

# **ENVIRONMENTALLY SUSTAINABLE DESIGN REPORT**

APPENDIX M



# Sydney Metro City & Southwest: Crows Nest Over Station Development

Environmentally Sustainable Design (ESD) Report

<b>Applicable to:</b>	Sydney Metro City & Southwest
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Changes made to this document since its last revision, which affect its scope or sense, are marked in the right margin by a vertical bar ( | ).

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## Executive Summary

An Environmental Impact Statement (EIS) was prepared for the proposed Over Station Development (OSD) at Crows Nest Station. An Ecological Sustainability Development (ESD) Report was prepared for Sydney Metro (EIS Appendix X version P08 dated November 2018). Since exhibition, the design of the OSD has responded to issues raised in the submissions. The purpose of this report is to identify those changes in the Amended OSD Scheme and assess the impacts of changes on the ESD strategy.

This Ecological Sustainability Development (ESD) Report outlines the sustainability requirements and targets relevant for the Crows Nest Over Station Development (OSD) for the amended State Significant Development Application (SSD Application).

The main objective of this report is to confirm design compliance with the relevant regulations and to provide guidance on various sustainability initiatives that the project will seek to incorporate through its design development.

Findings presented in this report support the amended SSD Application Response to Submissions Report submitted to the Department of Planning, Industry and Environment (DPIE), and demonstrates adherence to the following documents:

- Secretary's Environmental Assessment Requirements dated 26 September 2018
- *Environmental Planning and Assessment Act 1979*
- *Sydney Metro City & Southwest Sustainability Strategy 2017*
- *North Sydney Development Control Plan 2013, as amended 15 March 2018*
- *National Construction Code - Building Code of Australia 2019*
- *Building Sustainability Index*
- *National Australian Built Environment Rating System*
- *Green Star Design & As-Built v1.2*

The ESD framework summary combines all applicable initiatives and targets set within the following categories:

- Energy Efficiency
- Water
- Waste
- Materials
- Indoor Environment Quality
- Transport
- Ecology, Biodiversity, Land Use
- Emissions
- Climate Change Resilience

The following sustainability targets based on chosen rating tools are being pursued, and will be confirmed at detailed design stage:

**Table 1** Sustainability targets based on chosen rating tools

ESD Category	Sustainability targets		
	Site A - Commercial	Site B - Residential	Site C - Commercial
Energy	NABERS Energy <b>5 stars</b>	BASIX: <b>40%</b> GHG emission reduction NatHERS: <b>6 stars</b>	NABERS Energy <b>5 stars</b>
Water	NABERS Water <b>4 stars</b>	BASIX: <b>40%</b> water consumption reduction	NABERS Water <b>4 stars</b>
Management	Green Star <b>5 Star</b> Design and As Built v1.2	Green Star <b>5 Star</b> Design and As Built v1.2	Green Star <b>5 Star</b> Design and As Built v1.2
Indoor Environment			
Material			
Transport			
Land Use and Ecology			
Emissions			
Innovation			

## 1.0 Introduction

### 1.1 Purpose of this report

This report supports the Response to Submissions Report (Submissions Report) for the concept State Significant Development application (concept SSD Application) submitted to the Department of Planning, Industry and Environment (DPIE) pursuant to Part 4 of the Environmental Planning and Assessment Act 1979 (EP&A Act). The concept SSD Application is made under Section 4.22 of the EP&A Act.

Sydney Metro is seeking to secure concept approval for a mixed use development comprising three buildings above the Crows Nest Station, otherwise known as the over station development (OSD). The concept SSD Application seeks consent for building envelopes and land uses, maximum building heights, maximum gross floor areas, pedestrian and vehicular access, circulation arrangements and associated car parking and the strategies and design parameters for the future detailed design of the development.

The station and public domain elements form part of a separate planning approval for Critical State Significant Infrastructure (CSSI) approved by DPIE on 9 January 2017.

As the development is within a rail corridor, is associated with railway infrastructure and is for commercial premises and residential accommodation with a Capital Investment Value of more than \$30 million, the project is identified as State Significant Development (SSD) pursuant to Schedule 1, 19(2)(a) of the State Environmental Planning Policy (State and Regional Development) 2011 (SRD SEPP). The development is, therefore, State significant development for the purposes of Section 4.36 of the EP&A Act.

A Environmentally Sustainable Design Report (2018) was prepared as Appendix M of the Environmental Impact Statement for the concept SSD Application to specifically respond to the Secretary's Environmental Assessment Requirements (SEARs) issued on 26 September 2018. Following Exhibition of the Environmental Impact Statement, the design of the OSD has responded to issues raised in submissions. The purpose of this report is to identify those changes in the Amended OSD Scheme and to assess the impacts of changes with regards to Environmentally Sustainable Design.

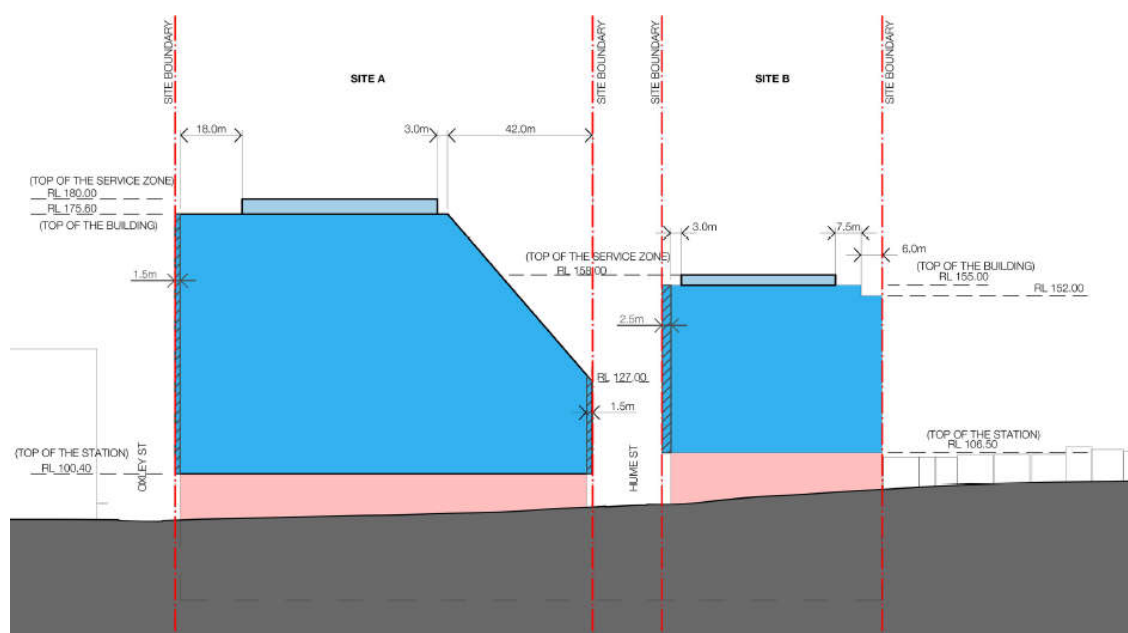
### 1.2 Changes between the Exhibited Scheme and Amended Scheme

In response to the submissions made on the Exhibited Scheme, the following changes have been made to the concept SSD Application under what is termed the Amended Scheme:

- Changes to the building envelope
- Changes in proposed land use on each site
- Reduction in car parking numbers
- Inclusion of an articulation zone
- Clarification on the provision of social infrastructure

- Amendments to the Design Guidelines

These changes are described in further detail in Chapter 7 of the Submissions Report. The western elevation of the Amended Scheme is shown below, with a summary of the changes between the Exhibited Scheme and Amended Scheme provided in the table below.



**Figure 1 – West elevation of the building envelope under the Amended Scheme, showing CSSI Approval (pink) and OSD components (blue)**

**Table 2 - Changes to overall concept scheme per site under the Exhibited Scheme and Amended Scheme (excluding station GFA)**

	Exhibited Scheme <sup>1</sup>	Amended Scheme <sup>1</sup>
<b>Site A</b>		
Land Use	Residential <sup>2</sup>	Commercial
GFA	37,500m <sup>2</sup>	40,207m <sup>2</sup>
Max height – top of roof (RL)	183	175.6
Max height – top of services zone (RL)	188	180
FSR - OSD	9.67:1	10.4:1
Non-residential FSR - OSD	0.7:1	10.4:1
Car parking	125	46
<b>Site B</b>		



	Exhibited Scheme <sup>1</sup>	Amended Scheme <sup>1</sup>
Land Use	Tourist / visitor accommodation	Residential
Max height – top of roof (RL)	155	155
Max height – top of services zone (RL)	158	158
GFA	15,200m <sup>2</sup>	12,685m <sup>2</sup>
FSR - OSD	8.12:1	6.8:1
Non-residential FSR - OSD	8.12:1	0.1:1
Car parking	25	55
<b>Site C</b>		
Land Use	Commercial <sup>2</sup>	Commercial
Max height – top of roof (RL)	127	127
Max height – top of services zone (RL)	132	132
GFA	2,700m <sup>2</sup>	3,031m <sup>2</sup>
FSR – OSD	4.44:1	4.9:1
Non-residential FSR - OSD	4.44:1	4.9:1
Car parking	0	0

<sup>1</sup> GFA figures exclude GFA attributable to the station and station retail space approved under the CSSI approval

<sup>2</sup> The Exhibited Scheme included a provisional option for social infrastructure GFA to be located on Site A or Site C inclusive of the GFA figures nominated above.

The revised concept SSD Application (SSD-9579) under the Amended Scheme seeks approval for the following:

- Maximum building envelopes for Sites A, B and C, including street wall heights and setbacks as illustrated in the plans prepared by Crows Nest Design Consortium for Sydney Metro at Appendix A to the Submissions Report
- Maximum building heights:
  - **Site A:** RL 175.60 metres or equivalent of 21 storeys (includes two station levels and conceptual OSD space in the podium approved under the CSSI Approval)
  - **Site B:** RL 155 metres or equivalent of 17 storeys (includes two station levels and conceptual OSD space approved under the CSSI Approval)
  - **Site C:** RL 127 metres or 9 storeys (includes two station levels and conceptual OSD space approved under the CSSI Approval)

**Note 1:** the maximum building heights defined above are measured to the top of the roof slab and exclude building parapets which will be resolved as part of future detailed SSD

Application(s)

- Maximum height for a building services zone on top of each building to accommodate lift overruns, rooftop plant and services:
  - **Site A:** RL 180 or 4.4 metres
  - **Site B:** RL 158 or 3 metres
  - **Site C:** RL 132 or 5 metres.

**Note 1:** the use of the space within the building services zone is restricted to non-habitable floor space.

**Note 2:** for the purposes of the concept SSD Application, the maximum height of the building envelope does not make provision for the following items, which will be resolved as part of the future detailed SSD Application(s):

- Communication devices, antennae, satellite dishes, masts, flagpoles, chimneys, flues and the like, which are excluded from the calculation of building height pursuant to the standard definition in NSLEP 2013
- Architectural roof features, which are subject to compliance with the provisions in Clause 5.6 of NSLEP 2013, and may exceed the maximum building height, subject to development consent.
- Maximum gross floor area (GFA) of 56,400 square metres for the OSD comprising the following based on the proposed land uses:
  - **Site A:** Commercial office premises - maximum 40,300 square metres
  - **Site B:** Residential accommodation - maximum of 13,000 square metres
  - **Site C:** Commercial office premises - maximum of 3,100 square metres

**Note:** GFA figures exclude GFA attributed to the station and station retail space approved under the CSSI Approval

- A minimum non-residential floor space ratio (FSR) for the OSD across combined Sites A, B and C of 43,505 square metres
- The use of approximate conceptual areas associated with the OSD which have been provisioned for in the Crows Nest station box (CSSI Approval) including areas above ground level (i.e. OSD lobbies and associated spaces)
- A maximum of 101 car parking spaces on Sites A and B associated with the proposed commercial and residential uses
- Modulation and expression of built forms within an articulation zone extending to the property boundary

- Loading, vehicular and pedestrian access arrangements
- Strategies for utilities and services provision
- Strategies for managing stormwater and drainage
- A strategy for the achievement of ecological sustainable development
- A public art strategy
- Indicative signage zones
- A design excellence framework
- The future subdivision of parts of the OSD footprint, if required.

## 2.0 Policy and Legislation

This report addresses the principles of ecologically sustainable development as detailed in the Secretary's Environmental Assessment Requirements issued for the SSD Application on 26 September 2018.

### 2.1 Secretary's Environmental Assessment Requirements

The Secretary's Environmental Assessment Requirements (SEARs) issued for the SSD Application on 26 September 2018 states that the Environmental Impact Statement (EIS) is to address the following:

- (13) Ecologically Sustainable Development

The EIS shall identify how ESD principles (as defined in *clause 7(4) Schedule 2 of the EP&A Regulation 2000*) will be incorporated in the design and operation of the development, including commitments to relevant industry benchmarks and best practice in waste and water management strategy.

- Plans and Documents

The EIS must include the ESD statement incorporating a sustainability framework.

### 2.2 Environmental Planning and Assessment Act

In Schedule 2 of the EP&A Regulation, section (7), clause (1)(f) requires that an EIS:

- Must include the reasons justifying the carrying out of the development in the manner proposed, having regard to biophysical, economic and social considerations, including the principles of ecologically sustainable development set out in subclause (4).

The EP&A Regulation ecologically sustainable development (ESD) Principles will be addressed as per approach summarised in Table 3:

**Table 3** The EP&A Regulations Approach

The principles of ESD	Approach
a) <b>The precautionary principle</b> , namely, that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation. In the application of the precautionary principle,	<ul style="list-style-type: none"> <li>• The construction industry is a leading contributor to greenhouse gas emissions causing potential damage to the environment. In order to minimise the development's impact, a series of sustainability impact assessments will be undertaken for each OSD component, including the incorporation of best practice strategies related to building systems, transportation, water use, construction, materials and waste management.</li> </ul>

The principles of ESD	Approach
<p>public and private decisions should be guided by:</p> <ul style="list-style-type: none"> <li>(i) Careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment, and</li> <li>(ii) An assessment of the risk-weighted consequences of various options.</li> </ul>	<ul style="list-style-type: none"> <li>• The entire development will comply with NCC Section J Energy Efficiency requirements, reducing energy usage and thus greenhouse gas emissions.</li> <li>• Green Star Design and As Built rating tool requirements will be incorporated to improve a project's sustainability performance aiming for 5 Star rating for the Residential building and 5 Star for the Commercial buildings.</li> <li>• The Commercial buildings will be also subjected to NABERS Energy and Water ratings promoting energy and greenhouse efficiency during their operational stage, ensuring continuous attention to minimisation of carbon emissions and energy consumption.</li> <li>• The Residential building will adhere to the requirements of BASIX ensuring the buildings will minimise the consumption of energy and water usage.</li> </ul>
<p>b) <b>Inter-generational equity</b>, namely, that the present generation should ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations</p>	<ul style="list-style-type: none"> <li>• The OSD development intends to meet the needs of the present without compromising the ability of future generations through the incorporation of sustainable development initiatives in the design and execution process, and in demonstrating the achievement of a specific level of sustainability within the Green Star Design and As Built rating tool. Many of the Green Star credits aim to maintain or enhance the environmental project outcome including responsible building materials, sustainable products, and recycled materials.</li> </ul>
<p>c) <b>Conservation of biological diversity and ecological integrity</b>, namely, that conservation of biological diversity and ecological integrity should be a fundamental consideration</p>	<ul style="list-style-type: none"> <li>• The OSD is located on previously developed sites covered by impervious surfaces. Incorporation of green roofs into the design will be considered to enhance ecological value and provide biodiversity and ecological integrity.</li> </ul>
<p>d) <b>Improved valuation, pricing and incentive mechanisms</b>, namely, that environmental factors should be included in the valuation of assets and services, such as:</p> <ul style="list-style-type: none"> <li>(i) Polluter pays, that is, those who generate pollution and waste should bear the cost of containment, avoidance or abatement, and</li> <li>(ii) The users of goods and services should pay prices based on the full life cycle of costs of providing goods</li> </ul>	<ul style="list-style-type: none"> <li>• The OSD development aims to comply with the Green Star Material category requirements, ensuring sustainable materials are selected for the development. Materials cost and environmental benefits will be analysed, choosing most sustainable products e.g. materials with recycled content, third-party certified materials.</li> <li>• Integrated project decision making and assessment of major building components and systems to maximise sustainable outcomes will create long-term value for building owners, occupants and other stakeholders.</li> <li>• Targeted sustainability performance will have an influence on the initial capital investment cost but can result in increased asset value, improving the</li> </ul>

The principles of ESD	Approach
<p>and services, including the use of natural resources and assets and the ultimate disposal of any waste,</p> <p>(iii) Cost-effective way, by establishing incentive structures, including market mechanisms, that enable those best placed to maximise benefits or minimise costs to develop their own solutions and responses to environmental problems.</p>	<p>development's overall environmental life cycle performance.</p>

### 3.0 Relevant Standards and Guidelines

A selection of specific objectives and guidelines is provided to facilitate incorporation of the best sustainability initiatives into the design of the Crows Nest OSD. A comprehensive approach is proposed in order to address the following:

- *Sydney Metro City & Southwest Sustainability Requirements 2017* (SMCSSR)
- *North Sydney Development Control Plan 2013*, as amended 15 March 2018 (DCP)

### 3.1 Sydney Metro City & Southwest Sustainability Strategy 2017

The Sydney Metro City & Southwest Sustainability Strategy document outlines performance targets, initiatives and outcomes which will be adopted across key policy areas in the design, construction and operational stages of Sydney Metro Projects.

The following table lists the Sustainability Objectives and OSD Provisions that have been developed for Sydney Metro projects. These Sustainability Objectives are to be adopted and incorporated in the Sydney Metro City & Southwest developments including OSD developments where relevant.

Many of the Provisions outlined below can be adopted for the Crows Nest OSD design and will be further analysed, developed and implemented in detailed design and contract documentation.

**Table 4** Sydney Metro City & Southwest Sustainability Strategy 2017 Sustainability Objectives and OSD Provisions

Theme	Objective	Relevant OSD Provisions for the proposed design
<b>Governance</b>	Demonstrate a high level of performance against objectives and appropriate benchmarks.	<ul style="list-style-type: none"> <li>• Suitable sustainability rating requirements are incorporated into the design boosting the building's performance, environmental outcomes and demonstrating leadership. Information on achieved sustainability goals will be publicly available through the GBCA Green Star project directory</li> </ul>
	Demonstrate leadership by embedding sustainability objectives into decision making.	
	Be accountable and report publicly on performance	
<b>Carbon &amp; Energy Management</b>	Improve the shift toward lower carbon transport	<ul style="list-style-type: none"> <li>• Bicycle parking is incorporated into the design to encourage healthier active transport options and the shift towards lower carbon transport</li> </ul>
	Reduce energy use and carbon emissions during construction	<ul style="list-style-type: none"> <li>• Greenhouse gas emissions generated during construction will be reduced due to adoption of</li> </ul>

Theme	Objective	Relevant OSD Provisions for the proposed design
		numerous sustainability rating tool requirements
	Reduce energy use and carbon emissions during operations	<ul style="list-style-type: none"> <li>Energy efficient lighting, heating, ventilation and cooling</li> <li>Incorporating passive design measures to minimise energy consumption</li> </ul>
	Support innovative and cost-effective approaches to energy efficiency, low-carbon / renewable energy sources and energy procurement	<ul style="list-style-type: none"> <li>Renewable energy generation to be considered for the design (photovoltaics)</li> </ul>
<b>Environmental Performance</b>	Reduce sources of pollution and optimise control at source to avoid environmental harm	<ul style="list-style-type: none"> <li>Construction environmental management plan to be executed during construction, in accordance with the planning approval and sustainability rating tool (Green Star)</li> </ul>
	Comply with environmental obligations outlined in applicable project planning approvals	
<b>Climate Change Resilience</b>	Infrastructure and operations will be resilient to the impacts of climate change	<ul style="list-style-type: none"> <li>Climate Adaptation Plan together with proposed mitigation measures to be included in the building design</li> </ul>
<b>Resources – Water Efficiency</b>	Minimise use of potable water	<ul style="list-style-type: none"> <li>Water-efficient fittings and fixtures to be included within the design</li> </ul>
	Maximise opportunities for reuse of rainwater, stormwater, wastewater and groundwater.	<ul style="list-style-type: none"> <li>Rainwater tanks to be incorporated in the design for harvesting and reuse where feasible</li> </ul>
<b>Resources – Waste &amp; Materials</b>	Minimise waste through the project lifecycle	<ul style="list-style-type: none"> <li>Waste Management Plan to be incorporated during construction and operation phase</li> </ul>
	Reduce materials consumption	<ul style="list-style-type: none"> <li>Adopting Reduce, Reuse, Recycle rule through the project lifecycle</li> </ul>
	Consider embodied impacts in materials selection	<ul style="list-style-type: none"> <li>Responsibly sourced construction materials to be procured for the project</li> </ul>
	Maximise beneficial reuse of spoil	<ul style="list-style-type: none"> <li>N/A for OSD development</li> </ul>
<b>Biodiversity Conservation</b>	Protect and create biodiversity through appropriate planning, management and financial controls	<ul style="list-style-type: none"> <li>Green roofs to be considered to enhance the ecological value of the site</li> </ul>



Theme	Objective	Relevant OSD Provisions for the proposed design
<b>Heritage Conservation</b>	Protect and promote heritage through appropriate design, planning, and management controls	<ul style="list-style-type: none"> <li>Compliance with planning approval requirements in relation to heritage</li> </ul>
<b>Liveability</b>	Promote improved public transport patronage by maximising connectivity and interchange capabilities	<ul style="list-style-type: none"> <li>Accessible bicycle parking will be provided to encourage the use of alternative transport options and public transportation</li> </ul>
	Provide well designed stations and precincts that are comfortable, accessible, safe and attractive	
<b>Community Benefit</b>	Make a positive contribution to community health and well-being	<ul style="list-style-type: none"> <li>Positive contribution to community health and well-being will be provided by delivering environmentally sustainable design on the OSD</li> <li>Co-ordinated approaches among cross-sectoral stakeholder interests in line with the Green Star Management category requirements</li> </ul>
	Ensure community and local stakeholder engagement and involvement in the development of the Project	
	Contribute to the delivery of legacy projects to benefit local communities	
	Create opportunities for local business involvement during the delivery and operations phases	
	Optimise community benefit of residual land development	
	Minimise negative impacts on the community and local businesses during construction and operation	
<b>Supply Chain</b>	Influence contractors, subcontractors and materials suppliers to adopt sustainability objectives in their works and procurement	<ul style="list-style-type: none"> <li>Sustainable Procurement Strategy and Responsibly Sourced Materials Policy to be incorporated for the construction stage.</li> </ul>
<b>Workforce Development</b>	Increase opportunities for employment of local people, participation of local businesses, and participation of SME's	<ul style="list-style-type: none"> <li>New OSD will create opportunities for employment within the construction, commercial and retail sector allowing the project to respond to workforce development objectives in the future operational stage.</li> </ul>
	Enable targeted and transferable skills development which resolves local and national skills shortages, supports industry to compete in home and global markets, and embeds a health and safety culture within all induction and training activities, promoting continuous improvement	

Theme	Objective	Relevant OSD Provisions for the proposed design
	Increased workforce diversity and inclusion, targeting indigenous workers and businesses, female representation in non-traditional trades, and long term unemployed	
	Inspire future talent and develop capacity in the sector, engaging young people via education and work experience, collaborating with higher education institutions to provide programs responding to rapid transit and other infrastructure requirement, and supporting vocational career development through apprenticeships and traineeships	
<b>Economic</b>	Consider adopting a Whole of Life Costing model to maximise sustainability benefits	<ul style="list-style-type: none"> <li>A business case outlining captured sustainability benefits will be possible to develop at the operational stage evaluating all achieved sustainability goals.</li> </ul>
	Optimise development opportunities for residual land	
	Capture sustainability benefits in the business case for the project	

## 3.2 North Sydney Development Control Plan 2013

The North Sydney Development Control Plan 2013 (North Sydney DCP), as amended 15 March 2018, provides numerous objectives and provisions for each sustainability issue that needs to be considered in the assessment of a proposed development. Many of the provisions are performance based, which provides added flexibility in meeting the desired intent of the provision.

At the current stage Crows Nest OSD design is consistent with the North Sydney DCP objectives. The following provisions are considered applicable and relevant for the OSD development:

### 3.2.1 Part 2.6 Efficient Use of Resources

#### 2.6.1 Energy Efficiency

- O.1 To ensure that developments minimise their use of non-renewable energy resources.
- O.2 To ensure that buildings are designed such that the air conditioning plant meets performance requirements while minimising energy usage.
- O.3 To encourage the use of energy-efficient lighting.

Applicable provisions:

- Submission of a BASIX certificate for residential component
- Obtaining a NABERS rating for commercial
- Obtaining a Green Star rating for the development

#### 2.6.2 Passive solar design

- O.1 To ensure that site layout and building orientation allow for maximum solar access and are adapted to local climatic conditions and prevailing site characteristics.

#### 2.6.3 Thermal mass and insulation

- O.1 To achieve more even, year-round average temperature, making the building more comfortable for occupants and resulting in less demand for artificial heating or cooling.

#### 2.6.4 Natural ventilation

- O.1 Not Applicable
- O.2 To reduce energy consumption by minimising the use of mechanical ventilation, particularly air conditioning.
- O.3 To ensure that workers are provided with direct access to fresh air and to assist in promoting thermal comfort for occupants.

#### 2.6.5 Water Conservation

- O.1 To minimise the use of potable water.
- O.2 To encourage the reuse of greywater, rainwater and stormwater.

Applicable provisions:

- Rainwater tanks
- Separate meters
- Sensor operated taps

### **2.6.6 Waste Management & Minimisation**

- O.1 To minimise material usage and waste during building, construction and demolition.
- O.2 To minimise the level of waste during operation, reduce new building material usage and minimise volume of demolition materials.

Applicable provision:

- Waste Management Plan

### **2.6.7 Stormwater management**

- O.1 To mimic pre-development or natural drainage systems through the incorporation of WSUD on-site.
- O.2 To protect watersheds by minimising stormwater discharge and maximising stormwater quality.
- O.3 To minimise off-site localised flooding or stormwater inundation.

Applicable provisions:

- Erosion and Sediment Control Plan
- Stormwater Management Plan
- Rainwater tanks
- Stormwater Quality Assessment

### **2.6.8 Building Material**

- O.1 To encourage the use of materials which have a low environmental impact during their life cycle.
- O.2 To encourage the use of toxin-free material to minimise the health impact of materials used indoors.
- O.3 To maximise the energy efficiency of buildings.

Applicable provisions:

- Materials which are sourced from renewable and abundant resources
- Materials which are durable
- Locally manufactured materials and produced
- Materials with a low embodied energy content
- Salvaged and/or recycled materials
- Timber used to be obtained from certified sustainable sources
- Materials with a high recycled content (>50%)
- Low volatile organic compound (voc) emitting materials

- Mechanical fixings instead of adhesives and glues, wherever possible
- When using medium density fibreboard, ensure that it has a low formaldehyde content
- Use toxin-free floor finishes

#### **2.6.10 Waste Management & Minimisation**

- O.1 To minimise material usage and waste during building, construction and demolition.
- O.2 To minimise the level of waste during operation reduce new building material usage and minimise volume of demolition materials.

Applicable provision:

- Waste Management Plan for the demolition, construction and operation

#### **2.6.11 Hot water systems**

- O.1 To ensure the most efficient water heating methods are used to assist in the reduction of greenhouse gas emissions and use of non-renewable resources.

#### **2.6.12 Green roofs**

- O.1 To provide accessible roof space providing increased amenity for the occupants and visitors of the building.
- O.2 To improve the aesthetics and amenity of the urban environment (this particularly relates to the appearance of the roof when viewed from surrounding buildings).
- O.3 To provide space to accommodate renewable energy production.
- O.4 To improve stormwater management by controlling both the quality and flow of stormwater.
- O.5 To increase biodiversity with the use of plant material, and in particular to promote food production where appropriate.
- O.6 To protect the building structure by increasing its thermal protection. This will also help to reduce internal heating and cooling requirements.

### **3.2.2 Part B Section 2 Non-residential thresholds**

Part B, Section 2: Commercial and Mixed-Use Development (Table B-2.13) of the North Sydney DCP sets submission requirements and performance targets. To comply with efficient use of resources requirements the proposed non-residential development over 5000m<sup>2</sup> GFA will need to achieve following performance targets:

- Minimum **4.5 star NABERS** rating for the base building, whole building, or tenancies as appropriate
- Minimum **5 Star Green Star** rating for the base building, or the whole building where there is to be one tenant to occupy the whole building

This requirement applies only to the Site A – Commercial and Site C – Commercial Buildings as the Site B – Residential building is classified as residential developments under the classifications within the North Sydney DCP.

### 3.2.3 Part B Section 10 – Car Parking and Transport

#### 10.2 Parking Provision

- O.1 To ensure that sufficient car parking is provided on-site to cater for the users of the development.
- O.2 To minimise the reliance on private car usage.
- O.3 To facilitate the use of public and alternative transport modes including walking and cycling.

#### 10.2.2 Car Share Schemes

- O.1 To minimise the impact on the safety and efficiency of existing roads.  
Provisions: Considerations for car share schemes and limiting impact on parking provision are provided.

#### 10.5 Bicycle Parking and Associated Facilities

- O.1 To encourage the use of bicycles as an environmentally beneficial form of transport and an alternative to the use of private motor vehicles.
  - Provisions for on-site secure bicycle parking, storage and showers are detailed in section 10.5 of the DCP. Table B10.4 details the requirements for the number of bike racks and storage. Provision 11 nominates the number of showers required for non-residential uses. Refer to Appendix A of this report for comparison between NS DCP and Green Star requirements.

#### 10.6 Green Travel Plans

- O.1 To encourage employees within an organisation to make greater use of public transport, cycling, walking and car sharing for commuting and work related journeys.

Applicable provisions:

- Green Travel plans are to be submitted for residential and non-residential developments. The DCP provides further guidance on requirements and content of the green travel plan;
- Identification and promotion of public transport options to access the site;
- Preparation of a Transport Access Guide (TAG) for the site;
- Car pool / car sharing.

### 3.2.4 Part B Section 19 - Waste Minimisation & Management

#### 19.1.1 General Objectives

The DCP has several objectives that address the treatment, disposal and processing of demolition, operational and construction waste involved during the project.

- O.1 Reduce the demand for waste disposal.

- O.2 Maximise reuse and recycling of building and construction materials, as well as household, industrial and commercial waste.
- O.3 Assist in achieving Federal and State Government waste minimisation targets in accordance with regional waste plans.
- O.4 Minimise the overall environmental impacts of waste.
- O.5 Require source separation, design and location standards which complement waste collection and management services offered by Council and private providers.
- O.6 Encourage building design and construction techniques which will minimise future waste generation.

### **19.2 Demolition Waste**

- O.1 To ensure that the reuse and recycling of demolition materials is maximised.

### **19.3 Construction Waste**

- O.1 Waste generation is minimised and reuse and recycling of construction materials is maximised in construction projects.

### **19.4 Waste Facilities and Management**

- O.1 Design buildings to encourage waste minimisation (source separation, reuse and recycling).

## **3.2.5 Part C Area Character Statements**

### **3.0 - St Leonards / Crows Nest Planning Area Character Statement**

The Planning Area is situated around the town centres of St Leonards and Crows Nest. The area is north-west of Sydney CBD and is situated on major traffic routes. The remainder of the area comprises of several predominantly low-density residential neighbourhoods, much of which is characterised by retention of the historic subdivision pattern.

Efficient Use of Resources:

- Energy efficient design and life cycle assessment of buildings enable the conservation of natural resources and minimisation of use of non-renewable energy resources.
- Stormwater runoff is minimised and recycled on-site where possible.

Crows Nest OSD location:

- Precinct 1 – Site A - Commercial Buildings; Site C - Commercial building
- Precinct 4 – Site B – Residential building





**Figure 1** St Leonards and Crows Nest Precincts (courtesy of North Sydney Council)

### 3.3 National Construction Code - Building Code of Australia

The National Construction Code 2019 (NCC) details the minimum necessary requirements for safety, health, amenity and energy efficiency in the design and construction of new buildings throughout Australia. NCC Building Code of Australia (BCA) Section J sets minimum energy performance requirements for all new developments, including the performance of building fabric, glazing thermal performance, air-conditioning, ventilation, lighting, power and hot water.

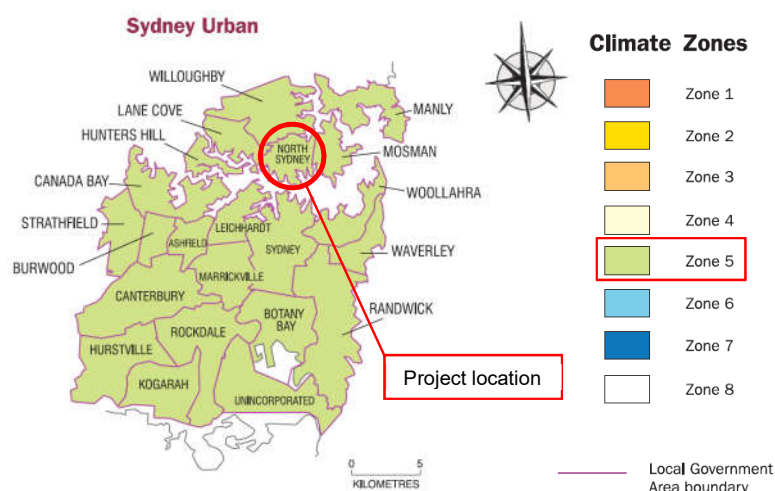
Compliance with BCA Section J for the commercial component of the development can be demonstrated by complying with the Deemed-to-Satisfy (DTS) Provisions; otherwise, a Performance Based Solution of the building design must be shown as compliant using an assessment method such as energy modelling in accordance with the JV3 methodology or Green Star energy modelling methodology. Compliance requirements for the residential component of the development are separately addressed under the BASIX requirements section of this report (Section 4.3.4.1).

Targeting various energy efficiency goals through the Green Star, NABERS and BASIX rating tools will assist the Crows Nest OSD in exceeding the minimum performance levels required in NCC BCA Section J.

#### 3.3.1 Climate Zone

The Crows Nest OSD Development is located in Climate Zone 5. The climate zone directly influences the thermal performance requirements.





**Figure 2** Sydney Urban, New South Wales climate zone map (courtesy of Australian Building Codes Board)

### 3.3.2 Minimum Thermal Performance

The minimum building fabric thermal performance for the proposed OSD development will be in accordance with BCA Part J1 DTS thermal performance as summarised in the Table 5 below.

**Table 5** Minimum Thermal Performance Requirement

Building Fabric Within Building Envelope*	Total R-Value [m <sup>2</sup> K/W]
Roof	<b>R3.7</b>
Walls and glazing construction (total system value)	<b>U2.0 (R0.5)</b>
- Wall Component (>80% wall of wall-glazing area)	<b>R1.0</b>
- Wall Component (<80% wall of wall-glazing area)	<b>R1.4</b>
Floor	<b>R2.0</b>
Note: Envelope is defined by the BCA as the “parts of a building’s fabric that separates a conditioned space from the exterior of the building or a non-conditioned space”.	

The glazing thermal performance will be required to meet the DTS requirements of Part J2 – Glazing and will be verified using the BCA Glazing Calculator at the Stage 2 SSD Application.

### 3.3.3 Building Sealing and Services

Section J requirements specific to building services will be implemented using the Deemed-to-Satisfy approach and will be documented by the project's services engineers during detailed design stages.

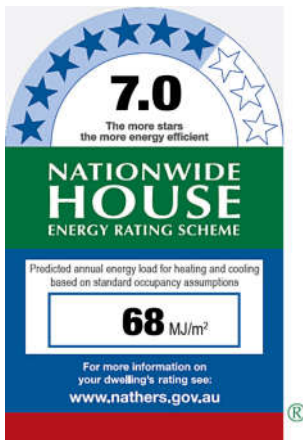
**Table 6** Building Sealing and Services

BCA Section J	Responsibility	Compliance Approach
J3 - Building Sealing	Architect, Façade & Mechanical Services	Deemed-to-satisfy provisions of Part J3
J5 - Air-conditioning and Ventilation Systems	Mechanical Services	Deemed-to-satisfy provisions of Part J5
J6 - Artificial Lighting and Power	Electrical Services	Deemed-to-satisfy provisions of Part J6
J7 - Heated Water Supply and Swimming Pool and Spa Pool Plant	Hydraulic Services	Deemed-to-satisfy provisions of Part J7
J8 - Facilities for Energy Monitoring	Mechanical & Electrical Services	Deemed-to-satisfy provisions of Part J8

### 3.3.4 Nationwide House Energy Rating Scheme

The Site B residential building of the Crows Nest OSD development is classified as a Class 2 residential building. The NCC BCA Section J sets minimum energy performance requirements of the sole-occupancy units (SOUs) of a Class 2 building. For reducing the heating or cooling loads they must collectively achieve an average energy rating of not less than 6 stars; and individually not less than 5 stars, using house energy rating software accredited under the Nationwide House Energy Rating Scheme (NatHERS). FirstRate5 is one of the accredited software programs that estimates such annual energy performance and rates it on a 10 star scale.

FirstRate5 modelling will be used to provide indicative star rating assessment of the residential components of the Crows Nest OSD at the Stage 2 SSD Application.



**Figure 3** Exemplary NatHERS 7.0 Star Band on the 1-10 star scale (courtesy [www.nathers.gov.au](http://www.nathers.gov.au))

#### 3.3.4.1 BASIX

In New South Wales, the online Building Sustainability Index (BASIX) system replaces the NCC energy efficiency requirements and adds other aspects of sustainable development. BASIX accepts NatHERS software results as one way of meeting its separate targets for the heating and cooling performance of the building.

BASIX is an integrated part of the planning system and implemented under the EP&A Act. It contains guidance and mandatory sustainability targets to reduce potable water consumption and greenhouse gas emissions. It also sets minimum performance levels for the thermal performance and comfort of the dwellings, expressed as the annual amount of energy required to heat and cool the dwelling (MJ/m<sup>2</sup>/year). The targets are expressed as a percentage saving against the NSW benchmarks determined based on NSW consumption data collected from water and energy suppliers.

BASIX sustainability water and energy targets for the Crows Nest OSD residential component:

- 40% reduction in potable water consumption
- 40% reduction in greenhouse gas emissions
- minimum performance levels of thermal comfort

Compliance with the required thermal performance for the development will be assessed at the Stage 2 SSD Application design stage using FirstRate5 modelling results for the individual SOUs.

There is not sufficient architectural detail provided to undertake BASIX assessment. A BASIX assessment will be provided with the future detailed SSD Application/s.

## 4.0 Sustainability Targets

Sustainability targets for the Crows Nest OSD are based on the following rating tools:

- National Australian Built Environment Rating System (NABERS)
- Green Star Design & As-Built v1.2 (GS)

### 4.1 National Australian Built Environment Rating System (NABERS)

NABERS is a national rating system measuring the environmental performance of Australian buildings and tenancies. The NABERS tools can be used to rate building performance on a rating scale from 1 to 6 stars. This star rating represents the building's actual operational performance, assessed using 12 months of measured performance data. A 6 star rating demonstrates market-leading performance, while a 1 star rating indicates that the building has considerable scope for improvement (Figure 4).



**Figure 4** NABERS star rating

Crows Nest OSD Commercial components aim to achieve the following NABERS star ratings:

**Table 7** NABERS Energy and Water targets and allowable consumptions

OSD Component	NABERS Energy target	Maximum allowable annual energy consumption	NABERS Water target	Maximum allowable annual water consumption
Site A – Office	5 Stars	Electricity: 2,713,384 kWh Gas: 1,085,353 MJ	4 stars	23,183 kL/year (0.682kL/m <sup>2</sup> )
Site C - Office	5 stars	Electricity: 215,474 kWh Gas: 86,189 MJ	4 stars	1,841 kL/year (0.682 kL/m <sup>2</sup> )

At the current design stage of the project NABERS reverse calculators were used to outline the maximum amounts of energy and water that the building can use to achieve a certain star rating. Results from the reverse calculators are for information purposes only.

NABERS reverse calculations for the **Site A - Commercial/Office** component with the base building assessment approach were based on the following assumptions:

- Hours each week with occupancy levels of  $\geq 20\%$  50 hrs/week
- Net Lettable Area of the building 34,000m<sup>2</sup>
- Percentage Breakdown of Energy Consumption: Electricity 90%, Gas 10%

To achieve NABERS Energy 5 star rating the Office - base building annual energy consumption cannot exceed 2,713,384 kWh for electricity and 1,085,353 MJ for gas.

NABERS Water 4 star rating can be achieved when annual water consumption does not exceed 23,183 kL/year (0.682 kL/m<sup>2</sup>)

NABERS reverse calculations for the **Site C - Commercial/Office** component with the base building assessment approach were based on the following assumptions:

- Hours each week with occupancy levels of  $\geq 20\%$  50 hrs/week
- Net Lettable Area of the building 2,700m<sup>2</sup>
- Percentage Breakdown of Energy Consumption: Electricity 90%, Gas 10%

To achieve NABERS Energy 5 star rating the Office - base building annual energy consumption cannot exceed 215,474kWh for electricity and 86,189MJ for gas.

NABERS Water 4 star rating can be achieved when annual water consumption does not exceed 1,841 kL/year (0.682 kL/m<sup>2</sup>)

Refer to Appendix B of this report for NABERS Reverse calculator results.

## 4.2 Green Star Design & As-Built

Green Star, developed and administered by the Green Building Council of Australia (GBCA), is a set of rating tools that deliver independent verification of sustainable outcomes throughout the life cycle of the built environment. The GBCA's mission is to "lead the sustainable transformation of the built environment" and it aims to achieve this by encouraging practices that:

- Reduce the impact of climate change
- Enhance the health and quality of life of inhabitants and the sustainability of the built environment
- Restore and protect the planet's biodiversity and ecosystems
- Ensure the ongoing optimum operational performance of buildings
- Contribute to market transformation and a sustainable economy



**Figure 5** Green Star – Design & As Built rating system

Green Star Design & As Built rating tool rates the environment performance of buildings on a scale from 4 to 6 Stars (Figure 5) through nine different categories:

- Management
- Indoor Environment Quality
- Energy
- Transport
- Water
- Materials
- Land Use and Ecology
- Emissions
- Innovation

Each category groups a number of issues related to certain sustainability impacts; these are known as credits. A credit addresses an initiative that improved or has the potential to improve a project's sustainability performance; each of these initiatives are defined as a criterion.

**Table 8** Green Star Design and As Built rating targets

OSD Development component	Green Star Design and As Built target rating
Site A - Office	5 Star
Site B – Residential	5 Star
Site C - Office	5 Star

Refer to Appendix C of this report for Green Star Scorecards indicating targeted credits for individual OSD development components.

## 5.0 Benchmarking

Benchmarking of similar developments was conducted to identify existing Green Star certified or registered residential and office buildings in Australia, and their general or specific sustainability features. Review of the GBCA Project Directory indicated that no project has yet been certified under the Green Star Design & As Built v1.2 rating tool. Thus, similar developments were provided considering legacy Green Star rating tools with corresponding star rating levels.

**Table 9** Benchmarking of similar developments

Project Name & Description	Ratings Targeted or Achieved	Best Practice Sustainability Features
<b>Residential</b>		
East Village Residential Zetland NSW Size: 17,271m <sup>2</sup>	4 Star Green Star - Multi Unit Residential Design v1 Certified Dec 2014 Score:50	<ul style="list-style-type: none"> <li>95% of carpets, floor coverings, wall and ceiling coverings, internal painted surfaces, adhesives and sealants are low VOC</li> <li>Adequate lighting levels for focused tasks provided to residents</li> <li>All composite wood products have low formaldehyde emissions, or contain no formaldehyde</li> <li>90% of kitchens have dedicated and separated extract fans</li> </ul>
Central Park Block 8 Chippendale NSW Size: 17,341m <sup>2</sup>	5 Star Green Star - Multi Unit Residential Design v1 Certified Aug 2017 Score 68	<ul style="list-style-type: none"> <li>rooftop gardens, green walls and smart-metering systems, on-site tri-generation plant,</li> <li>on-site water recycling and blackwater treatment plant for all non-potable water uses</li> <li>93% of all demolition waste recycled</li> <li>passive solar design</li> </ul>
The Quay Haymarket, NSW Size: 18,945m <sup>2</sup>	4 Star Green Star - Multi Unit Residential Design 1 Certified: Nov 2013 Score 47	<ul style="list-style-type: none"> <li>218 apartments</li> <li>Tri-generation electricity</li> <li>33% greater sun access than SEPP65</li> <li>30% greater natural ventilation than SEPP65</li> <li>Telescoping of plant and car park ventilation</li> <li>LED lighting</li> </ul>
McLachlan & Ann Residential Fortitude Valley QLD Size: 19,500m <sup>2</sup>	4 Star Green Star - Multi Unit Residential Design v1 Certified May 2014 Score 45	<ul style="list-style-type: none"> <li>Green Star Accredited Professional</li> <li>Comprehensive commissioning</li> <li>A tuning, monitoring and re-commissioning process</li> <li>ISO14001 Environmental Management System in place prior to/throughout the project</li> <li>Waste Management Plan implemented</li> </ul>



Project Name & Description	Ratings Targeted or Achieved	Best Practice Sustainability Features
The Bowery Lot 24 Bowden SA	5 Star Green Star - Multi Unit Residential Design v1 Certified Feb 2016 Score 64	<ul style="list-style-type: none"> <li>70% of dwellings have effective natural ventilation</li> <li>50% less GHG emissions than a standard practice building</li> <li>Each unit have controls to minimise energy usage for spaces when not occupied</li> <li>Common areas have automated controls to minimise energy use when unoccupied</li> </ul>
120 Terry St Rozelle, NSW Size: 16,220m <sup>2</sup> NLA	5 Star Green Star - Multi Unit Residential Design v1 Certified Dec 2013 Score 63	<ul style="list-style-type: none"> <li>Potable water for landscape irrigation reduced by 90% or a xeriscape garden is installed</li> <li>Potable water consumption of heat rejection systems to be reduced by 90% or no such system is in use</li> <li>80% of fire protection system test water to be reused on-site or will not expel water for testing</li> <li>Dishwashers and clothes washers will be installed and have a high-water efficiency</li> </ul>
<b>Office</b>		
180 Thomas St, Haymarket Size: 14,679m <sup>2</sup> NLA	5 Star Green Star - Office As Built 3 Certified Sep 2014 Score 69  4.5 star NABERS energy rating 4.5 star NABERS water rating	<ul style="list-style-type: none"> <li>Active chilled beam system is threaded throughout the building and supplies fresh, thermally treated air to the office</li> <li>Wintergarden</li> <li>Digital addressable lighting</li> <li>Rainwater harvesting system</li> <li>Passive solar shading</li> <li>New construction built on top of an existing building</li> <li>All HVAC refrigerants have an Ozone Depleting Potential (ODP) of zero</li> </ul>
StarTrack House 219-241 Cleveland St, Strawberry Hills Strawberry Hills NSW Size: 26,147 m <sup>2</sup> NLA	5 Star Green Star - Office As Built v3 Certified Oct 2014 Score 61  5 star NABERS energy	<ul style="list-style-type: none"> <li>1,048 panel solar voltaic system located on the building's roof (base building load by 25%)</li> <li>Energy efficient t5 light fittings</li> <li>External glazing panels within the building reduce the amount of solar heat gain from the sun and improve staff comfort</li> <li>A 15,000 litre rainwater storage tank provides rainwater for onsite drip irrigation</li> <li>Hydraulic fittings in the building's amenities are 5-star WELS rated</li> <li>A fire water reuse tank allows recycled water to be utilised for the testing of the building fire system</li> </ul>



Project Name & Description	Ratings Targeted or Achieved	Best Practice Sustainability Features
20 Martin Place Sydney NSW Size: 31,280m <sup>2</sup> NLA	6 Star Green Star - Office As Built v3 Certified Feb 2016 Score 66  5 star NABERS energy rating	<ul style="list-style-type: none"> <li>• Bike storage and end-of-trip facilities</li> <li>• Adaptive reuse of a Sydney heritage building - retaining the 22 storey structural steel frame within the building</li> <li>• Reduced embodied energy in construction</li> <li>• 60 per cent reduction in base building energy consumption</li> <li>• Low energy lighting</li> <li>• Low energy building AC services and lifts</li> <li>• Excellent daylight quality and views</li> <li>• Triple glazed naturally ventilated façade to reduce heat and solar</li> <li>• Affording occupants spectacular views</li> <li>• 80% of construction waste diverted from landfill</li> <li>• 64% zero VOC paints</li> <li>• Replacing 30% of cement with flyash</li> <li>• LED light fittings installed to all office floors</li> <li>• 100% outside air system served via chilled beams</li> <li>• 1.9L/min ultra-low flow basin taps</li> </ul>
Floth 69 Robertson Street Brisbane, QLD 1,041m <sup>2</sup> office building	6 Star Green Star - Design & As Built v1.1 Certified Nov 2015 Score 83.3  6 star NABERS Indoor Environment rating	<ul style="list-style-type: none"> <li>• Roof-mounted solar photovoltaic system provides 13% peak energy and offsetting 28 % of the building's operational energy</li> <li>• 100 % accredited greenpower purchased</li> <li>• Conducted whole-of-building, whole-of-life (cradle-to-grave) life cycle assessment (LCA)</li> <li>• 95% of the timber used in the building has been certified by a forest certification scheme</li> <li>• More than 9% (by cost) of materials have a transparency or sustainability initiative</li> <li>• 74% reduction in potable water consumption</li> </ul>
177 Pacific Highway North Sydney, NSW Size: 39,250m <sup>2</sup> NLA	5 Star Green Star - Office As Built 3 Certified: Aug 2017  5.5 star NABERS Energy rating	<ul style="list-style-type: none"> <li>• Low-temperature air conditioning systems for reduced energy consumption</li> <li>• Public garden plaza featuring café and retail areas</li> <li>• Rainwater harvesting</li> <li>• Performance glass facades</li> <li>• Base and tenant building management system</li> </ul>

Project Name & Description	Ratings Targeted or Achieved	Best Practice Sustainability Features
		<ul style="list-style-type: none"> <li>Precision air conditioning units, electrical metering, VAV recalibration</li> <li>More accurate sensing and effective use of advanced controls for HVAC</li> </ul>
101 Miller Street, North Sydney, NSW Size: 36,747m <sup>2</sup> NLA	5 Star Green Star - Office Design 2 Certified: Aug 2008  5 star NABERS energy rating	<ul style="list-style-type: none"> <li>A tri-generation system, comprising gas fired generator and an absorption chiller, enabled the project to realise its low energy consumption and greenhouse gas emissions</li> <li>CO<sub>2</sub>savings estimated at 40%</li> <li>Ventilation designed for superior air change effectiveness, according to ASHRAE F25-1997 and laminar flow patterns</li> <li>Re-used more than 50% of the total building facade (by area)</li> </ul>

## 6.0 The ESD framework

The proposed OSD will reflect best practice sustainable building principles to improve environmental performance, including energy and water efficient design and technology.

Relevant policies, standards and rating tools were reviewed to form an optimum ESD framework for the project's individual building components and the OSD. Applicable sustainability initiatives were addressed to guide further design works, as indicated in Table 10.

**Table 10** Regulations, standards and guidelines applicable for individual OSD components.

Relevant regulation, standard or rating tool	Crow Nest OSD Component		
	Site A - Commercial	Site B - Residential	Site C - Commercial
Secretary's Environmental Assessment Requirements	applies	applies	applies
Environmental Planning and Assessment Act 1979	applies	applies	applies
Sydney Metro City & Southwest Sustainability Strategy 2017	applies	applies	applies
North Sydney Development Control Plan	applies	applies	applies
National Construction Code - Building Code of Australia	applies	applies	applies
Building Sustainability Index	N/A	applies	N/A

Relevant regulation, standard or rating tool	Crow Nest OSD Component		
	Site A - Commercial	Site B - Residential	Site C - Commercial
National Australian Built Environment Rating System	applies	N/A	applies
Green Star Design & As-Built v1.2	applies	applies	applies

The following sustainability targets based on chosen rating tools are being pursued, and will be confirmed at detailed design stage:

**Table 11** Sustainability targets based on chosen rating tools

ESD Category	Sustainability targets	
	Residential	Office / Commercial
Energy	BASIX: <b>40%</b> GHG emission reduction NatHERS: <b>6 stars</b>	NABERS Energy <b>5 stars</b>
Water	BASIX: <b>40%</b> water consumption reduction	NABERS Water <b>4 stars</b>
Management	Green Star <b>5 Star</b> Design and As Built v1.2	Green Star <b>5 Star</b> Design and As Built v1.2
Indoor Environment		
Material		
Transport		
Land Use and Ecology		
Emissions		
Innovation		

The OSD Sustainability Design Initiatives proposed in Table 12 will be further investigated and considered for implementation during the detail design phase of the project. Performance against all the relevant requirements will be tracked and implemented in the next design stage and in the final delivery of the Crows Nest OSD.

**Table 12** OSD Sustainability Design Initiatives

ESD Category	OSD Sustainability Design Initiatives	Reference
Energy Efficiency	<ul style="list-style-type: none"> <li>Energy efficient LED and fluorescent lighting with lighting control system including timers, photocells and dimming</li> <li>Efficient heating, ventilation and cooling - common area automated control, economiser on an air-conditioning (using outside air in active and mixed mode)</li> <li>Commissioning and tuning requirements to be incorporated into the design for nominated building systems to assure high efficiency</li> <li>Incorporating passive design measures to minimise energy consumption – shading, blinds</li> <li>High-performance double-glazing windows and curtain wall</li> <li>High-performance thermal insulation for building fabric</li> </ul>	SEARs, EP&A, SMCSSR, NCC, NABERS, BASIX, NSDCP, GS

ESD Category	OSD Sustainability Design Initiatives	Reference
	<ul style="list-style-type: none"> <li>Energy meters for individual units, common areas, major uses and sources</li> <li>Building Management System to monitor, control, and optimise energy usage at the operational stage</li> <li>High efficiency boilers to provide heating hot water</li> <li>Use of renewable energy by solar panels installation will be considered</li> <li>For the building roof areas use of low SRI material or provision of solar panels to minimise heat island effect</li> </ul>	
Water	<ul style="list-style-type: none"> <li>Efficient fittings and fixtures based on Water Efficiency Labelling and Standards (WELS), and/or sensor operated taps</li> <li>Fire protection system to be design as a closed loop with water recirculation during testing</li> <li>Rainwater harvesting and used with flush fixtures</li> <li>Water meters for individual units, common areas, major uses and sources</li> <li>Building Management System to monitor, control, and optimise water usage at the operational stage</li> <li>Green roof or the landscaping to be design as a xeriscape garden, otherwise designed to reduce the consumption of potable water</li> </ul>	SEARSS, EP&A, SMCSSR, NCC, NABERS, BASIX, NSDCP, GS
Waste	<ul style="list-style-type: none"> <li>The minimisation of waste through efficient design and material selections</li> <li>Waste Management Plan will be reflected in the design of the building's facilities to provide adequate solutions for waste segregation and recycling</li> <li>Waste Management Plan at the construction stage to minimise, reuse and recycle construction materials</li> <li>Operational Waste Management Plan to be incorporated also for the operational stage</li> </ul>	SEARSS, EP&A, SMCSSR, NSDCP, GS
Materials	<ul style="list-style-type: none"> <li>Building materials will be selected considering the following qualities: durability, responsible sourcing, sustainable supply chain, low TVOC content, low formaldehyde emissions,</li> <li>Construction materials and products life cycle impact will be addressed by minimising Portland cement content and using crushed slag aggregate or other alternative materials for the concrete structure</li> <li>Building's steel will be sourced from a responsible steelmaker and will be produced using energy-reducing processed in its manufacture</li> <li>Timber, if used within the design, will be certified by a forest certification scheme or will be from a reused source</li> </ul>	SEARSS, EP&A, SMCSSR, NSDCP, GS
Indoor Environment Quality	<ul style="list-style-type: none"> <li>Ventilation systems to be designed to mitigate outdoor air pollutants and for ease of maintenance and cleaning, and cleaned prior to occupation and use, where required</li> </ul>	SMCSSR, NSDCP, GS

ESD Category	OSD Sustainability Design Initiatives	Reference
	<ul style="list-style-type: none"> <li>• Efficient heating, ventilating and air-conditioning (HVAC) system to assure high level of thermal comfort</li> <li>• Ventilation system</li> <li>• Provisions of outside air flow rates above the minimum regulatory requirements will be considered</li> <li>• Use of low Volatile Organic Content (VOC) and low formaldehyde materials to reduce air pollution</li> <li>• Reduction of internal ambient noise level by appropriate HVAC design and acoustic insulation from external noises</li> <li>• Lighting fixtures providing good colour quality and equipped with high frequency ballasts and high-Intensity discharge, where relevant</li> <li>• Glare control through selected systems and devices, blinds, screen and fixed devices, where relevant</li> <li>• Maximising areas with adequate daylight and views</li> </ul>	
Transport	<ul style="list-style-type: none"> <li>• Provision of Active Transport Facilities - bicycle parking and associated end-of-trip facilities – showers and lockers</li> <li>• Provision of amenities for walkable neighbourhoods</li> <li>• Good access to public transport</li> <li>• Limited car parking spaces to encourage use of public transport</li> </ul>	SMCSSR, NSDCP, GS
Ecology, Biodiversity, Land Use	<ul style="list-style-type: none"> <li>• Ecological value of the site is considered to be improved by the green roofs and/or vertical gardens supporting biodiversity of the site</li> <li>• Re-use of the previously developed site</li> <li>• Incorporation of remediation strategy, where relevant and where contaminants are detected</li> </ul>	SMCSSR, GS
Emissions	<ul style="list-style-type: none"> <li>• Rainwater collection and use for flush fixtures to reduce water discharge</li> <li>• Reduced impact refrigerants</li> <li>• External lighting designed to reduce light pollution of a night sky</li> </ul>	SMCSSR, NSDCP, GS
Climate Change Resilience	<ul style="list-style-type: none"> <li>• Climate Adaptation Plan will be developed for the project</li> <li>• Solutions to be included into the building design and construction that specifically address the risk assessment component of the plan</li> </ul>	SMCSSR, NSDCP, GS

## 7.0 Summary

The amended SSD Application for the Crows Nest OSD adheres to the requirements and guidelines covered in the following:

- Secretary's Environmental Assessment Requirements issued on 26 September 2018
- *Environmental Planning and Assessment Act 1979*
- *Sydney Metro City & Southwest Sustainability Strategy 2017*
- *North Sydney Development Control Plan 2013, as amended 15 March 2018*
- *National Construction Code - Building Code of Australia 2019*
- *Building Sustainability Index*
- *National Australian Built Environment Rating System*
- *Green Star Design & As-Built v1.2*

A number of sustainability initiatives were considered and reviewed to be incorporated in the Crows Nest OSD design to enhance its environmental performance. Energy efficiency and water use reduction targets were identified for the residential component, based on the BASIX system. The NABERS rating tool was used as a basis for the commercial component.

Dedicated Green Star pathways were identified for all buildings to improve the project's sustainability performance.

The following sustainability targets based on chosen rating tools are being pursued, and will be confirmed at detailed design stage:

**Table 13** Sustainability targets based on chosen rating tools

ESD Category	Sustainability targets		
	Site A - Commercial	Site B - Residential	Site C - Commercial
Energy	NABERS Energy <b>5 stars</b>	BASIX: <b>40%</b> GHG emission reduction NatHERS: <b>6 stars</b>	NABERS Energy <b>5 stars</b>
Water	NABERS Water <b>4 stars</b>	BASIX: <b>40%</b> water consumption reduction	NABERS Water <b>4 stars</b>
Management	Green Star <b>5 Star</b> Design and As Built v1.2	Green Star <b>5 Star</b> Design and As Built v1.2	Green Star <b>5 Star</b> Design and As Built v1.2
Indoor Environment			
Material			
Transport			

ESD Category	Sustainability targets		
	Site A - Commercial	Site B - Residential	Site C - Commercial
Land Use and Ecology			
Emissions			
Innovation			

This ESD framework has been developed to include all relevant sustainable design initiatives which will be further tracked and incorporated into the future SSD Application/s, and furthermore, implemented in the final delivery of the development.

This report addressed all relevant ESD requirements of the SEARs issued for the Crows Nest OSD on 26 September 2018.



## Appendix A

### Bicycle Parking and End-of-trip Facilities

**Table 14** Bicycle Parking and End-of-trip Facilities Requirements

OSD Component	Required Bicycle Parking		Required End-of-trip Facilities	
	NS DCP	Green Star	NS DCP	Green Star
<b>Site A – OFFICE (Class 5 building)</b>				
* Assumed 3400 occupants * Visitors	227 for occup. 85 for visitors	255 for occup. 51 for visitors	32 showers 312 lockers	33 showers 368 lockers
Total	<b><u>312</u></b>	306	32 showers 312 lockers	<b><u>33 showers</u></b> <b><u>368 lockers</u></b>
<b>Site B – RESIDENTIAL (Class 2 building)</b>				
Building 1 - 140 SOUs	140 for residents 14 for visitors	95 for residents 7 for visitors	Not required	
Total	<b><u>154</u></b>	102	-	-
<b>Site C – OFFICE (Class 5 building)</b>				
* Assumed 275 occupants * Visitors	18 for occup. 7 for visitors	21 for occup. 4 for visitors	4 showers 25 lockers	6 showers 26 lockers
Total	18 for occup. <b><u>7 for visitors</u></b>	<b><u>21 for occup.</u></b> 4 for visitors	<b><u>4 showers</u></b> <b><u>25 lockers</u></b>	<b><u>6 showers</u></b> <b><u>26 lockers</u></b>
Note: Underlined numbers of bicycle parking spaces and end-of trips facilities for individual buildings and amenities to be included in the design to assure compliance with more restrictive requirements.				

## Appendix B

### NABERS Reverse Calculator

The NABERS Energy and Water for reverse calculator indicates the maximum amounts of energy and water a building can use to achieve specified star rating. To ensure nominated rating, a factor of safety should be allowed for. The outputs are the maximum amounts of energy and water allowed to be used to achieve the rating.

#### SITE A – OFFICE

- **NABERS Energy** target: **5 STARS**
- **NABERS Water** target: **4 STARS**

Assumptions for Base Building Assessment:

- **NLA:** 34,000 m<sup>2</sup>
- **Hours each week with occupancy levels of 20% or more** 50 hrs/week

Percentage Breakdown of Energy Consumption:

- **Electricity - 90%; Gas - 10%; Coal - 0%; Oil - 0%**

Reverse calculator results:



#### Benchmarking factor at selected rating

71

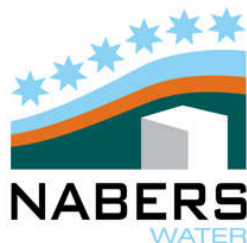
#### Maximum Allowable Energy Consumption

Electricity	2,713,384	kWh per annum
Gas	1,085,353	MJ per annum
Coal	-	kg per annum
Diesel	-	L per annum

Max total energy use in MJ	10,853,535	MJ per annum
Max total energy intensity	319	MJ/m2 per annum
Electricity energy intensity	287	MJ/m2 per annum
Gas energy intensity	32	MJ/m2 per annum
Coal energy intensity	-	MJ/m2 per annum
Diesel energy intensity	-	MJ/m2 per annum

Max total greenhouse emissions (raw), Scope 1, 2 & 3	2,566,138	kg CO2 per annum
Max greenhouse emissions intensity (raw), Scope 1, 2 & 3	75	kg CO2/m2 per annum
Electricity greenhouse emissions (raw), Scope 1, 2 & 3	2,496,313	kg CO2 per annum
Gas greenhouse emissions (raw), Scope 1, 2 & 3	69,824	kg CO2 per annum
Coal greenhouse emissions (raw), Scope 1, 2 & 3	-	kg CO2 per annum
Diesel greenhouse emissions (raw), Scope 1, 2 & 3	-	kg CO2 per annum

Max total greenhouse emissions (raw), Scope 1 & 2	2,280,903	kg CO2 per annum
Max greenhouse emissions intensity (raw), Scope 1 & 2	67	kg CO2/m2 per annum
Electricity greenhouse emissions (raw), Scope 1 & 2	2,224,975	kg CO2 per annum
Gas greenhouse emissions (raw), Scope 1 & 2	55,928	kg CO2 per annum
Coal greenhouse emissions (raw), Scope 1 & 2	-	kg CO2 per annum
Diesel greenhouse emissions (raw), Scope 1 & 2	-	kg CO2 per annum



#### Maximum Water Consumption at 4 Star NABERS Water

23,183 kL/year  
0.682 kL/m<sup>2</sup>

## SITE C – OFFICE

- **NABERS Energy** target: **5 STARS**
- **NABERS Water** target: **4 STARS**

Assumptions for Base Building Assessment:

- |   |                      |
|---|----------------------|
| • NLA:  | 2,700 m <sup>2</sup> |
| • Hours each week with occupancy levels of 20% or more                            | 50 hrs/week          |
| • Number of computers that are normally switched on when the building is occupied | 270                  |

Percentage Breakdown of Energy Consumption:

- Electricity - 90%; Gas - 10%; Coal - 0%; Oil - 0%

Reverse calculator results:



<b>Benchmarking factor at selected rating</b>	<b>71</b>	
<b>Maximum Allowable Energy Consumption</b>		
Electricity	215,474	kWh per annum
Gas	86,189	MJ per annum
Coal	-	kg per annum
Diesel	-	L per annum
Max total energy use in MJ	861,895	MJ per annum
Max total energy intensity	319	MJ/m <sup>2</sup> per annum
Electricity energy intensity	287	MJ/m <sup>2</sup> per annum
Gas energy intensity	32	MJ/m <sup>2</sup> per annum
Coal energy intensity	-	MJ/m <sup>2</sup> per annum
Diesel energy intensity	-	MJ/m <sup>2</sup> per annum
Max total greenhouse emissions (raw), Scope 1, 2 & 3	203,781	kg CO <sub>2</sub> per annum
Max greenhouse emissions intensity (raw), Scope 1, 2 & 3	75	kg CO <sub>2</sub> /m <sup>2</sup> per annum
Electricity greenhouse emissions (raw), Scope 1, 2 & 3	198,236	kg CO <sub>2</sub> per annum
Gas greenhouse emissions (raw), Scope 1, 2 & 3	5,545	kg CO <sub>2</sub> per annum
Coal greenhouse emissions (raw), Scope 1, 2 & 3	-	kg CO <sub>2</sub> per annum
Diesel greenhouse emissions (raw), Scope 1, 2 & 3	-	kg CO <sub>2</sub> per annum
Max total greenhouse emissions (raw), Scope 1 & 2	181,130	kg CO <sub>2</sub> per annum
Max greenhouse emissions intensity (raw), Scope 1 & 2	67	kg CO <sub>2</sub> /m <sup>2</sup> per annum
Electricity greenhouse emissions (raw), Scope 1 & 2	176,689	kg CO <sub>2</sub> per annum
Gas greenhouse emissions (raw), Scope 1 & 2	4,441	kg CO <sub>2</sub> per annum
Coal greenhouse emissions (raw), Scope 1 & 2	-	kg CO <sub>2</sub> per annum
Diesel greenhouse emissions (raw), Scope 1 & 2	-	kg CO <sub>2</sub> per annum



### Maximum Water Consumption at 4 Star NABERS Water

**1,841 kL/year**  
**0.682 kL/m<sup>2</sup>**

## Appendix C

### Green Star Scorecard: Site A – COMMERCIAL



#### Site A – COMMERCIAL BUILDING

#### Targeted Rating: Green Star 5 STAR - Australian Excellence

**Table 15** Green Star Scorecard for Commercial Building – Site A – Conservative Approach

Category / Credit	Aim of the Credit	Code	Credit Criteria	Points Available	Points Targeted*
<b>MANAGEMENT</b>					
<b>Green Star Accredited Professional</b>	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.	1.0	Accredited Professional	1	1
<b>Commissioning and Tuning</b>	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	1
<b>Adaptation and Resilience</b>	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	
<b>Building Information</b>	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 Operations and Maintenance Information	1	1
		4.2	Building User Information	1	1
<b>Commitment to Performance</b>	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	1	1
<b>Metering and Monitoring</b>	To recognise the implementation of effective energy and water metering and monitoring systems.	6.0	Metering	-	Complies
		6.1	Monitoring Systems	1	1
<b>Construction Environmental Management</b>	To reward projects that use best practice formal environmental management procedures during construction.	7.0	Environmental Management Plan	-	Complies
		7.1	Formalised Environmental Management System	1	1
		7.2	High Quality Staff Support	1	1
<b>Operational Waste</b>	Performance Pathway	8A	Performance Pathway - Specialist Plan	1	1

Category / Credit	Aim of the Credit	Code	Credit Criteria	Points Available	Points Targeted*
		8B	Prescriptive Pathway - Facilities	1	1
Total				15	13
INDOOR ENVIRONMENT QUALITY					
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	2	1
		9.3	Exhaust or Elimination of Pollutants	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	1	1
		10.3	Acoustic Separation	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	1	1
		11.2	Surface Illuminance	1	
		11.3	Localised Lighting Control	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	-	Complies
		12.1	Daylight	2	1
		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	1	1
		13.2	Engineered Wood Products	1	1
Thermal Comfort	To encourage and recognise projects that achieve high levels of thermal comfort.	14.1	Thermal Comfort	1	1
		14.2	Advanced Thermal Comfort	1	
Total				17	12
ENERGY					
Greenhouse Gas Emissions	E. Modelled Performance Pathway	15E.0	Conditional Requirement: Reference Building Pathway	-	Complies
		15E.1	Comparison to a Reference Building Pathway	20	7
Peak Electricity Demand Reduction	Performance Pathway	16A	Prescriptive Pathway - On-site Energy Generation	-	
		16B	Performance Pathway - Reference Building	2	0.8
Total				22	7.8
TRANSPORT					
Sustainable Transport	Performance Pathway	17A.1	Performance Pathway	10	-
	Access by Public Transport	17B.1	Prescriptive Pathway	3	3
	Reduced Car Parking Provision	17B.2	Prescriptive Pathway	1	1
	Low Emission Vehicle Infrastructure	17B.3	Prescriptive Pathway	1	1

Category / Credit	Aim of the Credit	Code	Credit Criteria	Points Available	Points Targeted*
	Active Transport Facilities	17B.4	Prescriptive Pathway	1	1
	Walkable Neighbourhoods	17B.5	Prescriptive Pathway	1	1
Total				7	7
WATER					
Potable Water	Performance Pathway	18A.1	Potable Water - Performance Pathway	12	4
Total				12	4
MATERIALS					
Life Cycle Impacts	Prescriptive Pathway - Life Cycle Impacts	19A.1	Comparative Life Cycle Assessment	6	5
		19A.2	Additional Life Cycle Impact Reporting	4	2
		19B.1	Concrete	3	
		19B.2	Steel	1	
		19B.3	Building Reuse	4	
		19B.4	Structural Timber	4	
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	1	1
		20.2	Timber Products	1	1
		20.3	Permanent Formwork, Pipes, Flooring, Blinds and Cables	1	1
Sustainable Products	To encourage sustainability and transparency in product specification.	21.1	Product Transparency and Sustainability	3	2
Construction and Demolition Waste	Fixed Benchmark	22A	Fixed Benchmark	1	
		22B	Percentage Benchmark	1	1
Total				17	13
LAND USE & ECOLOGY					
Ecological Value	To reward projects that improve the ecological value of their site.	23.0	Endangered, Threatened or Vulnerable Species	-	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	1	1
		24.2	Contamination and Hazardous Materials	1	
Heat Island Effect	To encourage and recognise projects that reduce the contribution of the project site to the heat island effect.	25.0	Heat Island Effect Reduction	1	
Total				6	1
EMISSIONS					
Stormwater		26.1	Stormwater Peak Discharge	1	1



Category / Credit	Aim of the Credit	Code	Credit Criteria	Points Available	Points Targeted*
	To reward projects that minimise peak stormwater flows and reduce pollutants entering public sewer infrastructure.	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	1	1
Microbial Control	To recognise projects that implement systems to minimise the impacts associated with harmful microbes in building systems.	28.0	Legionella Impacts from Cooling Systems	1	1
Refrigerant Impacts	To encourage operational practices that minimise the environmental impacts of refrigeration equipment.	29.0	Refrigerants Impacts	1	1
Total				5	5
INNOVATION					
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 or in the world.	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		1
Innovation Challenge	Where the project addresses a sustainability issue not included within any of the Credits in the existing Green Star rating tools.	30D	Innovation Challenge		
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 rating tools.	30E	Global Sustainability		
Total				10	1
TOTALS				Available	Targeted
<b>Green Star Rating Scale</b> Best Practice 4 STAR: 45 – 59 points Australian Excellence 5 STAR: 60 – 75 points World Leadership 6 STAR: 75+ points			CORE POINTS	100	64.8
			INNOVATION POINTS	10	1.0
			TOTAL SCORE TARGETED		65.8

\* Note: No commitment has been made to target specific credits and/or points. The individual credits and target points shown are indicative and subject to change.

## Green Star Scorecard: Site B – RESIDENTIAL

### Site B - Residential

#### Targeted Rating: Green Star 5 STAR - Australian Excellence

Table 16 Green Star Scorecard for Residential Building – Site B – Conservative Approach

Category / Credit	Aim of the Credit	Code	Credit Criteria	Points Available	Points Targeted*
MANAGEMENT					
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.	1.0	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	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	
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 Operations and Maintenance Information	1	1
		4.2	Building User 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	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
Construction Environmental Management	To reward projects that use best practice formal environmental management procedures during construction.	7.0	Environmental Management Plan	-	Complies
		7.1	Formalised Environmental Management System	1	1
		7.2	High Quality Staff Support	1	1
Operational Waste	Performance Pathway	8A	Performance Pathway - Specialist Plan	1	1
		8B	Prescriptive Pathway - Facilities	1	1
Total				15	13
INDOOR ENVIRONMENT QUALITY					

Category / Credit	Aim of the Credit	Code	Credit Criteria	Points Available	Points Targeted*
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	2	1
		9.3	Exhaust or Elimination of Pollutants	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	1	1
		10.3	Acoustic Separation	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	1	1
		11.2	Surface Illuminance	1	
		11.3	Localised Lighting Control	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	-	Complies
		12.1	Daylight	2	1
		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	1	1
		13.2	Engineered Wood Products	1	1
Thermal Comfort	To encourage and recognise projects that achieve high levels of thermal comfort.	14.1	Thermal Comfort	1	1
		14.2	Advanced Thermal Comfort	1	
Total				17	12
ENERGY					
Greenhouse Gas Emissions	E. Modelled Performance Pathway	15E.0	Conditional Requirement: Reference Building Pathway	-	Complies
		15E.1	Comparison to a Reference Building Pathway	20	7
Peak Electricity Demand Reduction	Performance Pathway	16A	Prescriptive Pathway - On-site Energy Generation	-	
		16B	Performance Pathway - Reference Building	2	0.8
Total				22	7.8
TRANSPORT					
Sustainable Transport	Performance Pathway	17A.1	Performance Pathway	10	-
	Access by Public Transport	17B.1	Prescriptive Pathway	3	3
	Reduced Car Parking Provision	17B.2	Prescriptive Pathway	1	1
	Low Emission Vehicle Infrastructure	17B.3	Prescriptive Pathway	1	1
	Active Transport Facilities	17B.4	Prescriptive Pathway	1	1
	Walkable Neighbourhoods	17B.5	Prescriptive Pathway	1	1
Total				7	7

Category / Credit	Aim of the Credit	Code	Credit Criteria	Points Available	Points Targeted*
WATER					
Potable Water	Performance Pathway	18A.1	Potable Water - Performance Pathway	12	4
Total				12	4
MATERIALS					
Life Cycle Impacts	Prescriptive Pathway - Life Cycle Impacts	19A.1	Comparative Life Cycle Assessment	6	5
		19A.2	Additional Life Cycle Impact Reporting	4	2
		19B.1	Concrete	3	
		19B.2	Steel	1	
		19B.3	Building Reuse	4	
		19B.4	Structural Timber	4	
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	1	1
		20.2	Timber Products	1	1
		20.3	Permanent Formwork, Pipes, Flooring, Blinds and Cables	1	1
Sustainable Products	To encourage sustainability and transparency in product specification.	21.1	Product Transparency and Sustainability	3	2
Construction and Demolition Waste	Fixed Benchmark	22A	Fixed Benchmark	1	
		22B	Percentage Benchmark	1	1
Total				17	13
LAND USE & ECOLOGY					
Ecological Value	To reward projects that improve the ecological value of their site.	23.0	Endangered, Threatened or Vulnerable Species	-	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	1	1
		24.2	Contamination and Hazardous Materials	1	
Heat Island Effect	To encourage and recognise projects that reduce the contribution of the project site to the heat island effect.	25.0	Heat Island Effect Reduction	1	
Total				6	1
EMISSIONS					
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

Category / Credit	Aim of the Credit	Code	Credit Criteria	Points Available	Points Targeted*
		27.1	Light Pollution to Night Sky	1	1
<b>Microbial Control</b>	To recognise projects that implement systems to minimise the impacts associated with harmful microbes in building systems.	28.0	Legionella Impacts from Cooling Systems	1	1
<b>Refrigerant Impacts</b>	To encourage operational practices that minimise the environmental impacts of refrigeration equipment.	29.0	Refrigerants Impacts	1	1
<b>Total</b>				<b>5</b>	<b>5</b>
<b>INNOVATION</b>					
<b>Innovative Technology or Process</b>	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	
<b>Market Transformation</b>	The project has undertaken a sustainability initiative that substantially contributes to the broader market transformation towards sustainable development in Australia or in the world.	30B	Market Transformation		
<b>Improving on Green Star Benchmarks</b>	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		1
<b>Innovation Challenge</b>	Where the project addresses a sustainability issue not included within any of the Credits in the existing Green Star rating tools.	30D	Innovation Challenge		
<b>Global Sustainability</b>	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 rating tools.	30E	Global Sustainability		
<b>Total</b>				<b>10</b>	<b>1</b>
<b>TOTALS</b>				<b>Available</b>	<b>Targeted</b>
<b>Green Star Rating Scale</b>			<b>CORE POINTS</b>	<b>100</b>	<b>64.8</b>
Best Practice	4 STAR: 45 – 59 points		<b>INNOVATION POINTS</b>	<b>10</b>	<b>1.0</b>
Australian Excellence	5 STAR: 60 – 75 points		<b>TOTAL SCORE TARGETED</b>		<b>65.8</b>
World Leadership	6 STAR: 75+ points				

\* Note: No commitment has been made to target specific credits and/or points. The individual credits and target points shown are indicative and subject to change.

## Green Star Scorecard: Site C – COMMERCIAL

### Site C – COMMERCIAL – OFFICE BUILDING

#### Targeted Rating: Green Star 5 STAR - Australian Excellence

Table 17 Green Star Scorecard for Commercial Building – Site C – Conservative Approach

Category / Credit	Aim of the Credit	Code	Credit Criteria	Points Available	Points Targeted*
MANAGEMENT					
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.	1.0	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	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	
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	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 Building Practices	To reward projects that use best practice formal environmental management procedures during construction.	7.0	Environmental Management Plan	-	Complies
		7.1	Formalised Environmental Management System	1	1
		7.2	High Quality Staff Support	1	1
Operational Waste	Performance Pathway	8A	Performance Pathway - Specialist Plan	1	
		8B	Prescriptive Pathway - Facilities	1	1
Total				14	12

Category / Credit	Aim of the Credit	Code	Credit Criteria	Points Available	Points Targeted*
INDOOR ENVIRONMENT QUALITY					
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	2	2
		9.3	Exhaust or Elimination of Pollutants	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	1	1
		10.3	Acoustic Separation	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	1	1
		11.2	Surface Illuminance	1	
		11.3	Localised Lighting Control	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	-	Complies
		12.1	Daylight	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	1	1
		13.2	Engineered Wood Products	1	1
Thermal Comfort	To encourage and recognise projects that achieve high levels of thermal comfort.	14.1	Thermal Comfort	1	1
		14.2	Advanced Thermal Comfort	1	
Total				17	14
ENERGY					
Greenhouse Gas Emissions	A. Prescriptive Pathway	15A.0	Conditional Requirement: Prescriptive Pathway	-	Complies
		15A.1	Building Envelope	1	1
		15A.2	Glazing	1	1
		15A.3	Lighting	1	1
		15A.4	Ventilation and Air-Conditioning	1	1
		15A.5	Domestic Hot Water Systems	1	1
		15A.6	Accredited GreenPower	5	
Peak Electricity Demand Reduction	Prescriptive Pathway	16A	Prescriptive Pathway - On-site Energy Generation	1	1
		16B	Performance Pathway - Reference Building	2	
Total				22	6
TRANSPORT					
	Prescriptive Pathway	17B.1	Access by Public Transport	3	2

Category / Credit	Aim of the Credit	Code	Credit Criteria	Points Available	Points Targeted*
Sustainable Transport		17B.2	Reduced Car Parking Provision	1	1
		17B.3	Low Emission Vehicle Infrastructure	N/A	
		17B.4	Active Transport Facilities	1	1
		17B.5	Walkable Neighbourhoods	1	1
Total				6	5
WATER					
Potable Water	Performance Pathway	18A.1	Potable Water - Performance Pathway		
	Prescriptive Pathway	18B.1	Sanitary Fixture Efficiency	1	1
		18B.2	Rainwater Reuse	1	1
		18B.3	Heat Rejection	2	
		18B.4	Landscape Irrigation	1	1
		18B.5	Fire System Test Water	1	1
Total				12	4
MATERIALS					
Life Cycle Impacts	Prescriptive Pathway - Life Cycle Impacts	19A.1	Comparative Life Cycle Assessment	0	
		19A.2	Additional Life Cycle Impact Reporting	4	
		19B.1	Concrete	3	2
		19B.2	Steel	1	
		19B.3	Building Reuse	4	
		19B.4	Structural Timber	4	
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	1	1
		20.2	Timber Products	1	1
		20.3	Permanent Formwork, Pipes, Flooring, Blinds and Cables	1	1
Sustainable Products	To encourage sustainability and transparency in product specification.	21.1	Product Transparency and Sustainability	3	3
Construction and Demolition Waste	Fixed Benchmark	22A	Fixed Benchmark	1	1
		22B	Percentage Benchmark	1	1
Total				12	9
LAND USE & ECOLOGY					
Ecological Value	To reward projects that improve the ecological value of their site.	23.0	Endangered, Threatened or Vulnerable Species	-	Complies
		23.1	Ecological Value	3	
		24.0	Conditional Requirement	-	Complies



Category / Credit	Aim of the Credit	Code	Credit Criteria	Points Available	Points Targeted*
<b>Sustainable Sites</b>	To reward projects that choose to develop sites that have limited ecological value, re-use previously developed land and remediate contaminate land.	24.1	Reuse of Land	1	1
		24.2	Contamination and Hazardous Materials	1	
<b>Heat Island Effect</b>	To encourage and recognise projects that reduce the contribution of the project site to the heat island effect.	25.0	Heat Island Effect Reduction	1	1
<b>Total</b>				<b>6</b>	<b>2</b>
<b>EMISSIONS</b>					
<b>Stormwater</b>	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
<b>Light Pollution</b>	To reward projects that minimise light pollution.	27.0	Light Pollution to Neighbouring Bodies	-	Complies
		27.1	Light Pollution to Night Sky	1	1
<b>Microbial Control</b>	To recognise projects that implement systems to minimise the impacts associated with harmful microbes in building systems.	28.0	Legionella Impacts from Cooling Systems	1	
<b>Refrigerant Impacts</b>	To encourage operational practices that minimise the environmental impacts of refrigeration equipment.	29.0	Refrigerants Impacts	1	1
<b>Total</b>				<b>5</b>	<b>4</b>
<b>INNOVATION</b>					
<b>Innovative Technology or Process</b>	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	
<b>Market Transformation</b>	The project has undertaken a sustainability initiative that substantially contributes to the broader market transformation towards sustainable development in Australia or in the world.	30B	Market Transformation		1
<b>Improving on Green Star Benchmarks</b>	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		1
<b>Innovation Challenge</b>	Where the project addresses a sustainability issue not included within any of the Credits in the existing Green Star rating tools.	30D	Innovation Challenge		6
<b>Global Sustainability</b>	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 rating tools.	30E	Global Sustainability		
<b>Total</b>				<b>10</b>	<b>8</b>

Category / Credit	Aim of the Credit	Code	Credit Criteria	Points Available	Points Targeted*
<b>TOTALS</b>				<b>Available</b>	<b>Targeted</b>
<b>Green Star Rating Scale</b>			<b>CORE POINTS</b>	<b>99</b>	<b>56.0</b>
Best Practice	4 STAR: 45 – 59 points		<b>INNOVATION POINTS</b>	<b>10</b>	<b>8.0</b>
Australian Excellence	5 STAR: 60 – 75 points		<b>TOTAL SCORE TARGETED</b>		<b>64.0</b>
World Leadership	6 STAR: 75+ points				

\* Note: No commitment has been made to target specific credits and/or points. The individual credits and target points shown are indicative and subject to change.