UCLHC

Arthur Stanley House

Stage 2 Sustainability Report

Issue | 18 December 2014

Job number 236908

Ove Arup & Partners Ltd
13 Fitzroy Street
London
W1T 4BQ
United Kingdom
www.arup.com

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Document Verification

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			Prepared by	Checked by	Approved by
		Name	Jamie Risner	Mel Allwood	Rachel Harris
		Signature			
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Contents

Appendices

1 Introduction

This report summarises Stage 2 design team sustainability inputs for the Arthur Stanley House project.

Summaries of the strategies used to address targeted credits are provided in section 2. Further information provided by the design team is included in the relevant appendices.

2 Stage 2 Sustainability Reporting

2.1 Hea 06: Safety and Security

The architect met with a Suitably Qualified Security Specialist, the local Architectural Liason Officer (ALO), on the 1st December 2014 to conduct a site visit and in addition conduct an evidence based security needs assessment.

The recommendations given by are ALO are:

1. *All communal and all residential doors will be to BS PAS 24-2012 or other acceptable standard with some delivery note or similar to inform me how many doors the certificate refers to.*
2. *Windows. All opening and accessible windows will be to BS PAS 24-2012 with p1A rated glazing.*
3. *Post. Delivered to an internal foyer with post boxes with further BS PAS 24-2012 doors fitted to prevent further entry into the building. Through the wall system is also appropriate.*
4. *Access control will be audio and video with no trades button fitted. Consideration should be given to capturing images and record them from this camera*
5. *Lighting of the site to a uniform level (BS 5489).*
6. *Basement. Fob on lift with BS PAS 24-2012 doors fitted to stairwell. Concern is the fire route, I suggest this places people outside of the building and does not allow entry into the residential areas.*
7. *Walls which are of stud partition will be enhanced with 9mm plywood or expanded metal mesh.*
8. *I was informed that new glazing would be fitted to this building. I will refer this to CTSA for suitable advice.*
9. *Bin store shall have further BS PAS 24-2012 door fitted to stores which allow access into the building. Self-closing and locking fit for purpose doors are acceptable where there is no further entry into the building. Gating will be provided in front of the bin stores to 2m high, to remove the recess.*
10. *Utility meters will be located in a central location such as cores*
11. *Any recess will be to 600mm maximum.*
12. *CCTV and alarms should be considered. If cctv is used then compliance and registration with the information commissioner is required.www.ico.gov.uk.*
13. *Lifts should be controlled by fob. Fire doors which are security tested may be used on each floor stairs. This will reduce unauthorised movement within the building.*
14. *Consider internal access control for each 10 residential units. Fobs on lift and BS PAS 24-2012 fire doors on each floor and at ground stairs.*
15. *Bike stores may have bike boxes fitted. LPS 1175 SR rated boxes should be used. Bike stores should have reduced access to around 10 bikes. This may be achieved by gating, or further rooms etc.*

The email from the ALO, containing the recommendations is included in Appendix 1.

2.2 Tra 02: Proximity to amenities

The assessor has verified that the site is within the acceptable proximity of the 3 required amenities, via a safe route: a cash machine, food outlet and post office. This is documented in Appendix 2.

2.3 Mat 06: Material Efficiency

The Structural Engineer has summarised their work to address Mat 06 in the Preparation, Brief and Concept design stages. This is included as a report in Appendix 3, including correspondence within the design team on the project and meeting minutes demonstrating that a wide range of relevant parties were consulted.

Further material efficiency analysis will be completed at the appropriate stages of design and construction.

2.4 Wst 02: Recycled Aggregates

The Structural Engineer has clarified the potential for recycled aggregates to be included on the project in a concise report included in Appendix 4. This report includes structural drawings of each floor demonstrating the volumes of concrete.

Initial calculations indicate that for this credit to be achieved, a recycled/secondary aggregate content exceeding approximately 41% in the foundations is required. This strategy would allow the credit to be achieved with no recycled/secondary aggregate content on the upper floors.

2.5 Ene 04: Low Carbon Design

The Mechanical Engineers 'Energy Statement and Sustainability Assessment' contains a Low and Zero Carbon Energy study in section 4.3: Zero Carbon Technologies (Be Green).

Also included in the report is the Passive Design Analysis required for credit one, this is under section 4.1: Be Lean.

The report is included in Appendix 5.

2.6 Le 04: Enhancing Site Ecology

A Suitably Qualified Ecologist from 'The Ecology Consultancy' Rosie Marston has produced an ecology report 'Preliminary Ecological Appraisal' as specified in requirement 2. This report provides appropriate recommendations on improving the site's biodiversity and confirms that the site is currently of low ecological value.

This report is included in Appendix 6.

3 Conclusion

This report demonstrates that the Stage 2 actions contributing to the targeted BREEAM credits have been completed.

Appendix 1: ALO Letter

Dear Jamie,

Please see below comments from the ALO meeting as requested.

regards,

Paul

Paul Barnes
Architect

LLEWELYN DAVIES

Architects | Planners | Designers
3rd Floor || 3 - 5 Rathbone Place | London || W1T 1HU || T+44(0)20 7907 7900 || www.ldavies.com

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From: Adam.Lindsay@met.pnn.police.uk [Adam.Lindsay@met.pnn.police.uk]
Sent: 02 December 2014 09:05
To: Paul Barnes
Subject: Arthur Stanley House on Tottenham Street

Dear Paul,

Further to our meeting of yesterday I have the following notes. We discussed SBD part 1 & 2 for the office and residential, security in general and at this time I don't know if the office space will be applying for SBD award.

I don't know what security features will be fitted to this building as at this time there are different options available.

There is concern relating to the fire routes within the building. The offices have a fire route through the residential section of the building. This route is from all levels. This will also include the basement. We discussed this concern and suggestions as to security mitigation we made. LPS 1175 SR 2 can be increased.
This security standard goes to level 6.
I suggest higher levels of security doors will be required on this development.

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3. Post. Delivered to an internal foyer with post boxes with further BS PAS 24-2012 doors fitted to prevent further entry into the building. Through the wall system is also appropriate.
4. Access control will be audio and video with no trades button fitted. Consideration should be given to capturing images and record them from this camera.
5. Lighting of the site to a uniform level (BS 5489).
6. Basement. Fob on lift with BS PAS 24-2012 doors fitted to stairwell. Concern is the fire route, I suggest this places people outside of the building and does not allow entry into the residential areas.
7. Walls which are of stud partition will be enhanced with 9mm plywood or expanded metal mesh.
8. I was informed that new glazing would be fitted to this building. I will refer this to CTSA for suitable advice.
9. Bin store shall have further BS PAS 24-2012 door fitted to stores which allow access into the building. Self closing and locking fit for purpose doors are acceptable where there is no further entry into the building. Gating will be provided in front of the bin stores to 2m high, to remove the recess.
10. Utility meters will be located in a central location such as cores
11. Any recess will be to 600mm maximum.
12. CCTV and alarms should be considered. If cctv is used then compliance and registration with the information commissioner is required.www.ico.gov.uk.
13. Lifts should be controlled by fob. Fire doors which are security tested may be used on each floor stairs. This will reduce unauthorised movement within the building.
14. Consider internal access control for each 10 residential units. Fobs on lift and BS PAS 24-2012 fire doors on each floor and at ground stairs.
15. Bike stores may have bike boxes fitted. LPS 1175 SR rated boxes should be used. Bike stores should have reduced access to around 10 bikes. This may be achieved by gating, or further rooms etc.

Further information is available at www.securedbydesign.com

Regards Adam Lindsay

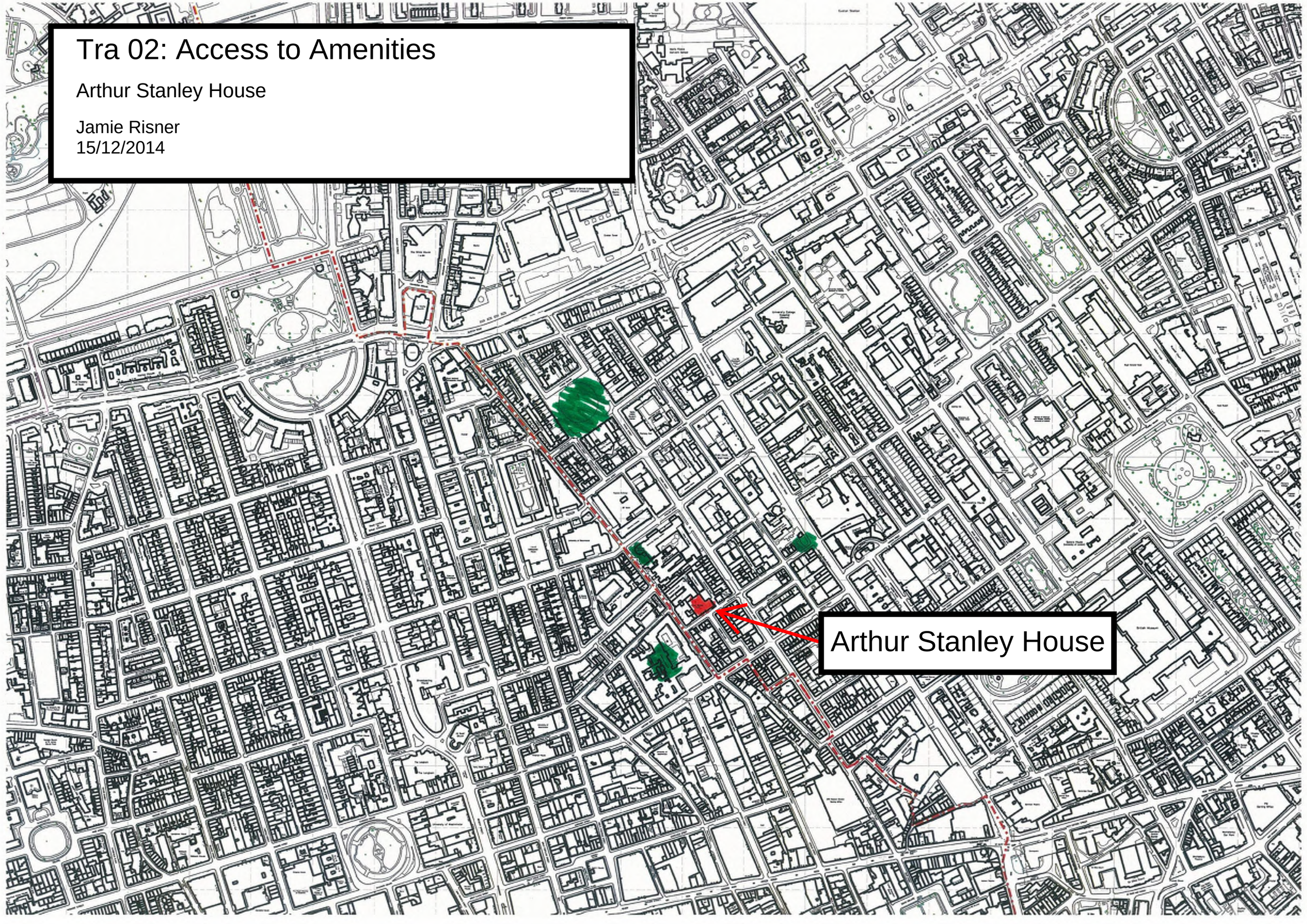
Designing Out Crime Officer
Ruislip Police Station
The Oaks, Ruislip,
TP C&S North West
0208 733 3703
07825103933
Office Email: DOCOMailbox.NW@met.police.uk
www.immobilise.com

Appendix 2: Proximity to Amenities Report

Tra 02: Access to Amenities

Arthur Stanley House

Jamie Risner
15/12/2014

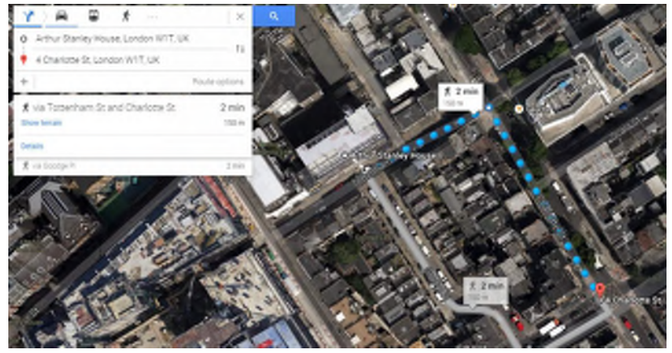


Amenity 1: Appropriate Food Outlet

Safe Crossing Shown Right

Charlotte Street Cluster of Cafés and restaurants

Route to Appropriate Food Outlet



Distance = 150 m

Charlotte/Goodge Street Corner

The walking route crosses one road, shown below:

Amenity 2: Cash Machine

Safe Crossing Shown Right

Bank of Cyprus Cash Machine

Route to Closest Cash Machine

Distance = 200m

Cash Machine

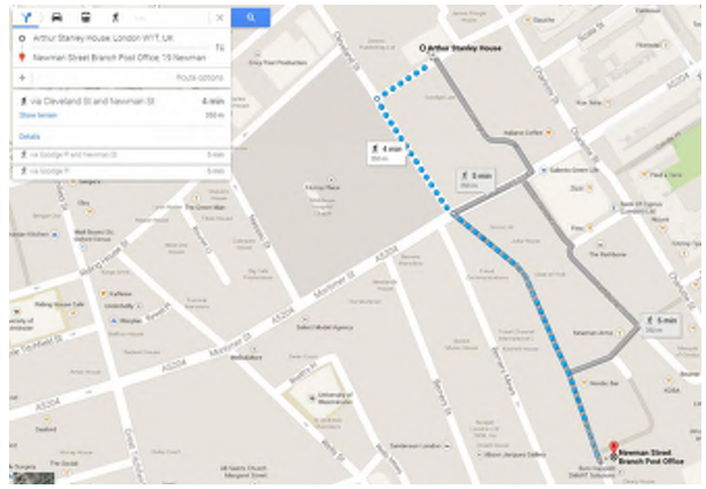
The walking route crosses one significant road, shown below:

Amenity 3: Post Office

Safe Crossing Shown Right

Newman Street Post Office

Route to Closest Post Office



Distance = 350m

Post Office

The walking route crosses one significant road, shown below:

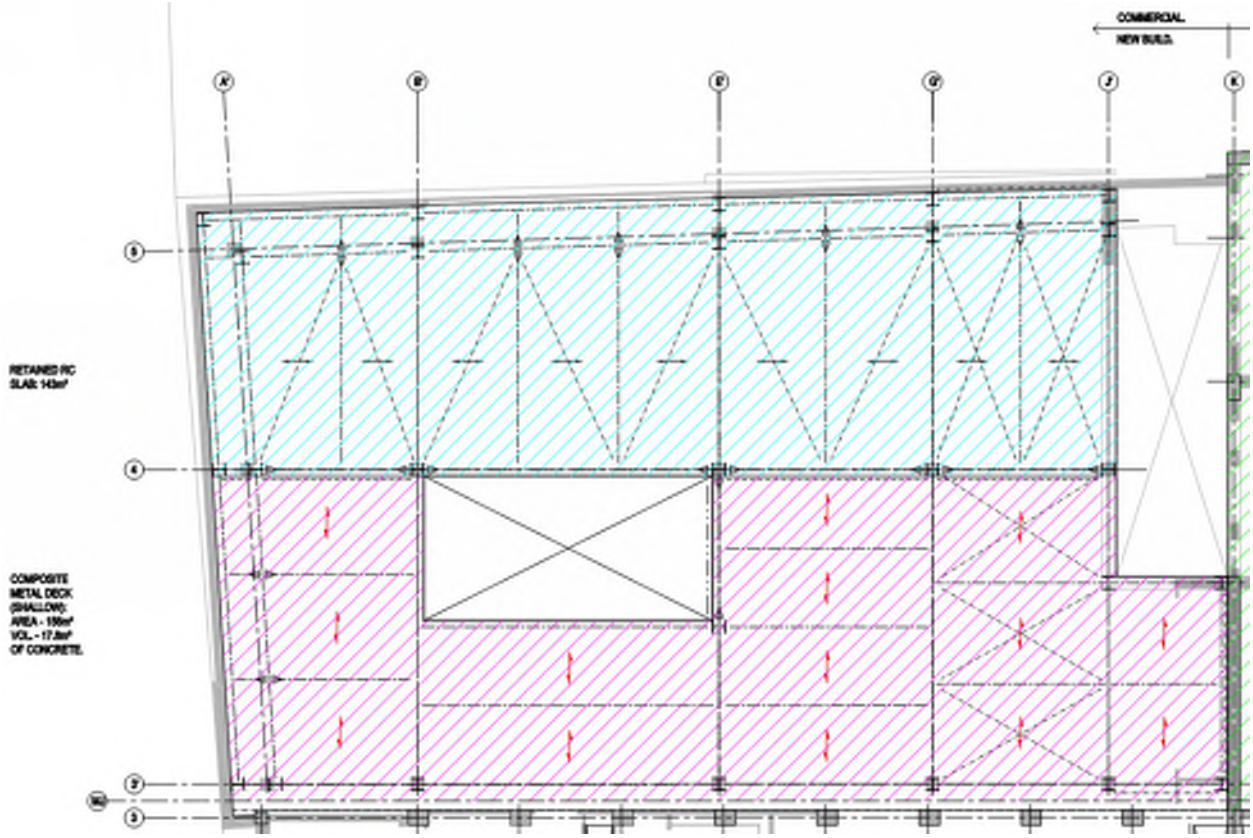
Appendix 3: Material Efficiency Report

1 BREEAM – MAT06 – MATERIAL EFFICIENCY

1.1 Selection of Steel Frame Construction

From an early stage, it was decided that a steel frame construction should be adopted for the Commercial New Build.

This decision was made based upon many factors, but the most prevalent driver was that we wished to retain sections of existing RC elements. The extract below from a URS sketch shows the part retention of the ground floor slab (in blue). The retention of the slab allowed for a reduction in the temporary works required to laterally restrain the retaining wall north of GL 5. It also allows for the re-use of material.



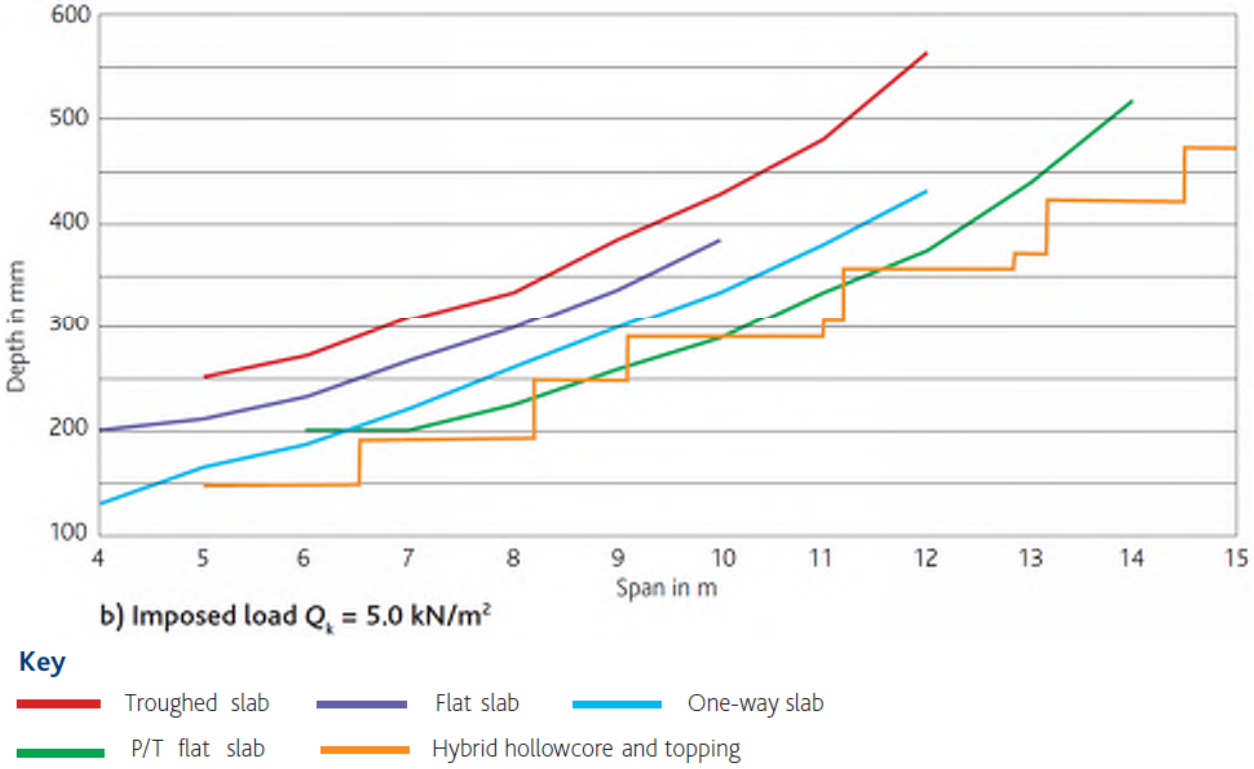
Extract from URS Sketch – Commercial New Build – Floor construction

The incorporation of this existing section of slab into an RC frame construction would have been extremely difficult – steel on the other hand is well suited to this use.

1.2 Selection of Floor Type

Once a steel frame construction was adopted by the design team, solutions were sought for floor construction types.

Included below is an extract from The Concrete Centre's "Concrete Buildings Scheme Design Manual", showing relevant RC floor types and thicknesses for span lengths. The figure indicates that a "Hybrid Hollowcore and Topping" may provide a sensible solution for our floor construction. This type of floor construction (structural topping on hollow precast prestressed concrete slabs) is rated A+ by the Green Guide 2008.



It should be noted that by comparison, for our span of 5m (say), the equivalent depth of section for a RC in-situ flat slab is 225mm approx., whilst the depth of section for the hollowcore solution is 150mm. It is clear that the hollowcore option is preferable from a material efficiency perspective, as well as a floor to ceiling height perspective. The flat slab option is rated E by the Green Guide 2008.

After some deliberation, it was decided that a "powerfloated in situ reinforced concrete slab on "shallow" profiled metal decking" be selected. This option is also rated A+ by the Green Guide 2008, but was selected for increased ease of construction, ease with which openings can be formed in the floor plate, as well as being a the most lightweight floor type. Use of a lightweight floor type reduces weight transferred to the foundations, and can allow for lighter foundations to be installed.

Appendix 4: Recycled Aggregate

1 BREEAM – WST02 – RECYCLED AGGREGATES

We recommend that the use of recycled aggregates or secondary aggregates should be adopted, should a local source be found, for a proportion of the mix.

Whilst working towards BREEAM accreditation for North West Cambridge, a project for The University of Cambridge, URS enquired with various concrete providers with regards to the supply of recycled aggregates. The following response was given by Cemex;

Procuring a consistent quality and quantity of Recycled Aggregate (or RCA) is difficult for the readymix industry across the UK, as often the material is kept on site and used as fill material. CEMEX do have the option of using a secondary aggregate and again we would welcome the opportunity to discuss.

With this in mind, it will be written into the specification that either recycled aggregates or secondary aggregates may be used, provided that they can be sourced within 30km radius of the site.

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Purpose of issue

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ARTHUR STANLEY HOUSE

Drawing Title

SKETCH - PROPOSED FIFTH FLOOR LAYOUT BREEAM - MAT01

Designed	Drawn	Checked	Approved	Date
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URS Internal Project No.	Suitability
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Scale @ A0	Zone
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ASH-URS-SK-JB-141215-0007	P01

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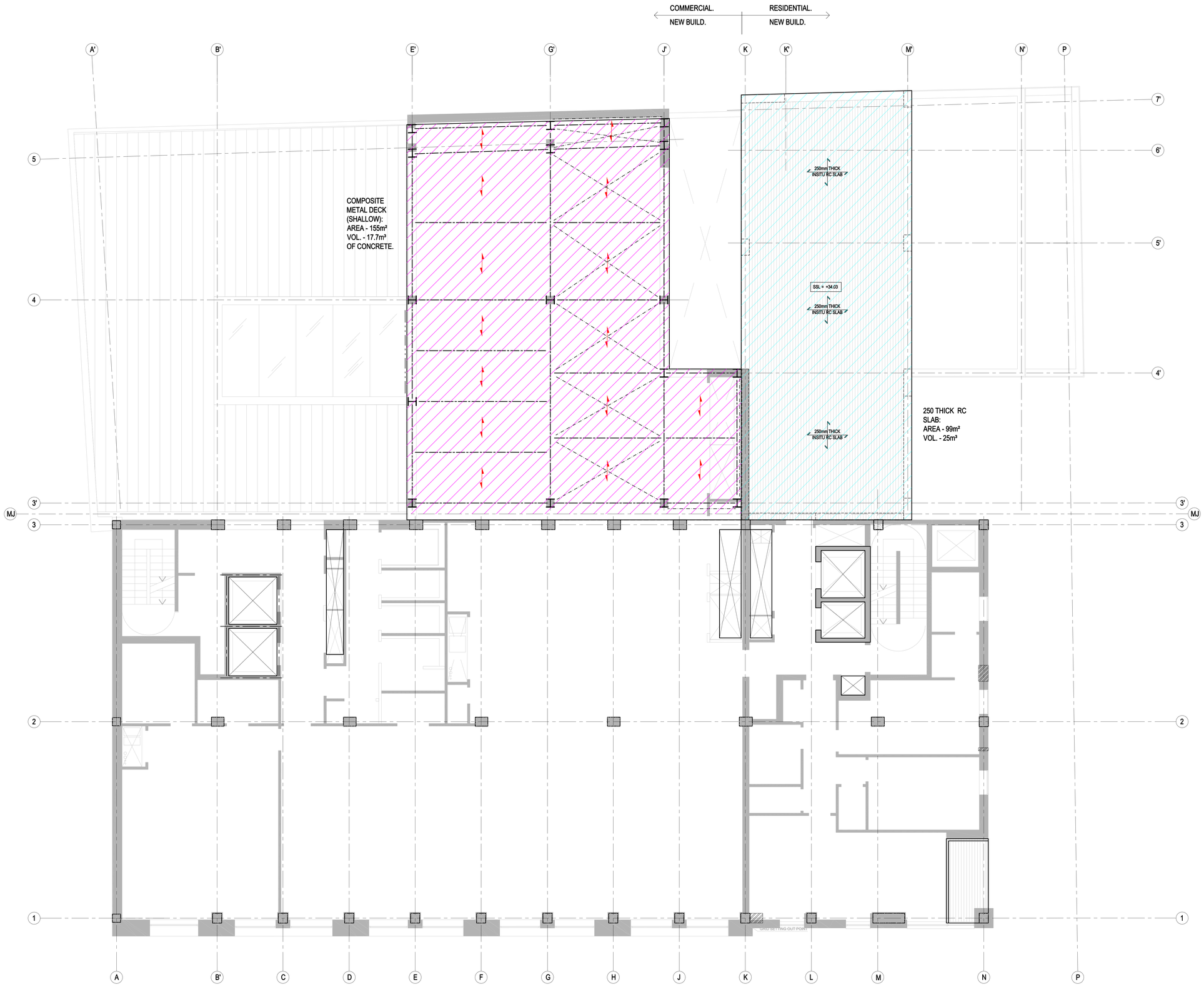

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SKETCH - PROPOSED FOURTH FLOOR LAYOUT
BREEAM - MAT01

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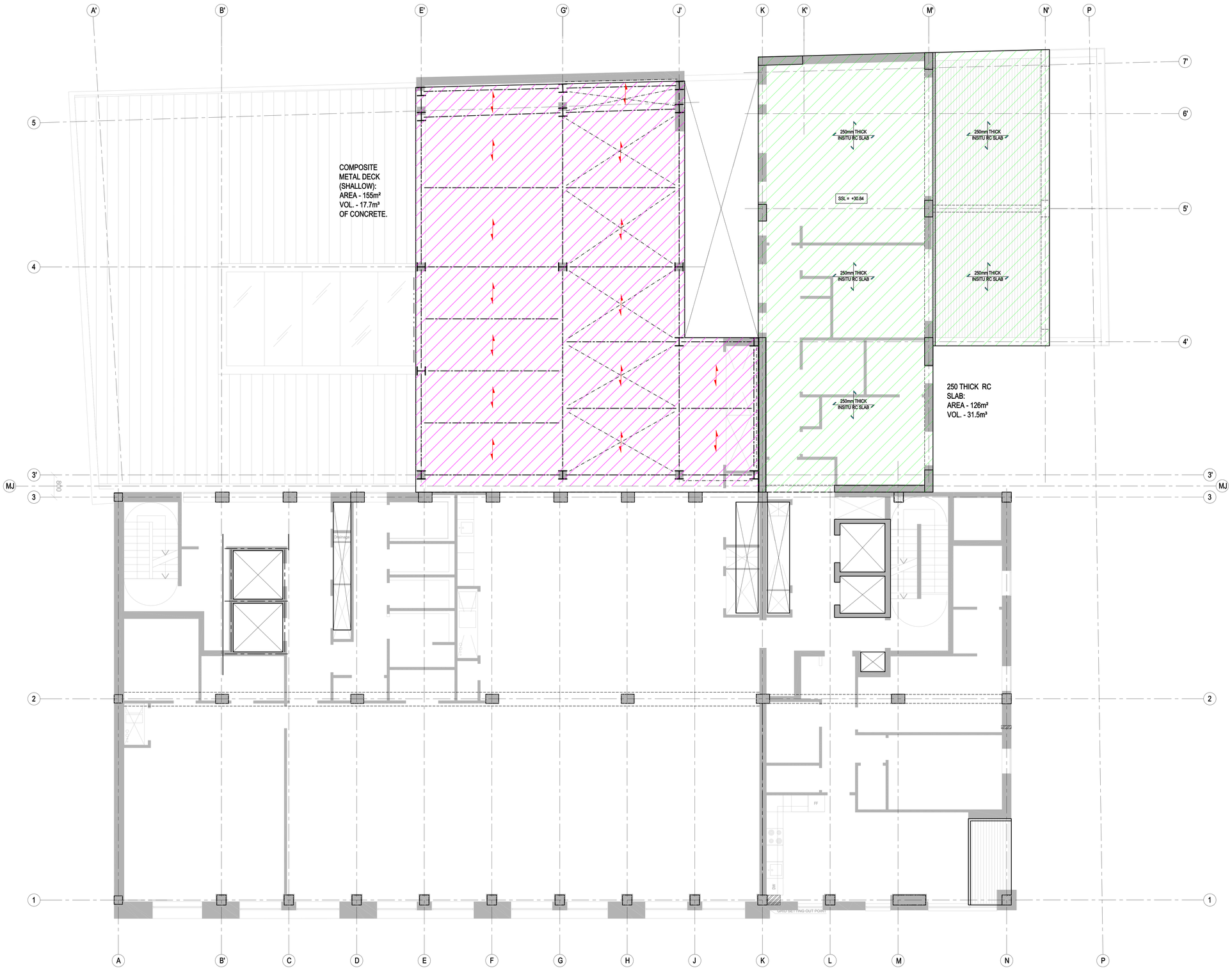

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SKETCH - PROPOSED THIRD FLOOR LAYOUT BREEAM - MAT01

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Plot Date: 12/12/2014 3:30 PM
File Name: ASH-URS-SK-JB-141215-0005

COMMERCIAL. NEW BUILD.

RESIDENTIAL. NEW BUILD.

COMPOSITE METAL DECK (SHALLOW):
AREA - 299m²
VOL. - 34.1m³
OF CONCRETE.

250mm THICK INSITU RC SLAB

SSL = +27.65

250 THICK RC SLAB:
AREA - 166m²
VOL. - 41.5m³

GRID SETTING OUT POINT

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SKETCH - PROPOSED SECOND FLOOR LAYOUT BREEAM - MAT01

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Rev: P01

Plot Date: 12/5/2014 5:29 PM
File Name: ASH-URS-SK-JB-141215-0004

COMMERCIAL. NEW BUILD.

RESIDENTIAL. NEW BUILD.

COMPOSITE METAL DECK (SHALLOW):
AREA - 299m²
VOL. - 34.1m³
OF CONCRETE.

250mm THICK INSITU RC SLAB

250mm THICK INSITU RC SLAB

SSL = +24.45

250mm THICK INSITU RC SLAB

250mm THICK INSITU RC SLAB

250mm THICK INSITU RC SLAB

250 THICK RC SLAB:
AREA - 166m²
VOL. - 41.5m³

GRID SETTING OUT POINT

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SKETCH - PROPOSED FIRST FLOOR LAYOUT
BREEAM - MAT01

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Plot Date: 12/15/2014 5:59 PM
File Name: ASH-URS-SK-JB-141215-0003

COMMERCIAL. NEW BUILD.

RESIDENTIAL. NEW BUILD.

RETAINED RC SLAB: 143m²

COMPOSITE METAL DECK (SHALLOW): AREA - 156m² VOL. - 17.8m³ OF CONCRETE.

250mm THICK INSITU RC SLAB

SSL = +20.63

250 THICK RC SLAB: AREA - 149m² VOL. - 37.3m³

TOTTENHAM MEWS

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SKETCH - PROPOSED GROUND FLOOR LAYOUT BREEAM - MAT01

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Plot Date: 12/15/2014 5:57 PM
File Name: ASH-URS-SK-JB-141215-0002

COMMERCIAL. NEW BUILD.

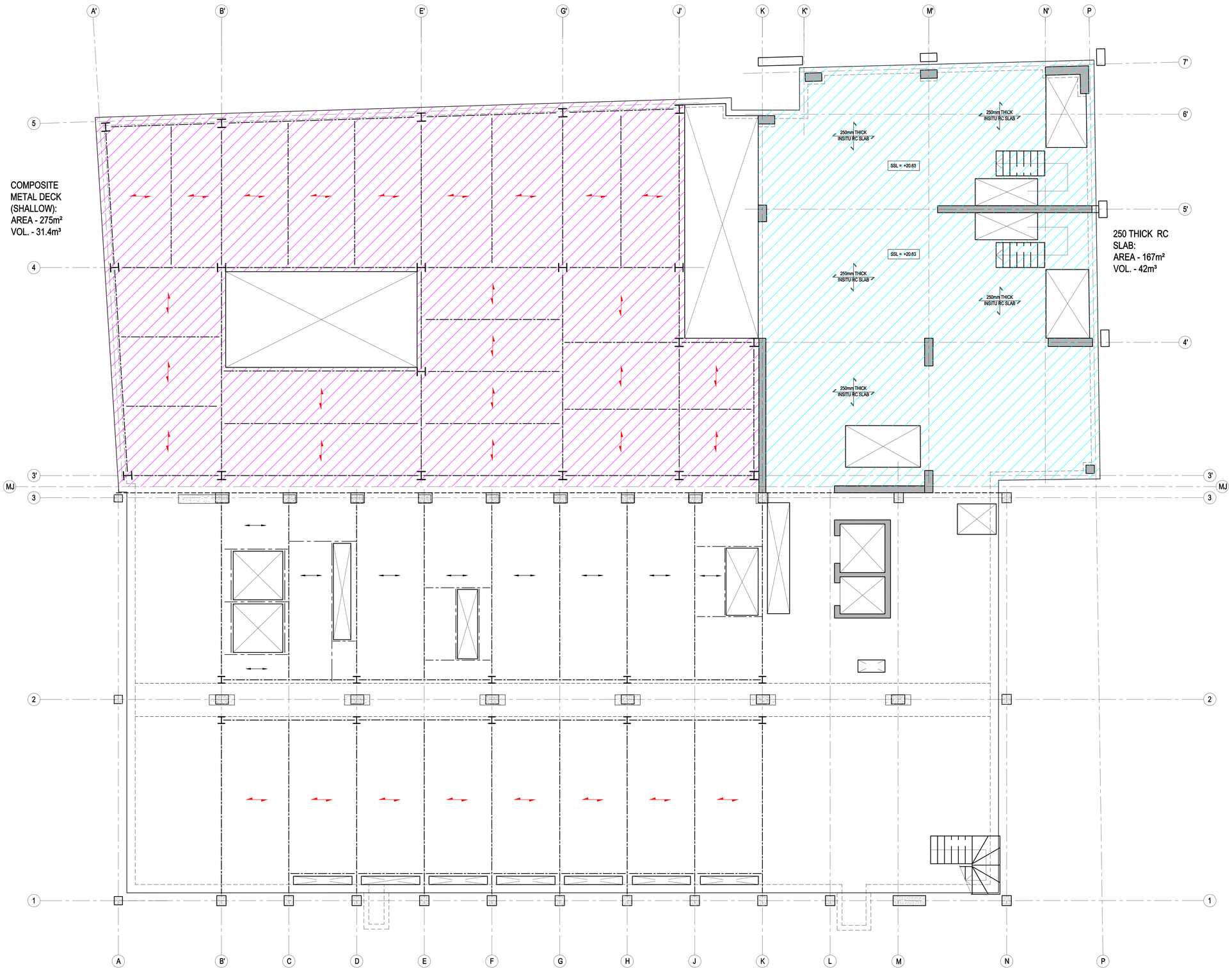
RESIDENTIAL. NEW BUILD.

COMPOSITE METAL DECK (SHALLOW):
AREA - 275m²
VOL. - 31.4m³

250mm THICK INSITU RC SLAB

SSL = +20.63

250 THICK RC SLAB:
AREA - 167m²
VOL. - 42m³



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ARTHUR STANLEY HOUSE

Drawing Title
SKETCH - PROPOSED BASEMENT FLOOR LAYOUT
BREEAM - MAT01

Designed	Drawn	Checked	Approved	Date
	JB	JB	DW	DEC 2014

URS Internal Project No.	Suitability
47069903	
Scale @ A0	Zone
1:50	

URS Infrastructure & Environment UK Limited
6-8 Greencoat Place
London
SW1P 1PL
Tel:+44 (0)20 7798 5000
Fax:+44 (0)20 7798 5001
www.urs.com

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Drawing Number	Rev
ASH-URS-SK-JB-141215-0001	P01

Plot Date: 12/15/2014 5:08 PM
File Name: ASH-URS-SK-JB-141215-0001

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250 GROUND BEARING RC SLAB
AREA = 516.9m²
VOLUME OF CONCRETE =129.2m³

RC PILE CAP (1000 dp)
AREA = 83.1m²
VOLUME OF CONCRETE =83.1m³

RC GROUND BEAM (750 dp)
AREA = 26.74m²
VOLUME OF CONCRETE =20.1m³

RC RETAINING WALL (2650 dp)
VOLUME OF CONCRETE =59.5m³

Revision Details	By / Check	Date	Suffix

Purpose of issue
INFORMATION

Client
UCLH CHARITABLE TRUST

Project Title
ARTHUR STANLEY HOUSE

Drawing Title
SKETCH - PROPOSED LOWER BASEMENT LAYOUT BREEAM ASSESSMENT

Designed	Drawn	Checked	Approved	Date
	JB	JB	DW	DEC 2014

URS Internal Project No.: 47069203
Suitability:
Scale @ A0: 1:50
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URS Infrastructure & Environment UK Limited
6-8 Greencoat Place
London
SW1P 1PL
Tel:+44 (0)20 7798 5000
Fax:+44 (0)20 7798 5001
www.urs.com

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Drawing Number: ASH-URS-SK-JB-141215-0000
Rev: P01

Plot Date: 12/12/2014 3:53 PM
File Name: ASH-URS-SK-JB-141215-0000

Appendix 5: Low Carbon Design Report

UCLH Charity

Arthur Stanley House

Energy Statement & Sustainability Assessment

Issue 1 | 18 December 2014

Job number 236908

Ove Arup & Partners Ltd
13 Fitzroy Street
London
W1T 4BQ
United Kingdom
www.arup.com

ARUP

Document Verification

ARUP

Job title		Arthur Stanley House			**Job number** 236908
Document title		Energy Statement & Sustainability Assessment			**File reference**
Document ref					
Revision	**Date**	**Filename**	141120 ASH Energy Statement Draft.docx		
Draft 1	20 Nov 2014	**Description**	First draft		
			Prepared by	Checked by	Approved by
		Name	Hugh Quail	Rachel Harris	Paul Lander
		Signature			
Issue 1	18 Dec 2014	**Filename**	141219 ASH Energy & Sustainability Statement.docx		
		Description	ASH Energy & Sustainability Statement Issue 1		
			Prepared by	Checked by	Approved by
		Name	Hugh Quail	Rachel Harris	Paul Lander
		Signature			
		Filename			
		Description			
			Prepared by	Checked by	Approved by
		Name			
		Signature			
		Filename			
		Description			
			Prepared by	Checked by	Approved by
		Name			
		Signature			
				Issue Document Verification with Document	✓

Contents

Appendices

Executive Summary

The proposed development at Arthur Stanley House consists of the refurbishment and redevelopment of the existing Sixties building and its extension to the north of the site. The current, out-dated building fabric will be upgraded during the planned works to meet the same performance of a new build façade; and the building services installation will aim to be as energy efficient as practicable and generate its own energy where feasible.

The following graph summarises the site wide percentage improvements on Part L 2013 carbon emissions that are achieved by the current energy strategy. This shows significant improvements in carbon emissions given the constraints of the site and its location. It is estimated that a total of 33.8 tonnes of CO_2 per annum could be abated which is equivalent to a 24.0% reduction in carbon emissions against the Part L 2013 baseline.

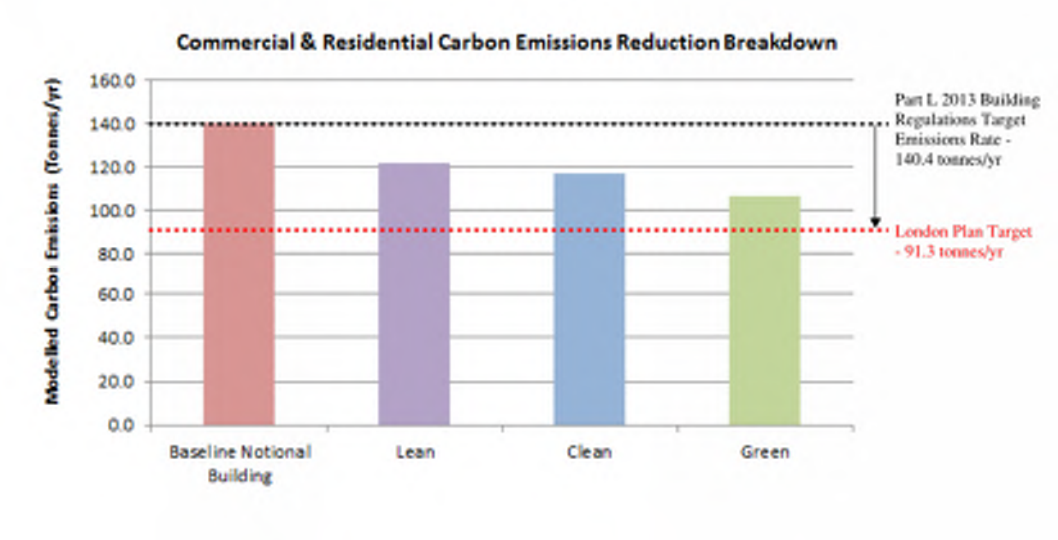


Figure 1: Arthur Stanley House Reduction in Carbon Dioxide Emissions

CHP and CCHP were deemed to be unfeasible, though capped pipework to the Residential and Commercial plant rooms will be provided such that a future connection to a district heating and cooling network could be facilitated.

The measures shown in the following report allow the development to achieve the required energy credits for BREEAM Very Good and Code for Sustainable Homes Level 4 to meet requirements for planning. However, the target of a 35% improvement over the Part L 2013 notional building has not been met. An 11% annual shortfall has been recorded which is equivalent to 15.3 tonnes per year. Over an assumed 30 year lifetime for services, this is equivalent to 459 tonnes of carbon dioxide.

The project has been assessed against BREEAM and Code for Sustainable Homes and the pre-assessment is included in the appendices. To achieve the target BREEAM rating of Very Good, the project will target 70 credits which equates to a score of 60.9%. To achieve the target CfSH Level 4, the project will target 78 credits, equivalent to a score of 72.5%.

1 Introduction

This report outlines the sustainability strategy that has been developed for Arthur Stanley House (ASH) to address the planning requirements of the Mayor of London's London Plan and the policies of the London Borough of Camden. It includes a detailed energy and carbon emissions reduction assessment as well as a pre-assessment of the building's targets for BREEAM and Code for Sustainable Homes.

The project involves the refurbishment and redevelopment of ASH, a former hospital site on the corner of Tottenham Street and Tottenham Mews. The building was part of the Middlesex Hospital and University College Hospital and it served as a clinic and out-patients department from 1965 to 2007. The proposed scheme comprises the alteration and extension of the existing building to create a mixed use development for residential and office floor space.

The existing ASH building has had its ageing plant and equipment removed and its out-dated building fabric will be upgraded during the planned works.

Both the residential and commercial office spaces, within the refurbished building and the proposed extension, will incorporate efficient plant and equipment; well-insulated building fabric to minimise heat loss and gains; and high performing glazing to maximise daylight whilst minimising building energy consumption.

The vision for ASH is to be as low energy as practicable and viable. This report outlines how this will be achieved.

2 Planning Context

2.1 London Plan

The London Plan, with revised early minor alterations and the Draft Further Alterations (2014), is the Spatial Development Strategy for London published by the Greater London Authority (GLA) and covers all 32 London Boroughs and includes the City of London Corporation. The Plan contains a number of policies which are relevant to Energy:

Policy 5.2: Minimising carbon dioxide emissions

"The Mayor will work with boroughs and developers to ensure that major developments meet the following targets for carbon dioxide emissions reduction in buildings. These targets are expressed as minimum improvements over the Target Emission Rate (TER) outlined in the national Building Regulations leading to zero carbon residential buildings from 2016 and zero carbon non-domestic buildings from 2019.

Residential buildings: Year Improvement on 2010 Building Regulations
2010 – 2013 25 per cent (Code for Sustainable Homes level 4)
*2013 – 2016 40 per cent**
2016 – 2031 Zero carbon

Non-domestic buildings: Year Improvement on 2010 Building Regulations

2010 – 2013 25 per cent
2013 – 2016 40 per cent
2016 – 2019 As per building regulations requirements
2019 – 2031 Zero carbon"

Also highlighted in this Policy is:

"The carbon dioxide reduction targets should be met on-site. Where it is clearly demonstrated that the specific targets cannot be fully achieved on-site, any shortfall may be provided off-site or through a cash in lieu contribution to the relevant borough to be ring fenced to secure delivery of carbon dioxide savings elsewhere."

* Since 6 April 2014 the 2013 changes to Part L of the Building Regulations have come into effect. As outlined in the Sustainable, Design and Construction SPG, from 6 April 2014 the Mayor will apply a 35 per cent carbon reduction target beyond Part L 2013 of the Building Regulations - this is deemed to be broadly equivalent to the 40 per cent target beyond Part L 2010 of the Building Regulations, as specified in Policy 5.2 of the London Plan for 2013-2016.

The 35% reduction target against 2013 Part L carbon emissions is used for comparison in this report.

Policy 5.3: Sustainable design and construction

"Development proposals should demonstrate that sustainable design standards are integral to the proposal, including its construction and operation, and ensure that they are considered at the beginning of the design process."

Policy 5.6: Decentralised energy in development proposals

"Development proposals should evaluate the feasibility of Combined Heat and Power (CHP) systems, and where a new CHP system is appropriate also examine opportunities to extend the system beyond the site boundary to adjacent sites."

"Major development proposals should select energy systems in accordance with the following hierarchy:

- Connection to existing heating or cooling networks
- Site wide CHP network
- Communal heating and cooling."

Policy 5.7: Renewable energy

"Within the framework of the energy hierarchy (see Policy 5.2), major development proposals should provide a reduction in expected carbon dioxide emissions through the use of on-site renewable energy generation, where feasible."

2.2 Camden Planning

There are two key documents that form part of Camden Council's Local Development Framework (LDF): the Core Strategy and Camden Development Policies. These along with the Mayor's London Plan form the statutory 'development plan' for Camden which is the basis for planning decisions in the borough.

Relevant policies on energy and carbon dioxide emissions are contained within Camden Development Policies:

Core Strategy

CS 13 - Tackling climate change though promoting high environmental standards

Making use of energy from efficient sources

"Once a development has been designed to minimise its energy consumption in line with the approach above, the development should assess its remaining energy needs and the availability of any local energy networks or its potential to generate its own energy from low carbon technology."

Generating renewable energy on-site

"Buildings can also generate energy, for example, by using photovoltaic panels to produce electricity, or solar thermal panels, which produce hot water. Once a

building and its services have been designed to make sure energy consumption will be as low as possible and the use of energy efficient sources has been considered, the Council will expect developments to achieve a reduction in carbon dioxide emissions of 20% from on-site renewable energy generation (which can include sources of site-related decentralised renewable energy) unless it can be demonstrated that such provision is not feasible."

Camden Development Policies

DP 22 – Promoting sustainable design and construction

The Council will promote and measure sustainable design and construction by:

- Expecting new build housing to meet Code for Sustainable Homes Level 3 by 2010 and Code Level 4 by 2013 and encouraging Code Level 6 (zero carbon) by 2016.
- Expecting non-domestic developments of 500sqm of floor-space or above to achieve "very good" in BREEAM assessments and "excellent" from 2016 and encouraging zero carbon from 2019.

Camden Planning Guidance: Sustainability

In support of the above policies, another document: "Camden Planning Guidance: Sustainability", provides information on ways to achieve carbon reductions and more sustainable developments.

Decentralised Energy Networks

"The Mayor of London has set a target that 25 per cent of the heat and power used in London is to be generated through the use of localised decentralised energy systems by 2025. In order to achieve this target the Mayor prioritises the development of decentralised heating and cooling networks at the development and area wide level, as well as larger scale heat transmission networks.

We will expect developments to connect to a decentralised energy network and use the heat unless developers can demonstrate it is not technically feasible or financially viable."

Renewable Energy

The guidance states that "developments will be expected to achieve a 20% reduction in carbon dioxide emissions from on-site renewable energy generation unless it can be demonstrated that such provision is not feasible. The 20% reduction should only be attempted once stages 1 and 2 of the energy hierarchy have been applied."

2.3 Fitzrovia Area Action Plan

From March 2014, specific guidance for buildings such as Arthur Stanley House has been set out in the Fitzrovia Area Action Plan/

Efficient Energy Supply

"The Council is actively promoting a decentralised energy network along Euston Road. Work on the network is expected to start from Somers Town, but has potential to continue to the Euston Growth Area and Euston Tower/ Regent's Place in the longer term. In conjunction with Westminster Council, Camden is also exploring the potential for development of a decentralised energy network focused on the Tottenham Court Road Growth Area.

Where development suitable for connection to a local energy network is proposed west of Tottenham Court Road the Council will expect developers to investigate the status of these proposed networks and ensure that there is potential for a connection in future."

Renewable energy

"Development should be designed with a target of 20% for the reduction of carbon emissions by using on-site renewable energy. Renewable technologies that may be appropriate in Fitzrovia include solar hot water panels, photovoltaic cells, ground source heat pumps and air source heat pumps."

Specific Guidance on Sustainability for Arthur Stanley House

"Development should include an assessment of the potential to connect to a local energy network, and should provide for a connection wherever feasible and viable, potentially cross borough."

2.4 National and regional planning documentation

The National Planning Policy Framework (NPPF) was published in March 2012 and sets out the Government's planning policies for England and how these are expected to be applied. There are three dimensions to sustainable development: economic, social and environmental. These dimensions give rise to the need for the planning system to perform a number of roles, one of which is the environmental role – contributing to protecting and enhancing our natural, built and historic environment and mitigating and adapting to climate change including moving to a low carbon economy. At the heart of the National Planning Policy Framework is a presumption in favour of sustainable development.

Supporting the NPPF are guidance documents which provide further clarification of how the NPPF can be interpreted. Air quality, pollution and Climate Change are of specific relevance to the energy report.

As the proposed development is in London, the 2014 "Supplementary Planning Guidance (SPG): Sustainable Design and Construction" is also to be considered within this report. Namely those instances relating to sustainable design, a low carbon future and design for future climate change.

3 Notional Building Energy Demand and Carbon Dioxide Emissions

In order to establish the Part L 2013 compliant notional carbon dioxide emissions for the proposed development (known as the Target Emission Rate), Government-approved software was used to model the proposed buildings.

A commercial office building energy model was created using IES software, based upon geometry received from the architect. The results of this model provide the 2013 Part L Target Emission Rate (TER) required for the commercial development.

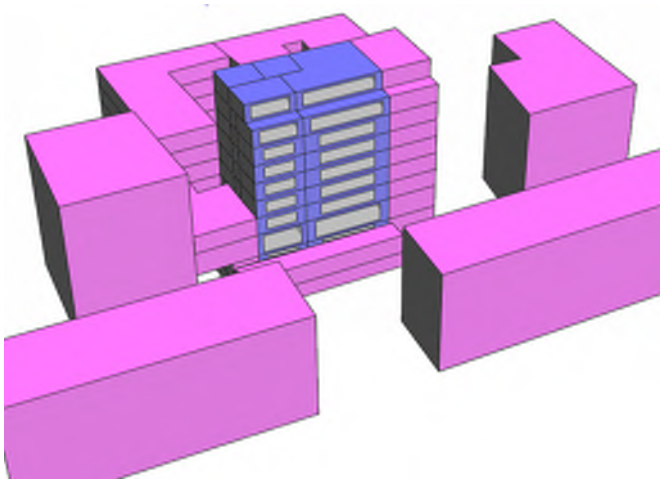


Figure 2: Image of the thermal model created in IES of the commercial notional building (in blue). Neighbouring buildings are shown in pink.

The Residential notional building TER was formulated using NHER Plan Assessor software version 6.0.1.1.

A number of assumptions regarding the types of plant and fabric performance were made to construct the notional building models. The section below outlines these as well as the assumptions-used by the software to calculate the TER for the residential, commercial and retail areas.

3.1 Notional building software assumptions: Residential Building

- Treated Area (m²): 1250
- Opening Areas: 25% of total floor area
- Roof U-Values: 0.13 W/m².K
- External Wall U-Values: 0.18 W/m².K
- Floor U-Values: 0.13 W/m².K
- Glazing U-values: 1.4 W/m².K
- g-values: 0.63
- Thermal Mass: Medium (TMP = 250kJ/m^{2}K)

- Living Area: Same as actual dwelling
- Number of sheltered sides: Same as actual dwelling
- Allowance for thermal bridging: y = 0.05 W/m^{2}K
- Ventilation System: Natural Ventilation with intermittent extract fans
- Air permeability: 5 m3/h per m2 of envelope area at 50Pa
- Extract Fans: 2 extract fans for total floor area up to 70m^2, 3 for total floor area > 70m^2 and up to 100m^2, 4 for total floor area > 100m^2
- Main heating fuel (space and water): Mains gas
- Boiler efficiency: 89.5%
- Heating system controls: Time and temperature zone control, boiler interlock and weather compensation.
- Hot water system: Heated by boiler. Separate time control for space and water heating.
- Hot water cylinder: 150 litre cylinder. Heat loss factor 1.39kWh/day
- Primary water heating losses: Fully insulated primary pipework. Cylinder temperature controlled by thermostat. Cylinder in heated space.
- Water use limited to 125 litres per person per day: Yes
- Secondary space heating: None
- Low energy light fittings: 100% of fixed outlets.
- Air conditioning: None

3.2 Notional building software assumptions: Commercial Office Building

- Treated Area (m^2): 5000m²
- Boiler Efficiency: 0.81 (SCoP)
- Specific Fan Power: 1.8 W/l/s
- Roof U-Values: 0.18 W/m².K
- Wall U-Values: 0.26 W/m².K
- Glazing U-values: 1.6 W/m².K
- g-values: 0.4
- Main Heating System: Gas fired boiler
- Main Cooling system: Air cooled chillers and FCU
- Cooling Efficiency: 4.5 (SEER)
- Domestic hot water: Same as main heating system

- Heat recovery: 70%
- Lighting efficacy: 60 lumens/W
- Lighting control: Daylight dimming, manual-on-auto-off
- Air Permeability: 5 m^3/h per m^2 of envelope area at 50Pa

3.3 Carbon Dioxide Emissions of Notional Buildings

Based on the notional building assumptions above, the 2013 Part L baseline carbon dioxide emissions are as follows:

Table 1: Notional Carbon Emissions

Site	Tonnes CO_2/yr
Notional Residential	22.0
Notional Commercial	118.4
Development Total	**140.4**

As can be seen for the in the above table, the total baseline emissions for the residential and commercial developments are 140.4 tonnes of CO_2 per annum.

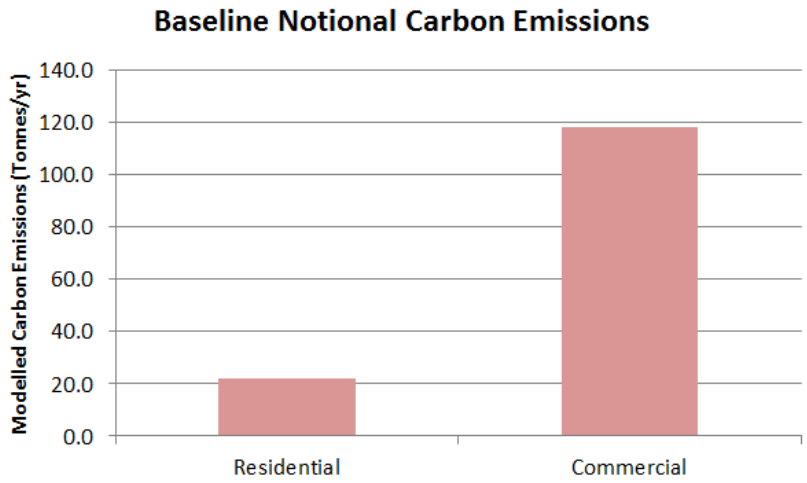


Figure 3: Baseline Notional Carbon Emissions

The following section outlines how the Arthur Stanley House residential and commercial buildings improve upon the notional 2013 Part L compliant building assumptions.

4 Reducing Carbon Emissions

It is proposed to follow the Mayor's hierarchy for reducing carbon emissions. This involves:

- Reducing energy consumption though architectural passive design (Be Lean);
- Using low energy technologies and building systems which supply energy efficiently (Be Clean);
- Generating energy where feasible on site from renewable energy technologies (Be Green).

4.1 Passive Design (Be Lean)

The starting point for the Arthur Stanley House energy strategy is to minimise energy consumption as much as possible through passive measures. Optimising passive design is the most effective means, both in carbon dioxide and financial terms, of ensuring both the commercial and residential buildings are inherently low in energy usage.

There are a range of energy-efficiency measures that have been applied to the buildings as an integral part of the design process:

- The existing façade will be removed and replaced with a high performing thermal envelope. This reduces the heating and cooling load for the building.
- Balconies on a number of the apartments reduce the direct solar gains they receive.
- Glazed area of facade incorporates high efficiency glazing throughout. The glazing performance serves to reduce the heat gain and heat loss at the building perimeter, which reduces the heating energy consumption.
- The glazed areas have been optimised for daylight while limiting heat gains and losses.
- Envelope air tightness for the residential & commercial buildings has been enhanced by 40% over notional facades (now 3m³/hr/m² @ 50Pa) leading to savings in heating and cooling energy consumption throughout the year and optimising the potential for heat recovery.
- Passive solar gain allows solar gain to offset the perimeter heat loss in the winter. The active building controls will automatically adjust the amount of heating in each zone, thereby reducing the energy demand of the heating system.
- Low energy lighting has been introduced to reduce both lighting input power and internal cooling loads in both developments. In the commercial offices this equates to lighting efficiencies of 76 lm/W.
- Overheating analysis has been conducted and this has led to high performance solar control being incorporated in to the facades that require it.

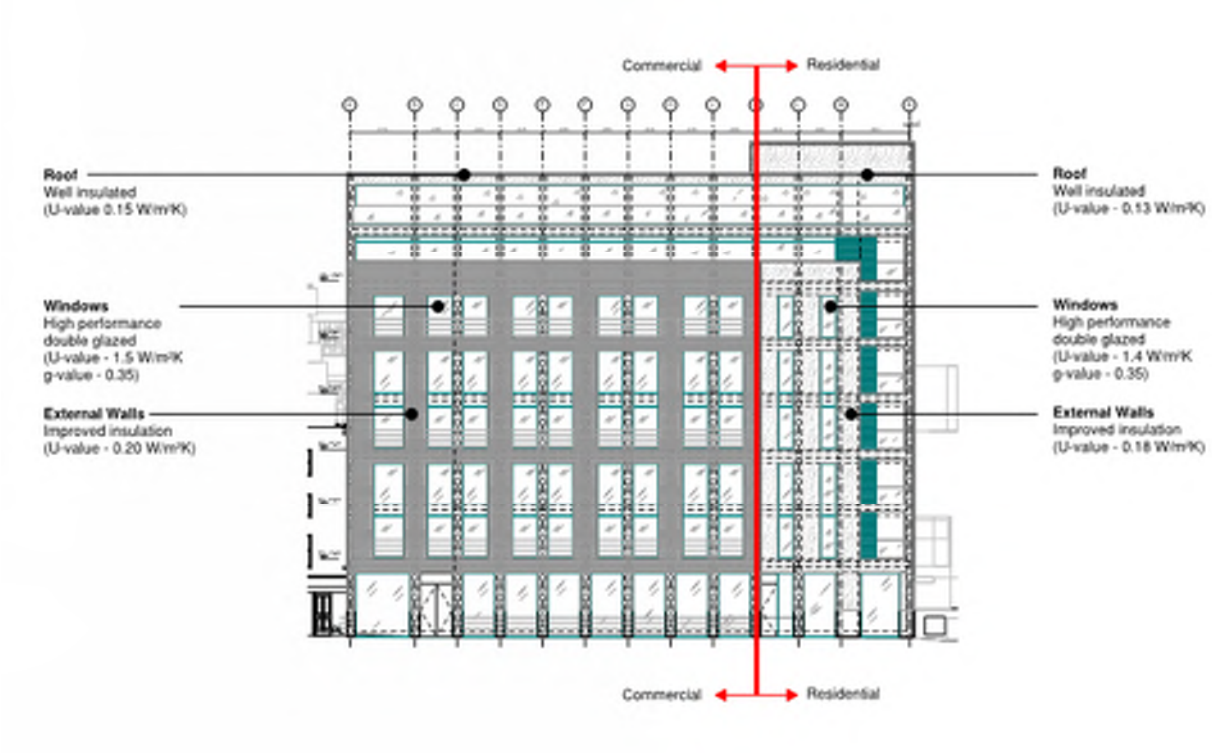


Figure 4: Proposed improvement of building fabric to optimise passive design

The following improvements to the notional building fabric and lighting parameters were modelled to optimise passive design and minimise energy consumption.

4.1.1 Lean Building: Residential

- Treated Area (m^2): 1250
- Opening Areas: Apartment specific (all <27% of floor area)
- Roof U-Values: 0.13 W/m².K
- External Wall U-Values: 0.18 W/m².K
- Floor U-Values: 0.13 W/m².K
- Glazing U-values: 1.4 W/m².K (1.8W/m²K for balcony windows)
- g-values: 0.35
- Thermal Mass: Medium (TMP = 250kJ/m2K)
- Shading and orientation: Apartment specific (applied to SE orientation)
- Living Area: Apartment specific
- Number of sheltered sides: Apartment specific
- Allowance for thermal bridging: y = 0.04 W/m^2K

- Low energy light fittings: 100% of fixed outlets.
- Ventilation System: Balanced mechanical ventilation with heat recovery. MVHR SFP 0.5W/l/s. Heat recovery 90%
- Air permeability 3m³/h perm² of envelope area at 50Pa
- Main heating fuel (space & water): Air source heat pumps & gas boilers
- Heating system controls: Charging system linked to use, programmer and TRVs
- Hot water system: Gas fired boilers
- Water heating boiler efficiency: 95%
- Hot water cylinder: No storage within apartment
- Primary water heating losses: Fully insulated primary pipework.
- Water use limited to 125 litres per person per day
- Secondary space heating: None
- Low energy light fittings: 100% of fixed outlets.
- Cooling Efficiency: 4 (EER)

4.1.2 Lean Building: Commercial

- Area (m^2): 5000
- Boiler Efficiency: 0.95
- Specific Fan Power: 1.6 W/l/s
- Roof U-Values: 0.15 W/m².K
- Wall U-Values: 0.2 W/m².K
- Glazing U-values: 1.49 W/m².K
- g-values: 0.35
- Lighting efficacy: 76 lumens/W (LED lighting throughout)
- Lighting control: Daylight dimming, manual-on-auto-off
- Main heating system: Gas fired boiler
- Water heating boiler efficiency: 95%
- Main Cooling System: Air cooled scroll compressor chillers
- Cooling Efficiency: 4 (EER)
- Ventilation system heat recovery: 0.8

4.1.3 Microclimate

As the design progresses through to tender and construction, a full dynamic model will be created to test the thermal comfort under summer and winter conditions.

The modelling process and software are used in line with the guidance contained in CIBSE AM11 Building Energy and Environmental Modelling taking into consideration site weather conditions and CIBSE External Design Condition predictions in relation to climate change.

The thermal modelling analysis will be used to assess the passive design strategy and the temperature control strategy for the building.

ASH is one of fourteen “opportunity sites” highlighted in the Fitzrovia Area Action Plan. The development of ASH will improve the frontage to Tottenham Mews and positively contribute to the streetscape and immediate local environment.

The height of the existing building compared to surrounding ones has been taken in to account when considering energy generation (see later sections in this report); and the shading the existing building provides will create a cooler environment for the extension to the north. Refer to the solar analysis in section 4.3.1 where the blue coloration indicates a cooler environment and thus reduced energy consumption within the office extension.

South-westerly, prevailing winds will affect natural ventilation in Arthur Stanley House and the use of opening windows in the Commercial & Residential developments will be optimised.

It is also intended that the L08 roof will be a green roof and will therefore increase the local biodiversity on the site.

4.1.4 Building Form and Orientation

The built form is dictated initially by the original Sixties building; however the massing of the commercial and residential extensions to the north has been optimised as much as possible to reduce heat loss through the building fabric during winter, to maximise the benefits of solar and internal gains and to reduce losses associated with air infiltration. During summer the building is designed to allow optimum levels of daylighting, minimise solar gain and avoid overheating. To this end, the façade is being optimised so that the percentage area of glazing is not greater than 25% of a room’s floor area.

The main building is orientated to face south-east. The offices on L07 will have increased levels of glazing to make the most of the prime views over London; but will be compensated and protected by strategically placed horizontal and vertical shading. In the winter the glazing has the added benefit of warming the space through passive solar gain. Shading will be provided to levels 01 to 06 by a brick detail, in keeping with the character of Fitzrovia, which extends outwards from the glazing and shades it.

The passive strategy adopted for the development reduces the overall amount of electrical energy required to power fans for ventilation, FCUs for cooling and lighting within the building.

4.1.5 Thermal Mass

Thermal mass is a property that enables building materials to absorb, store, and later release heat. Concrete is one particular building material which is high in thermal mass and this allows it to absorb heat and release it slowly throughout the day. During the renovation of the existing Sixties building, key elements of the concrete structure will be retained. This has the combined benefit of retaining embodied carbon and contributing to the building's thermal mass.

The extension will be a concrete slab and steel structure. The design will allow larger spans to optimise the office space but will not have high thermal mass. Overheating will be controlled by limiting the amount of solar gain entering the spaces through the design and location of external shading.

The use of Phase Change Materials (PCM) in the residential apartments will be explored, during the design development, with the aim of reducing summer time overheating.

4.1.6 Ventilation Strategy

The building has been designed to have a low energy approach to the provision of effective ventilation. The low energy ventilation strategy combines the use of passive and active measures to ventilate the building.

Each apartment will have a high efficiency Mechanical Ventilation Heat Recovery Unit (MVHR) for background ventilation that meets rates set by Part F. These will supply in to the main living areas and bedrooms and extract from bathrooms and the kitchens. The apartments will have openable windows as well for natural ventilation as well as purge ventilation.

Filtered, minimum fresh air will be provided for the offices. This has been design at the standard 10l/s/person and assuming 8m²/person. All of the office's minimum fresh air AHUs will have high efficiency heat recovery systems, either thermal wheels or plate heat exchangers depending on where they're serving. The fans will also be inverter driven to further save on energy.

The use of openable windows in the offices and a mixed-mode ventilation system will be explored as the building design develops.

4.1.7 Adaption to Climate Change

CIBSE climate data for London in the 2020s will be used to calculate the building's cooling and heating loads and eventually size the energy generating equipment. This will ensure that the building services design allows for predicted extremes in weather and temperature and that future occupants are comfortable during these periods.

Space will be allowed for the expansion of plant to cope with predicted climate change even further in to the future.

4.1.8 Lean Site-wide Results

The following tables summarise the percentage improvements on 2013 Part L carbon emissions that are achieved by the lean building strategy described above.

The results indicate a 9% improvement for the residential development and a 14% improvement for the commercial building.

Table 2: Residential Passive Design Carbon Emissions Reduction

Regulated Residential CO_2 Emissions (Tonnes CO2 per annum)		
Notional Residential	22.0	
Passive Design	20.0	
Regulated Carbon Savings		
	Tonnes CO2 per annum	% improvement
Savings from Passive Design	**2.0**	**8.8%**

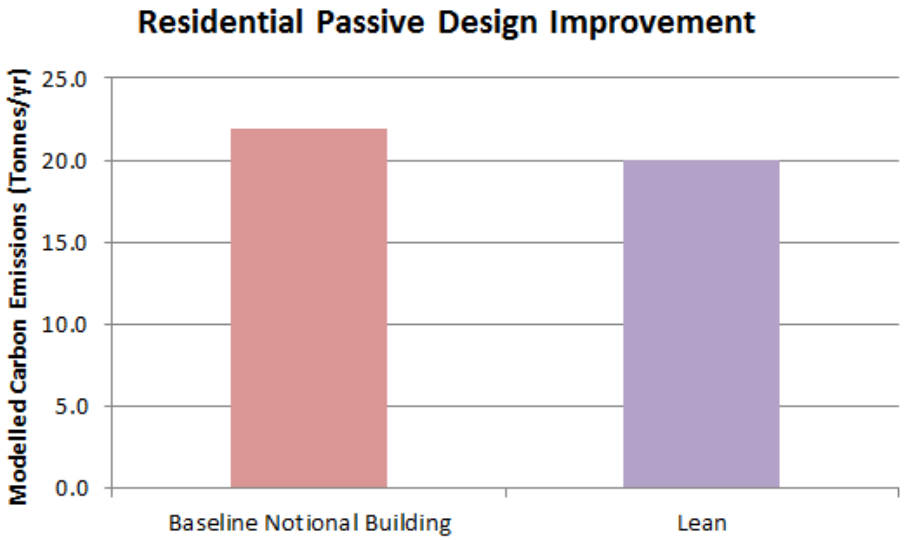


Figure 5: Residential passive design reduction in carbon emissions

Table 3: Commercial Passive Design Carbon Emissions Reduction

Regulated Commercial CO_2 Emissions (Tonnes CO2 per annum)		
Notional Commercial	118.4	
Passive Design	101.8	
Regulated Carbon Savings		
	Tonnes CO2 per annum	% improvement

Savings from Passive Design	**16.6**	**14%**

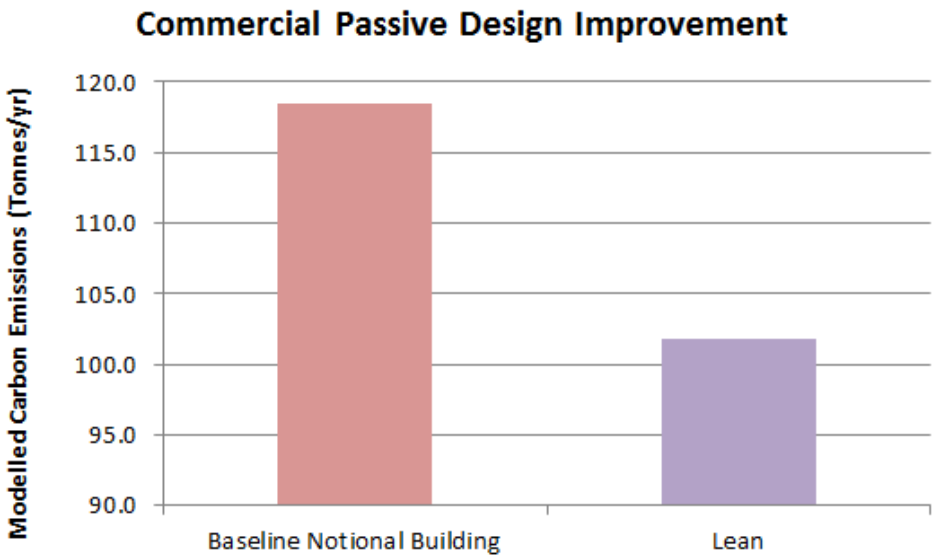


Figure 6: Commercial passive design reduction in carbon emissions

4.2 Energy Efficient Building Systems (Be Clean)

The previous section indicates the passive design elements that can achieve reductions in carbon emissions for Arthur Stanley House. To reduce carbon emissions further still, the design team has considered a range of low energy systems available to the project and assessed their viability. In line with planning policy, both decentralised energy schemes and CHP were considered.

4.2.1 District Heating

The London Heat Map has been used to assess the proximity of Arthur Stanley House to a heat network. Two images of the map are shown below, one indicating developments within a 500m radius of Arthur Stanley House and another showing developments within a 1km radius. The red lines on the map show potential DH networks; the yellow lines show existing DH networks; yellow squares indicate CHP sites and dark blue squares indicate communal boilers.

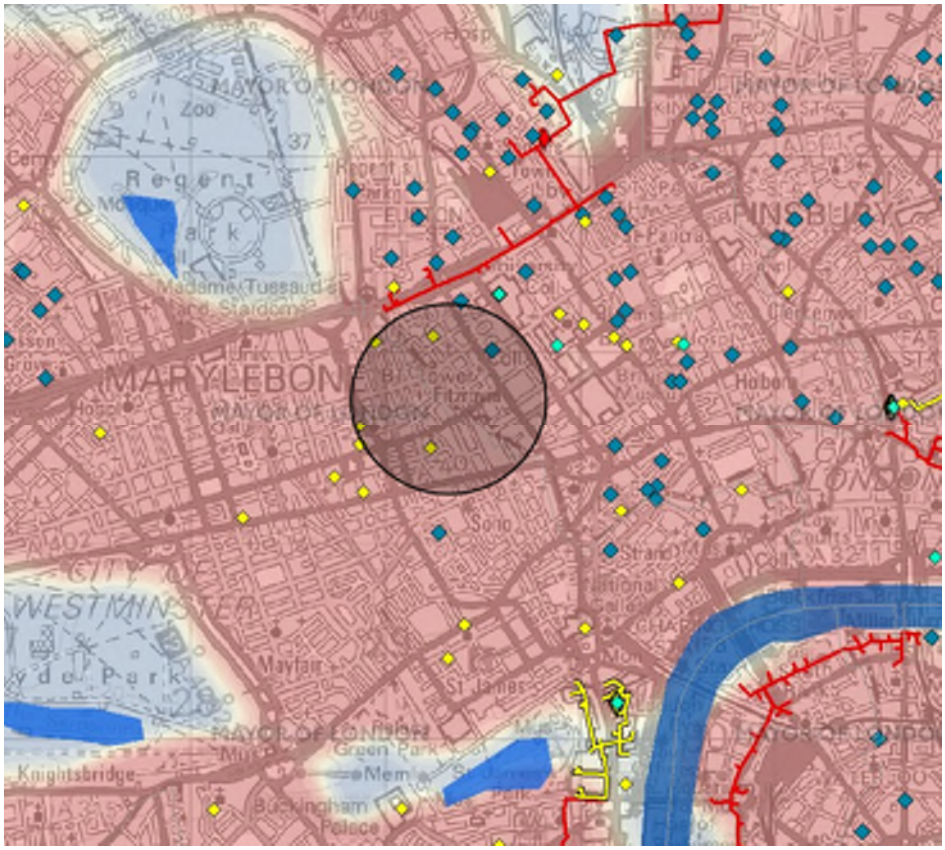


Figure 7: District heating developments within 500m of ASH

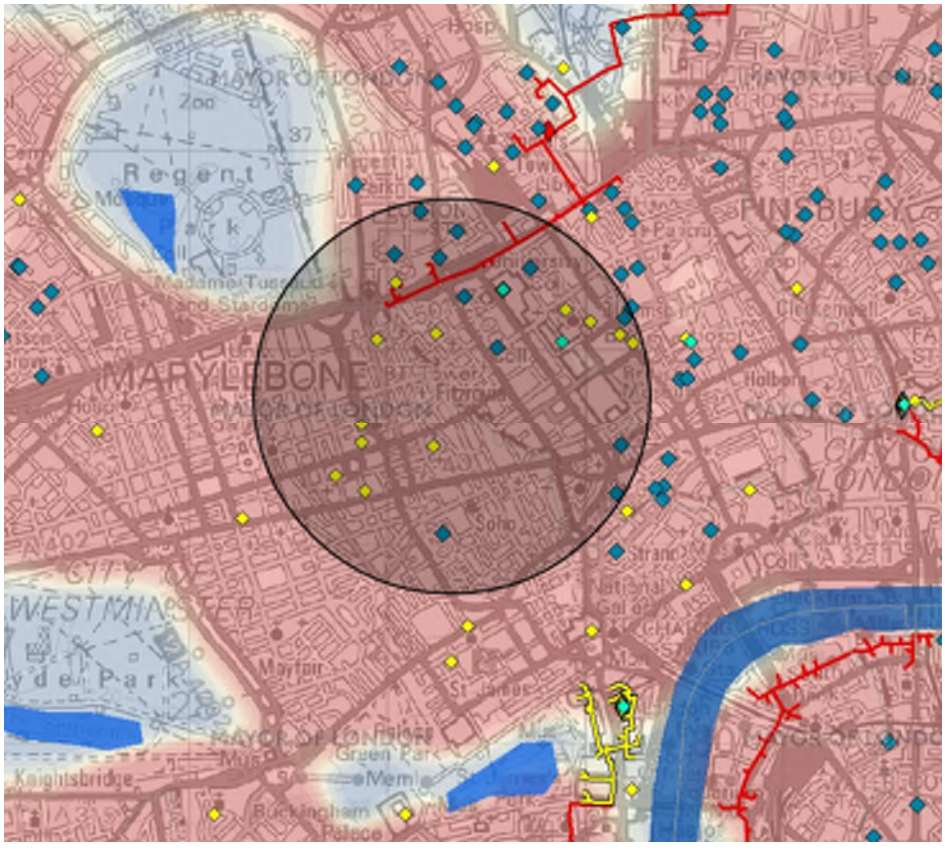


Figure 8: District heating developments within 1km of ASH

As can be seen in the above images, there are four CHP sites and one communal boiler system within 500m radius of ASH; and within 1km of the building is the proposed Euston Road district heating network.

The Fitzrovia Area Action Plan recommends that sites such as Arthur Stanley House which sit to the west of Tottenham Court Road should provide a future connection for district heating. As and when the Euston Road network expands, or a Tottenham Court Road energy network develops, the building will be able to be adapted to connect in to a low carbon energy network. This will be achieved by installing capped pipe work to the boundary of the site for the residential and office developments, as described in section 4.2.5 below.

4.2.2 Combined Heat & Power

Combined heat and power generates electricity with the by-product of useful heat. Whenever the unit operates, grid-electricity is displaced while the heat-generated can be used either directly, stored for use later or converted into cooling through absorption chillers. The low carbon nature of the CHP plant is attributed to the generation of electricity on site (so incurring no transmission losses) and the use of heat which would ordinarily be lost to atmosphere. For efficient use, all the generated heat needs to be used (or converted to cooling).

The improvements to the building highlighted in the preceding "Be Lean" section have led to a reduction in the requirements for both space heating and domestic hot water. As such, the hourly heating loads which may be expected in the proposed development will be lower than those of an existing building or site.

Residential CHP

It is widely accepted that CHP should run for at least 4500 hours per year to be economically feasible. This means that the CHP system would need to be running during the summer and therefore it is usual to size the system on the domestic hot water consumption. The daily profile of water use is not flat and therefore periods would occur when the CHP system is operating and there is more heat than required; the excess can be put in a thermal store for later use.

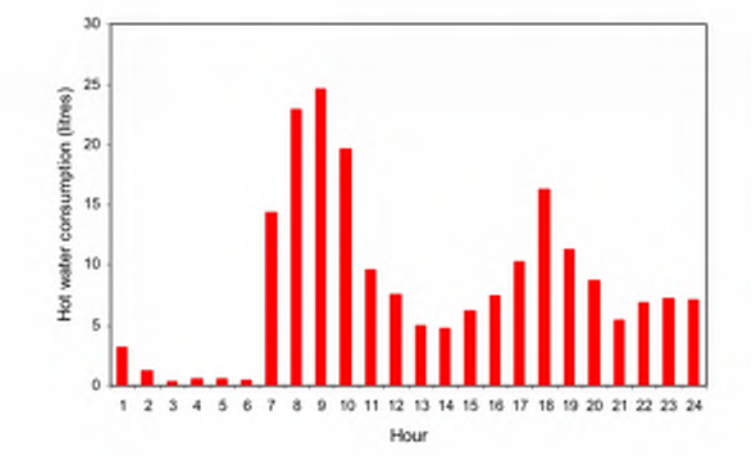


Figure 9: Daily profile of one dwelling, total domestic hot water used in one day = 203.5L

An estimate of likely hot water demand was made for the whole residential development. The DHW is estimated to have the highest load with a peak of 120kW in order to supply the building's Heat Interface Units (HIUs), as shown in the graph below.

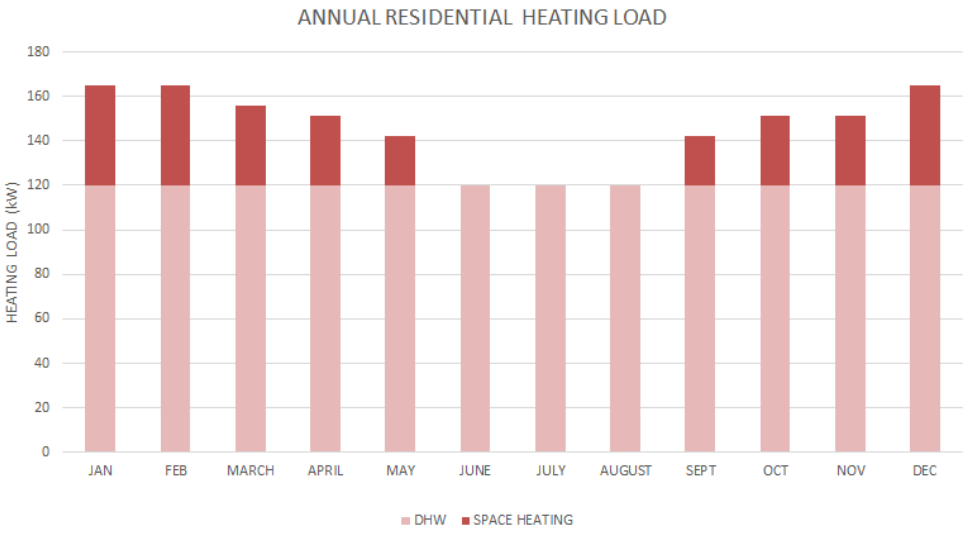


Figure 10: Estimated hot water demand for the residential development

Due to the changing profile of water use, a CHP would be sized much lower at around 40kWth (a third of DHW demand and roughly equivalent to the peak space heating in winter) so that it can operate continuously. The remainder of the heat demand would be met with other systems at peak times (e.g. boilers). Unfortunately, this is a small CHP unit and is likely to have low electrical efficiencies.

Additionally, the following guidance is given in the GLA's "Guidance on preparing energy assessments (April 2014)":

"It is not expected that small purely residential developments (for example, less than 300 dwellings) include on-site CHP. Due to the small landlord electricity supplies, CHP installed to meet the base heat load would require the export of electricity to the grid. It is recognised that the administrative burden of managing CHP electricity sales at this small scale, where energy service companies (ESCOs) are generally not active, is too great for operators of residential developments to bear. If CHP is installed but does not operate because arrangements for CHP electricity sales are not concluded, the projected CO_2 savings will not materialise."

The residential development will consist of 14 apartments and as such CHP is considered a risk to the project. At such a small scale, an ESCO is not likely to be active and could jeopardise projected CO_2 savings.

It is therefore considered that CHP is not feasible for this development.

Office CHP

The number of days a typical office is occupied per annum is circa 253, with 104 days accounted as weekends and 8 days as bank holidays. Any consideration of CHP should therefore consider that for over 30% of the year, there is no heat

requirement attributed to commercial premises; and assuming the offices are open for 12 hrs a day then there is just over 3000hrs when there is either a DHW or a space heating load. This is significantly less than the recommended 4500hrs for CHP operation.

An estimate of the likely hot water demand was made for the offices. There is a higher relative space heating load to DHW, as shown in the graph below.

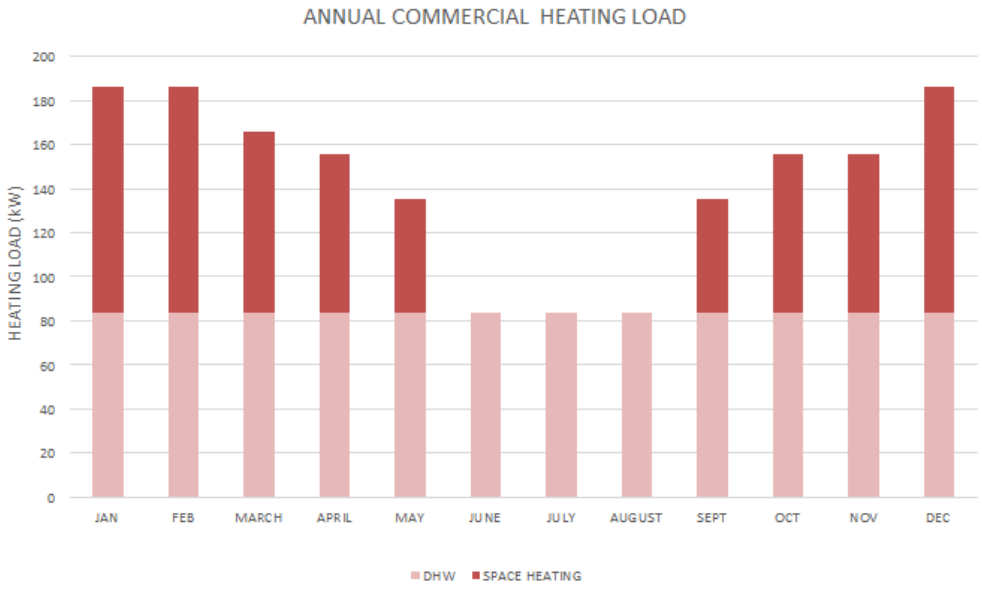


Figure 11: Estimated hot water demand for the commercial development

The resulting CHP size would also be around 40kWth assuming that it operates continuously.

While this could theoretically be installed, the capacity of CHP is so small that any reductions in carbon dioxide emissions accrued from its use would be small as the electrical efficiency would be low. It also presents an operational risk with ESCOs unlikely to take on such a small-scale CHP.

4.2.3 Combined Heating & Cooling Systems Comparison

CCHP is an extension of a standard CHP scheme with part or all of the heat produced from the CHP engine used to supply input in to an absorption chiller.

The design team have compared the carbon savings from a CCHP system with other potential heating and cooling systems for Arthur Stanley House, particularly over the medium to long term of the plant's life.

The following systems were assessed against the carbon emissions they created when producing 1kWh of CHW and 1kWh of LTHW:

1. CCHP
2. CHP & Turbocor Chillers
3. Condensing Gas Boilers & Turbocor Chiller
4. Air Source Heat Pump (CHW with LTHW heat recovery)

The CCHP system below is comprised of a high efficiency Gas CHP (37% thermal & 37% electrical efficiency) and a single effect absorption chiller (70% thermal efficiency). This is the base case as it produces the most electricity of the options.

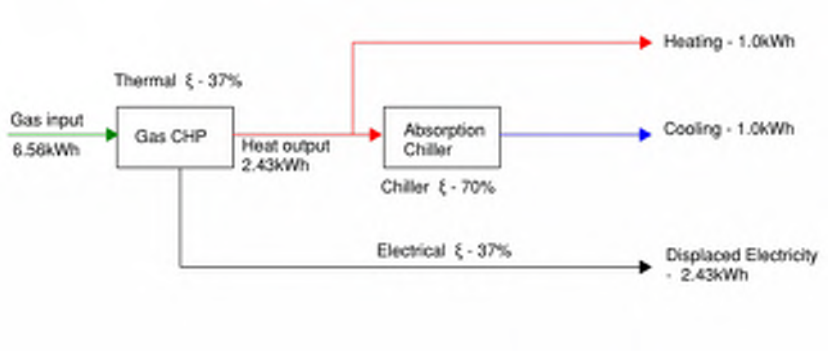


Figure 12: CCHP system

The second system consists of a smaller gas CHP that produces electricity and hot water (same efficiencies as above) and a separate air-cooled Turbocor chiller with a seasonal efficiency of 5.

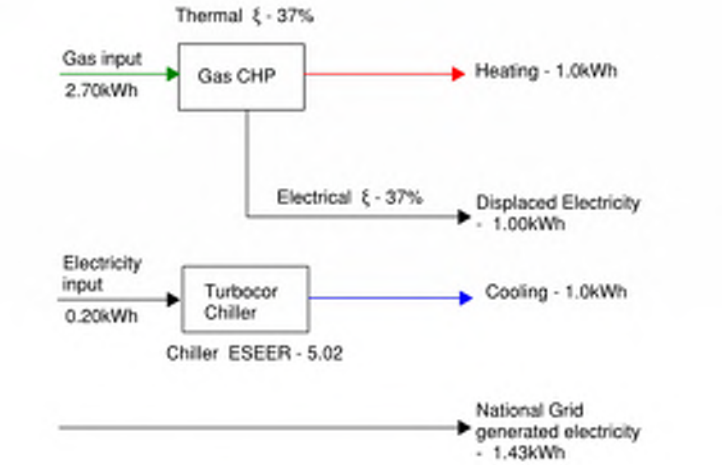


Figure 13: CHP & Turbocor Chiller system

The third system consists of high efficiency condensing gas boilers (96% thermal efficiency) and an air-cooled Turbocor chiller with a seasonal efficiency of 5.

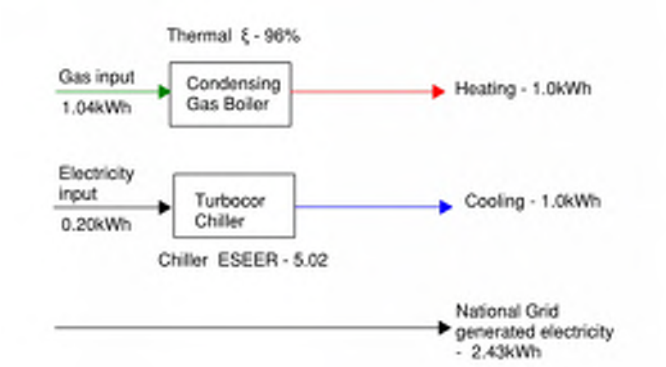


Figure 14: Condensing Gas Boiler and Turbocor Chiller system

The fourth system is a 4-pipe Air Source Heat Pump which can simultaneously produce hot and chilled water at high efficiencies (Total Energy Ratio of 7.1).

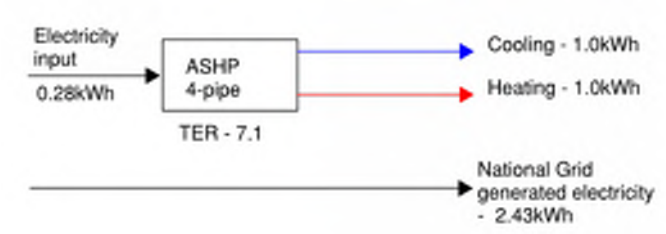


Figure 15: Air Source Heat Pump system (with dual CHW & LTHW production)

	Carbon emissions factors (kgCO2e/kWh)	
	2014	**2027**
Natural Gas	0.185	0.222
Grid Electricity	0.494	0.381

Note: 2014 figures taken from DEFRA conversion factors
2027 figures taken from SAP 2012 Emission factors 15 year projection 2013-2027

The below chart shows the performance of the systems based on carbon factors for 2014 from published Department for Environment, Food & Rural Affairs (DEFRA) conversion factors; and 2027 factors taken from a 15 year projection (2013 to 2027) of SAP 2012 emissions factors.

It is clear that a high efficiency CCHP could work efficiently based on today's carbon emissions factors; however over the medium to long term of the plant's life, the best performing system will be the ASHP given the expected decarbonisation of the grid as large scale renewables, nuclear and power stations with carbon capture replace existing gas/coal fired power stations.

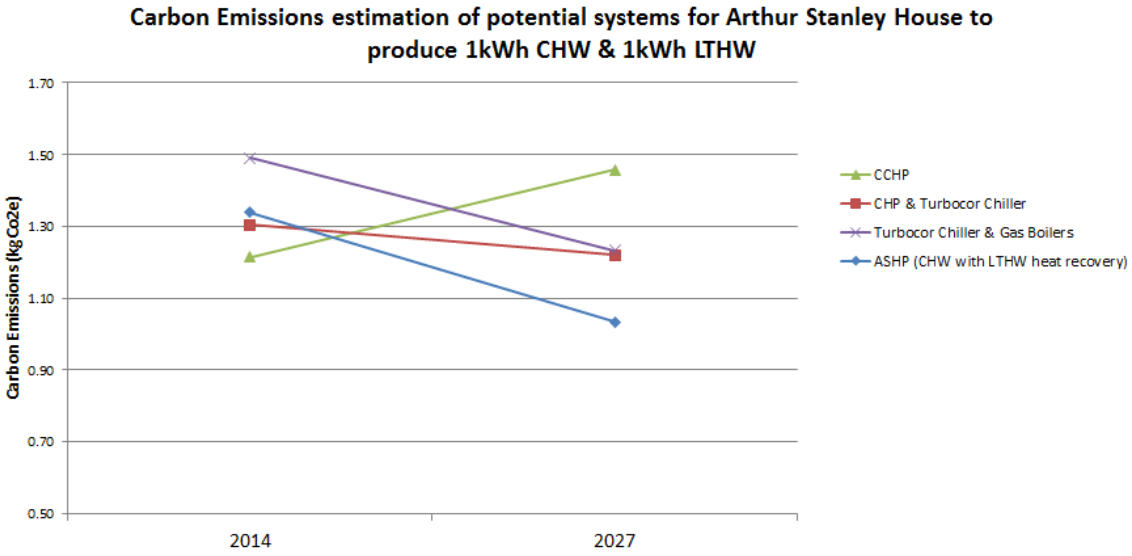


Figure 16: Combined Cooling & Heating Systems performance (high efficiency CHP)

The above analysis has assumed high efficiency CHP. In reality, due to the relatively small thermal loads in Arthur Stanley House, any CHP installation will have a small thermal capacity and would be based on a reciprocating engine. According to Department of Energy & Climate Change's (DECC) annually published data in the Digest of United Kingdom Energy Statistics 2014 (DUKES), Table 7D, the average electrical efficiency of reciprocating CHP in 2013 is 25% and thermally 36%. If these figures are applied to the systems analysis, then the results change as shown in the chart below:

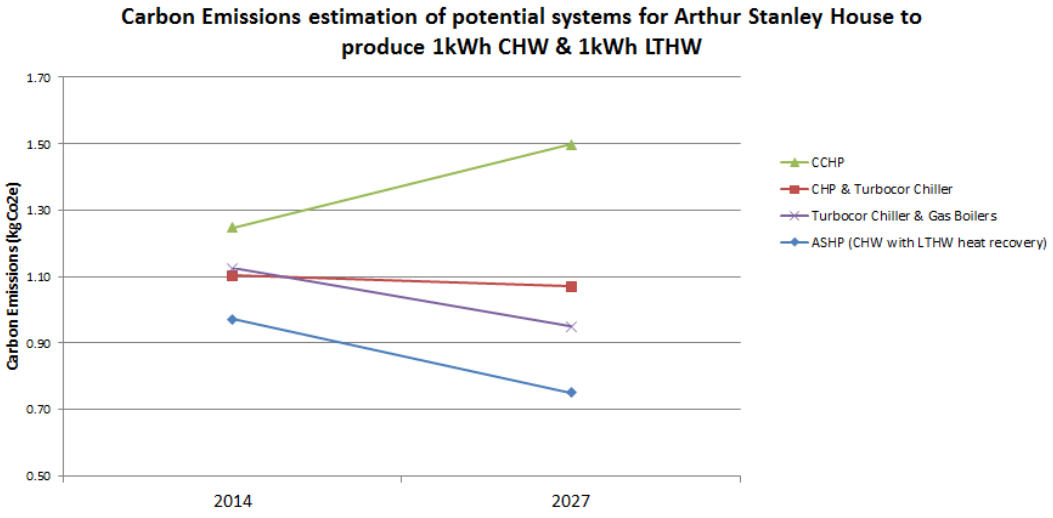


Figure 17: Combined Cooling & Heating Systems performance (low efficiency CHP)

The above chart shows, even more definitively, that if high electrical efficiencies cannot be achieved with a CHP system, as is expected for a development the size of Arthur Stanley House, then the most carbon efficient technology will be ASHP.

It is deemed therefore that CCHP & CHP are not feasible for the project. Additionally, absorption chillers have a higher initial capital cost and require additional maintenance which results in the requirement of a backup chiller during periods of downtime.

4.2.4 Expansion of decentralised energy networks in Camden

In line with the guidance provided in the Camden Planning Guidance on Sustainability, the development will provide a contribution for the expansion of decentralised energy networks in the borough so that Arthur Stanley House may connect in to an expanded Euston Road or Tottenham Court Road network.

Section 5.28 in the CPG-3 provides the following table to allow for contributions to be calculated for each development.

Size of development	Residential (per dwelling) or Per 300sq m of non-residential floorspace
Over 20 stories	£2,800
8-20	£2,500
5-7	£2,800
3-4	£4,100
2-3	£5,300
Single dwelling houses or single storey commercial developments	£8,600

Source: Community energy: Urban planning for a low carbon future.

4.2.5 Future connection of Arthur Stanley House

Energy centres for the site are in the B02 basement and are shown below with the proposed location for future district heating connections into Tottenham Street. There are two separate energy centres for this building due to ownership agreements between 36 Golden Square and UCLH Charity which are marked on the image below; and as such, the residential and office developments will require separate systems.

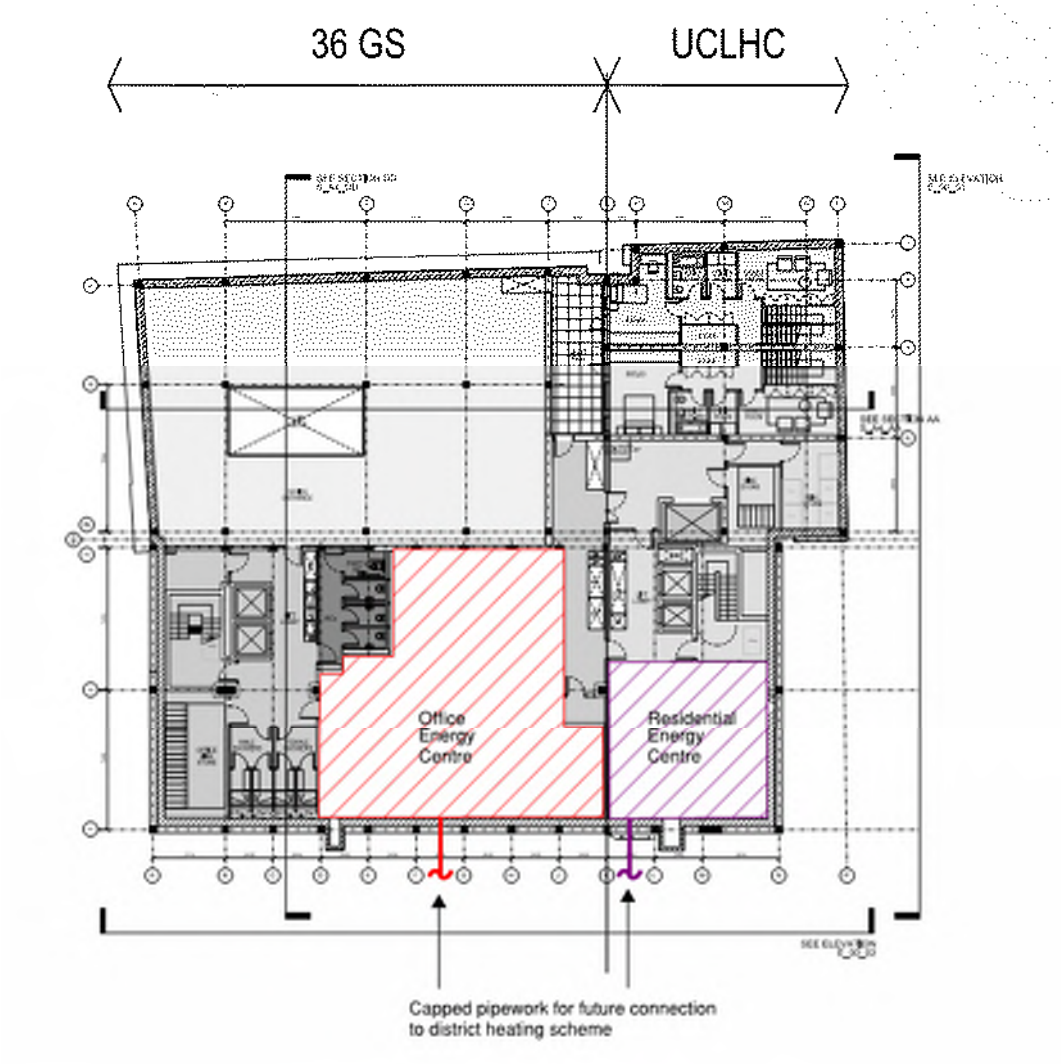


Figure 18: Future connections to future district heating schemes will be installed for services upgrades

Plant space in the basement will be able to be converted into energy centres where plate heat exchangers interface with the district heating network and control valves and pumps can distribute the hot water throughout the building.

It is intended that all apartments are fitted with Heat Interface Units (HIU) from the start; so that when the primary plant changes to district heating, the changeover is relatively seamless.

4.2.6 Active Cooling

After passive measures have been incorporated in the design to reduced solar loads as well as the overall heating gains, active cooling will still be required for the commercial offices to achieve comfortable working temperatures.

Due to the site's location in Fitzrovia there are no opportunities for river or dock water cooling. The footprint of the commercial portion of building is also not large enough to accommodate ground cooling. As such the design team has judged efficient air-cooled chillers as the best method for providing active cooling to the commercial offices.

A high efficiency air-cooled Turbocor chiller sized for the cooling loads at Arthur Stanley House has a seasonal efficiency (ESEER) of 5.19. This value improves as the outside air temperature decreases and the system operates on part load. The table below shows that at 25% part load, the system can operate at an efficiency of 6.72. The efficiency increases further still as the outside air temperature decreases.

COOLING PART LOAD					
% to Peak Load	*[%]*	*100*	*75*	*50*	*25*
Air Temp. °C	*[°C]*	*30.0*	*30.0*	*25.0*	*20.0*
Cooling capacity	[kW]	476.0	357.0	238.0	119.0
Total power input	[kW]	127.7	86.1	45.6	17.7
EER	-	**3.73**	**4.14**	**5.22**	**6.72**

Figure 19: Part Load chiller efficiency data

4.2.7 Overall results of energy efficient measures

The project will not be able to connect to a district heating network nor is it recommended to install CHP as shown above. The only installation which will reduce the carbon emissions further will be the high efficiency air-cooled Turbocor chiller for the offices. This gives a total improvement of 17.8% on the notional commercial building.

Table 4: Commercial Efficient Technology Carbon Emissions Reduction

Regulated Commercial CO_2 Emissions (Tonnes CO2 per annum)		
Notional Commercial	118.4	
Passive Design	101.8	
Efficient Energy Technology	97.3	
Regulated Carbon Savings		
	Tonnes CO2 per annum	% improvement
Savings from Passive Design	16.6	14%
Savings from efficient technology	4.5	3.4%
Total Cumulative Savings	**21.1**	**17.8%**

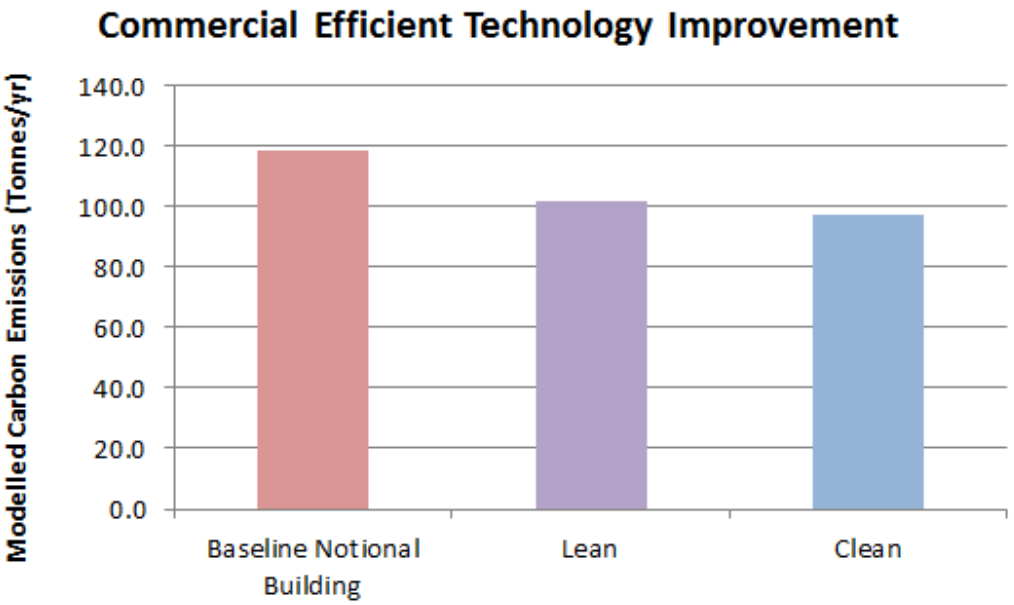


Figure 20: Commercial efficient technology reduction in carbon emissions

4.3 Zero carbon technologies (Be Green)

There are many technologies which generate energy from renewable resources. Here follows a list of commercially viable, proven technologies in the UK:

• Large scale wind (greater than 100 kW) turbines

• Small scale wind turbines

• Hydro electric

• Photovoltaics

• Solar thermal for hot water

• Biomass heating

• Ground source heating and cooling

• Air source heating and cooling

Some of the above can be discounted immediately, such as hydro-electric as there are no rivers on the site.

Other technologies which have been considered are as follows:

Wind Turbines

Wind turbines harness the kinetic energy in the wind and convert this to electrical energy through a mechanical turbine. The efficacy of wind turbines depends heavily on the (i) wind speed and (ii) the swept area of the turbine's blades.

In the urban environment, wind is generally very turbulent owning to the buildings obstructing its path; this leads to low, 'gusty' wind speeds. Large scale wind turbines need a considerable wind speed to even start operating, while smaller machines can cope with lower 'start up' speeds.

The physical constraints of the site preclude the use of large-scale wind turbines as these should be mounted on the ground; in addition, the wind speed is not suitable for such machines.

Small-scale wind turbines have been employed in the urban environment in recent years. Studies have indicated however that their performance is very poor unless they are sited well above the surrounding buildings. In the case of the proposed building, the roof-space is incredibly small and there is no room for turbines; additionally, they would not enhance the building visually and contribute virtually no energy to the development.

It is deemed therefore that wind turbines are not feasible for the project.

Photovoltaics (PV)

Photovoltaics are semiconductors which convert incident sunlight into electricity. They are an excellent technology in the urban-context; there are many roofs in London which are ideal for PV.

Key to the efficacy of PV is shading. If shading occurs on an individual module, the electrical output of the whole array is reduced. This tends to mean that the optimum siting of modules should be completely unshaded. Where this is unavoidable, bespoke electrical wiring can be made to arrays to ensure that the maximum output can be achieved even when particular modules are shaded.

PVs could be located on the L08 roof of Arthur Stanley House. This is an ideal location as the development is higher than many of its adjacent buildings and would prevent panels from being overshadowed. Additionally the building is south-east facing which will improve the efficiency of a PV installation further still.

It is deemed therefore that photovoltaics are feasible for the project.

Section 4.4 shows the proposed location of PVs.

Solar thermal for hot water

Solar panels can be used to good effect to raise the temperature of water when the sun shines. Both flat plate and evacuated tubes are available in the UK and there are many installations.

Flat panels should be orientated towards the sun and inclined at a suitable angle which is driven by the hot water requirement of a building. Evacuated tubes can be rotated to optimise the efficiency and therefore are able to be mounted at almost any angle.

It is deemed that solar thermal panels, like photovoltaics, are feasible for the project.

Biomass Heating

Biomass heating tends to use woodchip or wood pellets as a fuel source. These are then combusted at high efficiency to generate heat.

The heat loads for the proposed development are not expected to be large enough to make biomass heating a feasible option. In fact, recent publications from the Mayor of London's office advise that biomass installations below 500 kW thermal capacity should not be considered.

Combustion of biomass in a location such as the Arthur Stanley House will inevitably lead to a degradation in air quality Added to this would be the delivery of biomass to the site and the storage thereof; both of which are not favourable to the proposed development.

It is deemed therefore that biomass heating is not feasible for the project.

Ground Source Heating & Cooling

There is much debate as to whether this technology should really be considered "renewable" as electricity is still required to operate the components constituting a heat pump. That said, the technology does indeed utilise temperature differentials owing directly to the sun.

There are a number of ways in which the ground can be used: horizontal pipes in the ground; vertical boreholes, and; putting the pipe work in piles. In all cases, the

system is closed and the working fluid is pumped around. Open loop systems tend to use an aquifer deep underground to act as a heat sink; this technology is not widely used in the UK and various trial installations in London are not performing as designed.

In London, the ground make-up is such that clay is found in the tens of metres under the surface; unfortunately clay does not allow for the dissipation of heat effectively as it does not allow the free movement of water. If heat cannot be effectively moved, the use of heat pumps should be such that the net heat which is extracted and re-introduced to the ground over a year is equal i.e. the amount of heating and cooling supplied by the technology should be equal.

The proposed Arthur Stanley House development does have complimentary heating and cooling demands that could suit heat pump technology, although an air-source option is considered more appropriate due to the constraints of the site.

Air source heating

The Greater London Authority recognises air source heat pumps as a renewable energy source, as these systems operate by receiving and rejecting heat from the surrounding air.

Air source heat pump technologies have been deemed feasible for the proposed commercial and residential buildings

4.3.1 System sizing

Solar Panels

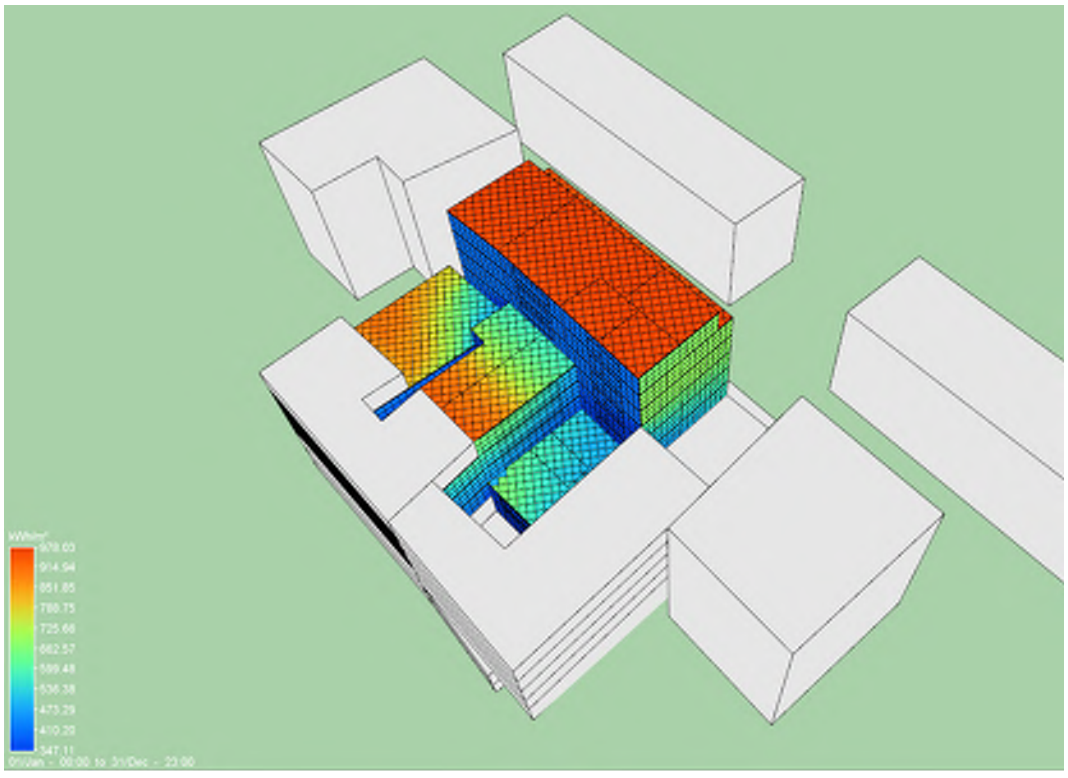


Figure 21: Solar analysis (view from north-west of ASH)

Arthur Stanley House's L08 roof has been deemed the most suitable for PV and solar thermal panels as it is not shaded by any adjacent buildings. The image above shows a solar analysis completed by the design team and shows that it is considerably better for locating an array of panels than roof levels L05, L04 or L02. The positioning of panels here does not detract from the architectural vision for the development as they will be tilted in a sympathetic way so that they do not protrude from the roof.

The use of both PV and solar thermal was tested and it was found that PV saves more carbon per unit area installed. Therefore, the design team proposes only PV panels are used.

The solar panel area proposed is 127m² for the Offices and a minimum of 29m² for the Residential development.

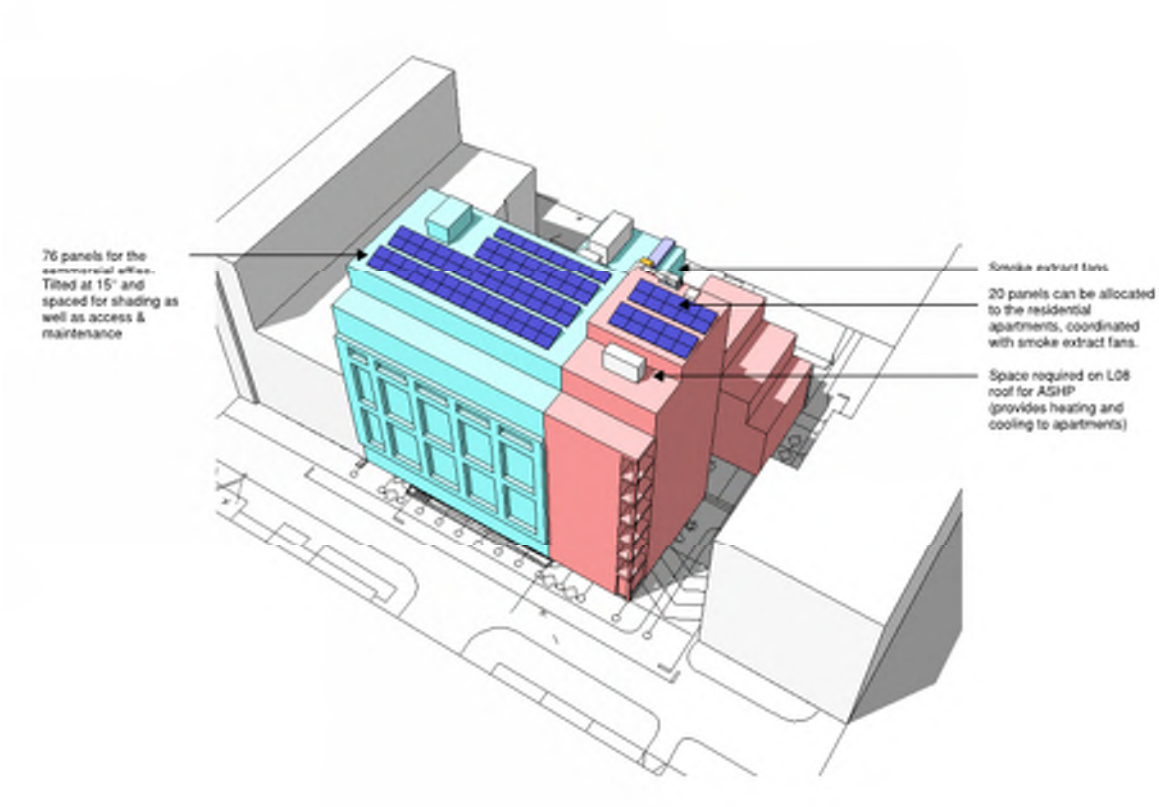


Figure 22: Potential solar panel layout at Arthur Stanley House

Air Source Heat Pumps

Residential ASHP

The residential development will be provided with an ASHP located on the L08 roof. The primary function of the system will be to provide heat to the apartments. It will additionally be able to provide cooling. If heat pump provides heating and cooling simultaneously then it will benefit from an estimated Total Energy Ratio (TER) of 7.

Commercial ASHP

The commercial offices will be provided with an ASHP which will be located on the L05 roof. This will be a 4-pipe system that can meet both cooling and heating loads in the office simultaneously. The system works most efficiently in this operational mode, with an estimated Total Energy Ratio (TER) of 7.

When the building is in peak cooling mode, the cooling production will switch to a Turbocor chiller as this will produce chilled water more efficiently during peak times of the year.

4.3.2 Overall results of green technologies

The following tables summarise the percentage improvement on 2013 Part L carbon dioxide emissions that are generated by the lean, clean and green building strategies described above.

Table 5: Residential Green Technology Carbon Emissions Reduction

Regulated Residential CO_2 Emissions (Tonnes CO2 per annum)		
Notional Residential	22.0	
Passive Design	20.0	
Efficient Energy Technology	20.0	
Green Technology	16.4	
Regulated Carbon Savings		
	Tonnes CO2 per annum	% improvement
Savings from Passive Design	2.0	8.8%
Savings from efficient technology	0	0%
Savings from green technology	3.6	16.4%
Total Cumulative Savings	**5.6**	**25.2%**

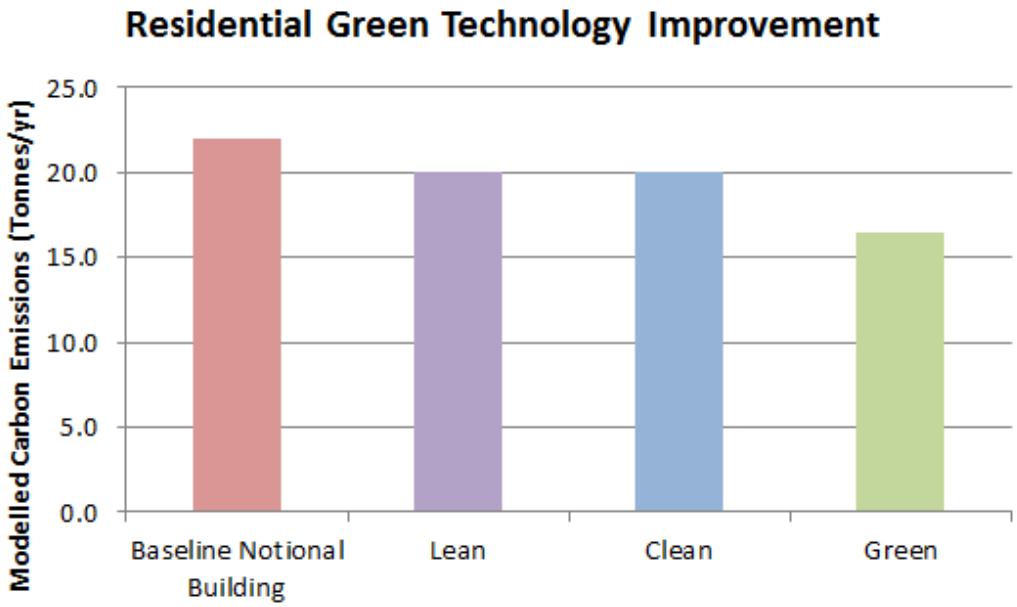


Figure 23: Residential green technology reduction in carbon emissions

Table 6: Commercial Green Technology Carbon Emissions Reduction

Regulated Commercial CO_2 Emissions (Tonnes CO2 per annum)		
Notional Commercial	118.4	
Passive Design	101.8	
Efficient Energy Technology	97.3	
Green Technology	90.2	
Regulated Carbon Savings		
	Tonnes CO2 per annum	% improvement
Savings from Passive Design	16.6	14%
Savings from efficient technology	4.5	3.8%
Savings from green technology	7.1	6.0%
Total Cumulative Savings	**28.2**	**23.8%**

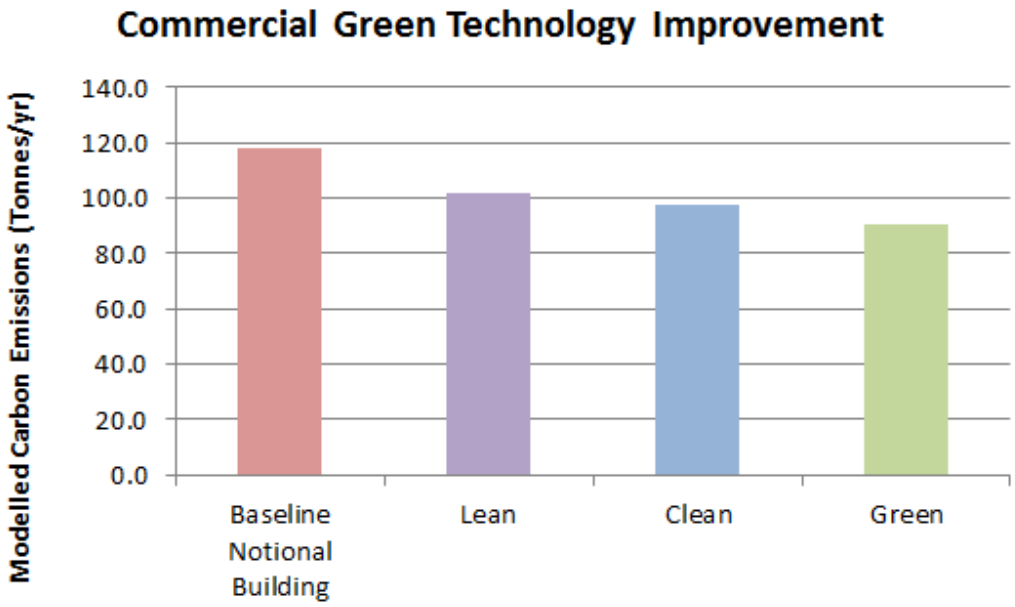


Figure 24: Commercial green technology reduction in carbon emissions

4.3.3 CO_2 Carbon Reduction Summary

Of the renewable technologies available, a combination of photovoltaics and air source heat pumps are considered the most practical and feasible for the Arthur Stanley House. It is estimated that approximately 10.7 tonnes of CO_2 could be abated on the site by the renewable technologies; 4.5 tonnes of CO_2 by the introduction of efficient technologies; and 18.6 tonnes of CO_2 by passive measures alone. In total, the energy efficient strategy is able to achieve a 24.0% reduction in carbon emissions against the Part L 2013 baseline.

Table 7: Total building reductions in carbon emissions achieved through passive design, efficient technologies and onsite green technology

Regulated Commercial & Residential CO_2 Emissions (Tonnes CO2 per annum)		
Notional Building	140.4	
Passive Design	121.8	
Efficient Energy Technology	117.3	
Green Technology	106.6	
Regulated Carbon Savings		
	Tonnes CO2 per annum	% improvement

Saving from passive design	18.6	13.2%
Saving from efficient technology	4.5	3.2%
Saving from green technology	10.7	7.6%
Total Cumulative Saving	**33.8**	**24.0%**
Target Saving	91.3	35.0%
Annual Shortfall	**15.3**	

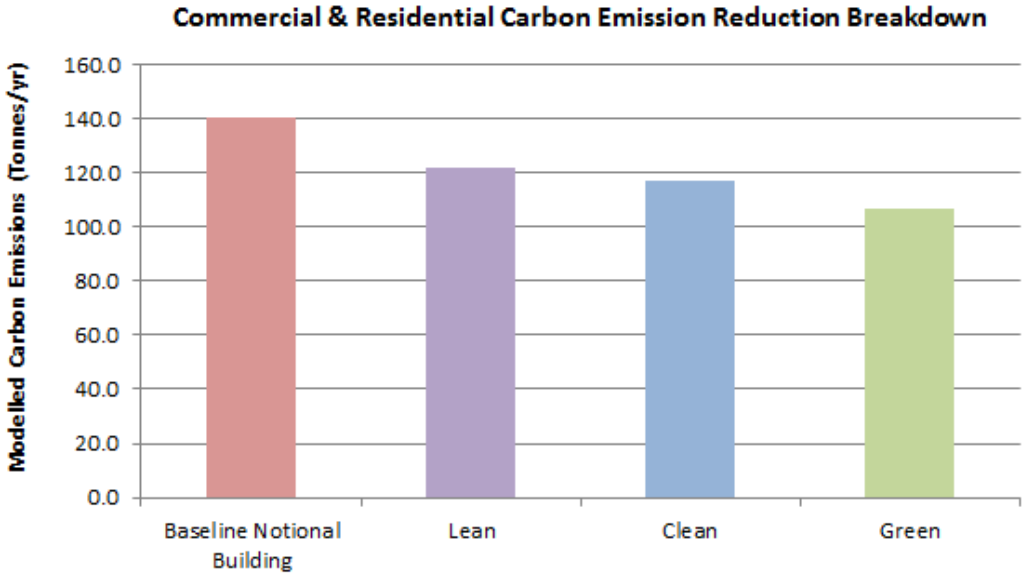


Figure 25: Commercial and residential reduction in carbon emissions achieved through passive design, efficient technology and onsite green technology

Shortfall - Carbon Offsetting

The above measures allow the development to achieve the required energy credits for BREEAM Very Good and Code for Sustainable Homes Level 4 to meet requirements for planning. However, the target of a 35% improvement over the Part L 2013 notional building has unfortunately not been met.

An 11% annual shortfall has been recorded which is equivalent to 15.3 tonnes per year. Over an assumed 30 year lifetime for services, this is equivalent to a 459 tonne carbon dioxide shortfall.

5 Feasibility Appraisal of Selected Technologies

The only suitable green technologies which have been deemed suitable for Arthur Stanley House are Air Source Heat Pumps and solar PV panels.

For this cost analysis, the following has been considered:

- Monocrystalline PV panels, with 29.4m² of panels attributed to the Residential building and 127m² of panels attributed to the Commercial building.
- Panels tilted at 15° to the horizontal roof
- ASHP for LTHW generation.

5.1 Cost Analysis

This section outlines the cost performance measured in Net Present Value (NPV). The analysis is only indicative at this early stage and therefore should only be used as a general indicator of the financial aspects of the project.

The discount rate that has been used is 4%.

5.1.1 PV monocrystalline panels

Considering a total of 156m² of PV panels in London at an angle of 15° to horizontal and orientated South-East, the energy output is estimated to be 21,783kWh/year.

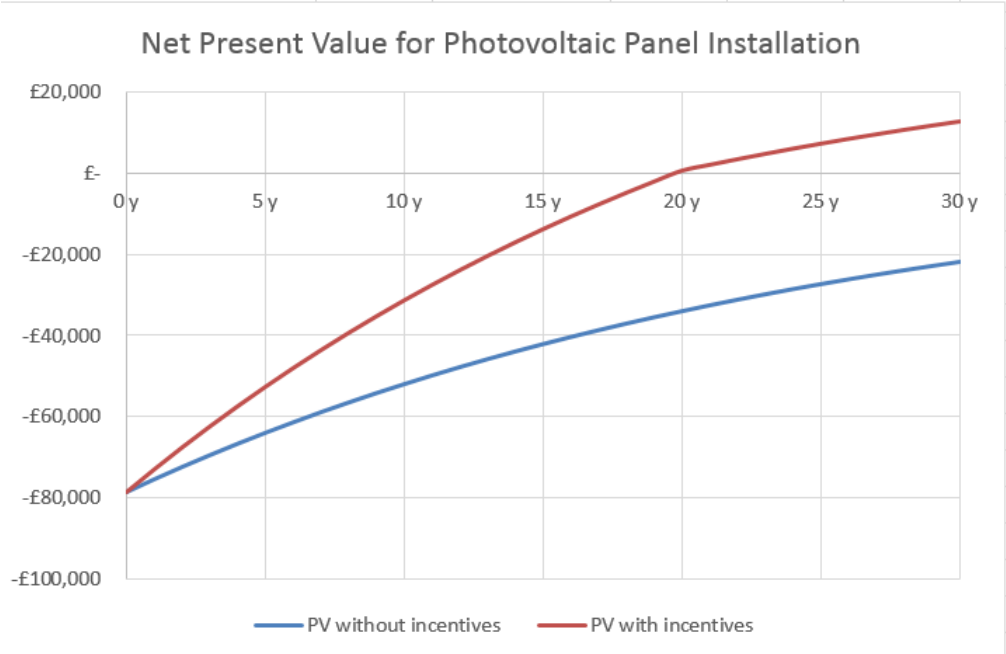
This represents an estimated 8.3tonnes of CO_2 which could be saved each year, based on a 15 year projection of Grid Electricity's CO_2 factor, 0.381 $kgCO_2$/kWh.

The capital expenditure is based on an installation cost of £2500 per kWp. The Arthur Stanley installation will have a peak of 31.4kWp and therefore the cost is estimated at £78,500.

Assuming a unit price of electricity to be 15p/kWh, the annual savings would be £3,270.

By including an additional incentive of 11.71p/kWh, the annual savings would £5,820.

The NPV graph below shows that without Feed in Tariffs (FiT) the PV installation isn't economically viable, even after 30 years. The inclusion of FiTs for 20 years suggests that the installation will have a payback within the 20 years. If the panels remain in use for any longer period then they will start to save the scheme money.

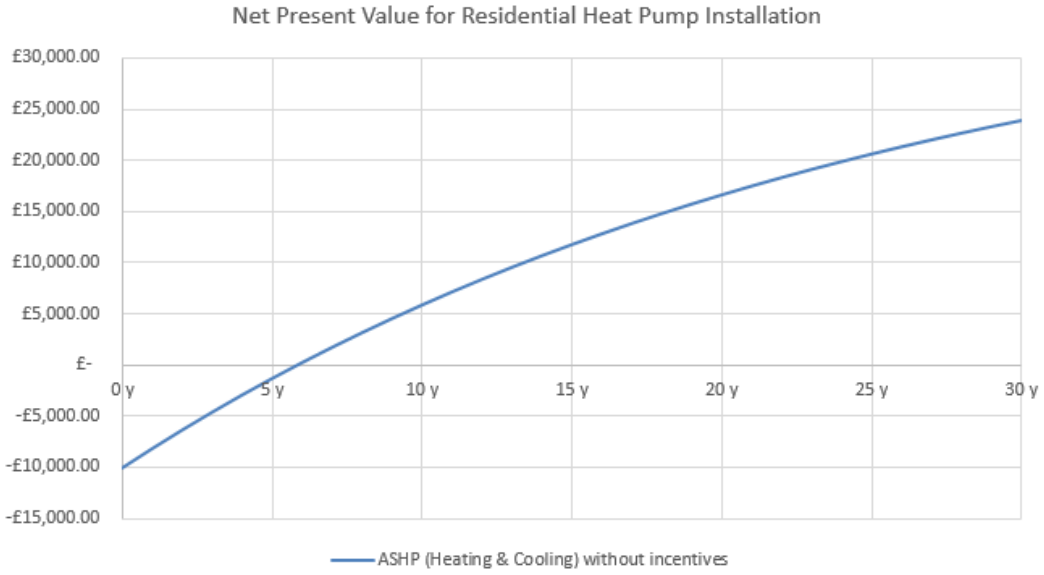


5.1.2 Air Source Heat Pumps

For the residential development a 4-pipe Air Source Heat Pump is being proposed which can produce simultaneous heating and cooling. The LTHW produced by the ASHP can raise water temperatures up to 45°C, additional boilers will be required to raise the temperature up to at least 65°C for DHW use. At peak efficiency, the ASHP is estimated to meet 40% of the heating requirements. When the ASHP produces LTHW and CHW simultaneously, it operates at a COP of 7; when it is in heating-only mode, the COP is a 3.16.

This option is analysed against a base case of boilers and a normal chiller for the apartments cooling needs. The additional capital cost is £10,100.

Assuming a price for thermal energy to be 4.8p/kWh and a unit price of electricity to be 15p/kWh, the annual saving would be around £1,960.



The NPV calculation suggests a payback within 6 years. It is possible that Renewable Heat Incentives (RHI) could be applied for so that the payback is even earlier.

This technology represents an estimated 23.3tonnes of CO_2 which could be saved each year, based on a 15 year projection of Grid Electricity's CO_2 factor, 0.381 $kgCO_2/kWh$ and Natural Gas of 0.222 $kgCO_2/kWh$.

6 Grants and Financial Incentives

Feed-in Tariffs (FiT) and the Renewable Heat Incentive (RHI) are two mechanisms introduced by the UK government to encourage individuals and businesses to invest in the production of small-scale renewable electricity and heat.

Feed-in Tariffs relate to the production of small scale, low carbon electricity by providing 'clean energy cash back' in return for the generation of renewable electricity. The feed-in tariffs provide a basic £0.03/kWh for electricity exported from a development, regardless of the low carbon technology. In addition, a further tariff is applied for all electricity that is generated on site (regardless as to whether it is actually used on site). The value of this tariff depends upon the low energy technology in question as well as the size of the installation.

The photovoltaic installation proposed for Arthur Stanley House falls into the 10kW to 50kW range. Installations of this size, according to the Ofgem Feed in Tariff rates, can receive an incentive of up to 11.71 p/kWh of electricity produced. The duration of the FiT is 20 years.

The Renewable Heat Incentive is a scheme, similar to feed-in tariffs, which will apply to schemes which generate low carbon heat energy. The scheme was launched in June 2011 and was subject to public consultation in 2010. As currently stands, air source heat pumps are eligible for the RHI 7.3 p/kWh. The RHI is calculated on the basis of 20 years of heat being produced.

7 Summary

The proposed development aims to be as energy efficient as practicable and generate its own energy where this is feasible. The location and nature of the building will naturally lead to certain energy requirements which cannot be avoided such as lighting, heating and cooling

The development was modelled using Government-approved software and the notional building Target Emission Rates were calculated for each building. Energy efficiency measures were employed for each building, and all available renewable energy technologies were considered.

Photovoltaic modules on the L08 roof and air source heat pumps serving the residential building space heating and domestic hot water were found to be the most feasible renewable technologies. In addition to this an air cooled Turbocor chiller will efficiently provide cooling to the commercial office; and when heating and cooling are required simultaneously a heat pump system will recover waste heat from the commercial building's cooling system to provide space heating LTHW and preheat domestic hot water.

CHP and CCHP were deemed to be unfeasible, though capped pipework to the Residential and Commercial plant rooms would be in place such that a future connection to a district heating and cooling network could be facilitated.

By following the hierarchy to reduce carbon dioxide emissions, a combined 24.0% improvement beyond Part L 2013 requirements for the commercial and residential areas has been achieved.

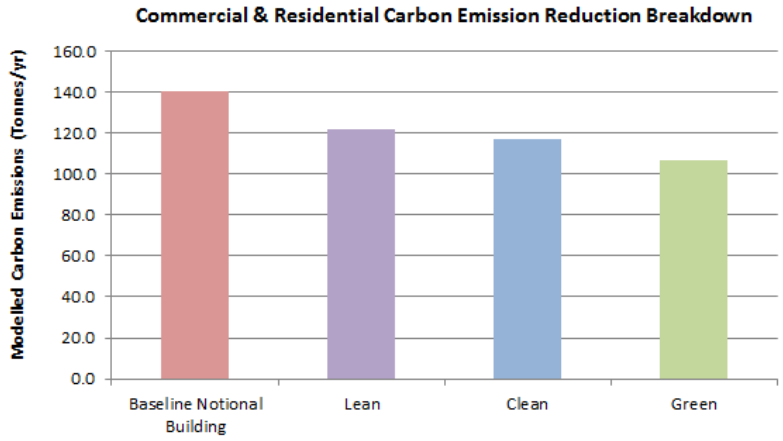


Figure 26: Arthur Stanley House reduction in carbon dioxide emissions

Note:

This statement in support of planning has been generated at an early stage of design and therefore its findings are likely to change as the design progresses. All calculations and plant sizing are approximate and are the result of software available at the time of publication.

Appendix A

Sustainability Assessment

Summary

Introduction

A Sustainability Framework pre-assessment meeting was held with the full design team on the 28th October 2014. This meeting developed BREEAM and Code for Sustainable Homes (CfSH) strategies to achieve the required targets.

BREEAM

The commercial section of the project will be assessed under the BREEAM 2014: New Construction scheme. Assessment under the BREEAM: 2014 Non-Domestic Refurbishment scheme was considered, but as only the previous buildings structural frame is retained it was seen as more appropriate to use New Construction. It is suggested that assessing with two separate schemes would drastically increase complexity without creating real sustainability gains.

The planning consultant has confirmed that a primary target of 'Very Good' will apply. Sub targets of 60% of the un-weighted credits in the Energy and Water sections and 40% in Materials are met as advised in the Camden SPG 3. The strategy outlined below in section A1 meets both the primary and sub targets.

Code for Sustainable Homes

The residential section of the project will be assessed under the CfSH 2010 (2014 Addendum) scheme. The planning consultant has confirmed that a primary target of 'Code Level Four' will apply. Sub targets of 50% of the un-weighted credits in the Energy, Water and Materials sections are targeted as advised in the Camden SPG 3. The strategy outlined below in section A2 meets both the primary and sub targets.

A1 BREEAM Pre-Assessment

The project is currently targeting a total of 70 credits, which equates to a score of 60.9%. This exceeds the 55% threshold for Very Good with a small buffer. All mandatory performance requirements for Very Good are considered to be achievable.

		Available	Targeted
Management			
Man 01	Project brief and design	4	2
Man 02	Life cycle cost and service life planning	4	1
Man 03	Responsible construction practices	6	6
Man 04	Commissioning and handover	4	4
Management score		**18**	**13**
Health & Wellbeing			
Hea 01	Visual Comfort	4	1
Hea 02	Indoor Air Quality	2	1
Hea 04	Thermal comfort	2	1
Hea 05	Acoustic Performance	1	1
Hea 06	Safety and Security	2	2
Health & Wellbeing score		**11**	**6**
Energy			
Ene 01	Reduction of energy use and carbon emissions	12	5
Ene 02	Energy Monitoring	2	2
Ene 03	External Lighting	1	1
Ene 04	Low carbon design	3	2
Ene 06	Energy Efficient Transportation Systems	3	3
Energy score		**21**	**13**
Transport			
Tra 01	Public Transport Accessibility	3	3
Tra 02	Proximity to amenities	1	1
Tra 03	Cyclist facilities	2	2
Tra 04	Maximum Car Parking Capacity	2	2
Tra 05	Travel Plan	1	1
Transport score		**9**	**9**
Water			
Wat 01	Water Consumption	5	3
Wat 02	Water Monitoring	1	1
Wat 03	Leak Detection	2	2
Wat 04	Water Efficient Equipment	1	1
Water score		**9**	**7**

Materials			
Mat 01	Life Cycle Impacts	5	3
Mat 02	Hard Landscaping and Boundary Protection	1	1
Mat 03	Responsible Sourcing of Materials	4	2
Mat 04	Insulation	1	1
Mat 05	Designing for durability and resilience	1	0
Mat 06	Material efficiency	1	0
Materials score		**13**	**7**
Waste			
Wst 01	Construction Waste Management	4	2
Wst 02	Recycled Aggregates	1	0
Wst 03	Operational Waste	1	1
Wst 04	Speculative Floor and Ceiling Finishes	1	1
Wst 05	Adaptation to climate change	1	0
Wst 06	Functional adaptability	1	0
Waste score		**9**	**4**
Land Use & Ecology			
LE 01	Site Selection	2	1
LE 02	Ecological Value of Site and Protection of Ecological Features	2	2
LE 03	Minimising impact on existing site ecology	2	0
LE 04	Enhancing site ecology	2	0
LE 05	Long Term Impact on Biodiversity	2	0
Land Use & Ecology score		**10**	**3**
Pollution			
Pol 01	Impact of Refrigerants	3	2
Pol 02	NOx emissions	3	3
Pol 03	Surface Water Run Off	5	1
Pol 04	Reduction of Night Time Light Pollution	1	1
Pol 05	Noise Attenuation	1	1
Pollution score		**13**	**8**
Innovation			
The project is not currently targeting any innovation credits			

A2 Code for Sustainable Homes Pre-Assessment

The project is currently targeting a total of 78 credits, which equates to a score of 72.48%. This exceeds the 68% threshold for CfSH Level 4 by a small margin. All mandatory performance requirements for Level 4 are considered to be achievable.

		Available	Targeted
Energy and Carbon Dioxide Emissions			
Ene 1	Dwelling Emission Rate	10	3
Ene 2	Building Fabric	9	4
Ene 3	Energy Display Devices	2	2
Ene 4	Drying Space	1	1
Ene 5	Energy Labelled White Goods	2	2
Ene 6	External Lighting	2	2
Ene 7	Low or Zero Carbon (LZC) Technologies	2	0
Ene 8	Cycle Storage	2	2
Ene 9	Home Office	1	0
Energy and Carbon Dioxide Emissions score		**31**	**16**
Water			
Wat 1	Indoor Water Use	5	4
Wat 2	External Water Use	1	1
Water score		**6**	**5**
Materials			
Mat 1	Environmental Impact of Materials	15	8
Mat 2	Responsible Sourcing of Materials - Basic Building Elements	6	5
Mat 3	Responsible Sourcing of Materials - Finishing Elements	3	3
Materials score		**24**	**16**
Surface Water Run-off			
Sur 1	Management of Surface Water Run-off from Developments	2	2
Sur 2	Flood Risk	2	2
Surface Water Run-off score		**4**	**4**
Waste			
Was 1	Storage of Non-Recyclable Waste and Recyclable Household Waste	4	4
Was 2	Construction Site Waste Management	3	3
Was 3	Composting	1	1
Waste score		**8**	**8**

Pollution			
Pol 1	Global Warming Potential (GWP) of Insulants	1	1
Pol 2	NO_x Emissions	3	3
Pollution score		**4**	**4**
Health & Wellbeing			
Hea 1	Daylighting	3	0
Hea 2	Sound Insulation	4	3
Hea 3	Private Space	1	1
Hea 4	Lifetime Homes	4	4
Health & Wellbeing score		**12**	**8**
Management			
Man 1	Home User Guide	3	3
Man 2	Considerate Constructors Scheme	2	2
Man 3	Construction Site Impacts	2	2
Man 4	Security	2	2
Management score		**9**	**9**
Ecology			
Eco 1	Ecological Value of Site	1	1
Eco 2	Ecological Enhancement	1	1
Eco 3	Protection of Ecological Features	1	1
Eco 4	Change in Ecological Value of Site	4	3
Eco 5	Building Footprint	2	2
Ecology score		**9**	**8**

Appendix B

Part L BRUKL and SAP Results

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2013

Project name

Arthur Stanley House_IES_Green

As designed

Date: Thu Nov 27 15:45:51 2014

Administrative information

Building Details

Address: Tottenham Street, London, W1

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.1

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.1

BRUKL compliance check version: v5.2.b.1

Owner Details

Name: UCLHC

Telephone number: Phone

Address: Street Address, London, W1

Certifier details

Name: Arup - BEL D

Telephone number: Phone

Address: 13 Fitzroy Street, Fitzrovia, London, W1T 4BQ

Criterion 1: The calculated CO_2 emission rate for the building should not exceed the target

1.1	CO_2 emission rate from the notional building, $kgCO_2/m^2.annum$	23.5
1.2	Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	23.5
1.3	Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	17.9
1.4	Are emissions from the building less than or equal to the target?	BER =< TER
1.5	Are as built details the same as used in the BER calculations?	Separate submission

Criterion 2: The performance of the building fabric and the building services should achieve reasonable overall standards of energy efficiency

Values which do not meet standards in the 2013 Non-Domestic Building Services Compliance Guide are displayed in red.

2.a Building fabric

Element	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	Surface where the maximum value occurs*
Wall**	0.35	0.24	0.66	L1000000:Surf[9]
Floor	0.25	0.22	0.22	B2000000:Surf[0]
Roof	0.25	0.15	0.15	L1000000:Surf[0]
Windows***, roof windows, and rooflights	2.2	1.5	1.5	B2000000:Surf[1]
Personnel doors	2.2	-	-	No Personnel doors in building
Vehicle access & similar large doors	1.5	-	-	No Vehicle access doors in building
High usage entrance doors	3.5	-	-	No High usage entrance doors in building

$U_{a\text{-}Limit}$ = Limiting area-weighted average U-values [$W/(m^2K)$]
$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [$W/(m^2K)$]
$U_{i\text{-}Calc}$ = Calculated maximum individual element U-values [$W/(m^2K)$]

* There might be more than one surface where the maximum U-value occurs.
** Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows.
*** Display windows and similar glazing are excluded from the U-value check.
N.B.: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

Air Permeability	Worst acceptable standard	This building
$m^3/(h.m^2)$ at 50 Pa	10	3

2.b Building services

The standard values listed below are minimum values for efficiencies and maximum values for SFPs. Refer to the Non-Domestic Building Services Compliance Guide for details.

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	YES
Whole building electric power factor achieved by power factor correction	>0.95

1- Main system

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.95	4	0	1.6	0.8
Standard value	0.91*	2.55	N/A	1.1	0.65
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

* Standard shown is for gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.

"No HWS in project, or hot water is provided by HVAC system"

1- CHECK2-CHP

	CHPQA quality index	CHP electrical efficiency
This building	0	0
Standard value	Not provided	N/A

Local mechanical ventilation, exhaust, and terminal units

ID	System type in Non-domestic Building Services Compliance Guide
A	Local supply or extract ventilation units serving a single area
B	Zonal supply system where the fan is remote from the zone
C	Zonal extract system where the fan is remote from the zone
D	Zonal supply and extract ventilation units serving a single room or zone with heating and heat recovery
E	Local supply and extract ventilation system serving a single area with heating and heat recovery
F	Other local ventilation units
G	Fan-assisted terminal VAV unit
H	Fan coil units
I	Zonal extract system where the fan is remote from the zone with grease filter

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
B2_office_1	-	1.6	-	1.6	-	-	-	1.6	-	-	N/A
B2_office_2	-	1.6	-	1.6	-	-	-	1.6	-	-	N/A
B2_plant	-	1.6	-	1.6	-	-	-	1.6	-	-	N/A
B2_showers	-	1.6	-	1.6	-	-	-	1.6	-	-	N/A
B1_office_1	-	1.6	-	1.6	-	-	-	1.6	-	-	N/A
B1_office_2	-	1.6	-	1.6	-	-	-	1.6	-	-	N/A
B1_office_3	-	1.6	-	1.6	-	-	-	1.6	-	-	N/A
B1_plant	-	1.6	-	1.6	-	-	-	1.6	-	-	N/A
grnd_office_1	-	1.6	-	1.6	-	-	-	1.6	-	-	N/A
grnd_office_2	-	1.6	-	1.6	-	-	-	1.6	-	-	N/A
L1_office_2	-	1.6	-	1.6	-	-	-	1.6	-	-	N/A
L7_office_3	-	1.6	-	1.6	-	-	-	1.6	-	-	N/A
L7_plant	-	1.6	-	1.6	-	-	-	1.6	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
L6_office_3a	-	1.6	-	1.6	-	-	-	1.6	-	-	N/A
L6_office_3	-	1.6	-	1.6	-	-	-	1.6	-	-	N/A
L6_mtg_a	-	1.6	-	1.6	-	-	-	1.6	-	-	N/A
L6_mtg	-	1.6	-	1.6	-	-	-	1.6	-	-	N/A
L5_office_3a	-	1.6	-	1.6	-	-	-	1.6	-	-	N/A
L5_office_3	-	1.6	-	1.6	-	-	-	1.6	-	-	N/A
L5_mtg_a	-	1.6	-	1.6	-	-	-	1.6	-	-	N/A
L5_mtg	-	1.6	-	1.6	-	-	-	1.6	-	-	N/A
L4_office_3a	-	1.6	-	1.6	-	-	-	1.6	-	-	N/A
L4_office_3	-	1.6	-	1.6	-	-	-	1.6	-	-	N/A
L4_mtg_a	-	1.6	-	1.6	-	-	-	1.6	-	-	N/A
L4_mtg	-	1.6	-	1.6	-	-	-	1.6	-	-	N/A
L3_office_3a	-	1.6	-	1.6	-	-	-	1.6	-	-	N/A
L3_office_3	-	1.6	-	1.6	-	-	-	1.6	-	-	N/A
L3_mtg_a	-	1.6	-	1.6	-	-	-	1.6	-	-	N/A
L3_mtg	-	1.6	-	1.6	-	-	-	1.6	-	-	N/A
L2_office_3a	-	1.6	-	1.6	-	-	-	1.6	-	-	N/A
L2_office_3	-	1.6	-	1.6	-	-	-	1.6	-	-	N/A
L2_mtg_a	-	1.6	-	1.6	-	-	-	1.6	-	-	N/A
L2_mtg	-	1.6	-	1.6	-	-	-	1.6	-	-	N/A
L1_office_3a	-	1.6	-	1.6	-	-	-	1.6	-	-	N/A
L1_office_3	-	1.6	-	1.6	-	-	-	1.6	-	-	N/A
L1_mtg_a	-	1.6	-	1.6	-	-	-	1.6	-	-	N/A
L1_mtg	-	1.6	-	1.6	-	-	-	1.6	-	-	N/A
grnd_office_3a	-	1.6	-	1.6	-	-	-	1.6	-	-	N/A
grnd_office_3	-	1.6	-	1.6	-	-	-	1.6	-	-	N/A
grnd_recep_a	-	1.6	-	1.6	-	-	-	1.6	-	-	N/A
grnd_recep	-	1.6	-	1.6	-	-	-	1.6	-	-	N/A
L4_office_1a	-	1.6	-	1.6	-	-	-	1.6	-	-	N/A
L4_office_1	-	1.6	-	1.6	-	-	-	1.6	-	-	N/A
L3_office_1a	-	1.6	-	1.6	-	-	-	1.6	-	-	N/A
L3_office_1	-	1.6	-	1.6	-	-	-	1.6	-	-	N/A
L2_office_1	-	1.6	-	1.6	-	-	-	1.6	-	-	N/A
L2_office_1a	-	1.6	-	1.6	-	-	-	1.6	-	-	N/A
B2_wc	-	1.6	-	1.6	-	-	-	1.6	-	-	N/A
B1_wc	-	1.6	-	1.6	-	-	-	1.6	-	-	N/A
grnd_wc	-	1.6	-	1.6	-	-	-	1.6	-	-	N/A
L1_wc	-	1.6	-	1.6	-	-	-	1.6	-	-	N/A
L2_wc	-	1.6	-	1.6	-	-	-	1.6	-	-	N/A
L3_wc	-	1.6	-	1.6	-	-	-	1.6	-	-	N/A
L4_wc	-	1.6	-	1.6	-	-	-	1.6	-	-	N/A
L5_wc	-	1.6	-	1.6	-	-	-	1.6	-	-	N/A
L6_wc	-	1.6	-	1.6	-	-	-	1.6	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
L7_wc	-	1.6	-	1.6	-	-	-	1.6	-	-	N/A
L1_office_1	-	1.6	-	1.6	-	-	-	1.6	-	-	N/A
L1_office_1a	-	1.6	-	1.6	-	-	-	1.6	-	-	N/A

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
B2_office_1	77	-	-	1255
B2_office_2	77	-	-	1133
B2_plant	77	-	-	746
B2_showers	-	90	-	291
B1_office_1	77	-	-	1272
B1_office_2	77	-	-	1155
B1_office_3	77	-	-	1510
B1_plant	77	-	-	299
grnd_office_1	77	-	-	1296
grnd_office_2	77	-	-	1185
L1_office_2	77	-	-	1152
L7_office_3	77	-	-	1212
L7_plant	77	-	-	217
L6_office_3a	77	-	-	731
L6_office_3	77	-	-	833
L6_mtg_a	77	-	-	429
L6_mtg	77	-	-	224
L5_office_3a	77	-	-	731
L5_office_3	77	-	-	833
L5_mtg_a	77	-	-	430
L5_mtg	77	-	-	223
L4_office_3a	77	-	-	731
L4_office_3	77	-	-	833
L4_mtg_a	77	-	-	430
L4_mtg	77	-	-	223
L3_office_3a	77	-	-	731
L3_office_3	77	-	-	833
L3_mtg_a	77	-	-	430
L3_mtg	77	-	-	223
L2_office_3a	77	-	-	731
L2_office_3	77	-	-	833
L2_mtg_a	77	-	-	430
L2_mtg	77	-	-	223
L1_office_3a	77	-	-	731
L1_office_3	77	-	-	833
L1_mtg_a	77	-	-	430

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
L1_mtg	77	-	-	223
grnd_office_3a	77	-	-	764
grnd_office_3	77	-	-	869
grnd_recep_a	-	90	25	229
grnd_recep	-	90	25	130
L4_office_1a	77	-	-	724
L4_office_1	77	-	-	614
L3_office_1a	77	-	-	724
L3_office_1	77	-	-	614
L2_office_1	77	-	-	614
L2_office_1a	77	-	-	724
B2_wc	-	90	-	158
B1_wc	-	90	-	165
grnd_wc	-	90	-	176
L1_wc	-	90	-	163
L2_wc	-	90	-	163
L3_wc	-	90	-	163
L4_wc	-	90	-	163
L5_wc	-	90	-	163
L6_wc	-	90	-	163
L7_wc	-	90	-	163
L1_office_1	77	-	-	614
L1_office_1a	77	-	-	724

Criterion 3: The spaces in the building should have appropriate passive control measures to limit solar gains

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
B2_office_1	NO (-87.4%)	NO
B2_office_2	NO (-99.5%)	NO
B2_plant	N/A	N/A
B2_showers	N/A	N/A
B1_office_1	NO (-83.9%)	NO
B1_office_2	NO (-98.4%)	NO
B1_office_3	NO (-91.9%)	YES
B1_plant	NO (-91.6%)	YES
grnd_office_1	NO (-76.9%)	NO
grnd_office_2	NO (-78.2%)	YES
L1_office_2	NO (-74.7%)	YES
L7_office_3	NO (-64%)	YES
L7_plant	NO (-76.2%)	YES
L6_office_3a	NO (-55.6%)	YES
L6_office_3	NO (-76.8%)	YES
L6_mtg_a	NO (-77.1%)	YES
L6_mtg	N/A	N/A

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
L5_office_3a	NO (-68.4%)	YES
L5_office_3	NO (-76.8%)	YES
L5_mtg_a	NO (-83.7%)	YES
L5_mtg	N/A	N/A
L4_office_3a	NO (-68.4%)	YES
L4_office_3	NO (-99.9%)	NO
L4_mtg_a	NO (-83.7%)	YES
L4_mtg	N/A	N/A
L3_office_3a	NO (-68.4%)	YES
L3_office_3	NO (-100%)	NO
L3_mtg_a	NO (-83.7%)	YES
L3_mtg	N/A	N/A
L2_office_3a	NO (-68.4%)	YES
L2_office_3	N/A	N/A
L2_mtg_a	NO (-83.7%)	YES
L2_mtg	N/A	N/A
L1_office_3a	NO (-68.7%)	YES
L1_office_3	N/A	N/A
L1_mtg_a	NO (-72.5%)	YES
L1_mtg	N/A	N/A
grnd_office_3a	NO (-42.8%)	YES
grnd_office_3	N/A	N/A
grnd_recep_a	NO (-42.2%)	YES
grnd_recep	N/A	N/A
L4_office_1a	NO (-64.2%)	YES
L4_office_1	NO (-68.9%)	NO
L3_office_1a	NO (-70.6%)	YES
L3_office_1	NO (-73%)	NO
L2_office_1	NO (-83.2%)	NO
L2_office_1a	NO (-78.3%)	YES
B2_wc	N/A	N/A
B1_wc	N/A	N/A
grnd_wc	N/A	N/A
L1_wc	N/A	N/A
L2_wc	NO (-94.2%)	YES
L3_wc	NO (-92.7%)	YES
L4_wc	NO (-89.1%)	YES
L5_wc	NO (-90.6%)	YES
L6_wc	NO (-90.6%)	YES
L7_wc	NO (-90.6%)	YES
L1_office_1	NO (-84.7%)	NO
L1_office_1a	N/A	N/A

Criterion 4: The performance of the building, as built, should be consistent with the BER

Separate submission

Criterion 5: The necessary provisions for enabling energy-efficient operation of the building should be in place

Separate submission

EPBD (Recast): Consideration of alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	YES
Is evidence of such assessment available as a separate submission?	NO
Are any such measures included in the proposed design?	YES

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m²]	4657.8	4657.8
External area [m²]	3115.3	3115.3
Weather	LON	LON
Infiltration [m³/hm²@ 50Pa]	3	3
Average conductance [W/K]	1362.8	0
Average U-value [W/m²K]	0.44	0
Alpha value* [%]	10.12	10

* Percentage of the building's average heat transfer coefficient which is due to thermal bridging

Building Use

% Area	Building Type
	A1/A2 Retail/Financial and Professional services
	A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways
100	**B1 Offices and Workshop businesses**
	B2 to B7 General Industrial and Special Industrial Groups
	B8 Storage or Distribution
	C1 Hotels
	C2 Residential Inst.: Hospitals and Care Homes
	C2 Residential Inst.: Residential schools
	C2 Residential Inst.: Universities and colleges
	C2A Secure Residential Inst.
	Residential spaces
	D1 Non-residential Inst.: Community/Day Centre
	D1 Non-residential Inst.: Libraries, Museums, and Galleries
	D1 Non-residential Inst.: Education
	D1 Non-residential Inst.: Primary Health Care Building
	D1 Non-residential Inst.: Crown and County Courts
	D2 General Assembly and Leisure, Night Clubs and Theatres
	Others: Passenger terminals
	Others: Emergency services
	Others: Miscellaneous 24hr activities
	Others: Car Parks 24 hrs
	Others - Stand alone utility block

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	3.23	11.78
Cooling	5.3	5.84
Auxiliary	13.6	13.38
Lighting	16.76	21.16
Hot water	2.3	2.26
Equipment*	50.62	50.62
TOTAL**	**41.19**	**54.42**

* Energy used by equipment does not count towards the total for calculating emissions.
** Total is net of any electrical energy displaced by CHP generators, if applicable.

Energy Production by Technology [kWh/m²]

	Actual	Notional
Photovoltaic systems	2.72	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m²]	101.32	116.25
Primary energy* [kWh/m²]	113.83	138.34
Total emissions [kg/m²]	17.9	23.5

* Primary energy is net of any electrical energy displaced by CHP generators, if applicable.

HVAC Systems Performance

System Type	Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Fan coil systems, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity									
Actual	10.1	91.2	3.2	5.3	13.6	0.87	4.78	0.95	6
Notional	36.6	79.7	11.8	5.8	13.4	0.86	3.79	----	----

Key to terms

Heat dem [MJ/m2]	= Heating energy demand
Cool dem [MJ/m2]	= Cooling energy demand
Heat con [kWh/m2]	= Heating energy consumption
Cool con [kWh/m2]	= Cooling energy consumption
Aux con [kWh/m2]	= Auxiliary energy consumption
Heat SSEFF	= Heating system seasonal efficiency (for notional building, value depends on activity glazing class)
Cool SSEER	= Cooling system seasonal energy efficiency ratio
Heat gen SSEFF	= Heating generator seasonal efficiency
Cool gen SSEER	= Cooling generator seasonal energy efficiency ratio
ST	= System type
HS	= Heat source
HFT	= Heating fuel type
CFT	= Cooling fuel type

Key Features

The BCO can give particular attention to items with specifications that are better than typically expected.

Building fabric

Element	$U_{i\text{-}Typ}$	$U_{i\text{-}Min}$	Surface where the minimum value occurs*
Wall	0.23	-	B2000000:Surf[7]
Floor	0.2	0.22	B2000000:Surf[0]
Roof	0.15	0.15	L1000000:Surf[0]
Windows, roof windows, and rooflights	1.5	1.5	B2000000:Surf[1]
Personnel doors	1.5	-	No Personnel doors in building
Vehicle access & similar large doors	1.5	-	No Vehicle access doors in building
High usage entrance doors	1.5	-	No High usage entrance doors in building

$U_{i\text{-}Typ}$ = Typical individual element U-values [W/(m²K)] $U_{i\text{-}Min}$ = Minimum individual element U-values [W/(m²K)]

* There might be more than one surface where the minimum U-value occurs.

Air Permeability	Typical value	This building
m³/(h.m²) at 50 Pa	5	3

L1A 2013 - Regulations Compliance Report
Design - Draft

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Assessor name	Mr Ross Milner	Assessor number	1
Client		Last modified	26/11/2014
Address	1 Arthur Stanley House 1 Tottenham Mews, Fitzrovia, London, Westminster, W1		

Check	Evidence	Produced by	OK?
Criterion 1: predicted carbon dioxide emission from proposed dwelling does not exceed the target			
TER (kg $CO_2/m^2.a$)	Fuel = N/A Fuel factor = 1.00 TER = 17.21	Authorised SAP Assessor	
DER for dwelling as designed (kg $CO_2/m^2.a$)	DER = 13.16	Authorised SAP Assessor	
Are emissions from dwelling as designed less than or equal to the target?	DER 13.16 < TER 17.21	Authorised SAP Assessor	Passed
Is the fabric energy efficiency of the dwellling as designed less than or equal to the target?	DFEE 44.17 < TFEE 48.49	Authorised SAP Assessor	Passed
Criterion 2: the performance of the building fabric and the heating, hot water and fixed lighting systems should be no worse than the design limits			
Fabric U-values			
Are all U-values better than the design limits in Table 2?	**Element** / **Weighted average** / **Highest** Wall: 0.18 (max 0.30) / 0.18 (max 0.70) Party wall: 0.00 (max 0.20) / N/A Floor: 0.13 (max 0.25) / 0.13 (max 0.70) Roof: (no roof) Openings: 1.55 (max 2.00) / 1.80 (max 3.30)	Authorised SAP Assessor	Passed
Thermal bridging			
How has the loss from thermal bridges been calculated?	Thermal bridging calculated from linear thermal transmittances for each junction	Authorised SAP Assessor	
Heating and hot water systems			
Does the efficiency of the heating systems meet the minimum value set out in the Domestic Heating Compliance Guide?	Community heating scheme Secondary heating system: None	Authorised SAP Assessor	N/A
Does the insulation of the hot water cylinder meet the standards set out in the Domestic Heating Compliance Guide?	No hot water cylinder in the dwelling	Authorised SAP Assessor	
Do controls meet the minimum controls provision set out in the Domestic Heating Compliance Guide?	Space heating control: Charging system linked to use, programmer and TRVs No hot water cylinder in the dwelling	Authorised SAP Assessor	Passed
Fixed internal lighting			

Check	Evidence	Produced by	OK?
Does fixed internal lighting comply with paragraphs 42 to 44?	Schedule of installed fixed internal lighting Standard lights = 0 Low energy lights = 10 Percentage of low energy lights = 100% Minimum = 75 %	Authorised SAP Assessor	Passed
Criterion 3: the dwelling has appropriate passive control measures to limit solar gains			
Does the dwelling have a strong tendency to high summertime temperatures?	Overheating risk (June) = Not significant Overheating risk (July) = Medium Overheating risk (August) = Slight Region = Thames Thermal mass parameter = 250.00 Ventilation rate in hot weather = 2.00 ach Blinds/curtains = Light-coloured venetian blind	Authorised SAP Assessor	Passed
Criterion 4: the performance of the dwelling, as designed, is consistent with the DER			
Design air permeability ($m^3/(h.m^2)$ at 50Pa)	Design air permeability = 3.00 Max air permeability = 10.00	Authorised SAP Assessor	Passed
Mechanical ventilation system Specific fan power (SFP)	Mechanical ventilation with heat recovery: SFP = 0.50 W/(litre/sec) Max SFP = 1.5 W/(litre/sec) Heat recovery efficiency = 91.00 % Min heat recovery efficiency = 70.00 %	Authorised SAP Assessor	Passed
Have the key features of the design been included (or bettered) in practice?	The following walls/wall have a U-value less than 0.15W/m^2K: • Wall 5 (0.00) • Wall 6 (0.00) • Wall 7 (0.00) • Wall 8 (0.00) Thermal bridging y value (0.016) is less than 0.04 Design air permeability of 3 $m^3/(h.m^2)$ is less than 4 $m^3/(h.m^2)$ at 50 Pa Space cooling is specified Use of the following low carbon or renewable technologies: • Photovoltaic array	Authorised SAP Assessor	

L1A 2013 - Regulations Compliance Report
Design - Draft

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Assessor name	Mr Ross Milner	Assessor number	1
Client		Last modified	26/11/2014
Address	2 Arthur Stanley House 2 Tottenham Mews, Fitzrovia, London, Westminster, W1		

Check	Evidence	Produced by	OK?
Criterion 1: predicted carbon dioxide emission from proposed dwelling does not exceed the target			
TER (kg $CO_2/m^2.a$)	Fuel = N/A Fuel factor = 1.00 TER = 18.69	Authorised SAP Assessor	
DER for dwelling as designed (kg $CO_2/m^2.a$)	DER = 13.85	Authorised SAP Assessor	
Are emissions from dwelling as designed less than or equal to the target?	DER 13.85 < TER 18.69	Authorised SAP Assessor	Passed
Is the fabric energy efficiency of the dwellling as designed less than or equal to the target?	DFEE 44.37 < TFEE 49.45	Authorised SAP Assessor	Passed
Criterion 2: the performance of the building fabric and the heating, hot water and fixed lighting systems should be no worse than the design limits			
Fabric U-values			
Are all U-values better than the design limits in Table 2?	**Element** / **Weighted average** / **Highest** Wall: 0.18 (max 0.30) / 0.18 (max 0.70) Party wall: 0.00 (max 0.20) / N/A Floor: 0.13 (max 0.25) / 0.13 (max 0.70) Roof: (no roof) Openings: 1.40 (max 2.00) / 1.40 (max 3.30)	Authorised SAP Assessor	Passed
Thermal bridging			
How has the loss from thermal bridges been calculated?	Thermal bridging calculated from linear thermal transmittances for each junction	Authorised SAP Assessor	
Heating and hot water systems			
Does the efficiency of the heating systems meet the minimum value set out in the Domestic Heating Compliance Guide?	Community heating scheme Secondary heating system: None	Authorised SAP Assessor	N/A
Does the insulation of the hot water cylinder meet the standards set out in the Domestic Heating Compliance Guide?	No hot water cylinder in the dwelling	Authorised SAP Assessor	
Do controls meet the minimum controls provision set out in the Domestic Heating Compliance Guide?	Space heating control: Charging system linked to use, programmer and TRVs No hot water cylinder in the dwelling	Authorised SAP Assessor	Passed
Fixed internal lighting			

Check	Evidence	Produced by	OK?
Does fixed internal lighting comply with paragraphs 42 to 44?	Schedule of installed fixed internal lighting Standard lights = 0 Low energy lights = 10 Percentage of low energy lights = 100% Minimum = 75 %	Authorised SAP Assessor	Passed
Criterion 3: the dwelling has appropriate passive control measures to limit solar gains			
Does the dwelling have a strong tendency to high summertime temperatures?	Overheating risk (June) = Slight Overheating risk (July) = Medium Overheating risk (August) = Medium Region = Thames Thermal mass parameter = 250.00 Ventilation rate in hot weather = 2.00 ach Blinds/curtains = Light-coloured venetian blind	Authorised SAP Assessor	Passed
Criterion 4: the performance of the dwelling, as designed, is consistent with the DER			
Design air permeability ($m^3/(h.m^2)$ at 50Pa)	Design air permeability = 3.00 Max air permeability = 10.00	Authorised SAP Assessor	Passed
Mechanical ventilation system Specific fan power (SFP)	Mechanical ventilation with heat recovery: SFP = 0.42 W/(litre/sec) Max SFP = 1.5 W/(litre/sec) Heat recovery efficiency = 91.00 % Min heat recovery efficiency = 70.00 %	Authorised SAP Assessor	Passed
Have the key features of the design been included (or bettered) in practice?	The following walls/wall have a U-value less than 0.15W/m^2K: • Wall 4 (0.00) • Wall 5 (0.00) • Wall 6 (0.00) • Wall 7 (0.00) • Wall 8 (0.00) Thermal bridging y value (0.016) is less than 0.04 Design air permeability of 3 $m^3/(h.m^2)$ is less than 4 $m^3/(h.m^2)$ at 50 Pa Space cooling is specified Use of the following low carbon or renewable technologies: • Photovoltaic array	Authorised SAP Assessor	

L1A 2013 - Regulations Compliance Report
Design - Draft

This design draft submission provides evidence towards compliance with Part L of the Building Regulations, in accordance with Appendix A of AD L1A. It has been carried out using Approved SAP software. It has been prepared from plans and specifications and may not reflect the 'as built' property. This report covers only items included within the SAP and is not a complete report of regulations compliance.

Assessor name	Mr Ross Milner	Assessor number	1
Client		Last modified	26/11/2014
Address	3 Arthur Stanley House 3 Tottenham Mews, Fitzrovia, London, Westminster, W1		

Check	Evidence	Produced by	OK?
Criterion 1: predicted carbon dioxide emission from proposed dwelling does not exceed the target			
TER (kg $CO_2/m^2.a$)	Fuel = N/A Fuel factor = 1.00 TER = 15.91	Authorised SAP Assessor	
DER for dwelling as designed (kg $CO_2/m^2.a$)	DER = 11.74	Authorised SAP Assessor	
Are emissions from dwelling as designed less than or equal to the target?	DER 11.74 < TER 15.91	Authorised SAP Assessor	Passed
Is the fabric energy efficiency of the dwellling as designed less than or equal to the target?	DFEE 38.33 < TFEE 43.08	Authorised SAP Assessor	Passed
Criterion 2: the performance of the building fabric and the heating, hot water and fixed lighting systems should be no worse than the design limits			
Fabric U-values			
Are all U-values better than the design limits in Table 2?	**Element** — **Weighted average** — **Highest** Wall — 0.18 (max 0.30) — 0.18 (max 0.70) Party wall — 0.00 (max 0.20) — N/A Floor — 0.13 (max 0.25) — 0.13 (max 0.70) Roof — (no roof) Openings — 1.40 (max 2.00) — 1.40 (max 3.30)	Authorised SAP Assessor	Passed
Thermal bridging			
How has the loss from thermal bridges been calculated?	Thermal bridging calculated from linear thermal transmittances for each junction	Authorised SAP Assessor	
Heating and hot water systems			
Does the efficiency of the heating systems meet the minimum value set out in the Domestic Heating Compliance Guide?	Community heating scheme Secondary heating system: None	Authorised SAP Assessor	N/A
Does the insulation of the hot water cylinder meet the standards set out in the Domestic Heating Compliance Guide?	No hot water cylinder in the dwelling	Authorised SAP Assessor	
Do controls meet the minimum controls provision set out in the Domestic Heating Compliance Guide?	Space heating control: Charging system linked to use, programmer and TRVs No hot water cylinder in the dwelling	Authorised SAP Assessor	Passed
Fixed internal lighting			

Check	Evidence	Produced by	OK?
Does fixed internal lighting comply with paragraphs 42 to 44?	Schedule of installed fixed internal lighting Standard lights = 0 Low energy lights = 10 Percentage of low energy lights = 100% Minimum = 75 %	Authorised SAP Assessor	Passed
Criterion 3: the dwelling has appropriate passive control measures to limit solar gains			
Does the dwelling have a strong tendency to high summertime temperatures?	Overheating risk (June) = Not significant Overheating risk (July) = Medium Overheating risk (August) = Slight Region = Thames Thermal mass parameter = 250.00 Ventilation rate in hot weather = 2.00 ach Blinds/curtains = Light-coloured venetian blind	Authorised SAP Assessor	Passed
Criterion 4: the performance of the dwelling, as designed, is consistent with the DER			
Design air permeability ($m^3/(h.m^2)$ at 50Pa)	Design air permeability = 3.00 Max air permeability = 10.00	Authorised SAP Assessor	Passed
Mechanical ventilation system Specific fan power (SFP)	Mechanical ventilation with heat recovery: SFP = 0.50 W/(litre/sec) Max SFP = 1.5 W/(litre/sec) Heat recovery efficiency = 91.00 % Min heat recovery efficiency = 70.00 %	Authorised SAP Assessor	Passed
Have the key features of the design been included (or bettered) in practice?	The following walls/wall have a U-value less than 0.15W/m^2K: • Wall 2 (0.00) • Wall 3 (0.00) • Wall 4 (0.00) • Wall 5 (0.00) • Wall 6 (0.00) • Wall 8 (0.00) Thermal bridging y value (0.016) is less than 0.04 Design air permeability of 3 $m^3/(h.m^2)$ is less than 4 $m^3/(h.m^2)$ at 50 Pa Space cooling is specified Use of the following low carbon or renewable technologies: • Photovoltaic array	Authorised SAP Assessor	

Appendix 6: Preliminary Ecological Appraisal Report

The Ecology Consultancy

The Ecology Consultancy

Arthur Stanley House, Fitzrovia, London

Preliminary Ecological Appraisal

Report for Llewelyn Davies

Version	Author	Checked by	Approved by	Date	Type
1	Rosanna Marston	Ben Kimpton	Giles Coe	08/12/2014	FINAL

The Ecology Consultancy, The Old Dairy, Barcombe Mils Road, Lewes, East Sussex, BN8 5FF
T. 01273 813739 **E.** sussex@ecologyconsultancy.co.uk **W.** www.ecologyconsultancy.co.uk

Contents

Executive Summary

The Ecology Consultancy was commissioned by Llewelyn Davies to undertake a Preliminary Ecological Appraisal (PEA) of Arthur Stanley House in London.

The main findings of the PEA are as follows:

- The site is not subject to any statutory or non-statutory nature conservation designations. The nearest statutory designated site is Hampstead Heath Woods Site of Special Scientific Interest located 5.55km north-west. The nearest non-statutory designated site is Gordon Square Site of Importance for Nature Conservation located 0.60km north-east. The proposed development is not anticipated to have any impact on these sites or the features for which they are designated.
- The site was dominated by buildings and hard-standing. These habitats were considered to be of value within the immediate vicinity of the site only, but may assume value up to a local level where they support protected and/or notable species.
- The site has low potential to support breeding birds and negligible potential to support roosting bats.
- The development proposals involve the removal of the portacabins and the renovation and extension of the existing main building known as Arthur Stanley House.
- Recommended mitigation for the site to ensure compliance with legislation and best practice is as follows:
    - habitats with potential to support breeding birds should be removed during September to February inclusive, to avoid the main bird breeding season. Alternatively suitable nesting locations at roof level could be netted off outside of the breeding season to deter species using them in the long-term;
    - should the presence of a protected species be confirmed or suspected during works, these must cease immediately and the advice of a suitably qualified and experienced ecologist must be sought; and
    - butterfly-bush should be removed from the site due to its potential to damage buildings/structures and its ability to spread.
- Recommendations are made in Section 5 of this report to enhance the biodiversity value of the site, including installing bird boxes, landscape planting of recognised value to wildlife and Sustainable Drainage Systems (SuDS) such as green roofs and rain gardens.

1 Introduction

BACKGROUND

1.1 The Ecology Consultancy was commissioned by Llewelyn Davies to undertake a Preliminary Ecological Appraisal (PEA) of Arthur Stanley House in Fitzrovia, London.

SCOPE OF THE REPORT

1.2 The PEA is based on a desk study, and a field survey using standard Phase 1 survey methodology (JNCC, 2010). The Phase 1 survey is designed to identify the broad habitat types present, to assess the potential of habitats to support protected species and to assist in providing an overview of the ecological interest at a site. It is generally the most widely used and professionally recognised method for initial ecological site appraisal.

1.3 This appraisal has been prepared with reference to best practice guidance published by the Chartered Institute for Ecology and Environmental Management (CIEEM, 2013) and as detailed in British Standard 42020:2013 Biodiversity - Code of Practice for Biodiversity and Development (BSI, 2013).

SITE CONTEXT AND STATUS

1.4 The site is situated off Tottenham Street in Fitzrovia, London W1. It comprises the main building Arthur Stanley House plus two portacabins surrounded by areas of hard-standing. The site covers 0.11 hectares (ha) in total. The site is situated in a dense urban area in the centre of London and is surrounded by various commercial buildings. The nearest larger area of open greenspace is Regent's Park located approximately 0.70 kilometre (km) north-west. The River Thames is located approximately 1.78km south-east. The National Grid Reference for the centre of the site is TQ 293 817.

DESCRIPTION OF THE PROPOSALS

1.5 Current proposals for the site (Llewelyn Davies, 2014) involve the renovation and extension of the existing main building Arthur Stanley House. This will involve the removal of the portacabins and the loss of some areas of hard-standing. The development will provide a mix of affordable housing, market housing and commercial/office space. There is space available for soft landscaping including courtyard areas and roof terraces. It is proposed to install PV and solar thermal panels at roof level.

2 Methodology

DESK STUDY

2.1 A biological data search for the site and surrounding land within 1km of its boundary was requested from Greenspace Information for Greater London (GiGL) in November 2014. A search was also completed using an on-line mapping service for information on statutory designated sites (MAGIC, 2014).

2.2 Information sourced from the desk study included:

- statutory sites of nature conservation importance;
- non-statutory sites designated as Sites of Importance for Nature Conservation Importance (SINCs) at county level, recognised as being of local conservation importance and often recognised in Local Planning Authority (LPA) development plans;
- legally protected species[1]; and
- notable habitats[2] and species[3] which may be relevant to the site, including Habitats and Species of Principal Importance for the Conservation of Biodiversity in England as listed in Section 41 of the Natural Environment and Rural Communities (NERC) Act 2006[4] (hereby referred to as 'species or habitats of principal importance').

HABITAT SURVEY

2.3 The habitat survey following standard Phase 1 survey methodology (JNCC, 2010), was carried out on 21 November 2014 and covered the entire site, including boundary features. Habitats were described and mapped. A habitat map of the site is included in Appendix 1 together with photographs in Appendix 2. A list of plant species was

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1 Legally protected species include those listed in Schedules 1, 5 or 8 of the Wildlife and Countryside Act 1981; Schedule 2 of the Conservation of Habitats and Species Regulations 2010 (as amended); or in the Protection of Badgers Act 1992 (as amended).

2 Notable habitats include habitats of principal importance; Local Biodiversity Action Plan (LBAP) habitats; Ancient Woodland Inventory sites; and Important Hedgerows as defined by the Hedgerow Regulations 1997.

3 Notable species include species of principal importance; those listed on LBAPs; Birds of Conservation Concern (Eaton *et al.*, 2009); and/or Red Data Book/nationally notable species (JNCC, undated).

4 Section 41 (S41) of the NERC Act (2006) includes a published list of habitats and species which are of principal importance for the conservation of biodiversity in England. It is used to guide decision-makers such as LPAs in implementing their duty under section 40 of the NERC Act (2006), to have regard to the conservation of biodiversity in England, when carrying out their normal functions. Further details of the NERC Act can be found at: www.opsi.gov.uk/acts/acts2006/ukpga_20060016_en_1.

compiled (Appendix 3), together with an estimate of abundance made according to the DAFOR[5] scale.

2.4 Incidental records of birds and other fauna noted during the course of the habitat survey were also compiled. Scientific names are given after the first mention of a species, thereafter, common names only are used. Nomenclature follows Stace (2010) for vascular plant species.

2.5 The survey, assessment and report were conducted and written by Rosie Marston BSc, MSc, ACIEEM, an ecologist with over two years' commercial experience who is competent in carrying out botanical surveys and protected species assessments.

PROTECTED SPECIES ASSESSMENT

2.6 An assessment of the site's potential to support protected species has been carried out, based on the results of the desk study, observations made during the site survey, an assessment of the suitability of on-site and adjoining habitat, and information on the distribution of these species. Those species considered potentially present owing to the presence of suitable habitat within the site were evaluated further, as follows:

- the presence of nesting habitat for breeding birds, such as mature trees, dense scrub, hedgerows, and buildings; and evidence of bird nesting including bird song, old nests, faecal marks etc.; and
- the presence of features in, and on trees, indicating potential for roosting bats *Chiroptera* such as fissures, holes, loose bark and ivy *Hedera helix* and those associated with buildings such as cavities, roof voids, hanging tiles, unenclosed soffits etc. A search for direct evidence, such as the presence of bats, staining, droppings and feeding remains was also carried out.

2.7 Due to the lack of suitable habitat and/or their known distribution, it is not considered that the site has potential to support any other protected species. Therefore, only those species listed above are included in the protected species risk assessment in Section 3 of this report.

[5] The DAFOR scale has been used to try and measure the frequency and cover of the different plant species as follows: Dominant (D) - >75% cover, Abundant (A) – 51-75% cover, Frequent (F) – 26-50% cover, Occasional (O) – 11-25% cover, Rare (R) – 1-10% cover, Locally Frequent (LF) is also used where the frequency and distribution is patchy.

2.8 The site was also assessed for its potential to support invasive plant species listed on Schedule 9 of The Wildlife and Countryside Act 1981 (as amended).

2.9 The likelihood of occurrence is ranked as follows and relies on the findings of the current survey and an evaluation of existing data.

- **Negligible** – while presence cannot be absolutely discounted, the site includes very limited or poor quality habitat for a particular species or species group. No local records from a data search, surrounding habitat considered unlikely to support wider populations of a species/species group. The site may also be outside or peripheral to known national range for a species.
- **Low** – on-site habitat of poor to moderate quality for a given species/species group. Few or no records from data search, but presence cannot be discounted on the basis of national distribution, nature of surrounding habitats, habitat fragmentation, recent on-site disturbance etc.
- **Medium** – on-site habitat of moderate quality, providing all of the known key requirements of given species/species group. Local records form the data search, within national distribution, suitable surrounding habitat. Factors limiting the likelihood of occurrence may include small habitat area, habitat severance, and disturbance.
- **High** – on-site habitat of high quality for given a species/species group. Local records provided by desk study. The site is within/peripheral to a national or regional stronghold. Good quality surrounding habitat and good connectivity.
- **Present** – presence confirmed from the current survey or by recent, confirmed records.

2.10 The purpose of this assessment is to identify whether more comprehensive Phase 2 surveys for protected species or mitigation should be recommended.

SITE EVALUATION

2.11 The site has also been evaluated by broadly following guidance issued by the Institute of Ecology and Environmental Management (IEEM, 2006)[6] which evaluates sites

[6] now the Chartered Institute of Ecology and Environmental Management (CIEEM)

according to a geographic scale (significance at the international level down to the local level) and using a range of criteria for assigning ecological value, as follows:

- presence of sites or features designated for their nature conservation interest. Examples include internationally or nationally designated sites such as Special Areas of Conservation (SACs), Special Protection Areas (SPAs) and Sites of Special Scientific Interest (SSSIs), locally designated sites such as Local Nature Reserves (LNRs) and SINCs;
- biodiversity value, for example, habitats or species which are rare or uncommon, species-rich assemblages, species which are endemic or on the edge of their range, large populations or concentrations of uncommon or threatened species, and/or plant communities that are typical of valued natural/semi-natural vegetation types;
- secondary and supporting value, for example, habitats or features which provide a buffer to valued features or which serve to link otherwise isolated features;
- presence of legally protected sites or species; and
- species or habitats of principal importance.

LIMITATIONS

2.12 It should be noted that whilst every effort has been made to provide a comprehensive description of the site, no investigation can ensure the complete characterisation and prediction of the natural environment.

Data Search

2.13 It is important to note that, even where data is held, a lack of records for a defined geographical area does not necessarily mean that there is a lack of ecological interest, the area may simply be under-recorded.

2.14 Where only four figure grid references are provided for protected species by recorders submitting data, their precise location can be difficult to determine and they could potentially be present anywhere within the given 1km x 1km National grid square.

Habitat Survey

2.15 The Phase 1 habitat survey does not constitute a full botanical survey, or a Phase 2 pre-construction survey that would include accurate GIS mapping for invasive or protected plant species.

Protected Species Assessment

2.16 The protected species assessment provides a preliminary view of the likelihood of protected species occurring on the site. This is based on the suitability of the habitat, known distribution of the species in the local area provided in response to our enquiries, and any direct evidence on the site. It should not be taken as providing a full and definitive survey of any protected species group. It is only valid at the time the survey was carried out. Additional surveys may be recommended if, on the basis of the preliminary assessment or during subsequent surveys, it is considered reasonably likely that protected species may be present.

3 Results

DESK STUDY

Designated Nature Conservation Sites

3.1 The site itself does not receive any statutory[7] or non-statutory[8] nature conservation designations. Within a 1km radius of the site there are no statutory sites and six non-statutory sites (all SINCs). See Table 1 for details.

Table 1: Designated Nature Conservation Sites within 1km of the site

Site Name	Habitats/Species of Interest	Location
Non-statutory Designated Sites (SINCs)		
Sites of Metropolitan Importance		
Regent's Park	**Habitats:** Amenity grassland, pond/lake, scattered trees, scrub and secondary woodland. **Species:** Migrant and breeding birds including one of London's largest heronries and a nationally significant population of pochard *Aythya ferina.* Invertebrates including various butterflies.	0.83km north-west
Sites of Borough Grade II Importance		
Park Square Gardens	**Habitats:** Amenity grassland, flower beds, planted shrubbery, mature scattered trees and secondary woodland. **Species:** Breeding birds including garden warbler *Sylvia borin* and dunnock *Prunella modularis.*	0.70km north-west
Sites of Local Importance		
Gordon Square	**Habitats:** Amenity grassland, planted shrubbery and scattered trees. **Species:** Breeding birds including mistle thrush *Turdus viscivorus.*	0.60km north-east
Russell Square	**Habitats:** Amenity grassland, hedge, planted shrubbery and mature scattered trees.	0.69km east

[7] Principally sites receiving protection under the Wildlife and Countryside Act, 1981 (as amended) and including LNRs, SSSIs, SACs and SPAs, amongst others.

[8] They typically comprise a series of sites designated a county level that are recognised to be of local conservation importance and are often included in LPA development plans. In other areas of the country they are sometimes called SNCIs (Sites of Nature Conservation Importance), CWSs (County Wildlife Sites) or SBIs (Sites of Biological Importance). All are described generally as Local Wildlife Sites by the UK Government.

Table 1: Designated Nature Conservation Sites within 1km of the site

Site Name	Habitats/Species of Interest	Location
Phoenix Garden	**Habitats:** Amenity grassland, flower beds, planted shrubbery, pond/lake, scattered trees and tall herbs. **Species:** Plants and birds including tits and finches.	0.80km south-east
St. James's Garden	**Habitats:** Amenity grassland, planted shrubbery, scattered trees and tall herbs. **Species:** Plants including common stork's-bill *Erodium cicutarium* which is rare in inner London.	0.91km north

Protected, Rare and/or Notable Species

3.2 The data search returned records for a range of taxonomic groups. Below is a summary of the number of species that records were returned for and those that were considered most relevant to the site and could potentially be present are named.

Plants

3.3 The data search returned records for approximately 100 species of vascular and lower plant, however many of these were coarse resolution records that were only accurate to within 10km of the site. Due to the lack of suitable habitats present it was considered unlikely that any protected, rare or notable species would occur on site.

Invertebrates

3.4 The data search returned records for eight species of invertebrate, which were all butterflies and moths. Due to the lack of suitable habitats present it was considered unlikely that any protected, rare or notable species would occur on site.

Birds

3.5 The data search returned records for approximately 40 species of birds. Those species associated with urban habitats that could potentially occur on site include the following:

- herring gull *Larus argentatus* (Birds of Conservation Concern[9] (BoCC) red-list species, species of principal importance, London Biodiversity Action Plan (BAP)

[9] Birds of Conservation Concern status is prioritised into high concern (Red), medium concern (Amber) and low concern (Green) (Eaton *et al*, 2009). Red list species are those that are globally threatened according to the IUCN criteria; those whose population or range has declined rapidly in recent years; and those that have declined historically and have not shown a substantial recent recovery. Amber list species are those with an unfavourable conservation status in Europe; those whose population or range has declined moderately in recent years; those whose population has declined historically but made a substantial recent recovery; rare

priority species and a London Species of Conservation Concern) – three records including a 2004 record located 0.76km north;

- starling *Sturnus vulgaris* (BoCC red-list species, species of principal importance, London BAP priority species and a London Species of Conservation Concern) – 122 records including a 2006 record located 0.16km north;
- house sparrow *Passer domesticus* (BoCC red-list species, species of principal importance, London BAP priority species and a London Species of Conservation Concern) – 26 records including a 2007 record located 0.21km north;
- peregrine *Falco peregrinus* (Schedule 1 species under the Wildlife and Countryside Act 1981(as amended), London BAP priority species and London Species of Conservation Concern) – 8 records with confidential locations, as recent as 2010; and
- black redstart *Phoenicurus ochruros* (Schedule 1 species, BoCC amber-list species and London BAP priority species) – 35 records with confidential locations, between 1985-2005.

3.6 All species of bird are protected under the Wildlife and Countryside Act 1981(as amended) with Schedule 1 species receiving an additional level of protection – see Appendix 4).

Bats

3.7 The data search returned records for four species of bat including common pipistrelle *Pipistrellus pipistrellus,* Nathusius' pipistrelle *Pipistrellus nathusii,* noctule *Nyctalus noctula* and brown long-eared *Plecotus auritus.*

3.8 The closest was a 2007 record for common pipistrelle, located 0.16km north.

3.9 All species of bat are fully protected under the Wildlife and Countryside Act 1981 (as amended) and under The Conservation of Habitats and Species Regulations 2010 (as amended) (see Appendix 4 for the full details of the legislation).

breeders; and those with internationally important or localised populations. Green list species are those that fulfil none of the criteria.

3.10 All of the above species of bat are London BAP priority species. With the exception of common pipistrelle they are also all London Species of Conservation Concern. In addition noctule and brown long-eared bats are species of principal importance.

Invasive species

3.11 The data search returned records for over 20 recognised invasive plant species as listed on the London Invasive Species Initiative (LISI), some of which are also listed under Schedule 9 under the Wildlife and Countryside Act 1981 (as amended). Species associated with urban habitats that could potentially occur on site include butterfly-bush *Buddleia davidii* (LISI only) and Japanese knotweed *Fallopia japonica* (LISI and Sch9).

HABITAT SURVEY

Overview

3.12 The site comprised the main building Arthur Stanley House, two portacabins and other structures, surrounded by areas of hard-standing. A Habitat Map of the site showing locations of Target Notes (TN) is presented in Appendix 1, with photographs in Appendix 2.

Buildings/Structures and Hard-Standing

Building 1

3.13 Arthur Stanley House (Building 1) was a derelict high-rise tower block approximately 50m tall and brick-built (Photograph 1). It featured metal and timber-framed glass windows, some of which had been boarded up. It had a flat roof, some parts of which were clad with bituminous roofing felt. The chimney tower to the north of the building had an opening on it where some of the mesh cover was falling away (Photograph 2). Although the building had deteriorated internally, externally it was overall in general good condition and was fairly well-sealed from the elements. A very limited number of gaps were observed in the brickwork at roof level where there was some crumbling mortar (Photograph 3).

Building 2

3.14 Building 2 comprised two portacabins erected one on top of the other to provide a site office and canteen. Together these were approximately 7m high with metal framed glass windows and were in general good condition.

Building 3

3.15 Building 3 was a small brick structure with a bituminous felt roof.

Hard-standing

3.16 Areas of hard-standing surrounded the buildings and some bryophytes were beginning to colonise the areas with a layer of looser, more gravelly substrate to the north-east of Arthur Stanley House. Also in this area were some small plastic tubs with a small amount of Canadian fleabane *Conyza canadensis* growing out of them.

Scattered scrub

3.17 A single plant of butterfly-bush was present on the brick wall in the north-east corner of the site.

Target Notes

Target Note 1

3.18 Gaps in the brickwork of the building/crumbling mortar.

PROTECTED AND INVASIVE SPECIES ASSESSMENT

3.19 Where the habitats within the site were suitable to support protected species, they were evaluated as to their likelihood to provide sheltering, roosting, nesting and foraging habitat for those species. Those species considered potentially present, and their further evaluations, are:

- breeding birds; and
- bats.

3.20 The site was also assessed for its potential to support invasive plant species including those listed in Section 14 and Part 2 of Schedule 9 of the Wildlife and Countryside Act 1981 (as amended).

3.21 The likelihood of these species being present is evaluated in Table 2 below. The relevant legislation and policies relating to protected species and invasive plant species are set out in Appendix 4.

Table 2: Assessment of potential presence of protected species and invasive plant species

Species	Main legislation and policy (see Appendix 4)	Reason for consideration	Likelihood of occurrence
Breeding birds	Wildlife and Countryside Act 1981 (as amended) - Schedules 1 to 8.	Suitable habitat for a limited range of breeding birds was present on site. The data search returned numerous records for bird species within 1km of the site, including rare and declining species utilising urban environments such as house sparrow and black redstart.	**LOW –** No evidence of breeding birds was noted during the Phase 1 survey. The relatively large areas of flat roof space and the openings into the building provided suitable nesting habitat for species of bird such as feral pigeon *Columba livia.* However, the adjacent land to the north-east was an active building site at the time of survey causing high levels of noise and disturbance. This could potentially reduce the likelihood of nesting birds being present during the breeding bird season, although some urban species such as feral pigeon habituate to such conditions. Whilst the building is relatively tall and derelict it was considered sub-optimal breeding habitat for rare species such as black redstart as it did not have a complex roof structure and was not a good example of its preferred habitat type (industrial infrastructure particularly along rivers and canals. Note: The River Thames is 1.78km from the site). In addition, there is no high quality foraging habitat in close proximity to the site.
Bats	Wildlife and Countryside Act 1981 (as amended) - Schedule 5. The Conservation of Habitats and Species Regulations 2010 (as amended) - Schedule 2.	Potentially suitable roosting habitat was present on site. The data search returned records for five bat species within 1km of the site, but no confirmed roost sites.	**NEGLIGIBLE** – The main on-site building Arthur Stanley House featured very few opportunities for roosting bats. Opportunities were limited to a small number of gaps in the external brickwork of the building due to crumbling mortar. There were no other habitats on site considered to be potentially suitable. The site was in a dense urban area largely devoid of green space which may be used for foraging, and there were no habitat corridors (such as street trees) leading to or from the site which bats might use to commute. The adjacent land to the north-east was an active building site at the time of survey causing a high amount of from noise and light pollution. Overall, despite a very limited number of features being present, the sites urban location, isolation from foraging/commuting habitat and high level of disturbance is thought to greatly reduce the risk of bats roosting on site.

Table 2: Assessment of potential presence of protected species and invasive plant species

Species	Main legislation and policy (see Appendix 4)	Reason for consideration	Likelihood of occurrence
Invasive plant species	Section 14 and Part II of Schedule 9 of the Wildlife and Countryside Act 1981 (as amended).	Invasive species are widespread in many habitats and commonly found in gardens. A number of commonly planted ornamental species are on the Schedule 9 list. The data search returned a number of records for invasive species within 1km of the site.	**LOW** – The site was dominated by buildings and hard-standing and this provided very little opportunity for invasive species to colonise. A single plant of butterfly-bush was growing out of the wall in the north-east corner of the site which although not listed as a Schedule 9 plant is listed on the London Invasive Species Initiative list.

4 Evaluation

SITE EVALUATION

4.1 Habitats and species on the site were evaluated following standard guidance on ecological impact assessment published by the Institute of Ecology and Environmental Management (IEEM, 2006) using the recommended geographic frame of reference – see Table 3. Key aspects of legislation regarding nature conservation are provided in Appendix 4.

Table 3: CIEEM Evaluation

Criteria	Remarks
Features of International Importance	The site is not subject to any international statutory nature conservation designations. The closest site of international importance is Lee Valley SPA and Ramsar located 8.09km north-east. No impact on the features for which it is designated is expected due to a lack of supporting habitats on-site and distance from the site.
Features of National Importance	The site is not subject to any national statutory nature conservation designations and it is not considered that any habitats or populations or assemblages of species within the site would meet the criteria for the designation of SSSIs at an appropriate geographic level[10]. The closest site of national importance is Hampstead Heath Woods SSSI, located 5.55km north-west. No impact on the features for which it is designated is expected for the same reasons as above.
Features of County (Greater London) Importance	The site is not subject to any non-statutory nature conservation designations such as a SINC and is not known to contain features that would meet the criteria for designation as a Local Wildlife Site following Defra (2006) guidance.
Features of District (Camden) Importance	The site is not thought to support any features of value at this level.
Features of Local (Fitzrovia) Importance	The site has the potential to support breeding birds that are protected and/or species of principal importance. Due to the limited extent of suitable habitat, it is considered likely that any populations of these species (if present) would be of importance up to a local level only.
Features of importance within the immediate vicinity of the site	The habitats present on site are common and widespread habitats of low conservation value but which may assume higher importance where they support protected and/or species of principal importance.
Social Importance	The site is a derelict building no social importance associated with its nature conservation features.

[10] JNCC Guidelines for selection of biological SSSIs (see http://jncc.defra.gov.uk/page-2303#download).

Table 3: CIEEM Evaluation

Criteria	Remarks
Economic Importance	The site is a derelict building with no economic importance associated with its nature conservation features.

PLANNING POLICY

4.2 On the basis of the survey it is considered that The Camden Core Strategy (Camden London Borough Council, 2010), Fitzrovia Area Action Plan (Camden Borough Council, 2014) and The London Plan (Greater London Authority, 2011 – revised 2013) contain a number of key nature conservation policies relevant to the site. A summary of these policies is outlined below and the full text given in Appendix 4.

Table 4: Regional and local planning policies relevant to the site

Policy	Relevance to the site
The Camden Core Strategy	
Policy CS15 – Protecting and improving our parks and open spaces and encouraging biodiversity The council will expect *'provision of new or enhanced habitat, where possible, including through biodiverse green or brown roofs and green walls'* and promote '*the provision of new trees and vegetation, including additional street trees'.*	There may be opportunities to create new areas of vegetation as part of the proposed development including biodiverse green roofs and green walls.
The Fitzrovia Area Action Plan	
Principle 2 – Public open space The Council will expect *'development in Fitzrovia that increases the use of open space to provide new on-site public open space'*	Given the densely built up nature of the area, opportunities may be limited to the creation of open space at roof level in combination with solar panels, gardens/amenity areas on terraces and in courtyards.
The London Plan	
Policy 2.18 Green Infrastructure: The Network of Open and Green Spaces *'Enhancements to London's green infrastructure should be sought from development and where a proposal falls within a regional or metropolitan park deficiency area…it should contribute to addressing this need.* *Development proposals should: a) incorporate appropriate elements of green infrastructure that are integrated into the wider network b) encourage the linkage of green infrastructure…to the wider public realm to improve accessibility for all and develop new links,*	The site falls within a regional or metropolitan park deficiency area. The proposed development should therefore contribute to addressing the need for enhancing London's green infrastructure.

Table 4: Regional and local planning policies relevant to the site

Policy	Relevance to the site
The Camden Core Strategy	
utilising green chains, street trees, and other components of urban greening'.	
Policy 5.11 Green Roofs and Development Site Environs *'Major development proposals should be designed to include roof, wall and site planting, especially green roofs and walls where feasible'*	There may be opportunities to create biodiverse green roofs and green walls as part of the proposed development.
Policy 5.13 Sustainable Drainage *'Development should utilise sustainable urban drainage systems (SUDS) unless there are practical reasons for not doing so'. Drainage should be designed and implemented in ways that deliver…biodiversity, amenity and recreation'.*	There may be opportunities to incorporate SuDS into the proposed development that can deliver for biodiversity such as rain garden planters.
Policy 7.19 Biodiversity and Access to Nature *'Development proposals should: a) wherever possible, make a positive contribution to the protection, enhancement, creation and management of biodiversity b) prioritise assisting in achieving targets in biodiversity action plans (BAPs)…and/or improving access to nature in areas deficient in accessible wildlife sites'.*	There are opportunities for the proposed development to make a positive contribution to the protection, enhancement, creation and management of biodiversity. These opportunities could also assist in achieving targets of the London BAP, and improve access to nature in an area deficient in accessible wildlife sites.

5 Conclusions and Recommendations

CONCLUSIONS

5.1 The site is not subject to any statutory or non-statutory nature conservation designations. The nearest statutory designated site is Hampstead Heath Woods SSSI located 5.55km north-west. The nearest non-statutory designated site is Gordon Square SINC located 0.60km north-east. The proposed development is not anticipated to have any impact on the features for which they are designated due to distance and lack of supporting on-site habitats.

5.2 The site was dominated by buildings and hard-standing. These habitats were considered of value within the immediate vicinity of the site only, but may assume value up to a local level where they support protected and/or notable species.

5.3 The site has low potential to support breeding birds and negligible potential to support bats. Plant species considered invasive within London were confirmed as being present.

5.4 The development proposals involve the removal of the portacabins and the renovation and extension of the existing main building Arthur Stanley House, which have potential to support protected species therefore mitigation is recommended to ensure compliance with legislation.

RECOMMENDATIONS

Mitigation

Breeding birds

5.5 It is recommended that the proposed works are undertaken during September to February inclusive, to avoid any potential offences relating to birds during their main breeding season.

5.6 Alternatively, suitable nesting locations at roof level could be netted off outside of the breeding bird season to deter species using them over the long-term period. This approach would provide greater flexibility for the timing of the work.

5.7 Where netting is not used, and clearance work cannot reasonably be carried out outside of the main breeding season, a search for any nesting birds up to 48 hours prior to clearance must be undertaken. If any nests are found, they are to be protected until such time as the ecologist confirms that the young have fledged. This would involve setting up an exclusion zone/cordon to an appropriate area for the species concerned. Works may then proceed up to, but not within, this exclusion zone. If any nesting birds

are found at any time during clearance works when the ecologist is not present, work must stop immediately and an ecologist consulted immediately for advice on how to proceed.

Other protected species

5.8 No other protected species were considered likely to occur on site and/or be affected by the proposed development. However, should the presence of a protected species be confirmed or suspected during works, these must cease immediately and the advice of a suitably qualified and experienced ecologist must be sought.

London invasive plant species

5.9 It is recommended that butterfly-bush is removed from the site it has potential to damage the wall it is growing on and can readily spread by seed.

5.10 Although this species is not listed on Schedule 9 of the Wildlife and Countryside Act 1981 (as amended) it is an LISI Category 3 species which is considered to be a '*species of high impact or concern which are widespread in London and require concerted, coordinated and extensive action to control/eradicate. These species are species currently causing large scale impacts across London and LISI supports area or catchment wide partnership working to ensure this'* (London Invasive Species Initiative, 2014).

Compensation/Enhancement

5.11 There are opportunities to enhance the biodiversity value of the site beyond the baseline conditions. Those opportunities listed below have been targeted to benefit habitats and species of principal importance and implement national, regional and local planning policies.

Bird boxes

5.12 Recommendations to both compensate for the loss of habitats of potential value to breeding birds, and to enhance the site for this species group include the use of artificial bird boxes. The new on-site buildings could include specially designed features within its structure, for example bird bricks that can be incorporated into walls, soffits or along parapets.

5.13 It is recommended that Schwegler woodcrete boxes should be used as they include a broad range of designs, are long lasting compared to wooden boxes and insulate occupants from extremes of temperature and condensation.

5.14 The landscape planting should also include the provision of native tree and shrub species of value to foraging and nesting birds (see landscape planting below).

Landscape planting

5.15 Where possible planting schemes should incorporate native species and any non-native planting schemes should comprise a high percentage of species of recognised wildlife value. The use of invasive species listed on Schedule 9 of the Wildlife and Countryside Act 1981 (as amended) or typically 'aggressive' species should be avoided.

Sustainable Drainage Systems (SuDS)

5.16 The site comprises buildings and hard-standing and as such the use of SuDS schemes are recommended. A linked system comprising green roofs, green walls, rain water harvesting, rain gardens, vegetated swales, below ground drainage and porous surfacing utilising materials such as grasscrete[11] should be considered as part of the master-planning for the site (see examples below). Such systems can increase biodiversity as well as reduce surface water run-off at the site.

5.17 The creation of biodiverse green roofs are recommended as they will assist in delivering objectives of regional and local planning policies and potentially support London BAP species such as house sparrow and black redstart. In addition, the Fitzrovia Area Action Plan recognises that Fitzrovia is *'severely lacking in public open space and access to nature conservation interest'.*

5.18 Any proposals for green roofs should include a specification of proven ecological value for foraging birds and invertebrates as pioneered by the Green Roof Consultancy[12]. Such roofs are typified by substrates of varying type and depth, include dead wood habitat and open areas of vegetation, require low levels of maintenance, and are attractive to people as well as wildlife. They also provide opportunities for natural colonisation by plants and invertebrates. Such roofs are preferable to standard sedum

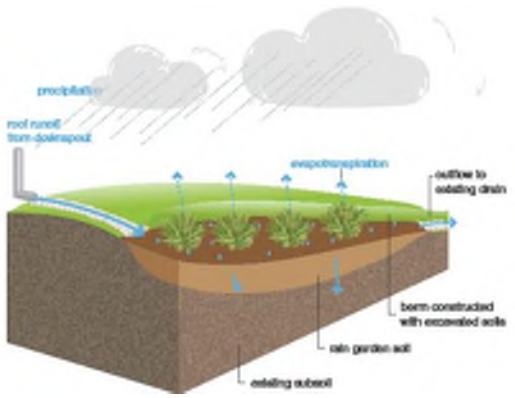
[11] Grasscrete comprises a range of cellular grassed pavement systems made from concrete or plastic and back-filled with recycled materials from the construction process and/or top-soil. The surface can be left to colonise naturally or can be planted with grass and low growing herbs.

[12] Green Roof Consultancy website http://greenroofconsultancy.com

species dominated roofs that deliver little in the way of biodiversity value and ecosystem services as they are typically less species-rich and have a shallower substrate depth[13].

5.19 There may be an opportunity to include rain gardens as part of landscape planting, including tree pits. Rain gardens should be designed to intercept water running off roofs (via drain pipes) and hard surfaces to reduce both the rate and volume of water discharging into the drainage system. These should be planted with species suitable for rain garden conditions and which provide both amenity and wildlife value.

Rain garden planter providing storm water/SuDS feature and amenity/visual value
(Image: The Green Roof Consultancy)



Cross section of typical domestic rain garden
(Image: Bray *et al.*, 2012)

Rain gardens in Toronto taking surface water from car park and pedestrian areas
(Photos: Dusty Gedge)

[13] Please note that the UK's Green Roof Code of Best Practice (GRO, 2014) advocates a minimum depth of 80mm for sedum based green roof installation which for pre-grown sedum mats includes the minimum mat thickness of 20mm. For wildflower based systems (as advocated here) a minimum depth of 100mm to 150mm will be required depending on the plant species specified.

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Appendix 1: Habitat Map

The Ecology Consultancy

Job title
Arthur Stanley House
ECL Job no. 141529 (141275)

Client
Llewellyn Davies

Drawing title
HABITAT SURVEY MAP

Section:	Scale (at A3)
N/A	1:200

Date of survey
21/11/2014

Surveyor
Surveyor name

Drawn	Checked
RM	WM

Approved	Date
WM	27/11/2014

KEY

- Site boundary
- Buildings/structures
- Hardstanding
- Wall
- Scattered scrub
- Target note

N

This plan is provided solely for the purpose of supporting the description of the ecological features of the site as contained in the accompanying report

Appendix 2: Photographs

Photograph 1
Building 1 (Arthur Stanley House).

Photograph 2
Mesh coming away from an opening on the chimney tower of Building 1, providing opportunities for nesting birds.

Photograph 3
Gaps in the brickwork of Building 1.

Appendix 3: Plant Species List

Plant Species List for Arthur Stanley House, Fitzrovia compiled from the Phase 1 habitat survey carried out on 21 November 2014.

Scientific nomenclature and common names for vascular plant follow Stace (2010). Please note that this plant species list was generated as part of a Phase 1 Habitat survey, does not constitute a full botanical survey and should be read in conjunction with the associated Phase 1 Report.

Abundance was estimated using the DAFOR scale as follows:

D = dominant, A = abundant, F = frequent, O = occasional, R = rare, L = locally

SCIENTIFIC NAME	COMMON NAME	ABUNDANCE
Buddleja davidii	Butterfly-bush	R
Conyza canadensis	Canadian fleabane	R

Appendix 4: Legislation and Policy

Important Notice: This section contains details of legislation and planning policy applicable in Britain only (i.e. not including the Isle of Man, Northern Ireland, the Republic of Ireland or the Channel Islands) and is provided for general guidance only. While every effort has been made to ensure accuracy, this section should not be relied upon as a definitive statement of the law.

A NATIONAL LEGISLATION AFFORDED TO SPECIES

The objective of the EC Habitats Directive[14] is to conserve the various species of plant and animal which are considered rare across Europe. The Directive is transposed into UK law by The Conservation of Habitats and Species Regulations 2010 (as amended) (formerly The Conservation (Natural Habitats, &c.) Regulations 1994 (as amended) and The Offshore Marine Conservation (Natural Habitats, &c.) Regulations 2007 (as amended).

The Wildlife and Countryside Act 1981 (as amended) is a key piece of national legislation which implements the Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention) and implements the species protection obligations of Council Directive 2009/147/EC (formerly 79/409/EEC) on the Conservation of Wild Birds (EC Birds Directive) in Great Britain.

Since the passing of the Wildlife & Countryside Act 1981, various amendments have been made, details of which can be found on www.opsi.gov.uk. Key amendments have been made through the Countryside and Rights of Way (CRoW) Act (2000) and Nature Conservation (Scotland) Act 2004.

Other legislative Acts affording protection to wildlife and their habitats include:

- Deer Act 1991
- Countryside and Rights of Way (CRoW) Act 2000
- Natural Environment & Rural Communities (NERC) Act 2006
- Protection of Badgers Act 1992
- Wild Mammals (Protection) Act 1996

Species and species groups that are protected or otherwise regulated under the aforementioned domestic and European legislation, and that are most likely to be affected by development activities, include herpetofauna (amphibians and reptiles), badger, bats, birds, dormouse, invasive plant species, otter, plants, red squirrel, water vole and white clawed crayfish.

Explanatory notes relating to species protected under The Conservation of Habitats and Species Regulations 2010 (as amended) (which includes smooth snake, sand lizard, great crested newt and natterjack toad), all bat species, otter, dormouse and some plant species) are given below. **These should be read in conjunction with the relevant species sections that follow.**

[14] Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora

- In the Directive, the term 'deliberate' is interpreted as being somewhat wider than intentional and may be thought of as including an element of recklessness.
- The Conservation of Habitats and Species Regulations 2010 (as amended) does not define the act of 'migration' and therefore, as a precaution, it is recommended that short distance movement of animals for e.g. foraging, breeding or dispersal purposes are also considered.
- In order to obtain a European Protected Species Mitigation (EPSM) licence, the application must demonstrate that it meets all of the following three 'tests': i) the action(s) are necessary for the purpose of preserving public health or safety or other imperative reasons of overriding public interest including those of a social or economic nature and beneficial consequence of primary importance for the environment; ii) that there is no satisfactory alternative and iii) that the action authorised will not be detrimental to the maintenance of the species concerned at a favourable conservation status in their natural range.

Bats

All species of bat are fully protected under The Conservation of Habitats and Species Regulations 2010 (as amended) through their inclusion on Schedule 2. Regulation 41 prohibits:

- Deliberate killing, injuring or capturing of Schedule 2 species (e.g. all bats)
- Deliberate disturbance of bat species as:

  a) to impair their ability:

  (i) to survive, breed, or reproduce, or to rear or nurture young;

  (ii) to hibernate or migrate[3]

  b) to affect significantly the local distribution or abundance of the species
- Damage or destruction of a breeding site or resting place
- Keeping, transporting, selling, exchanging or offering for sale whether live or dead or of any part thereof.

Bats are also currently protected under the Wildlife and Countryside Act 1981 (as amended) through their inclusion on Schedule 5. Under this Act, they are additionally protected from:

- Intentional or reckless disturbance (at any level)
- Intentional or reckless obstruction of access to any place of shelter or protection
- Selling, offering or exposing for sale, possession or transporting for purpose of sale.

How is the legislation pertaining to bats liable to affect development works?

A European Protected Species Mitigation (EPSM) Licence issued by the relevant countryside agency (e.g. Natural England) will be required for works liable to affect a bat roost or for operations likely to result in a level of disturbance which might impair their ability to undertake those activities mentioned above (e.g. survive, breed, rear young and hibernate). The licence is to allow derogation from the relevant legislation but also to enable appropriate mitigation measures to be put in place and their efficacy to be monitored.

Though there is no case law to date, the legislation may also be interpreted such that, in certain circumstances, important foraging areas and/or commuting routes can be regarded as being afforded *de facto* protection, for example, where it can be proven that the continued

usage of such areas is crucial to maintaining the integrity and long-term viability of a bat roost[15].

Birds

With certain exceptions, all birds, their nests and eggs are protected under Sections 1-8 of the Wildlife and Countryside Act 1981 (as amended). Among other things, this makes it an offence to:

- Intentionally (or recklessly in Scotland) kill, injure or take any wild bird
- Intentionally (or recklessly in Scotland) take, damage or destroy (or, in Scotland, otherwise interfere with) the nest of any wild bird while it is in use or being built
- Intentionally take or destroy an egg of any wild bird
- Sell, offer or expose for sale, have in his possession or transport for the purpose of sale any wild bird (dead or alive) or bird egg or part thereof.
- In Scotland only, intentionally or recklessly obstruct or prevent any wild bird from using its nest

Certain species of bird, for example the barn owl, black redstart, hobby, bittern and kingfisher receive additional special protection under Schedule 1 of the Act and Annex 1 of the European Community Directive on the Conservation of Wild Birds (2009/147/EC). This affords them protection against:

- Intentional or reckless disturbance while it is building a nest or is in, on or near a nest containing eggs or young
- Intentional or reckless disturbance of dependent young of such a bird
- In Scotland only, intentional or reckless disturbance whilst lekking
- In Scotland only, intentional or reckless harassment

How is the legislation pertaining to birds liable to affect development works?

To avoid contravention of the Wildlife and Countryside Act 1981 (as amended), works should be planned to avoid the possibility of killing or injuring any wild bird, or damaging or destroying their nests. The most effective way to reduce the likelihood of nest destruction in particular is to undertake work outside the main bird nesting season which typically runs from March to August[16]. Where this is not feasible, it will be necessary to have any areas of suitable habitat thoroughly checked for nests prior to vegetation clearance.

Those species of bird listed on Schedule 1 are additionally protected against disturbance during the nesting season. Thus, it will be necessary to ensure that no potentially disturbing works are undertaken in the vicinity of the nest. The most effective way to avoid disturbance is to postpone works until the young have fledged. If this is not feasible, it may be possible to maintain an appropriate buffer zone or standoff around the nest.

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[15] Garland & Markham (2008) Is important bat foraging and commuting habitat legally protected? Mammal News, No. **150**. The Mammal Society, Southampton.

[16] It should be noted that this is the main breeding period. Breeding activity may occur outside this period (depending on the particular species and geographical location of the site) and thus due care and attention should be given when undertaking potentially disturbing works at any time of year.

Invasive Plant Species

Certain species of plant, including Japanese knotweed *Fallopia japonica,* giant hogweed *Heracleum mantegazzianum* and Himalayan balsam *Impatiens glandulifera* are listed on Part II of Schedule 9 of the Wildlife and Countryside Act 1981 (as amended) in respect to Section 14(2). Such species are generally non-natives whose establishment or spread in the wild may be detrimental to native wildlife. Inclusion on Part II of Schedule 9 therefore makes it an offence to plant or otherwise cause these species to grow in the wild.

How is the legislation pertaining to invasive plants liable to affect development works?

Although it is not an offence to have these plants on your land *per se*, it is an offence to *cause* these species to grow in the wild. Therefore, if they are present on site and development activities (for example movement of spoil, disposal of cut waste or vehicular movements) have the potential to cause the further spread of these species to new areas, it will be necessary to ensure appropriate measures are in place to prevent this happening prior to the commencement of works.

Plants: Injurious Weeds

Under the Weeds Act 1959 any land owner or occupier may be required prevent the spread of certain 'injurious weeds' such as spear thistle *Cirsium vulgare*, creeping thistle *Cirsium arvense*, curled dock *Rumex crispus*, broad-leaved dock *Rumex obtusifolius*, and common ragwort *Senecio jacobaea*. It is a criminal offence to fail to comply with a notice requiring such action to be taken. The Ragwort Control Act 2003 establishes a ragwort control code of practice as common ragwort is poisonous to horses and other livestock. This code provides best practice guidelines and is not legally binding.

B NATIONAL AND EUROPEAN LEGISLATION AFFORDED TO HABITATS

Statutory Designations: National

Nationally important areas of special scientific interest, by reason of their flora, fauna, or geological or physiographical features, are notified by the countryside agencies as statutory Sites of Special Scientific Interest (SSSIs) under the National Parks and Access to the Countryside Act 1949 and latterly the Wildlife & Countryside Act 1981 (as amended). As well as underpinning other national designations (such as National Nature Reserves which are declared by the countryside agencies under the same legislation), the system also provides statutory protection for terrestrial and coastal sites which are important within a European context (Natura 2000 network) and globally (such as Wetlands of International Importance). See subsequent sections for details of these designations. Improved provisions for the protection and management of SSSIs have been introduced by the Countryside and Rights of Way Act 2000 (in England and Wales) and the Nature Conservation (Scotland) Act 2004.

The Wildlife & Countryside Act 1981 (as amended) also provides for the making of Limestone Pavement Orders, which prohibit the disturbance and removal of limestone from such designated areas, and the designation of Marine Nature Reserves, for which byelaws must be made to protect them.

Statutory Designations: International

Special Protection Areas (SPAs), together with Special Areas of Conservation (SACs) form the Natura 2000 network. The Government is obliged to identify and classify SPAs under the EC Birds Directive (Council Directive 2009/147/EC (formerly 79/409/EEC)) on the Conservation of Wild Birds). SPAs are areas of the most important habitat for rare (listed on Annex I of the Directive) and migratory birds within the European Union. Protection afforded SPAs in terrestrial areas and territorial marine waters out to 12 nautical miles (nm) is given by The

Conservation of Habitats & Species Regulations 2010 (as amended). The Offshore Marine Conservation (Natural Habitats, &c.) Regulations 2007 (as amended) provide a mechanism for the designation and protection of SPAs in UK offshore waters (from 12-200 nm).

The Government is obliged to identify and designate SACs under the EC Habitats Directive (Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora). These are areas which have been identified as best representing the range and variety of habitats and (non-bird) species listed on Annexes I and II to the Directive within the European Union. SACs in terrestrial areas and territorial marine waters out to 12 nautical miles are protected under The Conservation of Habitats & Species Regulations 2010 (as amended). The Offshore Marine Conservation (Natural Habitats, &c.) Regulations 2007 (as amended) provide a mechanism for the designation and protection of SACs in UK offshore waters (from 12-200 nm).

Ramsar sites are designated under the Convention on Wetlands of International Importance, agreed in Ramsar, Iran, in 1971. The Convention covers all aspects of wetland conservation and wise use, in particular recognizing wetlands as ecosystems that are globally important for biodiversity conservation. Wetlands can include areas of marsh, fen, peatland or water and may be natural or artificial, permanent or temporary. Wetlands may also incorporate riparian and coastal zones adjacent to the wetlands. Ramsar sites are underpinned through prior notification as Sites of Special Scientific Interest (SSSIs) and as such receive statutory protection under the Wildlife & Countryside Act 1981 (as amended) with further protection provided by the Countryside and Rights of Way (CRoW) Act 2000. Policy statements have been issued by the Government in England and Wales highlighting the special status of Ramsar sites. This effectively extends the level of protection to that afforded to sites which have been designated under the EC Birds and Habitats Directives as part of the Natura 2000 network (e.g. SACs & SPAs).

Statutory Designations: Local

Under the National Parks and Access to the Countryside Act 1949 Local Nature Reserves (LNRs) may be declared by local authorities after consultation with the relevant countryside agency. LNRs are declared for sites holding special wildlife or geological interest at a local level and are managed for nature conservation, and provide opportunities for research and education and enjoyment of nature.

Non-Statutory Designations

Areas considered to be of local conservation interest may be designated by local authorities as a Wildlife Site, under a variety of names such as County Wildlife Sites (CWS), Listed Wildlife Sites (LWS), Local Nature Conservation Sites (LNCS), Sites of Biological Importance (SBIs), Sites of Importance for Nature Conservation (SINCs), or Sites of Nature Conservation Importance (SNCIs). The criteria for designation may vary between counties.

Together with the statutory designations, these are defined in local and structure plans under the Town and Country Planning system and are a material consideration when planning applications are being determined. The level of protection afforded to these sites through local planning policies and development frameworks may vary between counties.

Regionally Important Geological and Geomorphological Sites (RIGS) are the most important places for geology and geomorphology outside land holding statutory designations such as SSSIs. Locally-developed criteria are used to select these sites, according to their value for education, scientific study, historical significance or aesthetic qualities. As with local Wildlife Sites, RIGS are a material consideration when planning applications are being determined.

C NATIONAL PLANNING POLICY

National Planning Policy Framework

The National Planning Policy Framework replaced PPS9 and emphasises the need for sustainable development. The Framework specifies the need for protection of designated sites and priority habitats and priority species. An emphasis is also made for the need for ecological networks via preservation, restoration and re-creation. The protection and recovery of priority species – presumably those listed as UK Biodiversity Action Plan priority species – is also listed as a requirement of planning policy. In determining planning application, planning authorities should aim to conserve and enhance biodiversity by ensuring that: designated sites are protected from adverse harm; there is appropriate mitigation or compensation where significant harm cannot be avoided; opportunities to incorporate biodiversity in and around developments are encouraged; planning permission is refused for development resulting in the loss or deterioration of irreplaceable habitats including aged or veteran trees and also ancient woodland.

The Natural Environment and Rural Communities Act 2006 and The Biodiversity Duty

The Natural Environment and Rural Communities (NERC) Act came into force on 1st October 2006. Section 40 of the Act requires all public bodies to have regard to biodiversity conservation when carrying out their functions. This is commonly referred to as the 'biodiversity duty'.

Section 41 of the Act (Section 42 in Wales) requires the Secretary of State to publish a list of habitats and species which are of 'principal importance for the conservation of biodiversity.' This list is intended to assist decision makers such as public bodies in implementing their duty under Section 40 of the Act. Under the Act these habitats and species are regarded as a material consideration in determining planning applications. A developer must show that their protection has been adequately addressed within a development proposal.

D REGIONAL AND LOCAL PLANNING POLICY

The Camden Core Strategy 2010-2025

CS15 - Protecting and improving our parks and open spaces and encouraging biodiversity

The Council will protect and improve Camden's parks and open spaces. We will:

a) protect open spaces designated in the open space schedule as shown on the proposals map, including our Metropolitan Open Land, and other suitable land of 400sqm or more on large estates with the potential to be used as open space;

b) tackle deficiencies and under-provision and meet increased demand for open space by:

- providing additional open space at King's Cross;

- securing additional on-site public open space in the growth areas of Euston, West Hampstead Interchange, Holborn and Tottenham Court Road, and other parts of Central London. Where the provision of on-site public open space is not practical on a particular site in these areas, the Council will require a contribution to the provision of additional public open space on identified sites in the vicinity. If it can be demonstrated to the Council's satisfaction that no such suitable sites are available, we will require improvements to other open spaces in the area;

- securing improvements to publicly accessible open land on the Council's housing estates; and

- securing other opportunities for additional public open space.

c) secure from developments that create an additional demand for public open space, where opportunities arise, improvements to open spaces, including to:
   - the facilities provided, such as play and sports facilities;
   - access arrangements; and
   - the connections between spaces.

The Council will protect and improve sites of nature conservation and biodiversity, in particular habitats and biodiversity identified in the Camden and London Biodiversity Plans in the borough by:

d) designating existing nature conservation sites;
e) protecting other green areas with nature conservation value, including gardens, where possible;
f) seeking to improve opportunities to experience nature, in particular in South and West Hampstead, Kentish Town and central London, where such opportunities are lacking;
g) expecting the provision of new or enhanced habitat, where possible, including through biodiverse green or brown roofs and green walls;
h) identifying habitat corridors and securing biodiversity improvements along gaps in habitat corridors;
i) working with The Royal Parks, the London Wildlife Trust, friends of parks groups and local nature conservation groups to protect and improve open spaces and nature conservation in Camden;
j) protecting trees and promoting the provision of new trees and vegetation, including additional street trees.

The Council will preserve and enhance the historic, open space and nature conservation importance of Hampstead Heath and its surrounding area by:

k) working with the City of London, English Heritage and Natural England to manage and improve the Heath and its surrounding areas;
l) protecting the Metropolitan Open Land, public and private open space and the nature conservation designations of sites;
m) seeking to extend the public open space when possible and appropriate;
n) taking into account the impact on the Heath when considering relevant planning applications;
o) protecting views from Hampstead Heath and views across the Heath and its surrounding area;
p) improving the biodiversity of, and habitats in, Hampstead Heath and its surrounding area, where opportunities arise.

The Council will preserve and enhance the Regent's Canal by:

q) balancing the differing demands on the Canal, its towpath and adjoining land;
r) implementing opportunities to make the Canal a safer place;
s) applying the guidance in the Regent's Canal Conservation Area Management Strategy;
t) implementing opportunities to provide additional nature conservation areas and improve the role of the Canal and its adjoining land as a habitat corridor (green chain);
u) working with British Waterways, Natural England, other land owners/developers, users and the local community to improve the Canal and towpath.

The Fitzrovia Area Action Plan (2014)

Principle 2 - Public open space

The Council will expect development in Fitzrovia that increases the use of open space to provide new on-site public open space. Where on-site provision is not practical, public open space should be provided on an identified site in the vicinity. The Council will implement a range of proposals set out in this Plan to increase and enhance the availability of public open space in Fitzrovia, with particular priority given to green spaces and recreation space for older children.

The London Plan (2011 – Revised 2013)

POLICY 2.18 GREEN INFRASTRUCTURE: THE NETWORK OF OPEN AND GREEN SPACES

Strategic

A The Mayor will work with all relevant strategic partners to protect, promote, expand and manage the extent and quality of, and access to, London's network of green infrastructure. This multifunctional network will secure benefits including, but not limited to, biodiversity; natural and historic landscapes; culture; building a sense of place; the economy; sport; recreation; local food production; mitigating and adapting to climate change; water management; and the social benefits that promote individual and community health and well-being.

B The Mayor will pursue the delivery of green infrastructure by working in partnership with all relevant bodies, including across London's boundaries, as with the Green Arc Partnerships and Lee Valley Regional Park Authority. The Mayor has published supplementary guidance on the All London Green Grid to set out the strategic objectives and priorities for green infrastructure across London.

C In areas of deficiency for regional and metropolitan parks, opportunities for the creation of green infrastructure to meet this deficiency should be identified and their implementation should be supported, such as in the Wandle Valley Regional Park.

Planning decisions

D Enhancements to London's green infrastructure should be sought from development and where a proposal falls within a regional or metropolitan park deficiency area (broadly corresponding to the areas identified as "regional park opportunities" on Map 2.8), it should contribute to addressing this need.

E Development proposals should:

a incorporate appropriate elements of green infrastructure that are integrated into the wider network

b encourage the linkage of green infrastructure including the Blue Ribbon Network, to the wider public realm to improve accessibility for all and develop new links, utilising green chains, street trees, and other components of urban greening (Policy 5.10).

LDF preparation

F Boroughs should:

a follow the guidance in NPPF paragraphs 73 and 74 and undertake audits of all forms of green and open space and assessments of need. These should be both qualitative and quantitative, and have regard to the cross-borough nature and use of many of these open spaces

b produce open space strategies that cover all forms of open space and the interrelationship between these spaces. These should identify priorities for addressing deficiencies and should set out positive measures for the management of green and open space. These strategies and their action plans need to be kept under review. Delivery of local biodiversity action plans should be linked to open space strategies.

c ensure that in and through DPD policies, green infrastructure needs are planned and managed to realise the current and potential value of open space to communities and to support delivery of the widest range of linked environmental and social benefits

d In London's urban fringe support, through appropriate initiatives, the Green Arc vision of creating and protecting an extensive and valued recreational landscape of well-connected and accessible countryside around London for both people and for wildlife.

POLICY 5.11 GREEN ROOFS AND DEVELOPMENT SITE ENVIRONS

Planning decisions

A Major development proposals should be designed to include roof, wall and site planting, especially green roofs and walls where feasible, to deliver as many of the following objectives as possible:

a adaptation to climate change (ie aiding cooling)
b sustainable urban drainage
c mitigation of climate change (ie aiding energy efficiency)
d enhancement of biodiversity
e accessible roof space
f improvements to appearance and resilience of the building
g growing food.

LDF preparation

B Within LDFs boroughs may wish to develop more detailed policies and proposals to support the development of green roofs and the greening of development sites. Boroughs should also promote the use of green roofs in smaller developments, renovations and extensions where feasible.

POLICY 5.13 SUSTAINABLE DRAINAGE

Planning decisions

A Development should utilise sustainable urban drainage systems (SUDS) unless there are practical reasons for not doing so, and should aim to achieve greenfield run-off rates and ensure that surface water run-off is managed as close to its source as possible in line with the following drainage hierarchy:

1 store rainwater for later use
2 use infiltration techniques, such as porous surfaces in non-clay areas
3 attenuate rainwater in ponds or open water features for gradual release
4 attenuate rainwater by storing in tanks or sealed water features for gradual release
5 discharge rainwater direct to a watercourse
6 discharge rainwater to a surface water sewer/drain
7 discharge rainwater to the combined sewer.

Drainage should be designed and implemented in ways that deliver other policy objectives of this Plan, including water use efficiency and quality, biodiversity, amenity and recreation.

LDF preparation

B Within LDFs boroughs should, in line with the Flood and Water Management Act 2010, utilise Surface Water Management Plans to identify areas where there are particular surface water management issues and develop actions and policy approaches aimed at reducing these risks.

POLICY 7.19 BIODIVERSITY AND ACCESS TO NATURE

Strategic

A The Mayor will work with all relevant partners to ensure a proactive approach to the protection, enhancement, creation, promotion and management of biodiversity in support of the Mayor's Biodiversity Strategy. This means planning for nature from the beginning of the development process and taking opportunities for positive gains for nature through the layout, design and materials of development proposals and appropriate biodiversity action plans.

B Any proposals promoted or brought forward by the London Plan will not adversely affect the integrity of any European site of nature conservation importance (to include special areas of conservation (SACs), special protection areas (SPAs), Ramsar, proposed and candidate sites) either alone or in combination with other plans and projects. Whilst all development proposals must address this policy, it is of particular importance when considering the following policies within the London Plan: 1.1, 2.1-2.17, 3.1, 3.3, 5.14, 5.15, 5.17, 5.20, 6.3, 7.14, 7.15, 7.25 and 7.26. Whilst all opportunity and intensification areas must address the policy in general, specific locations requiring consideration are referenced in Annex 1.

Planning decisions

C Development Proposals should:

a wherever possible, make a positive contribution to the protection, enhancement, creation and management of biodiversity

b prioritise assisting in achieving targets in biodiversity action plans (BAPs), set out in Table 7.3, and/or improving access to nature in areas deficient in accessible wildlife sites

c not adversely effect the integrity of European sites and be resisted where they have significant adverse impact on European or nationally designated sites or on the population or conservation status of a protected species or a priority species or habitat identified in a UK, London or appropriate regional BAP or borough BAP.

D On Sites of Importance for Nature Conservation development proposals should:

a give the highest protection to sites with existing or proposed international designations17 (SACs, SPAs, Ramsar sites) and national designations18 (SSSIs, NNRs) in line with the relevant EU and UK guidance and regulations

b give strong protection to sites of metropolitan importance for nature conservation (SMIs). These are sites jointly identified by the Mayor and boroughs as having strategic nature conservation importance

c give sites of borough and local importance for nature conservation the level of protection commensurate with their importance.

E When considering proposals that would affect directly, indirectly or cumulatively a site of recognised nature conservation interest, the following hierarchy will apply:

1 avoid adverse impact to the biodiversity interest

2 minimize impact and seek mitigation

3 only in exceptional cases where the benefits of the proposal clearly outweigh the biodiversity impacts, seek appropriate compensation.

LDF preparation

F In their LDFs, Boroughs should:

a use the procedures in the Mayor's Biodiversity Strategy to identify and secure the appropriate management of sites of borough and local importance for nature conservation in consultation with the London Wildlife Sites Board.

b identify areas deficient in accessible wildlife sites and seek opportunities to address them

c include policies and proposals for the protection of protected/priority species and habitats and the enhancement of their populations and their extent via appropriate BAP targets

d ensure sites of European or National Nature Conservation Importance are clearly identified.

e identify and protect and enhance corridors of movement, such as green corridors, that are of strategic importance in enabling species to colonise, re-colonise and move between sites

E BIODIVERSITY ACTION PLANs (BAPs)

The UK BAP was published in 1994 to comply with obligations under the Convention on Biological Diversity (The Biodiversity Treaty, 1992). It described the UK's biological resources and committed to developing detailed plans to conserve these recourses i.e. Habitat Action Plans and Species Action Plans. The most up to date targets and actions, including latest

[17] Designated under European Union Council Directive on the conservation of wild birds (79/409/EEC) 1992, European Union Council Directive on the conservation of natural habitats and of wild fauna and flora (92/43/EEC) 1992 and Ramsar Convention on wetlands of international importance especially as waterfowl habitat 1971

[18] Designated under the Wildlife and Countryside Act 1981 as amended by the Countryside Rights of Way Act 2000

progress reports, for UK HAPs and SAPs can be viewed on the DEFRA website[19]. Running parallel to this, Local Planning Authorities (LPAs) promoted habitat and species conservation at a county and district/borough level through their development of Local BAPs (LBAPs).

Since the publication of these BAPs, new strategies and frameworks have resulted in the devolvement of biodiversity issues and changes in the terminology used to describe these habitats and species in England. This has been brought about through the replacement of the previous England Biodiversity Strategy with *Biodiversity 2020: A Strategy For England's Wildlife and Ecosystem Services* (2011) and the replacement of the UK BAP itself with the *UK Post-2010 Biodiversity Framework* (2012).

All previous UK BAP species and habitats are still of material consideration in the planning process but are now referred to as Habitats and Species of Principal Importance for the Conservation of Biodiversity in England as listed in Section 41 of the Natural Environment and Rural Communities (NERC) Act 2006. The promotion of priority habitats and species in LBAPs are also of material consideration in the planning process.

The London BAP is delivered by the London Biodiversity Partnership for important habitats and species within the Greater London area. For more details on the London BAP visit http://www.lbp.org.uk/index.htm.

[19] DEFRA website http://ukbars.defra.gov.uk/plans/national.asp?S=&L=1&O=&SAP=&HAP=&submitted=1&flipLang=&txtLogout

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London - Beckett House, 72 Borough High Street, London SE1 1XF T. 020 7378 1914 W. www.ecologyconsultancy.co.uk

- **Sussex** - The Old Dairy, Barcombe Mills Road, Lewes, East Sussex BN8 5FF **T.** 01273 813739
- **Norfolk** - Thorpe House, 79 Thorpe Road, Norwich NR1 1UA **T.** 01603 628408
- **Scotland** - Suite 10, 3 Coates Place, Edinburgh EH3 7AA **T.** 0131 225 8610