Report:

Sustainability Design Report

Project:

552-568 Oxford St, Bondi Junction

For:

Denscen Pty Ltd

By:

Inhabit Australasia Pty Ltd.

Doc. No: 5081-RPT-ES0001
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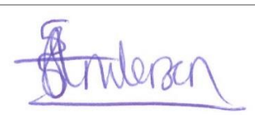
			Prepared by	Checked by	Approved by
		Name	Samantha Anderson	Darren O'Dea	Darren O'Dea
		Signature			

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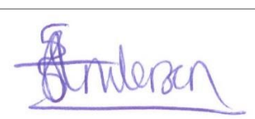
		Signature			

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Executive Summary

This report outlines the Sustainability Design objectives for 552-568 Oxford St development at Bondi Junction, New South Wales.

The passive design principles of the development and the proposed building sustainability initiative are discussed. These initiatives form the basis of the developments BASIX compliance and achievement of the water, thermal comfort and energy benchmark requirements required for Development Application submission.

The current design is expected to exceed all requirements.

1. Introduction

Denwol Group has appointed Inhabit for ESD consultancy on the proposed 552-568 Oxford St development in Bondi Junction, New South Wales.

This document has been prepared to outline the ecologically sustainable design (ESD) initiatives included in the new mixed multi-residential development and assesses the development compliance with Building Sustainability Index (BASIX) water, energy and thermal comfort benchmarks

The site is located in Bondi Junction, a suburb approximately 5km south-east of the Sydney Central Business District, and is currently occupied by a 3 storey commercial building. The existing building will be demolished for the proposed development which comprises one building with a 6 storey podium and 13 storey tower. The building is proposing to achieve the following ESD initiatives:

- Compliance with BASIX benchmarks for water, thermal comfort and energy
- Inclusion of a PV system to supply common area power, reducing running cost over time
- Achieve the BASIX energy requirement of 30%, with the expectation this will be exceeded as the design develops

Figure 1: Renders of the proposed development (Source: UP Architects)

2. Site and Usage

The site is located in the Sydney suburb of Bondi Junctions, approximately 5km from Sydney's CBD. A 3 storey commercial building currently occupies the site. The new development will be bounded by Oxford St to the south, Hollywood Avenue to the west, Grafton Lane to the north and an adjoining site to the east.

The development occupies a 1,127m^2 site. The proposed development is made up of 13 storey tower and 6 storey podium.

The development will consist of 83 0 NCC Class 2 apartments with a mixture of one, two and three bedroom dwellings, a car park, and include a retail component to the ground floor. For the purpose of BASIX compliance, only the NCC Class 2 apartments have been addressed in this report.

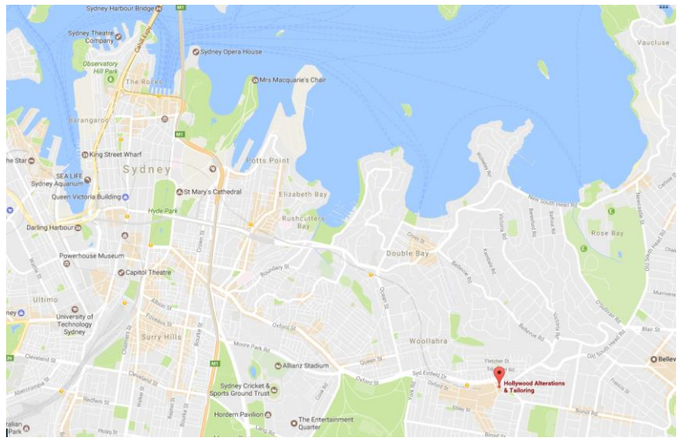


Figure 2: Location of proposed site from the Sydney CBD

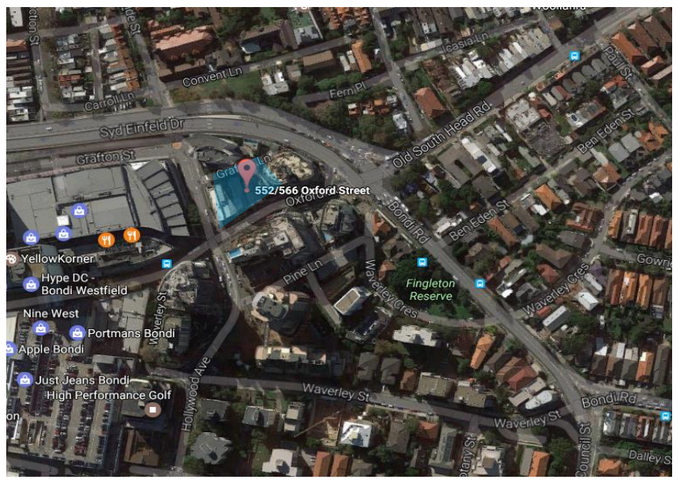
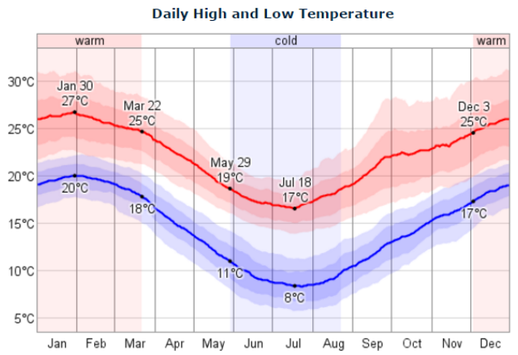
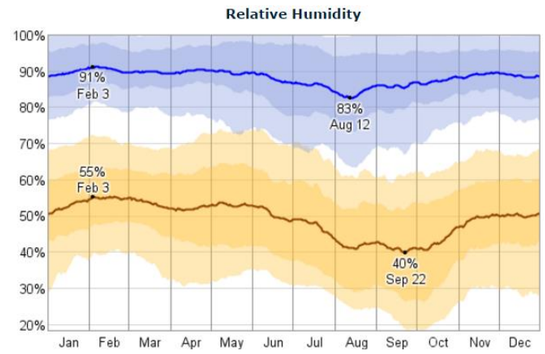


Figure 3: Site of proposed development

2.1 Sydney Climate

The Sydney climate is generally temperate, with warm to hot summers and cool winters.





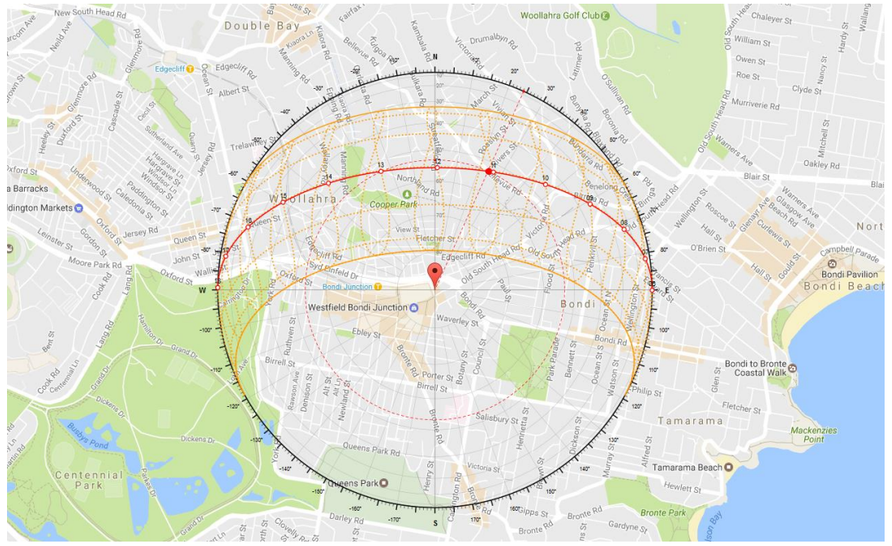


Figure 4: Sydney climate data

With passive design principles at the heart of any truly sustainable building, this temperate climate enables residential developments to have low heating and cooling energy demands.

2.2 Façade

The building envelope is the boundary between the conditioned interior of a building and the outdoors. The energy performance of building envelope components including external walls, roof and floor, is critical in determining how much energy is required for heating and cooling. Therefore optimisation of the façade is paramount in any efficient design.

552-568 Oxford St development has been designed with passive building principles in mind. This encompasses the design hierarchy of reducing demand as the first priority and not relying solely on the efficiency of the building services plant to reduce energy consumption and associated greenhouse gas emissions. The temperate Sydney climate has been taken advantage of, with a combination of optimal orientations, window to wall ratios (WWR), fabric constructions and glazing make-ups.

The proposed façade features maximised glazed areas providing access to daylight, but without overwhelming the thermal comfort with excessive solar gains and conductive heat loss. The glazed façade will consist of thermally high-performance double glazing with a low-e coating to the west while the solid façade benefits from high levels of insulation. The other more shaded façade use double glazing without a low-e coat to minamise heat loss. This is the optimum outcome to maximise natural daylight, reducing the requirement for electrical lighting and providing pleasing aesthetics for the building occupants while ensuring that energy is not wasted unnecessarily to keep the internal space at comfortable levels.

The proportion of direct sunlight that is reflected from the glazed façade create glare issues to observers outside the proposed towers. Windtech has undertaken a reflectivity report, with Table 1 summarising the outcomes of this study.

Table 1: Glazing Reflectivity Limits

Orientation	Reflectivity Limit
Non-Recessed Main Building Façade Leve 1-3 141^0 and 149^0 Aspect	11%
Non-Recessed Other Glazing- e.g. Ballustrades Leve 1-3 141^0 and 149^0 Aspect	8%
Non-Recessed Main Building Façade Level 13 and above 267^0 Aspect	11%
Non-Recessed Other Glazing- e.g. Balustrades Leve 13 and above 267^0 Aspect	8%
All other glazing	20%

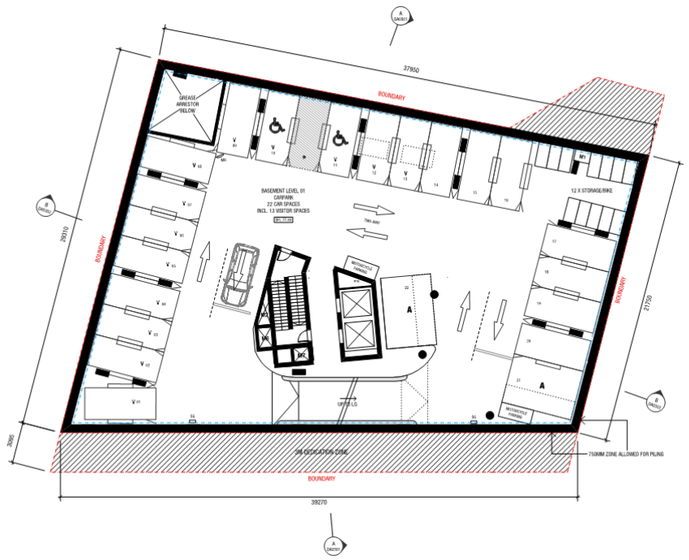
North

East

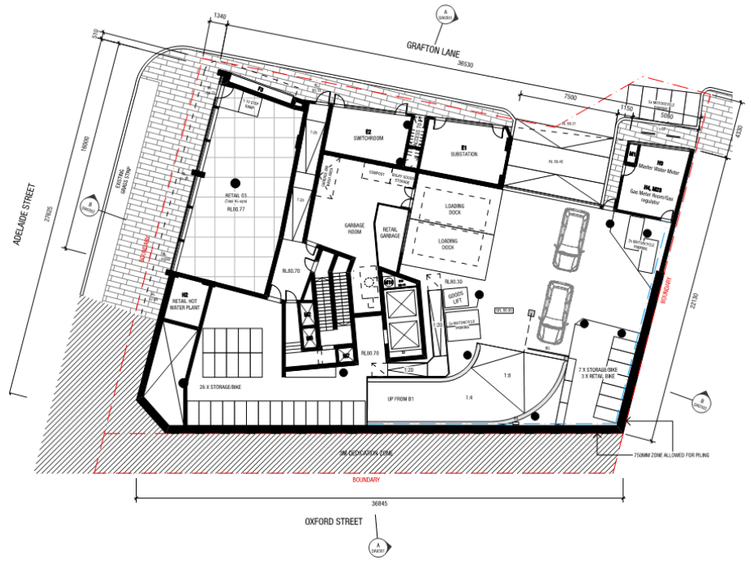
South

West

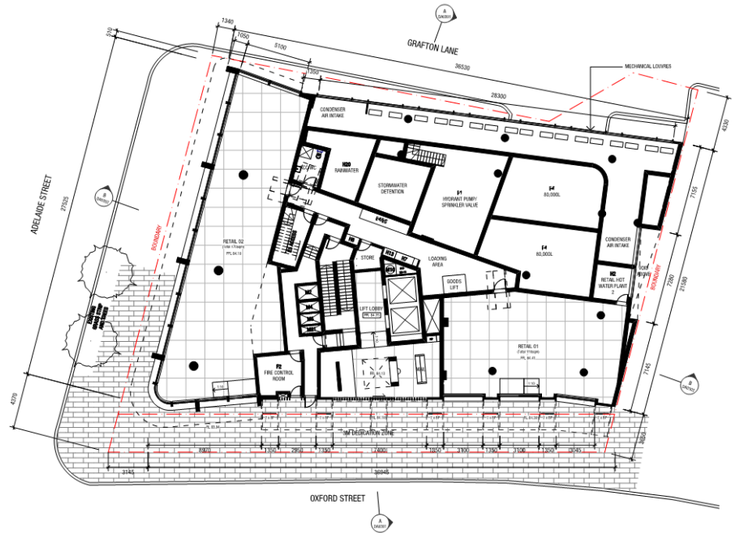
2.3 Floor Plans



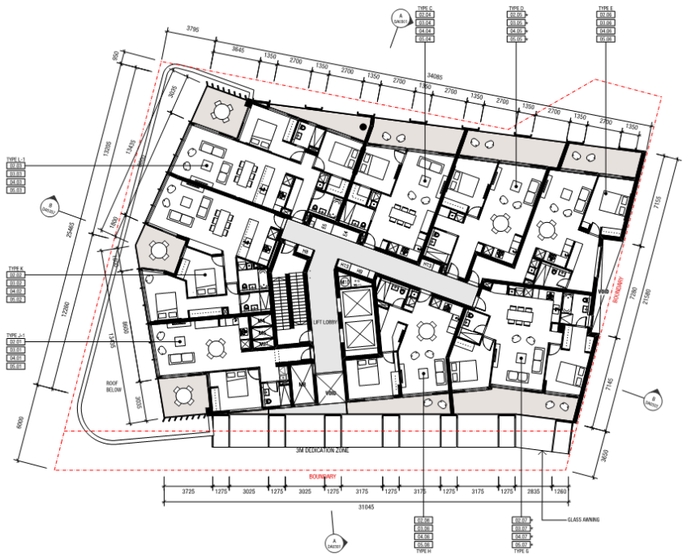
Basement



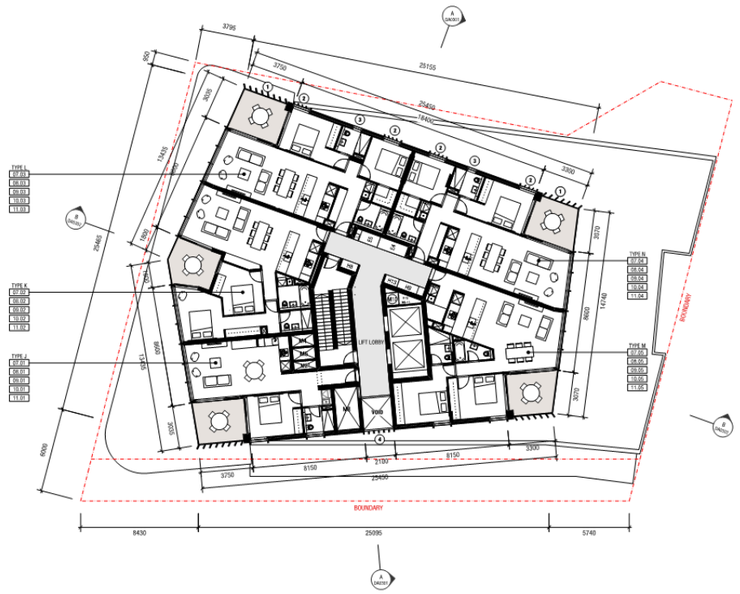
Lower Ground



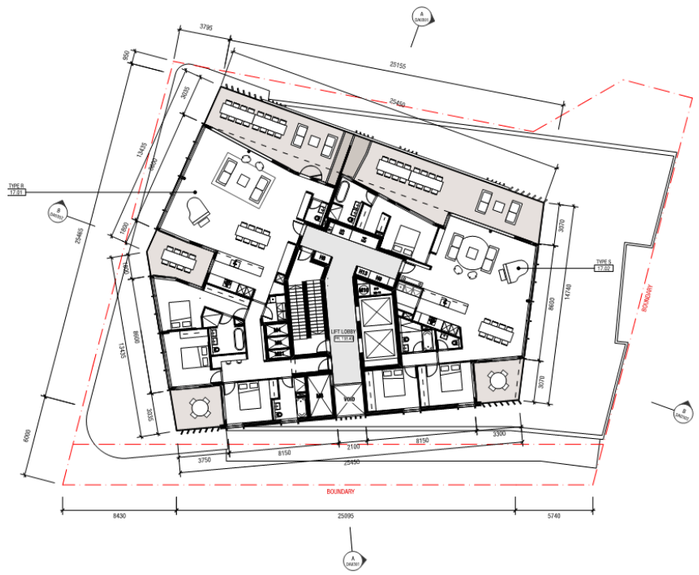
Ground Floor



Typical Podium



Typical Tower



Penthouse

3. ESD Objectives

3.1 Sustainability Objectives

The project is aiming to deliver a high degree of amenity and comfort to the development. The following elements, central to the design are key to delivering this:-

- Double glazed, low e-glass to the main western façade – achieving System U-values of 3.6W/m^2.K or less; and SHGC 0.20
- Minimum R-value of 2.0 m^2.K/m to all external no glazed walls
- Exposed floor to have a minimum R-value 1.9m^{2}K/W

These key envelope design features ensure the building inherently achieves high levels of performance regarding energy, health and comfort.

In addition to those above, the development is also exploring the feasibility of the following strategies:-

- Inclusion of a PV system to supply the comment area lighting and energy consumption;
- Inclusion of an electric charging station in the basement
- Sensor controlled automated lighting to dwellings and common areas.
- Collection of rainwater;
- Water efficient taps;
- Energy efficient light fittings;
- Energy efficient appliances
- Energy efficient VVVF lifts;
- Energy-efficient variable speed fans for mechanical exhaust system;

4. BASIX

This section outlines minimum compliance to achieve BASIX and thus gain development approval.

4.1 General Information

The design specifications that were used in the BASIX modelling is based on information received from the architects outlined in Table 2.

Table 2: Site Information

Site	
Site Area	1,127m^2
Roof Area	459.5m^2
Number of Apartments	83
Number of Residential Car Spaces	75
Number Non-residential Car Spaces	0

The following architectural drawings were used to assess compliance with BASIX:

- Plan Drawings: DA-0101 to DA-0204
- Elevations: DA0201 to DA0204

In NSW, BASIX is the mandated compliance pathway with the 2016 NCC (BCA) Section J for Class 1, 2, and 4 buildings. This approach allows for a more flexible design as building envelopes are simulated in NatHERS approved software and are required to achieve heating and cooling benchmarks based on applicable climate zones. In addition to the NatHERS requirements in other states, BASIX includes both energy efficiency and water efficiency requirements.

4.2 Energy

BASIX requires a 30% reduction in energy from the benchmark 3,929kg CO_2 per person per year.

Table 3 contains inputs that were used in the BASIX calculations based on the current design. Table 4 shows the energy consumption of the current design meets the minimum BASIX requirements for Energy.

Table 3: Energy Design Specifications

Base Building Fixtures	
Central hot water system	Centralised Gas-fired boiler with R1.0 pipe insutlation
Lifts	Gearless Traction with V V V F motor
Power Factor Correction	None
BMS System	Yes
Clothes Line	None
Clothes Washer	None
Dwelling Fixtures	
Cooling	3-Phase Reverse Cycle EER >4.0
Heating	3-Phase Reverse Cycle EER = >4.0
Ventilated Fridge Space	No
Dedicated LED/Fluorescent Fitting	Yes
Bathroom Exhaust	Exhausted to Roof or Façade- Interlocked to light
Kitchen Exhaust	Exhausted to Roof or Façade- Interlocked to light
Laundry Exhaust	Exhausted to Roof or Façade- Manual Switch
Cook top	Gas
Oven	Electric
Clothes Line	No
AC Zoning	No
Refrigerator	None
Dishwasher	4.0 Stars
Clothes Washer	None
Clothes Dryer	2.5 Stars
PV System	25kW

The above design achieves a 30% reduction and meets BASIX requirement

Table 4: Energy Consumption

BASIX benchmark	3,929kg CO_2 per person per year
Estimated consumption	2,750kg CO_2 per person per year
Reduction	30%

4.3 Thermal Comfort

BASIX stipulates a maximum heating and cooling load for each Class 2 apartments based on the building's location. Apartments at the 552-568 Oxford St, Bond Junction site are required to achieve a maximum heating load of 66 MJ/m^2/annum and a cooling load of 59 MJ/m^2/annum.

The average heating and cooling load amongst all apartments must not exceed 44.9 MJ/m^2/annum and a cooling load of 50.9 MJ/m^2/annum. The apartments at the development have been assessed using AccuRate; software accredited under the Nationwide House Energy Rating Scheme (NatHERS). To meet BASIX thermal comfort requirements, the minimum thermal performances of construction elements in Table 5 have been used within the NatHERS modelling.

Table 5: Building Envelope Materials

Construction	**Material used in Model**
Solid Façade (including spandrels)	Any solid wall façade elements to apartment facades are assumed to have: Total R-value = 2.0 m2.K/W
Glazed Façade	Glass Option 1 Balcony Glazing to most apartments NFRC System U-value = 6.7 W/m2.K System SHGC = 0.70 Glass Option 2 Uncoated DGU to Selected Windows NFRC system U-value = 4.1W/m2.K System SHGC = 0.47 Glass Option 3 DGU to selected windows

	NFRC system U-value = 3.87W/m2.K System SHGC = 0.23 Frame solar absorptivity to all glazing systems = 0.50
Roof	R3.5 m2.K/W insulation Total R-value = 3.9 m2.K/W
Floor/Ceiling	Plasterboard, Concrete Slab, Tiles or carpet (R1.5m^2.K/W insulation to exposed floors) (Tiles for living/ kitchen spaces, wet areas and wintergardens, carpets for bedroom and study area)

A summary all apartments assessed under NatHERS is shown in Table 6. The apartments throughout the development do not exceed the maximum heating cooling loads and therefore meet the BASIX requirements for Thermal Comfort.

Table 6: Heating and Cooling Load Results

	BASIX Benchmark (MJ/m^2.annum)	At 552-568 Oxford Street (MJ/m^2.annum)
Individual Heating Load	≤ 66	63.7 (17.01)
Individual Cooling Load	≤ 59	50.9 (16.02)
Average Heating Load	≤ 50.9	40.59
Average Cooling Load	≤ 44.9	23.43

4.4 Water

BASIX requires a 40% reduction in water from the benchmark of 90,340L per person per year to achieve compliance Table 7 contains the inputs that were used in the BASIX calculation based on the current design. Table 8 shows the water consumption of current design meets the minimum BASIX requirements for water.

Table 7: Water Design Specification

Base Building	
Area of Lawn	0 m^2
Area of Garden	15 m^2
Area of Low Water Use Species	0 m^2
Roof Area Diverted to rain water tank	459.5 m^2
Impervious Area Diverted to rain water tank	0 m^2
Garden/lawn Irrigated Diverted to rain water tank	0 m^2
Planter box area Diverted to rain water tank	0 m^2
Overflow Diverted to rain water tank	0 m^2
Alternative water use	Landscaping Car Wash Bay
Common Area showerheads	None
Common Area toilets	None
Common area taps	None
Water Tank	20kL
Dwelling Fixtures	
Shower Heads	3 Star (>7.5 but <=9 L/min)
Toilets	4 Star
Kitchen Taps	6 Star
Bathroom Taps	6 Star
Hot Water Demand Reticulation or Diversion	No
Clothes Washer	None
Dishwasher	5.5 Star

The above design achieves a 40% reduction and meets BASIX requirements

Table 8: Water Consumption

BASIX benchmark	90,340L per person per year
Estimated consumption	36,136L per person per year
Reduction	40%

5. Conclusion

552-568 Oxford Street development incorporates sustainable design concepts to maintain occupant comfort.

The use double glazing, low solar gain window and a high level of thermal insulation ensure the envelope achieves a high level of thermal performance, with an average of 87% of apartments exceeding the new BASIX cooling requirements to be introduced in July.

Additionally, a 30% reduction in energy has been achieved. The building achieves BASIX requirements and aims to exceed BASIX benchmarks during detailed design.

6. Appendix 1- Thermal Comfort Results

	Heating (MJ/m².annum)	Total Cooling (MJ/m².annum)	Conditioned floor area (m²)	Unconditioned floor area (m²)	Star Rating
2.01	47.9	46.9	94.8	13.3	3.3
2.02	31.9	35.5	67.4	75.8	4.3
2.03	38	25.4	63.4	71.3	4.1
2.04	38.2	31.7	69.9	45.7	4.1
2.05	33.8	34.4	68.2	48.7	4.5
2.06	51.1	33.8	84.9	55.6	4.3
2.07	43.6	26	69.6	70.7	4.1
2.08	24.3	45.4	69.7	46.6	4
3.01	48.1	49.3	97.4	13.4	3.3
3.02	34	37.8	71.8	75.8	4.3
3.03	42.1	33.9	76	71.3	4.1
3.04	39.4	31.5	70.9	45.7	4.1
3.05	34.8	34.8	69.6	48.7	4.5
3.06	49.4	36.1	85.5	55.6	4.3
3.07	43.7	25.9	69.6	70.7	4.1
3.08	25.1	45.1	70.2	46.6	4
4.01	59.5	25.5	85	49.6	3.6
4.02	39.5	17.9	57.4	75.8	4.3
4.03	52.6	14.4	67	71.3	4.1
4.04	50	24.7	74.7	45.7	4.1
4.05	44.1	25.9	70	48.7	4.5
4.06	53.6	27.6	81.2	55.6	4.3
4.07	51.8	19	70.8	70.7	4.1
4.08	32.8	32.3	65.1	46.6	4
5.01	59.8	20.3	80.1	49.6	3.6
5.02	38.7	18.5	57.2	75.8	4.3
5.03	51.9	14.6	66.5	71.3	4.1
5.04	50.6	24.6	75.2	45.7	4.1
5.05	44.6	26.2	70.8	48.7	4.5
5.06	47.6	31.2	78.8	55.6	4.3
5.07	51.3	19.6	70.9	70.7	4.1
5.08	33.1	32.1	65.2	46.6	4
6.01	59.1	20.8	79.9	49.6	3.6
6.02	47.2	16.6	63.8	72.4	4.3
6.03	30.9	13.8	44.7	71.3	4.1
6.05	46.2	20.6	66.8	74	3.3
7.01	54.3	22.5	76.8	49.6	3.6
7.02	44.7	13	57.7	75.8	4.3
7.03	30.5	13.9	44.4	71.3	4.1
7.04	48.8	20.4	69.2	72.7	4.1
7.05	46.2	21.7	67.9	74	3.3
8.01	54.5	22.2	76.7	49.6	3.6
8.02	39.2	14.8	54	75.8	4.3
8.03	29.5	14.3	43.8	71.3	4.1
8.04	46.7	21.1	67.8	72.7	4.1
8.05	45.8	22.1	67.9	74	3.3
9.01	54.6	18.9	73.5	49.6	3.6
9.02	39.9	17.7	57.6	75.8	4.3
9.03	27.9	14.3	42.2	71.3	4.1
9.04	42.5	21	63.5	72.7	4.1
9.05	45.4	22.3	67.7	74	3.3
10.01	54.7	22.2	76.9	49.6	3.6
10.02	40.2	14.4	54.6	75.8	4.3
10.03	23.6	13.4	37	71.3	4.1
10.04	33.3	22.1	55.4	72.7	4.1
10.05	44.8	22.6	67.4	74	3.3
11.01	57.3	16.5	73.8	49.6	3.6
11.02	42.6	13	55.6	75.8	4.3
11.03	22.1	13.3	35.4	71.3	4.1
11.04	32	20.2	52.2	72.7	4.1
11.05	46.1	18.9	65	74	3.3
12.01	56.4	14.5	70.9	117.4	6.5
12.02	19.7	12.2	31.9	71.3	4.1
12.03	31	22.2	53.2	72.7	4.1
12.04	44.9	19.4	64.3	74	3.3
12.05	REMOVED	0			
13.01	42.5	12.8	55.3	117.4	6.5
13.02	17.2	14.2	31.4	71.3	4.1
13.03	30	23.4	53.4	72.7	4.1

	Heating (MJ/m².annum)	Total Cooling (MJ/m².annum)	Conditioned floor area (m²)	Unconditioned floor area (m²)	Star Rating
13.04	42.9	20	62.9	74	3.3
13.05	REMOVED	0			
14.01	56.6	15	71.6	117.4	6.5
14.02	17.1	14.1	31.2	71.3	4.1
14.03	29.5	22.4	51.9	72.7	4.1
14.04	39.3	22.7	62	74	3.3
14.05	REMOVED	0			
15.01	54.8	14.5	69.3	117.4	6.5
15.02	9.2	47.8	57	74.8	3.4
15.03	8	43.1	51.1	74	3.4
15.04	32.7	29.4	62.1	74	3.3
15.05	REMOVED	0			
16.01	56.9	14	70.9	117.4	6.5
16.02	12.5	50.9	63.4	74.8	3.4
16.03	11.1	46.1	57.2	74	3.4
16.04	28.1	27.7	55.8	74	3.3
17.01	63.7	29	92.7	145.8	6.5
17.02	47.8	47	94.8	135.6	2.2

6.1 Summary of Thermal Comfort results

	BASIX Benchmark (MJ/m².annum)	At 552-568 Oxford Street (MJ/m².annum)
Individual Heating Load	≤ 66	63.7 (17.01)
Individual Cooling Load	≤ 59	50.9 (16.02)
Average Heating Load	≤ 50.9	40.59
Average Cooling Load	≤ 44.9	23.43