

## 12-16 Bent St, Lindfield

### Ecologically Sustainable Development Report for SSDA SSD-78156462

Prepared for: Sundale Developments

Attention: Phil Choy

Issue	File Ref.	Description	Author/Reviewer	Date
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**Limitations of this report:** The report is prepared using design and systems assumptions at a development application level of resolution (before tender and detailed construction level of design and specification). It should be recognized that final detailed design (for construction certificate) will be refined and adjusted after procurement of the building contractor and after final specification and construction details are resolved. Analysis at this stage relies on comparisons of proposed activities against averages (often at different rated performance levels) as complete bottom up data is not yet available.

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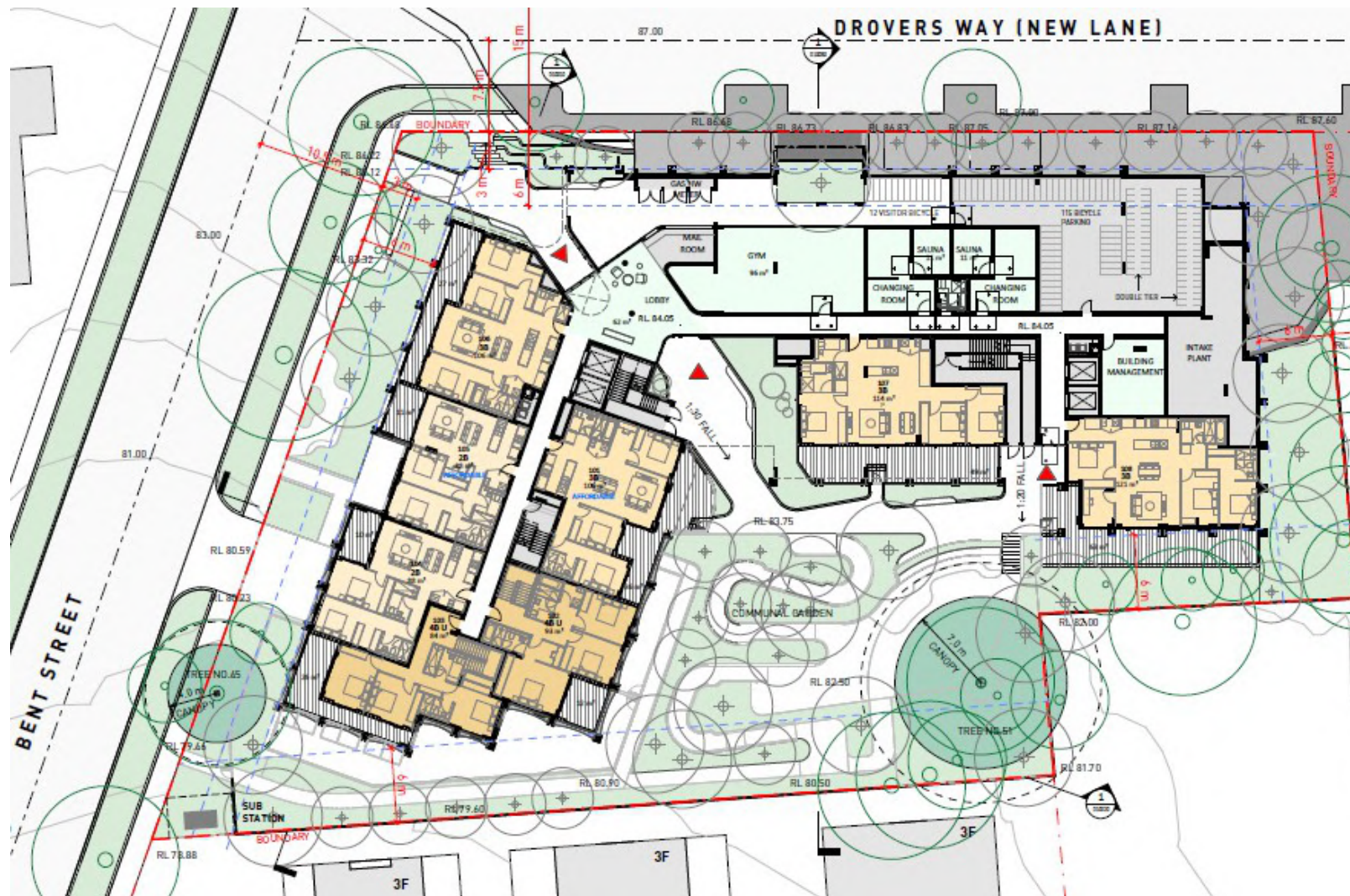


## ESD vision and summary of initiatives

The proposal will support the supply of healthy, affordable and environmentally efficient housing for the northern district of Sydney. Set up to be resource efficient, able to operate with net zero carbon emissions and climate change resilient.



# Ecologically Sustainable Development Report



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# 1. Introduction and project information

## Introduction and purpose of report

This ESD report has been prepared by Efficient Living Pty Ltd to support State Significant Development SSD-78156462 to develop an apartment building complex at 12-16 Bent St, Lindfield.

The ESD report has been structured considering the requirements of Planning Secretary Environmental Assessment Requirements ('SEARs') issued for the proposal (in this case industry specific SEARs for in-fill affordable housing).

In response to SEARs (Clause 1) the report considers relevant ESD related regulations and controls (as noted in Section 2 of the report).

In response to SEARs (Clause 15) the ESD report considers key ESD factors to address the ESD principles in section 193 of the EP&A Regulation including:

- Reduced carbon emissions, energy efficiency and energy sources—including efforts to reduce embodied carbon emissions in materials
- Water efficiency and alternative water sources to potable water where available
- Environmentally responsible material selection and waste management/recycling
- Climate change resilience
- Human health and wellbeing in the building environment

These factors primarily address the requirements of SEARs (Clause 15) together with other key ESD factors important to industry and the community.

## Property details

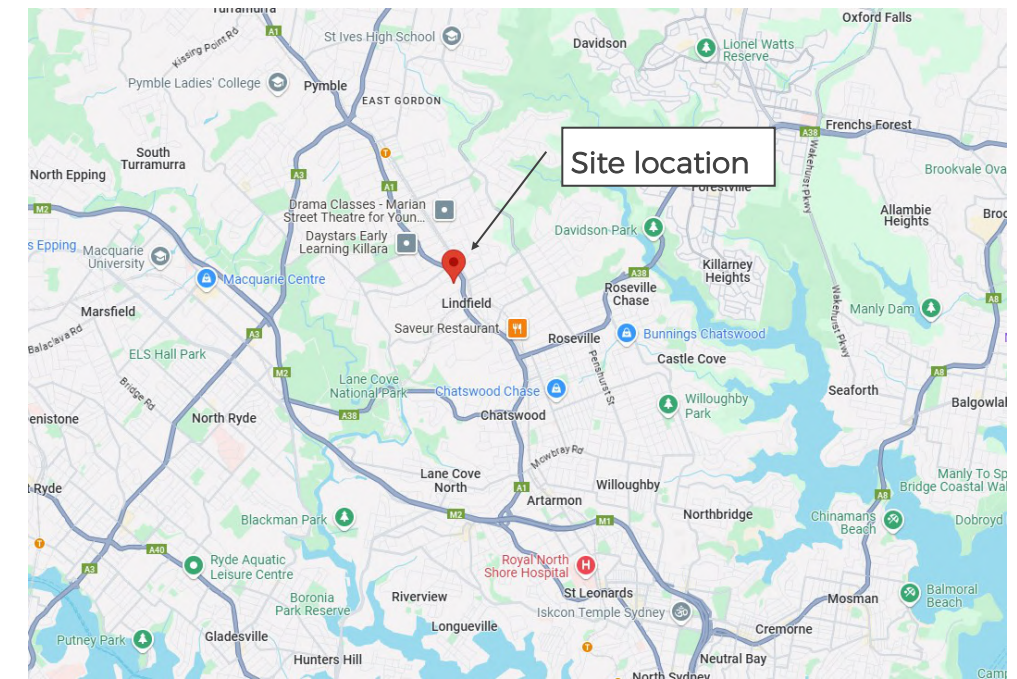
The property is located at 12-16 Bent St, Lindfield, In the Ku-ring-gai LGA.

- The site is c. 4324 sqm in size with a 60m frontage to Bent Street.
- The site is less than 350m from the Lindfield train station providing excellent public transport connectivity to wider Sydney areas.
- The existing site consists of 2 single-story residential buildings.
- The site is zoned R4, high density, and is within the SEPP (Housing) transit oriented development 400m to station defined area (and therefore can utilise the specific SEPP FSR and height controls)

## Proposal description

The key features of the proposal are:

- Development of a 10 level residential flat building in easy walking distance to Lindfield Station and Lindfield retail and community services
- GFA of 14,053 sqm
- FSR of c.3.25:1
- Building height of c. 32m
- A total of 115 apartments including 28 Affordable Housing apartments
- A total of 160 car spaces with 3 basement levels



Regional context of Site (Google Maps)



Local context of Site (Sixmaps)

## 2. Project responses to SEARs

### SEARs REQUIREMENTS

### Project response (and reference to relevant report section)

#### 1. Statutory Context

- Address all relevant legislation, environmental planning instruments (EPIs) (including drafts), plans, policies, guidelines and planning circulars.
- Identify compliance with applicable development standards and provide a detailed justification for any non-compliances.

The report primarily considers the EP&A Act ESD principles and required ESD measures for CI15 of the in-fill affordable housing SEARS provided for the proposal. In addition the report also considers ESD principles or objectives from the following State strategies and policies:

- Greater Sydney Region Plan
- Northern District Plan
- Sustainable Buildings SEPP and Housing SEPP (ADG)
- NSW Government Net Zero Plan

The report also includes compliance with National Construction Code (NCC) Section J Energy Efficiency requirements as is mandatory for components of this project type. These considerations are made in Section 4 of the report.

#### 15. Ecologically Sustainable Development (ESD)

- Identify how ESD principles (as defined in section 193 of the EP&A Regulation) are incorporated in the design and ongoing operation of the development.

- The project is not considered to create any threat of serious environmental damage given it's location on an existing developed site in a highly urbanised area. The development process is established with any potential impacts understood with a high level of certainty.
- The project demonstrates a commitment to minimising environmental impact, implementing climate change resilience measures, implementing resource conservation measures and implementing human health and wellbeing measures.
- In combination these initiatives deliver the concept behind a precautionary approach to approving development based on avoidance of potential future or uncertain impacts.
- On balance the project presents very low risk to the environment and supports sustainable outcomes.

#### Principle 1—the precautionary principle (Section 193, EP&A Regulation 1a)

The precautionary principle is that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.

In applying the precautionary principle, public and private decisions should be guided by—

- careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment, and
- an assessment of the risk-weighted consequences of various options.

## 2. Project responses to SEARs

### SEARs REQUIREMENTS

#### Principle 2—Inter generational equity (Section 193, EP&A Regulation 1b)

The principle of inter-generational equity is that the present generation should ensure the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations.

### Project response (and reference to relevant report section)

Achieving inter generational equity requires that the proposal takes steps to avoid, mitigate and support processes that preserve the environment and sustainability of communities over the long term.

Core responses to deliver these long term sustainability outcomes include:

- Avoiding resource depletion— through resource efficiency, steps towards a circular economy, with a focus on the longer term and full life cycle impacts for the environment and community.
- Helping to mitigate climate risk—through reduced CO2 emissions from the proposal (operational and embodied).
- Helping to adapt to climate risk—through including measures in the proposal that allow future communities to better manage climate change impacts.
- Creating places that will support ongoing human health over the long term.

The proposal includes environmental performance initiatives and outcomes to deliver inter generational equity. Sections 4-8 of this report set out these categories an) have been determined based on meeting or exceeding industry benchmarks.

The proposed ESD initiatives incorporate measures that greatly reduce GHG emissions and consumption of energy, incorporate onsite renewable electricity supply, conserve water and minimise resource consumption and embodied energy in materials.

The primary performance benchmarks for these categories include:

Minimising carbon emissions and energy (Section 4) - meeting or exceeding requirements

- Scope 1 and 2 CO2 emissions for the building c.60% savings against a BASIX benchmark; options included to reduce significant Scope 3 CO2 emissions, with scope to increase these savings to 65% with provisions for a 25kW PV array
- Sustainable Building SEPP 2022 BASIX energy score of 60% and average NatHERS thermal performance rating of c. 7.2 stars
- Future provision for a 25kW PV array included for onsite renewable electricity and option sought for 100% renewable electricity to electric services—roof space allocated to expand the potential PV array to 99kW subject to future body corporate preferences which would deliver c.82% CO2 savings against a BASIX benchmark
- Target to reduce upfront carbon emissions in materials by 20% with a focus on reduced embodied carbon concrete
- Provision for 100% EV parking spaces (NCC 2022) allows transition away from ICE vehicles with potential saving on average over 355 tCO2pa if 100% EVs are eventually supported in the building

Water conservation (Section 5) - meeting or exceeding requirements

- Reduce potable water demand to meet the Sustainable Building SEPP BASIX requirements through water efficient appliances and fixtures—achieves BASIX score of 40%
- Alternative water source (1,000L rainwater tank) used for landscape, landscape utilises palette of low water use species and efficient irrigation where required

## 2. Project responses to SEARs

SEARs REQUIREMENTS	Project response (and reference to relevant report section)
<p><b>Principle 2—Inter generational equity (Section 193, EP&amp;A Regulation 1b)</b></p> <p>The principle of inter-generational equity is that the present generation should ensure the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations.</p>	<p>Climate change resilience (Section 6)</p> <ul style="list-style-type: none"> <li>Final building systems and site drainage detailed design to be reviewed to consider increased extreme rainfall events, storm events and heat wave events for operational performance in extremes</li> <li>Heat island mitigation steps including high reflection horizontal hard surfaces, planned canopy and green cover and attention to preventing building reflection to the ground level</li> </ul> <p>Responsible materials and waste management (Section 7)</p> <ul style="list-style-type: none"> <li>Target to recycle or reuse at least 90% of construction waste; implement waste streaming to support operational phase recycling outcomes</li> <li>Procurement strategy to target key materials with Environmental Product Disclosures and low environmental impact</li> </ul> <p>Human health and wellbeing (Section 8)</p> <ul style="list-style-type: none"> <li>Procurement strategy to target low VOC and low/no formaldehyde products to improve air quality</li> <li>Acoustic and lighting (and daylighting) outcomes and products tailored for healthy and comfortable living environments</li> <li>High levels of daylight access to residential dwellings,</li> </ul>
<p><b>Principle 3- conservation of biological diversity and ecological integrity (Section 193, EP&amp;A Regulation 1c)</b></p> <p>The principle of the conservation of biological diversity and ecological integrity is that the conservation of biological diversity and ecological integrity should be a fundamental consideration.</p>	<p>The renewal strategy for the site seeks to maximise the use of local native species in landscape and minimise environmental impacts (such as carbon emissions, stormwater volume and quality controls) such that the post development outcome has no greater biodiversity or ecological impact than the current large detached dwellings with mainly non-indigenous vegetation and landscape.</p> <ul style="list-style-type: none"> <li>The proposal includes a net increase in tree canopy within the site area (pre development 1,427 sqm, post development 1,678 sqm) and extensive provision of green landscaping with predominantly native plant selection to support local biodiversity.</li> <li>Over 28% of the site will be retained with deep soil capable of supporting a variety of larger trees and shrubs.</li> <li>A stormwater management plan will be developed for the site seeking to minimise any impacts of stormwater (quantity and quality) leaving the site and entering the local water system (consistent with Ku Ring Gai Council stormwater management controls)</li> </ul>

## 2. Project responses to SEARs

### SEARs REQUIREMENTS

Principle 4—improved valuation, pricing and incentive mechanisms.

The principle of improved valuation, pricing and incentive mechanisms is that environmental factors should be included in the valuation of assets and services, such as—

- polluter pays, that is, those who generate pollution and waste should bear the cost of containment, avoidance or abatement, and
- the users of goods and services should pay prices based on the full life cycle of the costs of providing the goods and services, including the use of natural resources and assets and the ultimate disposal of waste, and
- established environmental goals should be pursued in the most cost effective way by establishing incentive structures, including market mechanisms, that enable those best placed to maximise benefits or minimise costs to develop their own solutions and responses to environmental problems.

### Project response (and reference to relevant report section)

- The sustainability and environmental measures for the project are being incorporated in the early design and cost plan for the project to ensure the most economic pathways are identified through design and construction.
- Further, the specification of materials and equipment will strongly consider the most cost efficient operations and maintenance outcomes which are anticipated to also match the most efficient environmental outcomes for the apartment complex operation (for example use of PV arrays to minimise the long term financial and environmental cost of electricity, choice of robust building materials with a long useful life).
- As the building will be 'all electric' future occupants will be able to choose their preferred pathway and retailer to access renewable electricity for private apartment uses and for electric vehicle charging—communal area access to renewable energy will be factored into the building cost through provision of the solar/PV array system and then will be determinable by the body corporate for remaining common area electricity demand.

## 3. State and Local strategies and policies

### Key State ESD related strategies and policies

#### Sustainable Buildings SEPP

For residential development the proposal will need to at least meet the requirements of the BASIX conditions for thermal performance, energy/ carbon reductions and potable water reductions.

- BASIX thermal performance average NatHERS 7 star
- BASIX Energy outcome of at least 60%
- BASIX Water outcome of at least 40%

#### Housing SEPP—NSW Apartment Design Guide

The objectives, design criteria and design guidance will need to be considered especially in relation to design criteria including:

- Sunlight to habitable rooms (70% of apartments to receive 2 hours, <15% receive no sunlight)
- Natural cross ventilation to at least 60% of apartments
- Apartment and room sizes, window requirements, room depths for habitable rooms, balcony provision and size

#### Greater Sydney Region Plan

Various objectives of this plan require targeted ESD outcomes including Objective 27 Biodiversity is protected, urban bushland and remnant vegetation in enhanced; 30 Increased tree canopy; 33 Low carbon city; 34 Energy and water flows are captured, used and reused; 35 More waste is recycled; 36 People and places adapt to climate change; 37 Exposure to natural and urban hazards is reduced; 38 Heatwaves are managed.

#### North Sydney District Plan

Various objectives of this plan require targeted ESD outcomes including Planning priority N21 with Reducing carbon emissions and managing energy, water and waste efficiently, Planning Priority N20; Delivering high quality open space, Planning Priority N19; Increasing urban tree canopy cover and delivering Green Grid connections, Planning Priority N17; Protecting and enhancing scenic and cultural landscapes, Planning Priority N16; Protecting and enhancing bushland and biodiversity, Planning Priority N15; Protecting and improving the health and enjoyment of Sydney Harbour and the District's waterways,



Planning Priority N5; Providing housing supply, choice and affordability, with access to jobs, services and public transport.

### National Construction Code (NCC) Section J Energy Efficiency

Section-J of the National Construction Code 2019 focuses on "energy efficiency of buildings". Section J is a minimum performance target for standard buildings and specifies minimum performance targets known as deemed-to-satisfy (DTS) requirements, for building fabric and services.

Section J performance requirements are relevant for the common areas proposed in a residential, Class 2 apartment development.

NCC 2022 Section J also requires provision of space and electrical infrastructure planning to allow future uptake of electric vehicle chargers, battery systems and PV arrays (if not already provided).

### Ku-ring-gai Council DCP

Ku-ring-gai Council DCP Section, Part C, 23 and 24, includes energy efficiency and water conservation guidelines. The content and objectives of these guidelines are met through the BASIX controls and Apartment Design Guide objectives and guidelines.



The NSW Government targets (NSW Climate Change Policy Framework—Net Zero Plan) for 70% reduced emissions by 2035 and net zero by 2050 should also shape the ESD initiatives for the proposal.

## 4. Energy efficiency and low carbon emissions

### Passive design Initiatives to reduce energy use

With thoughtful planning, a well-designed building can be passively heated, cooled, and ventilated for most of the year in temperate NSW climates. This approach minimizes reliance on mechanical heating, ventilation, and air-conditioning (HVAC) systems, which are only needed when outside temperatures are too extreme to be controlled passively.

### Proposed outcome meeting compliance and meeting or exceeding industry standards

- NatHERS average ratings of 7.2 stars for apartments (minimum c.6 stars for individual apartments) meeting BASIX thermal performance requirements

### Strong NatHERS ratings for apartments

Strong passive design will translate into strong measured thermal performance outcomes in NatHERS modelling. The project has achieved a weighted average of NatHERS 7.2 stars for apartments (minimum 6 stars per apartment) in line with the upgraded requirements of the Sustainable Buildings SEPP 2022..

### Compliance with NCC 2022

The project will comply with the latest NCC 2022 Section J inclusions for building fabric and energy requirements. These requirements are relevant for common residential spaces that may be conditioned.

### Cross Ventilation

The floor plate of the building has been designed to maximise the number of dwellings achieving natural cross ventilation.

60% of apartments will comply with natural cross ventilation requirements in accordance with SEPP 65 Apartment Design Guide.

Natural ventilation solutions have also been incorporated for rail exposed apartments with semi enclosed 'winter garden' balconies.

Opportunities to naturally ventilate the common areas will be further investigated as the design progresses.

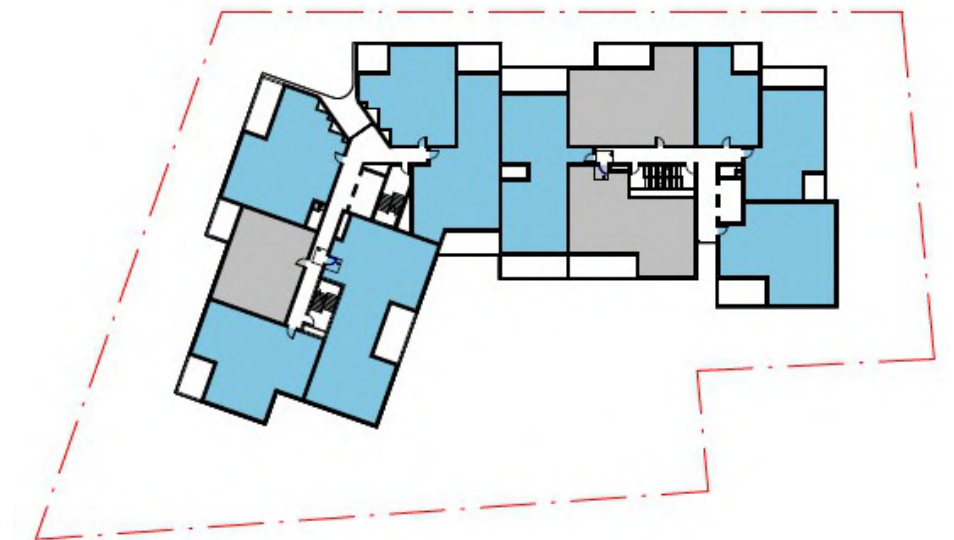
### Solar Access

The floor plate of the building has been designed to maximise solar access. Solar access provides daylight which means electric lights can be left off during the day but also provide passive heating during the winter months, meaning that the heating system has less work to do, and less energy is consumed heating the spaces.

70% of apartments will receive more than 2hrs of solar access between 9am-3pm exceeding the guidelines (minimum requirement of 70% apartments) in accordance with the Apartment Design Guide.



Level 7 - 71% solar access outcomes—ADGs



Level 7- 60% total cross ventilation outcomes—ADGs

## 4. Energy efficiency and low carbon emissions

### Service and appliance initiatives to reduce energy use and carbon emissions

#### Proposed outcome meeting or exceeding industry standards

- BASIX Energy outcome of at least 60% (6-20 storeys, CZ 56)
- Investigation of A/C efficiency target of > 3.5 ACOP seeking to exceed BASIX requirements of 3-3.5 ACOP
- Investigation of centralised HW efficiency of > 3 COP seeking to exceed BASIX requirements
- Appliance efficiencies in upper quartile of ratings
- Provision for future EV charging to 100% of spots and E bike charging provisions

### An all electric building supporting net zero carbon emissions in operation

The building will be serviced with all electric appliances from the outset making net zero carbon emission operational immediately feasible.

To operate as net zero three core sources of renewable electricity will be required from multiple stakeholders, including:

- An onsite solar/PV array supplying energy primarily to common area and service demands
- A future renewable electricity purchase agreement by the building operator/embedded network operator
- Green electricity purchase by each of the building tenants—ultimately at the discretion of these tenants

### Domestic Hot Water System

Domestic hot water systems can be responsible for 10-15% of total apartment building CO2 emissions.

A centralised electric heat pump system is planned for the building with high level of insulation for the hot water ring main throughout the building.

The coefficient of performance for this system will be minimum 2.5-3 (but will target greater than 3) compared to a traditional gas boiler system with coefficient of performance less than 1.

### Air conditioning services

With strong passive design, reflected in a minimum 7 star average NatHERS rating, space conditioning is responsible for about 5-8% of total apartment building CO2 emissions.

Air conditioners will be single phase with ACOPs meeting at least 3.0 COP (BASIX requirement) but targeting 3.5 or greater towards the higher end of efficiency. Outdoor condenser units will be located together on the rooftop, with appropriate visual screening, helping to distribute heat output away from community activity areas and the ground plane.

### Appliances

Appliances and related other electrical demand average approximately 35% of total CO2 emissions in a modern apartment building.

The following star ratings are targeted for key domestic appliances subject to final clarification of BASIX requirements.

- Dishwashers - minimum 3.5 star, target 4 star plus
- Clothes Dryers - minimum 7 star condenser/heat pump dryers (supporting avoidance of separate ducting requirements under NCC 2022 required for non-condensing dryers)

### Lighting

Lighting can use up to 10% of an apartment building's electricity consumption, therefore efficient luminaires and lighting control systems are critical in order to optimise the building's energy efficiency. The following measures will be implemented:

- LED lighting to be specified throughout with a target of 10% reduction in energy demand compared to NCC minimum compliance.

- Common area lighting to have motion and daylight sensors with further zoned lighting controls for car park areas.

### Lifts

Lift use can be responsible for over 10% of total apartment building CO2 emissions.

The lifts will incorporate PMS motor and regenerative drive technology.

### Car park ventilation

Common area ventilation can be responsible for over 10% of apartment building CO2 emissions.

Car park mechanical ventilation will be CO monitored/controlled and utilise energy efficient variable speed fans.

Other ventilation, such as to switch rooms, plant rooms and communal bathrooms, will be either interlocked to light switching or controlled through a building management system.

## 4. Energy efficiency and low carbon emissions

### Electric transport services

#### Electric transport

Electric vehicles are anticipated to experience high adoption over the coming decades (Electric Vehicle Council target 50-60% of new vehicle sales by 20230). When serviced with renewable electricity this mode of transport provides an effective net zero in operation outcome for travel.

Provision for electric cars is the major item to consider followed by power access and storage for the fast growing use of e-bikes and e-scooters.

#### Electric car provisions

Final detailed electrical system design will cater for a high uptake of electric cars and bikes.

Consistent with NCC 2022, dedicated distribution boards to support EV charging on each basement level will be provisioned together with an active load management system that allows future connection of all parking spots within an achievable total electrical demand level for the project.

Consideration of a charger provision and tariff system/model, so that individual apartments are provided with an accurate electricity bill for their usage, is also recommended. This service is most often provided by specialist EV charging entities.

Any shared car service parking spots and service provider procurement should also plan for shared EVs to further provide zero net carbon outcomes for car based transport.

#### E-bike and e-scooter provisions

Provision of standard GPOs with access from bike storage racks and other storage areas (potentially for e-scooters) will be provided to facilitate charging of these mobility devices.

### The future of Electric Vehicle batteries integrated with building electricity demand

Batteries in EVs theoretically store enough energy to run a typical apartment for 5-7 days. Technology is under development to allow the energy in EV batteries to be accessed by homes, and potentially apartment buildings, to help reduce peak demand and otherwise supplement demand throughout the day as required.

The software controlling the management of the car battery, through a 'two way' charging connection, would allow for a proportion of the battery power (say 50%) to be utilised for building energy management. The owner of the EV would be compensated for this service.

When fully developed this energy management system may be able to greatly reduce the buildings peak demand and therefore help reduce the required substation size requirements for 'all electric' buildings.

The final detailed electrical system design will consider incorporation of sourcing power from EV chargers through to the main switchboard for the apartment building.



Example of EV charging provision image from <https://evse.com.au/blog/apartmentevcharger/>



Modern buildings are providing charging options for e-bikes and e-scooters

## 4. Energy efficiency and low carbon emissions

### Renewable energy sources and energy management

#### Proposed outcome meeting compliance and meeting or exceeding industry standards

- A solar/PV array is not required to meet BASIX Energy compliance
- A solar/PV array of minimum 25kW with potential for 99kW has been provisioned for subject to the future building embedded network operator model and commerciality
- Option for a renewable electricity contract for base building and EV charging power
- Provision for future battery system integration

### Incorporation of solar/PV arrays

A 25kW PV array has been provisioned for with the ability to potentially expand this system to 99kW subject to future agreement with the building embedded network operator/ body corporate. The

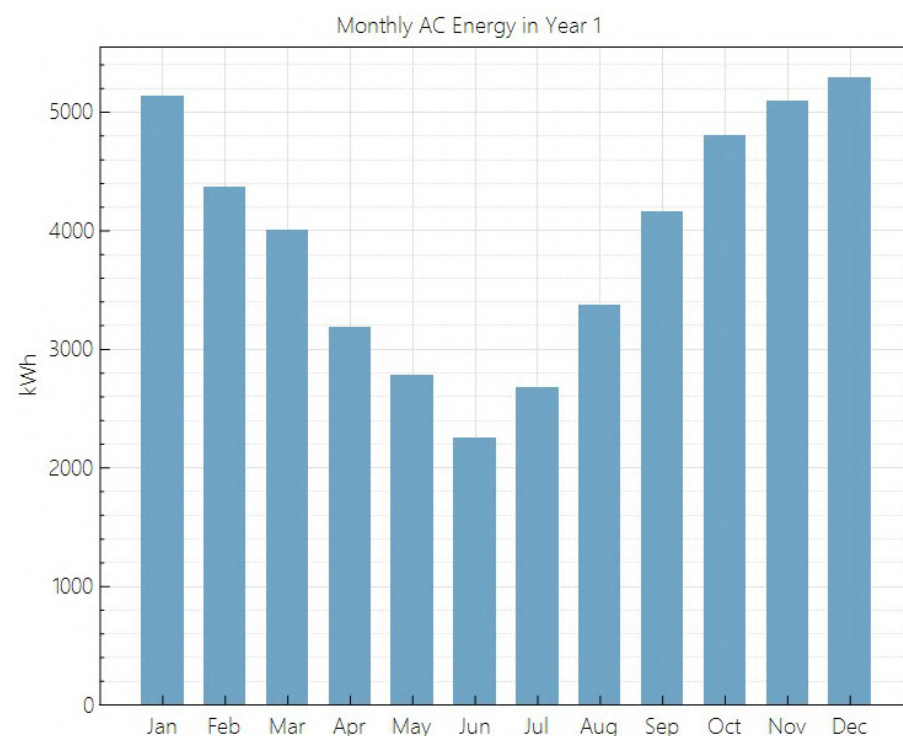


Figure 1—approximate output from 25kW PV array

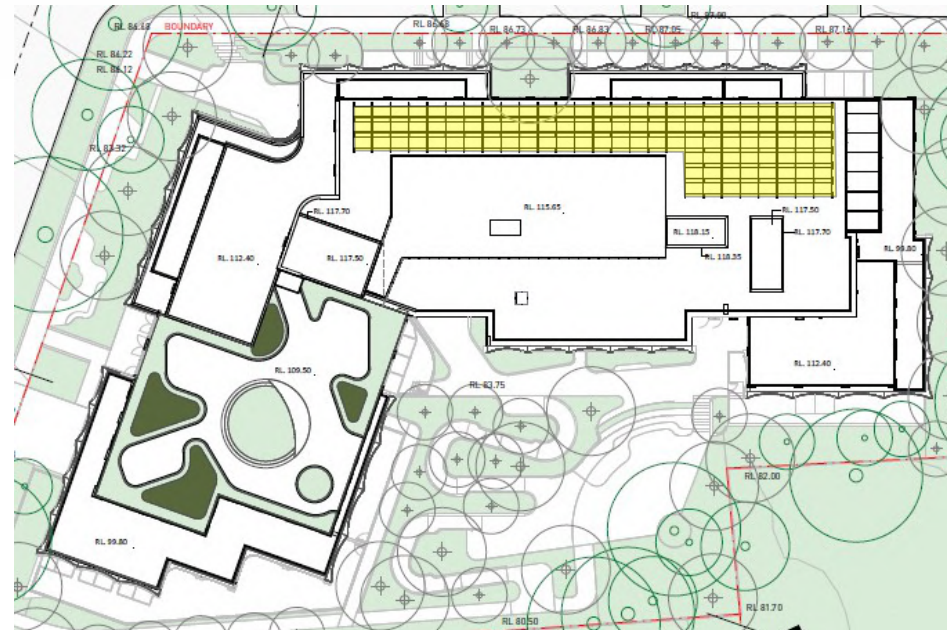


Figure 2—Yellow area allocated to provision for up to 99kW PV array

total production of a 25 kW system is estimated at 35,000 kWh as indicated at Figure 1.

Additional analysis will take place to quantify the total size PV array potential if all potential roof space is utilised after factoring space for rooftop mechanical equipment. An initial assessment of potential space indicates c.1200 sqm may be available with the potential for at least 99kW located on roof spaces as indicated in Figure 2 (yellow shaded areas).

### Indicative electrical demand in peak PV production periods

A high level assessment of common area electrical demand for an apartment building of this scale, in the peak production period of 9am–3pm, indicates a total of 38,000 kWh p.a.. This total is made up of assumed demand from typical lifts, lights and ventilation in common areas (from Efficient Living regular observation of BASIX engine calculations—excludes pool energy consumption).

This demand would be met, on average across the year, by a PV array of approximately 27kW in size.

We recommend that the final PV array sizing is finalised after investigation of:

- Potential battery storage feasibility that would allow further communal use of onsite renewable electricity in morning and night peak/high consumption periods
- Potential resident/body corporate desire to allow individual apartment access to onsite renewable electricity production

Any additional size, or excess production in summer months, could also be beneficial to connect to a shared EV charging network.

### Purchase of renewable electricity

The developer of the proposal will request that the planned embedded network operator for the building provide an option to purchase 100% renewable electricity through a longer term power purchase agreement.

If the cost of this agreement is comparative with standard grid sourced electricity (which is most often the case) then renewable electricity will be locked in for all common electrical services.

### Building energy management

Building systems will be set up with sufficient sub meters to allow detailed monitoring of consumption patterns and equipment performance.

### Investigation of a centralised battery system

In the next stage of detailed design, an area will be identified in the basement in close proximity to the main switchboard to allow potential installation of multiple batteries in the future—as now required in NCC 2022.

The building operator/embedded network operator will ultimately determine if a shared community battery is worthwhile given the specific demand profile, and PV production profile,

Ultimately the potential to utilise 'two way' EV batteries linked to the building system (discussed on the preceding page) will determine if a stationary battery system is also warranted.

## 4. Energy efficiency and low carbon emissions

### Summary of carbon emission reduction measures

#### Boundary and Scope of carbon emissions considered

- The most relevant boundary for considering CO<sub>2</sub> reduction measures are the activities carried out in building operations—predominantly residential activities
- Major Scope 1 CO<sub>2</sub> emissions are avoided due to the ‘all electric’ services to the building—relatively minor, refrigerant leakage from heat pump systems is also a source of emissions but is considered minor in the context of this project
- Scope 2 CO<sub>2</sub> emissions, the major source of emissions, come from electricity sourced to power building systems and appliances
- Significant Scope 3 CO<sub>2</sub> emissions, embodied carbon in key buildings materials and carbon emissions related to cars stored in the building for transport are also considered.

#### Operational carbon emissions—energy use

##### Passive design

- NatHERS average rating of c 7.2 stars using new BASIX 2022 benchmark
- Future compliance with NCC 2022 Section J for communal areas

##### Energy efficient systems and appliances

- Electric heat pump, centralised electric heat pump hot water
- Air conditioning with ACOP min 3.0 with target > 3.5
- Appliances rated in top quartile of efficiency ratings

##### Provisions for electric transport—EVs and other options

- NCC 2022—100% of car spaces will be provisioned for Type 2 EV charging capability with additional provisions for e bike charging

#### Operational carbon emissions—energy source

##### On-site renewable electricity

- Roof space for a PV array system of 25-99kW capacity has been provisioned.
- A 25kW capacity system would be expected to provide net energy approximately equivalent to 90% of key common area service electricity needs for lighting, ventilation etc in the 9am-3pm period
- Potential to expand the system to 99kW capacity will be investigated in detailed design and procurement phases but may ultimately be for the decision of the future body corporate managing the building

##### Offsite renewable electricity

- Developer will request an option for the building operator/ embedded network operator to purchase electricity from a verified renewable electricity source for at least the first 5 years (including to service EV chargers)

#### Operational carbon emissions—energy management

- Energy metering in place to allow monitoring and optimisation of core systems
- Provision for future battery storage if feasible to manage peak and also consideration of how future EV battery integration may occur

#### Reduced upfront embodied carbon emissions

The project will target savings of 15-20% in upfront carbon emissions in the key materials responsible for Scope 3 emissions in apartment buildings.

Work by the GBCA (GBCA Think Step ANZ Embodied Carbon and Embodied Energy in Australia's Buildings 2021) can be used to identify the key building materials responsible, on average, for embodied carbon emissions:

- Steel 46%
- Concrete 44%

Concrete embodied emissions will be reduced by targeting certified low carbon concrete mixes. For example from suppliers Holcim, Boral and Hymix. A combination of recycled materials, reduced

concrete and other additives allow concrete across strength grades with reduced carbon emissions of 40-60%.

It is recommended that steel is selected from suppliers with evidenced carbon emissions reduction targets in production and with Net Zero 2050 corporate targets (in alignment with the NSW Government goal).

It is proposed that the tender phase for building contractors include a requirement for submissions to provide material options that would achieve this outcome and clarify differences in relation to increased cost and/or increased uncertainty of supply. Based on this analysis the project proponent will be able to make an informed decision on the feasibility to implement a reduced embodied emission strategy.

#### Provide for EVs to replace fossil fuel vehicles

As a minimum the developer will meet NCC 2022 requirements to include future provision for 100% of residential car spots to be EV charger capable in the future (Type 2 charger @ min 7kW).

Annual CO<sub>2</sub> emissions amount to on average 2.22 tCO<sub>2</sub>pa per car (for a car driven 15,000 kmpa) so the potential for saved Scope 3 emissions by providing for low or no emission EVs is substantial.

## 4. Energy efficiency and low carbon emissions

### Estimates of operational carbon emissions

Residential apartment building (BASIX outputs)	Proposal case - reduced carbon (TnCO2 pa)	Base case (TnCO2pa)
Common area services	110	
Heating and cooling	30	
Hot water	57	
Cooking	35	
Lights	14	
Appliances and other	117	
<b>Residential total</b>	<b>363</b>	<b>937</b>
Renewable electricity onsite (0 kW BASIX)	0	
<b>Residential CO2 reduction p.a. BASIX</b>	<b>61%</b>	
Renewable electricity onsite (25 kW target)	34	
<b>Building operating CO2 total p.a. with PV array</b>	<b>330</b>	
<b>Residential CO2 reduction p.a. target</b>	<b>65%</b>	
Potential CO2 savings with 20% embodied carbon saving from concrete	2900	3179
Potential CO2 savings p.a. with future 100% EV uptake	0	355

#### Notes:

- Residential assumptions utilize BASIX outcomes observed by Efficient Living under BASIX 2022—the working model for the actual proposal has been used in the table
- Commercial emissions, if relevant, use average sqm electricity usage from 2022 Commercial Building Baseline Study, DISER
- Carbon intensity from grid assumed at 0.65kgCO2/kWh
- Carbon emission savings in lower embodied carbon concrete utilize 'GBCA Think Step ANZ Embodied Carbon and Embodied Energy in Australia's Buildings' to estimate a per apartment materials average and carbon intensity
- Carbon emission savings for EV uptake assume avoided CO2 emissions from typical ICE vehicle (2.2 tonnes CO2 pa—NTC 2022, CO2 Emissions Intensity for New Australian Vehicles 2021)
- Final CO2 emissions outcomes will vary from averages depending on final design, systems and materials selections for the buildings

## 5. Water efficient design

### Integrated water management plan

Water resources will be managed to deliver three clear objectives for the redeveloped site as an integrated water management plan.

- Reduce the demand for potable water through water efficient fixtures and an alternative water supply
- Reduce negative stormwater volume impacts within and leaving the site (please refer to the project Stormwater Management Plan (SMP))
- Reduce negative stormwater quality impacts within and adjacent to the site (please refer to the SMP)

### Proposed outcome meeting compliance and meeting or exceeding industry standards

- A BASIX compliance outcome of 40% has been achieved
- Industry benchmark water appliance efficient levels

### Water efficient fixtures and fittings

Water efficiency in the project will be underpinned by efficient fixtures and fittings.

The following WELS water ratings will be achieved in the top quartile of efficiency:

- Shower roses—flow rates of 6-7.5L/min 4 star
- Toilets 4 star
- Taps 5 star
- Dishwashers 4-5 star

### Rainwater tanks

The project will incorporate rainwater storage. Total storage capacity of at least 1,000L will be targeted for application to landscape irrigation and car wash bays consistent with BASIX requirements.

### Water sensitive urban design

#### Water efficient plant selection

All of the common area softscape area (c. 1396 sqm) will utilise native and/or low water demand plant species with the exception of a small grassed area (c. 48 sqm).

#### Water efficient irrigation methods

Irrigation of softscape areas will be driven by passive irrigation in combination with wicking beds that help store water from rainfall events for slow use by plants as required.

Any soft landscape areas in need of regular irrigation will be equipped with under surface drip irrigation to avoid evaporation losses and ensure moisture is directed at root areas.

Any higher need areas will also utilise irrigation control sensors so that irrigation does not occur in times of existing sufficient moisture levels.

Please refer to the Landscape Plan by Clouston Associates.



WELS shower label certifying 6.5 L flow rate—consistent with this proposal

## 6. Climate change resilience

### Future proofing

#### Proposed outcome meeting compliance and meeting or exceeding industry standards

- Detailed design of building drainage and systems to be reviewed for performance in extreme weather events (rainfall, storm, heat)
- Over 75% of horizontal surfaces to minimise urban heating effects
- Heat reflection from building to street level mitigated through façade design elements and lower level greenscapes.

### Climate Change Resilience

Relevant climate change impacts over the next 50 years include higher average temperatures and lower average rainfalls (mainly in winter) together with greater extreme events particularly in relation to rainfall, storms and heat waves. Impacts can be direct, for example rainfall ingress to the building, or indirect, for example expected higher maximum temperatures, longer and hotter heat events, increased rainfall intensity leading to increased flooding during rainfall events.

The following design measures will be implemented in the next stage of detailed design to improve climate change resilience:

- Equipment and building drainage design assessed to ensure management of increased storm, hail and rainfall events
- Landscape design and plant selection to survive an increased number of heat wave days, and dryer winter periods
- HVAC design thresholds to function properly with higher average temperatures and a higher number of heat wave days

### Heat Resilience

Over 75% of total site horizontal surfaces (excluding the area of proposed PV arrays) have been targeted for low urban heating outcomes (consistent with Green Building Council recommendations) including:

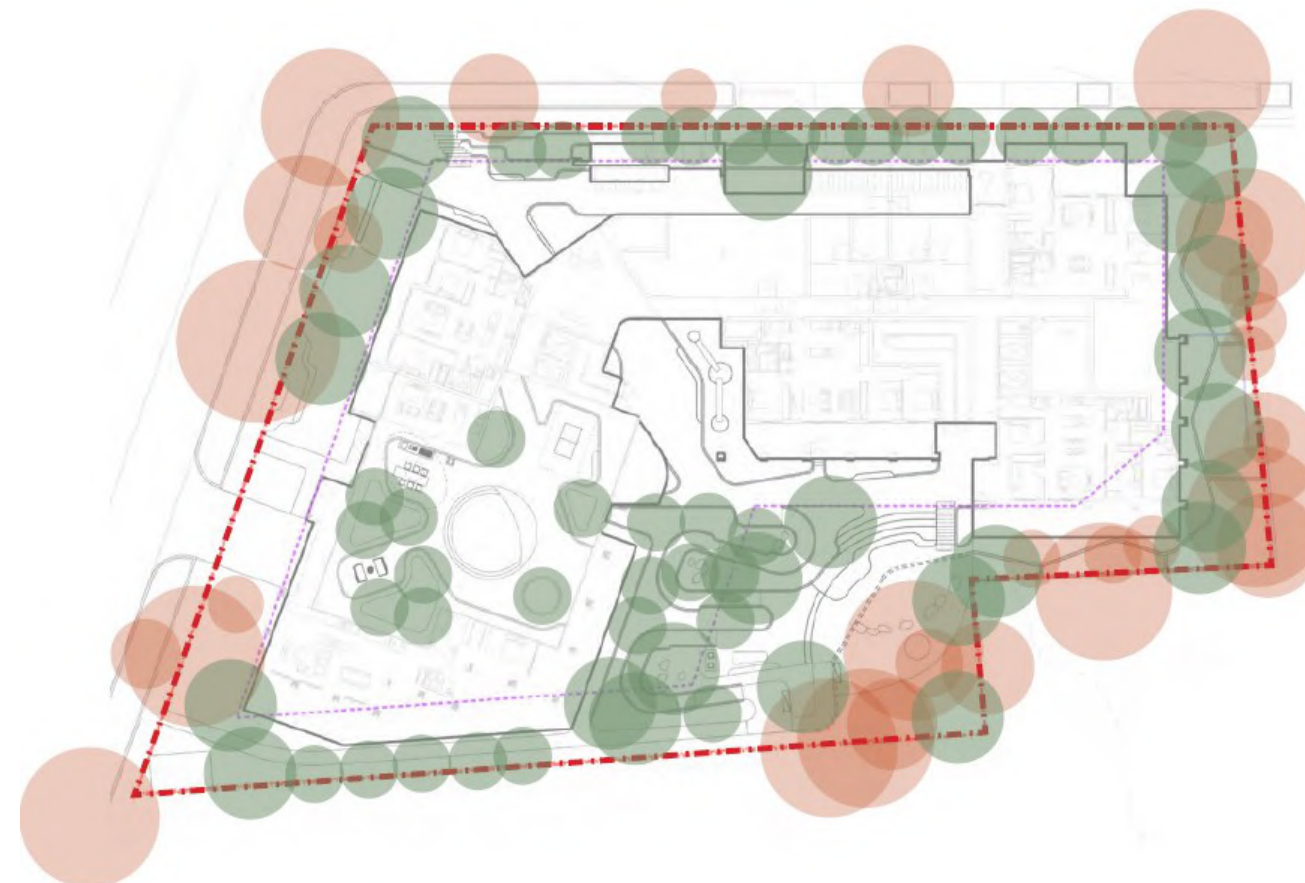
- Green softscape outcomes at street front, ground level courtyard and rooftop level
- Tree canopy, and naturalised shade structures provide shade to

hard surfaces helping to mitigate absorption of solar radiation/ urban heating effect—the figure below indicates new canopy in green and retained canopy in tan colour (pre development 1,427 sqm, post development 1,678 sqm)

- Final colours for the roof, podium hard surfaces and ground level hardscape surfaces will be specified to achieve low solar absorptance/high solar reflectivity.
  - Roof initial SRI target of minimum 81
  - Unshaded hardscapes initial SRI of target minimum 39

Highly reflective glazed facades can have a large influence on the ground level microclimate by pushing solar radiation down to this level.

- Façade material selection, balcony overhangs and shade structures in the proposal contribute to reduce this effect (especially compared to a more flush office building façade)
- The landscape plan incorporation of street level softscape/ canopy to the easterly, northerly and westerly aspects will help mitigate any downward reflection of solar radiation from the façade to the street



Proposed canopy—green canopy to be new trees within the site with tan canopy above representing existing trees—total trees removed 45 with 63 new trees in the proposal

## 7. Responsible materials, construction and waste management

### Lower impact materials and 'circular' waste management

Together with supporting lower upfront carbon emissions, the project will investigate the inclusion of responsible materials and include space for splitting and recycling of waste 'resources' during project construction and ongoing operation.

### Proposed outcome meeting compliance and meeting or exceeding industry standards

- Target for greater than 90% of construction and demolition waste to be recycled
- Environmental Product Disclosures (EPDs) sought for key materials
- EMS and EMP required for head building contractor (ISO 14001)

### Supporting responsible materials in the building structure and envelope

The detailed design and tender phases for the project will target procurement of products that follow good practice in respect to measuring environmental impacts and reducing these impacts. Products with a certified EPD will be sought where available.

The GBCA defined Good Practice products with a Responsible Product Value >10, as detailed at <https://new.gbca.org.au/green-star/rating-system/responsible-products-framework/#responsible-structure>, is a valuable resource to use in this process.

Building tender responses will be required to provide options for building materials alignment or otherwise with recognised responsible materials ratings schemes as set out by the GBCA.

Key building processes to be considered in detailed design would include:

- Design allowing sub structure and super structure to utilise certified concrete, steel and other major components
- Façade design also considered to support use of responsible glazing, panel and shade structures etc

### Responsible building finishes

The tender requirements for internal finish fitouts will also require options for key materials that have achieved certification for environmental responsibility (paints, carpet flooring etc).

Examples of certification include from GECA and GreenTag for a wide cross section of finishing materials and the FSC for timber.

### Responsible construction

The tender requirements for building contractors will include a preference for the head contractor to have an environmental management system under AS/NZS ISO 14001 and will develop and Environmental Management Plan for the project advised to all sub contractors.

### Construction waste recycling

Construction waste will target a recycling outcome of 90% by mass with sufficient record keeping procedures to evidence this outcome.

### Designing in Waste Sorting and Storage Facilities

The project will provide adequately sized waste storage areas in the basement with separation of major waste streams according to Willoughby Council services.

A separate waste streaming area for e-waste should also be considered for occasional removal as required.

A Waste Management Plan will be developed for the project guiding the final sizing and location of facilities and providing a guide to future building operators.



## 8. Human wellbeing and indoor environmental quality

### Human wellbeing initiatives

#### Proposed outcomes meeting or exceeding industry standards

- All NCC and Australian Standards for air quality, light and acoustic comfort met
- Cross ventilation outcomes for 60% of apartments meeting the ADG target
- Internal materials and fixings will be selected based on certification of low toxicity as measured by VOC off gassing and formaldehyde content
- Universal design has been incorporated in a proportion of apartments to insure inclusive outcomes for people with disabilities; internal and external communal spaces are multi use and designed to foster social interaction

### Air quality

Natural cross ventilation outcomes, as considered by the Apartment Design Guidelines criteria, have been met at 60% of apartments.

We also note that electric induction cooktops have been specified that prevent the air pollution (such as NO<sub>2</sub>) associated with gas cooktops.

### Acoustic Comfort

An acoustic study will be carried out to establish requirements for satisfactory acoustic outcomes for building occupants according to the activity they are undertaking.

For residential apartments the strategy and design and inclusions will ensure that:

- Maximum acceptable internal noise levels are achieved in bedroom and living room areas
- Acoustic separation insulation levels between apartments will be targeted to meet or exceed NCC minimum requirements

### Lighting Comfort

To further enhance the health and wellbeing of residents the project has considered daylighting outcomes through design and will consider future lighting fixture selection that exceeds basic compliance.

- Daylighting outcomes are enhanced by the ADG guidelines for window sizing and room depths.
- LED globe modulation, or flicker, should be reduced and target consistency with the international recommendation IEEE 1789-2015.
- LED lighting colour outputs should be accurate, and reflect natural colour outcomes, as measured by a CRI target greater than 85 (luminaire data sheets should quantify the CRI level)
- LED temperature should target lower levels (2700k-3000k) in bedrooms with brighter (4500K-6500K) in living and kitchen areas with dimming function

### Low exposure to toxins

Procurement of paints, adhesives, sealants, carpets and other large surface area materials for internal finishes will target products with a recognised certification of Total Volatile Organic Compounds measured in the lower quartile. The GBCA published limits from December 2021 can be reviewed for this purpose.

The tender issued for this stage of work will include clear guidelines on the requirements for products and materials to be used.

Any engineered wood products selected for the building will also have to be confirmed as having low or no formaldehyde content generally recognised as below 1mg/L.

### Outdoor communal Facilities and Spaces

The design provides extensive outdoor spaces for residents at ground level and rooftop level that are inclusive, safe, flexible and enjoyable.

Communal open space of total c. 1.655 sqm (approximately 38% of site area) has been established in the design. This space will be

embellished to support multiple outdoor experiences for wide interests over levels 1 and 9.

### Inclusive design and spaces

The project includes 15% of apartments meeting the 'Platinum' criteria under Livable Housing Australia accessibility standards. With the remaining c.85% of apartments meeting 'Silver' level under this criteria.

The project also includes a total of 28 affordable housing apartments with mixed 1, 2 and 3 bedroom designs.



*Communal spaces create community connection in higher density environments*



**ESD:** Ecologically Sustainable Development or often Environmentally Sustainable Development

**COP:** 'Co-efficient of performance' used to measure conversion of electrical energy into heating or cooling energy

**GFA:** Gross floor area

**ACOP:** 'Annualized co-efficient of performance' also used to measure conversion of electrical energy into heating or cooling energy but typically adjusted for local climate conditions

**NatHERS:** National Home Energy Rating Scheme—note only refers to thermal performance of the home

**BASIX:** Building Sustainability Index measuring thermal, total energy and water efficiency in the home—part of the Sustainable Buildings SEPP 2022

**EV:** Electric vehicle

**PV/solar array:** Solar panels using photo voltaic technology to convert solar radiation into electricity

**IEQ:** Indoor environmental quality usually referring to air, noise and light quality in the building

**DA/SSDA:** Development Application/ State Significant Development Application'

**SEPP:** State Environmental Planning Policy

**LEP:** Local Environmental Planning Policy

**DCP:** Development Control Plan

**CC:** Construction certificate

**SEAR:** Secretary's Environmental Assessment Requirement issued to support a SSDA

**ADG:** NSW Apartment Design Guide setting apartment design standards in the NSW Housing SEPP

**VOC:** 'Volatile organic compound' that is a chemical gas release from typically internal building surfaces and materials

**HVAC:** Heating, ventilation and air conditioning—also includes cooling processes

**Section J:** The energy efficiency section requirements of the National Construction Code

**GBCA:** Green Building Council of Australia—the owner of Green Star ratings for buildings and communities

**NABERS:** National Australian Built Environment Rating Scheme—providing ratings from actual water and energy consumption in buildings

**WELS:** Water efficiency labelling and standards scheme

**GEMS:** Greenhouse and Energy Minimum Standards

**MEPS:** Minimum Energy Performance Standards (under GEMS)

**EPD:** Environmental Product Disclosure providing transparent information on environmental impacts

**Emission scopes** – A mechanism for classifying different sources of carbon/GHG emissions used in carbon accounting. There are three 'scopes'

**Scope 1** covers direct emissions from on-site fuel combustion (e.g. diesel, natural gas and LPG).

**Scope 2** covers indirect emissions from the consumption of purchased electricity, steam, heating and cooling.

**Scope 3** covers indirect emissions from activities not owned or controlled by the reporting organisation, including production of fuels, electricity transmission losses, embodied carbon in construction and maintenance (including materials and products) tenant energy consumption, waste treatment, water treatment and travel to/from the building.

(adopted from Net Zero Technical Note—DPE 2023)