Development Control Committee A 25 February 2015 **TEM NO. 3**

WARD:	Cotham	**CONTACT OFF CER:**	Andrew Cross
S TE ADDRESS:	Penmaen Alexandra Park Redland Bristol BS6 6QB		

APPL CAT ON NO:	14/05713/F	Full Planning
E P R DATE:	13 January 2015	

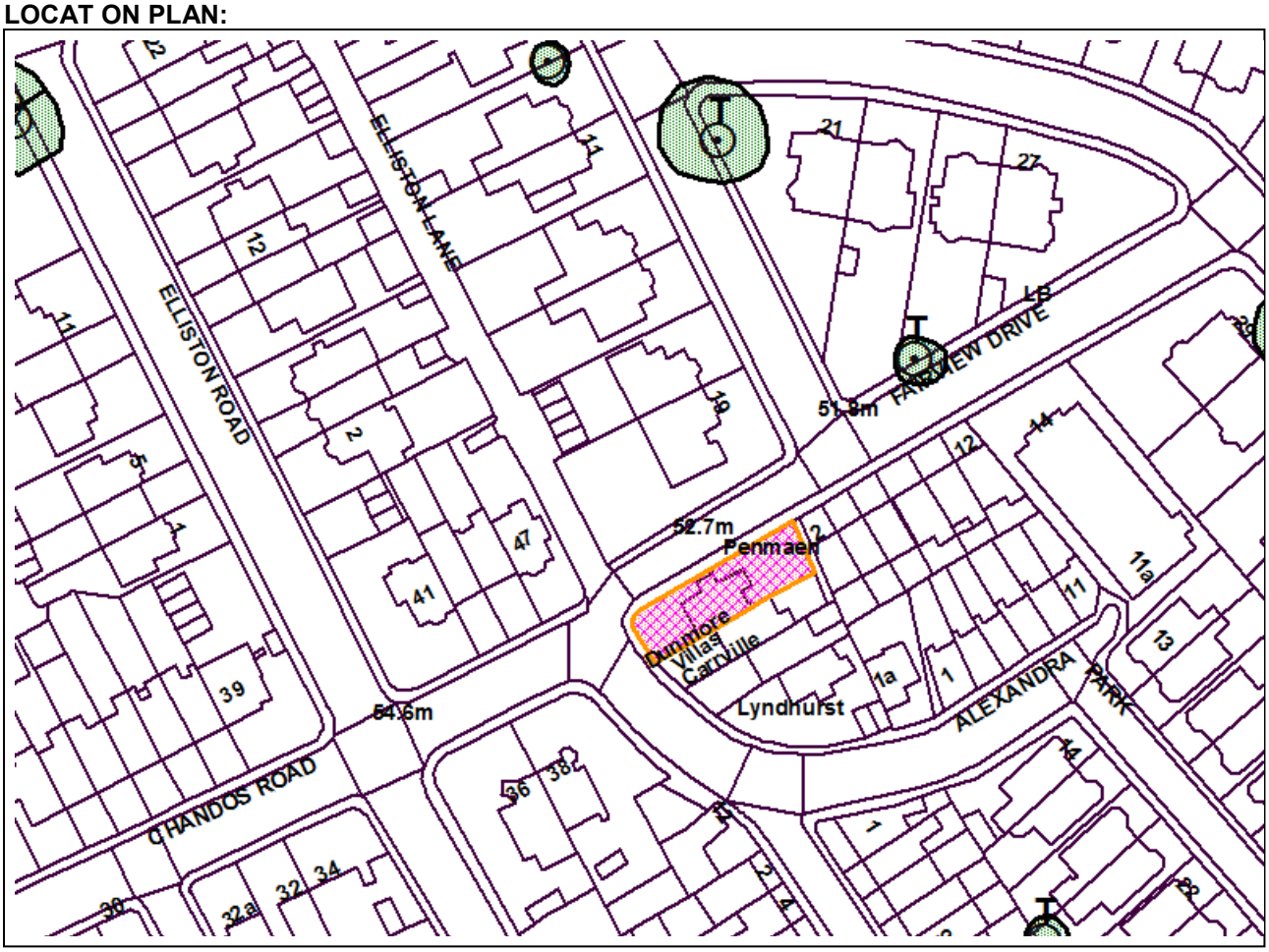
Proposed subdivision of existing HMO into 2no. C4 use HMOs (1 no. 5 bed and 1 no. 6 bed), rear extension and associated external works.

RECOMMENDAT ON: Grant subject to Condition(s)

AGENT:	Aspect360 Ltd 45 Oakfield Road Clifton Bristol BS8 2AX	**APPL CANT:**	Mr S. Pullen C/o Agent

The following plan is for illustrative purposes only, and cannot be guaranteed to be up to date.

LOCAT ON PLAN:



Development Control Committee A 25 February 2015
Application No. 14 05713 F: Penmaen Alexandra Park Redland Bristol BS6 6QB

SITE DESCRIPTION AND APPLICATION

The application property is a large end-terrace house set over four storeys, occupying a corner plot at the junction of Alexandra Park, Fairview Drive and Chandos Road. The site is set within the Cotham and Redland Conservation Area. The building is currently in use as a House in Multiple Occupation (HMO) with 9 bedrooms.

The application proposes the construction of a two-storey rear extension (at basement and ground floor levels), and the sub-division of the extended property to create two HMO's with a total of 11 bedrooms between them.

See plans and photographs for full details.

RELEVANT HISTORY

14/03663/F - Proposed subdivision of existing HMO into 2no. sui generis HMOs, rear extension and associated works. WITHDRAWN.

10/02026/F - Construction of a two-bed single dwellinghouse to rear of existing property. RFUSED.

81/01202/P_C - Change of use from dwellinghouse to multiple occupancy with a Warden's flat. PERMISSION GRANTED.

RESPONSE TO PUBLICITY AND CONSULTATION

Consultation was undertaken via site notice along with letters sent to 76 properties surrounding the application site. Following the receipt of amendments to the scheme which reduce the overall height of the extension by 300mm and amend the proposed fenestration arrangement and finishing materials, a re-consultation exercise was undertaken. A total of 27 written responses were received, with 5 in support and 22 raising objection.

Councillor Neil Harrison has commented as follows:

I am strongly opposed to this application on the basis of over-development. This residential street already has a very high population density and this application would place excessive strain on the local infrastructure in terms of waste management, traffic and noise. Other applications for increases in population density in this immediate area have been rejected and I hope that this one will too.

Redland and Cotham Amenities Society has commented as follows:

The Society objects because the application would result in an increase in HMO use in an area where this has been recognised as adding to the current over-provision of HMO, leading to imbalance in the residential community.
The increase from one nine person HMO to 2, of 6 and 5 six person respectively would HMO would increase the impact of HMO in this location as we do not accept that management of two units in essentially one building would reduce the impact of the HMO use in this area - 'Chandos Village', which is one of the most unbalanced areas in this part of Bristol.
In this connection we point out that of the on-line letters of support one is from Cambridge Park, where there are no registered HMO at all. Another is from Fulham, London. Only one is from the Chandos Area.

Points of objection received within neighbour comments are as follows:

Principle (See Key Issue A)

- Intensification of local student population
- An increase in proportion of student houses conflicts with the aims of the Article 4
- Contrary to BCS18 as the application increases the housing imbalance rather than redressing it
- C4 use class would be adequate for each of the proposed HMO's
- Sub-division would reduce opportunity to revert the property back to a single family home

Residential Amenity (See Key Issue B)

- Increase in existing noise impacts from parties etc
- Increase in anti-social behaviour
- Loss of privacy
- Overshadowing
- Problems associated with high density student populations would be exacerbated
- Overbearing impact
- Poor quality accommodation for future residents

Highways (See Key Issue C)

- Increase in Parking in Elliston Lane, causing an obstruction
- Increased pressure for on-street parking which has been recently reduced in capacity by the residents parking zone and double yellow lines
- Inadequate cycle storage (standard is 4 bedrooms = 3 spaces per dwelling, 2 or 3 bedroom =2 spaces per dwelling)
- Inadequate refuse/recycling storage provision
- It would add to refuse bins and recycling boxes blocking pavements
- The number of available parking permits for the site would double, increasing parking pressure in the area

Design/Character (See Key Issue D)

- Does not accord with the character and appearance of the area
- Development would be an eyesore within the Conservation Area
- Loss of garden and resultant reduction in greenery in the area
- Negative impact upon the Conservation Area
- Infilling a gap between buildings, harming the Conservation Area
- Loss of soft landscaping, including a cherry laurel tree
- Materials are out of character
- Proposal does not accord with the established building line
- Impact to the appearance of the terrace
- Sub-division of the property poses a threat to the architectural integrity of the building by changing floor plans

Sustainability and Flood Risk (See Key Issue E)

- No on-site renewable energy generation is proposed
- Increased rain water run-off

Other

- Why is a sui-generis use rather than C4 use being applied for? - Could lead to a further increase in student numbers
- Previous application 10/02026/F for a two-bed house to the rear of the property was refused on the grounds of cramped development causing harm to the Conservation Area
- The developer describes the development as cluster flats, presumably because policy DM1 is in favour of cluster flats, however the policy goes on to specify that cluster flats will typically have an on-site management team
- There are discrepancies within the Design and Access Statement in relation to the number of bedrooms proposed (section 4 indicates a total of 11 bed-spaces, while section 5 indicates 12 bed-spaces)

Support comments are as follows:

- It is positive to house students in smaller clusters as they are easier to manage
- Students represent over 10% of Bristol residents and should be supported in gaining good quality home life in relevant areas of the city
- Improvement to the property is positive, whether or not occupied by students
- The extension is of a good design
- The extension is of a clever design which will be a welcome addition to the street scene as it would mask the dower utilitarian appearance of the building's rear façade
- The proposal would fit in well with the local street and community

The various points raised will be discussed within the Key Issues section of this report.

City Design Group has commented as follows:-

The proposed scheme presents a two storey rear extension, one storey of which is a basement level partly submerged in the ground at a lower level than the adjacent street level. This helps to reduce the perceived bulk and massing of this element of the development.

The architectural design concept appears to be based on a simple box type form. Consequently, it does appear bulky and minimalist in style, particularly when set in a context of the surrounding area. The large area of blank, solid wall fronting the street appears overly massive and should be broken up by introducing an additional material. Incorporating a rubble stone panel which turns the corner between the north west and north east elevations and envelopes the window on the street elevation may help to introduce some visual interest in this instance. It would also create a visual link to the predominant building material in the local area. A single pitched roof sloping towards the street and forcing a lower façade height along the street frontage would also help to further reduce the perceived massing. Adding a green roof would also add interest and provide biodiversity benefits. Introducing a degree of verticality in the fenestration would also help in articulating the street elevation. Replacing the small window opening with a vertical strip window would help mark the end of the extension and increase the proportion of void within the solid elevation.

RELEVANT POLICIES

National Planning Policy Framework March 2012

Bristol Core Strategy Adopted June 2011

BCS9 Green Infrastructure
BCS10 Transport and Access Improvements
BCS13 Climate Change
BCS14 Sustainable Energy

BCS15	Sustainable Design and Construction
BCS16	Flood Risk and Water Management
BCS18	Housing Type
BCS20	Effective and Efficient Use of Land
BCS21	Quality Urban Design
BCS22	Conservation and the Historic Environment
BCS23	Pollution

Bristol Site Allocations and Development Management Policies Adopted July 2014

DM2	Residential sub-divisions, shared and specialist housing
DM17	Development involving existing green infrastructure
FDM21	Development of private gardens
DM23	Transport development management
DM26	Local character and distinctiveness
DM27	Layout and form
DM30	Alterations to existing buildings
DM31	Heritage assets
DM32	Recycling and refuse provision in new development
DM35	Noise mitigation

KEY ISSUES

(A) WOULD THE ENLARGEMENT AND SUB-DIVISION OF THE EXISTING HMO RESULT IN AN UNACCEPTABLE HOUSING IMBALANCE WITHIN THE LOCALITY?

The application property is at present an HMO with 9 bedrooms, and planning history relating to the site suggests that the property has been in multiple occupancy since the early 1980's.

The property is located in an area with a high concentration of HMO's, which has led to the introduction of an Article 4 directive following recent changes to permitted development, which enable the change of use of C3 use family homes to HMO's for up to 6 people (C4 use) without the need for planning permission. The Article 4 directive is such that permission is required for such a change. In the case of this application however the proposal is for the expansion and sub-division of an established HMO, with a net gain in bedrooms of two. The description of development put forward refers to the provision of two sui-generis HMO's, however given that the units proposed would comprise a 5 bedroom unit and a 6 bedroom unit, the description of development has been altered to refer to two C4 HMO's, as this is considered to be a more accurate description of the proposal as submitted.

Objection comments received included concern that the proposal is in conflict with the Article 4 direction. It should be noted that the Article 4 direction does not prevent the provision of new HMO's, or the expansion of existing HMO's, but it does prevent the provision of new small scale HMO's without the need to gain consent.

Policy BCS18 of the Bristol Core Strategy states that all new residential development should maintain, provide or contribute to a mix of housing tenures, types and sizes to help support the creation of mixed, balanced and inclusive communities.

Policy DM2 relates to residential sub-divisions and shared/specialist housing. Part ii expresses that the intensification of existing houses in multiple occupation will not be permitted where the development would create or contribute to a harmful concentration of uses within a locality as a result of reducing the choice of homes in an area by changing the housing mix.

The site is located in an area with a high proportion of flats and a low proportion of single family homes. As previously acknowledged, the site is set within an area with a high concentration of HMO's. Taking statistics from the 2011 census, Cotham Ward has a student population of 3867 and a usually resident population of 12554. Accommodation within the ward comprises 29.3% houses and 70.6% flats. Of the accommodation approximately 1/3 are one-bedroom dwellings, 1/3 are two bedroom dwellings and the remaining 1/3 have more than 2 bedrooms. The census profile suggest therefore that the Cotham ward is predominantly not an area of family housing. HMO's occupied by students represent 11.7% of households within the ward.

The application site is set within the Kensington Road Lower Super Output Area (LSOA) which has a usually resident population of 1838 and a student population of 849, which represents a slightly higher proportion than on a ward-wide level. At 41% the proportion of accommodation comprising houses is higher than the Ward average, as is the proportion of accommodation with more than 2 bedrooms (49%). HMO's occupied by students represent 20.3% of households within the LSOA.

Given however, that the proposal would not result in the loss of a family home, as the application property is an established HMO, the expansion of the existing HMO would not result in a housing imbalance in the area in this regard. The sub-division of the extended property would result in an additional housing unit set up as an HMO, however the net gain in bedrooms would be 2 overall, and the approach taken is not considered to be materially different than the expansion of the existing HMO to create a single 11 bedroom HMO. In terms of the Census profile of the area, the proposal would not represent a material change over the existing situation.

Of note are recent appeal decisions relating to properties on Stanley Road, which is also perceived as having a high student population. At 18 Stanley Road the planning inspector allowed an appeal, following committee refusal, of an increase in residents from 6 to 7, where the planning inspector concluded that the increase in residents does not result in an intensification of use of the property so as to become of a different character, with no resulting demonstrable harm to local residents. An appeal was dismissed at 6 Stanley Road, for the conversion form a single family home to a C4 use HMO, with the loss of the family home considered to cause unacceptable harm to the housing mix in the area as well as increased noise and disturbance causing harm to neighbouring residents.

Objection comments expressed that the proposed sub-division would make the reversion of the property back to a single family home less likely in the future. This may be the case if the ownership of sub-divided property changes in the future, however given that the property is not part of the family housing stock within the locality, and has not been for some time, refusal is not considered to be warranted on this basis. It should also be noted that each of the units proposed represents family-sized accommodation, and the reversion of the extended sub-divided property from C4 to C3 use could result in an additional family housing unit in the area.

It is therefore concluded that the proposal would not result in an unacceptable housing imbalance in the locality. Associated issues relating to residential amenity, highways, design and sustainability/flood risk must however be appropriately addressed, which will be discussed within the key issues to follow.

(B) WOULD THE PROPOSAL CAUSE ANY UNACCEPTABLE HARM TO THE RESIDENTIAL AMENITY OF NEIGHBOURING OCCUPIERS?

The proposed lower level of the extension proposed would have an overall height approximately the same as the existing boundary wall/fence between the application property and adjoining neighbour to the south. The upper floor of the extension proposed would be set approximately 2.75 metres from the aforementioned boundary line, and would have an additional height of 2.6 metres above the lower

element. This relationship is considered such that the structure would not result in an unacceptable overbearing sense of enclosure when considering neighbouring occupiers. The location of the extension being set to the north of the adjoining property, is such that overshadowing is not of concern.

Four new windows are proposed to the southern elevation with two at each level, three of which would serve circulation space while another would be a secondary window to a bedroom. Providing that the upper floor windows are obscure glazed and non-opening, which can be secured by condition, overlooking from these windows is not a concern. Other new windows would look over the rear garden or onto the street, which does not give rise to overlooking concerns.

Objection comments raised concern of increased noise associated with increased occupation and increased levels of anti-social behaviour. Policy DM2 includes consideration of such factors, amongst others, in relation to intensification of existing HMO's. The provision of an additional two bedrooms represents an increased occupancy of the site of 2 people. In percentage terms this equates to a 22% occupancy increase of the site. In terms of the context of an existing high proportion of HMO's, the increase in numbers and in percentage terms is negligible. While increased numbers of occupiers may have the potential to result in additional noise impacts, this is dependent on the specific occupiers, and the potential additional noise and anti-social behaviour impacts associated with two additional residents is not considered significant enough to justify refusal on this basis.

Concern was raised within objection comments in relation to living conditions for future occupiers. Each of the units proposed includes reasonable room sizes, including good sized communal space. Adequate servicing facilities would be provided, along with useable outdoor amenity space.

It is therefore concluded that the proposed works would not cause unacceptable harm to the residential amenity of neighbouring occupiers or future occupiers of the site.

(C) DOES THE PROPOSAL ADDRESS MOVEMENT, TRANSPORT AND HIGHWAY SAFETY ISSUES?

The provision of secure cycle parking is included within the proposed design. This would take the form of a covered stores positioned within the garden areas, and accords with current parking standards requirements.

Objection comments raised concern of increased pressure for on-street parking. The proposal to increase the number of bedrooms by two is not likely to have a significant impact upon existing parking levels within the vicinity, and refusal on this basis is not warranted. Problems of inconsiderate/illegal parking were raised within objection comments received. Such problems are down to the actions of individuals rather than a result of a development, and refusal of the proposal on this basis is not justified.

A designated refuse/recycling storage area would be provided within the curtilage of the site, with adequate opportunity to store refuse and recyclables within the site, other than on days of collection, which is acceptable.

On the basis of the above, the proposal is found to be acceptable when considering issues relating to movement, transport and highway safety.

(D) WOULD THE PROPOSED DESIGN BE ACCEPTABLE?

Since the previous withdrawn application the proposed extension has been reduced in scale and footprint. The external treatment of the proposed extension has also been altered, which was further amended during the course of the application in terms of finishing materials and fenestration arrangement, along with a slight reduction in overall height. The proposed extension would be of a

parapeted flat roof design of modern form, with external finishing materials of natural stonework and render to reflect the finishing materials of the host property. Green roofs are proposed throughout.

The application property occupies a corner plot and the side/rear of the property is prominently positioned within the street scene when considering views from Fairview Drive. The lower floor element would be concealed from street scene views by the existing boundary wall, with the upper floor element visible above it.

Objection comments have raised concern of the visual impact of the extension proposed in the Conservation Area setting; the provision of materials that are out of character; the infilling of the gap to the rear of the property; and non-compliance with the existing building line.

The proposed extension would be of a modern form, but would not be of a totally alien design in the context, with the flat roof form taking cues from existing original rear projections at the host property and others in the terrace. Finishing materials of natural stone and render would match those existing, with a render panel providing a visual break between the original and extended forms. The stepped form and spacing from adjacent properties is such that it is considered an acceptable degree of openness would be retained to the rear of the host property.

In relation to the building line issue raised, the host property at present does not accord with the established building line along Fairview Drive, with Penmaen projecting beyond it and acting as a visual stop at the end of the street. At upper floor level the proposed extension would align with the principle side elevation of the host property, which is considered the correct approach visually. The lower level of the extension would be set closer to the side boundary to the street, but with a lesser projection to the side than the existing porch. Given that the existing boundary wall would conceal the lower storey when considering street scene views, the approach put forward is considered acceptable in relation to existing building lines.

Consultation was undertaken with a City Council Urban Design Officer in relation to the proposal, who did not raise objection in principle to the proposal, but did put forward suggestions of alterations/improvements which led to the provision of amended details during the course of the application.

The loss of green garden space was raised as a concern, including the loss of a small tree/shrub to the rear corner of the site. The existing rear garden is almost entirely hard landscaped, with the exception of a small raised border. The proposed development incorporates the provision of a soft landscaped rear garden, which includes the retention of the tree/shrub, along with the provision of green roofs. The proposal would retain useable garden space, and the extent of soft landscaping would increase when compared to existing.

One objection comment raised concern of alterations to the plan form of the property by sub-dividing it. The application property is not Listed and as such internal alterations to plan form is not a planning consideration.

Overall it is considered that the proposed design, while of a simple modern form, respects the characteristics of the host property, wider street scene, and this part of the Cotham and Redland Conservation Area.

(E) WOULD THE PROPOSAL BE ACCEPTABLE IN RELATION TO ISSUES OF SUSTAINABILITY AND FLOOD RISK MITIGATION?

Current planning policy within the adopted Bristol Development Framework, Core Strategy (2011) requires new development to be designed to mitigate and adapt to climate change and meet targets to reduce carbon dioxide emissions. This should be achieved, amongst other measures, through efficient building design, the provision of on-site renewable energy generation to reduce carbon

dioxide emissions by at least 20% based on the projected residual energy demand of new buildings and extensions to existing buildings, and for new development to mitigate against the risk of flooding, including rainwater soak-away drainage.

No on-site renewable energy generation is proposed as part of the development. Solar PV and Solar Thermal technologies were considered to provide renewable energy generation, however the orientation of the property and the available areas where such technologies could be reasonably located are extremely limited, are such that solar technologies are not a viable option.

Air source heat pumps were considered as an alternative option, however these represent a very limited improvement, if any improvement, over a conventional modern gas combination boiler, but with potential resultant noise impacts from the externally located plant. In many cases these systems can be more polluting, less efficient, and less effective than gas.

Given the constraints of the site in terms of solar technologies, and a lack of benefit from other potential alternatives, it is considered reasonable in this instance to accept the development without the provision of on-site renewable energy generation.

The application site is set within flood zone 1 and as such is at low risk from tidal and fluvial flooding. The site for the proposed extension, at present, is entirely covered by hardstanding, a small proportion of which is graveled and therefore may facilitate some rainwater permeability. The proposal would introduce a soft landscaped rear garden, which would reduce rain water run-off levels, as would the provision of green roofs to the proposed extension.

On the basis of the above it is considered that the proposal is acceptable when considering issues relating to sustainability and flood risk.

CONCLUSION

On the basis of the above assessment the development is considered to be acceptable, and approval of the scheme is recommended, subject to conditions.

COMMUNITY INFRASTRUCTURE LEVY

HOW MUCH COMMUNITY INFRASTRUCTURE LEVY (CIL) WILL THE DEVELOPMENT BE REQUIRED TO PAY?

The CIL liability for this development is £3302.00

RECOMMENDED GRANT sub ect to condition s

Time limit for commencement of development

1. Full Planning Permission

   The development hereby permitted shall begin before the expiration of three years from the date of this permission.

   Reason: As required by Section 91 of the Town and Country Planning Act 1990, as amended by Section 51 of the Planning and Compulsory Purchase Act 2004.

Pre occupation condition s

2. Implementation/installation of refuse storage and recycling facilities - shown on approved plans

   No building or use hereby permitted shall be occupied or the use commenced until the refuse store, and area/facilities allocated for storing of recyclable materials, as shown on the approved plans have been completed in accordance with the approved plans. Thereafter, all refuse and recyclable materials associated with the development shall either be stored within this dedicated store/area, as shown on the approved plans, or internally within the building(s) that form part of the application site. No refuse or recycling material shall be stored or placed for collection on the public highway or pavement, except on the day of collection.

   Reason: To safeguard the amenity of the occupiers of adjoining premises, protect the general environment, and prevent obstruction to pedestrian movement, and to ensure that there are adequate facilities for the storage and recycling of recoverable materials.

3. Completion and maintenance of cycle provision - shown on approved plans

   No building or use hereby permitted shall be occupied or the use commenced until the cycle parking provision shown on the approved plans has been completed, and thereafter, be kept free of obstruction and available for the parking of cycles only.

   Reason: To ensure the provision and availability of adequate cycle parking.

4. Completion and Maintenance of Sustainable Urban Drainage - Shown on Approved Plans

   No building or use herby permitted shall be occupied or the use commenced until the sustainable urban drainage scheme (green roofs) for this site has been completed in accordance with the submitted details. The sustainable urban drainage scheme shall be managed and maintained thereafter.

   Reason: To ensure that the principles of sustainable drainage are incorporated into this proposal and maintained thereafter.

Post occupation management

5. Non Opening and Obscured Glazed Windows

   Notwithstanding the provisions of the Town and Country Planning (General Permitted Development) Order 1995 (or any Order revoking and/or re-enacting that Order) the proposed side-facing windows at upper floor level within the southern elevation of the extension hereby permitted shall be non-opening and glazed with obscure glass to a specification to be agreed with the Local Planning Authority and shall be permanently maintained thereafter as non-opening and obscure glazed.

   Reason: To safeguard the amenities of the adjoining premises from overlooking and loss of privacy.

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List of approved plans

6. List of approved plans and drawings

The development shall conform in all aspects with the plans and details shown in the application as listed below, unless variations are agreed by the Local Planning Authority in order to discharge other conditions attached to this decision.

Climate change & sustainability statement, received 18 November 2014
1000(L)00 Site location plan, received 18 November 2014
1575(L)10 F Proposed basement floor site plan, received 13 January 2015
1575(L)11 G Proposed ground floor plan, received 13 January 2015
1575(L)12 D Proposed first & second floor plans, received 13 January 2015
1575(L)15 G Proposed south elevation & section, received 13 January 2015
1575(L)16 G Proposed east elevation, received 13 January 2015
1575(L)17 G Proposed north elevation (behind wall), received 13 January 2015
1575(L)18 F Proposed north elevation (street view), received 13 January 2015
1575(L)19 B Existing & proposed west elevation (street view), received 18 November 2014
14007/01 Topographical survey, received 18 November 2014
14007/02 Basement & ground floor plans, received 18 November 2014
14007/02 First & second floor plans, received 18 November 2014
14007/04 Elevations, received 18 November 2014
Photomontages, received 13 January 2015

Reason: For the avoidance of doubt.

BACKGROUND PAPERS

City Design Group 29 January 2015

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V1.0211

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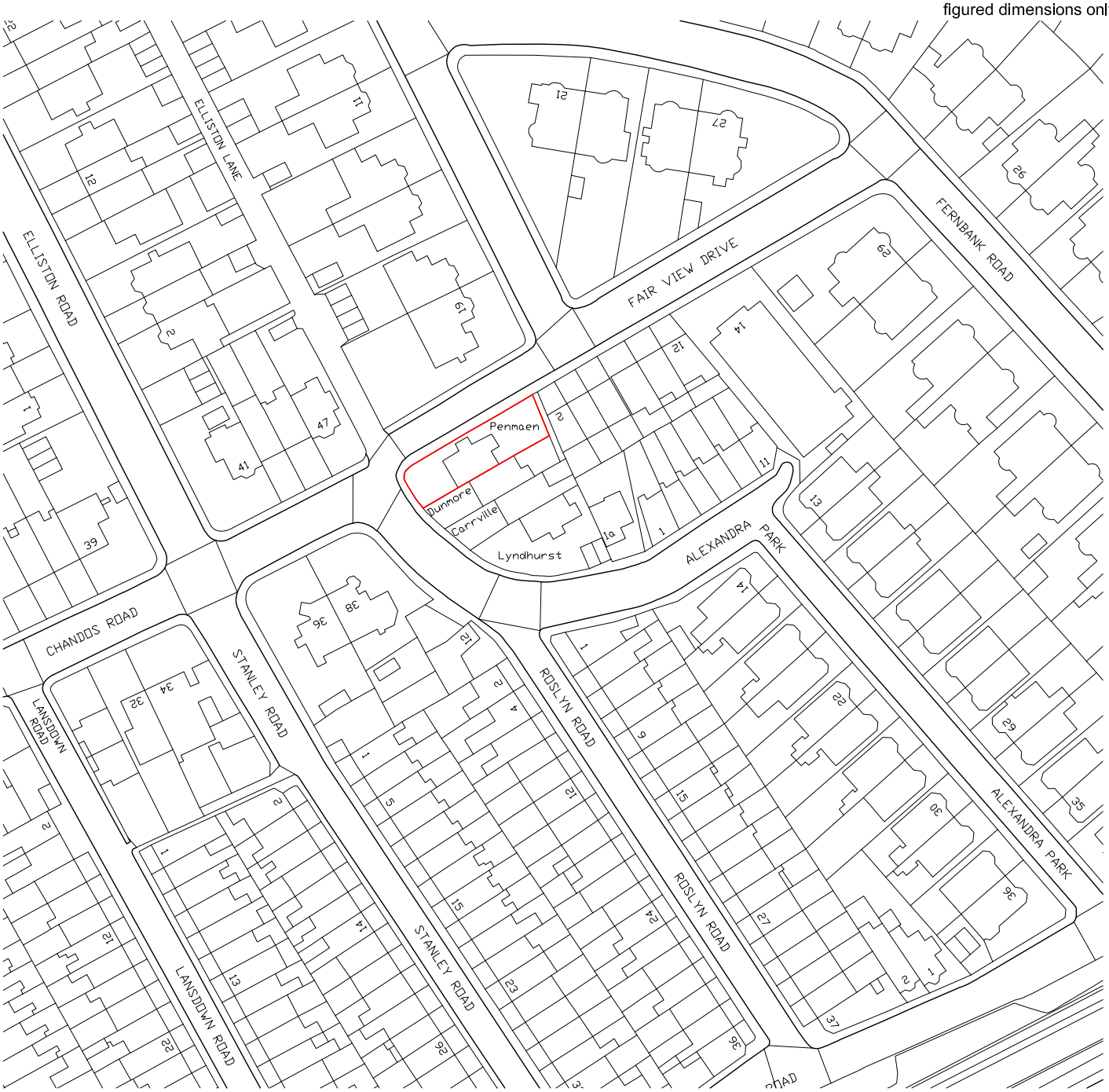

REV	Note	Date

105 WEST ARCHITECTS Ltd
107 Lower Redland Road, Redland
Bristol. BS6 6SW

T 0117 3737596
E Info@105west.co.uk

Project: Penmaen House, Alexandra Park, Bristol

Drawing Title: Location Plan

Drawing No.: 1000(L)00

Scale @A4	drawn by	Date	Rev
1:1250	LH	29/11/13	-

Climate Change and Sustainability Statement

New dwelling on the site of

Penmaen House, Alexandra Park, Redland Bristol BS6 6QB

Our reference: OC1407091

23 July 2014

Robin Brookes BA, DEA,HEA,OCEA
Woodlands, Ledge Hill, Market Lavington, Wiltshire SN10 4NW
T: 01380 812294 E: enquiries@environomic.co.uk
Call free: 0330 660 0294

CONTENTS

QUALIFICATIONS OF ASSESSOR

This energy statement and strategy has been prepared by Robin Brookes, proprietor of Environomic, to support the planning application for conversion of part of an existing building into a dwelling of multiple occupation with the addition of a new extension at Rockwood House, Downend, Bristol. The remaining dwelling will remain undeveloped.

Robin Brookes is a qualified On Construction Energy Assessor, accredited and registered with Stroma. He is also qualified as a Domestic Energy Assessor, a Home Energy Advisor and holds a Batchelor of Arts degree in 3D Construction Design.

This statement has been submitted to address Bristol Core Strategy Policies BCS13-16 relating to climate change, sustainable energy, sustainable design and construction, and flood risk and water management.

The statement reviews the energy efficiency and regulated carbon dioxide emissions of the proposed dwelling and uses the governmentôs Standard Assessment Procedure for Energy Rating of Dwellings (SAP) to ascertain compliance with Building Regulations Part L1A and the requirements of Bristol City Council.

Reference is made to the Code for Sustainable Homes in a proportionate response to the Cityôs requirements. The Statement should be read in conjunction with the Heritage, Design and Access Statement, as well as the set of design drawings accompanying the planning application.

SCOPE OF THIS STATEMENT

This statement seeks to address the following policies of Bristol Core Strategy;

BCS13 - Climate Change
BCS14 - Sustainable Energy
BCS15 - Sustainable Design and Construction
BCS16 - Flood Risk and Water Management

The full strategy and its policies are available over the internet from Bristol City Council Planning Portal: http://www.bristol.gov.uk/page/planning-core-strategy.

POLICIES IN RELATION TO THIS DWELLING

BCS13 - Climate Change

The new dwelling is to be sited in an existing dwelling in a suburban area. The site has a small garden. This will be re-landscaped with features to encourage wildlife. One of the two new roofs will be a living roof, providing further wildlife habitat, assisting with temperature control of the building and helping to reduce the heat island effect of the built up area.

There are no means to collect renewable energy being a small site surrounded by other buildings and with a poor solar aspect. Solar photovoltaic panels would only work effectively on the SW and SE sides of the main roof which is some distance away from the new dwelling. Also this roof is pitched both ways, leaving very little useful area to site solar panels. The new roofs of the new dwelling are on the North side and therefore in shadow most of the time. There are no other viable means of generating renewable energy as discussed below and therefore further reduction in carbon emissions will not be possible.

The property is not in a flood danger zone, so extensive works to mitigate flooding seems unnecessary. Some provision is being made to store and use rainwater run-off. Areas of permeable paving will mitigate against sudden heavy rainfall.

BCS14 - Energy Strategy

1. Summary Table

In compiling these figures, SAP has been employed as being the appropriate method for domestic dwellings. The table is clearly based on SBEM and therefore an interpretation has had to be made, since dwellings are assessed using SAP.

Since this dwelling will be converted from part of an existing building, Part L1B of the building regulations applies here, so the baseline energy demand figures have been based on a notional model, using tables 1,2 & 3 in Part L1B. I have used the Dwelling Emission Rate (DER) figure from this to find the baseline CO_2 emissions and kWh energy use.

The rest of the figures and the regulated CO_2 emissions have been calculated from the Dwelling Emission Rate (DER) of the dwelling as proposed and the same dwelling with solar PV installed.

The summary figures based on the total scheme emissions and energy use

	Energy demand kWh/a	Energy saving achieved %	Regulated CO_2 emissions	Saving achieved on residual CO_2 emissions %
Building regulations Part L compliance - baseline energy demand and emissions	17863		4099	
Proposed scheme after energy efficiency measures and CHP - residual energy demand and emissions	16872	6%	3847	
Proposed scheme after on-site renewables added	16872	0	3847	0
Proposed scheme offset for financial contribution or other allowable solution			N/A	N/A
Total savings on residual emissions				0

2. Detailed Measures

2.1 Baseline energy demand

The projected annual energy demand and regulated CO_2 emissions of the development as a Part L Building Regulations compliant scheme without renewable energy supply.

Baseline energy demand (kWh pa)	17863
Regulated emissions (kg pa)	4099

2.2 Heating

Following BCCôs Core Strategy, heat hierarchy:

1. Connection to existing CHP/CCHP distribution networks

There are no existing schemes to connect to. However, the heating system proposed distributes heat via a ówetôsystem and therefore it should be quite easy to connect to a community or district heating system when such a system comes available.

2. Site-wide renewable CHP/CCHP
3. Site-wide gas-fired CHP/CCHP
4. Site-wide renewable community heating/cooling
5. Site-wide gas-fired community heating/cooling

The site is a small piece of ôbrownfieldôland and there is no room for a community heating system in addition to the dwelling. The size of development would seem not to justify a system of this scale.

6. Individual building renewable heating

The dwelling will have a combi gas condensing boiler. Considering renewable heating

systems:

Biomass - problem with space for boiler, fuel and accumulator.

Biogas - not currently available, but when biogas plants are developed, they will feed into the gas main.

Ground sourced heat pumps - not enough ground area to lay coils, drilling down is very expensive, it causes the same emission problems as air-sourced heat pumps.

Air sourced heat pumps - small scale and could be installed. However, ASHPs emit more CO_2 than mains gas boilers due to the carbon footprint of the electricity used - both TER and DER increase when heat pumps are specified.

We therefore conclude that a gas combi boiler is the best solution at the moment and that when district heating becomes available, conversion to connect to it should be fairly straight forward. Biogas distributed through the mains gas network is also a future possibility.

2.3 Energy efficiency

Energy savings from energy efficiency measures (kWh pa)	991
Emission savings from energy efficiency measures (kg pa)	252
Total regulated emissions after CHP savings and energy efficiency measures (kg pa) (residual emissions)	3847

2.4 On site renewables

Total renewable capacity (kW)	none
Saving on residual emissions from the use of renewables (kg pa)	none
Saving on residual emissions from the use of renewables (%)	none

2.5 Allowable solutions

Additional saving on residual emissions from allowable solutions (kg pa)	N/A
Additional saving on residual emissions from allowable solutions (%)	N/A
Total savings on residual emissions from renewables and allowable solutions (%)	N/A

3. Feasibility of Renewable Technologies

Wind
This site is surrounded by other buildings which create an appreciable ówind shadowô Roof mounted turbines do not work well because of the turbulence on the roof therefore wind power is not a suitable solution. Also a turbine would have to be mounted on the remaining dwelling, some way from the proposed dwelling.

Solar Photovoltaic
This is not practical given the location of the roof and the current design of the roof on the existing building. There are no other viable options for mounting the panels.

Solar Thermal
A solar thermal panel cannot be sited on the new roofs for the afore mentioned reasons and would not achieve a 20% reduction in CO_2.

Hydro-electric
There are no opportunities on this site for hydro electric generation.

Biomass
This has already been discussed in section 2.2 above.

Biogas
This has already been discussed in section 2.2 above.

Ground Sourced Heat Pump
This has already been discussed in section 2.2 above.

Air Sourced Heat Pump
This has already been discussed in section 2.2 above.

Combined Heat and Power and Community Heating Schemes
CHP boilers are available for individual dwellings, but are more efficient when bigger and more suited to community heating schemes.

It is also true that community heating systems work best if the heat and power are being used locally all the time. For instance in association with a hospital or a community centre which would use the heat and power during the day. There is a faint possibility of linking into such a scheme since there are one or two community buildings nearby, but it is asking too much for this development to take on such a project unilaterally.

District Heating Scheme
The proposed heat distribution system makes it possible for the house to be connected to a district heating scheme later, as has already been discussed in section 2.2 above.

BCS15 - Sustainable Design and Construction

1.0 Waste and recycling

Waste and recycling storage is to be provided in accordance with Bristol City Council guidelines. A storage area for general refuse is provided near the South West gate, and meets the minimum footprint requirements of 0.6m x 1.5m, accommodating:

- a 180 litre wheely bin for general refuse
- 25 litre capacity storage for organic waste
- 44 litre capacity storage for dry recyclables (clothes, glass etc.)
- 44 litre capacity storage for dry recyclables (plastic, tins etc.)

There is also the potential to accommodate a green bin garden waste container

2.0 Materials

To reduce the environmental impact of the development, responsibly sourced and accredited materials are to be used (such as FSC timber), and to be rated A or B according to the BRE Green Guide to Specification.

3.0 Flexibility and Adaptability

Other than complying with Part M of the building regulations in the building of the extension, there is no opportunity adapt the dwelling to comply with the Lifetime Homes standards, enabling adaptation to disabled use.

4.0 Biodiversity

The site has a small amount of garden around the present building. The proposals make ecological improvements where possible:

- Planting improvements in pockets around the NW & NE sides and the courtyard behind the new extension
- Planting area with small trees and shrubs in the front access courtyard
- Planting a living roof on the lower flat roof of the new extension

Living Roof
There are many advantages to living or green) roofs including increased insulation. I have not included this effect in my calculations since it is outside my field, so we can expect thermal resistance in the roof to be increased. Other benefits are:

- Helping to reduce the urban heat island effect
- Managing water run-off
- Cooling in summer
- Improving biodiversity, air quality, health and well being
- Considerably increased life-span of the roof covering

5.0 Encouraging reduced car usage

Lockable cycle storage is provided to the front (SW) of the properties.

BCS16 - Flood Risk and Water Management

Water management (minimising runoff from rainwater)

- Water runoff is to be minimised as follows:
- Water butt located at rear of property for garden use
- The hardstanding areas of this site are to be created with permeable paving.

Water efficiency (indoor water use).

Water use is aimed to be minimised to less than 125L per person, and a number of measures implemented:

- Low flush restrictors
- Flow restrictors to taps
- Low flow shower head (6-9 litres / second)
- 18 litre maximum volume dishwasher
- 60 litre maximum volume washing machine

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Robin Brookes	**Stroma Number:**	STRO003819
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.0.28

Property Address: Unit 2 - notional

Address : Unit 2, Penmaen, Alexandra Park, Redland, BRISTOL, BS6 6QB

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Basement	94.13	(1a) x	2.34	(2a) =	220.26	(3a)
Ground floor	34.12	(1b) x	2.93	(2b) =	99.97	(3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	128.25	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		320.24	(5)

2. Ventilation rate:

	main heating		secondary heating		other		total		m³ per hour	
Number of chimneys	0	+	0	+	0	=	0	x 40 =	0	(6a)
Number of open flues	0	+	0	+	0	=	0	x 20 =	0	(6b)
Number of intermittent fans							4	x 10 =	40	(7a)
Number of passive vents							0	x 10 =	0	(7b)
Number of flueless gas fires							0	x 40 =	0	(7c)

			Air changes per hour	
Infiltration due to chimneys, flues and fans =	(6a)+(6b)+(7a)+(7b)+(7c) =	40	÷ (5) =	0.12 (8)

If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)

Number of storeys in the dwelling (ns)			0 (9)
Additional infiltration		[(9)-1]x0.1 =	0 (10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction			0 (11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35			
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0			0 (12)
If no draught lobby, enter 0.05, else enter 0			0 (13)
Percentage of windows and doors draught stripped			0 (14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =		0 (15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =		0 (16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area			15 (17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)		0.87 (18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used			
Number of sides sheltered			2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =		0.85 (20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =		0.74 (21)

Infiltration rate modified for monthly wind speed

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Monthly average wind speed from Table 7

(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7

DER WorkSheet: New dwelling design stage

Wind Factor (22a)m = (22)m ÷ 4

(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.95	0.93	0.91	0.82	0.8	0.71	0.71	0.69	0.74	0.8	0.84	0.87

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0

(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0

(24b)

c) If whole house extract ventilation or positive input ventilation from outside
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0

(24c)

d) If natural ventilation or whole house positive input ventilation from loft
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=	0.95	0.93	0.91	0.83	0.82	0.75	0.75	0.74	0.78	0.82	0.85	0.88

(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.95	0.93	0.91	0.83	0.82	0.75	0.75	0.74	0.78	0.82	0.85	0.88

(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			1.89	x	1.8	=	3.402			(26)
Windows Type 1			4.47	x	1/[1/(1.6)+ 0.04]	=	6.72			(27)
Windows Type 2			4.47	x	1/[1/(1.6)+ 0.04]	=	6.72			(27)
Floor Type 1			58.36	x	0.65	=	37.934			(28)
Floor Type 2			35.77	x	0.22	=	7.8694			(28)
Walls Type1	68.77	0	68.77	x	0.3	=	20.63			(29)
Walls Type2	27.37	0	27.37	x	0.3	=	8.21			(29)
Walls Type3	64.33	4.47	59.86	x	0.28	=	16.76			(29)
Walls Type4	41.23	6.36	34.87	x	0.28	=	9.76			(29)
Roof Type1	17.63	0	17.63	x	0.18	=	3.17			(30)
Roof Type2	18.14	0	18.14	x	0.18	=	3.27			(30)
Total area of elements, m²			331.6							(31)
Party wall			49.82	x	0	=	0			(32)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 124.45 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 33279.27 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Medium 250 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f

can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K — 49.74 (36)

if details of thermal bridging are not known (36) = 0.15 x (31)

Total fabric heat loss (33) + (36) = 174.19 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 × (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	100.34	98.5	96.69	88.2	86.61	79.21	79.21	77.84	82.06	86.61	89.82	93.18	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	274.54	272.69	270.88	262.39	260.8	253.41	253.41	252.04	256.26	260.8	264.02	267.38	

Average = Sum(39)$_{1...12}$ /12= 262.38 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	2.14	2.13	2.11	2.05	2.03	1.98	1.98	1.97	2	2.03	2.06	2.08	

Average = Sum(40)$_{1...12}$ /12= 2.05 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N — 2.89 (42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 — 102.84 (43)

Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	

Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)

(44)m=	113.13	109.02	104.9	100.79	96.67	92.56	92.56	96.67	100.79	104.9	109.02	113.13	

Total = Sum(44)$_{1...12}$ = 1234.14 (44)

Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)

(45)m=	167.77	146.73	151.41	132.01	126.66	109.3	101.28	116.22	117.61	137.06	149.62	162.47	

Total = Sum(45)$_{1...12}$ = 1618.15 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	25.17	22.01	22.71	19.8	19	16.39	15.19	17.43	17.64	20.56	22.44	24.37	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel — 0 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): — 0 (48)

Temperature factor from Table 2b — 0 (49)

Energy lost from water storage, kWh/year (48) x (49) = — 0 (50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) — 0 (51)

If community heating see section 4.3

Volume factor from Table 2a — 0 (52)

Temperature factor from Table 2b — 0 (53)

DER WorkSheet: New dwelling design stage

Energy lost from water storage, kWh/year	(47) x (51) x (52) x (53) =	0	(54)
Enter (50) or (54) in (55)		0	(55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	0	0	0	0	0	0	0	0	0	0	0	0	(56)

If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H

(57)m=	0	0	0	0	0	0	0	0	0	0	0	0	(57)

Primary circuit loss (annual) from Table 3 0 (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m=	0	0	0	0	0	0	0	0	0	0	0	0	(59)

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	50.96	46.03	50.96	49.32	49.26	45.65	47.17	49.26	49.32	50.96	49.32	50.96	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	218.73	192.76	202.37	181.32	175.93	154.95	148.45	165.49	166.93	188.02	198.93	213.43	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	218.73	192.76	202.37	181.32	175.93	154.95	148.45	165.49	166.93	188.02	198.93	213.43	

Output from water heater (annual)$_{1...12}$ 2207.3 (64)

Heat gains from water heating, kWh/month 0.25 ´ [0.85 × (45)m + (61)m] + 0.8 x [(46)m + (57)m + (59)m]

(65)m=	68.52	60.29	63.08	56.22	54.43	47.75	45.47	50.96	51.43	58.31	62.08	66.76	(65)

include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating

5. Internal gains (see Table 5 and 5a):

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m=	144.52	144.52	144.52	144.52	144.52	144.52	144.52	144.52	144.52	144.52	144.52	144.52	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	40.75	36.19	29.43	22.28	16.66	14.06	15.2	19.75	26.51	33.66	39.29	41.88	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	295.6	298.67	290.94	274.48	253.71	234.19	221.14	218.08	225.81	242.26	263.03	282.56	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	37.45	37.45	37.45	37.45	37.45	37.45	37.45	37.45	37.45	37.45	37.45	37.45	(69)

Pumps and fans gains (Table 5a)

(70)m=	3	3	3	3	3	3	3	3	3	3	3	3	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-115.61	-115.61	-115.61	-115.61	-115.61	-115.61	-115.61	-115.61	-115.61	-115.61	-115.61	-115.61	(71)

Water heating gains (Table 5)

(72)m=	92.1	89.72	84.79	78.08	73.16	66.32	61.11	68.49	71.44	78.38	86.22	89.73	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	497.8	493.94	474.52	444.2	412.88	383.93	366.81	375.68	393.11	423.65	457.89	483.53	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

DER WorkSheet: New dwelling design stage

Orientation:		Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
West	0.9x	0.77	x	4.47	x	19.64	x	0.63	x	0.7	=	26.83	(80)
West	0.9x	0.77	x	4.47	x	38.42	x	0.63	x	0.7	=	52.49	(80)
West	0.9x	0.77	x	4.47	x	63.27	x	0.63	x	0.7	=	86.44	(80)
West	0.9x	0.77	x	4.47	x	92.28	x	0.63	x	0.7	=	126.06	(80)
West	0.9x	0.77	x	4.47	x	113.09	x	0.63	x	0.7	=	154.49	(80)
West	0.9x	0.77	x	4.47	x	115.77	x	0.63	x	0.7	=	158.15	(80)
West	0.9x	0.77	x	4.47	x	110.22	x	0.63	x	0.7	=	150.57	(80)
West	0.9x	0.77	x	4.47	x	94.68	x	0.63	x	0.7	=	129.34	(80)
West	0.9x	0.77	x	4.47	x	73.59	x	0.63	x	0.7	=	100.53	(80)
West	0.9x	0.77	x	4.47	x	45.59	x	0.63	x	0.7	=	62.28	(80)
West	0.9x	0.77	x	4.47	x	24.49	x	0.63	x	0.7	=	33.45	(80)
West	0.9x	0.77	x	4.47	x	16.15	x	0.63	x	0.7	=	22.06	(80)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(83)m=	53.66	104.97	172.87	252.13	308.99	316.31	301.14	258.67	201.06	124.56	66.91	44.13	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(84)m=	551.46	598.91	647.39	696.33	721.87	700.23	667.94	634.35	594.17	548.21	524.8	527.65	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C): 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	1	1	1	0.99	0.99	0.96	0.92	0.94	0.98	1	1	1	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(87)m=	18.5	18.64	18.95	19.44	19.92	20.4	20.68	20.64	20.25	19.63	19.02	18.52	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(88)m=	19.24	19.25	19.26	19.3	19.31	19.35	19.35	19.36	19.33	19.31	19.29	19.28	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(89)m=	1	1	1	0.99	0.98	0.92	0.79	0.83	0.96	0.99	1	1	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(90)m=	17.04	17.19	17.51	18.02	18.5	19	19.24	19.22	18.85	18.22	17.6	17.08	(90)

fLA = Living area ÷ (4) = 0.19 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(92)m=	17.32	17.47	17.79	18.29	18.78	19.26	19.52	19.49	19.12	18.49	17.87	17.36	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(93)m=	17.32	17.47	17.79	18.29	18.78	19.26	19.52	19.49	19.12	18.49	17.87	17.36	(93)

8. Space heating requirement

Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	

Utilisation factor for gains, hm:

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(94)m=	1	1	0.99	0.99	0.97	0.92	0.81	0.84	0.96	0.99	1	1	(94)

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Useful gains, hmGm , W = (94)m x (84)m

(95)m=	550.2	596.97	643.79	688.21	701.21	644.98	539.1	534.3	568.53	542.92	523.03	526.66

(95)

Monthly average external temperature from Table 8

(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2

(96)

Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]

(97)m=	3574.11	3427.29	3057.19	2464.28	1845.37	1182.12	739.18	778.77	1285.29	2058.45	2844.55	3518.77

(97)

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	2249.79	1901.97	1795.57	1278.77	851.26	0	0	0	0	1127.55	1671.49	2226.13

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 13102.54 (98)

Space heating requirement in kWh/m²/year 102.16 (99)

9a. Energy requirements – Individual heating systems including micro-CHP)

Space heating:

Fraction of space heat from secondary/supplementary system 0 (201)

Fraction of space heat from main system(s) (202) = 1 – (201) = 1 (202)

Fraction of total heating from main system 1 (204) = (202) × [1 – (203)] = 1 (204)

Efficiency of main space heating system 1 90.3 (206)

Efficiency of secondary/supplementary heating system, % 0 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year
Space heating requirement (calculated above)	2249.79	1901.97	1795.57	1278.77	851.26	0	0	0	0	1127.55	1671.49	2226.13	
(211)m = {[(98)m x (204)] + (210)m } x 100 ÷ (206)	2491.46	2106.28	1988.45	1416.14	942.7	0	0	0	0	1248.67	1851.04	2465.26	(211)

Total (kWh/year) =Sum(211)$_{1...5,10...12}$= 14510.01 (211)

Space heating fuel (secondary), kWh/month
= {[(98)m x (201)] + (214) m } x 100 ÷ (208)

(215)m=	0	0	0	0	0	0	0	0	0	0	0	0

Total (kWh/year) =Sum(215)$_{1...5,10...12}$= 0 (215)

Water heating

Output from water heater (calculated above)

	218.73	192.76	202.37	181.32	175.93	154.95	148.45	165.49	166.93	188.02	198.93	213.43

Efficiency of water heater 80.2 (216)

(217)m=	89.3	89.27	89.16	88.91	88.39	80.2	80.2	80.2	80.2	88.7	89.11	89.32

(217)

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

(219)m=	244.92	215.94	226.97	203.94	199.03	193.2	185.1	206.34	208.14	211.97	223.25	238.96

Total = Sum(219a)$_{1...12}$ = 2557.76 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		14510.01
Water heating fuel used		2557.76
Electricity for pumps, fans and electric keep-hot		
central heating pump:	30	(230c)

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boiler with a fan-assisted flue		45	(230e)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =	75	(231)
Electricity for lighting		719.63	(232)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy kWh/year		Emission factor kg CO2/kWh		Emissions kg CO2/year	
Space heating (main system 1)	(211) x		0.216	=	3134.16	(261)
Space heating (secondary)	(215) x		0.519	=	0	(263)
Water heating	(219) x		0.216	=	552.48	(264)
Space and water heating	(261) + (262) + (263) + (264) =				3686.64	(265)
Electricity for pumps, fans and electric keep-hot	(231) x		0.519	=	38.93	(267)
Electricity for lighting	(232) x		0.519	=	373.49	(268)
Total CO2, kg/year		sum of (265)…(271) =			4099.05	(272)
Dwelling CO2 Emission Rate		(272) ÷ (4) =			31.96	(273)
EI rating (section 14)					68	(274)

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User Details:

Assessor Name:	Robin Brookes	**Stroma Number:**	STRO003819
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.0.28

Property Address: Unit 2

Address : Unit 2, Penmaen, Alexandra Park, Redland, BRISTOL, BS6 6QB

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Basement	94.13	(1a) x	2.34	(2a) =	220.26	(3a)
Ground floor	34.12	(1b) x	2.93	(2b) =	99.97	(3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	128.25	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		320.24	(5)

2. Ventilation rate:

	main heating		secondary heating		other		total		m³ per hour	
Number of chimneys	0	+	0	+	0	=	0	x 40 =	0	(6a)
Number of open flues	0	+	0	+	0	=	0	x 20 =	0	(6b)
Number of intermittent fans							4	x 10 =	40	(7a)
Number of passive vents							0	x 10 =	0	(7b)
Number of flueless gas fires							0	x 40 =	0	(7c)

			Air changes per hour	
Infiltration due to chimneys, flues and fans =	(6a)+(6b)+(7a)+(7b)+(7c) =	40	÷ (5) =	0.12 (8)

If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)

Number of storeys in the dwelling (ns)			0 (9)
Additional infiltration		[(9)-1]x0.1 =	0 (10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction			0 (11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35			
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0			0 (12)
If no draught lobby, enter 0.05, else enter 0			0 (13)
Percentage of windows and doors draught stripped			0 (14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =		0 (15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =		0 (16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area			15 (17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)		0.87 (18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used			
Number of sides sheltered			2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =		0.85 (20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =		0.74 (21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly average wind speed from Table 7												
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7

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Wind Factor (22a)m = (22)m ÷ 4

(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.95	0.93	0.91	0.82	0.8	0.71	0.71	0.69	0.74	0.8	0.84	0.87

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0

(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0

(24b)

c) If whole house extract ventilation or positive input ventilation from outside
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0

(24c)

d) If natural ventilation or whole house positive input ventilation from loft
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=	0.95	0.93	0.91	0.83	0.82	0.75	0.75	0.74	0.78	0.82	0.85	0.88

(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.95	0.93	0.91	0.83	0.82	0.75	0.75	0.74	0.78	0.82	0.85	0.88

(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			1.89	x	1.8	=	3.402			(26)
Windows Type 1			1.5	x1/[1/(1.6)+ 0.04]		=	2.26			(27)
Windows Type 2			0.75	x1/[1/(1.6)+ 0.04]		=	1.13			(27)
Windows Type 3			0.75	x1/[1/(1.6)+ 0.04]		=	1.13			(27)
Windows Type 4			1.49	x1/[1/(1.6)+ 0.04]		=	2.24			(27)
Windows Type 5			1.62	x1/[1/(1.6)+ 0.04]		=	2.44			(27)
Windows Type 6			1.61	x1/[1/(1.6)+ 0.04]		=	2.42			(27)
Windows Type 7			2.21	x1/[1/(1.6)+ 0.04]		=	3.32			(27)
Windows Type 8			2.17	x1/[1/(1.6)+ 0.04]		=	3.26			(27)
Windows Type 9			2.86	x1/[1/(1.6)+ 0.04]		=	4.3			(27)
Windows Type 10			5.36	x1/[1/(1.6)+ 0.04]		=	8.06			(27)
Windows Type 11			5.36	x1/[1/(1.6)+ 0.04]		=	8.06			(27)
Windows Type 12			3.36	x1/[1/(1.6)+ 0.04]		=	5.05			(27)
Floor Type 1			58.36	x	0.65	=	37.934			(28)
Floor Type 2			35.77	x	0.14	=	5.0078			(28)
Walls Type1	68.77	4.49	64.28	x	0.18	=	11.57			(29)
Walls Type2	27.37	2.21	25.16	x	0.18	=	4.53			(29)

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Walls Type3	64.33	12.51	51.82	x	0.17	=	8.81		(29)
Walls Type4	41.23	11.72	29.51	x	0.13	=	3.84		(29)
Roof Type1	17.63	0	17.63	x	0.13	=	2.29		(30)
Roof Type2	18.14	0	18.14	x	0.13	=	2.36		(30)
Total area of elements, m²			331.6						(31)
Party wall			49.82	x	0	=	0		(32)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 123.41 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 31541.29 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Medium 250 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 49.74 (36)

if details of thermal bridging are not known (36) = 0.15 x (31)

Total fabric heat loss (33) + (36) = 173.15 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 × (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	100.34	98.5	96.69	88.2	86.61	79.21	79.21	77.84	82.06	86.61	89.82	93.18	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	273.49	271.65	269.84	261.35	259.76	252.36	252.36	250.99	255.21	259.76	262.97	266.33	

Average = Sum(39)$_{1...12}$ /12= 261.34 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	2.13	2.12	2.1	2.04	2.03	1.97	1.97	1.96	1.99	2.03	2.05	2.08	

Average = Sum(40)$_{1...12}$ /12= 2.04 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.89 (42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 102.84 (43)

Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(44)m=	113.13	109.02	104.9	100.79	96.67	92.56	92.56	96.67	100.79	104.9	109.02	113.13	

Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)

Total = Sum(44)$_{1...12}$ = 1234.14 (44)

Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)

(45)m=	167.77	146.73	151.41	132.01	126.66	109.3	101.28	116.22	117.61	137.06	149.62	162.47	

Total = Sum(45)$_{1...12}$ = 1618.15 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	25.17	22.01	22.71	19.8	19	16.39	15.19	17.43	17.64	20.56	22.44	24.37	(46)

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Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel		0	(47)

If community heating and no tank in dwelling, enter 110 litres in (47)
Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)
Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day):		0	(48)
Temperature factor from Table 2b		0	(49)
Energy lost from water storage, kWh/year	(48) x (49) =	0	(50)
b) If manufacturer's declared cylinder loss factor is not known:			
Hot water storage loss factor from Table 2 (kWh/litre/day)		0	(51)
If community heating see section 4.3			
Volume factor from Table 2a		0	(52)
Temperature factor from Table 2b		0	(53)
Energy lost from water storage, kWh/year	(47) x (51) x (52) x (53) =	0	(54)
Enter (50) or (54) in (55)		0	(55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	0	0	0	0	0	0	0	0	0	0	0	0	(56)

If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H

(57)m=	0	0	0	0	0	0	0	0	0	0	0	0	(57)

Primary circuit loss (annual) from Table 3	0	(58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m
(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m=	0	0	0	0	0	0	0	0	0	0	0	0	(59)

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	50.96	46.03	50.96	49.32	49.26	45.65	47.17	49.26	49.32	50.96	49.32	50.96	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	218.73	192.76	202.37	181.32	175.93	154.95	148.45	165.49	166.93	188.02	198.93	213.43	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	218.73	192.76	202.37	181.32	175.93	154.95	148.45	165.49	166.93	188.02	198.93	213.43	

Output from water heater (annual)$_{1...12}$	2207.3	(64)

Heat gains from water heating, kWh/month 0.25 ´ [0.85 × (45)m + (61)m] + 0.8 x [(46)m + (57)m + (59)m]

(65)m=	68.52	60.29	63.08	56.22	54.43	47.75	45.47	50.96	51.43	58.31	62.08	66.76	(65)

include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating

5. Internal gains (see Table 5 and 5a):

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m=	144.52	144.52	144.52	144.52	144.52	144.52	144.52	144.52	144.52	144.52	144.52	144.52	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	33.56	29.81	24.24	18.35	13.72	11.58	12.52	16.27	21.84	27.73	32.36	34.5	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	295.6	298.67	290.94	274.48	253.71	234.19	221.14	218.08	225.81	242.26	263.03	282.56	(68)

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Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	37.45	37.45	37.45	37.45	37.45	37.45	37.45	37.45	37.45	37.45	37.45	37.45	(69)

Pumps and fans gains (Table 5a)

(70)m=	3	3	3	3	3	3	3	3	3	3	3	3	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-115.61	-115.61	-115.61	-115.61	-115.61	-115.61	-115.61	-115.61	-115.61	-115.61	-115.61	-115.61	(71)

Water heating gains (Table 5)

(72)m=	92.1	89.72	84.79	78.08	73.16	66.32	61.11	68.49	71.44	78.38	86.22	89.73	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	490.62	487.56	469.33	440.27	409.94	381.45	364.13	372.19	388.43	417.72	450.96	476.14	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast 0.9x	0.77	x	2.21	x	11.28	x	0.63	x	0.7	=	7.62	(75)
Northeast 0.9x	0.77	x	2.17	x	11.28	x	0.63	x	0.7	=	7.48	(75)
Northeast 0.9x	0.77	x	2.86	x	11.28	x	0.63	x	0.7	=	9.86	(75)
Northeast 0.9x	0.77	x	2.21	x	22.97	x	0.63	x	0.7	=	15.51	(75)
Northeast 0.9x	0.77	x	2.17	x	22.97	x	0.63	x	0.7	=	15.23	(75)
Northeast 0.9x	0.77	x	2.86	x	22.97	x	0.63	x	0.7	=	20.07	(75)
Northeast 0.9x	0.77	x	2.21	x	41.38	x	0.63	x	0.7	=	27.95	(75)
Northeast 0.9x	0.77	x	2.17	x	41.38	x	0.63	x	0.7	=	27.44	(75)
Northeast 0.9x	0.77	x	2.86	x	41.38	x	0.63	x	0.7	=	36.17	(75)
Northeast 0.9x	0.77	x	2.21	x	67.96	x	0.63	x	0.7	=	45.9	(75)
Northeast 0.9x	0.77	x	2.17	x	67.96	x	0.63	x	0.7	=	45.07	(75)
Northeast 0.9x	0.77	x	2.86	x	67.96	x	0.63	x	0.7	=	59.4	(75)
Northeast 0.9x	0.77	x	2.21	x	91.35	x	0.63	x	0.7	=	61.7	(75)
Northeast 0.9x	0.77	x	2.17	x	91.35	x	0.63	x	0.7	=	60.58	(75)
Northeast 0.9x	0.77	x	2.86	x	91.35	x	0.63	x	0.7	=	79.84	(75)
Northeast 0.9x	0.77	x	2.21	x	97.38	x	0.63	x	0.7	=	65.77	(75)
Northeast 0.9x	0.77	x	2.17	x	97.38	x	0.63	x	0.7	=	64.58	(75)
Northeast 0.9x	0.77	x	2.86	x	97.38	x	0.63	x	0.7	=	85.12	(75)
Northeast 0.9x	0.77	x	2.21	x	91.1	x	0.63	x	0.7	=	61.53	(75)
Northeast 0.9x	0.77	x	2.17	x	91.1	x	0.63	x	0.7	=	60.42	(75)
Northeast 0.9x	0.77	x	2.86	x	91.1	x	0.63	x	0.7	=	79.63	(75)
Northeast 0.9x	0.77	x	2.21	x	72.63	x	0.63	x	0.7	=	49.05	(75)
Northeast 0.9x	0.77	x	2.17	x	72.63	x	0.63	x	0.7	=	48.16	(75)
Northeast 0.9x	0.77	x	2.86	x	72.63	x	0.63	x	0.7	=	63.48	(75)
Northeast 0.9x	0.77	x	2.21	x	50.42	x	0.63	x	0.7	=	34.05	(75)
Northeast 0.9x	0.77	x	2.17	x	50.42	x	0.63	x	0.7	=	33.44	(75)

DER WorkSheet: New dwelling design stage

Northeast	0.9x	0.77	x	2.86	x	50.42	x	0.63	x	0.7	=	44.07	(75)
Northeast	0.9x	0.77	x	2.21	x	28.07	x	0.63	x	0.7	=	18.96	(75)
Northeast	0.9x	0.77	x	2.17	x	28.07	x	0.63	x	0.7	=	18.61	(75)
Northeast	0.9x	0.77	x	2.86	x	28.07	x	0.63	x	0.7	=	24.53	(75)
Northeast	0.9x	0.77	x	2.21	x	14.2	x	0.63	x	0.7	=	9.59	(75)
Northeast	0.9x	0.77	x	2.17	x	14.2	x	0.63	x	0.7	=	9.42	(75)
Northeast	0.9x	0.77	x	2.86	x	14.2	x	0.63	x	0.7	=	12.41	(75)
Northeast	0.9x	0.77	x	2.21	x	9.21	x	0.63	x	0.7	=	6.22	(75)
Northeast	0.9x	0.77	x	2.17	x	9.21	x	0.63	x	0.7	=	6.11	(75)
Northeast	0.9x	0.77	x	2.86	x	9.21	x	0.63	x	0.7	=	8.05	(75)
Southeast	0.9x	0.3	x	5.36	x	36.79	x	0.63	x	0.7	=	23.48	(77)
Southeast	0.9x	0.3	x	5.36	x	36.79	x	0.63	x	0.7	=	23.48	(77)
Southeast	0.9x	0.3	x	5.36	x	62.67	x	0.63	x	0.7	=	40	(77)
Southeast	0.9x	0.3	x	5.36	x	62.67	x	0.63	x	0.7	=	40	(77)
Southeast	0.9x	0.3	x	5.36	x	85.75	x	0.63	x	0.7	=	54.73	(77)
Southeast	0.9x	0.3	x	5.36	x	85.75	x	0.63	x	0.7	=	54.73	(77)
Southeast	0.9x	0.3	x	5.36	x	106.25	x	0.63	x	0.7	=	67.81	(77)
Southeast	0.9x	0.3	x	5.36	x	106.25	x	0.63	x	0.7	=	67.81	(77)
Southeast	0.9x	0.3	x	5.36	x	119.01	x	0.63	x	0.7	=	75.95	(77)
Southeast	0.9x	0.3	x	5.36	x	119.01	x	0.63	x	0.7	=	75.95	(77)
Southeast	0.9x	0.3	x	5.36	x	118.15	x	0.63	x	0.7	=	75.41	(77)
Southeast	0.9x	0.3	x	5.36	x	118.15	x	0.63	x	0.7	=	75.41	(77)
Southeast	0.9x	0.3	x	5.36	x	113.91	x	0.63	x	0.7	=	72.7	(77)
Southeast	0.9x	0.3	x	5.36	x	113.91	x	0.63	x	0.7	=	72.7	(77)
Southeast	0.9x	0.3	x	5.36	x	104.39	x	0.63	x	0.7	=	66.62	(77)
Southeast	0.9x	0.3	x	5.36	x	104.39	x	0.63	x	0.7	=	66.62	(77)
Southeast	0.9x	0.3	x	5.36	x	92.85	x	0.63	x	0.7	=	59.26	(77)
Southeast	0.9x	0.3	x	5.36	x	92.85	x	0.63	x	0.7	=	59.26	(77)
Southeast	0.9x	0.3	x	5.36	x	69.27	x	0.63	x	0.7	=	44.21	(77)
Southeast	0.9x	0.3	x	5.36	x	69.27	x	0.63	x	0.7	=	44.21	(77)
Southeast	0.9x	0.3	x	5.36	x	44.07	x	0.63	x	0.7	=	28.13	(77)
Southeast	0.9x	0.3	x	5.36	x	44.07	x	0.63	x	0.7	=	28.13	(77)
Southeast	0.9x	0.3	x	5.36	x	31.49	x	0.63	x	0.7	=	20.1	(77)
Southeast	0.9x	0.3	x	5.36	x	31.49	x	0.63	x	0.7	=	20.1	(77)
South	0.9x	0.77	x	0.75	x	46.75	x	0.63	x	0.7	=	10.72	(78)
South	0.9x	0.77	x	0.75	x	76.57	x	0.63	x	0.7	=	17.55	(78)
South	0.9x	0.77	x	0.75	x	97.53	x	0.63	x	0.7	=	22.36	(78)
South	0.9x	0.77	x	0.75	x	110.23	x	0.63	x	0.7	=	25.27	(78)
South	0.9x	0.77	x	0.75	x	114.87	x	0.63	x	0.7	=	26.33	(78)
South	0.9x	0.77	x	0.75	x	110.55	x	0.63	x	0.7	=	25.34	(78)
South	0.9x	0.77	x	0.75	x	108.01	x	0.63	x	0.7	=	24.76	(78)

DER WorkSheet: New dwelling design stage

South	0.9x	0.77	x	0.75	x	104.89	x	0.63	x	0.7	=	24.04	(78)
South	0.9x	0.77	x	0.75	x	101.89	x	0.63	x	0.7	=	23.35	(78)
South	0.9x	0.77	x	0.75	x	82.59	x	0.63	x	0.7	=	18.93	(78)
South	0.9x	0.77	x	0.75	x	55.42	x	0.63	x	0.7	=	12.7	(78)
South	0.9x	0.77	x	0.75	x	40.4	x	0.63	x	0.7	=	9.26	(78)
Southwest	0.9x	0.77	x	1.5	x	36.79		0.63	x	0.7	=	16.87	(79)
Southwest	0.9x	0.3	x	3.36	x	36.79		0.63	x	0.7	=	14.72	(79)
Southwest	0.9x	0.77	x	1.5	x	62.67		0.63	x	0.7	=	28.73	(79)
Southwest	0.9x	0.3	x	3.36	x	62.67		0.63	x	0.7	=	25.07	(79)
Southwest	0.9x	0.77	x	1.5	x	85.75		0.63	x	0.7	=	39.31	(79)
Southwest	0.9x	0.3	x	3.36	x	85.75		0.63	x	0.7	=	34.31	(79)
Southwest	0.9x	0.77	x	1.5	x	106.25		0.63	x	0.7	=	48.71	(79)
Southwest	0.9x	0.3	x	3.36	x	106.25		0.63	x	0.7	=	42.51	(79)
Southwest	0.9x	0.77	x	1.5	x	119.01		0.63	x	0.7	=	54.56	(79)
Southwest	0.9x	0.3	x	3.36	x	119.01		0.63	x	0.7	=	47.61	(79)
Southwest	0.9x	0.77	x	1.5	x	118.15		0.63	x	0.7	=	54.16	(79)
Southwest	0.9x	0.3	x	3.36	x	118.15		0.63	x	0.7	=	47.27	(79)
Southwest	0.9x	0.77	x	1.5	x	113.91		0.63	x	0.7	=	52.22	(79)
Southwest	0.9x	0.3	x	3.36	x	113.91		0.63	x	0.7	=	45.57	(79)
Southwest	0.9x	0.77	x	1.5	x	104.39		0.63	x	0.7	=	47.85	(79)
Southwest	0.9x	0.3	x	3.36	x	104.39		0.63	x	0.7	=	41.76	(79)
Southwest	0.9x	0.77	x	1.5	x	92.85		0.63	x	0.7	=	42.57	(79)
Southwest	0.9x	0.3	x	3.36	x	92.85		0.63	x	0.7	=	37.15	(79)
Southwest	0.9x	0.77	x	1.5	x	69.27		0.63	x	0.7	=	31.75	(79)
Southwest	0.9x	0.3	x	3.36	x	69.27		0.63	x	0.7	=	27.71	(79)
Southwest	0.9x	0.77	x	1.5	x	44.07		0.63	x	0.7	=	20.2	(79)
Southwest	0.9x	0.3	x	3.36	x	44.07		0.63	x	0.7	=	17.63	(79)
Southwest	0.9x	0.77	x	1.5	x	31.49		0.63	x	0.7	=	14.43	(79)
Southwest	0.9x	0.3	x	3.36	x	31.49		0.63	x	0.7	=	12.6	(79)
West	0.9x	0.77	x	0.75	x	19.64	x	0.63	x	0.7	=	4.5	(80)
West	0.9x	0.77	x	0.75	x	38.42	x	0.63	x	0.7	=	8.81	(80)
West	0.9x	0.77	x	0.75	x	63.27	x	0.63	x	0.7	=	14.5	(80)
West	0.9x	0.77	x	0.75	x	92.28	x	0.63	x	0.7	=	21.15	(80)
West	0.9x	0.77	x	0.75	x	113.09	x	0.63	x	0.7	=	25.92	(80)
West	0.9x	0.77	x	0.75	x	115.77	x	0.63	x	0.7	=	26.54	(80)
West	0.9x	0.77	x	0.75	x	110.22	x	0.63	x	0.7	=	25.26	(80)
West	0.9x	0.77	x	0.75	x	94.68	x	0.63	x	0.7	=	21.7	(80)
West	0.9x	0.77	x	0.75	x	73.59	x	0.63	x	0.7	=	16.87	(80)
West	0.9x	0.77	x	0.75	x	45.59	x	0.63	x	0.7	=	10.45	(80)
West	0.9x	0.77	x	0.75	x	24.49	x	0.63	x	0.7	=	5.61	(80)
West	0.9x	0.77	x	0.75	x	16.15	x	0.63	x	0.7	=	3.7	(80)

DER WorkSheet: New dwelling design stage

Northwest	0.9x	0.77	x	1.49	x	11.28	x	0.63	x	0.7	=	5.14	(81)
Northwest	0.9x	0.77	x	1.62	x	11.28	x	0.63	x	0.7	=	5.59	(81)
Northwest	0.9x	0.77	x	1.61	x	11.28	x	0.63	x	0.7	=	5.55	(81)
Northwest	0.9x	0.77	x	1.49	x	22.97	x	0.63	x	0.7	=	10.46	(81)
Northwest	0.9x	0.77	x	1.62	x	22.97	x	0.63	x	0.7	=	11.37	(81)
Northwest	0.9x	0.77	x	1.61	x	22.97	x	0.63	x	0.7	=	11.3	(81)
Northwest	0.9x	0.77	x	1.49	x	41.38	x	0.63	x	0.7	=	18.84	(81)
Northwest	0.9x	0.77	x	1.62	x	41.38	x	0.63	x	0.7	=	20.49	(81)
Northwest	0.9x	0.77	x	1.61	x	41.38	x	0.63	x	0.7	=	20.36	(81)
Northwest	0.9x	0.77	x	1.49	x	67.96	x	0.63	x	0.7	=	30.94	(81)
Northwest	0.9x	0.77	x	1.62	x	67.96	x	0.63	x	0.7	=	33.64	(81)
Northwest	0.9x	0.77	x	1.61	x	67.96	x	0.63	x	0.7	=	33.44	(81)
Northwest	0.9x	0.77	x	1.49	x	91.35	x	0.63	x	0.7	=	41.6	(81)
Northwest	0.9x	0.77	x	1.62	x	91.35	x	0.63	x	0.7	=	45.22	(81)
Northwest	0.9x	0.77	x	1.61	x	91.35	x	0.63	x	0.7	=	44.95	(81)
Northwest	0.9x	0.77	x	1.49	x	97.38	x	0.63	x	0.7	=	44.35	(81)
Northwest	0.9x	0.77	x	1.62	x	97.38	x	0.63	x	0.7	=	48.21	(81)
Northwest	0.9x	0.77	x	1.61	x	97.38	x	0.63	x	0.7	=	47.92	(81)
Northwest	0.9x	0.77	x	1.49	x	91.1	x	0.63	x	0.7	=	41.48	(81)
Northwest	0.9x	0.77	x	1.62	x	91.1	x	0.63	x	0.7	=	45.1	(81)
Northwest	0.9x	0.77	x	1.61	x	91.1	x	0.63	x	0.7	=	44.83	(81)
Northwest	0.9x	0.77	x	1.49	x	72.63	x	0.63	x	0.7	=	33.07	(81)
Northwest	0.9x	0.77	x	1.62	x	72.63	x	0.63	x	0.7	=	35.96	(81)
Northwest	0.9x	0.77	x	1.61	x	72.63	x	0.63	x	0.7	=	35.74	(81)
Northwest	0.9x	0.77	x	1.49	x	50.42	x	0.63	x	0.7	=	22.96	(81)
Northwest	0.9x	0.77	x	1.62	x	50.42	x	0.63	x	0.7	=	24.96	(81)
Northwest	0.9x	0.77	x	1.61	x	50.42	x	0.63	x	0.7	=	24.81	(81)
Northwest	0.9x	0.77	x	1.49	x	28.07	x	0.63	x	0.7	=	12.78	(81)
Northwest	0.9x	0.77	x	1.62	x	28.07	x	0.63	x	0.7	=	13.9	(81)
Northwest	0.9x	0.77	x	1.61	x	28.07	x	0.63	x	0.7	=	13.81	(81)
Northwest	0.9x	0.77	x	1.49	x	14.2	x	0.63	x	0.7	=	6.46	(81)
Northwest	0.9x	0.77	x	1.62	x	14.2	x	0.63	x	0.7	=	7.03	(81)
Northwest	0.9x	0.77	x	1.61	x	14.2	x	0.63	x	0.7	=	6.99	(81)
Northwest	0.9x	0.77	x	1.49	x	9.21	x	0.63	x	0.7	=	4.2	(81)
Northwest	0.9x	0.77	x	1.62	x	9.21	x	0.63	x	0.7	=	4.56	(81)
Northwest	0.9x	0.77	x	1.61	x	9.21	x	0.63	x	0.7	=	4.53	(81)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	135.01	244.11	371.18	521.65	640.21	660.07	626.19	534.07	422.75	279.85	164.29	113.87	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	625.63	731.66	840.5	961.92	1050.16	1041.52	990.32	906.26	811.18	697.57	615.26	590.01	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

DER WorkSheet: New dwelling design stage

(86)m=	1	1	0.99	0.99	0.96	0.9	0.81	0.85	0.96	0.99	1	1	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	18.55	18.73	19.08	19.6	20.11	20.57	20.8	20.76	20.37	19.73	19.09	18.57	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	19.25	19.26	19.26	19.31	19.32	19.35	19.35	19.36	19.34	19.32	19.3	19.28	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	1	1	0.99	0.98	0.94	0.82	0.62	0.69	0.92	0.99	1	1	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	17.1	17.28	17.64	18.19	18.69	19.14	19.3	19.29	18.96	18.32	17.67	17.13	(90)

fLA = Living area ÷ (4) = 0.19 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	17.38	17.56	17.91	18.46	18.96	19.41	19.59	19.57	19.23	18.59	17.94	17.41	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	17.38	17.56	17.91	18.46	18.96	19.41	19.59	19.57	19.23	18.59	17.94	17.41	(93)

8. Space heating requirement

Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(94)m=	1	0.99	0.99	0.97	0.93	0.83	0.66	0.72	0.91	0.98	0.99	1	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	623.57	727.5	830.89	935.42	976.21	859.71	650.82	650.99	739.48	684.58	611.99	588.47	(95)
Monthly average external temperature from Table 8													
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]													
(97)m=	3575.9	3439.17	3079.83	2498.26	1886.43	1214.19	755.1	795.42	1310.23	2075.87	2850.61	3518.23	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	2196.53	1822.25	1673.21	1125.24	677.2	0	0	0	0	1035.12	1611.81	2179.74	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 12321.11 (98)

Space heating requirement in kWh/m²/year 96.07 (99)

9a. Energy requirements – Individual heating systems including micro-CHP)

Space heating:

Fraction of space heat from secondary/supplementary system 0 (201)

Fraction of space heat from main system(s) (202) = 1 – (201) = 1 (202)

Fraction of total heating from main system 1 (204) = (202) × [1 – (203)] = 1 (204)

Efficiency of main space heating system 1 90.3 (206)

Efficiency of secondary/supplementary heating system, % 0 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year
Space heating requirement (calculated above)													
	2196.53	1822.25	1673.21	1125.24	677.2	0	0	0	0	1035.12	1611.81	2179.74	
(211)m = {[(98)m x (204)] + (210)m } x 100 ÷ (206)													(211)
	2432.48	2017.99	1852.95	1246.11	749.94	0	0	0	0	1146.32	1784.95	2413.89	

Total (kWh/year) =Sum(211)$_{1...5,10...12}$= 13644.64 (211)

DER WorkSheet: New dwelling design stage

Space heating fuel (secondary), kWh/month
= {[(98)m x (201)] + (214) m } x 100 ÷ (208)

(215)m=	0	0	0	0	0	0	0	0	0	0	0	0

Total (kWh/year) =Sum(215)$_{1...5,10...12}$= 0 (215)

Water heating

Output from water heater (calculated above)

	218.73	192.76	202.37	181.32	175.93	154.95	148.45	165.49	166.93	188.02	198.93	213.43

Efficiency of water heater 80.2 (216)

(217)m=	89.28	89.23	89.09	88.75	88.01	80.2	80.2	80.2	80.2	88.59	89.07	89.3

(217)

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

(219)m=	244.98	216.04	227.16	204.31	199.88	193.2	185.1	206.34	208.14	212.25	223.35	239.01

Total = Sum(219a)$_{1...12}$ = 2559.76 (219)

Annual totals	**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1		13644.64	
Water heating fuel used		2559.76	
Electricity for pumps, fans and electric keep-hot			
central heating pump:	30		(230c)
boiler with a fan-assisted flue	45		(230e)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =	75	(231)
Electricity for lighting		592.75	(232)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy kWh/year	**Emission factor** kg CO2/kWh		**Emissions** kg CO2/year	
Space heating (main system 1)	(211) x	0.216	=	2947.24	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	552.91	(264)
Space and water heating	(261) + (262) + (263) + (264) =			3500.15	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	307.64	(268)
Total CO2, kg/year	sum of (265)…(271) =			3846.71	(272)
Dwelling CO2 Emission Rate	(272) ÷ (4) =			29.99	(273)
EI rating (section 14)				70	(274)

Predicted Energy Assessment

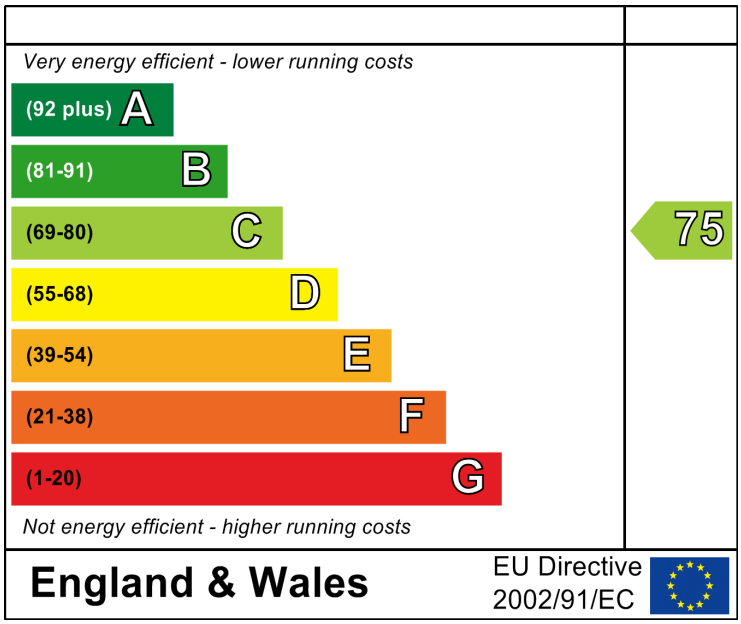
Unit 2, Penmaen
Alexandra Park
Redland
BRISTOL
BS6 6QB

Dwelling type: Ground floor Maisonette
Date of assessment: 21 July 2014
Produced by: Robin Brookes
Total floor area: 128.25 m²

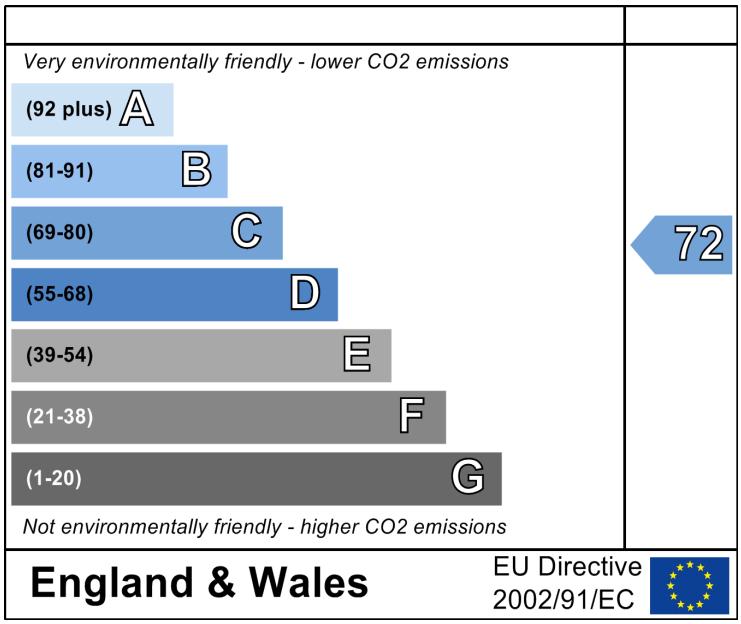
This is a Predicted Energy Assessment for a property which is not yet complete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, an Energy Performance Certificate is required providing information about the energy performance of the completed property.

Energy performance has been assessed using the SAP 2012 methodology and is rated in terms of the energy use per square metre of floor area, energy efficiency based on fuel costs and environmental impact based on carbon dioxide (CO2) emissions.

Energy Efficiency Rating



Environmental Impact (CO_2) Rating



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

The environmental impact rating is a measure of a home's impact on the environment in terms of carbonn dioxide (CO2) emissions. The higher the rating the less impact it has on the environment.

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.0.28
Printed on 23 July 2014 at 14:52:35

Project Information:

Assessed By: Robin Brookes (STRO003819) **Building Type:** Maisonette

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 128.25m²

Site Reference : Penmaen House **Plot Reference:** Unit 2

Address : Unit 2, Penmaen, Alexandra Park, Redland, BRISTOL, BS6 6QB

Client Details:

Name: Aspect 360

Address : 45 Oldfield Road, Clifton, Bristol, BS8 2AX

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Mains gas
Fuel factor: 1.00 (mains gas)

Target Carbon Dioxide Emission Rate (TER)	18.64 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	29.99 kg/m²	**Fail**

Excess emissions = 11.35 kg/m² (60.9 %)

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	66.10 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	98.40 kWh/m²	
		Fail

Excess energy = 32.30 kg/m² (48.9 %)

2 Fabric U-values

Element	Average	Highest	
External wall	0.17 (max. 0.30)	0.18 (max. 0.70)	**OK**
Party wall	0.00 (max. 0.20)	-	**OK**
Floor	0.46 (max. 0.25)	0.65 (max. 0.70)	**Fail**
Roof	0.13 (max. 0.20)	0.13 (max. 0.35)	**OK**
Openings	1.61 (max. 2.00)	1.80 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated using user-specified y-value of 0.15

3 Air permeability

Air permeability at 50 pascals	15.00 (As in this dwelling)	**OK**

4 Heating efficiency

Main Heating system:	Database: (rev 360, product index 010265): Boiler systems with radiators or underfloor heating - mains gas Brand name: Worcester Model: Greenstar CDi Model qualifier: 30 CDi (Combi) Efficiency 89.4 % SEDBUK2009 Minimum 88.0 %	**OK**

Regulations Compliance Report

Secondary heating system:	None	

5 Cylinder insulation

Hot water Storage:	No cylinder	

6 Controls

Space heating controls	Programmer, room thermostat and TRVs	**OK**
Hot water controls:	No cylinder	
Boiler interlock:	Yes	**OK**

7 Low energy lights

Percentage of fixed lights with low-energy fittings	75.0%	
Minimum	75.0%	**OK**

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (South West England):	Not significant	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: South West	1.5m²,
Windows facing: West	0.75m²,
Windows facing: South	0.75m²,
Windows facing: North West	1.49m²,
Windows facing: North West	1.62m²,
Windows facing: North West	1.61m²,
Windows facing: North East	2.21m²,
Windows facing: North East	2.17m²,
Windows facing: North East	2.86m²,
Windows facing: South East	5.36m²,
Windows facing: South East	5.36m²,
Windows facing: South West	3.36m²,
Ventilation rate:	4.00
Blinds/curtains:	Light-coloured curtain or roller blind Closed 100% of daylight hours

10 Key features

External Walls U-value	0.13 W/m²K
Party Walls U-value	0 W/m²K

SAP Input

Property Details: Unit 2

Address:	Unit 2, Penmaen, Alexandra Park, Redland, BRISTOL, BS6 6QB
Located in:	England
Region:	South West England
UPRN:	1253063468
Date of assessment:	21 July 2014
Date of certificate:	23 July 2014
Assessment type:	New dwelling design stage
Transaction type:	New dwelling
Tenure type:	Unknown
Related party disclosure:	No related party
Thermal Mass Parameter:	Indicative Value Medium
Water use <= 125 litres/person/day:	True
PCDF Version:	360

Property description:

Dwelling type:	Maisonette
Detachment:	
Year Completed:	2014

Floor Location:	Floor area:	Storey height:
Basement floor	94.13 m²	2.34 m
Floor 1	34.12 m²	2.93 m

Living area:	24.65 m² (fraction 0.192)
Front of dwelling faces:	North West

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
Front door	Manufacturer	Solid			Wood
SW window	Manufacturer	Windows	Secondary glazing	No	
W window	Manufacturer	Windows	Secondary glazing	No	
S window	Manufacturer	Windows	Secondary glazing	No	
NW basement windows	Manufacturer	Windows	Secondary glazing	No	
NW new basement	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	
NW timber frame	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	
NE window solid wall	Manufacturer	Windows	Secondary glazing	No	
NE new basement	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	
NE timber frame	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	
SE new basement	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	
SE timber frame	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	
SW new basement	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	

Name:	**Gap:**	**Frame Factor:**	**g-value:**	**U-value:**	**Area:**	**No. of Openings:**
Front door	mm	0.7	0	1.8	1.89	1
SW window	16mm or more	0.7	0.63	1.6	1.5	1
W window	16mm or more	0.7	0.63	1.6	0.75	1
S window	16mm or more	0.7	0.63	1.6	0.75	1
NW basement windows	16mm or more	0.7	0.63	1.6	1.49	1
NW new basement	16mm or more	0.7	0.63	1.6	1.62	1
NW timber frame	16mm or more	0.7	0.63	1.6	1.61	1
NE window solid wall	16mm or more	0.7	0.63	1.6	2.21	1
NE new basement	16mm or more	0.7	0.63	1.6	2.17	1
NE timber frame	16mm or more	0.7	0.63	1.6	2.86	1
SE new basement	16mm or more	0.7	0.63	1.6	5.36	1
SE timber frame	16mm or more	0.7	0.63	1.6	5.36	1
SW new basement	16mm or more	0.7	0.63	1.6	3.36	1

SAP Input

Name:	Type-Name:	Location:	Orient:	Width:	Height:
Front door		Timber frame wall	North West	0	0
SW window		Solid stone basement	South West	0	0
W window		Solid stone basement	West	0	0
S window		Solid stone basement	South	0	0
NW basement windows		Solid stone basement	North West	0	0
NW new basement		New cavity wall	North West	0	0
NW timber frame		Timber frame wall	North West	0	0
NE window solid wall		Solid stone walls	North East	0	0
NE new basement		New cavity wall	North East	0	0
NE timber frame		Timber frame wall	North East	0	0
SE new basement		New cavity wall	South East	0	0
SE timber frame		Timber frame wall	South East	0	0
SW new basement		New cavity wall	South West	0	0

Overshading: Average or unknown

Opaque Elements:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Elements							
Solid stone basement	68.77	4.49	64.28	0.18	0	False	N/A
Solid stone walls	27.37	2.21	25.16	0.18	0	False	N/A
New cavity wall	64.33	12.51	51.82	0.17	0	False	N/A
Timber frame wall	41.23	11.72	29.51	0.13	0	False	N/A
Flat roof	17.63	0	17.63	0.13	0		N/A
Flat living roof	18.14	0	18.14	0.13	0		N/A
Existing ground floor	58.36			0.65			N/A
New ground floor	35.77			0.14			N/A
Internal Elements							
Party Elements							
Party walls	49.82						N/A

Thermal bridges:

Thermal bridges: No information on thermal bridging (y=0.15) (y =0.15)

Ventilation:

Pressure test: No (Assumed)
Ventilation: Natural ventilation (extract fans)
Number of chimneys: 0
Number of open flues: 0
Number of fans: 4
Number of passive stacks: 0
Number of sides sheltered: 2
Pressure test: 15

Main heating system:

Main heating system:
Boiler systems with radiators or underfloor heating
Gas boilers and oil boilers
Fuel: mains gas
Info Source: Boiler Database
Database: (rev 360, product index 010265) Efficiency: Winter 80.2 % Summer: 90.3
Brand name: Worcester
Model: Greenstar CDi
Model qualifier: 30 CDi
(Combi boiler)
Systems with radiators
Central heating pump : 2013 or later
Design flow temperature: Design flow temperature >45°C

SAP Input

	Boiler interlock: Yes
Main heating Control:	
Main heating Control:	Programmer, room thermostat and TRVs Control code: 2106
Secondary heating system:	
Secondary heating system:	None
Water heating:	
Water heating:	From main heating system Water code: 901 Fuel :mains gas No hot water cylinder Solar panel: False
Others:	
Electricity tariff:	Standard Tariff
In Smoke Control Area:	Yes
Conservatory:	No conservatory
Low energy lights:	75%
Terrain type:	Low rise urban / suburban
EPC language:	English
Wind turbine:	No
Photovoltaics:	None
Assess Zero Carbon Home:	No

WEST ELEVATION:
ALEXANDRA PARK
Street View

REV	Note	Date
B	Planting added	03.11.14
	PLANNING APPLICATION	
A	Title updated	21.07.14

105 WEST ARCHITECTS Ltd
107 Lower Redland Road, Redland,
Bristol. BS6 6SW

T: 0117 3737596
E: info@105west.co.uk
Web site: www.105west.co.uk

Project: Penmaen House, Redland, Bristol

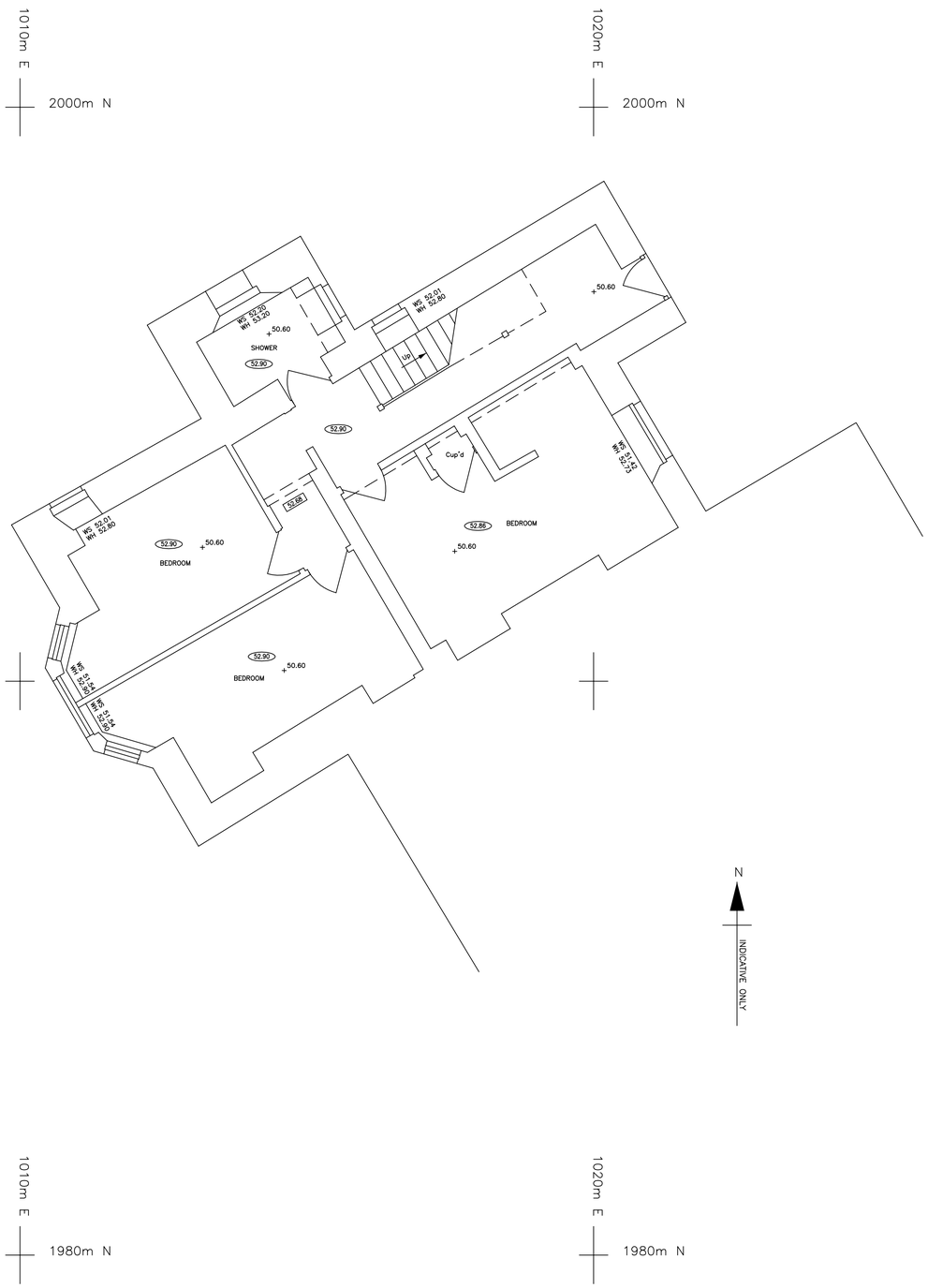
Drawing Title: Existing and Proposed West Elevation Street View

Drawing No.: 1575 L 19

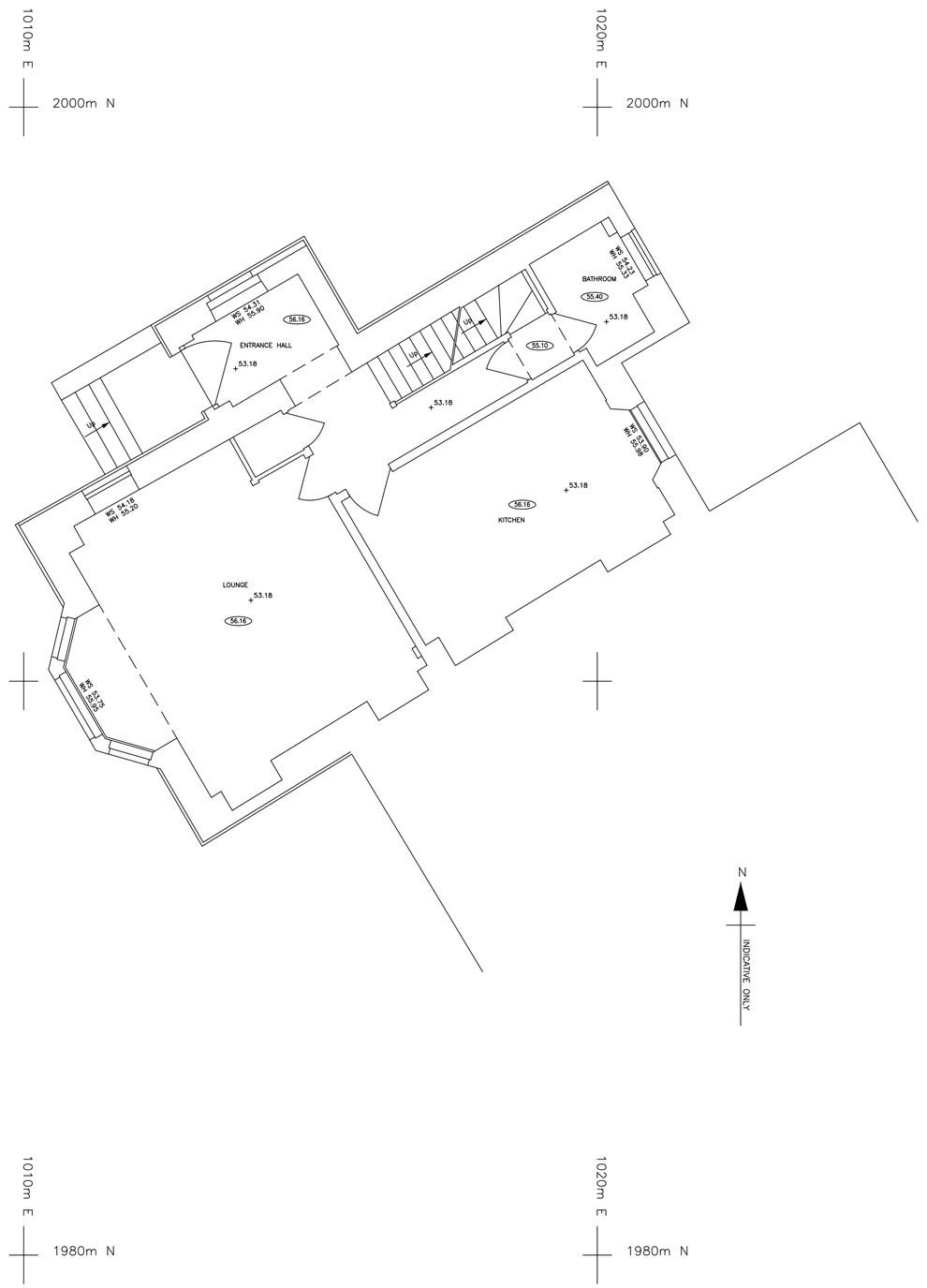
0 4m

Scale @A3	drawn by	Date	Rev
1:100	LH	20/06/14	B

BASEMENT



GROUND FLOOR



NOTES

Survey Detail Note

The detail shown is commensurate with the plotting scale of 1: 50

The area illustrated was surveyed to be plotted at a scale of 1:50

Subsequent enlargements will not increase the survey accuracy

Survey Datum Note

1. Levels, in metres, are relative to Site BM at:

Location	Value
Station 1	52.464
Station 2	52.500
Station 3	51.670

2. Standard Levels are quoted to 2 Decimal Places.

KEY

AB	Air Brick	IC	Inspection Cover
BL	Basement Light	IL	Invert Level
BT	British Telecom Cover	JB	Junction Box
C	Ceiling	MC	Mercury Inspection Cover
CC	Coal Chute		
Chy	Chimney	MH	Manhole
CL	Cover Level	RE	Rodding Eye
Col	Column	RSJ	Rolled Steel Joist
Conc	Concrete	RWP	Rain Water Pipe
Cup	Cupboard	S	Sill
D	Duct	SBM	Site Benchmark
DP	Down Pipe	SC	Stop Cock
Dr	Drain	S–H	Sill to Head Height
EIC	Electricity Inspection Cover	Sup–E	Supply Point–Electricity
		Sup–G	Supply Point–Gas
F	Floor	Sup–O	Supply Point–Oil
FC	False Ceiling	Sup–T	Supply Point–Telephone
FE	Fire Escape	TL	Threshold Level
FIG	Feeds Into Ground	V	Valve
F–S	Floor to Sill Height	VP	Vent Pipe
G	Gully	WB	Wash/Hand Basin
GV	Gas Valve	WC	Water Closet
H	Head Height	WM	Water Meter
h	Height		

Beam Height/Downstand

Ceiling Height

Station

REV	DETAILS	DR	CH	PA	DATE

DRAWN BY	CHECKED BY	PASSED BY	DATE
SMH	SMH		MAR. 2014

SCALES

1:50

PENMAEN HOUSE
ALEXANDRA PARK
REDLAND, BRISTOL

Floor Plans
Basement and Ground Floor
Sheet 1 of 2

STP Property

STEPHEN M HAMEY MRICS
Chartered Land Surveyor

35 Helston Road
Nailsea
North Somerset BS48 2UA
Telephone & Fax: 01275 792209

SURVEYS

DRAWING NUMBER **14007/02** REV **-**

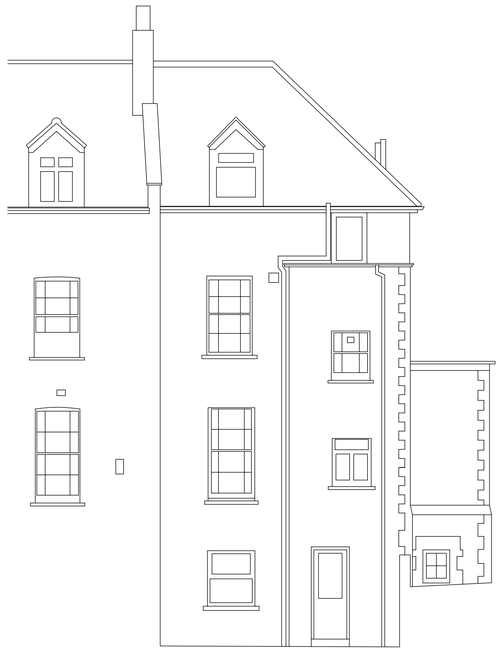
File Ref: 14007–02.DWG

Datum 50.00 AD

FRONT (WEST) ELEVATION

Datum 50.00 AD

SIDE (NORTH) ELEVATION



Datum 50.00 AD

REAR (EAST) ELEVATION

NOTES

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Conc	Concrete	RWP	Rain Water Pipe
Cup	Cupboard	S	Sill
D	Door	SBM	Site Benchmark
DP	Drain Pipe	SC	Stop Cock
Dr	Drain	S-H	Sill to Head Height
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h	Height	WM	Water Meter

Beam Height/Downstand

Ceiling Height

Station

REV	DETAILS	DR	CH	PA	DATE

DRAWN BY	CHECKED BY	PASSED BY	DATE
SMH	SMH		MAR. 2014

SCALES

1:50

PENMAEN HOUSE
ALEXANDRA PARK
REDLAND, BRISTOL

Elevations
Sheet 1 of 1

STP Property

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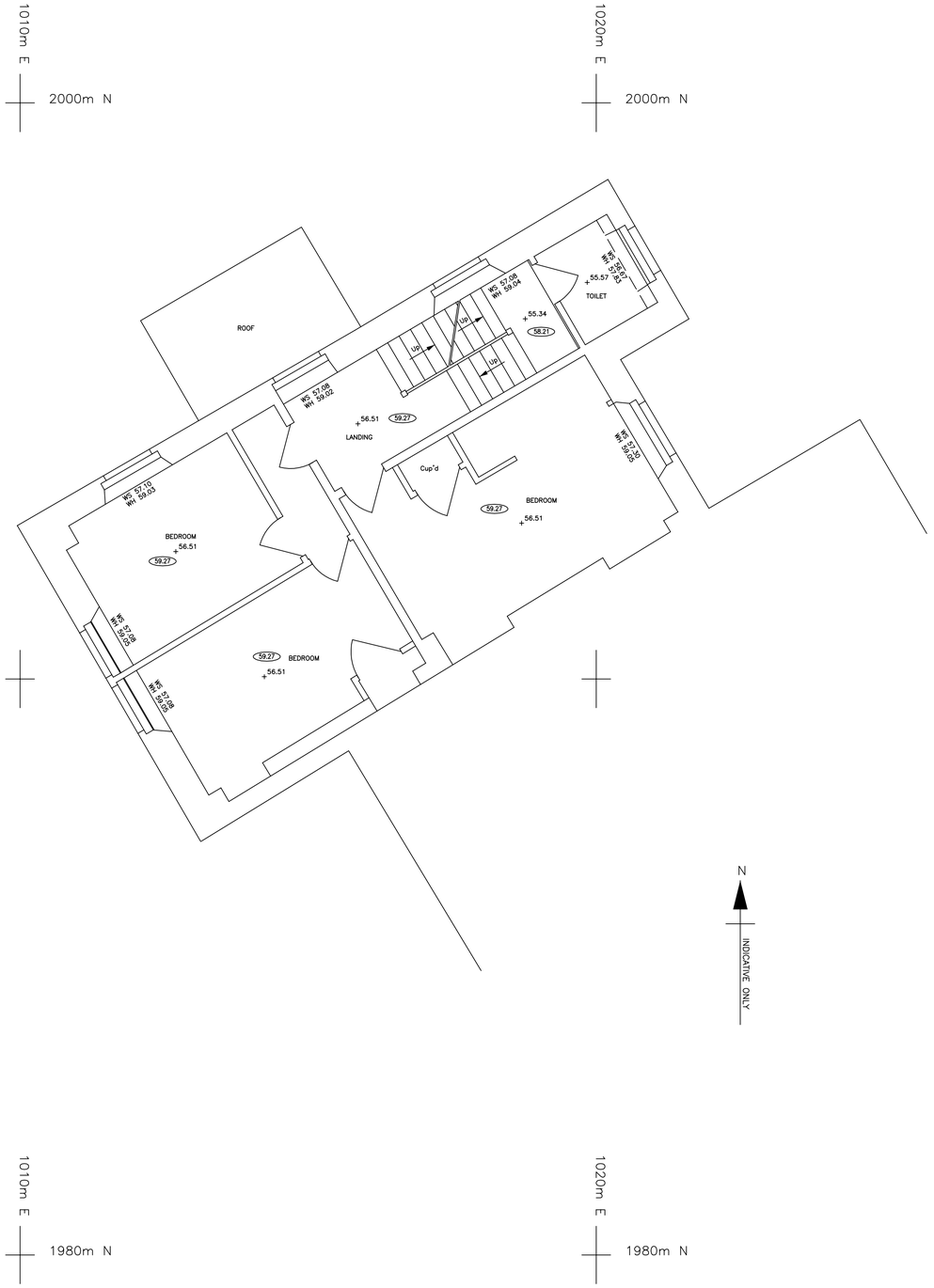
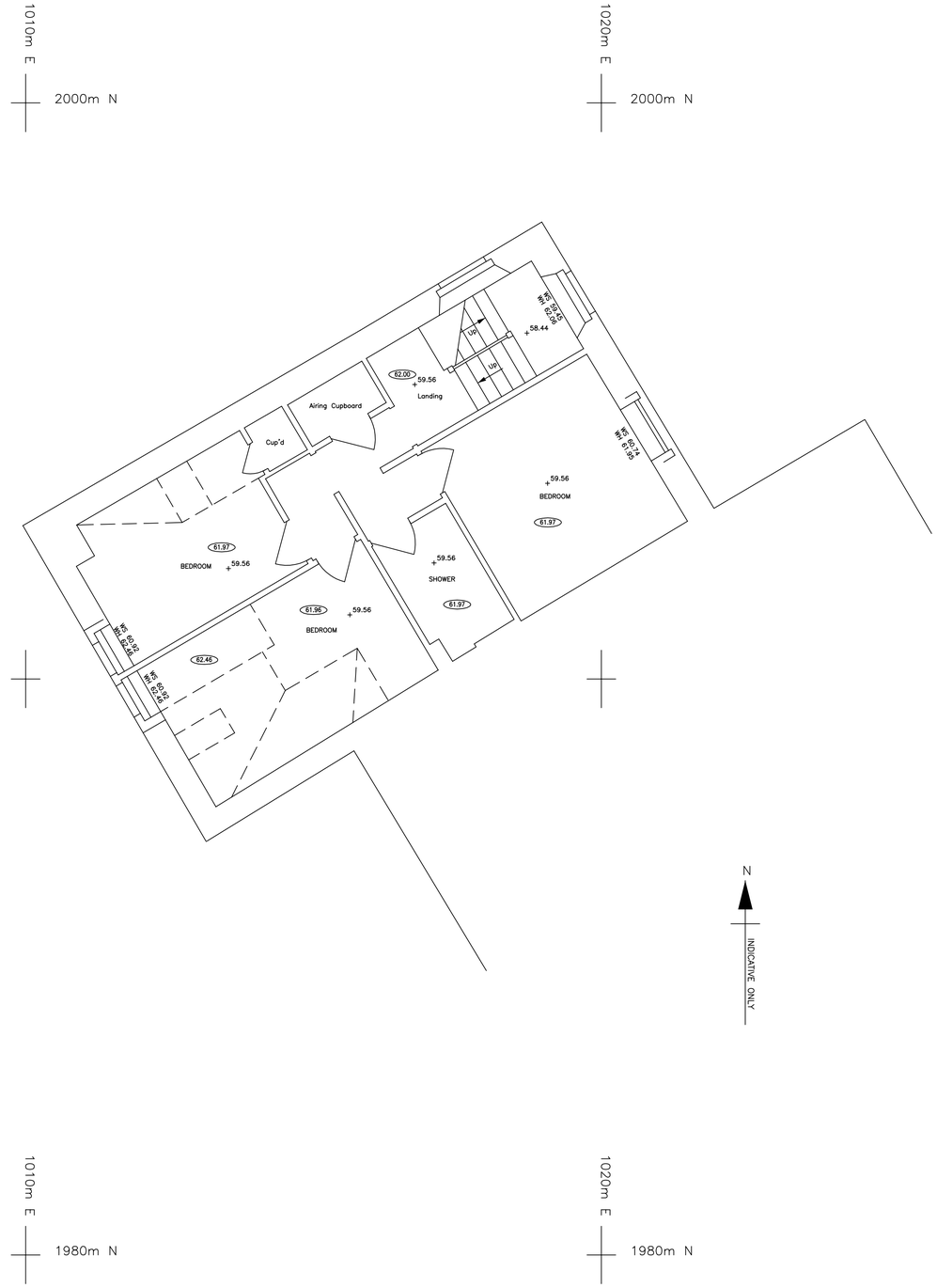
SURVEYS

DRAWING NUMBER	REV
14007/04	**-**

FIRST FLOOR



SECOND FLOOR



NOTES

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The area illustrated was surveyed to be plotted at a scale of 1:50

Subsequent enlargements will not increase the survey accuracy

Survey Datum Note

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Location	Value
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Station 2	52.500
Station 3	51.670

2. Standard Levels are quoted to 2 Decimal Places.

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Col	Column	RSJ	Rolled Steel Joist
Conc	Concrete	RWP	Rain Water Pipe
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GV	Gas Valve	WC	Water Closet
H	Head Height	WM	Water Meter
h	Height		

Beam Height/Downstand

Ceiling Height

Station

REV	DETAILS	DR	CH	PA	DATE

DRAWN BY	CHECKED BY	PASSED BY	DATE
SMH	SMH		MAR. 2014

SCALES

1:50

PENMAEN HOUSE
ALEXANDRA PARK
REDLAND, BRISTOL

Floor Plans
First and Second Floors
Sheet 2 of 2

STP Property

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SURVEYS

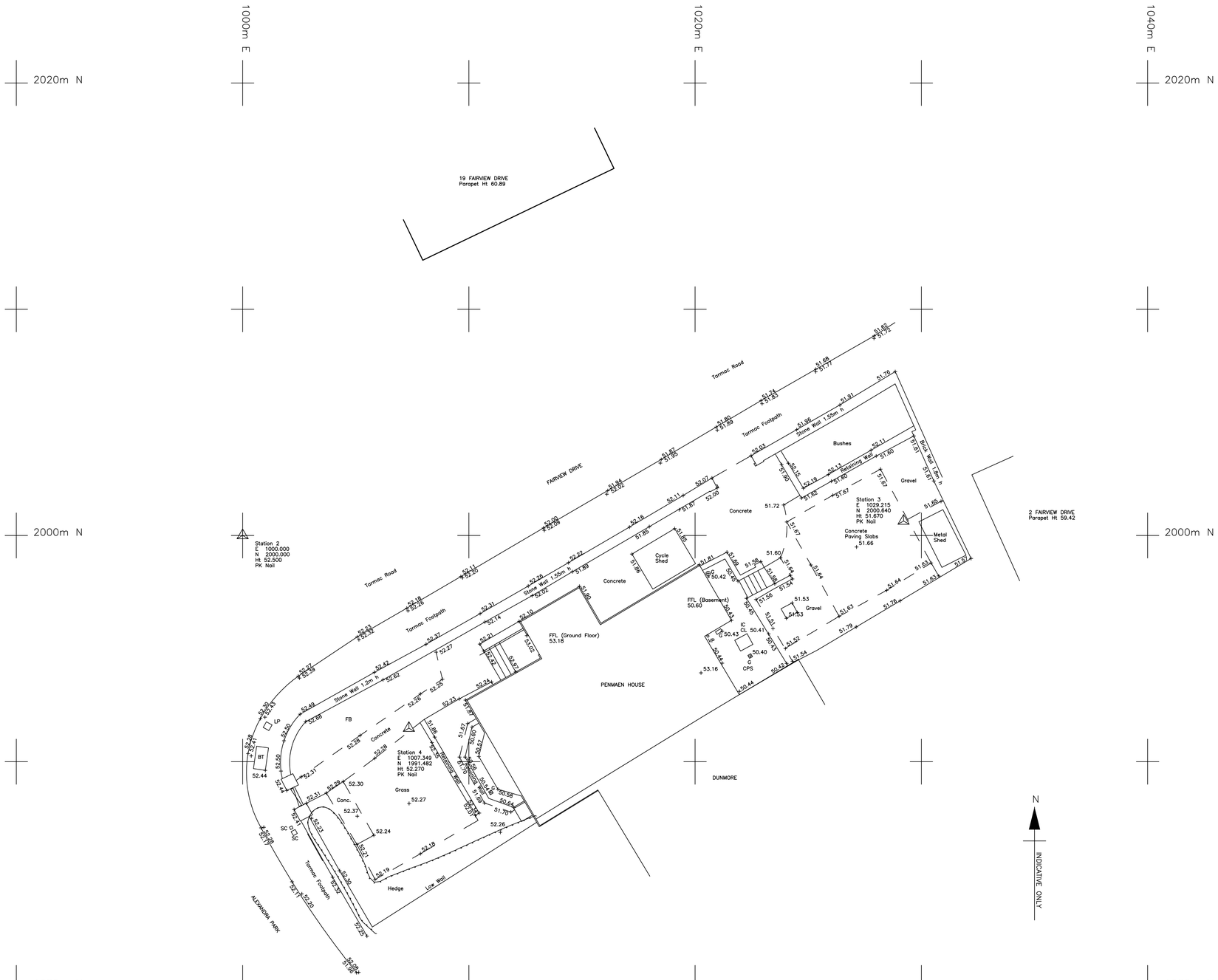
DRAWING NUMBER

14007/02

REV

-

File Ref: 14007–03.DWG



NOTES

Survey Detail Note

The detail shown is commensurate with the plotting scale of 1: 100

The area illustrated was surveyed to be plotted at a scale of 1:100

Subsequent enlargements will not increase the survey accuracy

Survey Datum Note

1. Levels, in metres, are relative to Site BM at:

Location	Value
Station 1	52.464
Station 2	52.500
Station 3	51.670

2. Standard Levels are quoted to 2 Decimal Places.

KEY

AP	Anchor Point	LP	Lamp Post
AV	Air Valve	LV	Low Voltage
B	Bollard	MC	Mercury Inspection Cover
BB	Bellisha Beacon		
BL	Basement Light	MH	Manhole
BS	Bus Stop	MV	Medium Voltage
BT	British Telecom Inspection Cover	Mkr	Marker
		NB	Notice Board
BW	Brick Wall	NP	Street Name Plate
CC	Coal Chute	O/H	Overhead
Ch	Channel	OSBM	Ordnance Survey Benchmark
Chy	Chimney		
CL	Cover Level	P	Post or Pillar
Conc	Concrete	PM	Parking Meter
Cul	Culvert	PS	Paving Slabs
D	Duct	RE	Rodding Eye
DK	Drop Kerb	RP	Reflector Post
DP	Down Pipe	RS	Road Sign
Dr	Drain	RWP	Rain Water Pipe
ELC	Electricity Inspection Cover	S	Stump
		s	Spread
EP	Electricity Pole	Sap	Sapling
FB	Flower Bed	SBM	Site Benchmark
FE	Fire Escape	SC	Stop Cock
FH	Fire Hydrant	SV	Sluice Valve
FIG	Feeds Into Ground	Tar	Tarmac
FP	Foot Path	TCB	Telephone Call Box
FS	Flag Staff	TS	Traffic Signal
G	Gully	TP	Telegraph Pole
g	Girth	U/C	Under Construction
GV	Gas Valve	UTL	Unable to Lift
h	Height	V	Valve
HV	High Voltage	VP	Vent Pipe
IC	Inspection Cover	WL	Water Level
IL	Invert Level	WM	Water Meter
JB	Junction Box	WO	Wash Out
KO	Kerb Outlet		Station
LB	Letter Box		

FENCE TYPES

B/W	Barbed Wire	I/R	Iron Railing
C/B	Close Boarded	I/W	Interwoven
C/I	Corrugated Iron	P/R	Post & Rail
C/L	Chainlink	P/W	Post & Wire
C/P	Chestnut Paling	W/M	Wire Mesh

REV	DETAILS	DR	CH	PA	DATE

DRAWN BY	CHECKED BY	PASSED BY	DATE
SMH	SMH		MAR. 2014

SCALES

1:100

PENMAEN HOUSE
ALEXANDRA PARK
REDLAND, BRISTOL

Topographical Survey
Sheet 1 of 1

STP Property

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SURVEYS

DRAWING NUMBER	REV
14007/01	-

File Ref: 14007-01.DWG

PENMAEN HOUSE – PROPOSALS FOR REAR EXTENSION

N

Responsibility is not accepted for errors made by others scaling from this drawing. All construction information should be taken from figured dimensions only.

Accommodation:

Unit 1: Ground, First and Second Floor: 6 Bedrooms
Unit 2: Basement and Ground Floor: 5 Bedrooms

Basement

0 4m

REV	Note	Date
F	Window/Door changed, additional step	11.01.15
E	Additional notes and planting	10.11.14
D	Bike store moved, Garden area increased	03.11.14
C	Application updated following advice from the Planning Officer	24.09.14
	PLANNING APPLICATION	
B	Title updated □ additional Bin	21.07.14
A	Notes □ Stores added	03.07.14

105 WEST ARCHITECTS Ltd
107 Lower Redland Road, Redland, Bristol. BS6 6SW

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E: info@105west.co.uk
Web site: www.105west.co.uk

Project: Penmaen House, Redland, Bristol

Drawing Title: Proposed Basement Floor/Site Plan

Drawing No.: 1575□L□10

Scale @A3	drawn by	Date	Rev
1:100	LH	20/06/14	F

EAST ELEVATION
From Garden

Materials

Walls: Basement, North and East elevations of Ground: One squared face natural limestone rubble wall to match existing building,
South and North Elevation: Render to match existing rear facade of building
Windows: Velfac composite 200 series in Ral 7016 Anthracite Grey
Door: Painted timber door in RAL 7016 Anthracite Grey
Roof: Trocal single ply membrane with sedum roof
Paving: Marshalls Saxon paving in Natural

EAST ELEVATION
From rear pedestrian access path

REV	Note	Date
G	Materials updated	13.01.15
F	Materials updated, building height dropped, windows amended	13.01.15
E	Material Note updated	17.11.14
D	Amended to Planning Officers' Recommendations - Material update	03.11.14
C	Amended to Planning officers' recommendations PLANNING APPLICATION	07.10.14
B	Notes added	03.07.14
A	Garden Wall changed	02.07.14

0 4m

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Project: Penmaen House, Redland, Bristol

Drawing Title: Proposed East Elevation

Drawing No.: 1575 L 16

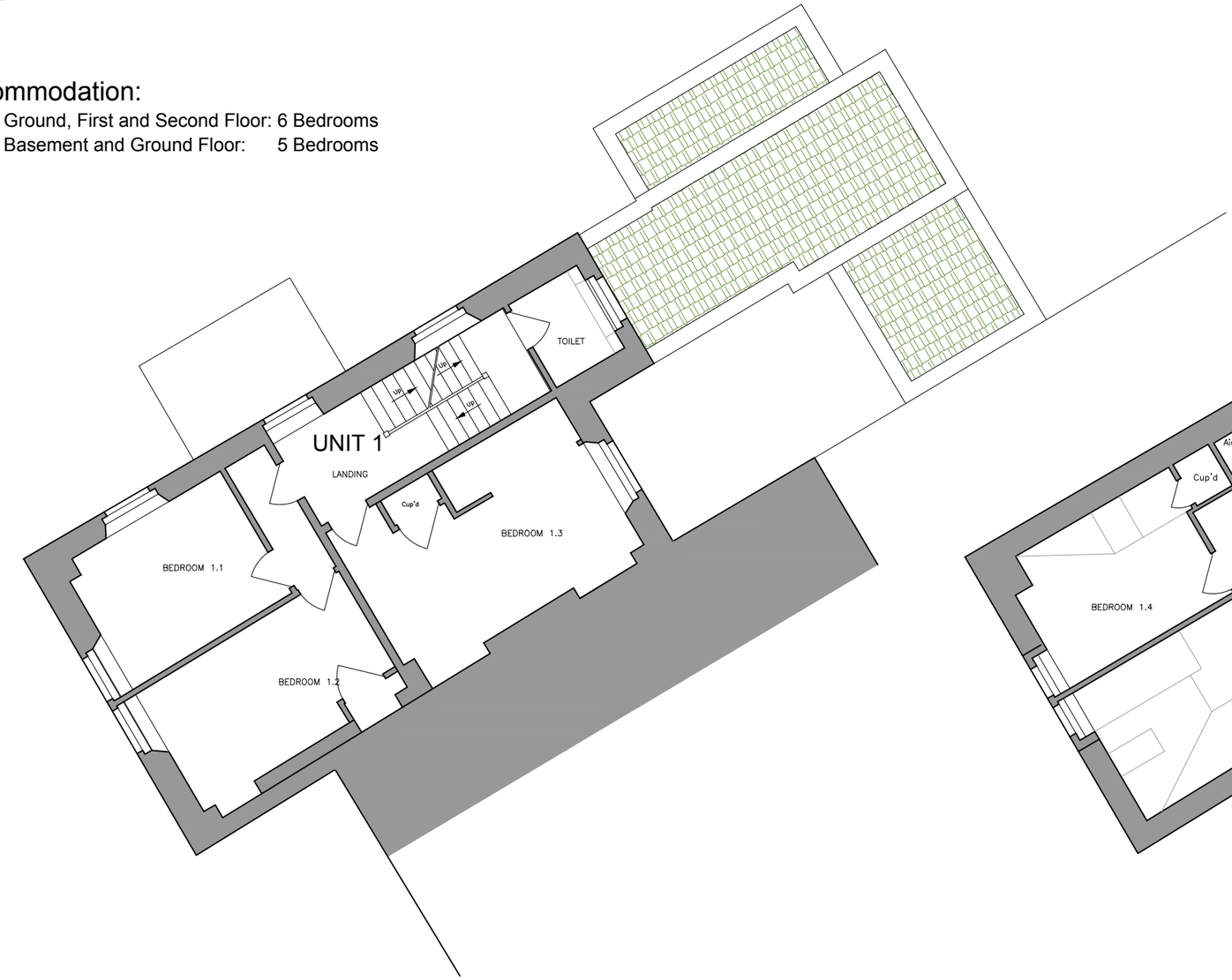
Scale @A3	drawn by	Date	Rev
1:100	LH	20/06/14	G

N

Responsibility is not accepted for errors made by others scaling from this drawing. All construction information should be taken from figured dimensions only.

Accommodation:

Unit 1: Ground, First and Second Floor: 6 Bedrooms
Unit 2: Basement and Ground Floor: 5 Bedrooms



First Floor

Second Floor

REV	Note	Date
D	Green roof added	11.01.15
C	Ground and basement outlines added	17.11.14
B	Note amended PLANNING APPLICATION	03.11.14
A	Notes added	03.07.14

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Drawing Title: Proposed First □ Second Floor Plans

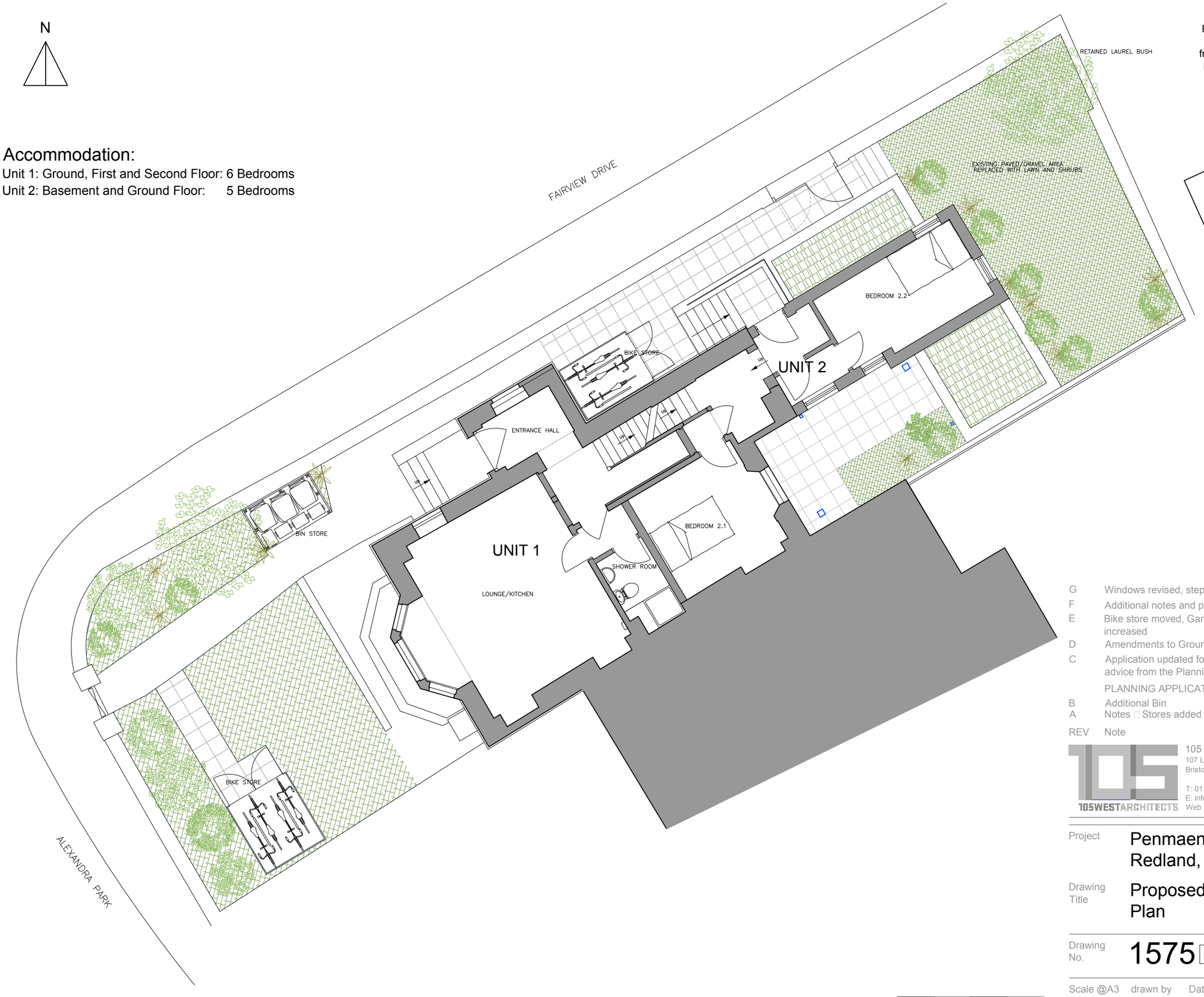
Drawing No.: 1575□L□12

Scale @A3	drawn by	Date	Rev
1:100	LH	20/06/14	D

N

Accommodation:

Unit 1: Ground, First and Second Floor: 6 Bedrooms
Unit 2: Basement and Ground Floor: 5 Bedrooms



Ground Floor

0 4m

Responsibility is not accepted for errors made by others scaling from this drawing. All construction information should be taken from figured dimensions only.

REV	Note	Date
G	Windows revised, steps amended	11.01.15
F	Additional notes and planting	10.11.14
E	Bike store moved, Garden area increased	03.11.14
D	Amendments to Ground floor	07.10.14
C	Application updated following advice from the Planning Officer	24.09.14
	PLANNING APPLICATION	
B	Additional Bin	21.07.14
A	Notes □ Stores added	03.07.14

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Drawing Title: Proposed Ground Floor Plan

Drawing No.: 1575□L□11

Scale @A3	drawn by	Date	Rev
1:100	LH	20/06/14	G

Materials

Walls: Basement, North and East elevations of Ground: One squared face natural limestone rubble wall to match existing building,
South and North Elevation: Render to match existing rear facade of building
Windows: Velfac composite 200 series in Ral 7016 Anthracite Grey
Door: Painted timber door in RAL 7016 Anthracite Grey
Roof: Trocal single ply membrane with sedum roof
Paving: Marshalls Saxon paving in Natural

NORTH ELEVATION:
FAIRVIEW DRIVE
Street View

REV	Note	Date
B	Amended to Planning Officers' Recommendations PLANNING APPLICATION	07.10.14
A	Notes Neighbouring building added	03.07.14
F	Materials updated	13.01.15
E	Materials updated, building height dropped, windows amended	13.01.15
D	Material Note updated	17.11.14
C	Amended to Planning Officers' Recommendations - Material update	03.11.14

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Project: Penmaen House, Redland, Bristol

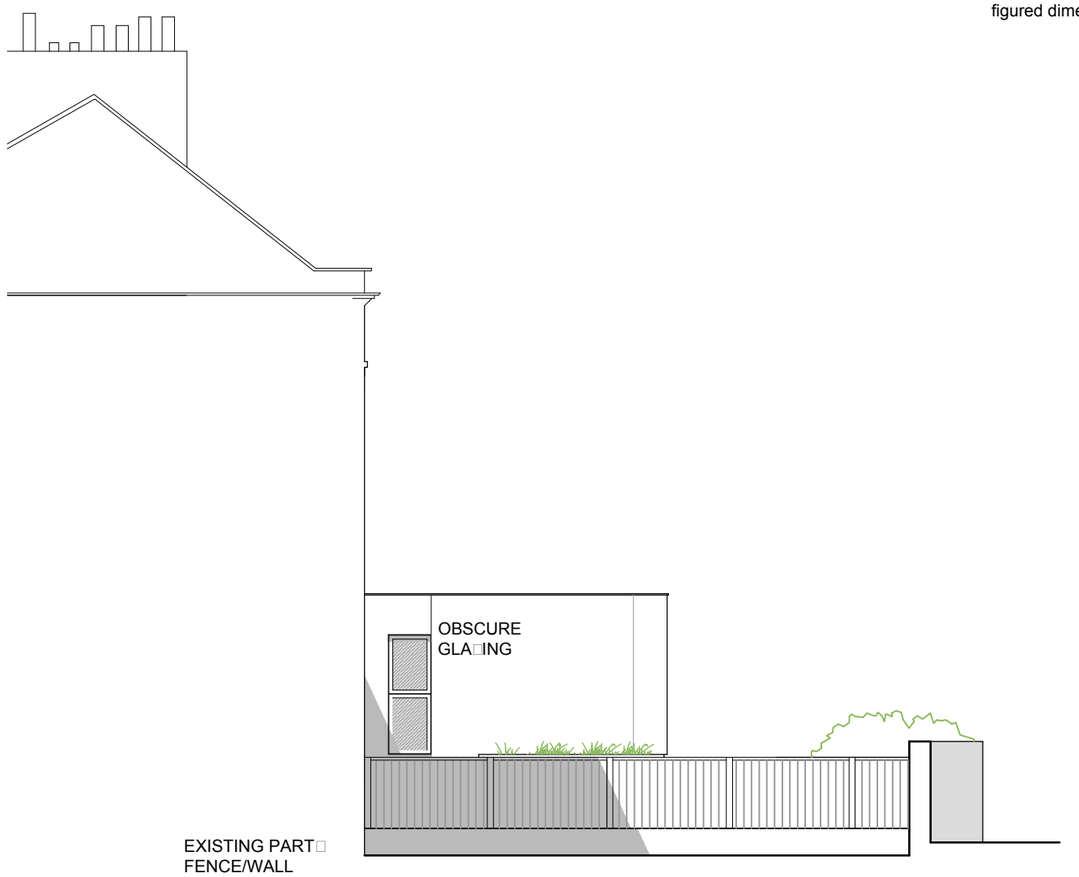
Drawing Title: Proposed North Elevation Street View

Drawing No.: 1575 L 18

0 4m

Scale @A3	drawn by	Date	Rev
1:100	LH	20/06/14	F

SOUTH ELEVATION/
SECTION



SOUTH ELEVATION
□From neighbouring
garden□

Materials
Walls: Basement, North and East elevations of Ground: One squared face natural limestone rubble wall to match existing building,
South and North Elevation: Render to match existing rear facade of building
Windows: Velfac composite 200 series in Ral 7016 □Anthracite Grey□
Door: Painted timber door in RAL 7016 □Anthracite Grey□
Roof: Trocal single ply membrane with sedum roof
Paving: Marshalls Saxon paving in Natural

REV	Note	Date
D	Ground floor extension amended PLANNING APPLICATION	07.10.14
C	Gla□ing detail amended	21.07.14
B	Notes added	03.07.14
A	Garden Wall changed	02.07.14

REV	Note	Date
G	Materials updated	13.01.15
F	Material update, building height dropped, windows amended	13.01.15
E	Amended to Planning Officers' Recommendations - Material update	03.11.14

0 4m

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Drawing Title: Proposed South Elevation/ Section

Drawing No.: 1575□L□15

Scale @A3	drawn by	Date	Rev
1:100	LH	20/06/14	G