thrown away. Better planning, early coordination with suppliers, and wider use of take-back schemes will also support waste reduction. By thinking ahead about how a building might change or be dismantled, projects can significantly cut construction and demolition waste in the future.

4.1.2 DESIGINING FOR LONGEVITY

In accordance with RICS guidance, the reference study period (RSP) for the assessment is 60 years. The material selection for Phase 1a of the Avondale Drive Estate has been primarily driven by their robust composition, resistance to weathering, and low maintenance requirements, all of which contribute to long-term durability. A significant proportion of the specified materials have life spans that align with, or have the potential to exceed, the 60-year RSP of the building.

The predominant exterior material used is brick, which offers a long and durable life expectancy, matching the building. The bricks used in these areas can be repurposed and recycled, extending their lifespan for a second use if removed or deconstructed correctly. The same principle applies to the steel framing system (SFS), which can similarly be recovered and repurposed through established recycling processes.

Aluminium window frames have been selected over timber frame for their known longer lifespan and lesser maintenance, PPC (Polyester Powder Coating) aluminium finishes to external elements have been incorporated to avoid rust which increases lifespan. his design approach minimises the frequency of replacement and associated material waste, contributing to improved long-term sustainability and lifecycle performance of the building.

The majority of internal partitions have a minimum lifespan of 60 years, consistent with the building's RSP. A limited number of internal finishes have shorter service lives, typically ranging between 10 and 30 years. However, maintenance interventions for these elements generally consist of minor touch-ups or repairs, which are not carbon intensive and therefore, have a negligible impact on the building's overall environmental performance.

As expected, mechanical services generally have shorter lifespans compared to solid building materials. These systems experience continuous operational wear and therefore, require periodic replacement or upgrades to maintain performance and efficiency. While this is common across all buildings, lifespan has been an important factor in the product selection process, with components chosen to ensure durability and longevity wherever possible. The specified products have a minimum expected lifespan of 25 years, extending to the RSP of 60 years. This careful selection supports efforts to minimise the carbon impact associated with future replacements and repairs, contributing to the overall building circularity performance of the building.

Future considerations

The Material Durability Report is unavailable at the time of assessment. This report would typically outline the measures required to protect vulnerable elements of the building from physical or environmental damage. Its purpose is to inform and refine design specifications that minimize material degradation arising from exposure to environmental factors, thereby enhancing the durability and longevity of materials used.

Key elements that would be addressed within the Material Durability Report include:

- Maintenance and repair strategy: outlining inspection intervals, preventative maintenance measures, and minor repair procedures.
- End-of-life and circularity considerations: identifying opportunities for reuse, recycling, and responsible material recovery.

Furthermore, a systematic risk assessment could be carried out to identify and evaluate the impact of climate change on structural and fabric resilience. The aim of this study would be to ensure that the building remains functional for as long as possible by mitigating risks posed by extreme weather conditions arising from future climate change.

Both reports would reduce the need for assumptions within the One Click LCA assessment and enhance the overall transparency and reliability of the results.

4.1.3 DESIGINING FOR ADAPTABILITY OR FLEXIBILITY

As part of the ongoing Circular Economy assessment, two key documents pertaining to flexibility and adaptability considerations should be produced:

1. Functional Adaptability Strategy
2. Climate Change Adaptation Strategy

As these documents were not developed, it can only be assumed that the scheme has been primarily designed to serve a single intended function. Based on the available project information and design intent, the following assumptions can reasonably be made regarding the scheme's adaptability and resilience.

The building has been designed to be structurally adaptable, whereby column positioning has been coordinated to be located within party and external walls, and not within habitable rooms to allow adaptable room layouts. Core, bracing shear walls and columns are the only fixed elements internally.

Levels of flexibility are present where the building has been designed to allow easy reconfiguration of its internal environment to suit potential changing needs of the occupants. The current design arrangement offers flexibility while minimising the need to remove or reassemble numerous doors and walls or result in elements of the exterior being demolished. In instances where two smaller dwellings may be combined into a single larger unit, careful consideration has been given to the positioning and configuration of internal walls to ensure such adaptations can be achieved with minimal impact on the existing structural and spatial layout.

Services within dwellings shall have a degree of flexibility with M&E fixtures and fittings, should the units be adapted for wheelchair users. M&E services have been positioned as close to party walls as possible within the dwelling to allow access externally if required.

Future considerations:

Scenario modelling should be incorporated into a Functional Adaptability Strategy as it provides a structured way to explore how the building could respond to future changes in use, occupancy, or operational requirements. By testing a range of potential scenarios, such as shifts in space layouts and building use scenarios informs the design team can better understand the building's capacity for flexibility and long-term adaptability. These models help identify design features that enable easy modification, reduce future material consumption, and minimise the need for excessive refurbishment. Ultimately, scenario modelling ensures that the building remains resilient to change over its lifecycle and after its RSP and aligns with circular economy principles by supporting reuse, longevity, and reduced waste generation

4.1.4 DESIGINING FOR REPLACEABILITY AND DISASSEMBLY

Most products have been selected for their long lifespan and durability, ensuring that replacement should not be necessary if used and maintained correctly. As outlined in Section 4.1.2, the primary building elements with shorter life cycles are the M&E services and internal finishes. While this is typical across all buildings, lifespan has been a key consideration during product selection, with components chosen to maximise durability and minimise the need for early replacement. The specified materials have a minimum expected lifespan of 25 years, extending up to a Replacement Service Period (RSP) of 60 years. This careful selection supports efforts to minimise the carbon impact associated with future replacements and repairs, contributing to the overall building circularity performance of the building.

Components within the SFS are mechanically fixed (bolted or screwed) rather than bonded with permanent adhesives. This approach enables damaged or corroded sections to be removed and replaced without impacting adjacent framing. It also ensures that the steel sections can be fully dismantled at the end of the building's life, with components suitable for reuse or closed-loop recycling through established steel recovery supply chains.

The PV panels on the top level of the design are strategically arranged so that if replacement becomes necessary for one panel, it can be carried out without disassembling any other surrounding components. M&E services shall be provided with sufficient access to facilitate ongoing maintenance and replacement of key components and as noted above, have been positioned as close to party walls as possible within the dwellings to allow access externally if required.

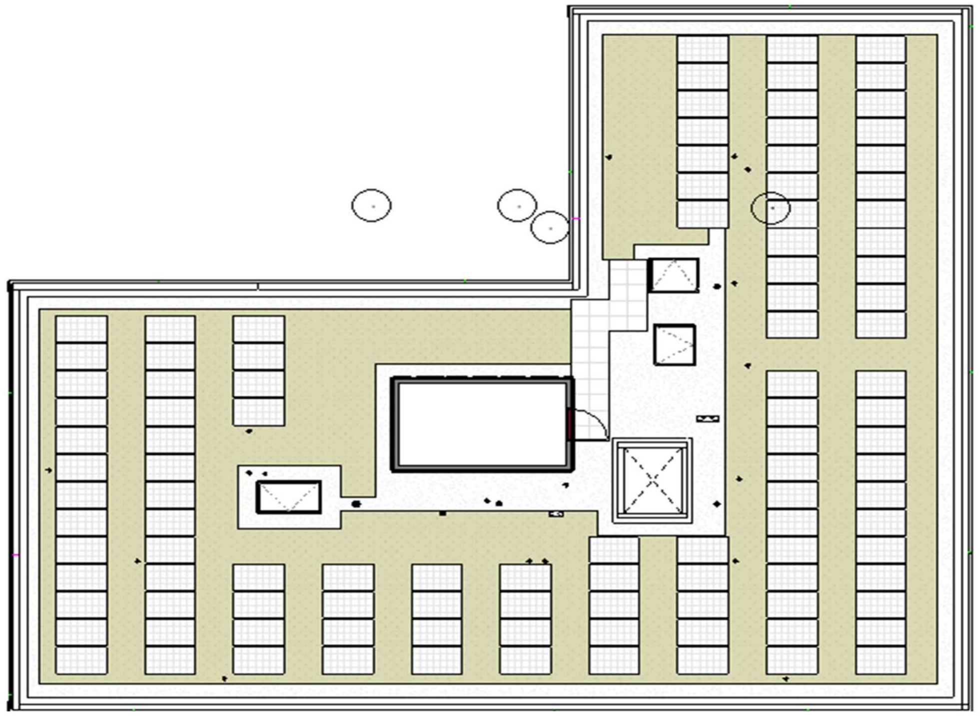

Figure 9: *Roof plan showing available maintenance access to each panel and plant room-PRP* [3]

Future considerations:

A maintenance plan should be developed by the client to outline the expected repairs and replacements required throughout the building's lifespan. This plan should also include projections of the associated energy and water use involved in maintenance and replacement activities. In the absence of this detailed plan, standard assumptions have been applied to represent these elements; however, these may not fully reflect the actual in-use performance of the development.

Key elements that would be addressed within the Maintenance Plan include:

- Regular inspection and servicing schedules for building systems and equipment.
- Procedures for preventative maintenance to minimise breakdowns and extend asset life.
- Clear responsibilities and communication protocols for contractors and building users.
- Monitoring of energy, water, and waste systems to ensure ongoing performance.
- Documentation of maintenance activities, warranties, and compliance requirements.
- Plans for replacement or upgrade of components in line with circular economy principles, such as repair-first and reuse strategies.

4.1.5 USING SYSTEMS, ELEMENTS OR MATERIALS THAT CAN BE RE-USED AND RECYCLED

In terms of the substructure and superstructure, the ground floor concrete slab and foundations are constructed of RC concrete which can be crushed and reused within the site. Similarly, the RC frame can be crushed and reused as aggregate after demolition. Alternatively, the structural framing and internal studwork can be disassembled and checked for weak points before reused at the end of the building's working life.

On removal or deconstruction, the brickwork used can be repurposed and recycled for future use. Similarly, the windows and doors can be reused if necessary, in line with the manufacturers life expectancy or dismantled and used for parts or recycled. The guttering could also be reused.

Internal finish specifications, such as carpets and tiles will have a high recycled content and can be reused for new projects if removed before the end of its lifespan. Similarly, whitegoods within the dwellings can be dismantled or disassembled and reused on other projects or recycled.

The overarching approach to waste management and recycling has been guided by the waste hierarchy set out in the WLWP (see Figure 10). The contractor recognises that the waste hierarchy should not only be applied during the construction phase but also considered at the end-of-life stage of the building. To achieve this, the potential for material recovery and recycling must be evaluated from the outset of construction, allowing for an informed analysis of which materials and components can be reused, recycled, or recovered in future deconstruction activities.

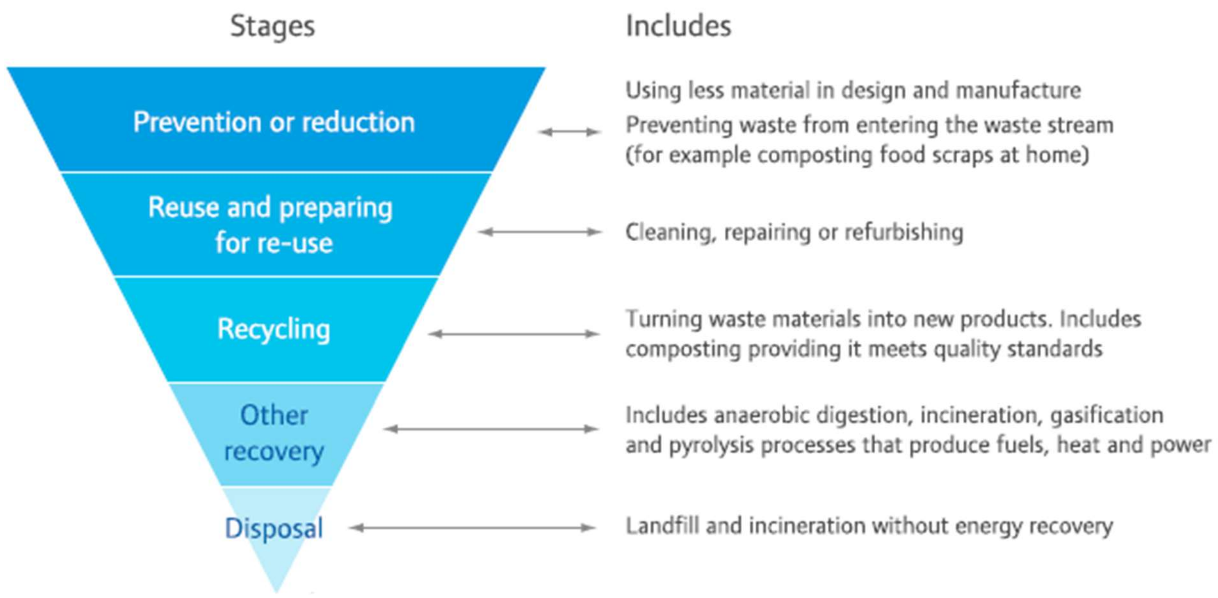

Figure 10*: Waste Hierarchy-WLWP* [13]

Future considerations:

Detailed information should be provided within the Operation and Maintenance Manual (OMM) to ensure that building materials can be accurately identified, understood, and reused at the point of demolition or deconstruction. The OMM typically includes material data to support future recycling or reuse opportunities at the end of the building's life. This enables demolition and deconstruction teams to identify materials with reuse potential, understand how elements are assembled, and follow recommended disassembly procedures to maximise material recovery and minimise waste.

Key inclusions of a typical OMM are:

- Material inventory listing components with high reuse or recycling potential

- Connection and fixing details.
- Manufacturer and specification data including recyclability, EPDs, and embodied carbon information.
- Guidance on disassembly outlining safe methods for removing key materials without contamination or damage.
- End-of-life recommendations indicating suitable reuse or recycling routes.

4.2. CIRCULAR ECONOMY KEY COMMITMENTS

In addition to the circular economy strategy outlined, the design team have addressed circular economy commitments across the design development as discussed below. The key circular economy commitments for the development are described in detail in Appendix C.

NOTE: *The circular economy principles referenced in this report were originally set out by Synergy; however, calfordseaden had limited access to the supporting documents. Despite this, calfordseaden has drawn on the available information to inform this section of the report, undertaking an internal assessment to provide an impartial interpretation of the principles. A full table outlining the commitments established by Synergy is provided in Appendix C.*

4.2.1 DESIGN TO CONSERVE RESOURCES

Phase 1a Avondale Drive Estate seeks to ensure that material and resource use is minimised as far as possible, in line with the first principle of circular economy: *conserve resources and source ethically.* As shown below, this focus has been given to minimising the quantities of materials and other resources used, as well as ensuring materials have been sourced responsibly during construction.

4.2.1.1 Minimising Quantities of Materials

A Pre-demolition Audit of the materials contained within the existing building was undertaken by WSP Consulting Ltd prior to demolition occurring on-site, where high priority was given to the re-use or recycling of high-grade materials on-site in accordance with the waste hierarchy as shown in *Figure 10*.

Within the building design, the form and orientation have been optimised for solar gain with priority for South, East and West orientations. Window placement to enhance solar gain has been considered at an early stage to improve thermal performance minimising the need for excessive insulation or other materials to regulate temperature.

A Just-in-Time (JIT) delivery approach was implemented to help minimise quantities of materials. By coordinating material deliveries with construction activities, on-site storage and the risk of material damage or over-ordering were minimised. This reduced packaging waste, prevented surplus materials, and supported efficient resource use in line with circular economy principles. Evidence of this approach was seen through multiple purchase orders issued at different stages, allowing the team to assess and procure only what was truly needed at the time. Prime benefits of a JIT approach are outlined in Figure 11.

The development has utilised the following measures to ensure materials are used efficiently and minimised the quantities of new materials brought to site:

- Design to standard materials dimensions
- Utilise materials with a high recycled content
- Rationalise structural design to reduce the volume of structural materials
- Avoid over specification
- Optimise foundation design

***Figure 11**: Benefits of JIT Lean Manufacturing*

Future considerations:

To clarify that the scheme has been designed to utilise materials in an efficient manner, it should be set out by a Material Efficiency Report. A Material Efficiency Report (MER) outlines how materials are selected, used, and managed to minimise waste, reduce environmental impact, and support circular economy principles throughout a building's life cycle.

Key inclusions of a typical MER include:

- Highlight areas where efficient use of materials can lead to cost savings through reducing waste and lower procurement needs
- Provides a clear record of sourcing practices
- Helps identify materials which account for a large proportion of a buildings embpod8ied carbon, and any opportunities to reduce emissions by using alternatives

4.2.1.2 Minimising Quantities of Other Resources

The principle of minimising the quantity usage has been applied not only to the materials but also to resources such as energy, water, land and ecosystems. The development is sited on brownfield land, thereby disruption to the existing landscape was minimal.

Higgins Group was required to set targets for energy and water used during construction, monitor and report usage and put in place measures to minimise consumption of these resources; these include:

- Use of alternatives to diesel / petrol powered equipment where possible
- The incorporation of sources of renewable energy, to offset the use of main utilities
- Selection and specification of energy efficient plant and equipment wherever viable; and

- Implementation of staff-based initiatives such as turning off plant and equipment when not in use, both onsite and within site offices.

The development has been designed to be highly energy efficient in accordance with CIBSE Code of Practice CP1 and best industry practices. M&E services have been sized in accordance with the calculated loads to avoid oversizing and subsequent increased energy consumption. Furthermore, services are insulated to prevent heat loss. With regards to building operation, the scheme has been designed in line with the GLA's energy hierarchy to minimise operational energy use and carbon emissions. The scheme has adopted a fabric first approach to minimise energy demand, including a highly efficient thermal envelope. Low energy LED lighting has been utilised.

A fabric first approach with enhanced u values and air tightness < 3 m^3/hm^2 @50Pa have been adopted to minimise space heating requirements where possible (4). By limiting unwanted heat loss in winter and heat gain in summer, the building envelope performs more efficiently, enabling heating and cooling systems to operate at lower loads and for shorter durations. This not only decreases operational energy consumption and carbon emissions but also extends the life of mechanical systems by reducing wear and demand.

According to the Part G water calculations, the scheme is projected to achieve mains water consumption of <105 litres per person per day due to water-saving measures such as restrictors being installed (6).

Future considerations:

Future efforts to minimise the use of additional resources should focus on reducing demand through careful material = efficient building design, and responsible operational practices. Prioritising reusable or recycled materials will help limit the need for frequent replacement, while improved water-saving technologies and monitoring systems can further reduce consumption, for example the addition of Wastewater heat recovery. By embedding these resource-efficient approaches early in design and continuing them through operation, buildings can lower their carbon impact and better support a circular, low-waste future.

4.2.1.3 Responsible Sourcing

Specific areas of the development, such as internal partitions, have a wide range of EPD's available that either match or align closely with the project specifications. However, other key elements , particularly the external envelope and M&E services, currently lack product-specific EPD data, especially within the One Click LCA database. This limitation poses a challenge in accurately establishing the project's building circularity score, as significant data gaps persist across the industry. This is especially evident within mechanical services, where generic datasets are often relied upon in the absence of verified manufacturer-specific information.

Other examples of where responsible sourcing is present within the project is:

- 100% of timber are FSC or PEFC certified.
- 100% concrete are BES 6001 certified (Responsible Sourcing of Construction Products).
- Where possible steel has been sourced from suppliers rated under the CARES Sustainable Constructional Steel Scheme.
- Where possible, construction materials are certified under an Environmental Management System (EMS) such as ISO 14001.
- Careful selection of materials which have a long-life span which match the RSP of 60 years.
- Substitution of high-carbon materials with low-carbon alternatives, such as incorporating GGBS(up to 70%) in concrete structures to reduce the embodied carbon of the structural elements.
- Use of materials with high recycled content where technically and financially feasible.

Future considerations:

Locally sourced materials should be prioritised and targeted, particularly for the building's shell and skin, to avoid reliance on manufacturers and suppliers that transport goods from abroad. While this may not always be the most cost-effective option, it can significantly reduce the building's overall carbon impact. Using nearby sources also simplifies logistics for future maintenance, repair, or material recovery, making it easier to retain resources within the same geographical area. This approach not only lowers the project's overall carbon footprint but also enhances material traceability and supports the principles of a circular, resource-efficient built environment.

This would ensure further alignment and adherence to policies such as the WLWP (13), LBH Local Plan Part 2 (11) and the strategic Climate Action Plan (12).

4.2.2 DESIGN TO ELIMINATE WASTE

Phase 1a Avondale Drive addresses the second core circular economy principle by ensuring the design is flexible and adaptable where possible, thereby increasing the building's lifespan and minimising maintenance, and by aiming to reduce construction, demolition, and excavation waste arisings. Tackling waste reduction 'at source' is achieved through minimising the materials being classified as waste and by considering how to minimise waste at the early stages of the design.

The design team made use of BIM models tO accurately estimate quantities an reduce over ordering surplus of materials. A Just-in-Time (JIT) delivery approach was implemented to help manage waste sustainably. By coordinating material deliveries with construction activities, on-site storage and the risk of material damage or over-ordering were minimised. This reduced packaging waste, prevented surplus materials, and supported efficient resource use in line with circular economy principles. Evidence of this approach was seen through multiple purchase orders issued at different stages, allowing the team to assess and procure only what was truly needed at the time.

4.2.2.1 Designing Out Construction, Demolition, Excavation and Municipal waste

A Pre-demolition Audit was produced by WPS Compliance Consulting Ltd in September 2023. It identifies the potential for reusing and recycling components and materials from Avondale Drive Estate which were stripped out or demolished (16). The inert material generated from the demolition amounted to approximately 58.97 tonnes of concrete, including the structural framework and preformed wall slabs. The only other notable material recovered was ferrous metal, estimated at 7.76 tonnes. The redevelopment of the site resulted in a significant increase in the quantities of both materials, primarily due to the substantially larger GIA f Phase 1a compared with the original structures.

Figure 12 show that the three inert materials from the demolition of the garages are concrete (87.9%), metals (11.6%) and timber (0.5%). Figure 13 highlights that 99.7% of material from the garaged can be recycled. According the SWMP this recommendation was followed. This increases building circularity as it minimises waste going to landfill.

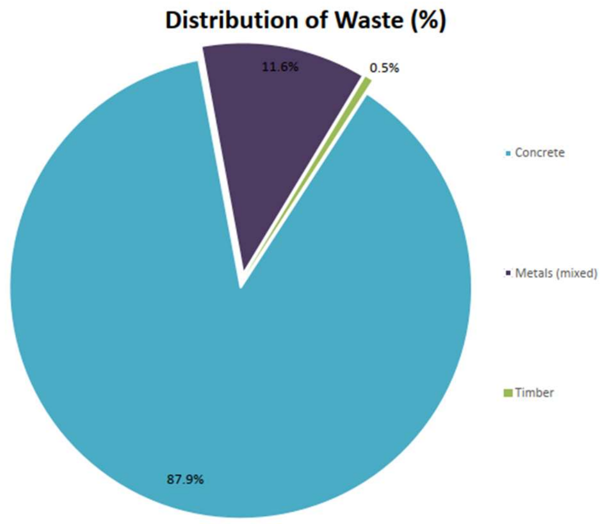

Figure 12: Distribution of waste- (5)

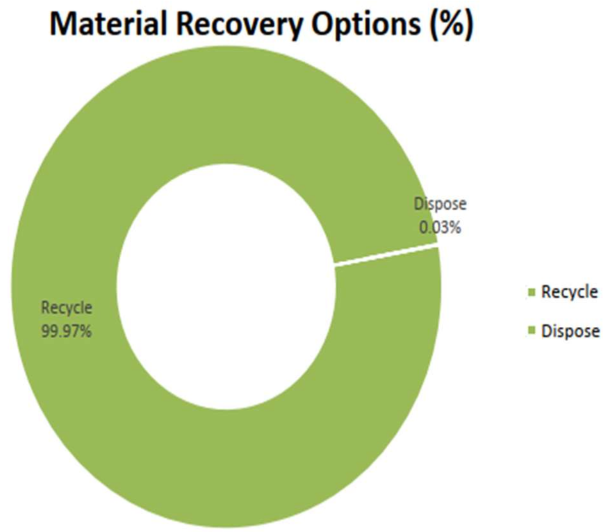

Figure 13: Material Recovery Options (5)

Higgins Group were required to follow the UK Government's 'Waste Management Plan for England 2021'(20), and the West London Waste Plan (13),' in order to reduce the amount of waste generated.

The following measures were used to facilitate the minimisation of waste generation during the construction process:

- Agreements with material suppliers to reduce the amount of packaging, to use reusable packaging or to participate in a packaging takeback scheme.
- Accurately forecasting the amount of materials needed, using larger pack sizes to reduce the amount of packaging per unit and by using cardboard packaging instead of plastic where possible.
- Implementation of a 'just-in-time' material delivery system to avoid materials being stockpiled, which would increase the risk of their damage and disposal as waste.
- Attention to material quantity requirements, to avoid over-ordering and generation of waste materials.
- Segregation of waste on site and strict division between landfill and recycled material
- Re-use and recycling of materials off-site, where re-use on-site is not practical (e.g., through use of an offsite waste segregation facility and re-sale for direct re-use or re-processing).

Future considerations

Take-back schemes are becoming an increasingly emerging feature in the UK construction sector, driven by a growing emphasis on circular economy principles. These schemes allow manufacturers and suppliers to reclaim products or materials at the end of their useful life, ensuring they are reused, refurbished, or recycled rather than discarded. By closing the loop on material flows, take-back systems directly support the goal of designing out construction, demolition, excavation, and even municipal waste. They reduce the volume of materials sent to landfill, minimise demand for virgin resources, and encourage more modular, repairable, and recyclable product design. As adoption grows, take-back schemes have the potential to transform waste from an unavoidable by-product into a valuable resource stream, strengthening sustainability performance across the entire project life cycle.

4.2.3 DESIGN TO MANAGE WASTE SUSTAINABLY

The development has aimed to implement the third core principle of circular economy by carefully managing demolition, construction, and municipal waste to maximise recycling and reuse and minimise waste sent to landfill.

A Site Waste Management plan has been produced and carefully monitored throughout the entire construction period, monitoring the waste activity on site (5). A Refuse Strategy has been developed for dwelling operational waste management (17). This is ensured to be inline with LBH local policies and regional policies.

A Just-in-Time (JIT) delivery approach was implemented to help manage waste sustainably. By coordinating material deliveries with construction activities, on-site storage and the risk of material damage or over-ordering were minimised. This reduced packaging waste, prevented surplus materials, and supported efficient resource use in line with circular economy principles. Evidence of this approach was seen through multiple purchase orders issued at different stages, allowing the team to assess and procure only what was truly needed at the time.

4.2.3.1 Demolition, Excavation and Construction Waste

In September 2023, WPS Compliance Consulting Ltd produced a Pre-Demolition Audit, outlining the sustainable management recommendations of waste materials which were to arise from the demolition of the garages at the Avondale Drive Estate.

This report identifies the materials that can be recovered from the existing garages and how the client could aim to re-use them wherever feasible.

Waste relating to the demolition and construction phase has been carefully managed through the implementation of a Demolition and Site Waste Management Plan which was submitted prior to above-ground works, with a primary aim to minimise waste during this period. As per GLA's guidance, a target is set for 95% of the construction and demolition waste to be diverted from landfill. A series of best practice construction measures were considered when appropriate, including reuse of materials for temporary works, clear labelling system for waste segregation, just-in-time procurement, correct on-site material storage, plasterboard recycling services, take back scheme for packaging materials, training, and engagement of staff.

To reduce potential risks throughout the demolition and construction phases of the proposed development, the following measures will be implemented where possible:

- Skips were colour coded and signposted to reduce risk of cross contamination.
- Burning of waste or unwanted materials was not permitted on-site.
- All potentially hazardous materials were properly sealed and securely stored when not used.
- Diversion building material waste from landfill where technically feasible
- Food waste from the welfare facilities on-site were suitably packaged and stored for collection by the authorities to reduce the risk of infestation by pests or vermin.

The SWMP indicates that 99–100% of site-generated waste was diverted from landfill, significantly exceeding the GLA's waste-diversion targets (5).

Future considerations

Prefabrication and off-site construction methods should be further explored to minimise material offcuts and significantly reduce on-site waste generation in future phases. By manufacturing components in controlled factory environments, material use can be optimised, and assembly processes streamlined. This approach not only lowers waste and site congestion but also improves build efficiency and consistency in quality. In addition, it offers opportunities to incorporate recycled or low-carbon materials during production, further aligning with circular economy principles.

4.2.3.2 Municipal Waste

It is important to provide spaces for segregating and storing waste for collection, recycling and reuse. A Refuse Strategy has been developed in line with the LBH recommendations whereby the development follows the guidance issued in document H6 of the Building Regulations with regards to waste capacity, so that a total of 0.25 m^3 is provided per dwelling [18]. The LBH sets out a further strategy stating, bin storage should be based on 120 litres per bedroom with 50% of containers being allocated for dry mix recycling, A further 10 litres per unit should be allocated for food waste recycling [11].

The development is providing a combined refuse capacity in excess of 8000 litres; a breakdown is outlined below:

- General waste: 4400 litres
- Recycled waste: 4400 litres
- Food waste: 480 litres

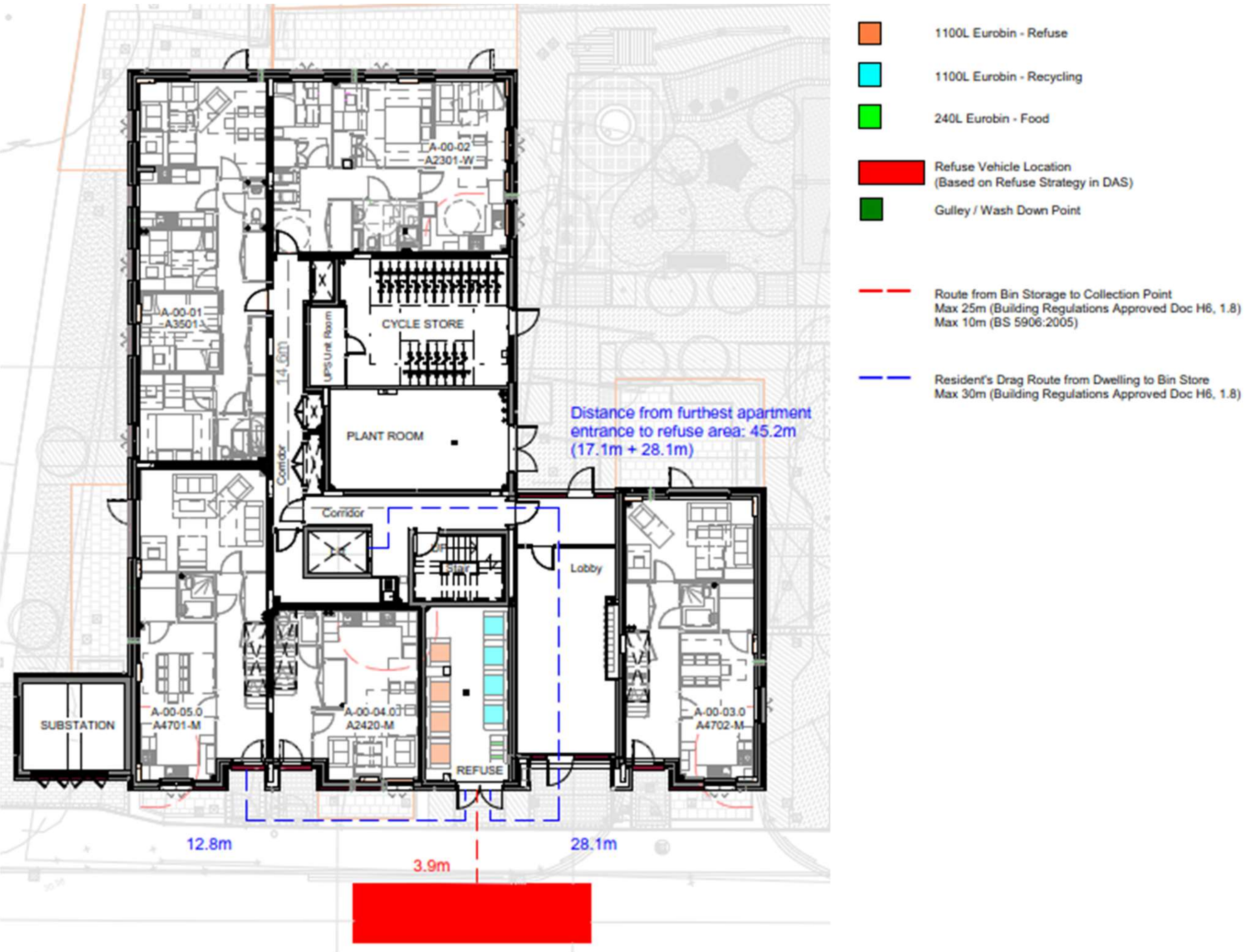

Figure 14: *Phase 1a Refuse Strategy- PRP [17]*

The design takes into consideration that 50% of waste storage capacity is allocated for mixed recycling. Appropriate storage spaces have been considered in the design, and targets have been exceeded for recycled waste, food waste and general waste. Each waste stream is collected weekly.

The GLA's 2030 waste target aims for 65% of municipal waste, and 50% of household waste, to be recycled by 2030 [9]. In response, the contractor worked closely with the Local Authority on refuse collection and recycling arrangements, supplying an appropriate number of Eurobins, including dedicated recycling containers (see Figure 10).

The provision of these refuse stores encourages Hillingdon's 'Zero Waste Challenge' (ZWC) which was set out by the local council in 2023 [23]. The ZWC is an initiative designed to help residents in the LBH improve their everyday waste-management habits. By supplying food-waste and recycling bins that exceed government minimum requirements, the scheme encourages greater participation in recycling and, ultimately, enhances building circularity.

Future considerations

Future municipal waste strategies, could include the expansion of source-separated waste streams, allowing materials such as textiles, and bulky items to be collected independently at the refuse vehicle collection point. This approach improves the quality of recovered materials, reduces contamination in mixed recycling, and supports higher overall recycling rates, helping to advance circular economy goals.

Developing or supporting local re-use hubs, repair cafés, and swap schemes plays a key role in future waste strategies. These initiatives help prevent waste at the source by extending the life of products through repair, and community exchange. By keeping items such as textiles, small appliances, and household goods in circulation for longer, they reduce demand for new materials and lessen pressure on local waste systems.

5. END OF LIFE STRATEGY

This section describes the strategy for how the scheme's design and construction will reduce material demands and enable building materials, components, and products to be disassembled and reused at the end of their useful life.

Although there is no, end of life strategy of future adaptability statement , it can be assumed that the development has been designed for repurpose and independent replacement of individual elements, based on their design life periods.

The building's structure has been designed with an indicative design life of 60 years (based on current British Standards), including the building's envelope i.e. the brick façade and upper floor cladding system and 30 years for secondary components. A brief guide on general building layers and their indicative life spans are show below.

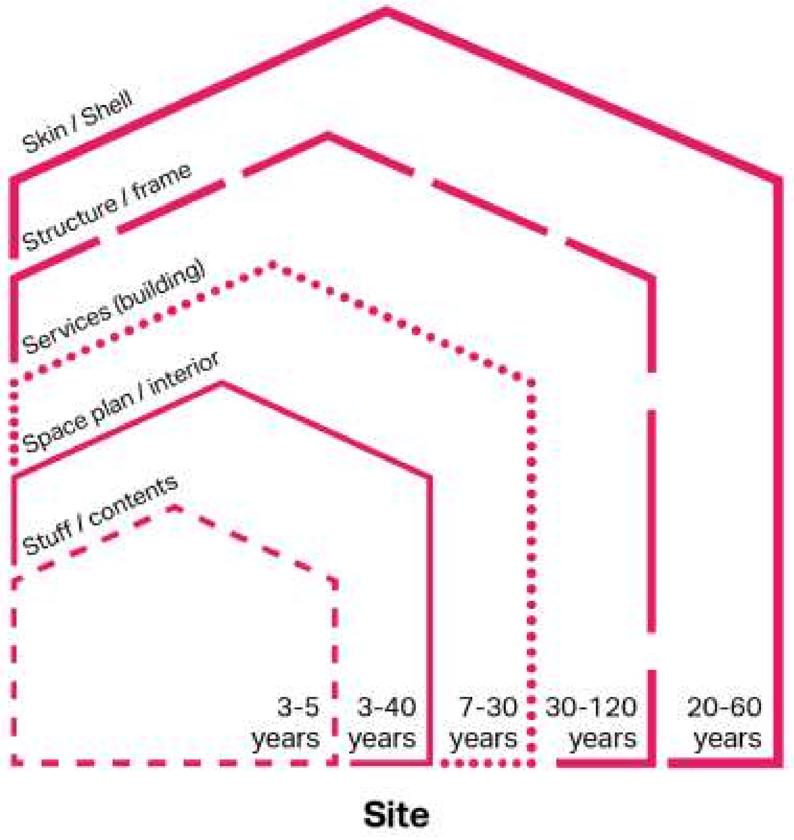

Figure 15: *Building layers and their indicative lifespans –GLA* [10]

5.1. DISASSEMBLY AND REUSE

Components and products have been designed and selected to allow for disassembly and reuse at the end of their useful life. Building information will be stored to facilitate end of life strategy, disassembly, future reuse, waste avoidance, and waste reduction.

Materials, where possible, have been chosen with consideration for future impacts and that have high quality and will retain value and/or be more feasible for reuse and recycling. Using materials and systems that exhibit principles of modularity, independence, and standardisation will facilitate reuse

The use of binders, sealers and glues both on, or in materials has been utilised when selecting materials in order to minimise chemical connections that can make materials difficult to separate and recycle.

Separate mechanical, electrical and plumbing (MEP) systems have been installed where appropriate. Disentangling MEP systems from the assemblies that host them makes it easier to separate components and materials for repair, replacement, reuse and recycling.

5.2. BUILDING CIRCULARITY SCORE

One Click LCA Building Circularity tool was used to estimate opportunities for the materials at end of life. The results are based on inputs used for the post-construction Whole Life Carbon Assessment [25].

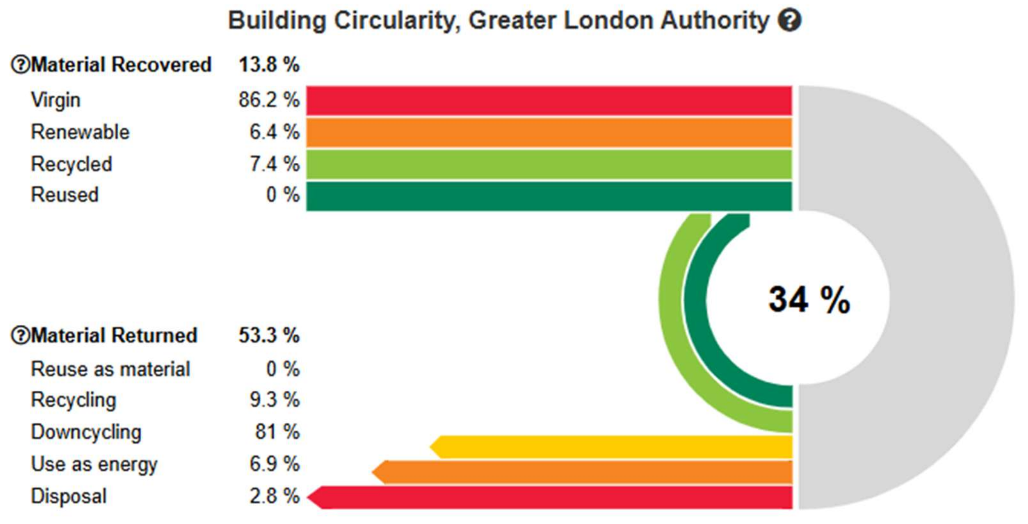

Figure 16: Building Circularity Score - OneClick

It is impossible to predict construction processes, reusable, and recycled value in 60(+) years, however, based on current practices and industry benchmarks applied by the OneClick tool, an estimation is produced by the tool and can be seen in the diagram above.

This building's circularity is evaluated in terms of the mass of the recovered building material as compared to virgin material used in the building construction and the percentage of the material that can be returned to building construction at the end of life of the building.

Materials recovered (13.8%) represents the use of circular materials in the project. It is the mass-based share of recycled, reused or renewable materials of the total materials used. Virgin materials (86.2%) have accounted for the majority of the material specification for Phase 1a Avondale Drive.

Materials returned (53.3%) represents the end-of-life handling of materials that were used in the project. It is the mass-based share of materials that are either recycled or reused as material, added with 50% of the materials that are either downcycled (with value loss, such as reuse of concrete aggregates) or used as energy (such as wood or plastic product incineration.

The Building Circularity score, (34%) which is shown in the middle, is the average from the materials recovered added up to the materials returned.

6. Limitations of Assessment

While the CES for Phase 1a of the Avondale Drive Estate provides valuable insights into the carbon performance of the development, it is subject to several limitations that should be acknowledged:

Data access and scope of comparison

As mentioned previously, the earlier stages of the assessment were undertaken by another consultancy firm, Synergy. As calfordseaden joined the project at a later stage, access to Synergy's original CES assessment and its detailed input data was not available for review. This restricted the ability to verify and directly compare certain assumptions on materials and scenarios on earlier stages of the assessment.

Additionally, the detailed planning stage assessment was undertaken by Synergy and encompassed all phases of the Avondale Drive Estate. In contrast, this post-construction assessment focuses solely on Phase 1a; therefore, a direct comparison between the two is not entirely accurate. However, as the assessment adopts a per-square-metre (m^2) approach, it still provides a useful guide and comparative benchmark for performance. A fully accurate comparison will only be possible once the 'As-Built' Circular Economy Statements' for all phases have been completed and combined.

Availability of EPD's

As OneClick LCA and Circular Economy Statements' are an evolving area of practice, EPD availability of materials and components was a limitation of this assessment. Not all products have verified EPD's, in such cases generic, industry averages or 'near matches' have been used to represent material impacts which may not fully reflect specific performance of the development. Although, the contractor supplied sufficient information on exact manufacturer information, EPD's availability is significantly limited. An area where they are most significantly limited is MEP services.

As the availability of EPD's continues to increase across the industry, future assessments will become increasingly accurate and provide representative carbon data.

Missing information

Some information was not available to be incorporated into the assessment; therefore, default scenarios provided within OneClick LCA have been applied where necessary. This particularly affects Modules B1, B2,B3 and B5, where the client was unable to supply detailed information on projected maintenance activities, including associated energy and water use. As a result, standard assumptions have been used to represent these elements, which may not fully reflect the actual in-use performance of the development.

Further areas of data that could not be obtained after request included smaller subcategories such as workers' transport to site. The client did not hold records for these activities; therefore, no assumptions could be made, and these elements were excluded from the assessment. While their omission is not expected to have a significant impact on the overall results, their inclusion in future assessments would improve completeness and accuracy.

7. Lessons Learnt for Future Projects

The completion of this post-construction CES has provided valuable insights into both performance of the development and the assessment process itself. After some reflection on the challenges encountered and the outcomes achieved, several lessons will be taken from this assessment which can be applied to future phases and other projects to ensure a seamless delivery from the very beginning of the RIBA process:

- **Early Engagement with the Design team**: Integration with the design team, particularly architects, structural and MEP engineers, at the earliest possible stage of the project would be extremely beneficial. Greater collaboration during RIBA Stages 1–3 would enable more informed material choices and design strategies that could reduce embodied and operational carbon from the outset. Early integration ensures that whole life carbon considerations are embedded in the design process, rather than being addressed retrospectively, which often limits opportunities for meaningful carbon reduction and application of circular economy principles.

- **Data Collection Protocols**: Collecting data from various design team members, as well as on-site information during construction, proved challenging at times due to the absence of consistent contractor reporting protocols. Introducing standardised data collection templates and setting clear submission timelines would streamline the process, improve data accuracy, and support more efficient and reliable whole life carbon assessments in future projects.

- **Monthly progress meetings with contractor:** Monthly progress meetings were held between calfordseaden and the Higgins, which proved effective in facilitating regular communication. These meetings provided an opportunity to discuss outstanding information requirements and clarify expectations outlined in the London Plan Guidance (LPG) for the post-construction CES.

- **Material substitute opportunities**: Several materials specified early in the design could have been substituted for lower-carbon alternatives without compromising performance or compliance. Earlier exploration of alternative materials, such as exploring other concrete mixes or the use of recycled steel could have led to significant reductions in embodied carbon and in turn improve building circularity performance.

- **Further reports to be produced:** To obtain a more accurate understanding of Phase 1a, Avondale Drive Estate's circular economy performance, several additional reports should have been provided by the design team. As the project was transferred from another company, the opportunity for early-stage collaboration, when requests for these reports would typically be made was not possible. As outlined within this assessment, the following documents could have informed the analysis and enhanced its overall validity and representativeness.

    - Sustainable procurement plan
    - Materials durability report
    - Material efficiency
    - Maintenance and repair plan
    - Functional Adaptability Strategy
    - Climate Change Adaptation Strategy

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9. APPENDIX A – POLICY FRAMEWORK

9.1. NATIONAL PLANNING POLICY: NATIONAL PLANNING POLICY FRAMEWORK, SEPTEMBER 2023 [1]

The NPPF states, 'the objective of sustainable development can be summarised as meeting the needs of the present without compromising the ability of future generations to meet their own needs,' outlining the three overarching, interdependent objectives of the planning system to achieve sustainable development:

a) **an economic objective** – to help build a strong, responsive and competitive economy, by ensuring that sufficient land of the right types is available in the right places and at the right time to support growth, innovation and improved productivity; and by identifying and coordinating the provision of infrastructure;

b) **a social objective** – to support strong, vibrant and healthy communities, by ensuring that a sufficient number and range of homes can be provided to meet the needs of present and future generations; and by fostering well-designed, beautiful and safe places, with accessible services and open spaces that reflect current and future needs and support communities' health, social and cultural well-being; and

c) **an environmental objective** – to protect and enhance our natural, built and historic environment; including making effective use of land, improving biodiversity, using natural resources prudently, minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy

In respect of sustainability, the document retains its focus for the role that the planning system must play in meeting the challenges presented by climate change. As stated in Paragraph 152:

"The planning system should support the transition to a low carbon future in a changing climate…It should help to: shape places in ways that contribute to radical reductions in greenhouse gas emissions, minimise vulnerability and improve resilience; encourage the reuse of existing resources, including the conversion of existing buildings; and support renewable and low carbon energy and associated infrastructure."

At Paragraph 154 it continues to state:

"New development should be planned for in ways that: a) avoid increased vulnerability to the range of impacts arising from climate change. When new development is brought forward in areas which are vulnerable, care should be taken to ensure that risks can be managed through suitable adaptation measures, including through the planning of green infrastructure; and b) can help to reduce greenhouse gas emissions, such as through its location, orientation, and design. Any local requirements for the sustainability of buildings should reflect the Government's policy for national technical standards."

9.2. REGIONAL PLANNING POLICY: LONDON PLAN, MARCH 2021 [2]

The adopted London Plan (March 2021) has introduced several new policy requirements that consider circular economy principles.

Policy D3 '*Optimising site capacity through the design led approach'* and Policy SI 7 'Reducing waste and supporting the Circular Economy' set clear policy objectives to:

- Create high quality buildings that consider practicality of use, flexibility, safety and building lifespan.
- Encourage the use of appropriate construction methods and robust materials.
- Consider the principles of the circular economy and aim for high sustainability standards.
- Ensure that products and materials are retained at their highest value for as long as possible.
- Improve resource efficiency.
- Minimise waste (both during construction and building operation); and
- Meet or exceed the following targets:
  - Zero biodegradable/recyclable waste to landfill by 2026.
  - Municipal waste recycling target of 65% by 2030.
  - Reuse/recycling or recovery of 95% of construction and demolition waste.
  - The beneficial use of at least 95 per cent of excavation waste.

Policy SI7 requires developments that are referable to the Mayor of London to submit a Circular Economy Statement as part of a planning application; it states:

Referable applications should promote circular economy outcomes and aim to be net zero-waste. A Circular Economy Statement should be submitted, to demonstrate:

- How all materials arising from demolition and remediation works will be re-used and/or recycled.
- 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.
- Opportunities for managing as much waste as possible on site.
- Adequate and easily accessible storage space and collection systems to support recycling and re-use.
- How much waste the proposal is expected to generate, and how and where the waste will be managed in accordance with the waste hierarchy.
- How performance will be monitored and reported.

Policy SI7 encourages London boroughs to set their own lower local thresholds for Circular Economy Statements.

Circular Economy Statements must adhere to the minimum content requirements stated in 'Circular Economy Statement: Guidance Pre-Consultation Draft' to be considered 'compliant'.

Circular Economy Statements will be checked for:

- Completeness
- Technical validity
- Level of ambition

Furthermore, Policy SI7 states that referable applications must demonstrate how performance of the Circular Economy Statement will be monitored and reported, including confirmation of:

- What happened
- How this is different from what was planned
- Why it differed and what the key learnings were

9.3. LOCAL PLANNING POLICY: LBH

9.3.1 LBH Local Plan Part 2, Development Management Policies

LBH made the decision to divide their local plan into two core sections: strategic policies and development management policies. In 2020, the LBH adopted an updated version of part 2 of their local plan, which identified the main challenges and priorities for housing and construction in the Borough until 2026. Its purpose is to provide detailed policies to form the basis of council decisions on planning applications The principles of this plan, underpin the legal requirements to comply with the GLA London Plan whilst also setting out initiatives to address and resolve local issues

Hillingdon Council have structured the document by identifying several key areas to change and use these as foundations for the policies outlined within. The key areas are as listed below:

- The economy
- Town centres
- New Homes
- Historic and built environment
- Environmental Protection and Enhancement
- Community Infrastructure
- Transport and aviation

A key aspect of the Hillingdon Local Plan: Part 2 is to work towards the nationwide goal to 'become a net-zero' by 2050. The main policy within the local plan addressing this is ***' Policy DMEI 2: Reducing Carbon Emissions'.*** Measures identified to enhance sustainability within the local area and mitigate climate change include:

- All developments are required to make the fullest contribution to minimising carbon dioxide emissions in accordance with London Plan targets.
- All major developments proposals must be accompanied by an energy assessment showing how these reductions will be achieved.
- Proposals that fail to take reasonable steps to achieve the required savings will be resisted. However, where it is clearly demonstrated that the targets for carbon emissions cannot be met onsite, the Council may approve the application and seek an off-site contribution to make up for the shortfall.

Hillingdon Council aims to integrate carbon management and sustainability into the design of new Homes. ***Policy DMIN 4: Reuse and Recycling of Aggregates*** moves the documents focus from operational carbon to embodied carbon involved in a WLCA and how to reduce these emissions.

- They council will promote the recycling of construction, demolition and excavation waste
- All developments will be encouraged to:
  - Recycle and re use construction, demolition and excavation waste as aggregates.
  - Process and re-use the recyclable material onsite, and where this is not possible, the material should be reused at another site or land restoration.

9.3.2 The Strategic Climate Action Plan, March 2021

This strategic climate action plan is built on the vision *' To become the greenest London Borough, to protect and enhance the environment, and to provide a brighter prospect for future generation'.* The plan sets out actions to realising the vision.

Hillingdon council pinpoints seven key themes which the councils response to the climate emergency will be developed.

- C1: Community Leadership
- C2: The council own operations
- C3: Building better places
- C4: Using clean and green energy
- C5: Waste Management
- C6: Climate Change Adaptation and Mitigation
- C7: Carbon offsetting

Despite all key themes being very relevant to WLCA's, C3, C4, and C5 are all significant to take into account. They state:

'To ensure all new development contributes to responsible environmental performance.'

'To ensure and certify that the Council secures energy supplies from low or clean forms of generation by 2030'

'To consider new planning policies to ensure all non-major new development is also zero carbon'

9.3.3. West London Waste Plan

In July 20215, the region of West London adopted a West London Waste Plan (WLWP), this has been prepared with the objective of ensuring consistency with national government policy and general conformity to the London Plan.

Policy WLWP 6: Sustainable Site Waste Management outlines how all new developments will be expected to consider and implement sustainable design and construction techniques,

- To encourage sustainable waste management, waste management developments will be permitted where it can be demonstrated that:
  - A minimum of 10% if the materials used in construction must be reused or recycled and sourced within 100km from the site.
  - Construction, demolition and excavation wastes are minimised and then reused or recycled on site, where practicable and environmentally acceptable
  - Site Waste management plans (SWMP) must be comprehensive
  - Where on-site management of waste is not possible, active consideration has been given to the transportation of construction, demolition and

9. APPPENDIX B – GLA CIRCULAR ECONOMY TABLE

NOTE: *The circular economy commitment referenced below were originally set out by Synergy; however, calfordseaden had limited access to the supporting documents. Despite this, calfordseaden has drawn on the available information to inform this section of the report, undertaking an internal assessment to provide an impartial interpretation of the principles.*

Aspect	Phase/building area	Steering approach	Explanation	Targets	Support analysis / Studies / surveys / audits to be undertaken and provided to demonstrate
Circular Economy approach for the new development	Construction	Sustainable Sourcing	Project to use a Sustainable Procurement plan Materials to be sustainably sourced Local suppliers to be preferred where possible, to reduce transport distances	100% FSC/PEFC certified timber 100% concrete BES 6001 certified. Steel, where possible, to be sourced under the CARES scheme Other materials to be certified under an Environmental Management System (eg ISO 14001	Sustainable Procurement Plan
		Construction Waste	Contractor to record total construction waste and how it will be disposed of. Measures to be implemented to manage and reduce construction waste (e.g. segregation on site, greater use of Prefabrication / MMC off-site)	<7.5m3 construction waste (excl excavation) per 100m2 GIA	OWMS
		Durability	Durable, long-lasting materials (e.g. brick for external walls) will be used.	-	Material Durability Report
		Optimise material use	Materials to be use efficiently to reduce wastage on site.	-	Sustainable Procurement plan Material Efficiency report
		Functional Adaptability	Design for adaptability and flexibility e.g. possible to change heat source to District Heating should it become available	Ability to swap Heat Pumps for DHN. Ability to add passive cooling and/or NOx filtration to any apartment, without any opening up works required.	Functional adaptability strategy
		Reuse and recycling at end of life	Design for disassembly and deconstruction, to ensure materials are retained in a high value state.	95% Diversion from Landfill (GLA target)	Specifications and reports from design team
Circular economy approach for the existing site	Demolition	Maximise recovery, reuse, and recycling of demolition waste	Concrete will be crushed, grated and stockpiled on site prior to being re-used, Bricks will be cleaned for re-use, Metal will be separated for recycling	95% Diversion from Landfill (GLA target)	Pre-demolition audit SWMP
Circular economy approach for municipal waste during operation	Operation	Storage and Segregation of Municipal Waste	On-site bin store to accommodate sufficient storage for both recyclable and landfill waste	>65% of municipal waste diverted from landfill	Operational waste management strategy

9. APPENDIX C – KEY COMMITMENTS

NOTE: *The circular economy commitment referenced below were originally set out by Synergy; however, calfordseaden had limited access to the supporting documents. Despite this, calfordseaden has drawn on the available information to inform this section of the report, undertaking an internal assessment to provide an impartial interpretation of the principles.*

Building Layer (as per GLA Guidance)	Site	Substructure	Super-structure	Shell/Skin	Services	Space	Stuff	Construction Stuff	Summary	Challenges	Counter-Actions +	Plan to prove and quantify
	SECTION A: CONSERVE RESOURCES											
Minimising the quantities of materials used	Re-use materials from demolition. Avoid major.	Minimise volume of concrete used and use alternatives to high cement mix Minimise volume of concrete used and use alternatives to high cement mix.	Minimise volume of concrete used and use alternatives to high cement mix	Use recycled and or recyclable brick	Fabric first approach resulting in very small central plant.	Aerated block partitions instead of plasterboard, to allow greater longevity and end-of life re-use /	Induction hobs instead of gas to avoid need for gas to building	Suppliers will agree to reduce packaging. Prefabrication where possible / MMC. JIT delivery to reduce stockpiling	Lean design principles. Prefabrication and standardisation where possible	Ensure structural design (sub & super) optimised	Structural Engineer and Architect	When design finalised for tender compare to benchmarks
Minimising the quantities of other resources used (energy, water, land)	Increasing number of dwellings / habitable rooms maximises use of land	WLC Assessment to reduce Embodied Carbon.	WLC Assessment. A Functional Adaptation Strategy (FAS) will be produced – looking at expandability, adaptation and reu	WLC & FAS. Envelope will have enhanced U-values & airtightness (see energy statement) as part of Net zero Carbon in use	Fabric first energy strategy minimises plant space. Zero-Carbon in use strategy minimises operational energy Low flow fittings reduce water consumption to	Unheated common parts reduce overall energy consumption	Induction hobs reduce energy consumption. EV chargers encourage uptake of low carbon transport.	The contractor will be required to monitor and report energy and water use on site	A functional Adaptation Strategy Study and Plan will be adhered to. Monitoring and reporting of energy use on site. Net Zero Carbon in use will minimise operational energy.	Making sure the Heat Pumps perform as well in the real world as they do in the MCS certificates.	Design Team: Heat pumps to have; Airflow, Drainage.,24-hr operation, Low water temps,	Detailed design of Heat Pump installation, not D&B. Named supplier at Tender. Insist on adequate commissioning before handover and seasonal commissioning after.
Specifying and sourcing materials responsibly and sustainably	Sustainable Procurement Plan Prioritise locally sourced materials and labour where possible	Prioritise Certified products and materials -EPDs -Iso 14001 -BES6001 -FSC -PEFC -CARES Concrete GGBS content to be optimised Seek to use materials that can be reused at end of lif	Prioritise products certified with BES6001 'Good' Concrete GGBS content to be optimised Recycled content to be optimised	Prioritise façade systems with EPD's	Use MCS certified Heat Pumps and PVs. Use MCS Certified installers. Prioritise products certified with -EPDS -PHC			Sustainable Procurement Plan to form a part of Tender package and contractual requirement. Review with contractor during prconstruction supply chain engagement and contractor's proposals sign-of	Use best practice when specifying and also when approving contractor's proposals	"Value Engineering'	Design Team to prepare Tender that insists on rigorous approvals procedure for Contractors proposals	See previous column

Building Layer (as per GLA Guidance)	Site	Substructure	Super-structure	Shell/Skin	Services	Space	Stuff	Construction Stuff	Summary	Challenges	Counter-Actions +	Plan to prove and quantify
	SECTION B: DESIGN TO ELIMINATE WASTE (AND FOR EASE OF MAINTENANCE)											
Designing for reusability / recoverability / longevity / adaptability / flexibility	-	The following aspects have been considered: Flexible floorplates Avoidance of toxic finishes Floor to ceiling heights Placement of core Standard components	The following have been considered: - MMC - Disassembly Strategy - Standardised Components	A brick façade was chosen for its longevity, ease of cleaning and ease of disassembly at end of life	The following aspects have been considered: -Avoid HIU's and / or HW Cyl's in each apartment. -MVHR units maintained from corridor. -Central plant easily replaced. Easy NOx filters retrofit	Blockwork partition walls were chosen for their greater robustness, lower maintenance and reclaim ability at end of life		Sustainable procurement plan Advice from Contractor and Supply Chain will be sought on ways to improve reusability /recoverability/longevity/adaptability /flexibility of the tendered design	Design spaces for flexibility whilst enabling access to all elements that could be re-used / replaced.	Avoid design solutions which could constrain disassembly / recovery	Disassembly recovery review (Design Team, Contractor and Supply chain) prior to commencement on site.	See previous
Designing out construction, demolition, excavation, industrial and municipal waste arising	-	The ground floor slab and foundations will be demolished and crushed to a 6F2 specification for reuse within the site .	The following have been considered: - MMC - DfMA - Supplier take-back - JIT delivery	The following have been considered: - MMC - DfMA - Supplier take-back - JIT delivery	The following have been considered: - MMC - DfMA - Supplier take-back - JIT delivery	The following have been considered: - MMC - DfMA - Supplier take-back - JIT delivery		Accurately forecasting the amount of materials needed, using larger pack sizes to reduce the amount of packaging per unit and by using cardboard packaging instead of plastic where possible.	Designing out waste through regular / modular design. Consideration for just-in-time delivery, reducing packaging, and supplier take back scheme	Supplier take back schemes are still not widespread in the UK	Review at Design Stage, and site stage.	Review procurement plan with contractor and contractor's supply chain

Building Layer (as per GLA Guidance)	Site	Substructure	Super-structure	Shell/Skin	Services	Space	Stuff	Construction Stuff	Summary	Challenges	Counter-Actions +	Plan to prove and quantify
	SECTION C: MANAGE WASTE											
Demolition waste (how waste from demolition of the layers will be managed)	Aim to achieve 95% diversion from land fill	The substructure of the current buildings Is likely to be shallow strip foundations, which will be dug out and crushed to be reused on this site of off site.	Solid brick walls and potentially some steel will be considered for reuse. Otherwise, will be recycled. The ground floor concrete slab and foundations are most likely constructed of concrete; all will be demolished and crushed to a 6F2 specification for reuse within the site. Clean concrete will be processed back to aggregate for concrete Construction.	Mainly bricks. Where possible these will be salvaged and re-used either on or off site. The roofing materials are likely to be landfilled as they are fibre cement products. Where possible any insulation will be recovered at the recycling facility for reprocessing. Contaminated insulation will need to be forwarded for disposal.	Copper pipework: recycle PVC,pipework recycled Electrical installations: recycled Extract fans+ ductwork: recycled.		Some ferrous and nonferrous metal, suitable for reuse can be sold and reused	Waste relating to the demolition phase will be managed through the implementation of a D&SWMP to be submitted prior to aboveground works, with a primary aim to minimise waste during this period. The contractor will support the segregation of recoverable and nonrecoverable waste streams and indicative vehicle routes will be mapped, focusing on reducing vehicle milage.	P[re-demolition audit will be undertaken , targeting 95% of waste diversion from landfill	Ensuring 95% of waste is diverted from landfill	Pre-demolition audit, pre contract engagement with demolition contractor	Demolition SWMP records
Excavation waste (how waste from excavation will be managed)	No basement is proposed; no off-site soil removals proposed by the landscape Architect	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Construction waste (how waste arising from construction of the layers will be reused or recycled)	Aim to achieve 95% diversion from landfill. Overall project target waste arisals <6.5 ton /100m2 GIFA of non-hazardous construction waste.	Aim to achieve 95% diversion from landfill. Overall project target waste arisals <6.5 ton /100m2 GIFA of non-hazardous construction waste.	Aim to achieve 95% diversion from landfill. Overall project target waste arisals <6.5 ton /100m2 GIFA of non-hazardous construction waste.	Aim to achieve 95% diversion from landfill. Overall project target waste arisals <6.5 ton /100m2 GIFA of non-hazardous construction waste.	Aim to achieve 95% diversion from landfill. Overall project target waste arisals <6.5 ton /100m2 GIFA of non-hazardous construction waste.	Aim to achieve 95% diversion from landfill. Overall project target waste arisals <6.5 ton /100m2 GIFA of non-hazardous construction waste.	Aim to achieve 95% diversion from landfill. Overall project target waste arisals <6.5 ton /100m2 GIFA of non-hazardous construction waste.	Aim to achieve 95% diversion from landfill. Overall project target waste arisals <6.5 ton /100m2 GIFA of non-hazardous construction waste.	Aim to achieve 95% diversion from landfill. Overall project target waste arisals <6.5 ton /100m2 GIFA of non-hazardous construction waste.	N/A	N/A	N/A
Municipal and industrial waste (how the design will support operational waste management)	Refuse storage planned in conjunction with site waste management strategy	-	-	-	-	-	Space will be provided for segregation of ecyclables and bulk items so that they can be collected for recycling.	-	-	Space will be provided for segregation of ecyclables and bulk items so that they can be collected for recycling.	Architect: As per previous column	Architect: As per previous column

9. APPENDIX D – REPORTING FORMS – Bill of Materials

***NOTE**: A Bill of materials was not available at the time of the assessment, these figures are based on assumptions and defaults from OneClick LCA.*

Bill of materials				
	Material quantity (kg)	**Material intensity (kg/m2 GIA)**	**Recycled content by value (%)**	**Source of information**
Substructure	1,357,562.44	460.82	0.23	OneClick LCA
Frame	247,619.96	87.45	0.05	OneClick LCA
Upper floors	1684987	571.96	0.73	OneClick LCA
Superstructure: Roof	184660.9	62.68	0.09	OneClick LCA
Superstructure: Stairs and Ramps	55689.73	18.9	0.12	OneClick LCA
Superstructure: External Walls	342860.9	116.38	0.26	OneClick LCA
Superstructure: Windows and External doors	10097.92	3.43	0	OneClick LCA
Superstructure: Internal Walls and Partitions	1168882	396.77	12.58	OneClick LCA
Superstructure: Internal doors	8127.38	2.76	0	OneClick LCA
Finishes	21603.75	7.33	0.23	OneClick LCA
Fittings, furnishings & equipment's	8660.07	2.94	0	OneClick LCA
Services (MEP)	249400.2	84.66	0.09	OneClick LCA
Prefabricated buildings and building units	-	-	-	OneClick LCA
Work to existing building	-	-	-	OneClick LCA
External works	341.56	0.12	0.01	OneClick LCA
Total	**5350493**	**1816.19**	**14.36**	
			This post-construction model does not currently demonstrate the target ≥20% recycled content by value. However, it is important to note that this outcome is based on OneClick's default values and assumptions, meaning the results may not fully reflect actual project conditions.	

9. APPENDIX E – REPORTING FORMS – Recycling and Waste Reporting

Recycling and Waste reporting						
Category	**Total estimate**	**Of which…**				**Source of information**
	Quantity (tonnes)	% Reused or recycled on-site	% Reused and recycled off-site	% Not reused or recycled		
				% To landfill	% To other (e.g., incineration)	
Excavation waste	3960	100%		0	-	SWMP [5]
Demolition waste	0	99%		-	-	
Construction waste	1017.4	95% to have beneficial use (ratio of on-site and off-site usage to be confirmed)		1%	-	
	Refuse allocated (litres)	% Reused on or off site	% Recycled or composted on or off site	% Not reused or recycled		
				% To landfill	% To other (e.g., incineration)	
Municipal waste	**43.73 tonnes per year (est)**	-	50% of containers should be allocated for dry mix recycling, a further 10 litres per unit for food waste as per LBH Local Plan [11]	-	-	Refuse Strategy Block A [17]
General refuse	4400litres			-	-	
Dry recyclables	4400litres			-	-	
Organic waste	480litres			-	-	

In line with London Plan Policy targets, a commitment has been made to meet the policy requirements: 95% reuse/recycling/recovery of construction and demolition waste, 95% beneficial use of excavation waste and 65% recycling of municipal waste by 2030.