Sustainability Statement

55 Fitzroy Park

Revision 01, November 2018

atelier ten

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Contents

Executive summary

This document has been generated by Atelier Ten on behalf of the Applicant and summarises the overall sustainability measures proposed for the 55 Fitzroy Park development (the 'Proposed Development'), which is described in detail within the Design and Access Statement, submitted in support of the planning application.

Sustainability lies at the core of the Proposed Development as a whole. By adopting a sustainable approach in design, construction and operation, the Proposed Development aims to meet the requirements of the current local planning policy and exceed Building Regulations standards, wherever it is technically, functionally and economically viable.

In order to achieve the National, Regional and Local planning requirements, the following targets have been set for the Proposed Development.

- The development will achieve a significant carbon reduction on-site as compared with a Building Regulations 2013 compliant building. In line with GLA Zero Carbon policy, the remaining regulated emissions will be offset using a cash in lieu contribution to the Camden Zero Carbon fund. Please refer to a separate Energy Statement developed by Blyth+Blyth for the achieved carbon reduction on-site.
- The whole development will reduce CO_2 emissions by at least 20% through the use of on-site renewable energy generation.
- At least 50% of timber and timber products will be sourced from accredited Forest Stewardship Council (FSC) or Programme for the Endorsement of Forestry Certifcation (PEFC) source.
- 10% of the total value of materials used should derive from recycled and reused content in the products and materials selected.
- The development will incorporate a green roof with planting that is drought resistant and has a low water demand.
- There will be no net loss in the quality and quantity of biodiversity
- The development will incorporate a storm-water attenuation to mitigating the potential increase in food risk as a result of climate change, in line with SuDs hierarchy.
- During construction, the development will maximise all opportunities to achieve greenfield runoff rates.
- All homes will meet a maximum water consumption of 105 litres/person/day.
- All homes will carry out a full model of the buildings to ensure that the building design optimises solar gain and daylight without resulting in overheating.

Based on the overheating analysis carried out for all homees using dynamic thermal modelling, the facade design has been optimised to maximise daylight and useful solar gains during winter time while cutting off unwanted solar heat gain during summer.

With the building massing, solar shading, thermal mass and natural ventilation strategy, the results of the overheating analysis show that all kitchen / living areas, studies and bedrooms meet the CIBSE overheating criteria.

1 Introduction

Atelier Ten have compiled this Sustainability Statement in support of a planning application submitted on behalf of Lynne Turner-Stokes for the demolition of the existing property and the construction of five detached homes at 55 Fitzroy Park, Highgate, London, N6 6JA.

The overall site area is 5,070m^2. The proposed overall plot ratio is 14.1%. The proposed plot ratios for the five plots are between 10.9% and 18.5% - all within the lowest nine in the local area.

Plots 01, 02 and 03 are situated on, and are accessed directly from, Fitzroy Park.

Plots 04 and 05 are located deeper into the site, and are also accessed from Fitzroy Park, via a new private pedestrian lane. Parking for these plots is located on-site close to the boundary with Fitzroy Park.

The Turner Stokes and Springer Families, the owner and developer of the site, and the design team, are committed to delivering an extremely high-quality development in this unique location.

This Statement sets out the environmental sustainability strategy for the proposed development in response to the LBC's and Greater London Authority's (GLA's) current planning requirements.

Sustainability lies at the core of the proposed development as a whole. By adopting a sustainable approach in design, construction and operation, the proposed development aims to satisfy the requirements of the current local planning policy and exceed Building Regulations standards, wherever it is technically, functionally and economically viable. These requirements are summarised under Section 2 Planning Policy.

This Statement outlines both the sustainable design and construction measures proposed for the development. These are illustrated in Sections 3 Sustainability Strategy.

Energy strategies in support of this sustainability statement are summarised in a separate Energy Statement.

Section 4 Overheating Analysis summarises the overheating analysis results for the houses.

Figure 1.1 Proposed site plan

2 Planning Policy

2.1 Overview

This section summarises national, regional and local planning policy requirements relevant to the proposed development with regards to environmental sustainability. The proposed development site is in Camden Council.

The relevant documents, which set out the current planning policy regarding energy and environmental sustainability strategies are listed below.

- National Planning Policy Framework (NPPF), published in July 2018
- The London Plan (LP), published in March 2016
- Sustainable Design and Construction Supplementary Planning Guidance (SPG), published in April 2014
- Housing Supplementary Planning Guidance (SPG), published in March 2016
- Camden Local Plan, published in 2017
- Camden Planning Guidance 3 Sustainability (CPG3), published in July 2015, updated in March 2018

2.2 National policy

The National Planning Policy Framework (NPPF) is a key part of the Government's reforms to make the planning system less complex and more accessible, to protect the environment and to promote sustainable growth. It sets out the Government's planning policies for England and how these are expected to be applied. The NPPF replaces the current suite of national Planning Policy Statements, Planning Policy Guidance Notes and some Circulars. The NPPF document does not contain any specific environmental sustainability targets.

2.3 Greater London planning policy

2.3.1 The London Plan

The London Plan (LP) was published in March 2016 and consolidated with alterations since 2011. It sets out the spatial development strategy for London. It is the overall strategic plan for London, setting out an integrated economic, environmental, transport and social framework for the development of the capital to 2036. It forms part of the development plan for Greater London. London boroughs' local plans need to be in general conformity with the LP, and its policies guide decisions on planning applications by councils and the Mayor.

Policy 5.2 Minimising Carbon Dioxide Emissions requires all new residential buildings in major developments to achieve a carbon zero by 2016.

The CO_2 reduction targets should be met on-site. Where it is clearly demonstrated that the specific targets cannot be fully achieve on-site, any shortfall maybe provided off-site or through a cash-in-lieu contribution to the relevant borough to be ring fenced to secure delivery of CO_2 savings elsewhere.

Policy 5.3 Sustainable Design and Construction requires development proposals to demonstrate that sustainable design standards are integral to the proposal, including its construction and operation, and to ensure that they are considered at the beginning of the design process.

Policy 5.15 Water Use and Supplies requires designing all residential developments so that mains water consumption would meet a target of 105 litres/person/day.

The LP also includes Policies 2.18 Green Infrastructure: the Multi-Functional Network of Green and Open Spaces, 3.2 Improving Health and Addressing Health Inequalities, 5.4A Electricity and Gas Supply, 5.9 Overheating and Cooling, 5.10 Urban Greening, 5.11 Green Roofs and Development Site Environs, 5.12 Flood Risk Management, 5.13 Sustainable Drainage, 5.14 Water Quality and Wastewater, 5.17 Waste Capacity, 5.18 Construction, Excavation and Demolition Waste, 5.19 Hazardous Waste, 5.21 Contaminated Land, 5.22 Hazardous Substances and Installations, 6.9 Cycling, 6.10 Walking, 6.13 Parking, 7.2 An Inclusive Environment, 7.7 Location and Design of Tall Buildings, 7.14 Improving Air Quality, 7.15 Reducing and Managing Noise, 7.19 Biodiversity and Access to Nature, and 7.21 Trees and Woodlands. These policies do not contain any specific environmental sustainability targets.

2.3.2 Sustainable design and construction supplementary planning guidance (SPG)

The Sustainable Design and Construction Supplementary Planning Guidance (SPG), published in April 2014, provides guidance on the implementation of the current London Plan Policy 5.3, as well as a range of policies, primarily in Chapters 5 and 7, that deal with matters relating to environmental sustainability.

In section 2.2 Land, the SPG recommends to:

- Provide space for individual or communal food growing, where possible and appropriate.
- Take advantage of existing spaces to grow food, including adapting temporary spaces for food growing.

In section 2.5 Renewable Energy, the SPG states that:

- Developers are encouraged to incorporate monitoring equipment, and systems where appropriate to enable occupiers to monitor and reduce their energy use.

In section 2.6 Water Efficiency, the SPG states that:

- Developers should maximise the opportunities for water saving measures and appliances in all developments, including the reuse and using alternative sources of water.
- Developers should design residential schemes to meet a water consumption rate of 105 litres or less per person per day
- All developments should be designed to incorporate rainwater harvesting.

In section 2.7 Materials and Waste, the SPG states that:

- The design of developments should prioritise materials that:
  - have a low embodied energy, including those that can be reused intact or recycled - at least three of the key elements of the building envelope (external walls, windows, roof, upper floor slabs, internal walls, floor finishes/ coverings) are to achieve a rating of A+ to D in the BRE's The Green Guide of Specification.
  - can be sustainably sourced - at least 50% of timber and timber products should be sourced from accredited Forest Stewardship Council (FSC) or Programme for the Endorsement of Forestry Certification (PEFC) source.
  - are durable to cater for their level of use and exposure.
  - will not release toxins into the internal and external environment, including those that deplete stratospheric ozone.
- The design of developments should maximise the potential to use pre-fabrication elements.
- Developers should maximise the use of existing resources and materials and minimise waste generated during the demolition and construction process through the implementation of the waste hierarchy.
- Developers should provide sufficient internal space for the storage of recyclable and compostable materials and waste in their schemes.
- The design of developments should meet borough requirements for the size and location of recycling, composting and refuse storage and its removal.

In section 2.8 Nature Conservation and Biodiversity, the SPG states that:

- There is no net loss in the quality and quantity of biodiversity.
- Developers contribute to biodiversity on their development site.

In section 3.2 Tackling Increased Temperature and Drought, the SPG states that:

- Developers should include measures, in the design of their schemes, in line with the cooling hierarchy set out in LP Policy 5.9 to prevent overheating over the scheme's lifetime.
- The design of developments should prioritise landscape planting that is drought resistant and has a low water demand for supplementary watering.

In section 3.3 Increasing Green Cover and Trees, the SPG states that:

- Developers should integrate green infrastructure into development schemes, including by creating links with wider green infrastructure network.
- Any loss of a tree/s resulting from development should be replaced with an appropriate tree or group of trees for the location, with the aim of providing the same canopy cover as that provided by the original tree/s.

In section 3.4 Flooding, the SPG states that:

- Developers should maximise all opportunities to achieve greenfield runoff rates in their developments.
- Developers should design Sustainable Drainage Systems (SuDS) into their schemes that incorporate attenuation for surface water runoff as well as habitat, water quality and amenity benefits.
- Developments are designed to be flexible and capable of being adapted to and mitigating the potential increase in food risk as a result of climate change.

2.3.3 Housing Supplementary Planning Guidance (SPG)

The Housing Supplementary Planning Guidance (SPG), published in March 2016, provides guidance on how to implement the housing policies in the 2016 LP. As SPG, it is a material consideration in drawing up development plan documents and in taking planning decisions.

Standard 34 requires all homes to satisfy London Plan policy on sustainable design and construction and make the fullest contribution to the mitigation of and adaptation of climate change.

Standard 35 requires a zero carbon development from 2016.

Standard 36 requires development proposals to demonstrate how the design of dwellings will avoid overheating without reliance on energy intensive mechanical cooling systems.

Standard 37 requires all new dwellings to be designed to ensure a maximum water consumption of 105 litres/person/day.

Standard 38 asks for flood resilient design in accordance with the NPPF and its associated technical guide, whilest ensuring level access. Implementing Sustainable Urban Drainage Systems and green roofs wherever practical with the aim of achieving a greenfield run-off rate is required in Standard 39.

2.4 Local planning policy

2.4.1 Camden Local Plan

Camden Local Plan was adopted in 2017 and has replaced the Core Strategy and Camden Development Policies documents as the basis for planning decisions.

Policy A3, Biodiversity, expects a net positive bio-diversity on site.

Policy CC1, Climate change mitigation, promotes zero carbon development.

Policy CC2, Adapting to climate change, requires adopting climate change adaptation measures such as:

1. the protection of existing green spaces and promoting new appropriate green infrastructure;
2. not increasing, and wherever possible reducing, surface water run-off through increasing permeable surfaces and use of Sustainable Drainage Systems;
3. incorporating bio-diverse roofs, combination green and blue roofs and green walls where appropriate; and
4. measures to reduce the impact of urban and dwelling overheating, including application of the cooling hierarchy.

Any development involving 5 or more residential units or 500 sqm

or more of any additional floorspace is required to demonstrate the above in a Sustainability Statement.

Policy CC2 also promotes sustainable design and construction by:

5. ensuring development schemes demonstrate how adaptation measures and sustainable development principles have been incorporated into the design and proposed implementation;
6. encourage new build residential development to use the Home Quality Mark and Passivhaus design standards

Policy CC3, Water and flooding, require development to:

1. incorporate water efficiency measures;
2. avoid harm to the water environment and improve water quality;
3. consider the impact of development in areas at risk of flooding (including drainage);
4. incorporate flood resilient measures in areas prone to flooding;
5. utilise Sustainable Drainage Systems (SuDS) in line with the drainage hierarchy to achieve a greenfield run-off rate where feasible; and
6. not locate vulnerable development in flood-prone areas.

Where an assessment of food risk is required, developments should consider surface water flooding in detail and groundwater flooding where applicable.

Policy CC4, Air quality, requires a construction impact risk assessment.

Policy CC5, Waste, requires providing facilities for the storage and collection of waste and recycling.

Policy T2, Parking and car-free development, requires all new developments in the borough to be car-free.

2.4.2 Camden Planning Guidance 3 Sustainability

The Camden Planning Guidance 3 Sustainability (CPG3) was updated on 26 March 2018 and is part of Camden Council's LDF. This document provides advice and information on how Camden apply their planning policies and is an additional "material consideration" in planning decisions.

In section 2 the CPG3 states that developments involving five or more dwellings and/or 500 (gross internal) floorspace or more are required to submit an energy statement, which demonstrates how CO_2 emissions will be reduced in line with the energy hierarchy.

In section 3 the CPG3 states that a full model of the building should be carried out to ensure that the building design optimises solar gain and daylight without resulting in overheating for developments comprising five dwellings or more or 500 m^2 or more of any floorspace.

It also states that any development proposing electric heating (including heat pumps) will need to demonstrate the carbon efficiency of the proposed heating system. Specifications of the electric heating system and calculations will need to be provided to demonstrate that the proposed electric heating system would result in lower carbon dioxide emissions than an efficiency gas fuelled heating system.

In Section 6, the CPG3 requires all developments to target at least a 20% reduction in carbon dioxide emissions through the installation of on-site renewable energy technologies.

Section 7 includes requirements on water efficiency. Minimising water use and maximising the re-use of water is required. Buildings with gardens or landscaped areas should provide water butts.

Section 8 states that all developments should aim for at least 10% of the total value of materials used to be derived from recycled and reused sources. This should relate to the WRAP Quick Wins assessments or equivalent.

Section 10 states that all developments are expected to incorporate brown roofs, green roofs and green walls unless it is demonstrated this is not possible or appropriate. The following are required to demonstrate this:

- a statement of the design objectives for the green or brown roof or green wall
- details of its construction and the materials used, including a section at a scale of 1:20
- planting details, including details of the planting technique, plant varieties and planting sizes and densities.
- a management plan detailed how the structure and planting will be maintained

Section 11 requires all sites in Camden over one hectare or 10,000 m^2 to produce a Flood Risk Assessment in line with the National Planning Policy Framework. All developments are expected to manage drainage and surface water on-site or as close to the site as possible, using Sustainable Drainage Systems (SUDS).

Section 12 states that all development is expected to consider the impact of climate change and be designed to cope with the anticipated conditions.

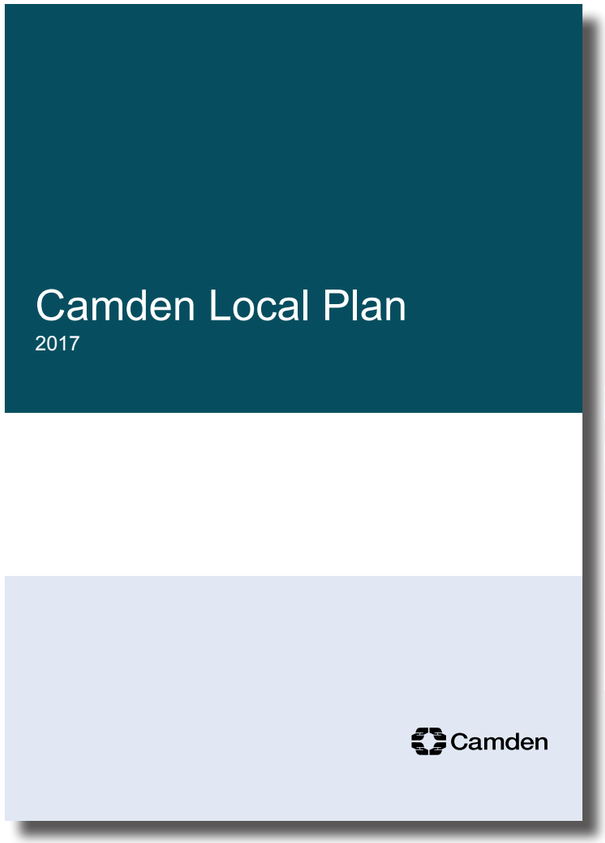


Figure 2.1 Camden Local Plan

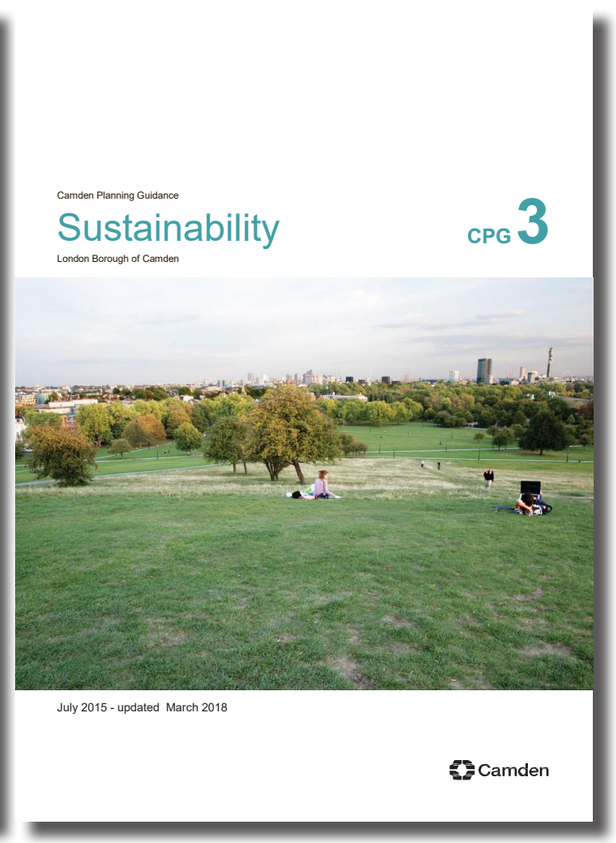


Figure 2.2 Camden Planning Guidance 3 Sustainability

2.5 Response to planning policy

In summary, the following are required for the proposed development in planning:

- All new residential buildings in major developments to achieve a carbon zero by 2016.The CO_2 reduction targets should be met on-site. Where it is clearly demonstrated that the specific targets cannot be fully achieve on-site, any shortfall maybe provided off-site or through a cash-in-lieu contribution to the relevant borough to be ring fenced to secure delivery of CO_2 savings elsewhere. [London Plan]
- All residential developments to meet mains water consumption target of 105 litres/person/day. [London Plan]
- All developments to target at least a 20% reduction in carbon dioxide emissions through the installation of on-site renewable energy technologies. [Camden Planning Guide]
- All homes to carry out a full model of the buildings to ensure that the building design optimises solar gain and daylight without resulting in overheating. [Camden Planning Guide]
- At least 50% of timber and timber products should be sourced from accredited Forest Stewardship Council (FSC) or Programme for the Endorsement of Forestry Certification (PEFC) source. [Sustainable Design and Construction SPG]
- No net loss in the quality and quantity of biodiversity. [Sustainable Design and Construction SPG]
- Developers should maximise all opportunities to achieve greenfield runoff rates in their developments. [Sustainable Design and Construction SPG]
- Aim for at least 10% of the total value of materials used to be derived from recycled and reused sources. [Camden Planning Guide]
- Incorporate brown roofs, green roofs and green walls [Camden Planning Guide]
- All developments are expected to manage drainage and surface water on-site or as close to the site as possible, using Sustainable Drainage Systems (SUDS) and consider the impact of climate change and be designed to cope with the anticipated conditions. [Camden Planning Guide]

In response to the planning policy, the development aims to achieve the following sustainability targets:

- The development will achieve a significant carbon reduction on-site as compared with a Building Regulations 2013 compliant building. In line with GLA Zero Carbon policy, the remaining regulated emissions will be offset using a cash in lieu contribution to the Camden Zero Carbon fund. Please refer to a separate Energy Statement developed by Blyth+Blyth for the achieved carbon reduction on-site.
- The whole development will reduce CO_2 emissions by at least 20% through the use of on-site renewable energy generation.
- At least 50% of timber and timber products will be sourced from accredited Forest Stewardship Council (FSC) or Programme for the Endorsement of Forestry Certifcation (PEFC) source.
- 10% of the total value of materials used should derive from recycled and reused content in the products and materials selected.
- The development will incorporate a green roof with planting that is drought resistant and has a low water demand.
- There will be no net loss in the quality and quantity of biodiversity
- The development will incorporate a storm-water attenuation to mitigating the potential increase in food risk as a result of climate change, in line with SuDs hierarchy.
- During construction, the development will maximise all opportunities to achieve greenfield runoff rates.
- All homes will meet a maximum water consumption of 105 litres/person/day.
- All homes will carry out a full model of the buildings to ensure that the building design optimises solar gain and daylight without resulting in overheating.

3 Sustainability Strategies

3.1 Energy and CO_2 emissions

The proposed development will be designed to minimise the CO_2 emissions associated with their operational energy consumption. As part of the design development a number of measures have been incorporated into the proposals, following GLA's energy hierarchy - lean, clean, green - in order to maximise the energy efficiency of the development and minimise the associated carbon emissions.

An outline of the key proposals under each of the levels of the hierarchy is provided below:

3.1.1 Be lean

The building incorporates a number of passive measures adopted to reduce the energy demand.

These include:

- High level of insulation and air tightness of the envelope of the building.
- Energy efficient low-e coated double glazing unit windows
- Minimisation of heat losses (i.e. thermal bridges) though selection of construction methods and materials, development of bespoke details for critical construction elements junction and reduced window-to-wall ratios.
- Face brick walls and stone flooring that can act as thermal mass

In addition to the passive design measures, the following active design measures are proposed to reduce energy consumption of the development:

- High efficiency luminaires and switching systems designed to maximise energy savings and flexibility in use
- High efficiency condensing boiler heating/hot water cylinder system
- Energy efficient whole house heat recovery system (MVHR) with 88% efficiency and low specific fan power (0.67 w/l/s)

3.1.2 Be clean

Due to lack of an existing or potential heating network within 500m from the proposed development, connecting to a local district heating network is not feasible.

3.1.3 Be green

It is proposed to utilise high efficiency photovoltaic panels with a total installed power load of 29.2kWp for the whole development.

For further details on the energy strategy adopted, refer to a separate Energy Statement document submitted as part of this application by Blyth+Blyth.

Overshadowing analysis result (Figures 3.1 - 3.3) show minimal overshadowing of the PV arrays by trees or surrounding buildings in mid seasons, which is considered to be the worst case. During the spring and summer period (March to September) the higher solar angle results in less overshadowing. In late autumn and winter (October to February) trees will shed leaves hence reducing PV overshadowing.

3.2 Cooling hierarchy and overheating

Policy 5.9 of the London Plan on overheating and cooling proposes the following hierarchy to reduce the potential for overheating and reliance on air-conditioning systems:

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

In this hierarchy, passive measures that reduce the amount of accumulated heat in the dwellings are given priority over the measures that passively manage the impact of the accumulated heat. Lowest in the hierarchy are active measures that remove the accumulated heat from the dwellings.

To the extent feasible, the design of 55 Fitzroy Park development upholds this hierarchy in order to limit the risk of overheating and the need for active cooling in dwellings. The proposed development prioritises passive design principles starting with its massing and orientation.

While solar heat gain typically proves beneficial in terms of reducing the heating energy use in dwellings, it also increases the risk of overheating in summers. Balancing between these two conflicting factors, the proposed design includes the following solar access and control measures:

- building massing and orientation balancing solar gains over the course of the day and the year,
- large operable windows in bedrooms and dwellings, with local variations based on degree of exposure,
- glazing with mid-range g-value of 0.45 that allows high degree of daylight, with possibility of variations to optimise solar control based on orientation and exposure,
- setback reveal creating local overhang and shading at windows,
- access to operable openings in all habitable rooms.

Please refer to Section 4 for more detailed overheating analysis methodologies and results.

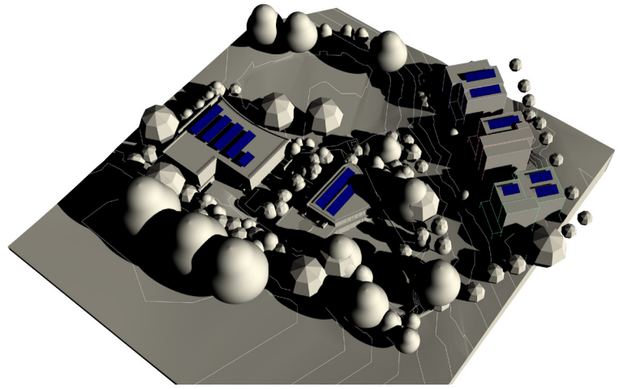


Figure 3.1 PV overshadowing in September 9.00am

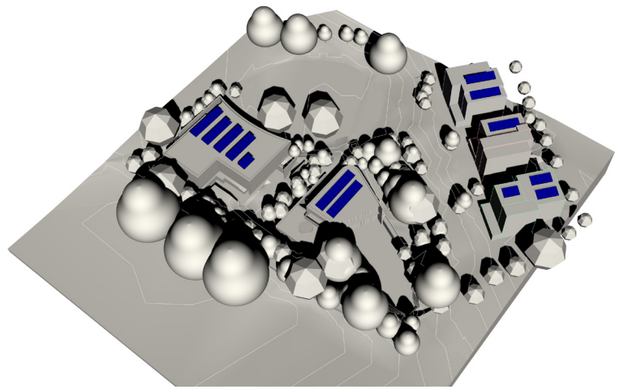


Figure 3.2 PV overshadowing in September 12.00 noon

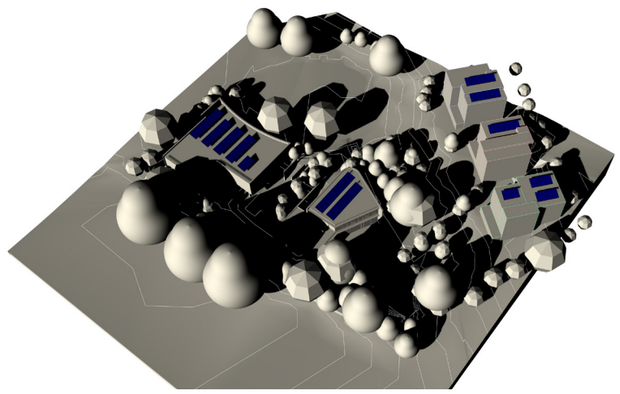


Figure 3.3 PV overshadowing in September 3.00pm

3.3 Water efficiency

The proposed development will minimise the consumption of potable water in sanitary applications and landscape irrigation and achieve the 105 l/p/s limit required in both London Plan and Camden Local Plan.

Low water use fixtures and fittings will be installed in the proposed development, where feasible. Fittings, such as flow restrictors, will be fitted to taps and potentially shower heads. WCs will be provided with dual flush cisterns and fitted with delayed action inlet valves.

Due to the extent of green roofs proposed for the buildings, it is not feasible to collect rainwater from the roofs.

A low-water irrigation strategy, including planting of low maintenance species, will be adopted in the proposed development.

3.4 Surface water run-off

LBH Wembley Engineering is appointed to carry out a hydrological and hydrogeological impact assessment of the proposed site. The assessment report includes flood risks from all sources relevant to the site, required surface water run-off storage and attenuation flow and volume, and Sustainable Drainage Systems (SuDS) considerations.

Surface water run-off storage and attenuation measures and SuDS are proposed for the site based on the SuDs hierarchy as outlined in the London Plan Policy 5.13 as below.

- Use infiltration techniques
- Attenuate rainwater in ponds or open water features for gradual release
- Attenuate rainwater by storing in tanks or sealing water features for gradual release
- Discharge rainwater direct to a water course
- Discharge rainwater to a surface water sewer/drain
- Discharge rainwater to the combined sewer

Based on the recommendations from the hydrologist, the following SuDS will be implemented on the development (Figure 3.4).

- green/brown roofs and permeable paving, will be implemented and adopted where appropriate to reduce and delay the discharge of rainfall run-off to public sewers and watercourses.
- an on-site pond receiving the surface water drainage
- a new linear wetland swale planted with grasses along the boundary of the site receiving the outflow from the pond controlled by a weir

With the above measure, achieving the greenfield run-off from the site will be targeted. For further details on the SuDS adopted, refer to a separate Hydrological and Hydrogeological Impact Assessment report submitted as part of this application by LBH Wembley Engineering.

3.5 Sustainable construction materials

Construction materials with a low environmental impact over the full life cycle of the buildings will be specified, where possible. Responsibly sourced materials for key building elements, including thermal insulation materials, and finishing elements, will be specifed, wherever feasible. Additionally, any timber used in these elements will be legally sourced (e.g. FSC certified).

The intent of the project is to select suppliers who can provide an environmental management system (EMS) certificate (e.g. EMAS/ ISO14001 certificate).

Adequate protection will be given to vulnerable parts of the buildings and landscape to minimise the frequency of material replacement.

3.6 Waste

Construction waste materials will be sorted into separate key waste groups either on-site or off-site and diverted from landfill. Wherever feasible, non-hazardous construction waste generated by the project will be reused, salvaged/reclaimed, recovered, recycled, composted on or off site and/or returned to the supplier.

Recycled and/or secondary aggregates (if this can be reasonably procured) will be used in construction, thereby reducing the demand for virgin material.

Adequate dedicated storage spaces for non-recyclable and recyclable waste generated by the dwelling occupants will be provided at ground level. This will enable appropriate management of waste disposal

Figure 3.4 SuDS proposal diagram by LDH Wembley Engineering (Source: Hydrological and Hydrogeological Impact Assessment Report)

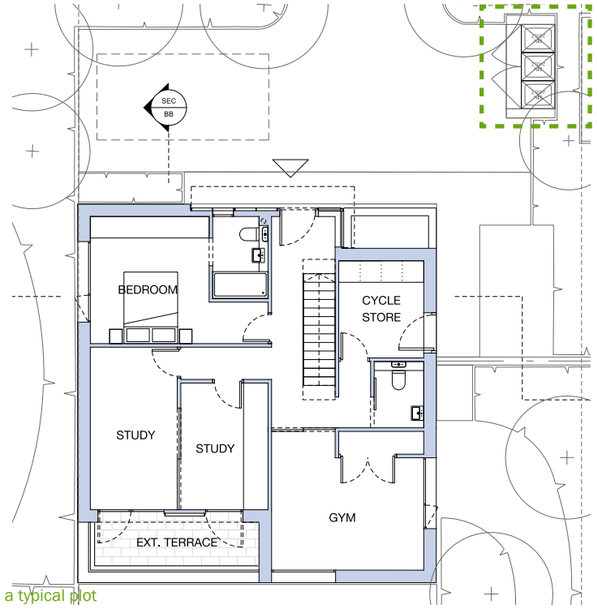


Figure 3.5 Dedicated storage spaces for non-recyclable and recyclable waste in a typical plot

during the buildings' operation (Figure 3.5).

3.7 Pollution

Insulating materials will only use substances that have Global Warming Potential (GWP) less than five. This will contribute to reduce blowing agent emissions associated with the manufacture, installation, use and disposal of foamed thermal and acoustic insulating materials.

Night time light pollution will be minimised through the appropriate location and selection of external luminaires and light controls during RIBA Stage 4 detailed design.

Potential noise from the proposed development affecting nearby noise-sensitive buildings will be reduced by adopting noise attenuation measures, where required.

3.8 Ecology and land use

The application includes an independent ecology report which records the extensive surveys undertaken on the site, an assessment of the site's baseline condition and sensitivities together with proposed mitigation both during construction and as part of the completed scheme.

It is proposed that the ecological value of the site will be enhanced as a result of the proposed development. This will be done by,

- establishing ecological corridors to provide strong connectivity between the Heath and Fitzroy Park area,
- significant enhancement of an existing pond and its associated habitats
- extension of other habitats including the retained orchard and extensive green roofs

Please refer to the Design and Access Statement for further details on the landscape design strategy.

Figure 3.6 View of the proposed pond and its associated habitats

4 Overheating analysis

4.1 Introduction

While the building regulation (SAP overheating risk assessment) protects future residents against intolerable risk of overheating, it does not give guidance on the experience inside the spaces. Therefore, overheating potential in living areas, bedrooms and studies was assessed further by referencing CIBSE's Technical Memorandum (TM) 59 - Design methodology for the assessment of overheating risk in homes. TM59 utilises annual hourly thermal simulations for a more rigorous test and captures occurrences of overheating with finer resolution than the regulatory requirements and procedures.

4.2 The Cooling hierarchy

Policy 5.9 of the London Plan on overheating and cooling proposes the following hierarchy to reduce the potential for overheating and reliance on air-conditioning systems:

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

In this hierarchy, passive measures that reduce the amount of accumulated heat in the dwellings are given priority over the measures that passively manage the impact of the accumulated heat. Lowest in the hierarchy are active measures that remove the accumulated heat from the dwellings.

Overheating of the five residential houses within the Fitzroy Park development is mitigated predominantly via passive design measures which include:

- building massing and orientation balancing solar gains over the course of the day and the year,
- openable windows in all living areas, studies, bedrooms and bathrooms
- glazing with mid-range g-value (0.45) that allows high degree of daylight, and solar control,
- window reveals, overhangs, vertical fins and trees providing local shading,
- external blinds for large exposed windows and internal blinds for smaller, less exposed windows.

To the extent feasible, the design of Fitzroy Park upholds the London plan cooling hierarchy in order to limit the risk of overheating and the need for active cooling in dwellings. The proposed development prioritises passive design principles starting with its massing and orientation. The massing takes advantage of the plot orientation and existing trees.

Large South-east and South-west facing windows allow entry of beneficial solar gains into the dwellings during the heating season, while overhangs minimise the exposure to excess solar radiation for extended periods in summer. The majority of large windows are shaded by existing trees, with foliage limiting solar gains in summer. Where necessary, external blinds are provided to further reduce solar heat gains.

The large windows also provide ample daylight into dwellings, which minimises the use of electric lighting and reduces internal gains. The adopted massing also enables access to operable openings in all habitable rooms. Making use of the spacious plot, all houses are designed with openings on at least three sides enhancing natural ventilation via cross ventilation.

These strategies are supplemented by MVHR units with integrated bypass, providing dependable ventilation and heat rejection at all times.

Due to limited availability of thermal mass in dwellings, operative temperatures within naturally ventilated living rooms track outdoor air temperature closely throughout the day. As a result, small increases in operative temperatures of living rooms that result from additional internal and solar gains during day time quickly cause exceedance against the CIBSE TM59 criteria. Hence, shading devices including window reveals, overhangs, vertical fins as well as external and internal blinds were carefully optimised to reduce solar heat gains.

Openable windows enable dwellings to cool naturally overnight, minimising the risk of night-time overheating in bedrooms. As a result, night temperatures in all bedrooms remain within the recommended ranges established in CIBSE TM59.

Maintaining sufficient air flow rate is critical to avoid overheating in spaces with no active cooling. The design relies on operable windows with no restrictions to achieve such flow rates. To supplement this design principle, MVHR units with by-pass will provide background ventilation during unoccupied hours.

4.3 Overheating assessment methodology

To quantify the benefits of these passive design measures and to further improve the quality of the dwellings, predicted occurrences of overheating in dwellings was assessed in detail using the methodology described in CIBSE's TM59. CIBSE AM11 compliant dynamic thermal analysis software IES Virtual Environment (VE) 2018.0.2.0 was used for this assessment. The overheating assessment was based on architectural drawings (plans, sections and elevations) provided on 2nd August 2018 by Piercy and Company for plots 1-3 and 5 and Fathom Architects for plot 4 and agreed changes to window sizes.

4.3.1 Site location and orientation

The assessed dwellings are located on a site North-east of Hampstead Heath. The houses on plots 1-3 are accessed at ground level from the East. The living areas of these houses are at lower ground level oriented to the West.

The house on plot 4 is accessed via an entrance courtyard in the North-west of the house and the living areas are South oriented.

The house on plot 5 is accessed from a foot path in the East of the house. The main living areas are oriented to the South-west.

4.3.2 Weather data

TM59 requires the use of the design summer year (DSY) 1 weather file most appropriate for the site location for the 2020s, high emissions, 50% percentile scenario. Due to the proximity of the weather station to the project site and the similarity of the peri-urban development in the surrounding areas, the weather data projected based on the design summer year of 1989 from the London Heathrow Airport has been adopted, as developed and recommended by CIBSE TM49 - Design summer years for London (LHR1989_2020High50pct.epw).

4.3.3 Construction of external and internal elements

The building envelope design includes high degree of insulation to minimise heat losses during the heating period. The basis of design performance values included in Table 4.1 were adopted in the assessment of the overheating risk. The windows and doors are double-layer insulated glazing units (DGU) with solar control and low-emissivity coating. The walls and the roofs are highly insulated. The design does incorporate some exposed thermal mass, in the form of stone or tiled floors in most areas except bedrooms and plot 4 ground floor gym and, first floor corridor where timber flooring was assumed. Plot 4 also has exposed facebrick walls in some areas. Other walls and ceilings are lightweight constructions and plasterboard was assumed in the simulation model for these walls and ceiling finishes.

Table 4.1 Fabric performance targets

Facade element	Project target
Roof U-value [W/(m².K)]	0.13
External wall U-value [W/(m².K)]	0.15
Floor U-value [W/(m².K)]	0.13
Window U-value [W/(m².K)]	1.10
Window g-value [-]	0.45
Air permeability [m³/(h.m²)] at 50Pa	3.0

4.3.4 Internal gains

All internal gains and profiles, including occupancy, lighting and equipment gains have been modelled in line with the gain profiles standardised by CIBSE TM59 (Table 4.2).

4.3.5 Ventilation strategy

The service design for dwellings includes mechanical ventilation units with heat recovery by-pass providing background ventilation. While the background ventilation rate is small compared to the air flow rates through the openable windows, it provides minimum ventilation during unoccupied hours and improves indoor conditions when low wind speed during peak summer periods limits the potential for natural ventilation. The building envelope design targets low air permeability of 3 $m^3/(hr.m^2)$ at 50 Pascal to minimise heat losses during the heating season. This has been modelled using the corresponding infiltration rate of 0.083 air changes per hour as established based on the methodology described in CIBSE TM23.

Based on these conditions, the primary mode of ventilation against overheating in the dwellings is natural ventilation provided by openable side-hung and sliding windows and doors. For all side-hung windows and doors a free opening angle of 90° was assumed (except two east facing bathroom windows on plots 1 and 2 which open 45°). Corresponding free areas are calculated using the MacroFlo module of IES VE 2018.0.2.0, in line with the pressure coefficients based on CIBSE Guide A and assuming semi-exposed walls. The effect of blinds restricting the air flow through windows was taken into account by reducing the free opening from 7am to 8pm by 60% for micro-louvred external blinds and by 25% for internal Venetian blinds.

All side-hung and sliding openings are assumed to be openable without concern for safety and security throughout the day and night when spaces are occupied. CIBSE TM59 acknowledges that noise and low air quality can limit the periods during which windows and doors can be left open. However, at the site location night time noise levels and air quality are not considered to be problematic and hence the overheating analysis follows TM59's default guidance, and assumes that the windows and doors are left open whenever the spaces are occupied and the indoor space temperature exceeds 22°C.

Interior doors between spaces are assumed to be open during day time hours in order to fully utilise the potential for cross ventilation within dwellings.

4.3.6 Shading

The massing of the proposed buildings and the existing trees and sloped landscapes provide a degree of solar protection. The trees that are considered to have a significant impact on solar gains were included in the simulation model geometry. The effect of shading was simulated explicitly in the dynamic thermal simulation model to capture changes in the level of shading these features provide

throughout the assessment period. It should be noted that although the existing trees on the site are proposed to remain, there is no guarantee that the trees will be there throughout the lifetime of the buildings. Although internal and external blinds are provided, the assessment results may be affected if trees have to be cut.

In addition to fixed shading elements, a combination of internal and external blinds are proposed to further reduce solar heat gains. Micro-louvred external blinds are proposed for all the floor-to ceiling windows on the South and West façades, except for some rooms where sufficient shading is provided (i.e. Plot 5 living room with overhang or bedrooms with external fins). Please refer to mark-ups in Appendix A where areas with external blinds are highlighted in green. All other windows will have internal Venetian blinds.

The transmission factor of external blinds was modelled as 0.36 at 0°, 0.20 at 15°, 0.08 at 30°, 0.05 at 45° and 0.03 for solar angles of 60° and above (based on Schueco solar shading CTB product data). All blinds were assumed to be lowered when the incident radiation exceeds 180 W/m² and raised when the incident radiation falls below 150 W/m². Internal blinds were assumed to have a shading coefficient of 0.61 with 0.30 short-wave radiant fraction.

4.3.7 Comfort criteria

As recommended in TM59, the default comfort category of 2 based on the CIBSE TM52 (2013) categorisation for new buildings has been adopted. The dwellings are not designed specifically for vulnerable residents, therefore Category I with more stringent requirements was determined to be unsuitable.

As per the guidance for homes that are predominantly naturally ventilated, including homes that have mechanical ventilation with heat recovery and with good opportunities for natural ventilation in the summer, the adaptive method based on CIBSE TM52 was referenced for the assessment. Requirements under this method are summarised in greater detail below.

Criterion A

Criterion A of compliance for predominantly naturally ventilated homes requires that the number of hours during which the temperature difference between the assessed spaces and the applicable adoptive comfort threshold is not greater than or equal to one degree during the period from May to September inclusive, for more than 3.0% of occupied hours.

For reference, the adopted design summer year 1 weather file includes 55 summer hours, or approximately 1.5% of all summer hours, with the outdoor air temperature exceeding the maximum adaptive temperature by at least one degree. This corresponds to 2.8% of all summer hours between 9:00 and 22:00, the period of default living room occupancy in TM59. As a result, five additional hours in living rooms with temperatures exceeding the applicable threshold leads to non-compliance under this criterion. This criterion applies to living rooms, kitchens and bedrooms.

Criterion B

Criterion B of compliance for predominantly naturally ventilated homes requires that the operative temperature in the bedrooms from 22:00 to 7:00 shall not exceed 26°C for more than 1% of all annual hours.

Table 4.2 Referenced TM 59 load profiles and schedules

Number of people	Description	Peak load (W)		Period																							
		Sensible	Latent	00–01	01–02	02–03	03–04	04–05	05–06	06–07	07–08	08–09	09–10	10–11	11–12	12–13	13–14	14–15	15–16	16–17	17–18	18–19	19–20	20–21	21–22	22–23	23–24
				Hour-ending																							
				1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00	10.00	11.00	12.00	13.00	14.00	15.00	16.00	17.00	18.00	19.00	20.00	21.00	22.00	23.00	24.00
1	Single bedroom occupancy	75	55	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.7
2	Double bedroom occupancy	150	110	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	1	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	1	0.7
2	Studio occupancy	150	110	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1	1-bed: living/kitchen occupancy	75	55	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0
1	1-bed: living occupancy	75	55	0	0	0	0	0	0	0	0	0	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0	0
1	1-bed: kitchen occupancy	75	55	0	0	0	0	0	0	0	0	0	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0	0
2	2-bed: living/kitchen occupancy	150	110	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0
2	2-bed: living occupancy	150	110	0	0	0	0	0	0	0	0	0	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0	0
2	2-bed: kitchen occupancy	150	110	0	0	0	0	0	0	0	0	0	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0	0
3	3-bed: living/kitchen occupancy	225	165	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0
3	3-bed: living occupancy	225	165	0	0	0	0	0	0	0	0	0	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0	0
3	3-bed: kitchen occupancy	225	165	0	0	0	0	0	0	0	0	0	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0	0
	Single bedroom equipment	80		0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.13
	Double bedroom equipment	80		0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.13
	Studio equipment	450		0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	1	1	0.44	0.44	0.24	0.24
	Living/kitchen equipment	450		0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	1	1	0.44	0.44	0.24	0.24
	Living equipment	150		0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	1	1	1	1	0.4	0.4
	Kitchen equipment	300		0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	1	1	0.17	0.17	0.17	0.17
	Lighting profile	2 (W/m2)		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0

This criterion applies to bedrooms only and aims to improve comfort during the sleeping hours. 1% of the annual hours between 22:00 and 7:00 for bedrooms corresponds to 32 hours. As a result, 33 or more hours above 26°C leads to non-compliance against this criterion.

For reference, the adopted design summer year 1 weather file includes 14 hours between 22:00 and 7:00 with the outside air temperature exceeding 26°C. As a result up to 18 additional hours above 26°C is permissible in bedrooms during this period while still maintaining compliance with this criterion.

Compliance in naturally ventilated homes

Predominantly naturally ventilated dwellings are considered to comply with TM59, if they meet the requirements of both Criterion A and Criterion B summarised above.

Compliance in mechanically ventilated homes

In predominantly mechanically ventilated homes, such as those with restricted window openings because they have either no opportunity or extremely limited opportunities for opening windows (e.g. due to noise levels or air quality), the CIBSE fixed temperature test must be followed. To pass this test, all occupied rooms should not exceed an operative temperature of 26°C for more than 3% of the annual occupied hours. The adopted design summer year 1 weather file for London includes 282 hours, or 3.2% of all annual hours, during which outside air temperature exceeds 26°C. This is more than 5.6% of all hours of occupancy in living rooms. As a result, provision of active cooling is likely to be unavoidable to meet the requirements for predominantly mechanically ventilated homes in London.

4.4 Overheating analysis results

With large openable windows, the indoor temperatures in living rooms track the outdoor air temperatures closely, whenever the windows in these space are open, i.e. whenever the rooms are occupied (9:00 to 22:00) and the space temperature exceeds 22°C. Bedrooms with a combination of fixed glazing and openable windows also achieve sufficient air change rates through natural ventilation to mitigate overheating both during the day and at night-time.

This confirms that the proposed design takes full advantage of the natural ventilation potential and performs in line with expectations from dwellings that rely on natural ventilation for heat rejection.

The results of the overheating analysis summarised in Table 4.3 show that all kitchen / living areas, studies and bedrooms meet the CIBSE overheating criteria.

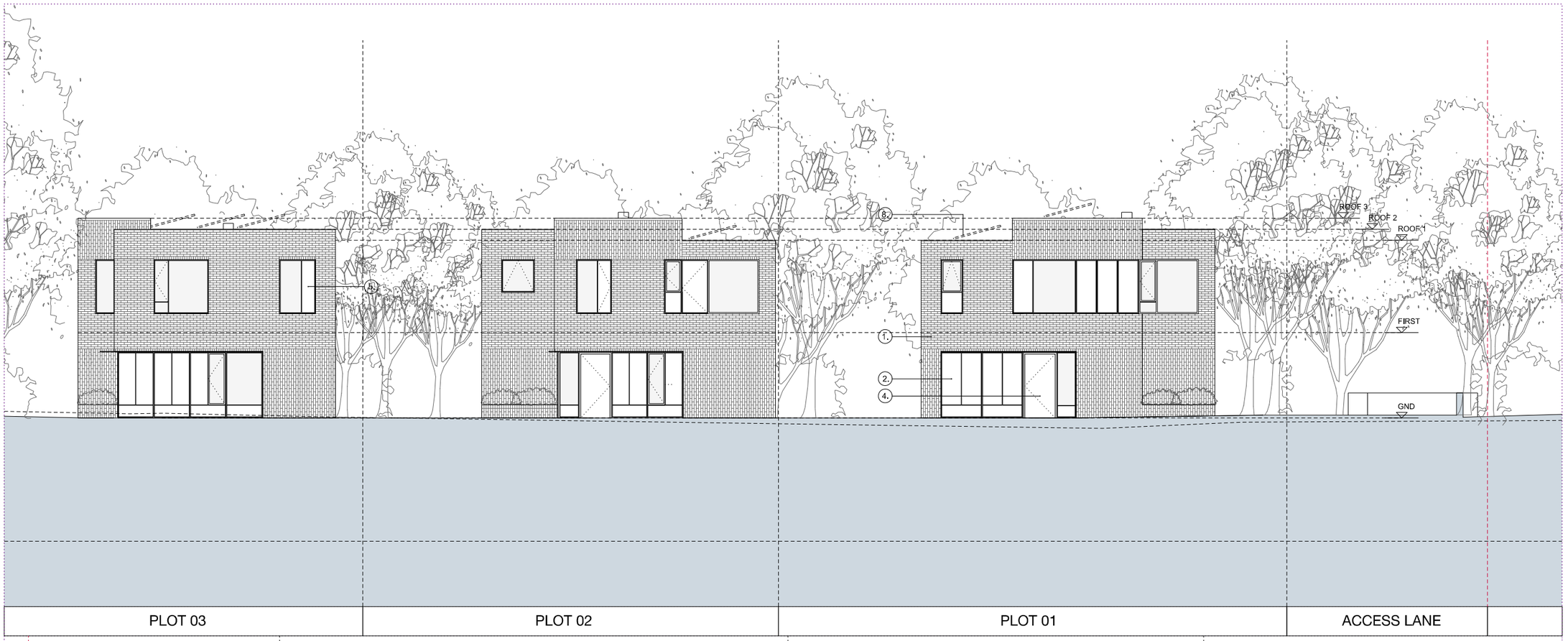
Table 4.3 CIBSE TM59 overheating analysis results

Room	Criterion A		Criterion B		Both criteria
	% of time exceeding threshold temperature	Pass / Fail	Number of hours exceeding threshold temperature	Pass / Fail	Pass / Fail
P1 00 Kitchen / Living	1.5	Pass			Pass
P1 01 Bedroom NE	0.8	Pass	29	Pass	Pass
P1 01 Study NW	1.9	Pass			Pass
P1 01 Study SW	2.9	Pass			Pass
P1 02 Bedroom NE	1.0	Pass	31	Pass	Pass
P1 02 Bedroom NW	1.3	Pass	32	Pass	Pass
P1 02 Master Bedroom SW	1.4	Pass	19	Pass	Pass
P2 00 Kitchen / Living	1.6	Pass			Pass
P2 01 Bedroom NE	1.0	Pass	25	Pass	Pass
P2 01 Study NW	2.7	Pass			Pass
P2 01 Study W	2.4	Pass			Pass
P2 02 Bedroom NE	1.1	Pass	23	Pass	Pass
P2 02 Bedroom NW	1.6	Pass	32	Pass	Pass
P2 02 Master Bedroom SW	1.4	Pass	21	Pass	Pass
P3 00 Kitchen / Living	1.1	Pass			Pass
P3 01 Bedroom NE	1.0	Pass	17	Pass	Pass
P3 01 Lounge	1.2	Pass			Pass
P3 01 Study NW	2.8	Pass			Pass
P3 01 Study SW	2.3	Pass			Pass
P3 02 Bedroom NE	1.1	Pass	23	Pass	Pass
P3 02 Bedroom SE	1.1	Pass	31	Pass	Pass
P3 02 Guest bedroom	1.3	Pass	23	Pass	Pass
P3 02 Master Bedroom NW	1.3	Pass	24	Pass	Pass
P4 00 Lounge	2.0	Pass			Pass
P4 00 Reception	2.8	Pass			Pass
P4 01 Bedroom 01	0.8	Pass	16	Pass	Pass
P4 01 Bedroom 02	0.6	Pass	17	Pass	Pass
P4 01 Master bedroom	2.9	Pass	27	Pass	Pass
P5 00 Kitchen / Living	1.4	Pass			Pass
P5 00 Study	0.6	Pass			Pass
P5 01 Bedroom 1	1.4	Pass	28	Pass	Pass
P5 01 Bedroom 2	1.2	Pass	29	Pass	Pass
P5 01 Bedroom 3	1.0	Pass	25	Pass	Pass
P5 01 Guest bedroom	0.6	Pass	24	Pass	Pass
P5 01 Master bedroom	1.3	Pass	19	Pass	Pass

Appendices

Appendix A External blinds mark-ups

Appendix A External blinds mark-ups



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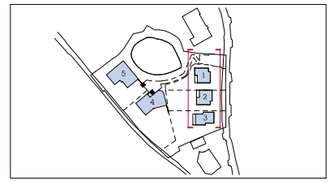
1. BRICKWORK IN VARYING BONDS
2. ARTICULATED METAL PANEL
3. METAL FRAMED WINDOW SYSTEM
4. TIMBER DOOR
5. METAL OPENING VENT PANEL
6. METAL BALUSTRADE
7. SLIDING GLASS DOOR SYSTEM
8. PV PANEL BEYOND

Rev	Date	Description
-	01.08.18	Planning



Project
55 Fitzroy Park

Client
The Turner Stokes Family and the Springer Family

Date
August 2018

Scale
1:75 at A1
1:150 at A3

Plots 1-3
Proposed Elevations

Drawn
LM

Checked
GW

Approved
HH

Drawing Status
PLANNING

Project	Discip.	Zone	Level	Series	Dwg No	Rev
13529	AP	Z1	LXX	04	120	-

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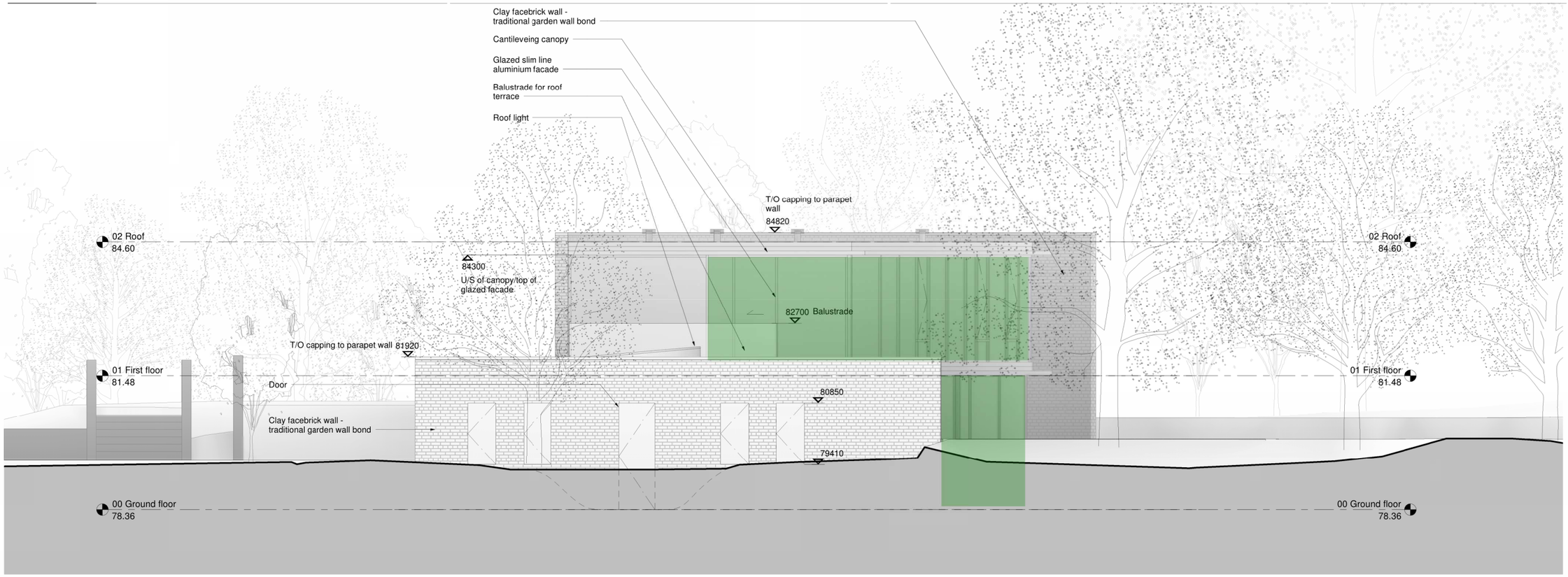
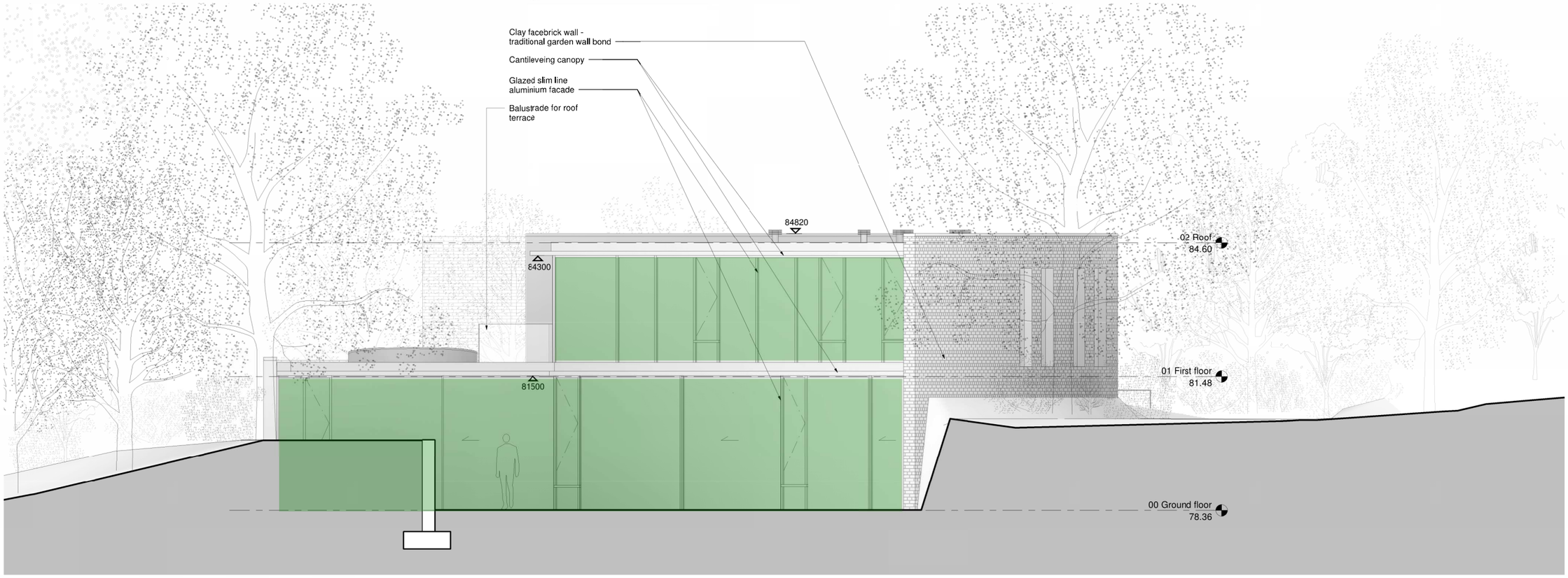


West elevation
1 : 50

0 1m 5m 10m



South elevation
1 : 50

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Rev.	Date.	Reason for issue	Issued by
0	27.04.2018	Issued for information	AC
1	11.05.2018	Planning draft	AC
2	12.17.2018	Issued for planning	AC

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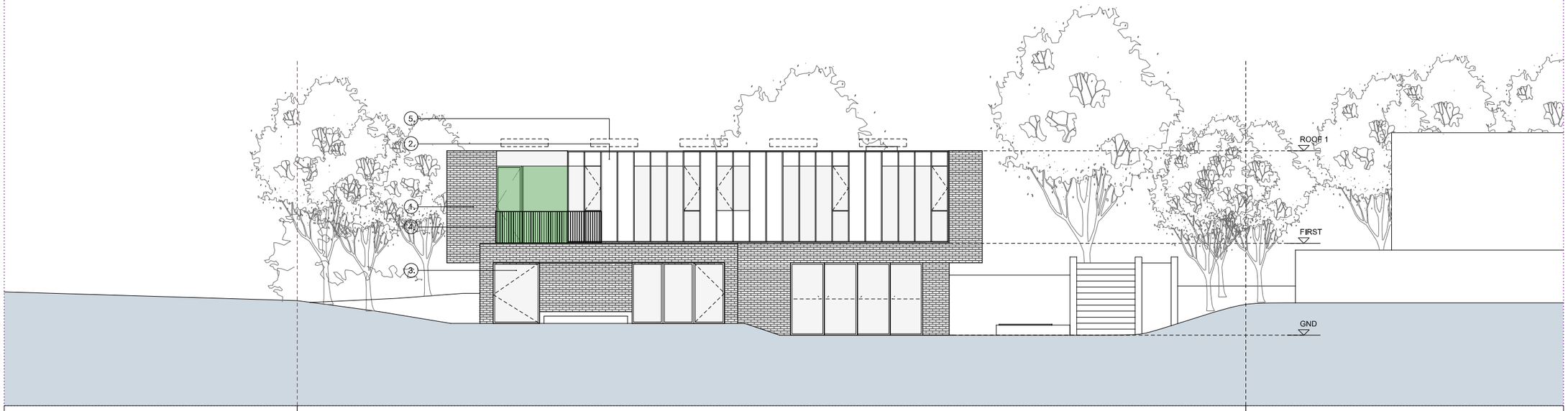
Project
Fitzroy Park - Plot 4

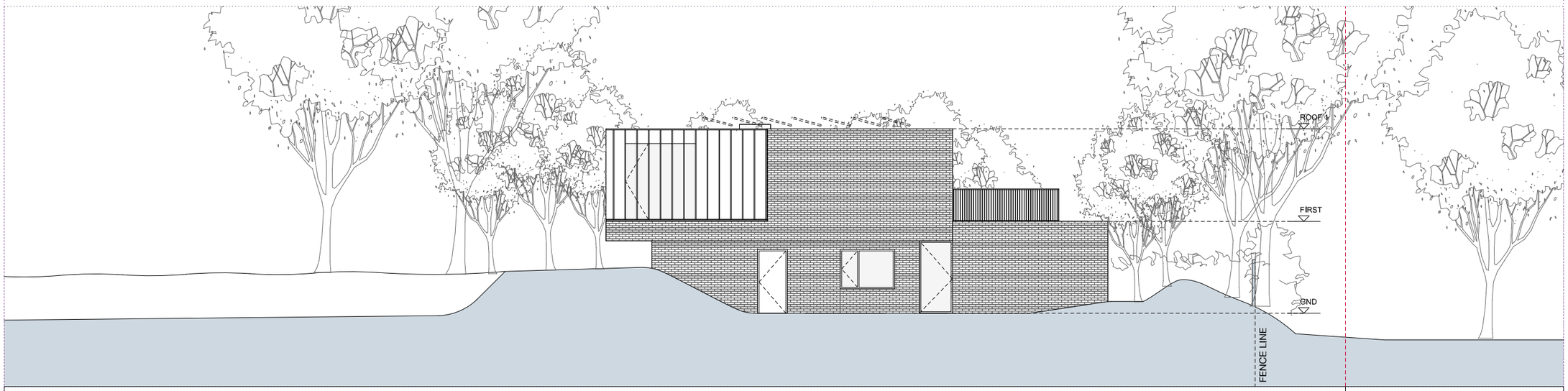
Title
Elevations

Scale		Paper size	Scale		Paper size
1 : 50	@	A1	1:100	@	A3

Project no.	Drawing no.	Rev.
0046	A2300	2



WATERHOUSE | PLOT 05 - SOUTH WEST ELEVATION | PLOT 04



PLOT 05 - NORTH WEST ELEVATION | MILLFIELD LANE

0 1 2 3 4 5 10 15

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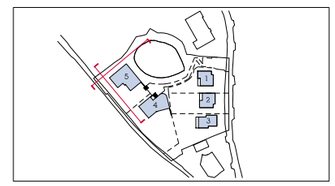
2. METAL FINS WITH SOLID & GLAZED PANELS BEHIND
3. FRAMED GLAZING
4. METAL BALUSTRADE
5. PV PANEL BEYOND

Rev	Date	Description
-	01.08.18	Planning



Project
55 Fitzroy Park

Client
The Turner Stokes Family and the Springer Family

Date
August 2018

Scale
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1:150 at A3

Plot 5
Proposed Elevations

Drawn: LM | Checked: GW | Approved: HH

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Project	Discip.	Zone	Level	Series	Dwg No	Rev
13529	AP	Z3	LXX	04	131	-

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