



Berol Quarter Limited

Berol Quarter, Tottenham Hale, London, N17 9LJ

Energy Statement



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November 2022
June 2023 update



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Energy Statement

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1 EXECUTIVE SUMMARY

WSP has been commissioned by Berol Quarter Limited (the Applicant) to develop and prepare an Energy Statement for the Planning Application of development at Berol Quarter in Tottenham Hale, London (the Site) in the London Borough of Haringey (LB Haringey). The development of the energy strategy has followed the GLA policy and maximised performance for full compliance.

The description of development is as follows and will be referred to as 'the Proposed Development' after:

Full planning permission for the refurbishment and extension of Berol House to include Use Class E floorspace and the redevelopment of 2 Berol Yard to provide new residential homes, Use Class E floorspace and associated landscaping, public realm improvements, car and cycle parking and other associated works.

Multiple layers of statutory and policy requirements apply to the Proposed Development at a national, regional and local level, each of which requires different energy efficiency and carbon emission targets to be met. The Proposed Development will be designed to address the relevant requirements applicable at each stage of development.

The Applicant's approach to sustainable development is underpinned by policies from the London Plan (2021) and the LB Haringey Local Plan. Together these documents provide strategic spatial policies, development management policies and site allocations to guide and manage development in the borough.

1.1 ENERGY AND CARBON POLICY SUMMARY

On that basis, the implications of the relevant targets for both the residential and non-residential components of the Proposed Development can be summarised as follows:

- All developments must meet the prevailing Building Regulations requirements. Specifically, with regards to energy and carbon compliance, all buildings must meet the Building Regulations Part L 'Target Emission Rate' (TER) requirements for the Part L revision which is current at the time of initial construction works for each particular developmental phase.
- The residential components of the Proposed Development will be assessed against Approved Document L1 which relates to new build residential buildings and all the non-residential components will be assessed against Approved Document L2 relating to new build non-residential buildings.
- As required by LB Haringey, the residential components of the Proposed Development must demonstrate how the zero-carbon target for both residential and non-residential developments will be met, with at least a 35% on-site reduction beyond Part L 2013 and proposals for making up the shortfall to achieve zero carbon, where required. For the purposes of calculating carbon reductions for planning the proposed SAP10 emission factors will be used.
- Domestic developments should achieve at least a 10% improvement on Building Regulations from energy efficiency.
- Non-domestic developments should achieve at least a 15% improvement on Building Regulations from energy efficiency.
- Developments will be required to connect to or demonstrate a potential connection to a decentralised energy system unless it can be demonstrated that it is not feasible or viable and evaluate the feasibility of communal heating systems.

- Major developments should provide a reduction in expected CO₂ emissions through the use of on-site renewable energy generation, where feasible to do so.
- Dynamic modelling for overheating risk analysis in line with the guidance and data sets in CIBSE TM52 and TM59 should be undertaken.
- All new non-residential development and non-self-contained residential accommodation over 500 square metres floorspace (gross) are expected to meet or exceed BREEAM 'very good' rating.
- The Energy Statement must include information of how the building's actual energy performance will be monitored post-construction and produce all relevant documentation as outlined in the "Be Seen – Energy Monitoring Guidance".
- All major developments are required to calculate and reduce the whole life-cycle carbon (WLC) emissions to fully capture the development's carbon impact.

1.2 ENERGY STRATEGY SUMMARY

The energy strategy has been structured in accordance with GLA's energy hierarchy: Be Lean, Be Clean, Be Green and Be Seen. The Proposed Development has been developed to achieve an energy efficient and sustainable development

The energy strategy will be carried out in line with Building Regulations Part L 2013, as advised in the GLA Pre-application notice (22. September 2022).

The Proposed Development will be designed to achieve optimum energy performance, and will incorporate the following design features:

- During design development, significant consideration has been given to how the building fabric will respond to its environment in order that the energy consumption of the building is reduced as far as possible through passive means. The building fabric will be designed to significantly exceed the minimum fabric requirements of Part L1 and L2 (2013) of the Building Regulations.
- Passive design measures will be incorporated into the design to reduce energy demand and the risk of overheating.
- A high-performance building services solution is proposed for the Proposed Development.
- WSP has been in contact with LB Haringey Council regarding a proposed District Heat Network. It has been determined that there is an opportunity to connect to a planned District Heat Network.
- Subject to future legal and technical agreements, the plant space will be designed for future connection into the district heating network through the provision of capped connections.
- Space heating and hot water are provided by the district heat network to the whole development.
- There is provision for gas boilers as a temporary solution in case there is a time lag between occupation of development and district heat network being read.
- Terminal units are designed to achieve a specific fan power in operation significantly lower than the Part L 2013 limiting SFP.
- All spaces will include 100% low energy lighting. Lighting controls will be specified as appropriate across the development.

- A CHP engine has not been proposed for the site as the true carbon savings of the technologies have diminished with the decarbonisation of the grid. Using SAP10.0 carbon emission factors for grid electricity causes CHP engines to produce more carbon than a standard gas fired boiler system.
- Retail units will be completed to shell and core standard only, providing base services for future extension by tenants. The retail tenants will be responsible for provision of services to suit their requirements. However, heating and cooling will be provided for the tenants' use from the plant space.
- Approximately 250 m² of PV can fit on the roof of the of Berol House and 140 m² of PV can fit on the roof of the of 2 Berol Yard. These arrays will contribute towards the on-site carbon reduction target.

1.3 RESULTS

CARBON EMISSIONS

Detailed energy modelling was undertaken based on the methodology from Part L1 and L2 of the Building Regulations (2013) in order to establish the baseline carbon emissions for the Proposed Development.

WSP utilised a dynamic simulation software package, the Virtual Environment (VE) suite from Integrated Environmental Solutions (IES). The carbon emissions for the residential elements of the Proposed Development were calculated utilising Accredited Design Standard Assessment Procedure (SAP) 10 software, Elmhurst Design.

The SAP 10.0 carbon factors have been used for all further calculations using version 1.2 of the GLA Carbon Emission Reporting Spreadsheet

The results of the analyses for the residential element, non-residential element and whole development are shown in

Table 1-1, Table 1-2, Table 1-3 and Table 1-4 and Table 1-5.

2 BEROL YARD

Table 1-1 Carbon emissions after providing renewable energy – Residential

TOTAL	REGULATED EMISSIONS (TONNES)	UNREGULATED EMISSIONS (TONNES)	% REDUCTION IN REGULATED CARBON EMISSIONS
Baseline emissions (Tonnes CO ₂)	206.6	115.2	-
Emissions after energy demand reduction (Tonnes CO ₂)*	184.8	115.2	10.6%
Emissions after energy efficient supply (Tonnes CO ₂)*	41.5	115.2	79.9%
Emissions after renewable energy (Tonnes CO ₂)	39.7	115.2	80.8%

**The energy efficiency savings have been calculated on the basis that the buildings are served by a central heating system served by gas fired boilers only, with a seasonal efficiency of 91%.*

Table 1-2 Carbon emissions after providing renewable energy – Non-Residential

TOTAL	REGULATED EMISSIONS (TONNES)	UNREGULATED EMISSIONS (TONNES)	% REDUCTION IN REGULATED CARBON EMISSIONS
Baseline emissions (Tonnes CO ₂)	33.4	16.6	-
Emissions after energy demand reduction (Tonnes CO ₂)*	27.9	16.6	16.5%
Emissions after energy efficient supply (Tonnes CO ₂)*	21.5	16.6	35.6%
Emissions after renewable energy (Tonnes CO ₂)	21.5	16.6	35.6%

**The energy efficiency savings have been calculated on the basis that the buildings are served by a central heating system served by gas fired boilers only, with a seasonal efficiency of 91%.*

BEROL HOUSE

Table 1-3 Carbon emissions after providing renewable energy – Non-residential (Refurbished)

TOTAL	REGULATED EMISSIONS (TONNES)	UNREGULATED EMISSIONS (TONNES)	% REDUCTION IN REGULATED CARBON EMISSIONS
Baseline emissions (Tonnes CO ₂)	134.0	59.0	-
Emissions after energy demand reduction (Tonnes CO ₂)*	80.4	59.0	40%
Emissions after energy efficient supply (Tonnes CO ₂)*	34.5	59.0	74%
Emissions after renewable energy (Tonnes CO ₂)	34.5	59.0	74%

Table 1-4 Carbon emissions after providing renewable energy – Non-residential (Extension)

TOTAL	REGULATED EMISSIONS (TONNES)	UNREGULATED EMISSIONS (TONNES)	% REDUCTION IN REGULATED CARBON EMISSIONS
Baseline emissions (Tonnes CO ₂)	38.3	42.7	-
Emissions after energy demand reduction (Tonnes CO ₂)*	28.9	42.7	24.5%
Emissions after energy efficient supply (Tonnes CO ₂)*	24.2	42.7	36.9%
Emissions after renewable energy (Tonnes CO ₂)	19.3	42.7	49.7%

**The energy efficiency savings have been calculated on the basis that the buildings are served by a central heating system served by gas fired boilers only, with a seasonal efficiency of 91%.*

SITE WIDE

Table 1-5 Carbon emissions after providing renewable energy – Site wide

TOTAL	REGULATED EMISSIONS (TONNES)	UNREGULATED EMISSIONS (TONNES)	% REDUCTION IN REGULATED CARBON EMISSIONS
Baseline emissions (Tonnes CO ₂)	412.4	233.9	-
Emissions after energy demand reduction (Tonnes CO ₂)*	322.1	233.9	22%
Emissions after energy efficient supply (Tonnes CO ₂)*	121.7	233.9	70%
Emissions after renewable energy (Tonnes CO ₂)	115.0	233.9	72%

1.4 RESULTS SUMMARY

The above tables show that the 10% residential and 15% non-residential GLA Be Lean targets have been exceeded. They also show that the residential element and non-residential elements both meet or exceed the overall Be Green target of 35% with an overall reduction of **72%** for the detailed application.

2 PROJECT BACKGROUND

The application site encompasses an area of approximately 0.5 hectares situated within the LB Haringey. The Site is bound by Watermead Way on the south and east, Ashley Road to the west and Burdock Road to the north.

Berol House is an existing three storey locally listed building. 2 Berol Yard is currently a vacant site which is used for car parking.

In terms of the proposed land use, Berol House and the non-residential areas in 2 Berol Yard will be Commercial, Business and Service use falling within Use Class E. The majority of 2 Berol Yard will be residential and therefore falls under Use Class C3. There will be class E and community space on the ground and first floor.

The Site lies approximately 160m north of Tottenham Hale underground and national rail station and is well served by public transport with a PTAL rating of 6a 'Excellent'.

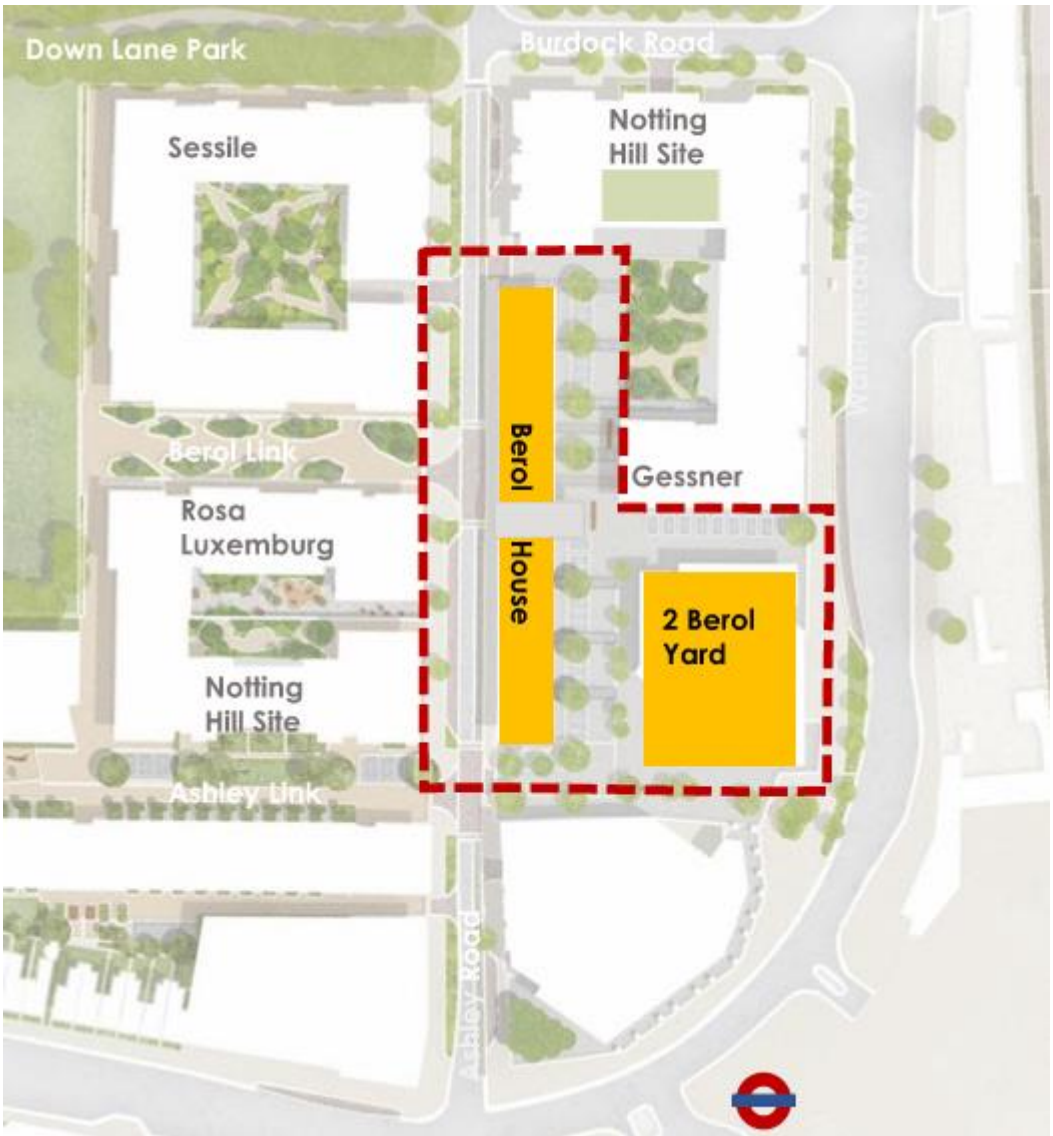


Figure 2-1 Site location

2.1 THE PROPOSED DEVELOPMENT

The applicant is preparing a planning application for the Proposed Development. The local authority is LB Haringey.

The application description is as follows:

Full planning permission for the refurbishment and extension of Berol House to include Use Class E floorspace and the redevelopment of 2 Berol Yard to provide new residential homes, Use Class E floorspace and associated landscaping, public realm improvements, car and cycle parking and other associated works.

Based on latest accommodation schedule provided by Allies and Morrison the proposed homes will be of the following mix, see Table 2-1.

Table 2-1 Proposed Homes Unit mix

FLAT TYPE	UNIT MIX (%)	UNIT SIZE (M2)	UNIT NUMBER
Studio	10	39	20
1B	23	50	48
2B3P	10	61	21
2B4P	44	70	93
3B5P	8	86	17
3B6P	5	95	11
Total	100		210

3 POLICY CONTEXT

LB Haringey’s approach to sustainable development is underpinned by policies from the London Plan (2021) and LB Haringey’s policy documents for the borough. Together these documents provide strategic spatial policies, development management policies and site allocations to guide and manage development in the borough.

3.1 NATIONAL PLANNING POLICY

The National Planning Policy Framework (NPPF) was updated in July 2021 and replaces the previous versions. Plans and decisions should apply a presumption in favour of sustainable development.

The National Planning Policy Framework (NPPF) sets the planning context for sustainable design and construction. It is this that Local Planning Policies are based on and adapted to account for regionally specific requirements.

The NPPF identifies three dimensions to sustainable development - economic, social and environmental – which should be applied jointly and simultaneously:

- **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;
- **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 a well-designed and safe built environment, with accessible services and open spaces that reflect current and future needs and support communities’ health, social and cultural well-being; and
- **Environmental objective** – to contribute to protecting and enhancing our natural, built and historic environment; including making effective use of land, helping to improve biodiversity, using natural resources prudently, minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy.

The NPPF promotes the pursuit of sustainable development by seeking positive improvements to the built and natural environment, and to people’s quality of life. The NPPF includes the following key themes:

- Delivering a sufficient supply of homes
- Building a strong, competitive economy
- Ensuring the vitality of town centres
- Promoting healthy and safe communities
- Promoting sustainable transport
- Supporting high quality communications
- Making effective use of land
- Achieving well-designed places
- Protecting green belt land

- Meeting the challenge of climate change, flooding and coastal change
- Conserving and enhancing the natural environment
- Conserving and enhancing the historic environment
- Facilitating the sustainable use of materials.

3.2 REGIONAL POLICY - THE LONDON PLAN MARCH 2021

The New London Plan was adopted in March 2021 and is the Spatial Development Strategy for Greater London. It sets out a plan for how London will be developed over the next 20-25 years.

An overview of the energy policy is provided in Table 3-1:

Table 3-1 Summary of key policies in the London Plan 2021

POLICY TITLE	SUMMARY OF POLICY
Policy SI1: Improving Air Quality	Development should not lead to further deterioration of existing poor air quality, create any new areas that exceed air quality limits and create unacceptable risk of high levels of exposure to poor air quality. Major development must be at least air quality neutral and should use design solutions to prevent or minimise increased exposure to existing air pollution and make provision to address local problems of air quality in preference to post-design or retrofitted mitigation measures. Major development must be submitted with an Air Quality Assessment. To reduce the impact on air quality during the construction and demolition phase development proposals must demonstrate how they plan to comply with the Non-Road Mobile Machinery Low Emission Zone and reduce emissions from the demolition and construction of buildings following best practice guidance
Policy SI2: Minimising Greenhouse Gas Emissions	Major development should be net zero-carbon. Reducing greenhouse gas emissions in operation and minimising both annual and peak energy demand in accordance with the energy hierarchy: Be Lean – Be Clean – Be Green – Be Seen. Major development proposals should include a detailed energy strategy to demonstrate how the zero-carbon target will be met and achieve a minimum on-site reduction of at least 35% beyond Building Regulations. Residential development should achieve 10% and non-residential should achieve 15% through energy efficiency measures. Where it is clearly demonstrated that the zero-carbon target cannot be fully achieved on-site, any shortfall should be provided, in agreement with the borough, either: 1) through a cash in lieu contribution to the borough’s carbon offset fund, or 2) off-site provided that an alternative proposal is identified and delivery is certain. Major development should calculate and minimise carbon emissions from any other part of the development, including plant or equipment (Unregulated emissions). Development (referable to the Mayor) should calculate whole life-cycle carbon emissions through a nationally recognised Whole Life-Cycle Carbon Assessment and demonstrate actions taken to reduce life-cycle carbon emissions.
Policy SI3 Energy Infrastructure	Boroughs and developers should engage at an early stage with relevant energy companies and bodies to establish the future energy and infrastructure requirements arising from large-scale development proposals such as Opportunity Areas, Town Centres, other growth areas or clusters of significant new development.
Policy SI4 Managing Heat Risk	Development should minimise adverse impacts on the urban heat island through design, layout, orientation, materials and the incorporation of green infrastructure. Through an energy strategy, development should demonstrate how they will reduce internal overheating and reliance on air conditioning systems in accordance with the cooling hierarchy.

3.3 REGIONAL POLICY – SUPPLEMENTARY PLANNING GUIDANCE

ENERGY ASSESSMENT GUIDANCE (JUNE 2020) DRAFT

The Mayor Energy Assessment Guidance sets out guidance on preparing energy assessments as part of planning applications. The document sets out the requirements to minimise CO₂ emissions through the application of the energy hierarchy:

1. **Be lean:** use less energy
2. **Be clean:** supply energy efficiently
3. **Be green:** use renewable energy
4. **Be seen:** monitor performance

Over the last 2 to 3 years, the quantum of coal in the electricity mix in the UK has substantially decreased and the quantum of low and zero carbon technologies (including PV, wind and nuclear energy) has increased; as a result, the carbon content of grid supplied electricity has reduced. This decarbonisation will accelerate; suggesting a push towards an increasingly electric future rather than the gas fuelled MEP solutions that we see today.

The Mayor strives to improve the air quality in London and a movement towards an all-electric solution also provides air quality benefits both local to the development and across the city.

Since January 2019, applicants submitting GLA referable applications have been encouraged to use the SAP 10.0 emission factors in areas where there are no opportunities to connect to existing or planned district heating networks. Under the 2013 Building Regulations, applicants were to continue to use the current Building Regulations methodology for estimating energy performance against Part L (2013) requirements, but with the outputs manually converted to the SAP 10.0 carbon emission factors.

In line with the GLA's pre-application report (September 2022), the carbon emissions will be assessed against the 2013 Building Regulations:

“The London Plan requires all major developments (residential and non-residential) to meet a net-zero carbon target. This should be met with a minimum on-site 35% reduction in carbon emissions beyond Part L of 2013 Building Regulations with any carbon shortfall to net zero being paid into the relevant borough's carbon offset fund.”

Table 3-2 Summary Part L Carbon Factors – Part L 2013 (SAP 2012), SAP 10

FUEL TYPE	PART L 2013 (SAP 2012) (kg.CO ₂ /kWh)	SAP 10.0 (kg.CO ₂ /kWh)
Grid Supplied Electricity	0.519	0.233
Natural Gas	0.216	0.210

3.4 LB HARINGEY'S LOCAL PLAN

LB Haringey's Local Plan: Strategic Policies (2013-2026) was adopted in March 2013 and consolidated with alterations in 2017. The most relevant policies for this development are as follows:

Policy title	Summary of policy
SP0: Presumption in favour of sustainable development	When considering development proposals the Council will take a positive approach that reflects the presumption in favour of sustainable development contained in the National Planning Policy Framework (NPPF). The Council will always work proactively with applicants to find solutions, which mean that proposals can be approved wherever possible and to secure development that improves the economic social and environmental conditions in Haringey. Planning applications that accord with the policies in Haringey's Local Plan (and, where relevant, with policies in neighbourhood plans) will be approved without delay, unless material considerations indicate otherwise.
SP4: Working towards a low carbon Haringey	The Council will promote the measures outlined below to reduce carbon emissions from new and existing buildings. 1. In line with London Plan policy, the Council will promote and require all new developments to take measures to reduce energy use and carbon emissions during design, construction and occupation, by incorporating the following measures: a. (...) All new residential development shall be zero carbon from 2016 onwards; and b. From 2011 onwards all new non-residential development shall be built to at least BREEAM "very good" standard and should aim to achieve BREEAM "excellent" (...). All new non-residential development shall be zero carbon from 2019. 2. The Council will promote low- and zero-carbon energy generation through the following measures: a. Requiring all developments to assess, identify and implement, where viable, site-wide and area-wide decentralised energy facilities including the potential to link into a wider network; b. Establishing local networks of decentralised heat and energy facilities by requiring developers to prioritise connection to existing or planned networks where feasible; c. Working with neighbouring boroughs and other partners to explore ways of implementing sub-regional decentralised energy networks including the potential in the Upper Lee Valley Opportunity Area; and d. All new developments are required, where viable, to achieve a reduction in predicted carbon dioxide emissions of 20% from on site renewable energy regeneration, which can include connections to local sources of decentralised renewable energy.
SP6: Waste and Recycling	The Council supports the objectives of sustainable waste management set out by the Government in PPS10 Planning for Sustainable Waste Management and the Mayor's London Plan. To achieve these, the Council shall: ▪ Safeguard existing waste sites unless compensatory provision is made; ▪ Maximise self-sufficiency in waste management capacity; ▪ Seek to minimise waste creation, increase recycling rates in relation to commercial, industrial and municipal waste in order to achieve the Mayor's recycling targets; ▪ Address waste as a resource and look to disposal as the last option, in line with the Mayor's waste hierarchy; ▪ Require integrated, well-designed recycling facilities to be incorporated into all new developments; ▪ Monitor changes in the stock of waste management facilities, waste arisings, and the amount of waste recycled, recovered and going for disposal; and

Policy title	Summary of policy
	Continue working with its partners in the North London Waste Authority to adopt the North London Waste Plan (NLWP)
SP11: Design	All new development should enhance and enrich Haringey's built environment and create places and buildings that are high quality, attractive, sustainable, safe and easy to use. To achieve this all development shall: - Be of the highest standard of design that respects its local context and character and historic significance, to contribute to the creation and enhancement of Haringey's sense of place and identity; - Ensure impacts on health, climate change, natural resources and biodiversity are minimised by adopting and improving sustainable design and construction techniques; - Incorporate solutions to reduce crime and the fear of crime, such as promoting social inclusion; creating well-connected and high quality public realm that is easy and safe to use; and by applying the principles set out in 'Secured by Design' and Safer Places; - Promote high quality landscaping on and off site, including improvements to existing streets and public spaces; - Seek the highest standards of access in all buildings and places; and - Ensure buildings are designed to be flexible and adaptable – and able to integrate services and functions.

3.5 LB HARINGEY'S DEVELOPMENT MANAGEMENT DPD

LB Haringey's Development Management DPD was adopted in July 2017. The most relevant policies for this development are as follows:

Policy title	Summary of policy
Policy DM21: Sustainable design, layout and construction	A. All new development, including building and landscape works, will be expected to consider and implement sustainable design, layout and construction techniques. Proposals should: a - Apply the energy hierarchy to minimise energy use in order to meet, and if possible exceed, minimum carbon dioxide reduction requirements; b - Apply the cooling hierarchy to reduce the potential for overheating and limit reliance on mechanical air conditioning systems; c - Maximise opportunities to enhance biodiversity on-site, including through appropriate landscaping, Sustainable Drainage Systems, living roofs and green walls d - Wherever possible, use building materials with high environmental performance ratings; and e - Seek opportunities for locally sourced labour. B. The Council will support appropriate measures to sustainably retrofit existing homes and nonresidential buildings. C. Proposals that fail to demonstrate adequate consideration for sustainable design, layout and construction techniques will be resisted. D. Consideration will be given to the use of carbon offset payments, to be secured by planning obligations, where it can be demonstrated that proposals are unable to meet carbon dioxide emission reduction targets on-site.
Policy DM22: Decentralised energy	Existing and planned future DE networks D. All development proposals should prioritise connection to existing or planned future DE networks. E. All major development located within 500 metres of an existing DE Network, and minor new-build development located within 25 metres, will be expected to secure connection to that network subject to demonstration of technical feasibility and financial viability.

Policy title	Summary of policy
	F. All major development located within 500 metres of a planned future DE Network, which is considered by the Council likely to be operational within 3 years of a grant of planning permission, will be expected to secure connection to that network subject to demonstration of technical feasibility and financial viability.

3.6 PART L1A AND L2A OF THE BUILDING REGULATIONS (2013)

All new buildings constructed in the UK must meet the minimum requirements of the UK Building Regulations. Specifically, with regards to energy and carbon compliance, all buildings must meet the Building Regulations Part L 'Target Emission Rate' (TER) requirements for the Part L revision which is current at the time of initial construction works for each particular developmental phase.

This is illustrated by the production of a BRUKL (Building Regulations United Kingdom Part L) document and SAP outputs which list details of the Part L calculation and proposed fabric and building services.

The analysis presented in this report will refer to the Part L 2013, as referred to in the GLA pre-application report. The GLA website further advises that *"However, as the accompanying Part L 2021 software is not yet available, planning applicants should continue to use the 2020 guidance, spreadsheet and the Part L 2013 methodology until the software has been approved by government and is fully functional."*

4 BASELINE CARBON EMISSIONS

The first stage of the energy assessment is to establish the baseline site energy demand and CO₂ emissions based on dynamic energy modelling software for the whole Proposed Development.

Detailed energy modelling was undertaken based on the methodology from Part L1A and L2A of the Building Regulations (2013) in order to establish the baseline carbon emissions for the Proposed Development.

WSP utilised a dynamic simulation software package, the Virtual Environment (VE) suite from Integrated Environmental Solutions (IES). A render of the model can be seen in Figure 4-1.

The carbon emissions for the residential elements of the Proposed Development were calculated utilising Accredited Design Standard Assessment Procedure (SAP) 2012 software, Elmhurst Design. The carbon emission and fabric performance of a relevant selection of units within the development were assessed under SAP methodology. The selection is representative of the worst-case scenario and includes the great majority of interim floors within the development with the highest multipliers. The carbon dioxide emission for the whole development have been calculated as a pro-rata from the tested selection and are reported in this document.

This process enabled the identification of optimum fabric and building services specification required to meet LB Haringey and the GLA’s planning targets.

Berol House

The thermal properties of the existing walls, floor and roof of Berol House has been determined based on typical construction at the time of erection. This exercise was carried out using iSBEM software. The thermal properties of the windows are based on typical constructions at the time of latest renovation, see Table 4-1. The existing MEP services have been modelled based on a site survey carried out by Berol Quarter Limited.

Table 4-1 Berol House Existing Fabric

ELEMENT	EXISTING
Exposed Floor U-value	0.58 W/m²K
Roof U-value	2.8 W/m²K
External Wall U-value	1.7 W/m²K
Glazing U-value	2.48 W/m²K
Glazing g-value	0.4
Air Permeability	25 m³/(h.m²) @50Pa

Table 4-2, Table 4-3, Table 4-4, Table 4-5 and Table 4-6 summarise the baseline carbon emissions split by type and for the whole Proposed Development. The SAP10.0 carbon factors have been used for all calculations using version 1.2 of the GLA Carbon Emission Reporting Spreadsheet.

Please note, in this issue of the report, Berol House baseline has been updated in line with the GLA energy assessment guidance for existing buildings following the GLA Energy comments received.

2 BEROL YARD

Table 4-2 Baseline regulated and unregulated carbon emissions of the scheme – Residential

TOTAL	BASELINE REGULATED EMISSIONS (TONNES CO ₂)	BASELINE UNREGULATED EMISSIONS (TONNES CO ₂)
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Baseline emissions	206.6	115.2
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Table 4-3 Overall baseline regulated and unregulated carbon emissions of the scheme - Non-residential

TOTAL	REGULATED EMISSIONS (TONNES CO ₂)	UNREGULATED EMISSIONS (TONNES CO ₂)
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Baseline emissions	206.6	115.2
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BEROL HOUSE

Table 4-4 Overall baseline regulated and unregulated carbon emissions of the scheme (Refurbishment)

TOTAL	REGULATED EMISSIONS (TONNES CO ₂)	UNREGULATED EMISSIONS (TONNES CO ₂)
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Baseline emissions	134.0	59.0
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Table 4-5 Overall baseline regulated and unregulated carbon emissions of the scheme (Extension)

TOTAL	REGULATED EMISSIONS (TONNES CO ₂)	UNREGULATED EMISSIONS (TONNES CO ₂)
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Baseline emissions	38.3	42.7
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SITE WIDE

Table 4-6 Overall baseline regulated and unregulated carbon emissions of the scheme

TOTAL	REGULATED EMISSIONS (TONNES CO ₂)	UNREGULATED EMISSIONS (TONNES CO ₂)
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Baseline emissions	412.4	233.9
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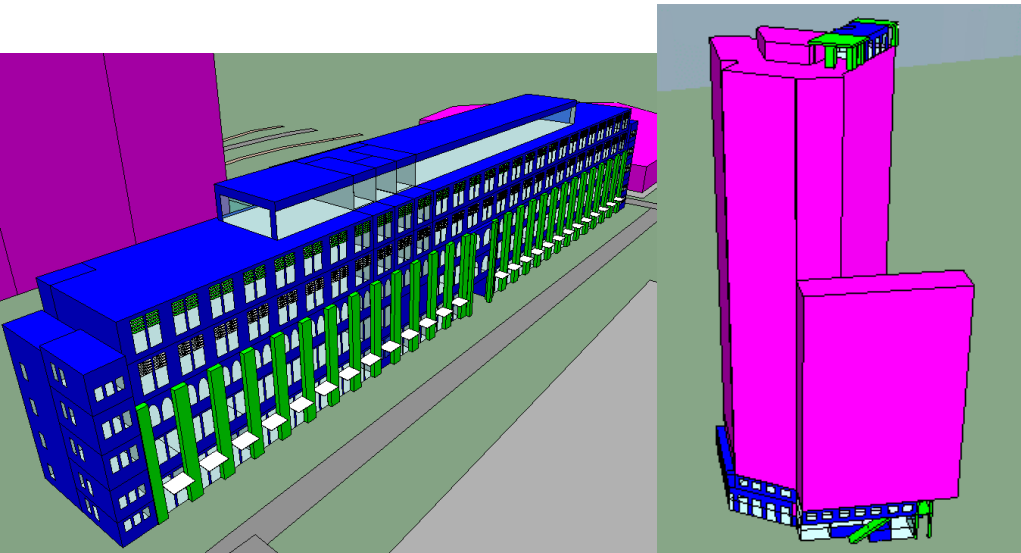


Figure 4-1 Render of the IES model of the development – perspective view. Berol House and 2 Berol Yard.

5 BE LEAN: DEMAND REDUCTION

The first step to achieving Building Regulations compliance and the targets outlined previously is to reduce energy demand. The measures associated with reducing demand can be termed as ‘Energy Efficiency Measures’.

5.1 BUILDING FABRIC

During design development, significant consideration has been given to how the building fabric will respond to its environment in order that the energy consumption of the building is reduced as far as possible through passive means.

The architectural geometry, glazing area and shading elements provided in the façade are designed to maximise the passive measures, to mitigate overheating issues and maximise daylight and sunlight access within the proposed apartments.

The building fabric of the Proposed Development aims to reduce heat loss in winter months and minimise heat gains in summer months with the aim of maximising the passive performance of the Proposed Development

An assessment of the building façade has been undertaken to establish the effect of differing U-values and g-values on carbon emissions and Target Fabric Energy Efficiency (TFEE) values.

Internal heat loss walls

It is assumed in this analysis that party wall conditions are subject between the walls separating apartments only. The party walls are assumed to be fully filled with sealed edges to achieve the U-value listed in Table 5-1.

The walls between communal corridors/core areas and apartments are treated as heat loss walls and the build-ups will be required to meet the U-values in Table 5-1.

The building fabric will be designed to exceed the limiting fabric requirements of Part L of the Building Regulations (2013) as applicable.

Table 5-1 Fabric performance targets – 2 Berol Yard

ELEMENT	RESIDENTIAL	COMMERCIAL
Exposed Floor U-value	0.10 W/m²K	0.11 W/m²K
Roof U-value	0.12 W/m²K	0.11 W/m²K
External Wall U-value	0.15 W/m²K	0.13 W/m²K
Common Area Wall U-value	0.18 W/m²K	0.18 W/m²K
Lift/Stair Core Wall U-value	0.25 W/m²K	0.25 W/m²K
Party Wall U-value	0.00 W/m²K	0.00 W/m²K
Dwelling Front Door U-value	1.00 W/m²K	1.00 W/m²K
Glazing g-value	0.4	0.4
Thermal Bridging	Approved junction details	Default
Air Permeability	3 m³/(h.m²) @50Pa	3 m³/(h.m²) @50Pa

The thermal properties of the existing wall and roof of Berol House has been determined based on typical construction at the time of erection.

Table 5-2 Fabric performance – Berol House

ELEMENT	REFURBISHMENT	EXTENSION
Exposed Floor U-value	0.58 W/m²K	0.13 W/m²K
Roof U-value	2.8 W/m²K	0.11 W/m²K
External Wall U-value	1.7 W/m²K	0.13 W/m²K
Glazing U-value	1 W/m²K	1 W/m²K
Glazing g-value	0.4	0.4
Air Permeability	25 m³/(h.m²) @50Pa	3 m³/(h.m²) @50Pa

5.2 THE BUILDING SERVICES

The entire development (domestic & non-domestic areas) will be served by the proposed district heat network as the primary heat source.

Residential Units (Use Class C3)

- Each apartment will be provided with a mechanical utility cupboard (MUC), where the majority of the apartment plant and equipment will be located.
- From the MUC the electrical, ICT, home automation, ventilation, domestic Thames Water meter, heating and cooling services will be distributed throughout the apartment. The services will be routed within the ceiling void to water outlets, power, data and lighting fittings and controls.
- Each apartment will be provided with a Mechanical Ventilation Heat Recovery (MVHR) unit. This will be located in the MUC and ducted at ceiling level.
- The apartments are to be served by the district heat network via radiators.
- 100% low energy LED/fluorescent lighting will be specified throughout.

Non-residential

- The commercial areas will be developed to shell and core standard only.
- For the purposes of the energy analysis, reasonable assumptions have been made for the fit-out design typical of non-residential areas. This includes heating and ventilation via FCUs, mechanical ventilation via MVHRs and low energy shop and display lighting with efficient controls.
- Whereas the base build is to be completed to a shell or shell and core standard only, agreements with the landlord will be used to ensure that the tenants' services meet the specifications required to achieve the overall carbon emission reductions outlined within this document.
- Low energy LED/fluorescent lighting incorporating daylight and motion controls will be specified throughout.
- Automatic monitoring and targeting of energy consumption for HVAC systems specified from the HVAC plant.

Performance Specification

Table 5-3 lists the general design rationale and proposed specification for the MEP building services.

Table 5-3 Performance Specification

TOTAL	REGULATED EMISSIONS (TONNES)
Air Handling Plant	Ventilation to the non-residential spaces is proposed to be through local mechanical ventilation units complete with heat recovery. The MVHR will be provided to achieve a specific fan power (SFP) of 1.5 W/l/s or lower. Supply and exhaust ventilation to non-residential areas will be designed to exceed the minimum performance criteria outlined in the Non-Domestic Building Services Compliance Guide.
Energy Recovery	Where appropriate, air handling systems will incorporate heat recovery systems. These transfer waste heat from the exhaust air stream to the supply air stream via a honeycomb matrix of heat absorbing material, which is slowly rotated within the supply and exhaust air streams. The AHUs will incorporate thermal wheels with a minimum heat recovery efficiency of 75% in Berol House and 80% in 2 Berol Yard.
Space Heating	Space heating will be supplied by the planned district heat network. In the residential flats heating will be distributed via radiators and in the commercial areas, fan coil units will serve the spaces.
Domestic Hot Water	DHW will be supplied by the planned district heat network.
Cooling	Cooling in the commercial areas will be supplied by chillers with an efficiency of 3.00 in Berol House and 4.50 in 2 Berol Yard.
Terminal Units	Heating and cooling to non-residential units to be provided by FCUs with an SFP of 0.20 W/l/s or lower.
Lighting Technology	Detailed lighting proposals will be developed during the subsequent design phases. High efficiency lighting will be provided throughout to significantly exceed the minimum requirements of the Non-Domestic Building Services Compliance Guide. This includes the use of high efficiency fluorescent and/or LED luminaires throughout. Lighting to achieve a lighting power density of 1.2 W/m²(100 lux) in the non-residential areas.
Lighting Control	Occupancy and daylight sensing will be specified to an appropriate level throughout the different areas of the Proposed Development. This assists in reducing the use of artificial lighting when areas are not occupied. Light dimming and PIRs are specified where applicable. Time switch on lighting controls is specified to avoid night-time parasitic power.

5.3 CARBON EMISSION REDUCTION

Based upon the energy efficiency measures outlined and excluding the contribution of the DHN and PV systems the following total carbon emissions are calculated in Table 5-6. The SAP 10.0 carbon factors have been used for all further calculations using version 1.2 of the GLA Carbon Emission Reporting Spreadsheet.

The carbon emissions from the development are shown to be lower than the minimum requirements of the Building Regulations by energy efficiency measures alone. This is achieved via the use of the energy efficiency measures proposed (including a highly efficient building fabric, 100% low energy lighting and centralised ventilation with heat recovery systems) which far exceed the minimum requirements of the Regulations.

The residential element meets the target of 10% reduction in regulated carbon emission from energy efficiency for domestic development (Table 5-4).

2 BEROL YARD

Table 5-4 Be Lean: Carbon emissions after the application of energy efficiency measures – Residential

TOTAL	REGULATED EMISSIONS (TONNES)	UNREGULATED EMISSIONS (TONNES)	% REDUCTION IN REGULATED CARBON EMISSIONS
Baseline emissions (Tonnes CO ₂)	206.6	115.2	-
Emissions after energy demand reduction (Tonnes CO ₂)*	184.8	115.2	10.6%

*The energy efficiency savings have been calculated on the basis that the buildings are served by a central heating system served by gas fired boilers only, with a seasonal efficiency of 91%.

Table 5-5 Be Lean: Carbon emissions after the application of energy efficiency measures – Non-Residential

TOTAL	REGULATED EMISSIONS (TONNES)	UNREGULATED EMISSIONS (TONNES)	% REDUCTION IN REGULATED CARBON EMISSIONS
Baseline emissions (Tonnes CO ₂)	33.4	16.6	-
Emissions after energy demand reduction (Tonnes CO ₂)*	27.9	16.6	16.5%

*The energy efficiency savings have been calculated on the basis that the buildings are served by a central heating system served by gas fired boilers only, with a seasonal efficiency of 91%.

BEROL HOUSE

Table 5-6 Be Lean: Carbon emissions after the application of energy efficiency measures (Refurbishment)

TOTAL	REGULATED EMISSIONS (TONNES)	UNREGULATED EMISSIONS (TONNES)	% REDUCTION IN REGULATED CARBON EMISSIONS
Baseline emissions (Tonnes CO ₂)	134.0	59.0	-
Emissions after energy demand reduction (Tonnes CO ₂)*	80.4	59.0	40%

Table 5-7 Be Lean: Carbon emissions after the application of energy efficiency measures (Extension)

TOTAL	REGULATED EMISSIONS (TONNES)	UNREGULATED EMISSIONS (TONNES)	% REDUCTION IN REGULATED CARBON EMISSIONS
Baseline emissions (Tonnes CO ₂)	38.3	42.7	-
Emissions after energy demand reduction (Tonnes CO ₂)*	28.9	42.7	24.5%

*The energy efficiency savings have been calculated on the basis that the buildings are served by a central heating system served by gas fired boilers only, with a seasonal efficiency of 91%.

WHOLE SITE

Table 5-8 Be Lean: Carbon emissions after providing renewable energy – Detailed and Outline Application Estimated Total

TOTAL	REGULATED EMISSIONS (TONNES)	UNREGULATED EMISSIONS (TONNES)	% REDUCTION IN REGULATED CARBON EMISSIONS
Baseline emissions (Tonnes CO ₂)	412.4	233.9	-
Emissions after energy demand reduction (Tonnes CO ₂)*	322.1	233.9	22%

5.4 PART L FABRIC ENERGY EFFICIENCY

Accredited Design SAP 2012 software was used to determine the FEE standards for all apartments. An analysis has been undertaken on the all the new build residential buildings to establish the performance of the fabric in relation to the TFEE. Results for TFEE and the Dwelling FEE (DFEE) for all residential buildings are as follows:

Table 5-9 Fabric energy efficiency and carbon emissions results by residential buildings

	AVERAGE TFEE (KWH/M²)	AVERAGE DFEE (KWH/M²)	IMPROVEMENT
Residential	43.0	36.6	15.0%

All residential areas achieve compliance with the TFEE standard. Detailed façade design and thermal bridging calculations will be performed during detailed design stage once junction details will be specified. The final strategy for compliance with TFEE will be defined as design develops. The project will ensure compliance with the TFEE is achieved.

6 OVERHEATING ANALYSIS

Policy SI4 of the New London Plan require *major development* proposals to reduce potential overheating and reliance on air conditioning systems and demonstrate this is in accordance with the following cooling hierarchy.

1. minimise internal heat generation through energy efficient design
2. reduce the amount of heat entering a building in summer through orientation, shading, albedo, fenestration, insulation and green roofs and walls
3. manage the heat within the building through exposed internal thermal mass and high ceilings
4. passive ventilation
5. mechanical ventilation
6. active cooling systems (ensuring they are the lowest carbon options).

Dynamic thermal models were built in IES VE to verify the internal conditions of the residential and non-residential elements of the development. All occupied spaces have been analysed against the criteria within TM52 and TM59. A stepped approach was utilised following the cooling hierarchy. Measures were incorporated into the models and building design until internal conditions became acceptable.

The following weather files have been used in the analysis following the GLA guidance for overheating assessments:

- London_LWC_2020High50 (a moderately warm summer)
- London_LWC_DSY2_2020High50 (a year with a very intense single warm spell)
- London_LWC_DSY3_2020High50 (a year with a prolonged period of sustained warmth)

6.1 LB HARINGEY OVERHEATING CRITERIA

In line with LB Haringey's Key Overheating Planning Application Requirements, assessment will also be carried out against London_LHR_2050High50 and London_LHR_2080High50.

6.2 CIBSE TM52 OVERHEATING CRITERIA

CIBSE TM52 sets out criteria based on an adaptive approach to thermal comfort. The 'adaptive' approach to thermal comfort shows that the temperature at which the majority of people are comfortable 'tracks' the mean indoor temperature because of the correlation between indoor and outdoor temperature in naturally ventilated (free-running) buildings.

The following three criteria, taken together, provide a robust yet balanced assessment of the risk of overheating of buildings in the UK and Europe. A room or building that fails any two of the three criteria is classed as overheating.

- The first criterion states the number of hours (He) during which ΔT (the difference between the actual operative temperature in a room and the limiting maximum acceptable air temperature) is greater than or equal to one degree (K) during the period May to September inclusive shall not be more than 3% of occupied hours.
- The second criterion deals with the severity of overheating within any one day, which can be as important as its frequency, the level of which is a function of both temperature rise and its

duration. This criterion sets a daily limit for acceptability. To allow for the severity of overheating the weighted exceedance (We) shall be less than or equal to 6.

- The third criterion sets an absolute maximum daily temperature for a room, beyond which the level of overheating is unacceptable. The value of ΔT shall not exceed 4K.

For the residential apartments, in line with TM59 requirements, the analysis is conducted to ensure a sufficient comfort level during the night. The following criteria is specified for bedrooms in TM59:

- To guarantee comfort during the sleeping hours the operative temperature in the bedroom from 10 pm to 7 am shall not exceed 26°C for more than 1% of annual hours.

There are four assessment categories within TM52 which is dependent on the acceptable temperature range of free-running buildings. The CIBSE suggestion is that designers should aim to remain within the Category II limits.

Table 6-1 Categories of building types within CIBSE TM52

Category	Explanation	Suggested acceptable range (K)
I	High level of expectation only used for spaces occupied by very sensitive and fragile persons	± 2
II	Normal expectation (for all new buildings and renovations)	± 3
III	A moderate expectation (used for existing buildings)	± 4
IV	Values outside the criteria for the above categories (only acceptable for a limited period)	> 4

The GLA acknowledges that meeting the TM52 criteria is challenging for DSY2 & DSY3 weather files but expects the criteria is met for the DSY1 weather scenario.

6.3 OVERHEATING ANALYSIS - RESIDENTIAL

The passive design of the units has been considered in great detail, and the orientation and massing has considered its position on the application site relative to other buildings which will provide an element of shading but also to maximise daylight opportunities. Internal layouts have also been refined to allow the daylighting requirements to be achieved without reliance on excessive amounts of glazing. Façade options have been studied to minimise heat loss and solar gains, and to investigate the introduction of external shading measures and glazing ratio optimisation.

MODELLING ASSUMPTIONS

For the purposes of this analysis the following key assumptions have been made based on CIBSE TM59 guidance:

OCCUPANCY AND EQUIPMENT GAINS

- Maximum sensible heat gain of 75W/person and a maximum latent heat gain of 55W/person are assumed in living spaces.
- Lighting energy is assumed at 2W/m² from 6pm to 11pm.
- Gain profiles are as described on the table below:

Table 6-2 Occupancy and equipment load assumptions

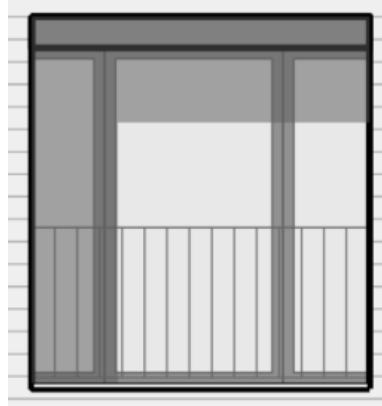
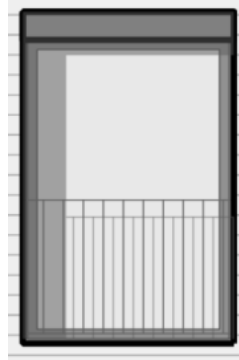
UNIT/ROOM TYPE	OCCUPANCY	EQUIPMENT LOAD
Studio	2 people at all times	Peak load of 450W from 6pm to 8pm 200W from 8pm to 10pm 110W from 9am to 6pm and from 10pm to 12pm Base load of 85W for the rest of the day
1 bedroom apartment Kitchen/Living/Dining	1 person from 9am to 10pm; room is unoccupied for the rest of the day	Peak load of 450W from 6pm to 8pm 200W from 8pm to 10pm 110W from 9am to 6pm and from 10pm to 12pm Base load of 85W for the rest of the day
2 bedroom apartment Kitchen/Living/Dining	2 people from 9am to 10pm; room is unoccupied for the rest of the day	Peak load of 450W from 6pm to 8pm 200W from 8pm to 10pm 110W from 9am to 6pm and from 10pm to 12pm Base load of 85W for the rest of the day
3 bedroom apartment Kitchen/Living/Dining	3 people from 9am to 10pm; room is unoccupied for the rest of the day	Peak load of 450W from 6pm to 8pm 200W from 8pm to 10pm 110W from 9am to 6pm and from 10pm to 12pm Base load of 85W for the rest of the day
3 bedroom apartment Kitchen	3 people at 25% gains from 9am to 10pm; room is unoccupied for the rest of the day	Peak load of 300W from 6pm to 8pm Base load of 50W for the rest of the day
3 bedroom apartment Living Room	3 people at 75% gains from 9am to 10pm; room is unoccupied for the rest of the day	Peak load of 150W from 6pm to 8pm 60W from 9am to 6pm and from 10pm to 12pm Base load of 35W for the rest of the day
Double bedroom	2 people at 70% gains from 11pm to 8am 2 people at full gains from 8am to 9am and from 10pm to 11pm 1 person at full gains from 9am to 10pm	Peak load of 80W from 8am to 11pm Base load of 10W during sleeping hours
Single bedroom (too small to accommodate double bed)	1 person at 70% gains from 11pm to 8am 1 person at full gains from 8am to 11pm	Peak load of 80W from 8am to 11pm Base load of 10W during sleeping hours

The TM59 assumptions above are stringent and worst-case scenario and assume full occupation during the day in all apartments. This is to account for vulnerable people such as children and the elderly and for people on shift work who may remain in their residences during the day.

VENTILATION

- MVHR is assumed to be incorporation at a later design stage to mitigate the overheating future weather scenarios, MVHR results have not been included in Table 6-4.
- An infiltration rate of 0.15 ACH in all apartments where it is applicable.
- Stairs are only ventilated by infiltration
- Windows will open in accordance with Table 6-3

Table 6-3 Opening Types

Opening Type	Opening operation
	Triple pane door 1 pane opens fully inwards. Remaining 2 panes are fixed.
	Triple pane window All 3 panes open fully inwards.
	Single pane door Pane opens fully inwards.

	Slim pane door Mainly installed for cleaning, but pane opens fully inwards when needed.
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Shading

- An effective g-value of 0.40 has been assumed without the incorporation of blinds.
- Inset balconies have been introduced for all flats to provide amenity space and shading.
- Dedicated shading elements have been introduced above some windows to block out direct solar gain on the South façade. The design can be seen in Figure 6-1 and Figure 6-2. The incorporating of shading elements has been designed to manage the overheating risk while also ensuring adequate daylight to enter the spaces. The placement of the shading can be found in the Allies and Morrison’s architectural drawings.



Figure 6-1 Shading design - Horizontal and southern vertical reveal



Figure 6-2 Shading design - Horizontal and vertical shading to both vertical reveals

SELECTION OF APARTMENTS.

The overheating analysis was carried out to CIBSE TM59 requirements. The following sample floors were included in the residential assessment, assessed flat marked with post-it icon:

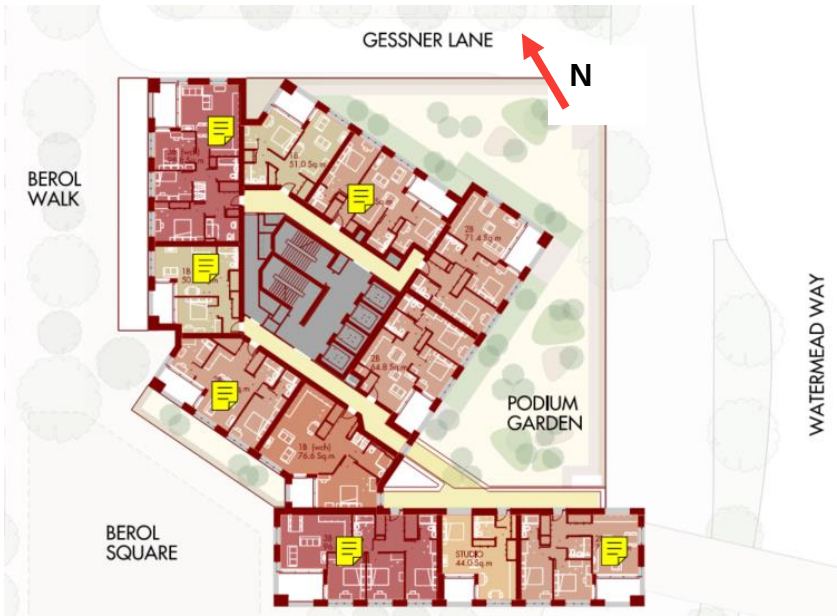


Figure 6-3 Lower levels typical floor (1st to 5th Floors)

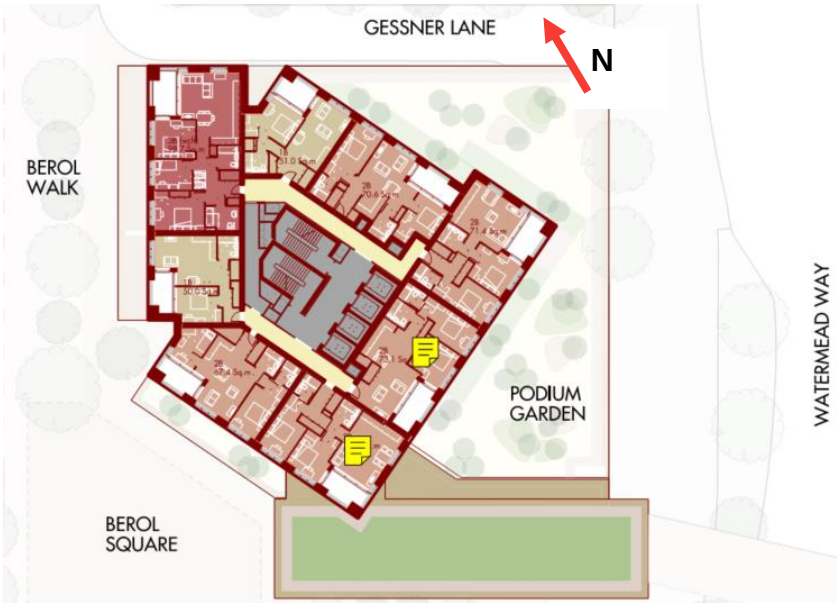


Figure 6-4 Mid levels typical floor (6th- 16th Floor)

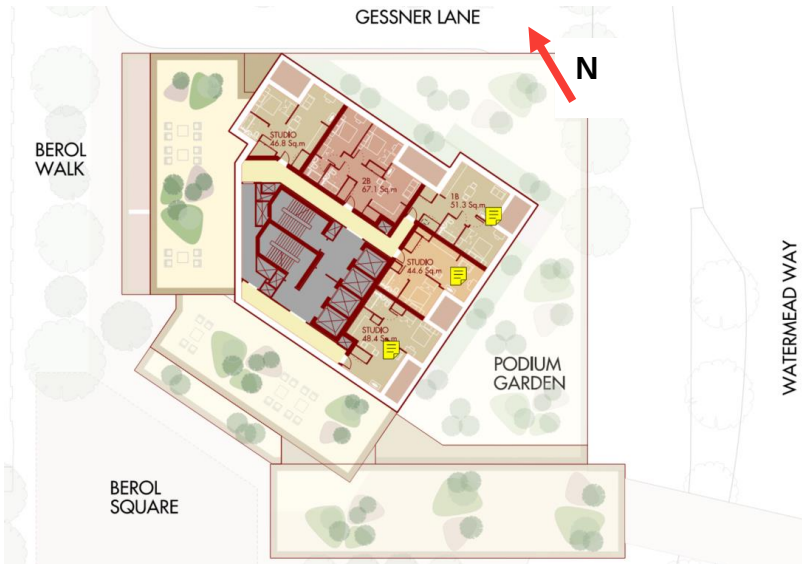


Figure 6-5 Top level typical floor

The chosen floors, which include a representative of the worst-case scenario, were assessed against Category II criteria. Overheating analysis was carried out using the five weather files as described in previously. A summary of the results is provided below.

There are no apartment on the ground floor, as this area is used for commercial spaces.

Selection has taken into consideration exposure and orientation by taking the worst case scenario apartments, such as West and South.

RESULTS

Table 6-4 Cooling Hierarchy, project measures and project performance/simulation results for occupied zones – Residential

DESCRIPTION	PROJECT MEASURES	DSY 1 2020HIGH50	DSY 2 2020HIGH50	DSY 3 2020HIGH80	DSY 1 2050HIGH50	DSY 1 2080HIGH50
THERMAL COMFORT PERFORMANCE						
1.Minimise internal heat generation through energy efficient design	100% low energy LED lighting will be provided to reduce internal heat gains within the apartments.	0% zones pass	0% zones pass	0% zones pass	0% zones pass	0% zones pass
2.Reduce the amount of heat entering a building in summer through orientation, shading, albedo, fenestration, insulation and green roofs and walls	The proposal for the façades include solar control glass and high thermal performance specification; helping to reduce solar gain and the mean radiant temperature of the occupants. The	0% zones pass	0% zones pass	0% zones pass	0% zones pass	0% zones pass

	proposed balconies and shading devices will reduce solar gains within the rooms behind.					
3.Manage the heat within the building through exposed internal thermal mass and high ceilings	Exposed ceilings were considered not suitable for the aesthetic of the residential spaces. Therefore, a passive strategy with exposed internal ceiling was not implemented for the Proposed Development.	Not applicable				
4.Passive ventilation	Occupants of the apartments are considered to open windows or louvres when the internal temperature exceeds 23°C and the room is occupied.	100% zones pass	6% zones pass	3% zones pass	9% zones pass	3% zones pass

*Rooms compliance for simulation when active cooling system and mechanical ventilation are incorporated are assessed against TM52 minimum criteria for mechanically cooled buildings.

Overheating in Corridors

In addition, it is recognised that market feedback on internal heat networks (particularly within multi storey residential buildings) in recent years has highlighted a common, significant failing; the overheating of internal corridor spaces particularly in summer. Solutions adopted to mitigate this problem include:

- 100% low energy lighting to reduce heat gains within the corridors.
- Corridor pipe heat losses are assumed at 10 W/m at all times. This is to be reviewed at later design stage once final pipe selections have been carried out.
- Mechanical ventilation at 40l/s is proposed in the corridors to mitigate overheating risk.

The corridors were tested in the same sample floors used for the apartment overheating analysis. Results of the analysis show that none of the corridors tested have temperatures over 28 °C for more than 3% of total annual hours. Therefore, corridors comply with the requirements of TM59.

FUTURE WEATHER FILES MITIGATION

1st mitigation: external shutters

This option will reduce the solar gain but also reduce the natural ventilation airflow to the spaces. Without having a specific product specified, this cannot be tested thoroughly. Furthermore, shutters may reduce daylight to the spaces to a level where there is additional reliance on electric lighting, hereby increasing the energy usage of the space.

2nd mitigation: MVHR with summer boost bypass

A rate of 8l/s have been added to the spaces. Due to the fully openable windows, there is already a high level of the air entering the space. Therefore, it can be concluded that the MVHR rate should be higher in order to make a difference in mitigating the overheating.

3rd mitigation: MVHR units (5kW cooling per flat)

DESCRIPTION	PROJECT MEASURES	DSY 1 2020HIGH50	DSY 2 2020HIGH50	DSY 3 2020HIGH80	DSY 1 2050HIGH50	DSY 1 2080HIGH50
THERMAL COMFORT PERFORMANCE						
Cooling	5kW cooling added to all flats.	100% zones pass	100% zones pass	100% zones pass	100% zones pass	100% zones pass

RESIDENTIAL OVERHEATING ANALYSIS CONCLUSIONS

A range of overheating studies have been undertaken in line with guidance in industry documents such as CIBSE TM52, CIBSE TM59 and CIBSE Guide A, and a dynamic simulation model has been developed in order to test the influence of various parameters and ensure that overheating will not be an issue.

On the basis of the above, apartments are considered to comply with Policy 5.9 of the London Plan and Part L (2013) Criterion 3 of the Building Regulations and with CIBSE TM59 and TM52.

The strategy for minimising cooling demand in accordance with Policy 5.9 for the Proposed Development is as follows:

- 100% low energy lighting will be provided to reduce internal heat gains within the apartments.
- A highly efficient fabric and glazing is proposed incorporating glazing with low-e solar shield glass to protect the interior from solar gain.
- The apartments will have fully openable windows to allow natural ventilation.

The results of the assessments showed that all apartments are compliant with the TM52 and TM59 overheating criteria for the DSY1 weather scenario.

The assumptions used focus on the worst-case scenario when rooms are occupied all day to take into account vulnerable people, the risk reduces when apartments are occupied only in the evening. As per TM59 guidance, the aim of this test is to encourage good design that is comfortable within sensible limits, without being so stringent that it over-promotes the use of mechanical cooling. During design development the team will look at additional opportunities to reduce the risk of overheating even further in extreme hot weather and heat wave events.

OVERHEATING RISK MANAGEMENT

At the current stage, it is proposed that the managing company will manage the overheating risk within the Proposed Development. Contractual arrangements are to be set out once planning permission is granted.

6.4 OVERHEATING ANALYSIS - NON-RESIDENTIAL

MODELLING ASSUMPTIONS

For the purposes of this analysis the following key assumptions have been made based on CIBSE TM52 guidance:

Internal gains

- The use of high efficiency fluorescent and/or LED luminaries is specified throughout. It is expected that the internal gains will be significantly lower than the specified in this analysis, however this will be designed in the detailed design stage.
- An infiltration rate of 0.15 ACH in all spaces where it is applicable.

The following gains were used in the analysis:

Table 6-5 Occupancy gains

AREA	MAXIMUM SENSIBLE GAIN	MAXIMUM LATENT GAIN	OCCUPANCY DENSITY
Office	75	55	1 person per 10 m ²
Retail	75	55	1 person per 5 m ²

Table 6-6 Internal equipment gains for conditioned areas

AREA	LIGHTING	EQUIPMENT
Office	10 W/m ²	10 W/m ²
Retail	10 W/m ²	10 W/m ²

NCM gains and occupancy profiles were used for all non-residential spaces.

Ventilation

The following auxiliary ventilation rates have been specified in the analysis:

Table 6-7 Ventilation rates

AREA	VENTILATION RATES
Office	10 l/s/person @20C
Retail	10 l/s/person @20C

Auxiliary ventilation is considering operating all times in all spaces where it has been specified. The summer ventilation supply temperature has been adjusted in the analysis to consider the use of heat recovery in all main spaces.

6.5 RESULTS

The table below summarises the performance of the project during occupied hours after each step of the cooling hierarchy is introduced.

Table 6-8 Cooling Hierarchy, project measures and project performance/simulation results for occupied zones – Non-residential spaces

DESCRIPTION	PROJECT MEASURES	DSY 1 2020HIGH50	DSY 2 2020HIGH50	DSY 3 202HIGH80	DSY 1 2050HIGH50	DSY 1 2080HIGH50
THERMAL COMFORT PERFORMANCE						
1.Minimise internal heat generation through energy efficient design	100% low energy LED lighting will be provided to reduce internal heat gains within the apartments	0% zones pass	0% zones pass	0% zones pass	0% zones pass	0% zones pass

	and communal spaces.					
2.Reduce the amount of heat entering a building in summer through orientation, shading, albedo, fenestration, insulation and green roofs and walls	The proposal for the façades include solar control glass and high thermal performance specification where possible; helping to reduce solar gain.	0% zones pass	0% zones pass	0% zones pass	0% zones pass	0% zones pass
3.Manage the heat within the building through exposed internal thermal mass and high ceilings	Exposed ceilings were considered not suitable for the aesthetic of the residential spaces. Therefore, a passive strategy with exposed internal ceiling was not implemented for the Proposed Development.				Not Applicable	
4.Passive ventilation	A passive design ventilation strategy is not proposed for the non-residential spaces.				Not Applicable	
5.Mechanical ventilation (windows closed)*	Part F minimum ventilation rates will be provided	0% zones pass	0% zones pass	0% zones pass	0% zones pass	0% zones pass
6.Active cooling systems (ensuring they are the lowest carbon options)*	An efficient chiller allows mitigation of overheating spaces. As the cooling strategy is electrically based it is the most carbon efficient solution. This is due to high efficiencies and the carbon emissions associated to it will continually decrease with the decarbonisation of the grid.	100% zones pass	100% zones pass	100% zones pass	100% zones pass	100% zones pass

*Rooms compliance for simulation when active cooling system and mechanical ventilation are incorporated are assessed against TM52 minimum criteria for mechanically cooled buildings.

BS EN ISO 7730 – PREDICTED MEAN VOTE (PMV) AND PERCENTAGE OF PEOPLE DISSATISFIED (PPD) INDICES FOR AIR-CONDITIONED BUILDINGS

Thermal comfort can be difficult to measure because it is highly subjective. It depends on the air temperature, humidity, radiant temperature, air speeds, activity rates, and clothing levels. However, each individual experiences these sensations differently based on his or her physiology and state. TM52 recommends carrying out predicted mean vote and predicted percentage dissatisfied for airconditioned spaces.

Predicted mean vote (PMV)

The PMV is an index that predicts the mean votes of a large group of persons on the seven-point thermal sensation scale based on the heat balance of the human body. Thermal balance is obtained when the internal heat production in the body is equal to the loss of heat to the environment. Values are measured on the following 7-point thermal sensation scale, see Figure 6-6.

Predicted percentage dissatisfied (PPD)

The PPD is an index that establishes a quantitative prediction of the percentage of thermally dissatisfied people who feel too cool or too warm. For the purposes of ISO 7730⁶, thermally dissatisfied people are those who will feel hot, warm, cool or cold, see Figure 6-6.

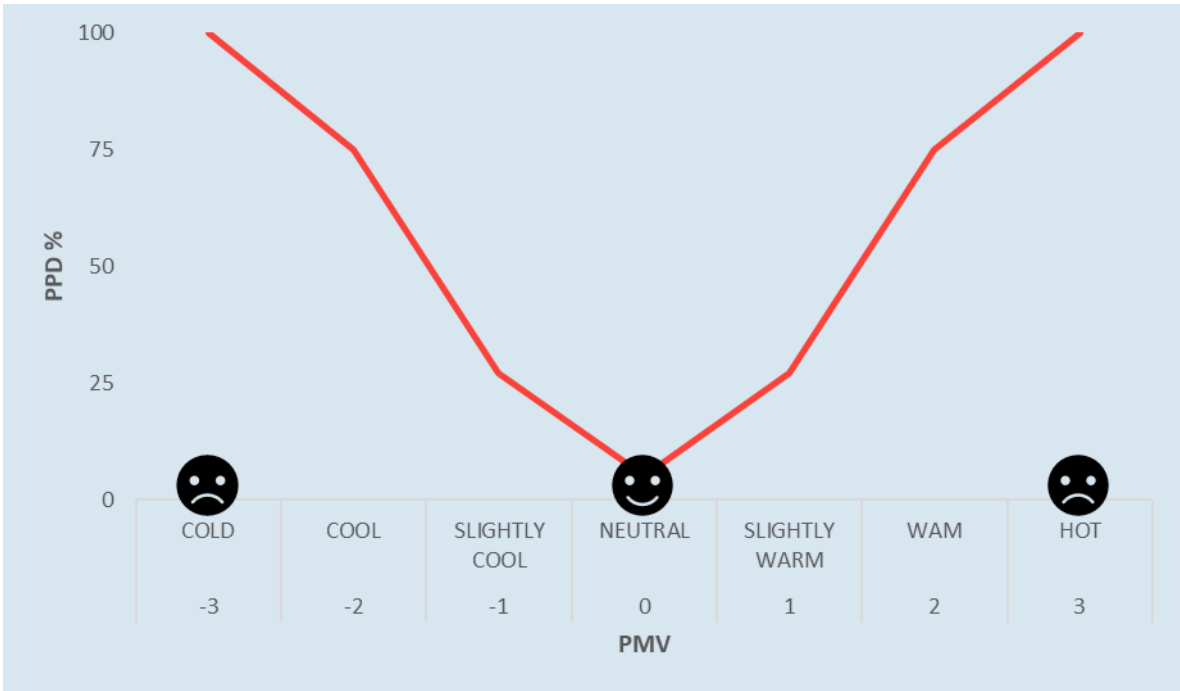


Figure 6-6 PPD/PMV 7-point thermal scale

Zero is the ideal value, representing thermal neutrality, and the comfort zone is defined by the combinations of the six parameters for which the PMV is within the recommended limits (-0.5 < PMV < +0.5).

Percentage of people dissatisfied (PPD) predicts the percentage of people who would be dissatisfied, taken as those who would vote >+1 or <-1 on the sensation scale. The PPD is a function of the predicted mean vote (PMV). It applies to a large group of people in the same thermal environment and with identical clothing and activity level.

PPD assumes that everyone has the same metabolic rate and the same clothing insulation, while people are free to choose their clothing for comfort and their activities vary. The actual percentage dissatisfied may therefore differ substantially from that predicted by the PPD equation; in general, having a free choice of attire would tend to reduce the actual percentage dissatisfied while variation in activity level within a space would tend to increase the actual percentage dissatisfied.

The CIBSE Guide A operative temperature ranges correspond to a PMV of +/- 0.25 which sits between the Category A and Category B requirements listed in Annex A, Table A.1 of EN ISO

7730 as shown on Table 6-9 below. Compliance with the CIBSE Guide A criteria will therefore effectively also demonstrate compliance with the Category B requirements set out in EN ISO 7730.

Table 6-9 Annex A, Table A.1 of EN ISO 7730

Category		Thermal state of the body as a whole	
		Allowable percentage dissatisfied (PPD) or predicted people %	Allowable predicted mean vote (PMV)
A	Recommended for spaces occupied by very sensitive and fragile persons with special requirements (very young children, elderly, ill)	<6	-0.2 < PMV < +0.2
B	Recommended for most new buildings and renovations	<10	-0.5 < PMV < +0.5
C	Recommended for existing buildings	<15	-0.7 < PMV < +0.7

WELL STANDARD

The WELL Standard set out the percentage of occupied hours and the percentage of occupied spaces, which should meet the PMV ranges, see Table 6-10.

Table 6-10 WELL Standard PMV criteria

PMV Range	Percentage of Occupied Hours	Percentage of Regularly Occupied Spaces
+/- 0.5	For at least 90%	At least 90%
+/- 1.0	For at least 98%	At least 95%

RESULTS

Table 6-11 PMV and PPD indices for Current London DSY1 2020High50

SPACE TYPE % OCCUPIED HOURS COMPLYING WITH PMV AT +/-0.5 /PPD AT 10%CRITERIA (WORST PERFORMING SPACE)

	DSY1 2020High50	DSY2 2020High50	DSY3 2020High50
Berol House - Retail	>99.9%	>99.8%	100%
Berol House - Office	>98.5%	>95.1%	94.7%
2 Berol Yard - Retail	>98.9%	>99.1%	>99.2%
2 Berol Yard - Office	100%	100%	100%

All commercial spaces perform in line with the WELL Standard and it is therefore anticipated that these will provide thermal comfort to the occupants. Please note that as the units are finished to shell and core standard, the building services have been modelled to a standard specification. Once the detailed specification is carried out, it is recommended that the thermal comfort analysis is undertaken to ensure compliance is still achieved.

7 BE CLEAN: HEATING INFRASTRUCTURE

After consumption has been reduced through the application of energy efficiency measures, the next step is to consider low carbon technologies in order to provide further reduction in carbon dioxide emissions.

An appraisal of 'efficient supply' technologies was undertaken. This included an assessment of the use of CHP, Combined Cooling Heat and Power (CCHP) and district heating systems.

7.1 CONNECTION TO AN AREA WIDE HEAT NETWORK

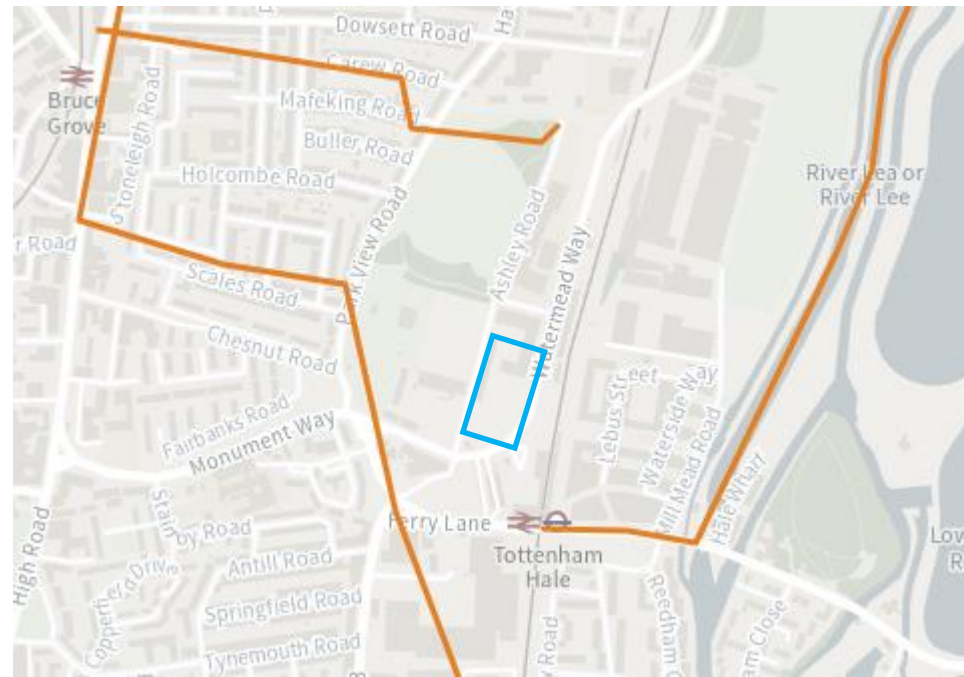


Figure 7-1 Excerpt from the London Heat Map showing proposed district heating networks

The development is located within the Heat Network Priority Areas (HNPAs). In line with the GLA heating hierarchy a low-temperature communal system is proposed for the Proposed Development.

Figure 7-1 shows the location of proposed district heating systems within the vicinity of the Proposed Development.

FUTURE DISTRICT HEATING NETWORK CONNECTION

Following conversations with the local council, it was confirmed that a district heat network is proposed and that the site will be able to connect to this in the future. As can be seen on Figure 7-2, in between 2023-2025 it is anticipated that the Tottenham Hale Network Route infrastructure will be finalised and heat via boilers can be supplied in the first instance. In 2027 at the latest, the heating will be from a clean energy source. The network development and masterplan can be seen in Figure 7-2 and Figure 7-3, the network is supplying the Proposed Development is shown in red. The phasing of DEN coming into site along Ashley Road is shown in Figure 7-4.

HDEN 2023 to 2025

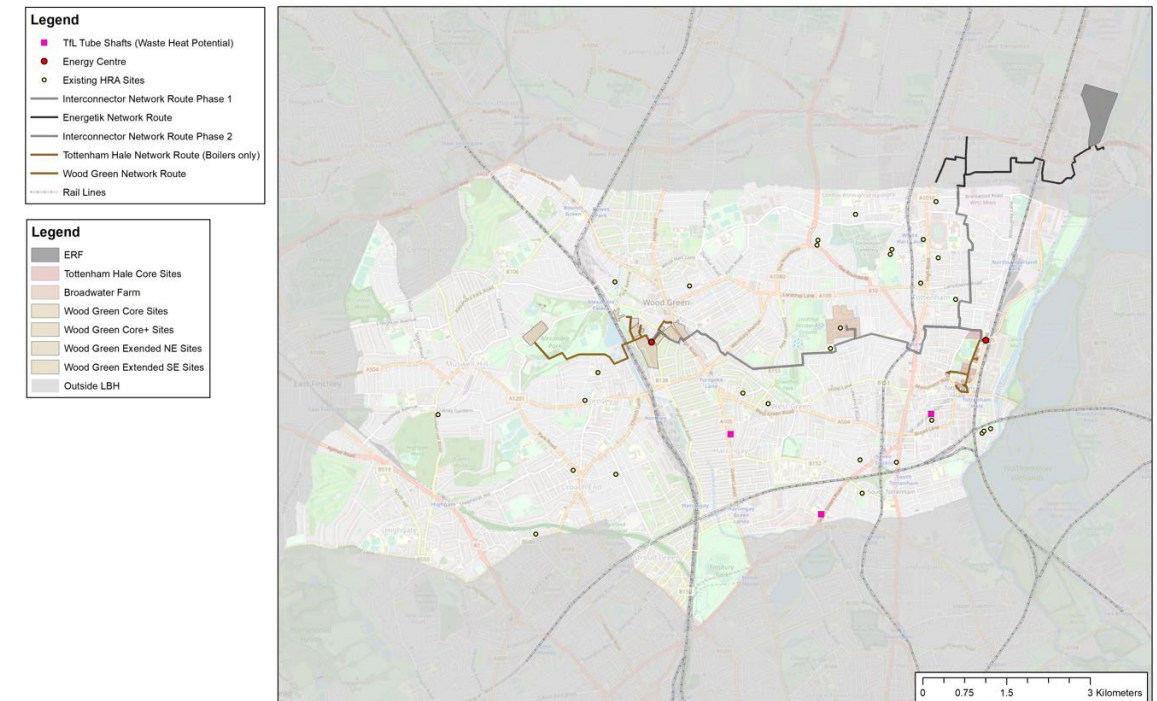


Figure 7-2 District heat network 2023-2025

HDEN 2030+

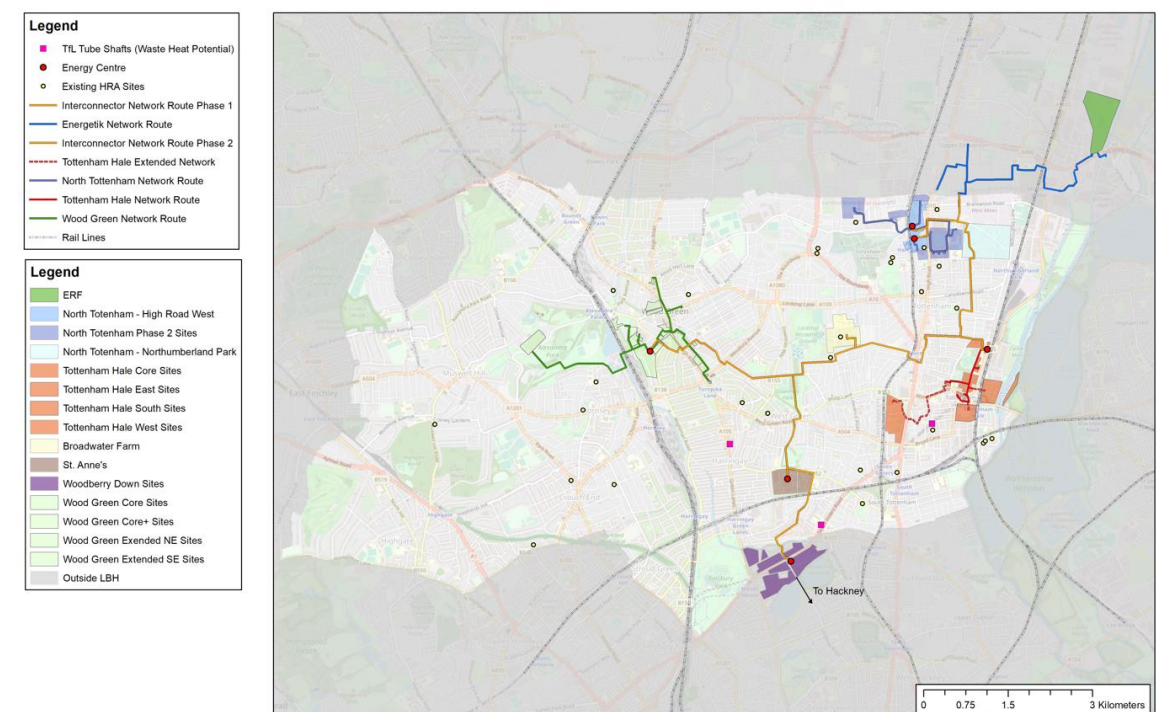


Figure 7-3 District heat network 2030+



Figure 7-4 DEN phasing into site

TEMPORARY PLANT

In line with GLA Energy Assessment Guidance Draft (April 2020) section 9.26, if there is a time lag between the occupation of the scheme and the operation of the district heat network, temporary plant must be installed. Gas boilers are suggested as temporary plant, given the lower cost compared to low carbon technology. Appendix A provides space allowance report produced by the building services engineers. The proposed scheme will follow this guidance, should a time lag occur. The temporary plant will consist of 100% gas boilers, which can be switched off and removed from site when the district heat network is in operation.

ENERGY LOADS

Annual electrical and space heating loads have been provided by Formation and can be found in Figure 7-5 and Figure 7-6. The DHW demand has been estimated to be 194kW at peak power requirement.

Electrical Loads			Per Property			Per Development		
Dwelling Type	Bedrooms	No. of Units	Estimated Elec Load kW	Estimated Elec Load kVA	Annual Demand kWh/annum	Estimated Elec Load kW	Estimated Elec Load kVA	Annual Demand kWh/annum
Studio/1 bed	1	101	1.68	2.10	2,453	169.68	212.10	247,733
2 bed	2	59	1.80	2.25	2,628	106.20	132.75	155,052
3 bed	3	50	2.00	2.50	2,920	100.00	125.00	146,000
TOTALS		210				375.88	469.85	548,785

Figure 7-5 Electrical Loads – Residential

Space heating Loads			Per Property			Per Development	
Dwelling Type	Average Area m2	No. of Units	Estimated Heating Load kW	Degree Days x Property Factors	Annual Demand kWh/annum	Estimated Heating Load kW	Annual Demand kWh/annum
Studio/1 bed	55	101	2.00	2,038	4,076	202.00	411,676
2 bed	80	59	2.60	2,038	5,299	153.40	312,629
3 bed	100	50	3.20	2,038	6,522	160.00	326,080
TOTALS		210				515.40	1,050,385

Figure 7-6 Space Heating Load – Residential

CARBON FACTOR

The carbon factor of the district heat network has been calculated to be 0.0338. This is based on the SAP 10.0 energy from waste carbon factor, 0.026, multiplied by a distribution factor of 1.3. As the development of district heat network develops, the carbon factor will be adjusted in future analysis, if required.

7.2 CARBON EMISSION REDUCTION

The overall carbon emissions for the development is shown in Table 7-1, Table 7-2, Table 7-3 and Table 7-5.

The SAP 10.0 carbon factors have been used for all further calculations using version 1.2 of the GLA Carbon Emission Reporting Spreadsheet.

2 BEROL YARD

Table 7-1 Be Clean: Carbon emissions after the application of energy efficiency measures – Residential

TOTAL	REGULATED EMISSIONS (TONNES)	UNREGULATED EMISSIONS (TONNES)	% REDUCTION IN REGULATED CARBON EMISSIONS
Baseline emissions (Tonnes CO ₂)	206.6	115.2	-
Emissions after energy demand reduction (Tonnes CO ₂)*	184.8	115.2	10.6%
Emissions after energy efficient supply (Tonnes CO ₂)*	41.5	115.2	79.9%

*The energy efficiency savings have been calculated on the basis that the buildings are served by a central heating system served by gas fired boilers only, with a seasonal efficiency of 91%.

Table 7-2 Be Clean: Carbon emissions after the application of energy efficiency measures – Non-Residential

TOTAL	REGULATED EMISSIONS (TONNES)	UNREGULATED EMISSIONS (TONNES)	% REDUCTION IN REGULATED CARBON EMISSIONS
Baseline emissions (Tonnes CO ₂)	33.4	16.6	-
Emissions after energy demand reduction (Tonnes CO ₂)*	27.9	16.6	16.5%
Emissions after energy efficient supply (Tonnes CO ₂)*	21.5	16.6	35.6%

*The energy efficiency savings have been calculated on the basis that the buildings are served by a central heating system served by gas fired boilers only, with a seasonal efficiency of 91%.

BEROL HOUSE

Table 7-3 Be Clean: Carbon emissions after the application of energy efficiency measures – Non-residential (Refurbish)

TOTAL	REGULATED EMISSIONS (TONNES)	UNREGULATED EMISSIONS (TONNES)	% REDUCTION IN REGULATED CARBON EMISSIONS
Baseline emissions (Tonnes CO ₂)	134.0	59.0	-
Emissions after energy demand reduction (Tonnes CO ₂)	80.4	59.0	40%
Emissions after energy efficient supply (Tonnes CO ₂)*	34.5	59.0	74%

Table 7-4 Be Clean: Carbon emissions after the application of energy efficiency measures – Non-residential (Extension)

TOTAL	REGULATED EMISSIONS (TONNES)	UNREGULATED EMISSIONS (TONNES)	% REDUCTION IN REGULATED CARBON EMISSIONS
Baseline emissions (Tonnes CO ₂)	38.3	42.7	-
Emissions after energy demand reduction (Tonnes CO ₂)*	28.9	42.7	24.5%
Emissions after energy efficient supply (Tonnes CO ₂)*	24.2	42.7	36.9%

*The energy efficiency savings have been calculated on the basis that the buildings are served by a central heating system served by gas fired boilers only, with a seasonal efficiency of 91%.

WHOLE SITE

Table 7-5 Be Clean: Carbon emissions after the application of energy efficiency measures – Whole site

TOTAL	REGULATED EMISSIONS (TONNES)	UNREGULATED EMISSIONS (TONNES)	% REDUCTION IN REGULATED CARBON EMISSIONS
Baseline emissions (Tonnes CO ₂)	412.4	233.9	-
Emissions after energy demand reduction (Tonnes CO ₂)*	322.1	233.9	22%
Emissions after energy efficient supply (Tonnes CO ₂)*	121.7	233.9	70%

8 BE GREEN: RENEWABLE ENERGY

Renewable energy technologies can provide a source of energy on-site that is not primarily based on the consumption of fossil fuels or grid electricity and/or utilises a heat source that is renewable such as ground source and solar thermal systems.

In accordance with the requirements of the London Plan policy, we have evaluated a number of renewable energy technologies and outlined how they may be applied to the Proposed Development.

8.1 WIND POWER

Harnessing the kinetic energy of wind can provide a renewable source of onsite electricity generation. Wind turbines need to be positioned where a frequent and steady source of wind is available that is not too turbulent or uneven in direction. Typically, wind turbines are positioned on the roof of buildings that are significantly higher than their surroundings and or located in open areas where there is minimum disruption to prevailing winds.

The Proposed Development is located within an urban environment with near-by buildings providing turbulent wind conditions unsuitable for wind power generation. In addition, it is not considered appropriate in townscape, architectural and aviation safeguarding terms to provide wind turbines on top of buildings. While the roof of 2 Berol Yard is higher than neighbouring buildings, there is limited space to generate a significant amount of power and reinforcing the roof to be strong enough to sustain a wind turbine is likely to be very costly. On that basis they are not proposed for the Proposed Development.

8.2 BIOMASS HEATING

Biomass heating has embodied environmental impacts from transport and fuel combustion which makes it less desirable in Air Quality Management Areas (AQMAS), such as where the application site of the Proposed Development is located. A review of the potential impact on air quality from increased wood fuelled biomass use in London has been carried out by AEA Energy & Environment and was published in December 2007. The assessment indicates that potentially increasing the contribution from small-scale wood fuelled biomass combustion may lead to a substantial increase in nitrogen dioxide and particulate matter concentrations.

Further to this, solid biomass relies on a reliable fuel supply which must be delivered and stored on site. The application Site therefore requires good access routes and space for fuel storage and plant, which could not feasibly be incorporated within the proposed scheme. It also has relatively high maintenance requirements and fuel costs.

This technology is therefore deemed to be unsuitable for the Proposed Development.

8.3 SOLAR THERMAL HOT WATER HEATING

Solar thermal hot water (STHW) generation involves capturing solar radiant heat to preheat or heat domestic hot water. Correctly located and orientated, solar thermal systems can meet a proportion of a building's domestic hot water dependent on the expected demand profile and available space for locating STHW panels. Due to the limited amount of available space which will be used for solar photovoltaic panels, a STHW system is not proposed for the development.

8.4 GROUND, AIR AND WATER SOURCE HEATING AND/OR COOLING

Ground source heating and/or cooling may be incorporated to make use of the thermal storage and ground temperature to provide heating and/or cooling to a building. Ground source heating is

an effective renewable energy source when used to provide space heating via low grade heating system such as underfloor heating.

Air source heat pumps (ASHPs) are capable of providing heating and/or cooling utilising air temperatures. The use of ASHPs is an effective LZC technology as they have high efficiencies for both heating and cooling.

With the decarbonising grid due to an increase in renewable energy generation and a reduction in coal power generation, the operational impact of electrically led systems is reduced. Therefore, the benefit of heat pump technologies will improve through the lifetime of the Proposed Development. It is preferable to place ASHPs on the roof of a development to allow sufficient airflow, for this reason it has been concluded that ASHP are not suitable for the current development, as roof space is limited.

Bodies of water can be used to extract or reject heat as long as there is an adequate water flow. However, there is minimal flow in a canal and utilising this as a source to extract/reject heat is not feasible.

WSHPs have a significantly higher coefficient of performance (COP) than ASHPs due to the higher temperature of the heat source which is constant throughout the year. A highly efficient building fabric combined provide an ideal method of providing space heating to the development. Low flow temperatures from the WSHPs further reduce the energy consumption and carbon emissions for the Proposed Development.

WSHPs are powered by grid supplied electricity. As mentioned in the ASHP section above, the National Grid is increasingly decarbonising due to an increase in renewable energy generation and a reduction in coal power generation.

While heat pumps could provide a low carbon technology for the development, these are not complementary to the GLA's requirement to support and develop district heating networks due to high cost. GLA advises against installation of permanent low-carbon heating plant (such as heat pumps) in scenarios where district heating will be available as this could impact the financial viability of the connection.

8.5 PHOTOVOLTAIC PANELS

The feasibility of providing PV panels has been assessed based upon estimated energy production (kWh) from the installed location along with manufacturers cost data to enable a life cycle cost analysis to be undertaken. Panels correctly oriented, maintained and not obscured by shading can be expected to provide in the region of 120kWh/m²/year in London.

A roof mounted PV array is proposed on the roof within the Proposed Development to provide a reduction in carbon emissions from renewable sources. Currently, it has been estimated that approximately an area of 140m² PV panels size can fit on the roof of 2 Berol Yard and approximately 250m² of PV panels can be accommodated on Berol House.

With these arrays in place, it is expected that approximately 4.9kgCO₂ from Berol House and 1.8kgCO₂ from 2 Berol Yard can be saved on an annual basis.

8.6 LOCAL PLANNING CRITERIA, INCLUDING LAND USE AND NOISE

There are no known issues regarding the installation of roof mounted PVs. They will be located on the roof of the buildings therefore require no additional land and there are no acoustic issues to consider with PVs.

8.7 FEASIBILITY OF EXPORTING HEAT/ELECTRICITY FROM THE SYSTEM

The electricity generated by the PVs is likely to be used primarily by the Proposed Development. More details on the actual electrical demand profile across the residential and non-residential elements of the development will be explored in the next stages of design to determine the quantum of electricity that could be potentially exported to the local distribution network should the generation exceed the local electricity demand. This will ensure energy is not wasted through over-generation. Heat generated by the heat pumps is expected to be fully used by the Proposed Development.

8.8 EXPECTED HEATING AND HOT WATER COSTS

BEIS has produced a spreadsheet which predicts the cost of gas and electricity until 2035. Over the next 10 years, the cost of electricity for residential areas is 19p/kWh and 4p/kWh for gas. Using information published in 2020 on B&G Energy’s website the cost per heat from a heat network is 4.53p/kWh. This price is a direct cost per delivered kWh heat and excludes any service or standing charges.

To estimate the operational cost of the ambient loop system in comparison to an example DHN strategy the following demands have been calculated for the proposed development:

- Space heating demand – 20.77 kWh/m²/year
- DHW demand – 28.98 kWh/m²/year

Applying the above demands, efficiencies and fuel unit costs the annual costs are shown in Table 8-1.

Table 8-1 Comparing estimated heating and hot water costs for tenants

DHN EXAMPLE FOR 55M2 FLAT	
Space Heating	£51.7 /year
DHW	£72.2 /year
DHN Standing Charge	£92.4 /year
Total	£216/year

8.9 SYSTEM MONITOR OF PERFORMANCE

The Proposed Development will be provided with Building Management System. This will control and monitor the building systems and services throughout the development, provide feedback of plant, system performance and energy usage of the system. The BMS will analyse this data to enable optimum use of the engineering facilities within the development with minimum of human intervention, and maximum energy efficiency.

The landlord services fall under the category of sub metering as the main supplies will be bulk metered as part of the building switch rooms. Both small power and lighting are to be sub metered in distribution boards in compliance with TM39:2009. This is achieved via in line meters in the distribution boards. All metering information can be collected and distributed to the BMS via the landlords unified network.

Apartments will be provided with small metering to minimise apartment access.

8.10 CARBON EMISSIONS REDUCTION

All renewable energy technologies which may be considered feasible for the Proposed Development have been assessed, the outcomes of which are summarised above. From that exercise, it was concluded that only roof mounted PV panels would be suitable for inclusion in the Proposed Development with the district heat network in place. Savings from renewable energy are shown in the below tables.

2 BEROL YARD

Table 8-2 Carbon emissions after providing renewable energy – Residential

TOTAL	REGULATED EMISSIONS (TONNES)	UNREGULATED EMISSIONS (TONNES)	% REDUCTION IN REGULATED CARBON EMISSIONS
Baseline emissions (Tonnes CO ₂)	206.6	115.2	-
Emissions after energy demand reduction (Tonnes CO ₂)*	184.8	115.2	10.6%
Emissions after energy efficient supply (Tonnes CO ₂)*	41.5	115.2	79.9%
Emissions after renewable energy (Tonnes CO ₂)	39.7	115.2	80.8%

*The energy efficiency savings have been calculated on the basis that the buildings are served by a central heating system served by gas fired boilers only, with a seasonal efficiency of 91%.

Table 8-3 Carbon emissions after providing renewable energy – Non-Residential

TOTAL	REGULATED EMISSIONS (TONNES)	UNREGULATED EMISSIONS (TONNES)	% REDUCTION IN REGULATED CARBON EMISSIONS
Baseline emissions (Tonnes CO ₂)	33.4	16.6	-
Emissions after energy demand reduction (Tonnes CO ₂)*	27.9	16.6	16.5%
Emissions after energy efficient supply (Tonnes CO ₂)*	21.5	16.6	35.6%
Emissions after renewable energy (Tonnes CO ₂)	21.5	16.6	35.6%

*The energy efficiency savings have been calculated on the basis that the buildings are served by a central heating system served by gas fired boilers only, with a seasonal efficiency of 91%.

BEROL HOUSE

Table 8-4 Carbon emissions after providing renewable energy – Non-residential (Refurbished)

TOTAL	REGULATED EMISSIONS (TONNES)	UNREGULATED EMISSIONS (TONNES)	% REDUCTION IN REGULATED CARBON EMISSIONS
Baseline emissions (Tonnes CO ₂)	134.0	59.0	-
Emissions after energy demand reduction (Tonnes CO ₂)*	80.4	59.0	40%
Emissions after energy efficient supply (Tonnes CO ₂)*	34.5	59.0	74%
Emissions after renewable energy (Tonnes CO ₂)	34.5	59.0	74%

Table 8-5 Carbon emissions after providing renewable energy – Non-residential (Extension)

TOTAL	REGULATED EMISSIONS (TONNES)	UNREGULATED EMISSIONS (TONNES)	% REDUCTION IN REGULATED CARBON EMISSIONS
Baseline emissions (Tonnes CO ₂)	38.3	42.7	-
Emissions after energy demand reduction (Tonnes CO ₂)*	28.9	42.7	24.5%
Emissions after energy efficient supply (Tonnes CO ₂)*	24.2	42.7	36.9%
Emissions after renewable energy (Tonnes CO ₂)	19.3	42.7	49.7%

**The energy efficiency savings have been calculated on the basis that the buildings are served by a central heating system served by gas fired boilers only, with a seasonal efficiency of 91%.*

SITE WIDE

Table 8-6 Carbon emissions after providing renewable energy – Site wide

TOTAL	REGULATED EMISSIONS (TONNES)	UNREGULATED EMISSIONS (TONNES)	% REDUCTION IN REGULATED CARBON EMISSIONS
Baseline emissions (Tonnes CO ₂)	412.4	233.9	-
Emissions after energy demand reduction (Tonnes CO ₂)*	322.1	233.9	22%
Emissions after energy efficient supply (Tonnes CO ₂)*	121.7	233.9	70%
Emissions after renewable energy (Tonnes CO ₂)	115.0	233.9	72%

9 RESULTS

The three principal steps taken; Be Lean (Use Less Energy), Be Clean (Supply Energy Efficiently) and finally Be Green (Renewable Technology Measures) are summarised below. The target (Building Regulations compliant) carbon emissions for the Proposed Development are calculated to be **297.4 tonnes CO₂ per annum**. Any percentages refer to the reduction of carbon emissions from this baseline, see Figure 9-1.

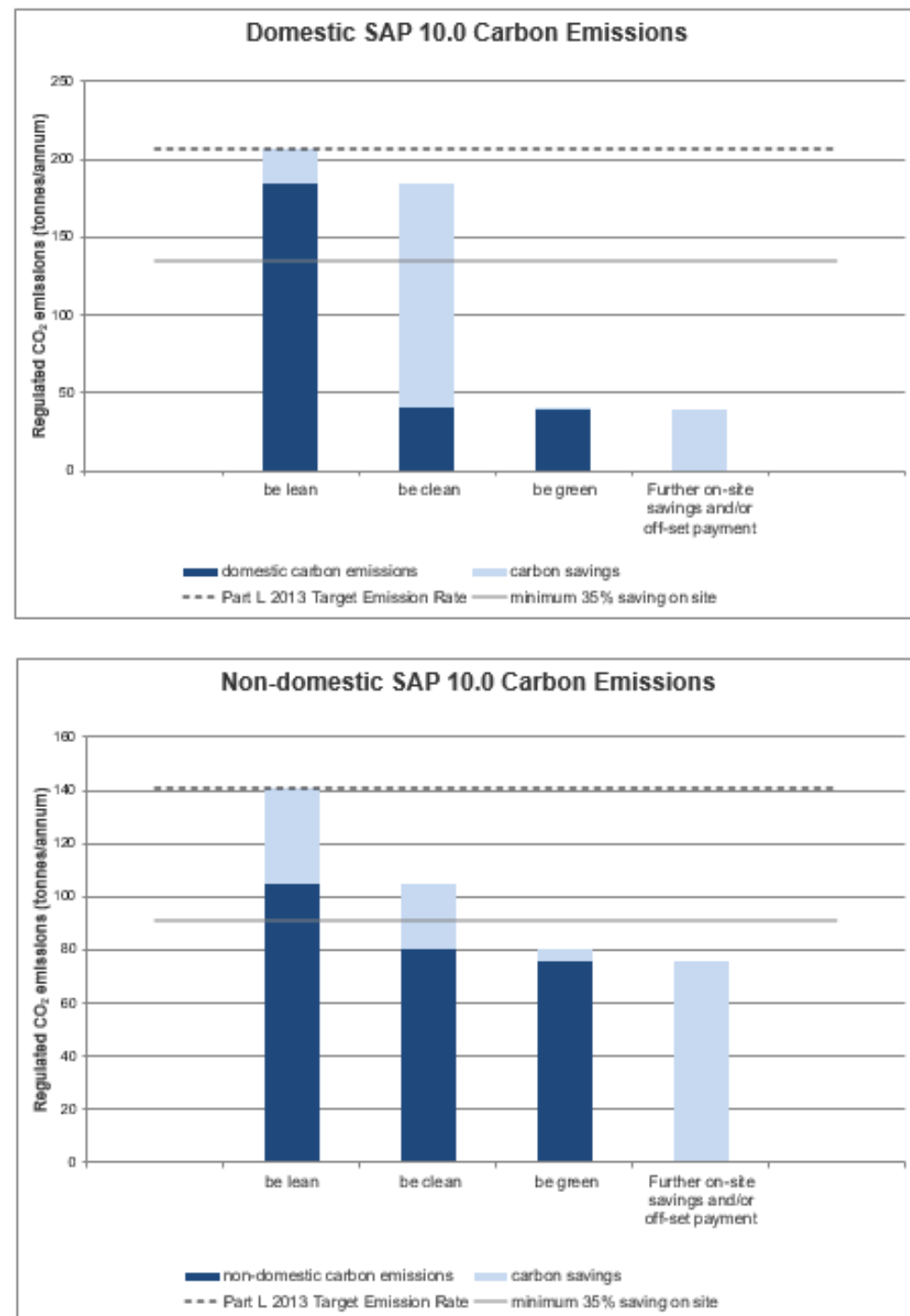


Figure 9-1 Carbon emission reduction graphics

9.1 DEMAND REDUCTION (BE LEAN)

The application of the measures identified in Section 5 provides an overall reduction of **22%** in carbon emissions from the Proposed Development and a total carbon reduction of **90.3 tonnes CO₂ per annum** from the baseline carbon emissions. After this stage of the energy hierarchy the total regulated carbon emissions from the Proposed Development is shown to be **322.2 tonnes CO₂ per annum**.

9.2 HEATING INFRASTRUCTURE (BE CLEAN)

A connection to a district heating network will be available in future as the proposed Tottenham Hale District Heat Network is developed. By connecting to the district heat network, the Proposed Development and a total carbon reduction of **200.4 tonnes CO₂ per annum** from the be lean carbon emissions. After this stage of the energy hierarchy, the total regulated carbon emissions from the Proposed Development is shown to be **121.7 tonnes CO₂ per annum**.

If a time lag occurs between site occupancy and operation of the district heat network, temporary plant in the form of gas boilers will be installed in line with the GLA Energy Assessment Guidance.

9.3 RENEWABLE ENERGY (BE GREEN)

The feasibility of a range of renewable technologies has been assessed in the context of the London Plan. It was concluded that PV is suitable for the development.

The renewable technology provides an overall reduction of **72%** in carbon emissions from the Proposed Development and a total carbon reduction of **297.4 tonnes CO₂ per annum** from the baseline carbon emissions compliant development. After this stage of the energy hierarchy, the total regulated carbon emissions from the Proposed Development is shown to be **115 tonnes CO₂ per annum**.

9.4 GLA GUIDANCE ON PREPARING ENERGY ASSESSMENTS

In direct response to the information outlined within the Greater London Authority (GLA) Guidance on Preparing Energy Assessments (June 2022), the results outlined previously are summarised in the tables below, with the results presented against the overall carbon reduction target. As per the guidance, these have been separated into summaries for new build Residential and Non-Residential and also existing building refurbishments.

The proposals for the Proposed Development outlined within this energy strategy are considered to maximise the potential carbon savings which can be achieved on the application site through the provision of:

- A highly efficient building fabric across both buildings.
- Efficient building services plant, including providing high efficiency air handling plant with heat recovery and low specific fan power.
- 100% low energy lighting and maximised use of LED and low energy fixtures.
- District heat network connection.
- Roof mounted PV panels.

Overall, the Proposed Development is shown to exceed the carbon reduction target of 35% set by GLA. The building fabric, air tightness, thermal bridging and g-value specifications have all been

maximised to provide the maximum carbon reductions. High performing efficient building services plant, including providing high efficiency air handling plant with heat recovery and low specific fan power have been considered.

The carbon emissions of the proposed non-residential element are expected to be refined once more detailed internal layouts are incorporated into the Part L analysis. This will impact the MEP services strategy along with specified efficiencies and associated controls.

9.5 PART L 2013 FABRIC ENERGY EFFICIENCY (FEE)

Accredited Design SAP 2012 software was used to determine the FEE standards for all apartments. An analysis has been undertaken on the all the new build residential buildings to establish the performance of the fabric in relation to the TFEE. Results for TFEE and the Dwelling FEE (DFEE) for all residential buildings are as follows:

Table 9-1 Fabric energy efficiency and carbon emissions results by residential buildings

	AVERAGE TFEE (KWH/M²)	AVERAGE DFEE (KWH/M²)	IMPROVEMENT
Residential	43.0	36.6	15.0%

All residential areas achieve compliance with the TFEE standard. Detailed façade design and thermal bridging calculations will be performed during detailed design stage once junction details will be specified. The final strategy for compliance with TFEE will be defined as design develops. The project will ensure compliance with the TFEE is achieved.

9.6 PART L 2013 CARBON DIOXIDE EMISSIONS

The following tables provide a summary of the performance of the Proposed Development. The performance of residential and non-residential elements is provided in Table 9-2 summarises the overall site performance.

Table 9-2 Regulated carbon dioxide savings from each stage of the energy hierarchy (SAP10.0 carbon factors) –Site wide

	REGULATED CARBON DIOXIDE EMISSIONS SAVINGS (TONNES CO ₂ PER ANNUM)	REGULATED CARBON DIOXIDE EMISSIONS SAVINGS (%)
Be Lean: Savings from energy demand reduction	90.3	22%
Be Clean: Savings from heat network	200.4	49%
Be Green: Savings from renewable energy	6.7	2%
Cumulative on-site savings	297.4	72%
Total Target Savings	412.4	100%
Carbon Shortfall	115.0	-
Cumulative shortfall for offset payment (over 30 years)	£327,696	

Table 9-3 Regulated carbon dioxide savings from each stage of the energy hierarchy (SAP10.0 carbon factors) –Residential

	REGULATED CARBON DIOXIDE EMISSIONS SAVINGS (TONNES CO ₂ PER ANNUM)	REGULATED CARBON DIOXIDE EMISSIONS SAVINGS (%)
Be Lean: Savings from energy demand reduction	21.8	10.6%
Be Clean: Savings from heat network	143.4	69.4%
Be Green: Savings from renewable energy	1.8	0.9%
Cumulative on-site savings	167.0	80.8%
Total Target Savings	206.6	100.0%
Carbon Shortfall	39.7	-
Cumulative shortfall for offset payment (over 30 years)	£113,016	

Table 9-4 Regulated carbon dioxide savings from each stage of the energy hierarchy (SAP10.0 carbon factors) –Non-residential

	REGULATED CARBON DIOXIDE EMISSIONS SAVINGS (TONNES CO ₂ PER ANNUM)	REGULATED CARBON DIOXIDE EMISSIONS SAVINGS (%)
Be Lean: Savings from energy demand reduction	68.5	33%
Be Clean: Savings from heat network	57.0	28%
Be Green: Savings from renewable energy	4.9	2%
Cumulative on-site savings	130.4	63%
Total Target Savings	205.8	100.0%
Carbon Shortfall	75.3	-
Cumulative shortfall for offset payment (over 30 years)	£214,679	

10 FLEXIBILITY AND PEAK ENERGY DEMAND

In line with Policy SI2 and SI3 of the London Plan, the possibility for including measures for reducing peak energy loadings has been considered in detail.

Load and peak demand calculations have been undertaken for the whole development and appropriate system capacity has been provided.

HEATING DEMAND

The peak heating load for the Proposed Development has been estimated as approximately 1,235kW. This load can be provided by the proposed district heat network. In case of a timelag, gas fired boilers will be installed to manage the load in the interim period. These will have an efficiency of minimum 96% and therefor the peak gas load is 1,286kW.

ELECTRICAL DEMAND

Formation has undertaken analysis of the electrical load demand for the Proposed Development as summarised in Figure 7-5.

Formation and Berol Quarter Limited will engage with the local Distribution Network Operator (DNO) for the proposed development to ascertain the capacity to serve the Proposed Development.

The electrical capacity required for the Proposed Development is 1,280 kVA. A 1,500 kVA transformer will be installed in the sub-station, resulting in a spare capacity of 220 kVA over the site.

ELECTRICAL ENERGY STORAGE

Battery storage has not been included due to a lack of spare renewable energy generation and space considerations. However, as battery technology improves, the potential for this to be included will be investigated for future phases of the development.

RENEWABLE ENERGY GENERATION

The development will incorporate on-site electricity generation in the form of photovoltaic panels located at roof level. PV panels are proposed on roofs of Berol House and 2 Berol Yard, saving approximately 6.7tCO₂ annually.

The solar panels are to be connected into the correct string arrangement to suit the specified inverter and wired via 4mm double insulated DC cabling back to a local electrical switch room.

The DC cabling will be connected to a TPN inverter via DC isolation and then back to the electrical infrastructure via an AC isolator and generation meter. No RCD protection is to be used for the PV system to avoid nuisance tripping.

The generation meter is to be connected to the main building wide metering system via either a Pulse or MBUS gateway.

The relevant applications are to be submitted by the nominated installer / contractor.

Due to the relatively small size of the PV array in comparison to the overall development, it is estimated that there will not be a major impact on the demand side flexibility.

Further potential measure for reducing the peak demands than those identified above will be investigated at detailed design stage.

Table 10-1 Summary of interventions for achieving flexibility

FLEXIBILITY ACHIEVED THROUGH	YES/NO	DETAILS
Electrical Energy Storage (kWh) capacity	No	Battery storage has not been included due to a lack of spare renewable energy generation and space considerations
Heat Energy Storage (kWh) capacity	No	Thermal storage has not currently been included, but should be re-evaluated during future design stages.
Renewable Energy Generation (load matching)	Yes	A PV array is proposed on the roof. As the arrays are of a relatively small size array it will compared to the development, they have not been considered when assessing demand flexibility
Gateway to enable automated demand response	No	Not proposed
Smart systems integration	No	Not proposed

11 BE SEEN

The ‘Be Seen’ – Energy Monitoring Guidance’ consultation ended in early 2021. Therefore, meeting the ‘Be Seen’ stage has become a requirement. In light of this, the Proposed Development has sought to and is committed to comply with the requirements described in the guidance for the “Planning Stage”, “As-Built Stage” and “In-Use Stage”.

For compliance with “Planning Stage” requirements, the following has been completed for the proposed development:

SITE WIDE

- Completion of the GLA’s ‘be seen’ spreadsheet with performance indicators including contextual data, building energy use and carbon emissions for the entire development as a whole. (Note this will be downloaded from the ‘Be Seen’ webpage and completed within 4 weeks of planning approval)
- Confirm target dates for all subsequent ‘Be Seen’ stages’

RESIDENTIAL

- Report the energy consumption (kWh/m²) and carbon emissions (tonnes CO₂/m²) estimates following Part L (2013) compliant methodology using SAP assessments as per the ‘Be Seen’ guidance

NON-RESIDENTIAL

- Report the energy consumption (kWh/m²) and carbon emissions (tonnes CO₂/m²) estimates following Part L (2013) compliant methodology using SAP assessments as per the ‘Be Seen’ guidance
- Production of a TM54 analysis in line with the minimum requirements of the ‘Be Seen’ energy monitoring guidance (Pre-consultation DRAFT April 2020)
- Contribution of operational carbon performance for Module B6 of the separate Whole Life-Cycle Carbon assessment using the findings of the TM54 analysis

All dwellings are included in the residential “Be Seen” analysis. The areas included in the non-residential analysis are Berol House (refurbished and extension) and the non-residential areas of 2 Berol Yard.

Table 11-1 to

Table 11-5 provides a summary of the planning stage performance indicators.

Table 11-1 Planning Stage Contextual Data

PERFORMANCE INDICATOR	PART L CALCULATION
Location/Address	Berol Quarter, Ashley Road, Tottenham Hale N17 9LJ
Site Plan	See architectural drawings from Allies and Morrison
Typology/Planning Use Classes	A2-A5, B1, C3-C4
GIA per Typology/Planning Use Classes	2 Berol Yard, A2-A5 - 840m ²
	C3-C4 – 24,882m ²
	Berol House, A2-A5 – 714m ² B1 – 5,212m ²
Anticipated Reporting Stage	As Built – Q3 2026
	In Use – Q2 2027

Table 11-2 Planning Stage Residential Performance indicators

PERFORMANCE INDICATOR	PART L (2013) CALCULATION
Annual Electricity Use (kWh/yr)	97,850
Annual Gas Use (kWh/yr)	0
Other Fuel Use (kWh/yr)	717,457
Elec Generation, Gross (kWh/yr)	7,717
Predicted Annual Carbon Emissions (tonnesCO ₂ /m ²)	154.9

Table 11-3 Planning Stage Non-Residential

PERFORMANCE INDICATOR	PART L (2013) CALCULATION
Annual Electricity Use (kWh/yr)	567,236
Annual Gas Use (kWh/yr)	0
Other Fuel Use (kWh/yr)	286,583
Elec Generation, Gross (kWh/yr)	21,024
Predicted Annual Carbon Emissions (tonnesCO ₂ /m ²)	194.1

Table 11-4 Application Carbon Offset

PERFORMANCE INDICATOR	
Total Site Carbon Emissions	3,449
Total Site cash-in-lieu contribution	£327,696

Table 11-5 Planning Stage Non-residential Performance indicators (TM54) (Whole site)

TM54 ANALYSIS	
Annual Electricity Use (kWh/yr)	860,113
Other Fuel Use (kWh/yr)	2,166,916
Elec Generation, Gross (kWh/yr)	21,024
Predicted Annual Carbon Emissions (tCO ₂ /yr)	273.6

The CIBSE TM54 analysis results above have been used to represent the regulated and unregulated energy requirements for Module B6 within the accompanying Whole Life-Cycle Carbon (WLC) report. Please refer to the CIBSE TM54 analysis in the appendices and the separate WLC for further details.

The building's actual energy performance will be monitored post-construction. The Proposed Development will be provided with Building Management System. This will control and monitor the building systems and services throughout the development, provide feedback of plant, system performance and energy usage of the system. The BMS will analyse this data to enable optimum use of the engineering facilities within the development with minimum of human intervention, and maximum energy efficiency.

The landlord services fall under the category of sub metering as the main supplies will be bulk metered as part of the building switch rooms. Both small power and lighting are to be sub metered in distribution boards in compliance with TM39:2009. This is achieved via in line meters in the distribution boards. All metering information can be collected and distributed to the BMS via the landlords unified network. Apartments will be provided with small metering to minimise apartment access.

12 CONCLUSION

The strategies for the Proposed Development outlined within this energy statement are considered to maximise the potential carbon savings which can be achieved on the application site through the provision of:

- A highly efficient building fabric across both buildings.
- Connection to the LB Haringey proposed district heat network.
- Efficient building services plant, including providing high efficiency air handling plant with heat recovery and low specific fan power.
- 100% low energy lighting and maximised use of LED and low energy fixtures.
- Roof mounted PV panels.

Additionally, measures have also been included to comply with the overheating requirements of TM52 and TM59.

Overall, the Proposed Development is shown to achieve the following carbon reduction after following the Energy Hierarchy of Be Lean, Be Clean, Be Green when compared to Part L 2013 using SAP 10.0 carbon factors:

- **Whole Proposed Development – 67%** carbon emission reduction over the Building Regulations 2013 Part L baseline.

The result has also been analysed using the Be Seen methodology and will be checked again at later stages in the design process.

The Proposed Development meets and exceeds the carbon reduction target of 35% set by GLA.

13 APPENDIX A

13.1 SAP CALCULATIONS – “BE LEAN” – BLOCK COMPLIANCE

13.2 SAP CALCULATIONS – “BE CLEAN” – BLOCK COMPLIANCE

13.3 SAP CALCULATIONS – “BE GREEN” – BLOCK COMPLIANCE

13.4 SAP CALCULATIONS – “BE LEAN” – EXAMPLE FLAT 1

13.5 SAP CALCULATIONS – “BE LEAN” – EXAMPLE FLAT 2

13.6 SAP CALCULATIONS – “BE CLEAN” – EXAMPLE FLAT 1

13.7 SAP CALCULATIONS – “BE CLEAN” – EXAMPLE FLAT 2

13.8 SAP CALCULATIONS – “BE GREEN” – EXAMPLE FLAT 1

13.9 SAP CALCULATIONS – “BE GREEN” – EXAMPLE FLAT 2

14 DOMESTIC OVERHEATING CHECKLIST

15

APPENDIX B

15.1

BRUKL SHEETS “BE LEAN”

15.2 BRUKL SHEETS “BE CLEAN” & “BE GREEN”