LONDON BOROUGH OF CAMDEN

CENTRAL SOMERS TOWN, BLOCKS 5 AND 6

UPDATE TO ENERGY AND SUSTAINABILITY STRATEGY

Revision 01, issued 06 September 2022

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1.0 INTRODUCTION

FLOH Consulting Ltd. has been appointed by London Borough of Camden to prepare this note considering the energy and sustainability strategy at RIBA Stage 2, to support the planning submission for proposed blocks 5 and 6 at Central Somers Town, London.

1.1 The project

Includes the development of two adjacent blocks, referred to as block 5 and block 6, which combined will provide a total of 34 social rent homes for residents of Camden.

Accessed by Purchese Street to the west, the site is bound by Hampden Close to the north and Brill Place to the south.

1.2 Background

This project is part of Camden's regeneration scheme to provide quality, energy efficient and affordable houses within the borough. The original Somers Town scheme was considered in 2015 when a masterplan sustainability and energy statement[1], prepared by Messrs Atelier Ten, was submitted for planning approval.

A specific sustainability statement[2] prepared by Messrs Max Fordham was also prepared, which considered blocks 2, 5 and 6.

Whilst some parts of the development have since been developed, blocks 5 and 6 have not. It is thus necessary to prepare updated documentation to support the current approach.

This document should be read in conjunction with the RIBA Stage 2 report[3] also authored by FLOH Consulting Ltd.

1.3 Aims and objectives

Are to:

- Review and comment on applicable sustainability objectives associated with updated scheme.
- Undertake water efficiency calculation to demonstrate principles of extant scheme remain.
- Undertake sample modelling to predict overheating risk.
- Investigate and resolve issues associated with carbon compliance.
- Demonstrate likely energy and carbon performance of updated scheme compared to extant scheme.

1.4 Structure

This document has been structured in accordance with the previous aforementioned site specific sustainability statement for blocks 5 and 6 to provide a commentary on the updated scheme.

1.5 Disclaimer

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[1] Central Somers Town CIP, Masterplan Sustainability & Energy Statement, Revision 02, 14 December 2015, Atelier Ten
[2] Polygon Open Space Residential, Central Somers Town Plots 2, 5 and 6 Housing – Sustainability Statement for Planning Submission, Rev D Issue, 04 December 2015, Max Fordham LLP
[3] Central Somers Town, RIBA Stage 2 report, Revision 01, 01 June 2022, FLOH Consulting Ltd.

1.6 Terms of reference

Are generally included as footnotes within the body of the document.

1.7 Glossary of terms

CT	Constant temperature
DHWS	Domestic hot water service
DN	Nominal standard pipe diameter
DPCV	Differential pressure control valve
FLOH	FLOH Consulting Limited
HIU	Heat interface unit
HN	Heat network
IDNO	Independent distribution network operator (electrical)
IV	Isolation valve
LPHW	Low pressure hot water
LV	Low voltage electrical supply
PRV	Pressure reducing valve
PHX	Plate heat exchanger
VT	Variable temperature
ER	Employment Requirements

2.0 SUSTAINABILITY STRATEGY

2.1 Water efficiency

2.1.1 Water efficiency calculation

A revised water efficiency calculation demonstrating how the targeted 105 litres per person per day has been undertaken and is included in appendix A.

2.1.2 Water re use and harvesting

Water recycling had been discounted on cost grounds.

However, considering the commitment in the masterplan sustainability and energy statement for 50% of water to be used for 'WC flushing, washing machines and vehicle washing' to be from 'rainwater and/or greywater recycling', such application has been explored further.

Condition 39 of the planning consent states that:

Prior to implementation of the relevant part of the development full details of rainwater recycling proposals for Plots 5 and 6 shall be submitted to the local planning authority and approved in writing. The development shall thereafter be constructed in accordance with the approved details.

Whilst subject to design development, a potential approach to incorporating such water recycling strategies could be to incorporate a below ground collection chamber externally beneath the ramp between blocks 5 and 6.

An approximate storage volume of 10,000 litres is anticipated. Additional treatment and filtration plant would also be required, which could also be accommodated in adjacent plant space beneath the ramp.

To supplement fixed water recycling systems, provision of local water butts to ground floor dwellings and community centre will be explored.

2.2 Surface water run off

Reference to updated documentation by wider team as applicable should be made for further information.

2.3 Materials

Reference to updated documentation by wider team as applicable should be made for further information.

2.4 Waste

Reference to updated documentation by wider team as applicable should be made for further information.

2.5 Air pollution

Reference to updated documentation by wider team as applicable should be made for further information.

2.6 Light pollution

The approach outlined in the extant scheme remains, such that the design will be in accordance with ILE Guidance Notes for the Reduction of Obtrusive Light assuming the site and be E3 category.

2.7 Noise pollution

Reference to updated documentation by wider team as applicable should be made for further information.

2.8 Health and wellbeing

Reference to updated documentation by wider team as applicable should be made for further information.

2.9 Daylighting

Proposals rely on the assessment undertaken in the extant scheme therefore further daylighting analysis has not been undertaken.

2.10 Overheating

A CIBSE TM52[4] assessment was previously undertaken for the extant scheme which is a method primarily applied to non-domestic buildings. In 2017, CIBSE published TM59[5], which considers domestic applications specifically.

As such a revised CIBSE TM59 assessment has been undertaken, reported herein.

2.10.1 Overview

Mitigation of overheating risk is a key design consideration in thermally high performing structures. Measures to mitigate overheating risk must be considered through design development to ensure positive effects of solar gain are maximised whilst overheating is limited.

2.10.2 Assessment criteria

Dwellings are predominantly naturally ventilated therefore the following criteria apply:

a. For living rooms, kitchens and bedrooms: the number of hours during which DT is greater than or equal to one degree (K) during the period May to September inclusive shall not be more than 3 per cent of occupied hours. (CIBSE TM52 Criterion 1: Hours of exceedance).

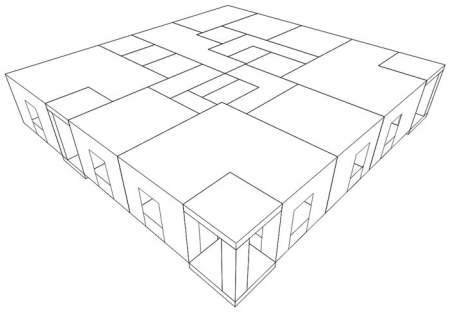
b. For bedrooms only: to guarantee comfort during the sleeping hours the operative temperature in the bedroom from 10 pm to 7 am shall not exceed 26 °C for more than 1% of annual hours.

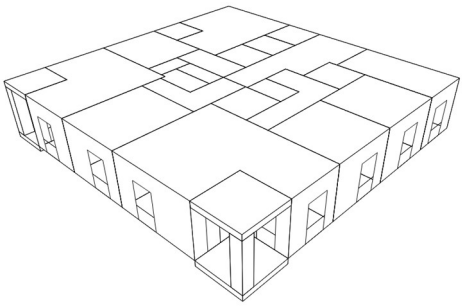
2.10.3 Baseline case

A computational model of a typical floor of the building has been generated using the IES Virtual Environment 2021 suite.

Model geometry and window configurations have been based on the Levitt Bernstein (LB) scheme. Sample model images are included below.

Figure 2-1: Model geometry, facing south west (left) and facing south east (right)





[4] CIBSE TM52: The limits of thermal comfort: avoiding overheating in European buildings, Chartered Institution of Building Services Engineers, 2013

[5] CIBSE TM59: Methodology for the overheating assessment in homes, Chartered Institution of Building Services Engineers, 2017

2.10.4 Input information

A summary of input information is provided below:

- Building fabric – refer to the later energy strategy section for a summary of target fabric standards.
- Internal gains profiles - gain profiles such as occupancy, equipment and lighting follow that set out in CIBSE TM59.
- Air exchanges - continuous mechanical ventilation with heat recovery is proposed for all dwellings.

2.10.5 Window openings

Windows at ground floor have been assumed closed overnight (22:00 – 07:00), as would be expected in practice given the potential security risk.

Previous air quality and noise assessments associated with the extant scheme have been reviewed and neither stipulate requirements for windows to be closed.

2.10.6 Blinds

Although internal blinds and curtains as well as foliage, such as tree cover, can provide some reduction in solar gains, they have not been taken into account since neither are deemed fixed means of shading.

External blinds however are deemed permissible since they constitute part of the base build and as such remain a fixed means of shading.

2.10.7 Weather file

As stipulated in CIBSE TM59, the model has been assessed against current Design Summer Year information, DSY1. Specifically, the Heathrow DSY has been assigned since it is considered most appropriate to the proposed site location, in terms of density and surroundings.

2.10.8 Summary of model iterations

Sample modelling has been undertaken based on the following:

- TM101A - Excluding blinds to all windows & doors, all openable windows & doors closed, standard MVHR rates, G-value 0.6. [WINDOWS CLOSED].
- TM102A - Excluding blinds to all windows & doors, all openable windows & doors open 20% >22 deg.C, standard MVHR rates, G-value 0.6. [WINDOWS OPEN].
- TM103A - Excluding blinds to all windows & doors, all openable windows & doors open 25% >22 deg.C, standard MVHR rates, G-value 0.6. [INCREASED WINDOW OPENINGS].

2.10.9 Results

The following tables present results for the ‘baseline’ case (TM101A) with windows closed, with separate tables for criterion A and B of the assessment.

Additional columns present performance of the equivalent assessment with windows open to different extents.

Table 2.1: Summary of performance for TM59 criterion A

Room	TM 101A		TM 102A		TM 103A	
	TM52 criteria failing	TM59 status	TM52 criteria failing	TM59 status	TM52 criteria failing	CIBSE TM59 status
04_B5_B18_2B4P_BEDROOM 01	1 & 2 & 3	Fail	2	Pass	2	Pass
04_B5_B18_2B4P_BEDROOM 02	1 & 2 & 3	Fail	2	Pass	2	Pass
04_B5_B18_2B4P_LIVING DINING KITCHEN	1 & 2 & 3	Fail	2	Pass	2	Pass
04_B5_B19_1B2P_BEDROOM	1 & 2 & 3	Fail	2	Pass	2	Pass
04_B5_B19_1B2P_LIVING DINING KITCHEN	1 & 2 & 3	Fail	2	Pass	2	Pass
04_B5_B20_1B2P_BEDROOM	1 & 2 & 3	Fail	2	Pass	2	Pass
04_B5_B20_1B2P_LIVING DINING KITCHEN	1 & 2 & 3	Fail	1&2	Fail	2	Pass

Table 2.2: Summary of performance for TM59 criterion B

Room	TM 101A	TM 102A	TM 103A
	TM59 status	TM59 status	TM59 status
04_B5_B18_2B4P_BEDROOM 01	Fail	Pass	Pass
04_B5_B18_2B4P_BEDROOM 02	Fail	Pass	Pass
04_B5_B19_1B2P_BEDROOM	Fail	Pass	Pass
04_B5_B20_1B2P_BEDROOM	Fail	Pass	Pass

Note that original planning permission included a requirement that some east and west facing dwellings had predominantly closed windows to address overlooking issues.

A detail has been developed by the architect to have openable vents in subject spaces where this constraint is imposed.

A sample dwelling has been modelled to demonstrate likely overheating performance with windows closed but incorporating the proposed openable vent and results are as follows:

Table 2.3: TM59 criterion A performance for sample dwelling with openable vent

Room	Windows closed, no openable vent		Vent openable to 50% free area		Vent openable to 100% free area	
	TM52 criteria failing	TM59 status	TM52 criteria failing	TM59 status	TM52 criteria failing	CIBSE TM59 status
02_B5_B11_1B2P_BEDROOM 01	2	Pass	2	Pass	2	Pass
02_B5_B11_1B2P_BEDROOM 02	2	Pass	2	Pass	2	Pass
02_B5_B11_1B2P_LIVING DINING KITCHEN	2	Pass	2	Pass	2	Pass

Table 2.4: TM59 criterion A performance for sample dwelling with openable vent

Room	TM59 status	TM59 status	TM59 status
02_B5_B11_1B2P_BEDROOM 01	Fail	Pass	Pass
02_B5_B11_1B2P_BEDROOM 02	Fail	Pass	Pass

2.10.10 Discussion

Preliminary analysis has indicated that a reasonable level of performance can be achieved with the scheme as designed, with compliance with TM59 criteria being possible without significant intervention.

Natural ventilation to mitigate risk of overheating in dwellings where additional constraints to window openings are imposed can be provided via openable vent.

This analysis has only looked at sample parts of the building and has assumed that windows can be opened for general ventilation. It must be repeated for all parts and on the basis of acoustic and air quality requirements at the next design stage.

2.11 Management

Reference to updated documentation by wider team as applicable should be made for further information.

2.12 Ecology and land use

Reference to updated documentation by wider team as applicable should be made for further information.

2.13 Transport

Reference to updated documentation by wider team as applicable should be made for further information.

2.14 Sustainability benchmarking – Home Quality Mark

The Home Quality Mark (HQM) is a third-party assessment and certification scheme used to demonstrates best practice standards in terms of holistic design aspects associated with the design, specification and construction of new homes. Such aspects include.

Standards are significantly above those required by regulations alone, but do not address specific performance in vital areas like energy demand. Notwithstanding this, HQM certification provides reliable and robust confirmation of quality homes and assesses performance of the financial, wellbeing, environmental and social issues associated with new homes.

It is not Camden Policy for HQM to be achieved however a number of design principles already incorporated into the scheme are aligned with HQM requirements, so there is scope to consider further during later design stages.

3.0 ENERGY STRATEGY

Consideration is given here to the application of the energy hierarchy, which is to:

- Be Lean – reduce demand as far as possible through fabric and servicing improvements.
- Be Clean – exploit local energy resources, supply energy efficiently and cleanly by connecting to district heating networks.
- Be Green – Apply renewable energy technologies to generate, store and use renewable energy on site.

3.1 Building fabric

3.1.1 Principles

A fabric first approach will be adopted to minimise energy demand before the application of efficient and renewable energy technologies.

3.1.2 Target fabric standards

Fabric standards from Table 1.1 of Building Regulations Approved Document L1 (ADL1)[6] are used by the notional model. These are better than minimum values and will need to be improved upon to achieve compliance. The notional model standards and the improved standards, likely for this project, are set out below.

Table 3.1: Target fabric standards

Element	ADL1 Notional	Likely improved fabric standards
Floor	0.13 W/m^{2}K	0.11 W/m^{2}K
Wall	0.18 W/m^{2}K	0.17 W/m^{2}K
Roof	0.11 W/m^{2}K	0.11 W/m^{2}K
Window	U value 1.20 W/m^{2}K, g value 0.68	U value 1.10 W/m^{2}K, g value 0.60
Door	1.60 W/m^{2}K	1.60 W/m^{2}K
Air permeability	5.0 m^3/hr.m^2 @ 50Pa	5.0 m^3/hr.m^2 @ 50Pa

Note - In the extant scheme, very high fabric performance standards were stated, beyond that of Passivhaus. Whilst effective in reducing space heating energy demand, such an approach increases the likelihood and severity of overheating risk. Further, the delivery of such high fabric standards in practice carries cost, complexity and buildability issues which can be avoided by adopting a more pragmatic approach.

3.2 Thermal bridging

Thermal bridges occur when an area of a building has significantly higher heat transfer than the surrounding parts. Breaks in insulation, reduced insulation or more conductive materials can contribute to thermal bridge effects.

In accordance with ADL, thermal bridges should be assessed in a new dwelling using one of the following methods.

a. Use construction joint details calculated by a suitably competent person following the guidance in the Building Research Establishment's BR 497 and the temperature factors set out in the Building Research Establishment's Information Paper 1/06.

[6] The Building Regulations 2010, Conservation of fuel and power, Approved document L, Volume 1: Dwellings, 2021 edition

b. Use junction details from a reputable non-government database containing independently assessed thermal junction details, such as Local Authority Building Control's Construction Details library.

c. Use the values in the Standard Assessment Procedure[7], Table K1. A mixture of known and default values may be used.

d. Use a default y-value of 0.20W/(m^2.K).

3.3 Mechanical ventilation

The approach outlined in the extant scheme remains, such that continuous mechanical ventilation systems with heat recovery will be proposed in each dwelling.

3.4 Decentralised energy networks

When it was first conceived it was intended that the development would be connected to the Somers Town Heat Network. This remains the case as London Bough of Camden has invested significantly in the development of the network and as it is within proximity of the development.

Gas fired boiler plant serves the network, located in the energy centre on Purchese Street. Heat network pipelines route alongside the proposed site, serving various buildings in the vicinity.

A connection to this network, via duty standby plate heat exchangers located in a dedicated plant room in block 5, is proposed for the generation of thermal energy to serve space heating and hot water systems throughout both blocks.

Whilst it is understood that the heat network was originally configured to serve blocks 5 and 6, more detailed discussions with Vital Energy are ongoing to confirm available capacity and agree a final point of connection.

3.5 Renewable technology

In accordance with previous assessment undertaken for the extant scheme, PV arrays will be provided to each roofscape. These will be optimised for yield but also to meet the carbon performance requirements, discussed later in this document.

PV installations will incorporate inverters and a connection to the switchgear with suitable switching, earthing and metering arrangement.

Given the homes being delivered will be council owned, it may be possible to adopt a separate metering and billing arrangement and use a common approach to electrical generation and use. This will be discussed further with LBC on design development.

3.6 Carbon emissions assessment

A carbon emissions assessment has been prepared to analyse the proposed approach to envelope performance and thermal energy generation.

3.6.1 SAP methodology

To demonstrate compliance with ADL1, the Government's Standard Assessment Procedure (SAP) must be followed to calculate the performance of the 'actual' dwelling and compare it to a theoretical 'notional dwelling'.

3.6.2 Extant scheme

Carbon performance of the extant scheme was assessed against SAP 2012 therefore assessments using SAP 2012 have been undertaken to align with this.

[7] The Government's Standard Assessment Procedure for Energy Rating of Dwellings , Version 10.2, Published on behalf of BEIS by BRE Garston , April 2022

3.6.3 Representative typologies

A representative dwelling assessment, reflecting architectural proposals throughout blocks 5 and 6, has been undertaken, which will be used as a basis for comparing fabric standards and system types to inform the planning process and subsequent design development.

3.6.4 Fabric performance

Target fabric standards set out in table 3.1 have been used in the assessment.

3.6.5 Thermal energy generation

Much has changed in the arena of fuel use and carbon emissions in the intervening period since earlier carbon assessments. Whilst the design standards for heat networks have been increased significantly, carbon emission factors of fuels have also changed significantly, alongside tightening of the Building Regulations, and electrically driven approaches are now favourable.

Notwithstanding this, the Government, and indeed London Policy, remains committed to heat networks and they remain central to overall carbon reduction policy. It is acknowledged that heat networks present an opportunity for carbon reduction at scale and that existing heat networks can be decarbonised through their life.

This is acknowledged under clause 1.7 of the recently published ADL1 which states that where dwellings are connected to an existing heat network, the primary energy rate and emission rate in the notional dwelling can be adjusted to match those of the existing network.

Unfortunately, in SAP 2012 it is not possible to make such a change in the software therefore to normalise, iterations have been run using gas fired boilers since this will then be equivalent between both the notional and the actual dwellings.

As such, it has not been possible to assess measures at the 'Be Clean' stage of the energy hierarchy. This will be further refined during subsequent design stages.

3.6.6 Input information

An overview of input information is set out in the following table:

Table 3.2: Summary of SAP input information

Element	Local
Ventilation	Whole house heat recovery ventilation
Lighting	100% low energy lighting
Space heating	Local gas fired boiler (to allow permissible normalisation of emissions)
Heat emitters	Radiators
Heating controls	[CHF] Programmer and at least two room thermostats
Water heating	HIU
Showers and baths	1 bath and a shower with a flow rate at 8 l/min via main water heating system

3.6.7 Thermal bridging

Initially, option 'c' (K1 figures as described in section 3.3) will be used , however it should be noted that these figures are stated within the SAP documentation as conservative defaults and are unlikely to demonstrate compliance. Further iterations will use SAP Appendix R2 values.

3.6.8 PV

A 34kWp PV array has been applied across both blocks, based on an allocation of a 1kWp system per dwelling. The anticipated total roof area required for such a system is in the order of 221m^2 which would be apportioned across the roof of each block.

3.6.9 Proposed iterations

Each using a gas boiler under allowed rules to normalise emissions for existing heat network, are:

- A baseline case, generally as described in the forgoing sections with notional fabric standards from table 3.1 (using a gas boiler under allowed rules to normalise emissions for existing heat network)
- Be Lean - As iteration one, but with improved fabric standards from table 3.1.
- Be Green - As iteration two, but with 1kWp PV per dwelling.

3.6.10 Results

Table 3-3: Estimated carbon performance for dwellings

	Total carbon (tCO_2)	**% reduction**
Baseline	45.58	n/a
Be lean	40.29	11.6%
Be clean	40.29	0%
Be green	25.75	32%
Total reduction	**19.83**	**43.5%**

3.6.11 Carbon contribution

In line with Camden Policy, where the net zero-carbon target has not been met using on site measures, the anticipated carbon contribution has been calculated. Using GLA's recommended carbon offset price of £95 per tonne of carbon dioxide, the likely contribution is in the order of £75,000.00, which will be subject to detailed design.

3.7 Discussion

This analysis is indicative at RIBA stage 2 using SAP 2012. A correction to the carbon emission for both the notional and actual dwelling primary energy and emission rates to account for a connection to an existing heat network has been applied.

3.7.1 Compliance with Building Regulations Part L1

All models demonstrated compliance with Part L1 2013, with improvements to fabric beyond that of notional standards demonstrating improvements to carbon performance over 10% at the 'Be Lean' Stage.

As mentioned previously, in order to normalise analysis of the actual dwellings to reflect that of the notional, given connection to an existing heat network is proposed, it has not been possible to assess measures at the 'Be Clean' stage of the energy hierarchy.

Inclusion of PV at the 'Be Green' Stage however demonstrated considerable improvement to carbon performance with a further 32% reduction in emissions emissions reduction when compared to the 'Be Lean' Stage, which is equivalent to a total 43.5% total reduction compared to the baseline.

3.8 Concluding remarks

When compared to the extant scheme, the SAP2012 assessment, aligned to reflect the same approach, but adopting the updated fabric and servicing strategy, demonstrates an overall carbon reduction in the order of 43.5%.

APPENDIX A – WATER EFFICIENCY CALCULATIONS

Target water usage per person, one bedroom dwelling

Installation type	Comment	Unit of measure	Capacity / flow rate	Use factor	Fixed use (litres / pers / day)	Litres / pers / day
WC (single flush)	n/a	Flush volume (litres)	n/a	4.42	0.00	0.00
WC (dual flush)	Based on typical dual flush WCs available on market	Full flush volume (litres)	4.00	1.46	0.00	5.84
		Part flush volume (litres)	2.60	2.96	0.00	7.70
WC (multiple fittings)	Calculated using ADG table A2.7	Average effective flushing volume (litres)	n/a	4.42	0.00	0.00
Taps (excluding kitchen and utility taps)	Based on single mixer tap at each basin	Flow rate (litres / minute)	5.00	1.58	1.58	9.48
Bath (where shower also present)	Based on typical bath capacity available on market	Capacity to overflow (litres)	140.00	0.11	0.00	15.40
Shower (where bath also present)	Based on typical shower available on market	Flow rate (litres / minute)	8	4.37	0.00	34.96
Bath only	n/a	Capacity to overflow (litres)	n/a	0.50	0.00	0.00
Shower only	n/a	Flow rate (litres / minute)	n/a	5.60	0.00	0.00
Kitchen/utility room sink taps	Based on single mixer tap at sink	Flow rate (litres / minute)	6.00	0.44	10.36	13.00
Washing machine	Based on typical WM available on market. Note, cold feed only	Litres / kg dry load	8.17	2.10	0.00	17.16
Dishwasher	Based on typical DW available on market. Note, cold feed only	Litres / place setting	1.25	3.60	0.00	4.50
Waste disposal unit	n/a	Litres / use	n/a	3.08	0.00	0.00
Water softener	n/a	Litres / person / day	n/a	1.00	0.00	0.00
Total calculated use						108.03
Normalisation factor						0.91
Internal water consumption						98.31
External water consumption						5.00
Total (internal + external)						**103.31**

Water efficiency calculations have been carried out in accordance with the 'Water Efficiency Calculator for New Dwellings' in Approved Document G[8] (ADG).

[8] The Building Regulations 2010 Approved Document G, Sanitation, hot water safety and water efficiency, HM Government, 2015 edition with 2016 amendments

Target water usage per person, two or three bedroom dwelling

Installation type	Comment	Unit of measure	Capacity / flow rate	Use factor	Fixed use (litres / pers / day)	Litres / pers / day
WC (single flush)	n/a	Flush volume (litres)	n/a	4.42	0.00	0.00
WC (dual flush)	Based on typical dual flush WCs available on market	Full flush volume (litres)	n/a	1.46	0.00	**0.00**
		Part flush volume (litres)	n/a	2.96	0.00	0.00
WC (multiple fittings)	Calculated using ADG table A2.7	Average effective flushing volume (litres)	3.07	4.42	0.00	13.57
Taps (excluding kitchen and utility taps)	Based on single mixer tap at each basin	Flow rate (litres / minute)	5.00	1.58	1.58	9.48
Bath (where shower also present)	Based on typical bath capacity available on market	Capacity to overflow (litres)	140.00	0.11	0.00	15.40
Shower (where bath also present)	Based on typical shower available on market	Flow rate (litres / minute)	8	4.37	0.00	34.96
Bath only	n/a	Capacity to overflow (litres)	n/a	0.50	0.00	0.00
Shower only	n/a	Flow rate (litres / minute)	n/a	5.60	0.00	0.00
Kitchen/utility room sink taps	Based on single mixer tap at sink	Flow rate (litres / minute)	6.00	0.44	10.36	13.00
Washing machine	Based on typical WM available on market. Note, cold feed only	Litres / kg dry load	8.17	2.10	0.00	17.16
Dishwasher	Based on typical DW available on market. Note, cold feed only	Litres / place setting	1.25	3.60	0.00	4.50
Waste disposal unit	n/a	Litres / use	n/a	3.08	0.00	0.00
Water softener	n/a	Litres / person / day	n/a	1.00	0.00	0.00
			Total calculated use		108.07	
Normalisation factor					0.91	
Internal water consumption					98.34	
External water consumption					5.00	
Total (internal + external)					**103.34**	

END OF DOCUMENT