



ECOLOGICALLY SUSTAINABLE DEVELOPMENT REPORT

Trinity Point Mixed Use

81 Trinity Point Drive, Morisset Park, NSW, 2264

PREPARED FOR

Johnson property Group
C/- Koichi Takada Architects
Suite 41 & 42, Level 4
61 Marlborough Street
Surry Hills NSW 2010

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Ecologically Sustainable Development Report

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Northrop Consulting Engineers Pty Ltd

ACN 064 775 088 | ABN 81 094 433 100

Level 11, 345 George Street, Sydney NSW 2000

02 9241 4188 | sydney@northrop.com.au | www.northrop.com.au

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Executive Summary

Northrop Consulting Engineers has been engaged to develop a Sustainability Strategy for the new mixed-use development located at 81 Trinity Point Drive, Morisset Park, NSW, 2264. The report outlines the proposed Sustainability Strategy and addresses the following ecologically sustainable development planning requirements:

- Planning Secretary's environmental assessment requirements (SEARs)

The development is also subject to the building sustainability and environmental performance standards below. How the development will respond to these requirements is outlined in this report.

- Building Sustainability Index (BASIX) - NSW Planning
- Building Code of Australia 2019 – Section J Minimum Code Compliance

The development goal is to be an industry leader in sustainable design, establishing a benchmark whereby future mixed-use developments will aspire, and promoting market transformation. The key drivers in incorporating the initiatives from the Sustainability Strategy are to minimise greenhouse gas emissions, reduce energy consumption and operational costs, reduce water consumption, reduce material resources, minimise the use of natural resources, minimise waste and improve recycling, reduce adverse environmental impacts of the project, and promote a resilient development.

The key sustainability initiatives that will be investigated in future DAs related to the development concept include:

- Optimal Window to Wall Ratios
- Shading devices
- High-Performance Window system
- Elimination of Thermal Bridges
- Optimal levels of insulation
- Natural Ventilation
- High glazing VLT
- Optimised internal finishes to enhance daylight diffusion
- Low energy fittings
- Lighting controls & timing schedules
- Efficient HVAC System
- High rated Minimum Energy Performance Standards
- Water Efficient fixtures
- Efficient Hot Water System
- Smart Meters
- Rooftop solar
- Battery Storage
- Smart Micro Grids
- Purchase of Greenpower (100% renewable energy source)
- High levels of Thermal Comfort

- Low VOCs and low formaldehyde materials
- Water Efficient Fixtures, Fittings and Appliances
- Rainwater harvesting & reuse
- Construction waste diversion from landfill
- Waste segregation
- Bike share (and helmet) facilities
- Electric Vehicle charging stations
- Native vegetation
- Urban Heat Island Effect Mitigation

The Sustainability Strategy's initiatives and their impacts will be detailed during the design development through an iterative collaboration between consultants and designers, based on water and energy modelling, cost-benefit analysis, and feasibility.

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1. Introduction

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The development goal is to be an industry leader in sustainable design, establishing a benchmark whereby future mixed-use developments will aspire, and promoting market transformation. The key drivers in incorporating the initiatives from the Sustainability Strategy are to minimise greenhouse gas emissions, reduce energy consumption and operational costs, reduce water consumption, reduce material resources, minimise the use of natural resources, minimise waste and improve recycling, reduce adverse environmental impacts of the project, and promote a resilient development.

The sustainability initiatives proposed within this report, have been considered to ensure that the development meets the associated planning requirements. These initiatives are pragmatic and cost-effective solutions for the project. They minimise environmental impacts, reduce operational costs, and improve the asset value of the building.

1.1 Development Description

The proposal is for a concept development application pursuant to Division 4.4 of the Environmental Planning and Assessment Act (EP&A Act) 1979. Detailed proposals are to be the subject of further development application/s.

The concept approval is sought for the following:

- Building envelopes for a mixed-use tourist, hospitality and residential development including six buildings incorporating sculptural rolling roofs and facades covered in greenery;
- Maximum GFA of 42,675m²;
- 614 basement parking spaces; and
- Staging of the development.

The indicative development yield is:

- Hotel – 218 rooms
 - 6 x Serviced Suites
- Residential – 180 dwellings
- Function Centre – 300 seats
- Restaurants: 2x 300 seats
- Wellness Centre – 300m²

- Business Centre – 215m²
- Retail Centre – 535m²
- Parking – 614
- Associated landscaping

1.2 Referenced documentation

The following documents have been used in the production of this report:

- SSD Scoping Report & Request for Secretary's Environmental Assessment Requirements (issued July/2021)
- Scoping Report Presentation (issued August/21)
- Development Application – Architectural Draft Set
- Landscape Concept Set (issued 11/03/22)

1.3 Limitations of the Report

Due care and skill have been exercised in the preparation of this report.

No responsibility or liability to any third party is accepted for any loss or damage arising out of the use of this report by any third party. Any third party wishing to act upon any material contained in this report should first contact Northrop for detailed advice, which will consider that party's particular requirements.

2. Planning Secretary's Environmental Assessment Requirements - Ecologically Sustainable Development

The Planning Secretary's Environmental Assessment Requirement (SEARs) defines that the project's Environmental Impact Statement (EIS) must address the following specific matters regarding an Ecologically Sustainable Development (ESD):

1. Incorporation of Ecologically Sustainable Development principles in the design, construction, and ongoing operation phases of the development (as defined in clause 7(4) of Schedule 2 of the Environmental Planning and Assessment Regulation 2000).
2. Demonstration of how future buildings would meet or exceed minimum building sustainability and environmental performance standards.
3. Demonstration of how the development minimises greenhouse gas emissions (reflecting the Government's goal of net-zero emissions by 2050) and consumption of energy, water (including water sensitive urban design) and material resources.

2.1 Incorporation of Ecologically Sustainable Development Principles

The principles of Ecologically Sustainable Development as defined in clause 7(4) of Schedule 2 of the Environmental Planning and Assessment Regulation 2000 have been incorporated into the design and ongoing operation phases of the development as follow:

- **Inclusion of the precautionary principle** – through the implementation of environmental management and building maintainability, the project attempts to incorporate adaptability and resilience into the project design. The concept behind the precautionary principle is to create spaces that can both; accommodate for changes, which may eventuate in the future, and avoid the risk of serious or irreversible damage to the environment.
- **Inter-generational equity** to ensure that the health, diversity, and productivity of the environment are maintained or enhanced for the benefit of future generations – through the inclusion of, best practice PVC and low impact paints, sealants, and adhesives, alongside a focus on providing greater vegetation and support for the building's connection with nature, the project demonstrates a strong commitment to the preservation of environmental health, diversity, and productivity of the local area.
- **Conservation of biological diversity and ecological integrity** – through the planting of native vegetation, improvement of stormwater runoff from the site, and use of integrated landscaping, the project will act to improve, conserve, and support the local biological diversity and integrity. Improving water balance for the building to manage water and wastewater more efficiently. Integrating rainwater harvesting for garden irrigation.
- **Improved valuation, pricing, and incentive mechanisms** - the project has involved significant input from the Quantity Surveyor who will be involved throughout the entire design process to ensure that the project both remains on budget and effectively considers environmental factors in the valuation of assets and services. Furthermore, the project has looked more broadly and considered the economic cost benefits that will stem from the project both short and long term, these are included within the economic analysis provided as part of the project submission.
- **Trajectory to reduce the carbon emission** of the proposed building by proposing active and passive design strategies, building service innovation, efficient building systems, and onsite

energy generation. Building service innovation includes strategies for reducing the carbon footprint of the heating, ventilation, and air conditioning systems, efficient lighting, and providing controls around these systems

- **Providing learning and an engaging environment** by providing features like building automation, operational waste reduction measures, etc. and providing measures to incorporate whole-building environmental comfort which includes acoustic, visual, and thermal comfort, and enhancing the users' collaboration by providing engaging enclosed and open spaces and amenities.

2.2 Meet or exceed minimum building sustainability and environmental performance standards.

The development is subject to two building sustainability and environmental performance standards: the Building Sustainability Index (BASIX) for the residential part of the development, and the NCC Section J Fabric Performance Code Compliance Requirements. The goals and how the development will respond to these requirements are as follow:

- **Building Sustainability Index (BASIX):** Basix is an NSW Government planning measure to reduce household electricity and water use by setting minimum sustainability targets for residential developments. Basix identifies design features that will affect the likely level of thermal comfort, water, and energy use per household such as location, building size, orientation and construction type, landscaping and fixtures. It sets minimum targets that must be achieved before a Basix certificate can be generated and then submitted as part of a development application. Northrop Consulting Engineers will prepare the developments' Basix Certificate defining a compliance pathway for the Energy, Water, and Thermal Comfort (Nationwide House Energy Rating Scheme), for the residential portion of the development.
- **NCC Section J Fabric Performance Code Compliance Requirements:** The objective of this environmental performance standard is to reduce greenhouse gas (GHG) emissions from the built environment. Operational energy is the energy used during the occupation/operation of the building and the GHG emissions attributable from the operational component is the focus of the NCC requirements. These requirements are partly based on achieving an internal environment in which conditions are sufficiently amenable for occupants to minimise their use of artificial heating, cooling, or lighting. Northrop Consulting Engineers will prepare the NCC Section J Deemed-to-Satisfy (DTS) assessment according to the National Construction Code (NCC) 2019 defining a compliance pathway for the building fabric performance for the non-residential portion of the development.

2.3 Demonstration of how the development minimises greenhouse gas emissions and consumption of energy, water, and material resources.

The development will minimise greenhouse gas emissions, consumption of energy, water, and material resources through the application of the following measures described in detail in Section 3 - Sustainability Strategy:

- **Minimise greenhouse gas emissions and consumption of energy:** The development will minimise greenhouse gas emissions through the application of the building electrification to phase out gas, passive design strategies, efficient lighting systems, efficient HVAC system, efficient appliances specification, heat pumps for domestic hot water and on-site renewable energy.

- **Minimise water consumption:** the development will minimise water consumption through the specification of efficient water fixtures and fittings, water-efficient appliances, rainwater harvesting & reuse, stormwater runoff capturing and greywater treatment plant.
- **Minimise material resources consumption:** the development will minimise material resources consumption through the application of life cycle analysis for material selection, modular structure to reduce waste, reduction in material used for structure and finishes, low carbon footprint materials, local procurements, and low embodied carbon in building services.

3. Sustainability Strategy

To respond to the Ecologically Sustainable Development planning requirements and the development aspirations outlined previously, the design team developed a Sustainability Strategy. It assessed the design potential of the building and its ability to minimise resources consumption and operational costs, promote positive impacts to the environment, economy and the health and wellbeing of our community. This process has resulted in several effective sustainability initiatives to be considered throughout the design, construction, and operational stages of the building. These initiatives and actions will help to minimise the use of natural resources, minimise waste, improve recycling, reduce adverse environmental impacts of the project, and promote a resilient development.

The application and the extent of these initiatives will be investigated during the design development.

The initiatives were organised within the following goals:

- Building Electrification
- Low Operational Carbon Strategies:
 - Passive Design
 - Lighting
 - HVAC System
 - Appliances
 - Domestic Hot Water
 - Renewables
 - Smart Homes
- Sustainable Transport
- Low Ecological Footprint
- Zero Embodied Carbon
- Offsite Carbon Offsets
- Water Efficient
- Waste Reduction
- Healthy & Comfortable Environment
- Regenerative Design

The following section details the proposed initiatives:

3.1 Building Electrification

Electrification results in emissions reductions due to current retailers using renewable energy and low carbon fuels to service the main electricity grids. While the electricity grid is expected to become cleaner over time, phasing out of other fuels such as Natural gas – typical in residential development, can produce multiple benefits. This is due to its lack of efficiency in the energy production process, as well as reducing the number of pollutants that are being directly emitted into the environment.

The target is to replace the use of all fossil fuels (coal, oil, and natural gas) on-site with electricity as the only source of energy.

3.2 Operational Carbon - Passive Design

The first step towards an energy-efficient building starts with its shell and as such passive design is a key element when designing low energy buildings. Good passive design reduces the need for

auxiliary heating or cooling by taking advantage of the varying climate to achieve thermal comfort. The following initiatives will play a significant role in ensuring that the building's annual energy performance is lower than a business-as-usual development.

3.2.1 High Average NatHERS Rating

NatHERS ratings will be used to assess the thermal performance of dwellings by modelling the performance of building fabric elements. These fabric elements will influence the energy consumed to maintain comfortable internal temperatures.

The target is to define building fabric properties (insulation specifications, window SHGC and U values etc.) which would achieve building sustainability and environmental performance standards using the accredited software modelling.

The target is to achieve a high NatHERS rating.

3.2.2 Optimal Window to Wall Ratios

Window Wall ratios is a significant contributor to the energy performance of a building. The areas of glazing on a façade impact the thermal performance, thermal comfort, daylighting levels, natural ventilation and external views.

While finding the balance between the different attributes is important, understanding the thermal performance impact of glazing extents will have a higher weighting as it affects the solar loads and consequently energy consumption of the air conditioning systems.

The target is to have an optimised window to wall ratios for each dwelling, with window placement that minimise heat gain during summer and maximise heat gain in winter.

3.2.3 Shading

Direct solar radiation entering a dwelling can act as a heater in winter however can drastically increase air-conditioning loads throughout summer. As such optimised shading will allow the entry of warmth in winter and block this in summer.

The target is to provide effective horizontal shading to the north, east and west windows.

3.2.4 Thermal mass

The use of high thermal mass materials to create thermal lag within the building will minimise the internal effect of diurnal temperature change reducing the need for constant adjustment of heating and cooling systems.

Further analysis should be conducted to determine how to achieve an optimal thermal lag for the buildings. The target is to design exposed internal concrete floor or high-density material on walls or ceilings.

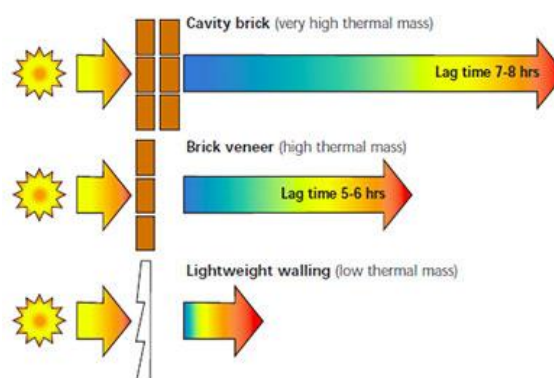


Figure 1: lag time of different wall constructions

3.2.5 High-Performance Window system and window operability

Adequate window operability will provide great access to natural ventilation. This can be achieved by looking at window makeups and incorporating different types (casement, sliding, louvre, etc) to have larger overall operability percentages and to be able to catch the breeze from varying angles.

This is especially important for windows on higher floors as there is usually a restrictor in place for child fall prevention. The target is to aim for a high operability percentage as it will align with the passive cooling strategy.

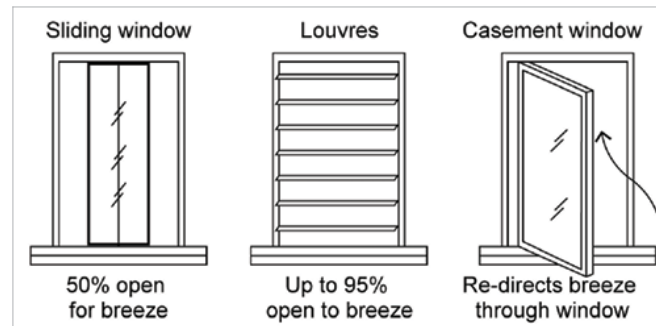


Figure 2 shows different window types to catch a breeze.

3.2.6 Elimination of Thermal Bridges

Thermal bridging from structural elements allows more heat transfers through the building envelope. This effect reduces the performance of the building envelope and affects the cooling and heating loads increasing energy demand from the HVAC system.

The target is to prevent thermal bridging from structural elements.

3.2.7 Airtight Building Envelope

The reduction in air infiltration rates provides significant benefits to the HVAC energy use and thermal comfort point of view. Improving airtightness results in the reduction of uncontrolled inward (and outward) leakage of air through cracks, porous building elements and other unintentional openings.

With the airtightness of the dwellings improved, adequate ventilation design should be provided for the development to prevent condensation and potential mould formation.

The target is to increase the airtightness of the development adopted with the architectural design.

3.2.8 Optimal levels of insulation

Optimal levels of insulation aim to ensure the thermal comfort for the building occupants is appropriate for the climate conditions of the site, to minimise the amount of artificial heating and cooling required for the space and consequently resulting in a greenhouse gas emission reduction per dwelling.

The target for the external fabric performance is to exceed the minimum code compliance.

3.2.9 Natural Ventilation

Increasing the natural ventilation of the space is a method used to passively cool and ventilate the space without using mechanical air conditioning systems and thus an effective way to minimise energy consumption in the building. Ensuring that windows are openable and designed to capture prevailing winds into the dwelling will help to ensure that the natural ventilation can be utilised by residents.

The target is to maximise the natural ventilation with window operability and sizes, and also with the mixed-mode mechanical system.

3.3 Operational Carbon – Lighting

3.3.1 Glazing products with VLT of >60%

Selecting glazing that provides a high transmittance of visual light, while still meeting the thermal performance needs of the code, will allow a greater level of daylight into dwellings and improve tenant visual comfort within the space.

The target is to have high visual light transmittance above 60% for the dwelling glazing.



Figure 3 Indication of VLT glazing tints

3.3.2 Skylights

Installing skylights in rooms without access to external walls and windows will help to increase daylight, improve tenant visual comfort, and reduce reliance on artificial lighting.

3.3.3 Optimised internal finishes to enhance daylight diffusion

The use of pale internal finishes will help to maximise light propagation through the space and minimise the energy used for lighting spaces throughout daylight hours.

The cost implications of doing this should be minimal given colour of materials is generally non-determinant of price.

3.3.4 Low energy fittings

Dedicated LED light fittings are to be installed for all living spaces within the apartments including living areas, kitchens, bathrooms and hallways and also communal areas.

The installation of efficient lighting systems includes both lighting technology and design approach. Benefits of a considered approach result in cost-neutral or cost positive lighting design and efficacy opportunities.

3.3.5 Surface focused lighting

The use of task lighting in areas where localised light levels and control are required is beneficial in reducing the number and power density of general lighting required in space for comfort and task purposes.

3.3.6 Lighting controls & timing schedules

The implementation of motion sensors and lighting controls within residences and communal spaces are outlined to be beneficial to reduce the time light fittings are on.

The target is the application of motion sensors and dimmers in the apartment spaces which would provide a higher standard of lighting control for the apartment occupants and result in greater energy

utilisation for the development. Controls and schedules should also be designed on communal and back of house areas.

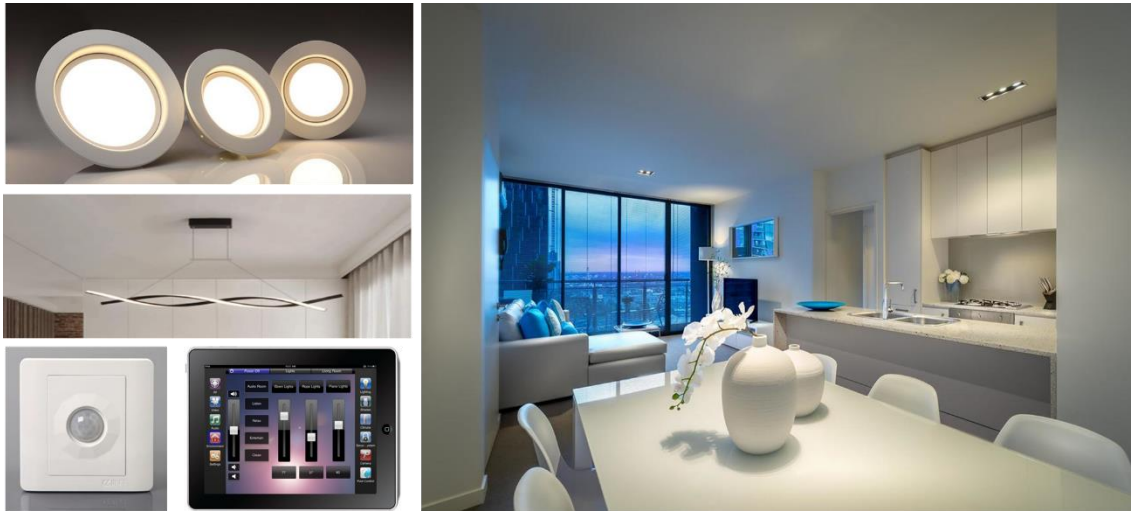


Figure 4 Lighting control for residential and commercial developments

3.4 Operational Carbon - HVAC

3.4.1 Efficient HVAC System

Heating and cooling systems are responsible for the largest portion of energy use in buildings, therefore selecting an efficient HVAC system can have a major impact in reducing the operational energy requirements for the development.

Various options will be investigated to provide an improved energy efficient outcome system while ensuring a better level of control for the users. This will include equipment selection, control strategies and zoning. The development will consider the provision of a Geothermal Heat pump to the dwellings as it provides great efficiencies and maintains individual control over systems.

In addition to the Geothermal system, the following air condition systems will be assessed for the development:

- Heat Pump
- Variable Refrigerant Flow (VRF)
- Heat Recovery (Hotel only)

The different option will be analysed and evaluated taking into consideration different aspects such as the energy efficiency, the maintenance requirements, the refrigerant ozone depletion potential, etc..

The target is to provide an energy efficient HVAC system with a high Coefficient of Performance (COP).

3.4.2 Ceiling Fans

Ceiling fans are an effective way to reduce operational energy consumption while improving the level of comfort for the occupant, through the wind-chill effect. When used in combination with the Air Conditioning system, ceiling fans can also help to extend the life of the AC system. Also, from a maintenance point of view, ceiling fans are much more cost effective when compared to any HVAC system.

The target is to propose them for both the hotel room, shared areas and the residential units.

3.4.3 Heat Recovery Ventilation

A Heat Recovery Ventilation (HRV) will be considered for large central ventilation systems, such as the ones serving the hotel. This system reduces the heating and cooling demand by using the

residual heat (or cold) in the exhaust air to pre-heat (or pre-cool) the fresh air coming from the outside. The exhaust air is used as a heat source or heat sink, depending on the climatic conditions and building needs, typically recovering 60-95% of the energy. HRV systems are also effective in improve the indoor air quality, by removing excessive moisture, odours and contaminants and improving the comfort and wellbeing of the building occupants.

3.4.4 Mixed Mode System

“Mixed-mode” refers to a hybrid approach to space conditioning that uses a combination of natural ventilation from operable windows (either manually or automatically controlled) and mechanical systems that include air distribution equipment and refrigeration equipment for cooling. A well-designed mixed-mode building begins with an intelligent facade design to minimize cooling loads. It then integrates the use of air-conditioning when and where it is necessary, with the use of natural ventilation whenever it is feasible or desirable, to maximize comfort while avoiding the significant energy use and operating costs of year-round air conditioning.

3.5 Operational Carbon - Appliances

3.5.1 High rated MEPS (5+ Stars)

The energy use from appliances and equipment in residential development represents a high portion of the total operational energy used. The selection of high rated appliances and equipment will have a considerable impact on the energy consumption of the development. Generally, an Energy rating increase of 1 Star is translated in an improved efficiency of around 10-20%.

The target is to specify at least five-star Minimum Energy Performance Standards (MEPS) appliances and equipment.

3.5.2 Induction cooktops

Induction cooktops draw less energy than electric coil or hotplate cooktops. This is mainly because induction cooktops don't have to heat an element to transfer heat. So, this means no heat or energy is wasted. This, plus the fact that food is heated up much faster (so the appliance doesn't need to be on for as long) means that they are generally considered to be the most energy-efficient option.

The induction cooktops initiative is also part of the Building Electrification initiative to phase out gas from the development.

The target is to specify Induction cooktops for the development.

3.5.3 Reduce dryer use

Electric clothes dryers use a large amount of energy, one way to reduce the consumption of the residential units is the provision of a covered outdoor space (such as balconies or shared areas) for the occupants to dry their clothes. Council or other authorities may not allow clothes hangers on balconies if these are visible from outside the lot. It is recommended to investigate local requirements and to provide the buildings with an easily accessible and appropriate space for the residents to dry their clothes, thus reducing the use of electric clothes dryers.

3.6 Operational Carbon - Domestic Hot Water

The reduction of energy consumed by the Domestic Hot Water system is dictated by two aspects; the efficiency of the fixtures and fitting, and the central system used to heat the water.

3.6.1 Efficient fixtures and fittings

Water Efficient fixtures and fittings will reduce the hot water demand of the site. Product water efficiency is regulated under the Water Efficiency Labelling and Standards (WELS) Scheme.

The target is to specify at least 5-star WELS fixtures and fittings.

3.6.2 Efficient hot water system

The team is investigating the provision of a heat pump hot water system. This system is particularly energy efficient, reducing the energy required for hot water by at least 50% when compared to a conventional resistive electric water heater. The most common systems are air-source heat pumps, that extract heat from the air and transfer it to the water. Ground-source heat pumps are also available and can be more efficient than the air-source, albeit more expensive and not always viable.

Further exploration will be carried out to investigate the most appropriate and efficient system for domestic hot water heating.

3.7 Operational Carbon - Smart Homes

3.7.1 Smart Meters

Implementing smart metering and an integrated metering strategy within the residential components of the development will help to educate residents about the connection between energy use and energy service. These meters will assist in energy auditing, fault detection and root cause analysis. Overall, the provision of this service has been shown to reduce the consumption of electricity within dwellings by over 15%.

3.7.1.1 Option 1: Basic Control

Smart home technology in its most basic form would allow for a centralised switch (on/off) solution with minimal functions i.e. remote access to turn off all lighting or the air conditioning system.

This level of control is suitable for residents that would like the option to turn household devices off and on remotely as a cross-checking exercise for example. Typical functions for basic smart home automation set up could include:

- On/off energy switches for devices connected to smart plugs
- Energy consumption monitoring (based on devices connected to smart plugs)
- SMS or email alerts

This system would cost in the order of \$1,500 - \$3,000 per apartment and would require the installation of several sensors and smart plugs as the way to connect devices.

3.7.1.2 Option 2: Individual Control

Schneider Electric's Push controls were investigated for the recognised customisable, affordable and user-friendly technology on offer, tailored to suit multi-unit residential developments.

The Push controls are a fully programmable and scalable solution, capable of controlling the following devices:

- Scene Control
- Integrated with Clipsal Lighting Controls (individual dimming controls)
- Audio Visual
- Air Conditioning (individual ducted and split systems)
- Security
- Blinds

The level of individual and addressable controls is significantly increased when compared to off-the-retail-shelf solutions. Air-conditioning options extend to integrated heat and cooling controls including, integrated scenes with other devices, room temperature feedback, setpoint, mode, fan speed etc and

lighting can be individually dimmed to suit resident's desired settings (or scenes) for example. This type of system could be adjusted remotely to ensure that dwellings were at the residents' preferred temperature before their arrival.

This cost of this system would cost approximately \$4,000 - \$5,000 per apartment inclusive of the control pad, equipment, labour. However, would also likely require the use of propriety components, such as Clipsal lighting, compatible air conditioners and smart meters.

3.7.1.3 Option 3: Control and Monitoring

Furthermore, approximately \$6,000-\$7,000 per apartment for a fully integrated system with the inclusion of whole-home energy management and monitoring capabilities, extending to a completely automated home that reacts to actions and instructions from the resident.

This type of system would require a central control point to relate to a management system with ongoing services to provide an integrated occupant experience, where they could control the whole variety of devices within their home.

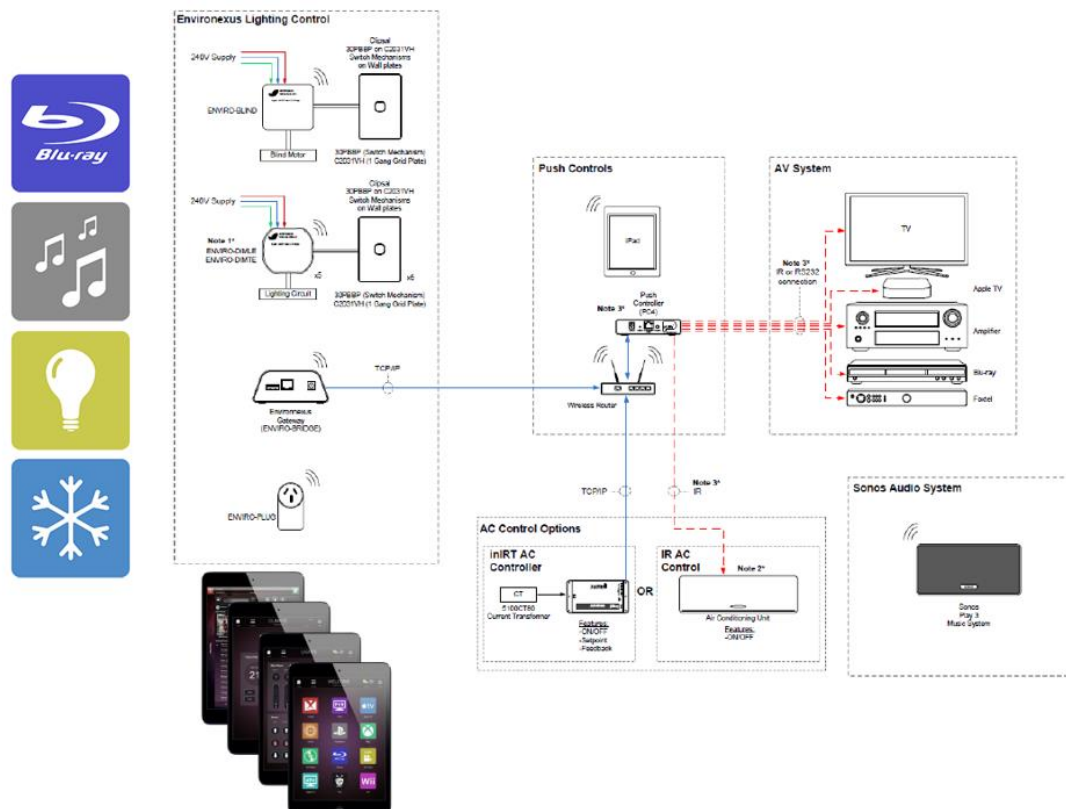


Figure 5 Push Controls integrated with Environexus

3.8 Operational Carbon - Renewables

3.8.1 Photovoltaic Array System

Rooftop solar power within the development has the potential to provide a portion of the building energy use across the year. Using a system connected to the base building systems will offset the energy used by the central services such as lifts and common area lighting. Using solar power to reduce common area energy costs will significantly reduce ongoing costs and will minimise strata levies.

If there was a desire to maximise the amount of solar PV to be installed this could be incorporated with an embedded network to allow the use of the output electricity within dwellings. This will allow onsite generation to reduce residents' energy costs rather than simply reducing their building levies.

3.8.2 Battery Storage

Battery storage systems provide significant value in terms of energy quality, reliability of supply and use in peak shifting over the day. Currently, the preferred battery type for applications such as home energy storage and electric car transport is Lithium-Ion batteries.

Further investigation into batteries would be recommended if an embedded network is to be pursued for the development. This system would provide improved flexibility of energy drawn from the grid with energy drawn during off-peak periods and used to address demand peaks throughout the day. Battery control systems provide an option for peak demand reductions given their fast response time and ability to provide a variable current supply as demand requires.

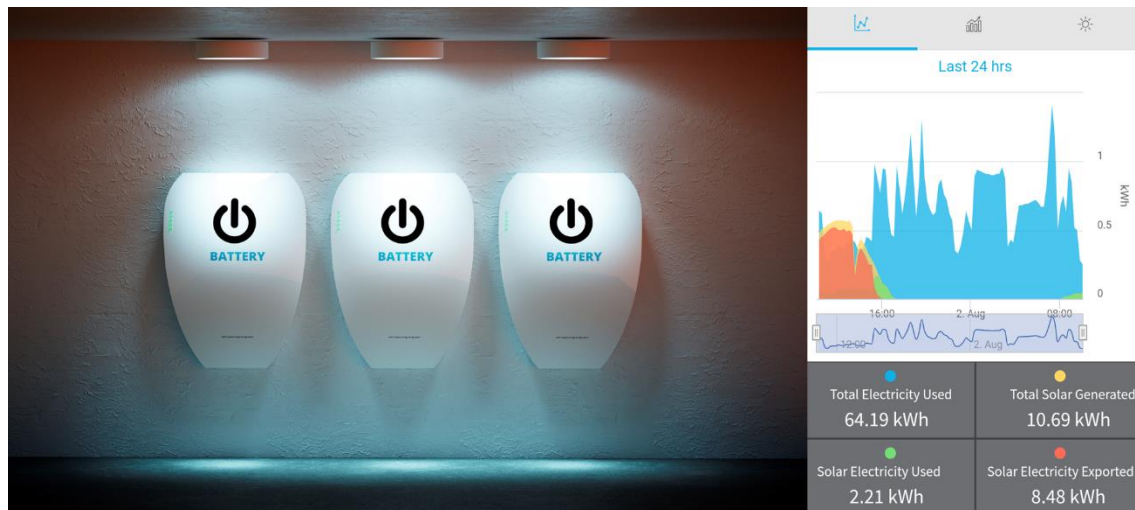


Figure 6: Battery storage system

3.8.3 Embedded networks & Smart Micro Grids

An embedded network / Microgrid is a private electricity network that uses local energy generation sources (e.g. rooftop solar) which can be connected to battery storage systems and supply loads within that network. An integrated microgrid would allow the precinct to manage the system within its borders and interact with the larger grid network as a single entity under an Embedded Network arrangement.

The development will explore the feasibility of providing an embedded network in place to serve each of the dwellings within the building and connect these to a central connection point. Under the embedded network arrangements, electricity can be purchased in bulk at a lower cost than is available to individual residents. Billing is then provided by either the building or through a third party (Origin, OC Energy, WIN Energy etc).

These systems can often provide reduced energy costs for residents and can assist in the distribution of onsite energy generation and storage.

Through an embedded network the additional energy generation could also be traded automatically via smart contracts. Smart contracts are effective programmes that are loaded into and sit alongside traditional transactions within a blockchain, that can automatically execute pre-definable code when called.

3.8.4 Wind Turbines

Wind turbines use the energy of the wind to spin an electric generator, which produces electricity.

This initiative should be assessed and investigated through the design development stage. The following items should be considered for evaluation:

- The amount of wind at the site
- The zoning requirements and covenants in the area
- The economics, payback, and incentives of installing a wind system at the site.

3.8.5 Building-Integrated PV Panels

Building-integrated photovoltaics are solar power modules that are built into a structure in place of standard building materials.

BIPV adoption has been slow in Australia due to restrictive building and construction standards, as well as the complexities in informing and educating a broad-based industry (design, construction, and operation stages) about product availability, standards and cost-effective solutions.

This initiative should be assessed and investigated through the design development stage.

3.9 Zero Embodied Carbon

3.9.1 Material Selection - life cycle analysis

Examine and select materials that are responsible for lower emissions from cradle to grave. The intent is to target carbon neutrality and prioritise materials that have a minimal environmental impact, maximise reuse, recycling, and renewables, exceed standards in life-cycle analysis, and nurture the wellbeing of their users. Strategies that will be investigated include the use of fly ash in the concrete mixture to reduce the use of Portland cement, replacing asphalt paving with recycled bricks, etc.

3.9.2 Modular Structure

The team will investigate the use of modular structures to reduce construction waste on site. This will also positively impact the construction time and reduce risks on site

3.9.3 Reduction in material use

One way to achieve the zero embodied carbon is through a reduction of the materials used. Different strategies such as exposed ceilings, walls, floor and reduction in concrete and steel structural elements size will be taken into consideration and investigated further in the phase of the project.

3.9.4 Low carbon footprint materials

The adoption of low carbon footprint materials will also have a major impact on the development embodied carbon. A list of strategies that will be taken into consideration include:

- Low carbon concrete
- Timber floor instead of carpet or vinyl
- MDF, plywood or timber wall cladding instead of plasterboard
- Wall and ceiling interior paints with low impact EPD (Environmental Product Declaration)
- Steel roof instead of aluminium
- Moving from Petroleum based insulation products to products that have less impact like Fiberglass and Cellulose
- Use a high recycled content Insulation
- Specify blown-in insulation instead of rigid and spray foam insulations

3.9.5 Local procurement

Transportation is a major contributor in a material carbon footprint. It is recommended to source steel and concrete from local suppliers, to considerably reduce the carbon footprint of the development.

3.9.6 Low embodied carbon in building services

The following will be taken into consideration during the selection and design of the proposed buildings' services, to further reduce the embodied carbon of the development:

- Use low impact refrigerants like HFO blends and natural gases like R744 (CO₂) or R717 and R718 (ammonia and water)
- Reduce the volume of refrigerant used (Refrigerant Charge).

3.10 Offsite Carbon Offsets

3.10.1 Purchase of Greenpower (100% renewable energy source)

On-site renewable generation options are limited due to shading and small roof spaces of large buildings. So, a mechanism for the purchase of off-site renewable energy or equivalent certificates is needed to allow developments to achieve net-zero.

The remainder energy consumption can be offset with an off-site renewable energy procurement through the purchase of GreenPower or a renewable energy power purchase agreement (PPAs).

- Purchasing Greenpower. GreenPower is a government accredited renewable energy product and is purchased with an electricity contract. Once purchased it cannot be sold again.
- Add the development to a renewable energy power purchase agreement (PPAs). A PPA involves purchasing renewable electricity directly from a renewable energy generator or retailer.

3.10.2 Purchase of Carbon Offsets

Offset units are used to compensate for emissions a building produces and to bring its carbon footprint down to zero. Offset units are generated by off-site projects that reduce, remove or capture emissions from the atmosphere such as reforestation, renewable energy, or energy efficiency.

3.11 Healthy Environment

3.11.1 High levels of Thermal Comfort

The Section J JV3 thermal comfort assessment aims to ensure the thermal comfort for the building occupants is appropriate for the climate conditions of the site, to minimise the amount of artificial heating and cooling required for the space. Thus, resulting in a greenhouse gas emission reduction per dwelling.

The Section J JV3 thermal comfort section should be assessed via the simulation method pathway when this assessment is performed

3.11.2 Low VOCs and low formaldehyde

The idea of improving indoor environment quality helps to ensure that building occupants are comfortable within a space and reduce exposure to internal pollutants.

To assist with improved indoor environmental quality of the building occupants, 50% of materials (by cost) used on site are proposed to contain low Volatile Organic Compounds (VOCs) including paints, flooring, sealants and adhesives and all engineered wood products used in the development are to be low formaldehyde or formaldehyde-free.

Paints are required to have a VOC of less than 5g/L. All other adhesives, sealants and carpets used in the building shall meet the TVOC limits in accordance with Green Star requirements. Emissions for each application must be acquired through recognised testing methods and reported through a recognised datasheet. In the case of paints and adhesives and sealants, theoretical TVOC calculations are also acceptable.

3.11.3 Trickle Ventilation

A trickle vent is a very small opening within a building's fabric that allows a small amount of ventilation into spaces when major elements of the ventilation systems, such as windows and doors, are closed. Trickle ventilators can also provide a greater level of control over the provision of outside air to inside spaces. Several products are available that control ventilation flow based on temperature and pressure, allowing outside air into spaces when it would be beneficial to the internal conditions and automatically shutting this off when it would result in increased heating or cooling costs.

A well-controlled trickle vent will also reduce condensation risk, avoid over ventilation (reducing air-conditioning energy and improve comfort through minimising drafts. The provision of trickle ventilators would not remove the requirements for openable windows but could assist with acoustic and ventilation controls while providing a continuous source of fresh outside air.

This initiative should be designed considering the intent of a high sealed fabric.

3.12 Water Efficient

3.12.1 Water Efficient Fixtures and Fittings

Water Efficient fixtures and fittings will reduce the water demand of the site. Product water efficiency is regulated under the Water Efficiency Labelling and Standards (WELS) Scheme.

The target is to specify at least 5-star WELS fixtures and fittings.

3.12.2 Water Efficient Appliances

Water Efficient appliances will reduce the water demand of the site. Product water efficiency is regulated under the Water Efficiency Labelling and Standards (WELS) Scheme.

The target is to specify at least 5-star WELS appliances.

3.12.3 Rainwater harvesting & reuse

The rainwater harvesting & reuse for irrigation and internal uses will reduce the site runoff and potable water demand. The installation of rainwater tanks within the basement of the site would attract a minimal additional project cost as these systems could be coupled with the onsite detention tanks for stormwater drainage systems.

The proposed rainwater tank should have the capacity to collect rainwater from the building rooftop. A water balance for the site should be investigated to determine the non-potable water demand required for irrigation to the common landscaping proposed for the development.

3.12.4 Stormwater runoff capturing

Stormwater runoff has an impact on both water quality and flow rates occurring offsite. The development's proximity to Lake Macquarie and the increase in heavy rain events experience in the last few years makes it necessary to develop a strategy to limit the stormwater runoff from the site.

The civil design will include the provision of On-Site Detention (OSD) Tanks. The aim is to provide enough capacity to store rainwater during extreme storms and heavy downpour and release it in a slow and controlled manner. OSD tanks also provide the benefit of preventing or reducing flooding.

The tanks' location, size and capacity will be confirmed in the next phase of the project.

3.12.5 Greywater treatment plant

The provision of an on-site greywater treatment plant is under discussion. The idea is to collect greywater (wastewater from non-toilet plumbing) from hand basins, clothes washers, showers, and baths, treat it on site and re use it for cooling towers, irrigation, clothes washers, and toilet flush. Greywater is firstly treated through a series of filters and sterilizing devices, then stored on site for re-

use. This strategy will reduce the potable water usage on site, while also limiting the amount of contaminated wastewater discharged in the local infrastructures.

The location, size and capacity of the greywater treatment plant will be discussed and confirmed in the next phase of the project.

3.12.6 Fire Hydrant/Sprinkler test water reuse

Similar to sprinkler test water reuse, the maintenance of fire protection systems and equipment requires the checking of the water supplies. This is carried out in several tests aimed at proving water supplies, ensuring the required flows and pressures are achieved and ensuring that equipment such as pump sets operate as intended. It is proposed that the water used in the fire hydrant system test is captured, which would otherwise be discharged to the sewer or stormwater system, by redirecting it to the rainwater tank.

The target is to recover the excess of 80% of all water within the system by returning the water to the tank.

3.13 Waste Reduction

3.13.1 Construction waste diversion from landfill

Building materials account for approximately half of all materials used and about half the solid waste generated worldwide incurring significant environmental impacts at each processing interval.

The target is that at least 80% of construction and demolition waste will be recycled, to reduce the carbon footprint of the site. This commitment could be incorporated into the head contractors' Environmental Management Plan for the site. Reclamation of high value building materials should be considered first preference. Where reclamation is not viable, materials such as asphalt, bricks, timber, plastics (including PVC) and concrete should be recycled accordingly.

3.13.2 Waste segregation

Providing isolated chutes located centrally within the building to dispose of general waste and comingled recycling will improve the waste outcomes for the development. The use of source separation of waste will drastically improve environmental outcomes as post collections segregation takes longer, costs more and increases cross-contamination. Overall, the separation of general waste and comingled recycling will reduce waste disposal costs for the development and therefore help to minimise waste levies payable by residents. Furthermore, and for example, source separation for Paper and Cardboard with an on-site compactor to process both residents and retailers' paper-based recycling will likely result in notable operational cost savings because this resource stream attracts either low cost, nil charge or pay-back for its collection.

3.13.3 E-waste bins

The inclusion of electronic waste bins or e-waste bins on site further improves waste management. Electronic waste often contains harmful chemicals, such as lead, which leach into the environment and cause significant harm. However, these items also generally contain high-value materials such as gold and platinum which can be salvaged and reused segregating this potentially high-value waste from the general waste stream both helps to minimise environmental impact while also providing new, often rare, raw materials for manufacturing.

3.13.4 Waste Management Plan / Unified bin design

Unified bin design and source separation throughout the development can form part of a waste management strategy to create a waste sortation culture in the building. Not only should each be a different colour e.g., red for general waste, yellow for co-mingled recycling, blue for paper and green for organics but should be consistent throughout the site. This is to assist with clarity and develop effective waste sortation before disposal. The waste strategy should be as part of the Waste

Management Plan and considered during the early stages of development to ensure appropriate design integration across all development.

Providing integrated bins into the project's communal areas and communal amenities would both improve the aesthetic and help to promote the effective use of the onsite sortation facilities. Examples of where the bins can be introduced include the co-working spaces, cinema rooms, yoga spaces, pool, and dining facilities.



Figure 7 Unified bin design and source sortation (www.wasteoptions.com.au)

3.13.5 Waste Education Programs

Waste education in terms of effective signage displays or collaboration with community programs would have a positive benefit to the building as part of a wide approach to community participation.

Recycling education could be coupled with the digital signage in the common areas as a way of informing residents of different waste management practices and/or other useful Council initiatives.

3.14 Sustainable Transport

3.14.1 Bike (and helmet) share facilities

The practice of cycling assists the environment and human health by reducing pollutants that would otherwise have been released by other transport options. According to the ABS, over one-third of daily car trips are less than 3km in length and these trips could be replaced with cycling. Providing secure bike storage facilities for residents will promote the use of bicycles as a form of transport.

Providing secure storage either as a communal storage cage in the basement or a nook adjacent to building entry assist in encouraging cycling. Overall, the cost of providing bike storage will be nominal with the most expensive component being the provision of additional space for this facility.

3.14.2 Resident car share hubs

The provision of a specific share car network would allow residents to relinquish car ownership entirely and would reduce the number of parking spaces required within the building.

A third party such as Go-Get could also be provided with a car-share space with residents given access to their booking system. This would reduce management requirements and move responsibility for the provision and maintenance of vehicles away from the building management.

3.14.3 Electric Vehicle charging stations

The provision of electric vehicle charging stations or provisioning for these to be installed in future would improve asset value to the development and promote a sustainable transport alternative.

The target is the provision of EV charging for the two shared cars, and one additional EV charging.

Further investigation is required to determine the feasibility of this initiative with the current sub-station capacities for the site.

3.14.4 Digital transport information displayed in communal and lobby areas

The target is to display transport information to users in communal and lobby areas or through an app to promote sustainable transport options. For example, when go get cars are available, they can be displayed in communal and lobby areas or the development app.

3.15 Low Ecological Footprint

3.15.1 Native vegetation

The planting of native vegetation throughout the site will reduce the water needed for irrigations, reduce vegetation maintenance requirements, and promote biodiversity. In addition, native vegetation stores a significant amount of carbon, mitigating the effects of climate change. It controls erosion by protecting soils, reduces land degradation and salinity, improves water quality and availability, and provides habitat for a wealth of unique biodiversity including threatened species.

The following principles are integrated into the landscape masterplan:

- Predominantly native plants.
- Retention of existing endemic foreshore vegetation.
- Rehabilitation of the former foreshore vegetation for the 20m foreshore zone through vegetation management and a VMP.
- Extensive canopy tree planting for shade.
- Water collection for irrigation use.
- Water quality management through the placement of bioswales on-site to treat water before releasing it to the lake.
- Deep soil planting areas throughout the site and at major public open space areas to permit taller tree planting.
- Minimal turf areas.
- Vegetation management of the adjoining foreshore wetland areas through ongoing maintenance under approved VMP's
- Historic tree retention through suitable TPZ and elevated deck walkway as required.
- Recycled concrete in paving aggregates and use of shell material.
- Permeable paving to selected areas to reduce water runoff.
- Planting selections using proven tough species and pioneer species.

3.15.2 Nonobtrusive outdoor lighting

Light pollution revealing up into the night sky (skyglow) or spilling onto neighbouring properties can harm the environment in many ways including effects on:

- Migratory birds – nocturnal birds use the moon and stars for navigation and can become disoriented by lights shining upwards into the sky.
- The disruption of biological rhythms and other effects on the behaviour of nocturnal animals and insects.
- Greenhouse gas emissions are emitted to unnecessarily light the night sky.

Ensuring that nil outdoor lights are up-facing into the night sky would not attract any additional costs and would provide ongoing operational and maintenance savings and reduce the site's impact on the natural environment.

3.15.3 Urban Heat Island Effect Mitigation

Selection of roof colour has minimal impact on the architectural aesthetic or cost for the development however can have a substantial influence on the overall impact of the site in terms of the heat island effect. The use of pale-coloured roofs and facades will have marginal cost implications and would assist in the propagation of daylight through areas that are shadowed by adjacent buildings.

The target is to have a provision of at least 75% of all external façade, pavement and roof surfaces following the Solar Reflectance Index (SRI) guideline of a three-year SRI >64.

3.15.4 Rooftop gardens

Plants can reduce the overall heat absorption of the building which in turn reduces the energy used by the building's active cooling systems. The primary cause of the urban heat island effect in urbanised areas is absorbed direct solar radiation by roads and building materials. These construction materials store the sun's radiation and later release it with a changed wavelength that cannot penetrate back through the lower atmosphere. This phenomenon creates a heat bubble over urbanised areas.

By installing roof or terrace gardens, the development will create a passive cooling solution and reduce the heat gains. Plants in effect cool the ambient environment by direct shading and by the process of transpiration, which is the evaporation of water from plant leaves. Rooftop and terrace gardens have the potential to minimise temperature in the immediate atmosphere by approximately 3-4°C, improving the ambient temperature conditions within the building and minimising the building's effect on urban heat islands.

4. Summary of Initiatives and Targets

The table below highlight the goals, initiatives, and respective targets for the development. The application and the extent of these initiatives will be investigated during the design development.

Goals	Initiatives	Targets
Building Electrification	Building Electrification	Phase out gas
		Heat pump - domestic hot water
		Induction cooktops
Operational Carbon - Passive Design	NatHERs Rating	Achieve high NatHERs rating
	Optimal Window to Wall Ratios	Optimise daylight and solar heat gains
	Shading devices	Overhangs for North, East and West
	Thermal Mass	Internal exposed concrete floor, or high-density material
	High-Performance Window system	U-value 2.6, SHGC 0.53 (to be confirmed)
	Elimination of Thermal Bridges	According to NCC
	Airtight Building Envelope	Below 0.6 air changes per hour (ACH, measured at 50 Pascals pressure)
	Optimal levels of insulation	Roof: R 5.0, Wall: R 2.5, Floor: R 2.0 (to be confirmed)
	Natural Ventilation	High operability percentages windows, cross ventilation with opposite windows
Operational Carbon - Lighting	High glazing VLT	>60%
	Skylights	Solar Tubes or shaded skylights for deep floor plans
	Optimised internal finishes to enhance daylight diffusion	Pale finishes
	Low energy fittings	Low LPDs - 20% Improvement from NCC - 3.5W/m ² (to be confirmed)
	Surface focused lighting	Reduced Light Power Density per unit
	Smart Sensors	Daylight + Movement + Time

Goals	Initiatives	Targets
Operational Carbon - HVAC	Efficient HVAC System	Heat Pump / Efficient VRF system / Geothermal / Heat recovery for the Hotel
	Ceiling Fans	Ceiling Fans for comfort ventilation
	Heat Recovery Ventilation	Consider heat recovery system for large central ventilation systems
	Mixed Mode System	HVAC system operated in line with a natural ventilation system
Operational Carbon - Appliances	Efficient Appliances (Energy Star Rating)	• Dishwasher: 5-star energy rating • Clothes Washer: 5-star energy rating • Fridge: 5-star energy rating • Dryer: 5-star energy rating
	Induction cooktops	In line with Building Electrification strategy and Efficient Appliances
	Reduce dryer use	Covered Clothes Hanger
Operational Carbon - Domestic Hot Water	Water Efficient fixtures	• Showerheads: 5-star WELS rated • Kitchen Taps & Bathroom Taps: 5-star WELS rated
	Efficient Hot Water System	Heat pump (pending HVAC) or Air source heat pump
Operational Carbon - Renewables	PV Array	99 kWp - small scale PV array system
	Battery Storage	Target to be developed
	Small Wind Turbines	To be investigated
	Smart Micro Grids	-
Operational Carbon - Smart Homes	Building Automation	-
	Smart Meters	Smart metering and an integrated metering strategy:• Option 1: Basic Control• Option 2: Individual Control• Option 3: Control and Monitoring

Goals	Initiatives	Targets
Sustainable Transport	End of Trip facilities	[Green Star Building - Credit 27] • 4 showers for 200 occupants, 1 additional shower every 200 occupants above 200 (Hotel) • 1 locker for every 8 regular building occupants or staff (Hotel) • n. of bicycle parking facilities to be confirmed
	Electric Vehicle sharing	[Green Star Building - Credit 27] Reducing private vehicles use: • Emission reduction: 40% • Active mode encouragement: 90% • Vehicle Kilometres Travelled (VKT) reduction: 20%
	Electric Vehicle charging stations	[Green Star Building - Credit 27] • At least 5% of all car parking spaces • Electrical infrastructure and a load management plan prepared to allow for future installation of EV charging to 25% of all car parking spaces (including the minimum 5% and car-share spaces already provided)
Low Ecological Footprint	Native vegetation	A planting mix of at least 90% native vegetation
	Non-obtrusive outdoor lighting	Nil outdoor lights are up-facing into the night sky
	Urban Heat Island Effect Mitigation: a three-year SRI >64	• A provision of at least 75% of all external façade, pavement and roof surfaces follow the Solar Reflectance Index (SRI) • Green roof & façade
Embodied Carbon	Material Selection - life cycle analysis	10-20% emissions reduction on upfront carbon: • Using 30% fly ash blend concrete to reduce the usage of Portland Cement • Replacing Asphalt paving with recycled brick to reduce the recurring impacts of maintaining and replacing the asphalt paving • Introducing a permeable system that helps with stormwater management.
	Modular structure	Construction waste reduction
	Reduction in material use	Strategies include but are not limited to: • Exposed ceiling, walls, polished concrete • Reduction in concrete slab and steel
	Low carbon footprint materials	Strategies include but are not limited to: • Low carbon concrete • Timber floor instead of carpet or vinyl • MDF, plywood or timber wall cladding instead of plasterboard • Wall and ceiling interior paints with low impact EPD • Steel roof instead of aluminium • Moving from Petroleum based insulation products to products that have less impact like Fiberglass and Cellulose • Use a high recycled content Insulation • Specify blown-in insulation instead of rigid and spray foam insulations
	Local Procurement	Choose local steel and concrete supplier
	Embodied carbon in building services	• Use low impact refrigerants like HFO blends and natural gases like R744 (CO ₂) or R717 and R718 (ammonia and water) • Reduce the volume of refrigerant used (Refrigerant Charge)

Goals	Initiatives	Targets
Offsite Carbon Offsets	Purchase Carbon offset for construction	Account for the total embodied carbon emissions (tCO ₂ e) from its construction (including the energy consumed during construction) through the utilization of carbon-sequestering materials and/or through a one-time carbon offset purchase
	Purchase of Greenpower (100% renewable energy source)	100% of the remaining Energy not offset by the PV system
	Purchase of Carbon Offsets	100% of embodied construction material
Water Efficient	Water Efficient Fixtures and Fittings	Showerheads: 5-star WELS rated Kitchen Taps & Bathroom Taps: 5-star WELS rated Toilets: 5-star WELS rated
	Water Efficient Appliances	Minimum 5-star WELS
	Rainwater harvesting & reuse	[Green Star Building - Credit 25]The building uses 45% (40% for Class 2 and Class 3 buildings) less potable water compared to a reference building
	Stormwater runoff capturing	Provision of OSD Tank - dimension to be discussed
	Greywater treatment plant	% of greywater reuse to be confirmed Greywater collection from hand basins, clothes washers and showers/bats Treated water can be reused for cooling towers, irrigation, clothes washers, toilets flush
Waste Reduction	Construction waste diversion from landfill	At least 80% of construction and demolition waste is to be recycled
	Waste segregation	Isolated chutes located centrally within the building

Goals	Initiatives	Targets
	Waste Management Plan / Unified bin design	[Green Star Building - Credit 4] The building must provide bins or storage containers to building occupants to enable them to separate their waste. These bins must be labelled and easy to access, and evenly distributed throughout the building. They must also allow for separating the following as a minimum: • General waste going to landfill • Recycling streams to be collected by the building's waste collection service, including: – paper and cardboard – glass – plastic • One additional waste stream was identified by the project team. This may include collecting any of the following waste types: organics, e-waste, batteries etc.
	Anaerobic digester	Size to be confirmed
	Waste Education Programs	Effective signage displays
Healthy & Comfortable Environment	High levels of Thermal Comfort	Aligned with Minimum 8 Stars NatHERs
	Acoustic comfort	• Internal noise levels: internal ambient noise levels are suitable and relevant to the activity type in the room • Reverberation: built to reduce the persistence of sound to a level suitable to the activities in the space • Acoustic separation: the enclosed spaces have been built to minimise crosstalk between rooms and between rooms and open areas
	Visual comfort - views to the outside	60% of the nominated area has a clear line of sight to a high quality internal or external view - related to the window to wall ratio
	Boardwalks	Healthier lifestyle
	Public amenities	[Green Star Buildings - Credit 28] • Class 2 /3 buildings: 1.75 m² / dwelling (minimum of 250 m²) ; • All other building types: 0.25 m²/ occupant or 2.5% of GFA, whichever is greater;
	Low VOCs and low formaldehyde	50% of materials (by cost) used on site are proposed to contain low Volatile Organic Compounds (VOCs)
Regenerative Design	Promoting biological diversity	Green roofs and skins with native vegetation
	Teach and inspire occupants	

5. Conclusion

Northrop Consulting Engineers assisted the development's design and its ability to address the Ecologically Sustainable Development (ESD) goals from the Planning Secretary's Environmental Assessment Requirement (SEARs)

The report outlines a compliance response to the sustainability planning requirements and establishes a Sustainability Strategy with detailed initiatives and targets. This Strategy intends to minimise resources consumption and operational costs, promote positive impacts to the environment, economy and the health and wellbeing of our community.

The development is aiming to incorporate Ecologically Sustainable Development principles in the design, construction, and ongoing operation phases of the development. Future buildings will meet or exceed minimum building sustainability and environmental performance standards. The development will minimise greenhouse gas emissions and the consumption of energy, water, and material resources.

Based on the above, the development has the potential to meet all the planning requirements.

Northrop notes that the documentation provided for the development application package is, generally, in compliance with the information provided within this report, however, it is the contractor's responsibility to ensure that the final constructed building complies with the applicable standards.