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Sorrento Activity Centre

Sustainable Design Assessment Report

Megara

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Executive summary

This report outlines the Ecological Sustainable Design (ESD) strategy for the proposed development at Sorrento Activity Centre, Sorrento, WA. The new 8-storey building comprises apartments and commercial / food & beverage tenancies, as well as car parking.

A key part of this development is integrating sustainable strategies and design into the design and construction of the building.

Table 1 below confirms that the proposed development responds to these requirements.

Table 1 - ESD target

Development must demonstrate that:	Requirement will be met	Comments
Sustainable Design Assessment Report to demonstrate the proposed development has been designed to support amenity, reduce resident running costs, provide a marketing point of difference and to gain wider community support.	✓	The proposed development has been designed to exceed these requirements and deliver a 5-star Green Star certified building. Please refer to Section 11.3 of this report.

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1.0 Introduction

The proposed development, is a multi-unit residential mixed-use development. The project site is to be located at Sorrento Activity Centre, in Sorrento. The development will be 8-storeys and consists of apartments and commercial / food & beverage tenancies as well as car parking.

Table 2 - Development space allocation

Space Type	Area / Number
Commercial / food & beverage tenancies	1374 m^2
Apartments	75 aparmtents

1.1 Project information

Below is an overview of the project:

Table 3 - Project Information

Item	Detail
Project address	Sorrento Activity Centre, Sorrento WA 6011
Project applicant / developer	Megara
Development approval details	N/A
Development approval sustainability requirements	SDAR Report
Sustainability vision / general approach	See Sections 2.0 to 11.0 of this report

“The physical form will create a sense of arrival and a transition into the intensity of the beach front core from the surrounding residential areas. This precinct will also cater for medium to high-density residential development and tourism accommodation. Reflecting Sorrento’s relaxed coastal aesthetic, buildings are required to be positioned in landscaped settings to provide privacy and recreation spaces for residents and a softening of the built form.”

This report outlines how the development has been designed to meet the above requirements.

Figure 1.1 - Visualisation of the Sorrento Activity Centre development

1.2 Sustainability targets

The development is designed to fulfil the requirement in terms of sustainable design and is aiming to achieve the following:

- 5-star Green Star – Design & As-Built v1.3 certified rating; and
- Average 7-star NatHERS rating for the residential components of the development.

The project is also required to comply with the National Construction Code (NCC) Section J 2019 for Energy Efficiency. These commitments are outlined in more detail in the following sections of this report.

2.0 Indoor environmental quality

The Indoor Environment Quality of a building aims to achieve sustainability performance improvements in a manner that also improves occupants' experience of the space. Sustainable buildings are designed for people and reductions in energy use should never be made at the expense of the occupants' health and wellbeing.

A holistic approach to sustainability will result in multiple benefits both in energy efficiency and encouraging occupant wellbeing. This can be achieved by improvements to air quality through appropriate ventilation, the provision of high levels of thermal, visual and acoustic comfort, reduction to occupant stress and the creation of low-toxicity environment through reductions to pollutants.

2.1 Design initiatives

The following table summarises the specific initiatives included in the design in relation to Indoor Environment Quality:

Table 4 - Indoor Environment Quality initiatives

Design Issue	Design initiative included in the Sorrento Activity Centre design	Benchmark	Sorrento Activity Centre target
Thermal comfort	High-performance glazing External shading Airtightness	Green Star Credit 14 – Thermal Comfort: average NatHERS of 7 stars	Average 7 stars NatHERS or higher
Natural ventilation	Natural cross ventilation for 65% of the proposed dwellings	AS1668.4 and CIBSE Guide A – 60% of dwellings	At least 73% of the proposed dwellings
Daylight	Large windows with moderate Visual Light Transmittance (VLT) optimised for sufficient natural daylight	Green Star Credit 12.1 – Daylight: daylight factor of 1.5% for living and bedrooms spaces for 40% floor area	Daylight factor of 1.5% for living and bedrooms spaces for at least 60% of the floor area
External Views	Good orientation Large windows with moderate Visual Light Transmittance (VLT)	Green Star Credit 12.2 – External Views: 60% of living and bedroom spaces within 8m of view	At least 60% of living and bedroom spaces within 8m of view
Hazardous materials and VOCs	Specification of low VOCs in paints adhesives and sealants Low formaldehyde in engineered woods	Green Star Credit 13 – Indoor Pollutants: 95% of relevant products to comply	At least 95% of relevant products to comply
Internal lighting levels	All LED, low energy and flicker-free lighting	Green Star Credit 11 – Lighting Comfort: Low energy and flicker-free lighting	All LED, low energy and flicker-free lighting
Acoustics	Acoustic separation between residential units Compliance with acoustic requirements for external and internal noise levels	Green Star Credit 10 – Acoustic Comfort: acoustic separation and internal noise levels complying with Table 1 of AS/NZS2107:2016	Acoustic separation and internal noise levels complying with Table 1 of AS/NZS2107:2016

The following indoor environment quality improvements have been considered throughout the detailed design of the development.

2.2 Thermal comfort

The human body regulates its core temperature via the hypothalamus within a narrow range of 36 to 38 degrees. An indoor environment that is too hot or too cold can affect mood, performance and productivity. However, at which temperature a resident feels comfortable varies significantly from person to person. To control internal comfort and minimise excessive heat loss in winter and heat gains in summer, a number of strategies will be investigated for the proposed development:

- Façade design and glass selection is very important; heat gains and losses must be moderated, and thermal bridging should be avoided. Double glazing systems are considered for this development to improve the thermal performance of the building envelope.
- The high-performance glazing will additionally help to manage acoustic aspects of the building. Separated party walls between apartments will also reduce noise impacts from neighbouring flats.
- The façade should be well sealed to avoid draughts and air leakage.

2.3 Shading devices

Shading is a critical component of the building design. Large overhangs, both vertical and horizontal, should be incorporated, and the north facing glazing should aim to reduce the amount of direct solar radiation for all times during the year. The development provides some shading to the glazed facades by means of extended floor plates.

Figure 2.1 Building design showing shaded glazed facades.

2.4 Glazing performance

The proposed high-performance glazing provides solar control to prevent summer heating while allowing useful passive solar heating in winter. The low U-value of the glazing would minimise the conductive loss or gain. These result in an improved thermal comfort, improved energy rating of apartments as well as a reduced overall carbon footprint of the development.

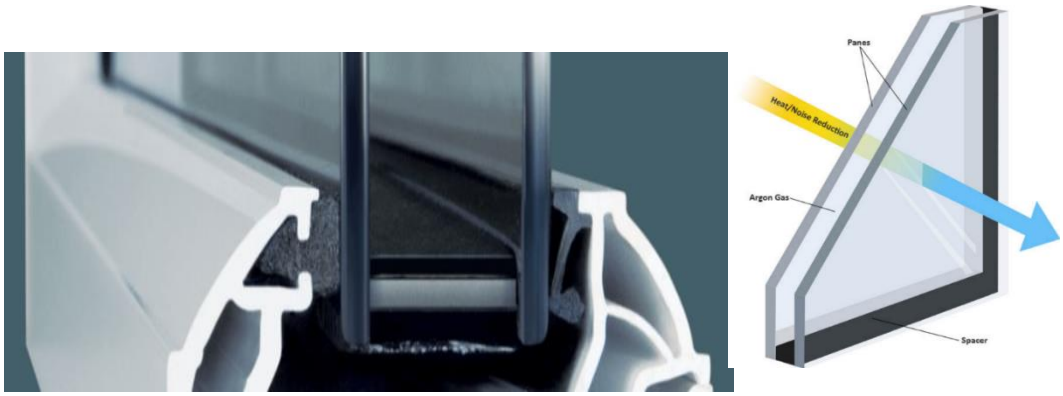

Figure 2.2 – High performance glazing options are proposed for the development

2.5 Emissions & toxicity

Volatile organic compounds (VOCs) are emitted as gases from certain solids or liquids. VOCs include a variety of chemicals, some of which may have short and long term adverse health effects. Concentrations of many VOCs are consistently higher indoors than outdoors. VOCs are emitted by a wide array of products numbering in the thousands (typically paints and lacquers, paint strippers, cleaning supplies, pesticides, building materials and furnishings, office equipment such as copiers and printers).

The development will aim to specify materials with low emissions content including low-VOC and low formaldehyde content to avoid contaminating the indoor air.

Figure 2.3 - VOCs that result in sick building syndrome

2.6 Natural lighting

Appropriate daylight is essential for users' wellbeing and connection to the outdoors, and for energy efficiency. However, excessive daylight can cause glare which is a major IEQ concern and must be avoided. The development is designed such that every living space is designed to have large sliding doors to the balconies in addition to large full height windows to maximise daylight levels while shading devices are proposed to reduce glare. The location and height of the development offer extensive views over the Indian ocean and surrounding area.

The following design opportunities are considered throughout the detailed design process to maximise the daylighting potential:

- Given the extent of proposed glazing, glass with a moderate visual light transmittance (VLT) allows sufficient daylight to penetrate the space.

2.7 Airtightness

Airtightness is the fundamental building property that impacts infiltration and exfiltration (the uncontrolled inward and outward leakage of outdoor air through cracks, interstices or other unintentional openings of a building, caused by pressure effects of the wind and/or stack effect).

The development will include measures and specifications to limit air leakage from the building envelope elements such as glazing systems and external walls.

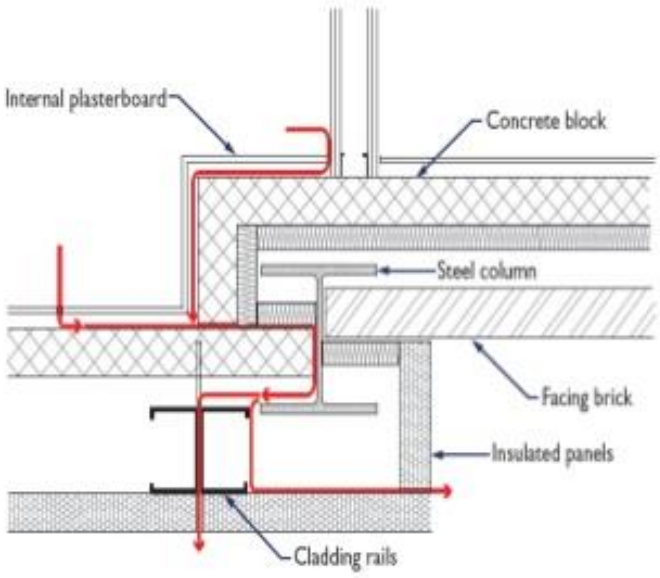

Figure 2.4 - Continuous airtightness line of building details

3.0 Energy efficiency

The construction industry is responsible for around 20% of Australia's carbon footprint. These emissions include embodied energy and water consumption that goes into the building during construction as well as operational energy and water usage of the completed building, maintenance during the life span and the demolition at the end of the building's life.

The following sections set out design strategies utilised for this development to reduce the buildings energy demand and greenhouse gas emissions.

3.1 Design initiatives

The following table summarises the specific initiatives included in the design in relation to energy efficiency:

Table 5 Energy efficiency initiatives

Design Issue	Design initiative included in the Sorrento Activity Centre design	Benchmark	Sorrento Activity Centre target
Building fabric enhanced over NCC requirements	High-performance fabric and insulation	Green Star Credit 15 – Greenhouse Gas Emissions: minimum NatHERS of 5.5 stars and average NatHERS of 6.5 stars	Minimum NatHERS of 6 stars and average NatHERS of 7 stars
Operating energy and peak demand reduction	High-efficiency building services High-performance building fabric and glazing	Green Star Credit 16 – Peak Demand Reduction: reduce total peak demand by 15% through on-site renewables	Target reducing total peak demand by 15% through on-site renewables
On-site energy generation	Solar PV panels are to be installed	As above	As above
Energy sub-metering	Separate sub-metering for each tenant for energy and water Smart metering installed	Green Star Credit 6 – Metering: accessible metering to be provided to monitor building energy and water consumption	Accessible metering to be provided to monitor building energy and water consumption
Air leakage	The building will be designed and built with airtightness in mind and an airtightness test will be undertaken	Green Star Credit 2.2 – Commissioning: target 15 $m^3/h.m^2$ for air tightness	Target a maximum of 15$m^3/h.m^2$ for air tightness
Lighting efficiency	All lighting will be LED, low energy lighting	Green Star Credit 15 – Greenhouse Gas Emissions: lighting power density is reduced by 10%	Target lighting power density reduction by at least 10%
Ventilation and air-conditioning	Energy-efficient HVAC will be installed	Green Star Credit 15 – Greenhouse Gas Emissions: air conditioning equipment is at least 3-star as per AS 3823.2-2011	Air conditioning equipment will be at least 3-star as per AS 3823.2-2011
Appliances and equipment	All appliances installed will be energy and water efficient	Green Star Credit 15 – Greenhouse Gas Emissions: appliances to have a minimum Energy Star rating of 1-star below the maximum	Appliances to have a minimum Energy Star rating of 1-star below the maximum

3.2 NatHERS

The Nationwide House Energy Rating Scheme (NatHERS) is a tool to assess the energy usage of residential dwellings. For a multi-residential development, every apartment is investigated as a separate unit with its own rating before an overall average rating is calculated. The NatHERS tool considers a wide range of parameters like orientation, glazing, insulation, size of rooms and door openings, shading and awnings and ceiling fans.

The NCC requires a minimum of a 5-star NatHERS rating for the worst-performing apartment in the complex and an overall average of 6-star. The proposed development is targeting to exceed these requirements by targeting a minimum of a 6-star rating and an overall average of 7-stars.

3.3 Artificial lighting and controls

It will be considered to specify all light fittings as LED fittings including lighting in the 'communal' corridors, stairwells, garage and external lighting. All common area lighting will incorporate light controls such as occupancy sensing (PIRs) and time switch to reduce lighting consumption when lighting is not required.

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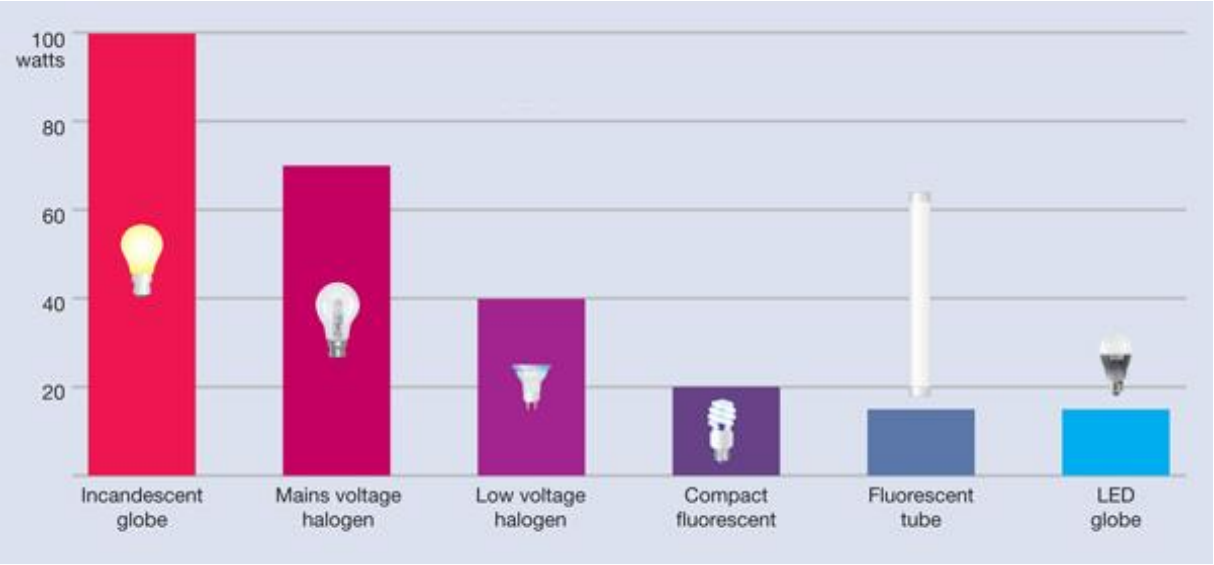

Figure 3.1 - Comparison of LED lighting with other conventional lighting system

3.4 Transparent consumption

Smart metering

Provision of smart metering for the energy and water usage recording, tracking with user interface would be a novel feature on this development. The software could also provide a snapshot view of how the building is performing. This provides a means to inform the building occupants well as engage them in a sustainable lifestyle.

Live display

Live displays could be installed in each apartment that show the building's energy, water and waste consumption. This would be linked to the BMS and other inputs and could display live data about the building's consumption and how it is performing in relation to a typical building. This would also encourage users of the building and educate them about their own behaviour in relation to energy, water and waste.

3.5 Commissioning and building tuning

Comprehensive pre-commissioning and commissioning activities will be undertaken for all building systems as a standard practice for the development.

Further to commissioning, seasonal building tuning would be considered on the building for at least 12 months following occupancy to ensure systems are performing to their design potential at full and part load conditions. Quarterly adjustments and measurement for the first 12 months after occupation and a review of building system manufacturer warranties will help improve on the building's energy performance.

3.6 Solar photovoltaic (PV) panels

Solar Photovoltaic (PV) panels will be considered to be installed on the roof of the building to supply power for the common areas, including corridors, car parking, stairwells, reception and pool area.

Figure 3.2 Rooftop PV system

4.0 Water efficiency

The water consumption of Western Australian is the second highest in Australia with an average of 241,000 litres per household per annum, well above the Australian average of 190,000 litres (Australian Bureau of Statistics, 2017). A reduction of water usage does not only alleviate pressure from the local water supply but also means reduced costs of living in WA.

The following sections set out design strategies utilised for this development to reduce the building's water consumption. Rainwater harvesting and reuse is not recommended for domestic consumption.

4.1 Design initiatives

The following table summarises the specific initiatives included in the design in relation to water efficiency:

Table 6 - Water efficiency initiatives

Design Issue	Design initiative included in the Sorrento Activity Centre design	Benchmark	Sorrento Activity Centre target
Potable water consumption	All water fittings and fixtures to be water efficient	Green Star Credit 18 – Potable Water: 7.5% reduction in potable water consumption	Target at least 7.5% reduction in potable water consumption
Water metering	Separate sub-metering for each tenant for energy and water Smart metering installed	Green Star Credit 6 – Metering: accessible metering to be provided to monitor building energy and water consumption	Accessible metering to be provided to monitor building energy and water consumption
Landscape irrigation	All landscape irrigation will be drip irrigation with moisture sensing override	Green Star Credit 18B.4 – Landscape Irrigation: drip irrigation with a moisture sensor is installed	All landscape irrigation will be drip irrigation with moisture sensing
Heat rejection water	The HVAC system will not use any potable water for heat rejection	Green Star Credit 18B.3 – Heat Rejection: no water is used for heat rejection	No water is used for heat rejection
Sanitary fixture efficiency	All sanitary fixtures and fittings will be water efficient	Green Star Credit 18 – Potable Water: all fixtures are within one star of the WELS rating	All fixtures are within one star of the WELS rating

4.2 Water fixtures & fittings

Occupant consumption is a major contributor to potable water usage. The following water fixture WELS ratings will be considered to ensure the efficient use of potable water by building occupants (must be within 1-star).

Table 7 - Proposed water fittings WELS rating

Fixture / Fitting Type	WELS Rating
Taps	6-star
Urinals	6-star
Toilets	5-star
Showers	3-star
Clothes Washing Machine	5-star
Dishwasher	6-star

4.3 Rainwater harvesting

Rainwater harvesting involves the collection, storage and distribution of rainwater from the roof and other areas, for use inside and outside the building. The collected water can be used for irrigation as well as toilet flushing.

Figure 4.1 - Use of harvested rain water and drip irrigation system for landscaping

4.4 Drip irrigation

A major amount of potable water usage goes back to landscape irrigation. To reduce the amount of water used for the landscaped areas on the ground floor, a drip system with moisture sensor control may be installed for irrigation.

5.0 Building materials

Buildings consume considerable natural resources in their construction, operation and demolition. This section of the report will provide details about the potential impacts caused by the building and how these impacts have been reduced when compared to typical buildings of this nature. The building will aim to reduce the total embodied energy and carbon considered in the construction and then aim to maximise the operational efficiency of the buildings services to provide and enhance tenant provisions for the minimum amount of energy and water. Furthermore, methods for maintaining operational efficiency over the life of the building will be investigated to ensure that the benefits are maximised over the life of the building.

5.1 Design initiatives

The following table summarises the specific initiatives included in the design in relation to building materials:

Table 8 - Building materials initiatives

Design Issue	Design initiative included in the Sorrento Activity Centre design	Benchmark	Sorrento Activity Centre target
Embodied carbon in the building materials	The building design and material selection will reduce the extent of environmental impact as much as possible	Green Star Credit 19 – Materials: cumulative impact reduction of 30%	Target cumulative impact reduction of at least 30%
Concrete	All concrete in the building will reduce Portland cement use	Green Star Credit 19 – Materials: Portland cement content is reduced by 30%	Target Portland cement content is reduced by at least 30%
Sustainable timber	Timber in the project will be either recycled / reused or certified from a sustainable source	Green Star Credit 20 – Materials: 95% of timber used in the building and construction will be from sustainable source or be reused	Target at least 95% of timber used in the building and construction to be from a sustainable source or be reused
Permanent formwork, pipes, ducts, cables	PVC products will meet Best Practice Guidelines for PVC	Green Star Credit 20 – Materials: 90% of all PVC products are to meet Best Practice Guidelines for PVC	Target at least 90% of all PVC products are to meet Best Practice Guidelines for PVC
Structural and reinforcing steel	Steel will be procured from an energy-reducing processing plant	Green Star Credit 20 – Materials: 95% of steel sourced from a Responsible Steel Maker	Target at least 95% of steel sourced from a Responsible Steel Maker

The design team will actively target reduced carbon footprint during construction and embodied energy within building materials. The design team aims to specify at least 60% of the steel used for reinforcing bar and mesh having been produced using energy-reducing manufacturing methods. Timber used for construction works shall be either certified as responsibly sourced or recycled material.

5.2 Embodied carbon

While building operations such as the use of electricity or water generate greenhouse gases, carbon and carbon equivalent gases are also emitted through the production and delivery of products and materials for construction.

For example, to produce Portland cement, a main ingredient in concrete, raw materials are crushed and then heated to over 1400 degrees Celsius. This requires a significant amount of energy and emits large amounts of greenhouse gases

during this production process. These gases are accounted as carbon equivalents in form of 'embodied carbon' in a building.

Embodied carbon, therefore, comprises a major proportion of the total carbon footprint of a building. An option to provide a life cycle analysis (LCA) of total carbon and environmental footprint will be considered at key design stages to ensure that design options are prioritised in terms of life-cycle impact and embodied energy/water rather than just day one impacts.

The following measures will be considered throughout the design development to reduce the amount of embodied carbon:

- **Sub-structure**
  - Maximise recycled content of materials in structural components.
- **Super-Structure**
  - Maximise recycled content in concrete and formwork;
  - Use of lightweight and reusable materials where possible.
- **Envelope**
  - Adopt a low-carbon, lightweight approach;
  - Consider necessity of massing elements;
  - Consider composite materials or dual function elements;
  - Considering the use of recycled materials
- **Internal Walls**
  - Consider necessity of internal walls;
  - Consider recycled content or reused materials;
  - Consider low carbon steel framing;
  - Designing for flexibility and future-proofing to reduce renovation efforts.
- **Internal Finishes**
  - Consider setting a recycled content target for all finishes;
  - Consider long life and highly durable finished is areas of high foot traffic;
  - Considering Carbon Neutral certified products.

6.0 Transport

Sustainable projects facilitate a reduction of the dependency of occupants on private car use as an important means of reducing overall greenhouse gas emissions. The use of motor vehicles directly contributes to climate change in two ways; through the high amounts of energy required to produce cars and build and maintain supporting road transport infrastructure and services; and the direct emissions that result from car operations.

If reliance on individual motor vehicle transportation is to be reduced, it is necessary to maximise alternative transportation options. This may include initiatives that encourage and make possible the use of mass transport options, cycling or walking, and the selection of sites that are close to a large number of amenities.

6.1 Design initiatives

The following table summarises the specific initiatives included in the design in relation to transport:

Table 9 - Transport initiatives

Design Issue	Design initiative included in the Sorrento Activity Centre design	Benchmark	Sorrento Activity Centre target
Providing bike storage	Bike storage will be provided for residents	Green Star Credit 17B.4 – Active Transport Facilities: 79 bays plus 1 per 2.5 dwellings over 100 (residents), plus 5% of dwellings for visitors	The project will provide the benchmark required with 5 spaces for secure bike parking.
Providing access to showers and end of trip facilities	End of trip facilities are provided for the commercial part of the development.	Green Star Credit 17B.4 – Active Transport Facilities: 1 shower including drying space and locker	1 UAT with shower and 5 lockers is provided for the commercial units.
Car sharing and other low emission vehicle infrastructure	Car parking bays and infrastructure for Electric Vehicles (EV) will be provided.	Green Star Credit 17B.3 – Low Emission Vehicle Infrastructure: 5% of parking is dedicated to EV.	5% of car bays will be equipped with the infrastructure for EV charging, with 100% of the bays being future proofed.
Improving pedestrian spaces	The building provides excellent access to amenities such as shops, cafes, bars, medical, banking and others	Green Star Credit 17B.5 – Walkable Neighbourhoods: At least 8 amenities are within 400m of the building	The development with a vast number of amenities is less than 400m away from the building. Commercial units and amenities on ground floors promoting pedestrian traffic. Further funds and plans will be expended aiming to improve the pedestrian experience through wayfinding, softening the landscaping and providing shade structures.

6.2 Walkable neighbourhood

The proposed development is located at a convenient walking distance to the Sorrento Activity Centre which hosts a range of shops, eateries, services, employment and amenities to residents, visitors and workers, with Hillary's Marina beach a mere 3 minute bus ride away. The development will also include private amenities for the residents such as pool, dining/lounge, games room and rest areas with an assortment of eateries at street level.

The development area offers picnic tables, barbecues, toilets, cafes and shaded rest areas including Geneff Park and Sorrento beach.

The close proximity to these amenities would reduce the need for residents to use private vehicles to utilise these facilities and land uses, this is further aided by the local convenience store on the BP site.

Figure 6.1 - Project location and neighbourhood.

6.3 Cyclist facilities

In Perth 48% of all car trips are less than 5 km distance. Cars produce an average of 0.3 kg of CO_2 per km travelled, whereas, a cyclist emits negligible greenhouse or other pollution. For each kilometre a person cycles instead of driving, approximately 0.3 kg of CO_2 are saved from being emitted to the environment. Furthermore, cycling will encourage an active and healthy lifestyle for the residents.

The development includes cycle storage facilities for the residents. Additional visitors bike racks may be provided outside the building.

6.4 Access to public transport

With its location in Sorrento, the proposed development is located in close proximity to public bus routes on west coast drive that go to Hillary's Marina Beach 1km away or a 25-30 minute ride to Stirling or warwick train station.The closest bus stop is just infront of the development site, therefore easily accessible by foot or bicycle, this accessible stop has high frequency buses available at peak hours at only 10 to 15 minute intervals.

6.5 Electric vehicles

The number of electric cars on the road grew to 3 million worldwide between 2016 and 2017. This is an expansion of 56%. With further expected exponential growth, the number of electric cars on the roads will reach between 125 and 220 million by 2030 according to the International Energy Agency (International Energy Agency, 2018).

The proposed development intents to support the uptake of low-emissions and electric vehicles. A number of car parking spots are planned to be dedicated to electric vehicles while 100% of the bays will be capable of the addition of electric charging infrastructure for future charging.

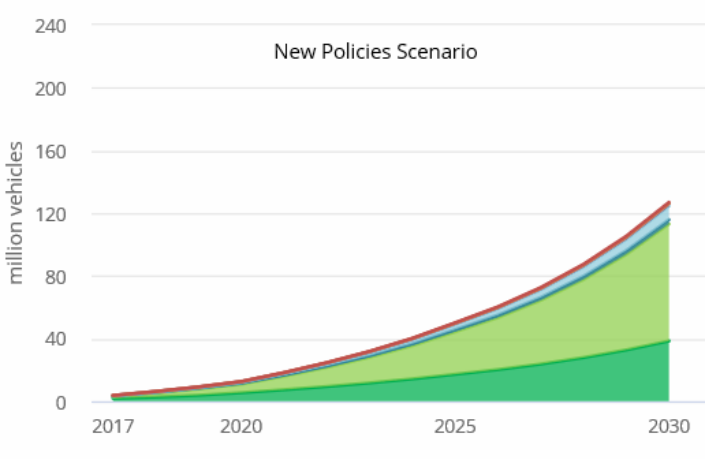

Figure 6.2 - Global Electric Vehicle Deployment by 2030

7.0 Waste management

The main objectives for the waste management strategies for construction and operational waste are to ensure that waste is avoided and recycled during design, construction and operation.

Waste within a building construction context can be avoided by encouraging the selection of lower-impact and long-term materials. Operational waste to landfill can be reduced by providing relevant and easily accessible facilities for recyclable waste and other waste that can be diverted from landfill such as organic waste, batteries or e-waste.

7.1 Design initiatives

The following table summarises the specific initiatives included in the design in relation to waste management:

Table 10 - Waste initiatives

Design Issue	Design initiative included in the Sorrento Activity Centre design	Benchmark	The Sorrento Activity Centre target
Construction waste management plan	The head contractor will have an Environmental Management Plan (EMP) and Environmental Management System (EMS) in place	Green Star Credit 7 – Responsible Production Practices: Best practice EMP to be developed; head contractor to be ISO 14001 certified	A best practice EMP including waste aspects will be developed and the head contractor will have an ISO 14001 certification in place
Construction waste	The amount of construction waste that is diverted from landfill will be maximised	Green Star Credit 22B – Construction and Demolition Waste: 90% of waste from construction to be diverted from landfill	Minimum 90% of waste from construction to be diverted from landfill
Operation waste management plan	Adequate facilities will be provided to store separate waste streams	Green Star Credit 8B – Operational Waste: Facilities to be in place to collect and separate waste streams and provide best practice access requirements for pick-up	Bin store is provided to cater for different waste streams. Good external and internal access to the storeroom to be provided
Access and storage for recycling and green waste	Recycling and organic/food waste are addressed in the operational waste concept	Green Star Credit 8B – Operational Waste: 3 Waste Streams must be served	Three waste streams will be collected and separated in the building including landfill and recycling waste. Composting/organic waste is considered as a waste stream as well. Further streams to be confirmed

7.2 Building materials and resource minimisation

In 2014-15 Australia produced the equivalent of 565 kg per capita of municipal waste and 831 kg of construction and demolition waste. While around 60% of this waste is recycled, a large part still goes to landfill (Pickin & Randell , 2017). A reduction of both construction and operational waste is therefore an important target for the development of Sorrento Activity Centre.

7.3 Waste management

A dedicated waste storage area will be provided for the separation and storage of recyclable waste during operation, allowing for the different waste streams to be separated to match the local recycling scheme. At least three streams will be covered including landfill, recycling and a third stream which may be organic/food waste.

Throughout project design, operation and construction, principles of resource recovery will be applied, so that materials and products are recovered and reused where possible, reducing landfill and saving money. Some strategies that will be investigated include:

- Innovative waste separation and collection strategies to allow materials to be isolated for reuse;
- A purchasing policy which aims to minimise waste from products and packaging, encourage the use of products which have minimum environmental impact; and
- Manufacturers and suppliers will be encouraged to take full responsibility for the life cycle impact of products including ownership at end of life.

7.4 Composting organic waste strategy

The development is exploring the possibility of recycling all forms of food and organic waste by identifying waste streams and incorporate a strategy that reduces food or organic waste going to landfills. Supporting schemes such as Kooda provides composting bins in a central location and then pick up the waste to produce compost.

Figure 7.1 - Sample composting scheme

7.5 Design for off-site construction

Prefabricated construction methods considered to be more energy and waste efficient because production processes can be better controlled and made more efficient in the factory than on site, for example. better machinery, less cut-offs, better reuse of materials, material cycles, etc.

8.0 Urban ecology

With continuously growing cities, urban ecology plays a large role in conserving biodiversity and improving life quality for urban residents. Well planned buildings and landscape architecture protects and enhances biodiversity, provides sustainable landscaping such as low water use, low fertiliser requirements and local native and indigenous plant species selection. If possible, remnant indigenous plant communities should be managed and protected.

8.1 Design initiatives

The following table summarises the specific initiatives included in the design in relation to urban ecology:

Table 11 - Urban ecology initiatives

Design Issue	Design initiative included the Sorrento Activity Centre design	Benchmark	Sorrento Activity Centre target
Maintaining / enhancing ecological value	Native vegetation is reintroduced to the site throughout the building and the development will maximise retention of existing significant trees	Green Star Credit 23.1 – Ecological Value: Site improvement by for example replacing hardscape with native vegetation	The vegetation, especially native vegetation will be maximised wherever possible throughout the development
Heat Island Effect Reduction	Use of vegetation/green spaces, pool and SRI approved roofing will actively reduce the heat island effect	Green Star Credit 25.1 – Heat Island Effect Reduction: 75% of site area reduces impact of heat island effect	A minimum of 75% compliance is targeted

8.2 Enhancing ecological value

The site location near the coast is largely parking spaces with few buildings and spotted with trees as seen in the aerial image of the site below (Figure 8.1 - Aerial Image of Sorrento Activity Centre site 2021).

The growing urban population fuels the raising demand for building structures with higher densities. The R development caters for these requirements by using the major part of the site as a building footprint. To still achieve a relatively high level of vegetation coverage on the site, landscaped areas are woven through the building design by placing trees and planters on most of the balconies and by generously sized planters, external greean areas can also be found outside the building itself.

Figure 8.1 - Aerial Image of Sorrento Activity Centre site 2021

Figure 8.2 - Illustration of the proposed vegetation coverage

8.3 Minimising heat island effect

The heat island effect describes the condition where urban areas have a higher average temperature than its rural surroundings owing to the make-up of the built environment. The use of light roof materials combined with shaded and landscaped areas can reduce the heat island effect significantly and contributes to further energy savings. The development includes roof gardens as well as landscaped ground floor to minimise the heat island effect.

Figure 8.3 - Design ideas included in the development – roof gardens, lighter coloured paving and landscaping

9.0 Innovation

Innovative technology, design and processes in all developments should be encouraged due to the positive influence on the sustainability of buildings.

The design will reduce its impact on the environment as far as possible and has optimised its sustainability credentials. However, further to this the development will maximise the health and wellbeing elements within the building. These principles are outlined in the table below.

9.1 Design initiatives

The following table summarises the specific initiatives included in the design in relation to innovation:

Table 12 - Innovation initiatives

Design Issue	Design initiative included in the Sorrento Activity Centre design	Benchmark	Sorrento Activity Centre target
VOCs in paints	The specification of the paints will ensure ultra-low VOCs are specified	50% of paints (by volume) specified in the building will have a maximum TVOC content of 5g/L	50% of paints (by volume) specified in the building will have a maximum TVOC content of 5g/L
Air leakage	The building will be designed and built with airtightness in mind and an airtightness test will be undertaken	Green Star Credit 2.2 – Commissioning: target 15 $m^3/h.m^2$ for air tightness	Target 5$m^3/h.m^2$ for air tightness for industry leading tightness. Depends on outcome of testing

9.2 Ultra-Low VOCs

Volatile organic compounds (VOCs) are emitted as gases from certain solids or liquids. VOCs include a variety of chemicals, some of which may have short- and long-term adverse health effects. Concentrations of many VOCs are consistently higher indoors than outdoors. VOCs are emitted by a wide array of products numbering in the thousands (typically paints and lacquers, paint strippers, cleaning supplies, pesticides, building materials and furnishings, office equipment such as copiers and printers).

The development will aim to specify materials with an ultra-low emissions content including ultra-low-VOC paints.

10.0 Construction / building management

Good construction and building management play an integral part in achieving best practice outcomes associated with building quality and long-livety and reduced resource consumption and greenhouse gas emissions. Good construction management also supports construction staff in their safety, health and wellbeing and their professional development. The building management must be made aware of sustainable practices and targets integrated in the building for a successfully operating building with a minimum carbon footprint and maximum resident's comfort.

10.1 Design initiatives

The following table summarises the specific initiatives included in the design in relation to construction management:

Table 13 - Construction management initiatives

Design Issue	Design initiative included in the Sorrento Activity Centre design	Benchmark	Sorrento Activity Centre target
Construction environmental management plan	A project specific environmental management plan (EMP) will be developed and implemented	Green Star Credit 7.0 – Environmental Management Plan: A best practice EMP to be developed and put in place.	A best practice project specific EMP will be developed and implemented.
Contractor has valid ISO 14001 accreditation	The head contractor will have a valid ISO 14001 accreditation	Green Star Credit 7.1 Formalised Environmental Management System: The head contractor has a formalised approach to ensure conformance with the EMP.	The head contractor will have a valid ISO 14001 accreditation
Building tuning	Above standard building tuning and commissioning will be undertaken	Green Star Credit 2 – Commissioning and Tuning: Ensure correct commissioning of services and building tuning for 12 months after Practical Completion	A commissioning plan will be developed and implemented. Tuning will be undertaken for 12 months after practical completion
Building user's guide	A Building user's guide will be provided to all relevant stakeholders	Green Star Credit 4.1 – Building Information: O&Ms and Building Log Book (reference directory on where to find building information, regularly updated) generated in accordance with standards	Comprehensive building information will be provided to all relevant stakeholders in line with Green Star requirements

10.2 Commissioning

Commissioning, handover and tuning practices will be implemented to ensure that all building services operate to their full potential and as they were designed.

A Service and Maintainability Report can be prepared based on a review of the following aspects of all building systems:

- Commissionability;
- Controllability;
- Maintainability;
- Operability; and
- Safety

Actions from this report can be incorporated into an owner's project requirements (OPR) document which will be prepared at the design stage of the project.

Pre- Commissioning and commissioning activities can ensure that the building systems function to their full potential and as intended in the design. A commissioning plan will assist the project team through the commissioning process.

Figure 10.1 - Example of airtightness testing

10.3 Air permeability performance testing

Part of the building commissioning is air permeability performance testing which investigates whether the building envelope has been sealed off in accordance to the architect's details. A well designed and constructed building envelope minimises uncontrolled air flows in and out the building and reduces the associated losses of heating and cooling energy.

10.4 Tuning

Building tuning will be undertaken for 12 months after Practical Completion. The tuning process will include data analysis from the building systems as well as feedback from building occupants. Operations and maintenance and a tuning manual will assist the tuning team to address any issues with the building systems that arise during the tuning period.

11.0 Codes and Ratings

The building will be subject to voluntary and mandatory building codes and metrics to measure the performance of the rating. This section of the report outlines the main codes and ratings and identifies the project's response.

11.1 National Construction Code – Section J 2019

The development is required to comply with the National Construction Code (NCC) Section J 2019 for Energy Efficiency. NCC Section J covers items including:

- Building fabric;
- External glazing;
- Building sealing;
- Air movement;
- Air conditioning;
- Artificial lighting and power;
- Hot water supply;
- Access to maintenance.

11.2 NatHERS

Residential building compliance is achieved through a thermal modelling process defined as the Nationwide House Energy Rating Scheme (NatHERS). This process requires a minimum star rating to be achieved for the building's thermal comfort, which informs the energy efficiency of the building.

The Nationwide House Energy Rating Scheme (NatHERS) is a tool to assess residential dwellings' energy usage. For a multi-residential project such as Sorrento Activity Centre, every apartment/room is investigated as a separate unit with its own rating before an overall average rating is calculated. The NatHERS tool considers a wide range of parameters like orientation, glazing, insulation, size of rooms and door openings, shading and awnings and ceiling fans.

The National Construction Code (NCC) requires a minimum of a 5 Star NatHERS rating for the worst-performing apartment in the complex and an overall average NatHERS rating of 6 Stars. The proposed development is designed to exceed these requirements, reducing the building's average energy consumption by approximately 46%.

The proposed development is located at NatHERS Climate Zone 52 (Carine).

Table 11.1 - NatHERS target

	Minimum NCC Requirement	Target for the proposed development
Worst case NatHERS rating	5 Stars	5.5 Stars
Overall average NatHERS rating	6 Stars	7 Stars
Estimated Average Energy Usage	70 MJ/m^2	28 MJ/m^2 (40% reduction)

11.3 Green Star

The development is being designed to fulfil all requirements in terms of Ecologically Sustainable Design (ESD) and is aiming to achieve an Uncertified 5-star Green Star Design and As-Built v1.3 rating. Green Star is a comprehensive sustainability design tool that assesses the environmental impact of a building over a range of environmental indicators, from management and ecology to energy and water use, material selection and waste production.

A 5-star Green Star benchmark rating requires a total of 60 points to be achieved in the aforementioned categories. Sufficient weighted credits have been selected to achieve this requirement rating, and further opportunities will be pursued during the design stages of the project.

Based on the proposed design response, the predicted performance in each respective environmental category is tabulated in ***Appendix A***. The sustainability strategy of this development demonstrates how the development is proposing to achieve the 5-star Green Star benchmark rating.

Table 11.2 - Green Star target

Total available points	Minimum points required for 5-star rating	Target for the proposed development
110 Points	60 Points	**66 Points** **(5-star with approx. 10% buffer)**

12.0 References

Australian Bureau of Statistics. (2017). *4610.0 - Water Account, Australia 2015-16*. Retrieved 10 05, 2018, from http://www.abs.gov.au/ausstats/abs@.nsf/Latestproducts/4610.0Main%20Features32015-16?opendocument&tabname=Summary&prodno=4610.0&issue=2015-16&num=&view=

GHD, Canning Bridge Structure Plan Project Working Group. (2016). *Canning Bridge Activity Centre Plan.* Booragoon/South Perth: City of Melville, City of South Perth, Government of Western Australia.

International Energy Agency. (2018). *Global EV Outlook 2018*. (International Energy Agency) Retrieved 10 05, 2018, from https://www.iea.org/gevo2018/

Pickin, J., & Randell , P. (2017). *Australian National Waste Report 2016.* Docklands, Vic 3008: Department of the Environment and Energy and Blue Environment Pty Ltd.

Appendix A Green Star strategy

Green Star - Design & As Built Scorecard

Project:	1031937 - Sorrento Activity Centre	Round:	1
Targeted Rating:	5 Star - Australian Excellence		

Core Points Available	Total Score Targeted
98	66

CATEGORY / CREDIT	AIM OF THE CREDIT / SELECTION	CODE	CREDIT CRITERIA		POINTS AVAILABLE	POINTS TARGETED
Management					14	
Green Star Accredited Professional	To recognise the appointment and active involvement of a Green Star Accredited Professional in order to ensure that the rating tool is applied effectively and as intended.	1.1	Accredited Professional		1	1
Commissioning and Tuning	To encourage and recognise commissioning, handover and tuning initiatives that ensure all building services operate to their full potential.	2.0	Environmental Performance Targets		-	Complies
		2.1	Services and Maintainability Review		1	1
		2.2	Building Commissioning		1	1
		2.3	Building Systems Tuning		1	1
		2.4	Independent Commissioning Agent		1	
Adaptation and Resilience	To encourage and recognise projects that are resilient to the impacts of a changing climate and natural disasters.	3.1	Implementation of a Climate Adaptation Plan		2	2
Building Information	To recognise the development and provision of building information that facilitates understanding of a building's systems, operation and maintenance requirements, and environmental targets to enable the optimised performance.	4.1	Building Information		1	1
Commitment to Performance	To recognise practices that encourage building owners, building occupants and facilities management teams to set targets and monitor environmental performance in a collaborative way.	5.1	Environmental Building Performance		1	1
		5.2	End of Life Waste Performance	A. Contractual Agreements	1	1
Metering and Monitoring	To recognise the implementation of effective energy and water metering and monitoring systems.	6.0	Metering		-	Complies
		6.1	Monitoring Systems		1	1
Responsible Construction Practices	To reward projects that use best practice formal environmental management procedures during construction.	7.0	Environmental Management Plan		-	Complies
		7.1	Environmental Management System		1	1
		7.2	High Quality Staff Support		1	1
Operational Waste	B. Prescriptive Pathway	8A	Performance Pathway: Specialist Plan		0	
		8B	Prescriptive Pathway: Facilities		1	1
Total					14	13

Indoor Environment Quality					16	
Indoor Air Quality	To recognise projects that provide high air quality to occupants.	9.1	Ventilation System Attributes		1	1
		9.2	Provision of Outdoor Air	☑ A. Comparison to Industry Standards ☑ B. Performance Based Approach ☐ C. Natural Ventilation	2	1
		9.3	Exhaust or Elimination of Pollutants	☑ A. Removing the Source of Pollutants ☑ B. Exhausting the Pollutants Directly to the Outside	1	1
Acoustic Comfort	To reward projects that provide appropriate and comfortable acoustic conditions for occupants.	10.1	Internal Noise Levels		1	1
		10.2	Reverberation		0	
		10.3	Acoustic Separation	C. Residential Projects	1	1
Lighting Comfort	To encourage and recognise well-lit spaces that provide a high degree of comfort to users.	11.0	Minimum Lighting Comfort		-	Complies
		11.1 General Illuminance and Glare Reduction	11.1.1 General Illuminance	☐ A. Non Residential Spaces ☑ B. Residential Spaces	1	1
			11.1.2 Glare Reduction	☑ A. Prescriptive Method 1 ☑ B. Prescriptive Method 2 ☑ C. Performance Method		
		11.2	Surface Illuminance	☐ A. Prescriptive Method ☐ B. Performance Method ☑ C. Residential Spaces (Prescriptive Method)	1	1

		11.3	Localised Lighting Control		1	1
Visual Comfort	To recognise the delivery of well-lit spaces that provide high levels of visual comfort to building occupants.	12.0	Glare Reduction	☐ A. Fixed Shading Devices ☑ B. Blinds or Screens ☐ C. Daylight Glare Model	-	Complies
		12.1	Daylight	☐ A. Prescriptive Methodology ☑ B. Compliance Using Daylight Factor ☐ C. Compliance Using Daylight Autonomy	2	2
		12.2	Views		1	1
Indoor Pollutants	To recognise projects that safeguard occupant health through the reduction in internal air pollutant levels.	13.1 Paints, Adhesives, Sealants and Carpets	13.1.1 Paints, Adhesives and Sealants	☑ A. Product Certification ☑ B. Laboratory Testing ☐ C. No Paints, Adhesives or Sealants	1	1
			13.1.2 Carpets	☑ A. Product Certification ☑ B. Laboratory Testing ☐ C. No Carpets		
		13.2	Engineered Wood Products	☑ A. Product Certification ☑ B. Laboratory Testing	1	1
Thermal Comfort	To encourage and recognise projects that achieve high levels of thermal comfort.	14.1	Thermal Comfort	☐ A. Naturally Ventilated Spaces ☐ B. Mechanically Ventilated Spaces ☑ C. Residential Spaces	1	1
		14.2	Advanced Thermal Comfort	☐ A. Naturally Ventilated Spaces ☐ B. Mechanically Ventilated Spaces ☐ C. Residential Spaces	1	
Total					**16**	**14**

Energy					**22**	
Greenhouse Gas Emissions	B. NatHERS Rating Pathway	15A.0	Conditional Requirement: Prescriptive Pathway		-	Does not comply
		15A.1	Building Envelope		0	
		15A.2	Wall-Glazing Construction and Retail Display Glazing		0	
		15A.3	Lighting		0	
		15A.4	Ventilation and Air Conditioning		0	
		15A.5	Domestic Hot Water		0	
		15A.6	Transition Plan		0	
		15A.7	Fuel Switching		0	
		15A.8	On-Site Storage		0	
		15A.9	Vertical Transportation		0	
		15A.10	Off-Site Renewables		0	
		15B.0	Conditional Requirement: NatHERS Pathway		-	Complies
		15B.1	Thermal and Energy Performance		6	3
		15B.2 Building Services and Appliances	15B.2.1 Lighting		1	1
			15B.2.2 Ventilation and Air Conditioning	☑ A. Mechanically Conditioned Spaces ☐ B. Spaces With Mechanical Heating Only ☐ C. Naturally Ventilated Spaces	2	2
			15B.2.3 Domestic Hot Water		2	
			15B.2.4 Appliances & Equipment		1	
			15B.2.5 Fuel Switching		1	
			15B.2.6 On-Site Storage		1	
			15B.2.7 Vertical Transportation		1	
			15B.2.8 Passive Laundry Facilities		1	1
			15B.2.9 Unoccupied Areas		1	
			15B.2.10 Off-Site Renewables		5	
		15C.0	Conditional Requirement: BASIX Pathway		-	
		15C.1	BASIX Greenhouse Gas Reductions		0	
		15C.2	Off-Site Renewables		0	
		15D.0	Conditional Requirement: NABERS Pathway		-	
		15D.1	NABERS Energy Greenhouse Gas Emissions Reduction		0	
		15D.2	Off-Site Renewables		0	
		15D Additional Prescriptive	15D.3.1 Transition Plan		0	
			15D.3.2 Fuel Switching		0	
			15D.3.3 On-Site Storage		0	
		15E.0	Conditional Requirement: Reference Building Pathway		-	
		15E.1	GHG Emissions Reduction: Building Fabric		0	
		15E.2	GHG Emissions Reduction		0	
		15E.3	Off-Site Renewables		0	
		15E.4	District Services		0	
		15E.5 Additional Prescriptive	15E.5.1 Transition Plan		0	
			15E.5.2 Fuel Switching		0	
			15E.5.3 On-Site Storage		0	
Peak Electricity Demand Reduction	B. Performance Pathway	16A	Prescriptive Pathway: On-Site Energy Generation		0	
		16B	Modelled Performance Pathway: Reference Building		2	1
Total					**18**	**8**

Transport						
					10	
Sustainable Transport	B. Prescriptive Pathway	17A	Performance Pathway		0	
		17B.1	Access by Public Transport		3	1
		17B.2	Reduced Car Parking Provision		1	
		17B.3	Low Emission Vehicle Infrastucture	B. Parking for Electric Vehicles	1	1
		17B.4	Active Transport Facilities		1	1
		17B.5	Walkable Neighbourhoods	A. Proximity to Amenities	1	1
Total					7	4

Water						
					12	
Potable Water	B. Prescriptive Pathway	18A	Potable Water - Performance Pathway		0	
		18B.1	Sanitary Fixture Efficiency		1	1
		18B.2	Rainwater Reuse		1	
		18B.3	Heat Rejection		2	2
		18B.4	Landscape Irrigation		1	1
		18B.5	Fire Protection System Test Water		1	1
Total					6	5

Materials						
					14	
Life Cycle Impacts	A. Performance Pathway - Life Cycle Assessment	19A.1	Comparative Life Cycle Assessment		6	3
		19A.2	Additional Reporting	☑ A. Additional Life Cycle Impact Reporting ☐ B. Material Selection Improvement ☐ C. Construction Process Improvement ☐ D. LCA Design Review	4	1
		19B.1 Concrete	19B.1.1 Portland Cement Reduction		0	
			19B.1.2 Water Reduction		0	
			19B.1.3 Aggregates Reduction	A. Course Aggregate Reduction	0	
		19B.2 Steel	A. Reduced Mass of Steel Framing	A. High Strength Steel	0	
		19B.3	Building Reuse	19B.3.1 Façade Reuse	0	
				19B.3.2 Structure Reuse	0	
		19B.4	Structural Timber	19B.4.0 Responsible Sourcing	-	
				19B.4.1 Reduced Embodied Impacts	0	
Responsible Building Materials	To reward projects that include materials that are responsibly sourced or have a sustainable supply chain.	20.1	Structural and Reinforcing Steel	20.1.0 Responsible Steel Maker	-	Complies
				B. Energy-Reducing Processes in Steel Reinforcement Production	1	1
		20.2	Timber	☑ A. Certified Timber ☐ B. Reused Timber	1	1
		20.3	Permanent Formwork, Pipes, Flooring, Blinds and Cables	B. Best Practice Guidelines for PVC	1	1
Sustainable Products	To encourage sustainability and transparency in product specification.	21.1	Product Transparency and Sustainability	☑ A. Reused Products ☑ B. Recycled Content Products ☑ C. Environmental Product Declarations (EPDs) ☑ D. Third Party Certification ☑ E. Stewardship Programs	3	1
Construction and Demolition Waste	B. Percentage Benchmark	22.0	Reporting Accuracy	A. Compliance Verification Summary	-	Complies
		22A	Fixed Benchmark		0	
		22B	Percentage Benchmark		1	1
Total					14	9

Land Use & Ecology						
					5	
Ecological Value	To reward projects that improve the ecological value of their site.	23.0	Endangered, Threatened or Vulnerable Species	A. EPBC	-	Complies
		23.1	Ecological Value		3	

Sustainable Sites	To reward projects that choose to develop sites that have limited ecological value, re-use previously developed land and remediate contaminate land.	24.0	Conditional Requirement		-	Complies
		24.1	Reuse of Land	A. Previously Developed Land	1	
		24.2	Contamination and Hazardous Materials	☐ A. Site Contamination ☐ B. Hazardous Materials	0	
Heat Island Effect	To encourage and recognise projects that reduce the contribution of the project site to the heat island effect.	25.1	Heat Island Effect Reduction		1	1
Total					**5**	**1**

Emissions					**5**	
Stormwater	To reward projects that minimise peak stormwater flows and reduce pollutants entering public sewer infrastructure.	26.1	Stormwater Peak Discharge		1	1
		26.2	Stormwater Pollution Targets		1	1
Light Pollution	To reward projects that minimise light pollution.	27.0	Light Pollution to Neighbouring Bodies		-	Complies
		27.1	Light Pollution to Night Sky	A. Control of Upward Light Output Ratio (ULOR)	1	1
Microbial Control	To recognise projects that implement systems to minimise the impacts associated with harmful microbes in building systems.	28	Legionella Impacts from Cooling Systems	B. Waterless Heat Rejection Systems	1	1
Refrigerant Impacts	To encourage operational practices that minimise the environmental impacts of refrigeration equipment.	29.1	Refrigerants Impacts	A. Calculating TSDEI	1	
Total					**5**	**4**

Innovation					**10**	
Innovative Technology or Process	The project meets the aims of an existing credit using a technology or process that is considered innovative in Australia or the world.	30A	Innovative Technology or Process		10	
Market Transformation	The project has undertaken a sustainability initiative that substantially contributes to the broader market transformation towards sustainable development in Australia	30B	Market Transformation			
Improving on Green Star Benchmarks	The project has achieved full points in a Green Star credit and demonstrates a substantial improvement on the benchmark required to achieve full points.	30C	Improving on Green Star Benchmarks			2
Innovation Challenge	Where the project addresses an sustainability issue not included within any of the Credits in the existing Green Star rating tools.	30D	Innovation Challenge			4
Global Sustainability	Project teams may adopt an approved credit from a Global Green Building Rating tool that addresses a sustainability issue that is currently outside the scope of this Green Star	30E	Global Sustainability			1
Total					**10**	**7**

TOTALS	AVAILABLE	TARGETED
CORE POINTS	98	58.0
CATEGORY PERCENTAGE SCORE		59.2
INNOVATION POINTS	10	7.0
TOTAL SCORE TARGETED		66.2

Appendix B List of reference documents

Table B.1 - Drawings and models used for developing the analysis

Drawing Number / File name	Drawing Title	Revision	Date Issued
1.01	General Arrangement Ground Floor	-	22.05.2022
1.02	General Arrangement Mezzannine Floor	-	22.05.2022
1.03	General Arrangement Level 1	-	22.05.2022
1.04	General Arrangement Level 2	-	22.05.2022
1.05	General Arrangement Level 3	-	22.05.2022
1.06	General Arrangement Level 4	-	22.05.2022
1.07	General Arrangement Level 5	-	22.05.2022
1.08	General Arrangement Level 6	-	22.05.2022
1.09	General Arrangement Level 7	-	22.05.2022
1.10	General Arrangement Roof	-	22.05.2022

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