City & Southwest

Ecological Sustainability Development Report

Detailed State Significant Development Application

Site C, Crows Nest over station development

April 2021 | Version: 1

Contents

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Executive summary

This Ecological Sustainability Development (ESD) Report supports a State Significant Development (SSD) Application, and outlines the sustainability requirements and targets relevant to the detailed design, construction and use of the Over Station Development (OSD) on Site C of the Crows Nest Station Precinct.

The main objective of this report is to confirm design compliance with the relevant regulations and to provide guidance on various sustainability initiatives that have been incorporated in the project throughout the design.

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

- *Secretary's Environmental Assessment Requirements dated 24 February 2021 (SSD- 13852803)*
- *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 v1.3*

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.

Introduction

1.1 Purpose of this report

This report supports a State Significant Development application (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 detailed SSD Application is made under Section 4.22 of the EP&A Act.

Sydney Metro is seeking to secure approval for the construction of a commercial building at Site C above the Crows Nest Station, otherwise known as the over station development (OSD). The detailed SSD Application for Site C OSD is classified as SSD pursuant to Clause 12 of *State Environmental Planning Policy (State and Regional Developments) 2011* (SRD SEPP). Under Clause 12 of the SRD SEPP, any development application that is pursuant to a concept SSD Application is also classified as SSD whether or not that part of the development exceeds the minimum capital investment value specified in the relevant schedule of the SRD SEPP. In this regard, the proposed development on Site C is pursuant to the approved concept SSD Application and has not been delegated to Council under Section 4.37 of the EP&A Act. The proposed development is therefore, classified as SSD and is submitted to DPIE for assessment and determination.

Sydney Metro proposes to procure the construction of the OSD as part of an Integrated Station Development package, which would result in the combined delivery of the station, OSD and public domain improvements. The station and public domain elements form part of a separate planning approval for Critical State Significant Infrastructure (CSSI) approved by DPE on 9 January 2017.

This report has been prepared to specifically respond to the Secretary's Environmental Assessment Requirements (SEARs) issued for the concept SSD Application on 24 February 2021 which states that the Environmental Impact Statement (EIS) is to address the following requirements:

Table 1 SEARs issued on 24 February 2021 (ESD scope)

Reference	SEARs requirement	Where addressed in report
12. Ecologically Sustainable Development	*Identify how ESD principles (as defined in clause 7(4) of Schedule 2 of the Regulation) will be incorporated into the design, construction and ongoing operation of the proposed development.* *Demonstrate how the future building will meet or exceed the relevant industry recognised building sustainability and environmental performance standards.* *Detail measures to be incorporated to reduce carbon emissions, reflecting the Government's goal of net zero emissions by 2050, and the consumption of resources water (including through water sensitive design principles and water re-use) and energy.* *Estimate the likely greenhouse gas emissions from the development, including construction and operation, having regard to the Greenhouse Gas Protocol for Project Accounting, and measures to be incorporated to reduce greenhouse gas emissions.*	Section 3.0 Policy and Legislation Section 3.1 Secretary's Environmental Assessment Requirements Section 3.2 Environmental Planning and Assessment Act
Plans and documents	*The EIS must include the ESD statement (incorporating a sustainability framework)*	Section 7.0 The ESD Framework

1.2 Overview of Sydney Metro in its context

Sydney Metro is Australia's biggest public transport project (**Figure 1**). There are four core components:

- **Metro North West Line (formerly the 36 kilometre North West Rail Link)** - Services started in May 2019 in the city's North West between Rouse Hill and Chatswood, with a metro train every four minutes in the peak. The project was delivered on time and $1 billion under budget.
- **Sydney Metro City & Southwest** – The Sydney Metro City & Southwest project includes a new 30km metro line extending metro rail from the end of the Metro North West Line at Chatswood, under Sydney Harbour, through new CBD stations and southwest to Bankstown. It is due to open in 2024 with the ultimate capacity to run a metro train every two minutes each way through the centre of Sydney. Sydney Metro City & Southwest will deliver new metro stations at Barangaroo, Crows Nest, Victoria Cross, Martin Place, Pitt Street, Waterloo and new underground metro platforms at Central Station. In addition it will upgrade and convert all 11 stations between Sydenham and Bankstown to metro standards.
- **Sydney Metro West** – Sydney Metro West is a new underground railway connecting Greater Parramatta and the Sydney CBD. This once-in-a-century infrastructure investment will transform Sydney for generations to come, doubling rail capacity between these two areas, linking new communities to rail services and supporting employment growth and housing supply between the two CBDs. Sydney Metro West stations have been confirmed at Westmead, Parramatta, Sydney Olympic Park, North Strathfield, Burwood North, Five Dock, The Bays, Pyrmont and the Sydney CBD. Further planning is underway to determine the locations of the Pyrmont and Sydney CBD stations.

- **Sydney Metro - Western Sydney Airport** – Metro rail will also service Greater Western Sydney and the new Western Sydney International (Nancy Bird Walton) Airport. The new railway line will become the transport spine for the Western Parkland City's growth for generations to come, connecting communities and travellers with the rest of Sydney's public transport system with a fast, safe and easy metro service. Six new stations will be delivered at St Marys, Orchard Hills, Luddenham, Airport Business Park, Airport Terminal and Western Sydney Aerotropolis. The Australian and NSW governments are partners in the delivery of this new railway.

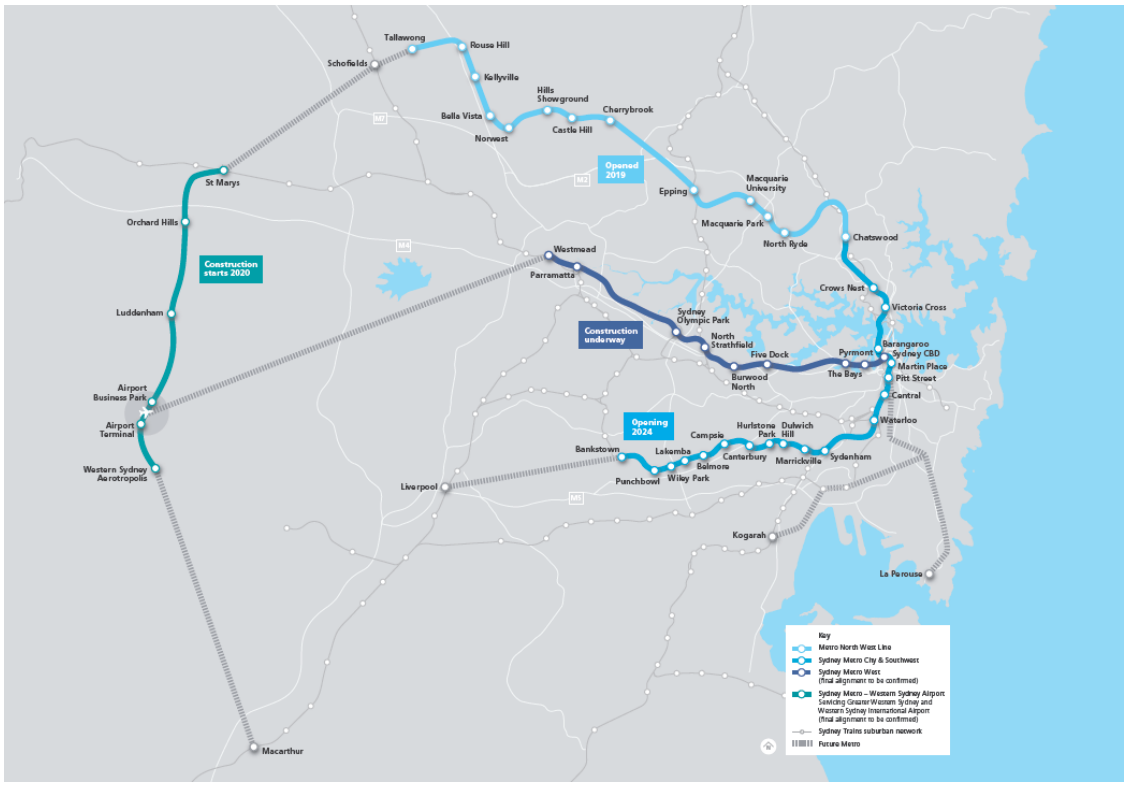

Figure 1: Sydney Metro network

1.3 Background and Concept Approval

Sydney Metro is seeking to deliver OSD above the approved Crows Nest Station. On 23 December 2020 the Minister for Planning and Public Spaces granted consent to the concept proposal for OSD at the Crows Nest Station including building envelopes, development parameters and strategies for a future development above the approved Crows Nest Station, and the use of the OSD spaces approved within the station under the CSSI Approval.

While the Crows Nest Station and OSD will form a single integrated station development, the planning pathways defined under the EP&A Act require separate assessment for each component of the development. In this regard, the approved station works (CSSI Approval) are subject to the provisions of Part 5.1 of the EP&A Act (now referred to as Division 5.2) and the OSD component is subject to the provisions of Part 4 of the EP&A Act.

The concept proposal for Crows Nest OSD complements the St Leonards commercial core and seeks to minimise overshadowing and amenity impacts and integrate with the broader Crows Nest village including Willoughby Road. It provides an opportunity for a mixed-use development that capitalises on its immediate access to Australia's biggest public transport project that delivers significant improvements to the amenity

of the local area. This aligns with the vision for the area, as outlined in key strategic planning documents, including the Greater Sydney Commission's (GSC) *North District Plan* and the St Leonards and Crows Nest 2036 Plan.

In October 2018, the NSW Department of Planning, Industry and Environment (DPIE) released a draft Rezoning Proposal for the Crows Nest metro site. The Rezoning Proposal sought to increase the relevant planning controls applying to the site to be commensurate with the built form proposed in the concept SSD Application.

The release of the Rezoning Proposal was simultaneous to the release of other (then) draft strategic planning documents including the *St Leonards and Crows Nest 2036 Draft Plan* (2036 Draft Plan). The *2036 Draft Plan* recommended significant changes to the planning controls for the immediate area surrounding the Crows Nest OSD site subject to consideration of community feedback to its exhibition.

The 2036 Plan and the associated Special Infrastructure Contribution (SIC) scheme were finalised by DPIE on 29 August 2020. The Rezoning Proposal was also finalised, and new planning controls gazetted, on 31 August 2020 applying new planning controls to the Crows Nest metro site.

1.4 Site description

The Crows Nest Station precinct is located between the Pacific Highway and Clarke Street (eastern side of the Pacific Highway) and Oxley Street and south of Hume Street, Crows Nest. It is located within the North Sydney local government area (LGA), however, it is also near the boundaries of both the Willoughby and Lane Cove LGAs.

Figure 2: Aerial photograph of Site C within the greater Crows Nest Station precinct

Site C is located at the north-western corner of Hume Street and Clarke Street, and comprises one allotment with the address of 14 Clarke Street, Crows Nest. It is legally described as Lot 1 in DP1123850.

The site is roughly rectangular in shape, and being located within the Crows Nest village centre. Adjoining Site C is a seven storey residential building (known as 'Wyndel Apartments') at 22-26 Clarke Street and a five storey commercial building at 20 Clarke Street.

Previously existing buildings on the site have been demolished to facilitate the construction of Crows Nest Station under the CSSI Approval. The demolition works are now complete, and the site is vacant and surrounded by construction hoarding. Once the station is completed as per the CSSI Approval, the entry within Site C will provide connection to the east towards Willoughby Road.

1.5 Overview of the proposed development

This detailed SSD Application will seek consent for the construction of a commercial office building on the site. It will be highly integrated with the approved Crows Nest Station under construction below.

Specifically, consent is sought for the following works:

- Construction of a new commercial building with the following parameters:
- A total gross floor area (GFA) of 3,097m2 (not including 245m2 of station GFA)
- A maximum building height of RL 127m, with an additional 5m 'building services zone' to accommodate rooftop plant and equipment, lift overruns and services (RL 132m total)
- Nine storeys, comprising:
- Building entrance lobby on the ground level as part of the CSSI Approval Crows Nest Station
- Bicycle parking and end of trip facilities on level 1 as part of the CSSI Approval Crows Nest Station
- Commercial offices on levels 2 – 8
- An accessible garden on part of level 9 for use by tenants
- An additional two levels of plant and services (levels 9 – 10)
- Associated building servicing and building landscaping elements.
- Signage zones for building / business identification.
- No vehicle parking will be provided on site.

The CSSI Approval for the metro station includes space provisioning on the ground level and level 1 for the Site C OSD. The use and fit-out of these OSD spaces requires approval under Part 4 while the actual station structure itself is approved as part of the Sydney Metro City & Southwest project.

Policy and legislation

1.6 Secretary's Environmental Assessment Requirements

The Secretary's Environmental Assessment Requirements (SEARs) issued for the concept SSD Application on 24 February 2021 states that the Environmental Impact Statement (EIS) is to address the following:

(12) Ecologically Sustainable Development (ESD) and climate change

- *identify how ESD principles (as defined in clause 7(4) of Schedule 2 of the Regulation) will be incorporated into the design, construction and ongoing operation of the proposed development.*
- *demonstrate how the future building will meet or exceed the relevant industry recognised building sustainability and environmental performance standards.*
- *detail measures to be incorporated to reduce carbon emissions, reflecting the Government's goal of net zero emissions by 2050, and the consumption of resources, water (including through water sensitive design principles and water re-use) and energy.*
- *estimate the likely greenhouse gas emissions from the development, including construction and operation, having regard to the Greenhouse Gas Protocol for Project Accounting, and measures to be incorporated to reduce greenhouse gas emissions.*

1.7 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 2:

Table 2 the EP&A Regulations Approach

The principles of ESD	Approach
a) The precautionary principle, 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, public and private decisions should be guided by: (i) Careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment, and (ii) An assessment of the risk-weighted consequences of various options.	• 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 have been undertaken, including the incorporation of best practice strategies related to building systems, transportation, water use, construction, materials and waste management. • The entire development will comply with NCC Section J Energy Efficiency requirements, reducing energy usage and thus greenhouse gas emissions. • Green Star Design and As Built v1.3 rating tool requirements will be incorporated to improve a project's sustainability performance aiming for a 5 Star rating for the Commercial building, noting that a 5 Star design review rating has been achieved. • The commercial building 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. The building is targeting a 5 Star NABERS Energy rating and 4 Star NABERS Water rating. Predictive NABERS Energy and Water modelling has been completed and indicates that the design is on track to achieve the targeted NABERS Energy and Water ratings.
b) Inter-generational equity, 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	• 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 v1.3 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.
c) Conservation of biological diversity and ecological integrity, namely, that conservation of biological diversity and ecological integrity should be a fundamental consideration	• The OSD is located on a site previously covered by impervious surfaces. The planned incorporation of rooftop garden and vegetative planter boxes into the design will enhance ecological value and provide biodiversity and ecological integrity.

The principles of ESD	Approach
d) Improved valuation, pricing and incentive mechanisms, namely, that environmental factors should be included in the valuation of assets and services, such as: (i) Polluter pays, that is, those who generate pollution and waste should bear the cost of containment, avoidance or abatement, and (ii) The users of goods and services should pay prices based on the full life cycle of costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any waste, (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.	• 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. • 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 • Targeted sustainability performance will have an influence on the initial capital investment cost but can result in increased asset value, improving the development's overall environmental life cycle performance.

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 Site C 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)*
- *National Construction Code - Building Code of Australia 2019 (BCA).*

1.8 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 Site C 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 the Site C OSD development where relevant.

The provisions outlined below have been adopted for the Crows Nest Site C OSD design.

Table 3 Sydney Metro City & Southwest Sustainability Strategy 2017 Sustainability Objectives and OSD Provisions

Theme	Objective	Relevant Site C OSD Provisions for the proposed design
Governance	Demonstrate a high level of performance against objectives and appropriate benchmarks.	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
	Demonstrate leadership by embedding sustainability objectives into decision making.	
	Be accountable and report publicly on performance	
Carbon & Energy Management	Improve the shift toward lower carbon transport	Bicycle parking and end of trip facilities including showers and lockers have been incorporated into the design to encourage healthier active transport options and the shift towards lower carbon transport

	Reduce energy use and carbon emissions during construction	Greenhouse gas emissions generated during construction will be reduced due to adoption of numerous sustainability rating tool requirements Low carbon concrete used during construction. 25% of electricity used during construction will be purchased through Green Power or carbon offsets.
	Reduce energy use and carbon emissions during operations	Energy efficient lighting, heating, ventilation and cooling Incorporating passive design measures to minimise energy consumption 5 Star NABERS Energy target for the Site C commercial building. Predictive NABERS Energy Modelling has been completed for Site C.
	Support innovative and cost-effective approaches to energy efficiency, low-carbon / renewable energy sources and energy procurement	Purchasing a percentage of power through a Green Power Purchase Agreement will be considered in operation of the building.
Environmental Performance	Reduce sources of pollution and optimise control at source to avoid environmental harm	Construction environmental management plan to be executed during construction, in accordance with the planning approval and sustainability rating tool (Green Star)
	Comply with environmental obligations outlined in applicable project planning approvals	
Climate Change Resilience	Infrastructure and operations will be resilient to the impacts of climate change	A Climate Adaptation Plan has been prepared for the Site C development. The plan outlines risks to the building infrastructure and operation as a result of a changing climate, and identifies initiatives implemented in design to adapt to these risks, with a focus on maintaining safe and healthy working environments during extreme weather conditions. The Climate Adaptation Plan has been prepared in line with the Green Star Design & As-Built v1.3 guidelines.

Resources – Water Efficiency	Minimise use of potable water	Water-efficient fittings and fixtures included within the design Waterless heat rejection incorporated into the commercial building design. 4 Star Water NABERS target for the Site C commercial building
	Maximise opportunities for reuse of rainwater, stormwater, wastewater and groundwater.	Rainwater tanks have been incorporated in the design for harvesting and reuse.
Resources – Waste & Materials	Minimise waste through the project lifecycle	Waste Management Plan to be incorporated during construction and operation phase Adopting Reduce, Reuse, Recycle rule through the project lifecycle
	Reduce materials consumption	
	Consider embodied impacts in materials selection	Responsibly sourced construction materials to be procured for the project
	Maximise beneficial reuse of spoil	N/A for Site C OSD development
Biodiversity Conservation	Protect and create biodiversity through appropriate planning, management and financial controls	Enhanced ecological value to be incorporated in the form of green roofs and integrated façade planting enhancing the ecological value of the site
Heritage Conservation	Protect and promote heritage through appropriate design, planning, and management controls	Compliance with planning approval requirements in relation to heritage
Liveability	Promote improved public transport patronage by maximising connectivity and interchange capabilities	Accessible bicycle parking will be provided to encourage the use of alternative transport options and public transportation
	Provide well designed stations and precincts that are comfortable, accessible, safe and attractive	
Community Benefit	Make a positive contribution to community health and well-being	Positive contribution to community health and well-being will be provided

	Ensure community and local stakeholder engagement and involvement in the development of the Project	by delivering environmentally sustainable design on the OSD Co-ordinated approaches among cross-sectoral stakeholder interests in line with the Green Star Management category requirements Community benefit opportunities were investigated as part of the Site C design.
	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	
Supply Chain	Influence contractors, subcontractors and materials suppliers to adopt sustainability objectives in their works and procurement	Sustainable Procurement Strategy and Responsibly Sourced Materials Policy to be incorporated for the construction stage.
Workforce Development	Increase opportunities for employment of local people, participation of local businesses, and participation of SME's	New OSD will create opportunities for employment within the construction and commercial sector allowing the project to respond to workforce development objectives in the future operational stage.
	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	
	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	
Economic	Consider adopting a Whole of Life Costing model to maximise sustainability benefits	A business case outlining captured sustainability benefits will be possible to develop at the operational stage evaluating all achieved sustainability goals.
	Optimise development opportunities for residual land	
	Capture sustainability benefits in the business case for the project	

1.9 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.

Clause 11 of the SRD SEPP states as follows: 'Development control plans (whether made before or after the commencement of this Policy) do not apply to… State significant development'. Accordingly, the North Sydney Development Control Plan 2013 (NSDCP 2013) is not a relevant consideration for SSD. Notwithstanding this, an assessment against the relevant NSDCP 2013 provisions has been undertaken as per below.

At the current stage Crows Nest Site C OSD design is consistent with the North Sydney DCP objectives. The following provisions are considered to be relevant for the OSD development.

1.9.1 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:

- *Obtaining a NABERS rating for commercial building. Site C is targeting a 5 Star NABERS Energy rating. Predictive NABERS Energy modelling has been completed for the design*

- *Obtaining a Green Star rating for the development. Site C is targeting a 5 Star Green Star Design & As-Built v1.3 rating. A 5 Star Design review submission has been awarded to the project.*

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.
Applicable provisions:

- *Design in line with requirements of Section J of the NCC 2019.*

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.
Applicable provisions:

- *Design in line with requirements of Section J of the NCC 2019.*

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.
Applicable provisions:

- *High efficiency centralised air-cooled chiller equipped with economy cycle*
- *Outside air provision rate higher than code requirement for commercial spaces.*

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:

- *Site specific Operational Waste Management Plan prepared for the project.*

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:

- *Contractor will develop a Construction 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.

Applicable provision:

- *Hot water provided by high efficiency electric heat pumps.*

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.
Applicable provision:

- *Roof top garden and integrated façade planter boxes*

1.9.2 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 5000m² 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 is applicable to Site C as a commercial office building is proposed.

1.9.3 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.
Applicable provisions:

- *No car parking is included in the development proposal*
- *End of trip facilities with bicycle parking, showers and change facilities have been included into the design. Numbers meet the DCP requirements.*

10.2.2 Car Share Schemes

O.1 To minimise the impact on the safety and efficiency of existing roads.
Applicable 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.
Applicable provisions:

- *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. The End of Trip bicycle parking provisions for Site C meet the DCP and Green Star requirements (awarded in the Green Star Design review submission).*

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 the Site C OSD development. 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, including the new metro station directly below Site C.*
- *Preparation of a Transport Access Guide (TAG) for the site;*
- *Car pool / car sharing.*

1.9.4 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.

Applicable provisions:

- *Contractor will prepare a Construction Waste Management Plan, to divert at least 90% of waste generated during construction from landfill to reuse or recycling, in line with the Green Star Design & As-Built v1.3 requirements.*
- *Operational Waste Management Plan has been prepared and incorporated into the design to promote separation and recycling of materials and divert waste from landfill, in line with the Green Star Design & As-Built v1.3 requirements.*

19.2 Demolition Waste

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

Applicable provisions:

- *Contractor will prepare a Construction Waste Management Plan, to divert at least 90% of waste generated during construction from landfill to reuse or recycling, in line with the Green Star Design & As-Built v1.3 requirements.*

19.3 Construction Waste

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

Applicable provisions:

- *Contractor will prepare a Construction Waste Management Plan, to divert at least 90% of waste generated during construction from landfill to reuse or recycling, in line with the Green Star Design & As-Built v1.3 requirements.*

19.4 Waste Facilities and Management

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

Applicable provisions:

- *A site specific Operational Waste Management Plan has been prepared and incorporated into the design to promote separation and recycling of materials and divert waste from landfill, in line with the Green Star Design & As-Built v1.3 requirements.*

1.9.5 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.*

Site C is located within Precinct 1.

Figure 3: St Leonards and Crows Nest Precincts (courtesy of North Sydney Council)

1.10 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. JV3 verification modelling has been completed for the design to demonstrate compliance with Section J of the NCC 2019.

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

1.10.1 Climate Zone

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

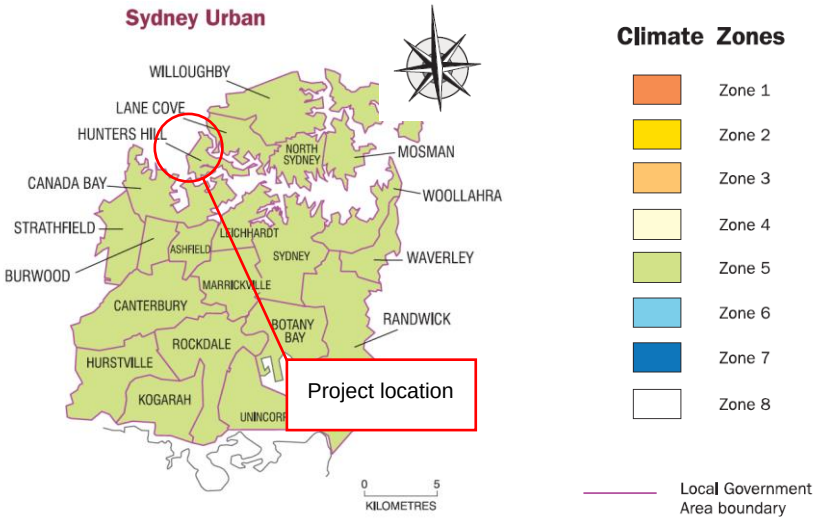

Figure 4: Sydney Urban, New South Wales climate zone map (courtesy of Australian Building Codes Board)

1.10.2 Minimum Thermal Performance

The minimum building fabric thermal performance for the proposed Site C development will meet (or exceed) the NCC 2019 Section J requirements as verified through JV3 modelling. The minimum thermal performance for building fabric elements is summarised in the **Error! Reference source not found.** below.

Table 4 Minimum Thermal Performance Requirement

Building Fabric Within Building Envelope*	Total R-Value [m2K/W]
Roof	**3.7 m^2K/W**
Walls (external)	**1.0 m^2K/W**

Walls (internal)	**1.0 m^2K/W**
Floors (slab on ground and exposed)	**2.0 m^2K/W**
Window U-Value	**2.0 W/m^2K**
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 meet the Section J NCC 2019 requirements as verified through JV3 modelling.

1.10.3 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 5 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

Sustainability Targets

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

- *National Australian Built Environment Rating System (NABERS)*
- *Green Star Design & As-Built v1.3 (GS)*

1.11 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 5).

Figure 5 NABERS star rating

Crows Nest Site C OSD aims to achieve the following NABERS star ratings:

Table 6 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 C - Office	5 stars	Electricity: 199,513 kWh Gas: 79,805 MJ	4 stars	1,704 kL/year (0.682 kL/m²)

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 for the proposed commercial building. Results from the reverse calculators are for information purposes only.

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 ≥ 20%* *50 hrs/week*
- *Net Lettable Area of the building* *2,500m²*
- *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 199,513 kWh for electricity and 79,805 MJ for gas.

NABERS Water 4 star rating can be achieved when annual water consumption doesn't exceed 1,704 kL/year (0.682 kL/m²)

Predictive NABERS Energy and Water modelling have been completed for the Site C design and demonstrate that the project is on track to achieve the targeted NABERS Water and Energy ratings

Refer to Appendix B for NABERS Reverse calculator results.

1.12 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 6 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 6) 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 7 Green Star Design and As Built rating targets

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

Refer to Appendix C for Green Star Scorecard indicating targeted credits for the Site C OSD development. It is noted that a 5 Star design review rating was awarded for the targeted credits outlined in Appendix C.

Benchmarking

Benchmarking of similar developments was conducted to identify existing Green Star certified 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 v1.3 rating tool. Thus, similar developments were provided considering legacy Green Star rating tools with corresponding star rating levels.

Table 8 Benchmarking of similar developments

Project Name & Description	Ratings Targeted or Achieved	Best Practice Sustainability Features
Office		
180 Thomas St, Haymarket Size: 14,679m^2 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	• Active chilled beam system is threaded throughout the building and supplies fresh, thermally treated air to the office • Wintergarden • Digital addressable lighting • Rainwater harvesting system • Passive solar shading • New construction built on top of an existing building • All HVAC refrigerants have an Ozone Depleting Potential (ODP) of zero
StarTrack House 219-241 Cleveland St, Strawberry Hills Strawberry Hills NSW Size: 26,147 m2 NLA	5 Star Green Star - Office As Built v3 Certified Oct 2014 Score 61 5 star NABERS energy	• 1,048 panel solar voltaic system located on the building's roof (base building load by 25%) • Energy efficient t5 light fittings • External glazing panels within the building reduce the amount of solar heat gain from the sun and improve staff comfort • A 15,000 litre rainwater storage tank provides rainwater for onsite drip irrigation • Hydraulic fittings in the building's amenities are 5-star WELS rated • A fire water reuse tank allows recycled water to be utilised for the testing of the building fire system • Bike storage and end-of-trip facilities

20 Martin Place Sydney NSW Size: 31,280m^2 NLA	6 Star Green Star - Office As Built v3 Certified Feb 2016 Score 66 5 star NABERS energy rating	• Adaptive reuse of a Sydney heritage building - retaining the 22 storey structural steel frame within the building • Reduced embodied energy in construction • 60 per cent reduction in base building energy consumption • Low energy lighting • Low energy building AC services and lifts • Excellent daylight quality and views • Triple glazed naturally ventilated façade to reduce heat and solar • Affording occupants spectacular views • 80% of construction waste diverted from landfill • 64% zero VOC paints • Replacing 30% of cement with flyash • LED light fittings installed to all office floors • 100% outside air system served via chilled beams • 1.9L/min ultra-low flow basin taps
Floth 69 Robertson Street Brisbane, QLD 1,041m2 office building	6 Star Green Star - Design & As Built v1.1 Certified Nov 2015 Score 83.3 6 star NABERS Indoor Environment rating	• Roof-mounted solar photovoltaic system provides 13% peak energy and offsetting 28 % of the building's operational energy • 100 % accredited greenpower purchased • Conducted whole-of-building, whole-of-life (cradle-to-grave) life cycle assessment (LCA) • 95% of the timber used in the building has been certified by a forest certification scheme • More than 9% (by cost) of materials have a transparency or sustainability initiative • 74% reduction in potable water consumption

177 Pacific Highway North Sydney, NSW Size: 39,250m^2 NLA	5 Star Green Star - Office As Built 3 Certified: Aug 2017 5.5 star NABERS Energy rating	• Low-temperature air conditioning systems for reduced energy consumption • Public garden plaza featuring café and retail areas • Rainwater harvesting • Performance glass facades • Base and tenant building management system • Precision air conditioning units, electrical metering, VAV recalibration • More accurate sensing and effective use of advanced controls for HVAC
101 Miller Street, North Sydney, NSW Size: 36,747m^2 NLA	5 Star Green Star - Office Design 2 Certified: Aug 2008 5 star NABERS energy rating	• 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 • $C0_2$savings estimated at 40% • Ventilation designed for superior air change effectiveness, according to ASHRAE F25-1997 and laminar flow patterns • Re-used more than 50% of the total building facade (by area)

The ESD Framework

The proposed Site C development 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 9.

Table 9 Regulations, standards and guidelines applicable for Site C Commercial Building.

Relevant regulation, standard or rating tool	Crow Nest Site C – Commercial
Secretary's Environmental Assessment Requirements	applies
Environmental Planning and Assessment Act 1979	applies
Sydney Metro City & Southwest Sustainability Strategy 2017	applies
North Sydney Development Control Plan	Does not apply, but has been addressed
National Construction Code - Building Code of Australia	applies
National Australian Built Environment Rating System	applies
Green Star Design & As-Built v1.3	applies

The following sustainability targets based on chosen rating tools are being pursued. The project is capable of achieving these targets; however certification cannot be issued until the building has been constructed and is operational.

Table 10 Sustainability targets based on chosen rating tools

ESD Category	Sustainability targets
	Site C - Commercial
Energy	NABERS Energy **5 stars**
Water	NABERS Water **4 stars**
Management	Green Star **5 Star** Design and As Built v1.3
Indoor Environment	
Material	
Transport	
Land Use and Ecology	
Emissions	
Innovation	

The sustainability design initiatives identified in

Table 11 for the Site C OSD have been incorporated into the design for the project. Initiatives will be tracked and implemented throughout final delivery of the Crows Nest OSD.

Table 11 OSD Sustainability Design Initiatives

ESD Category	Site C Sustainability Design Initiatives	Reference
Energy Efficiency	• Energy efficient LED and fluorescent lighting with lighting control system including timers, photocells and dimming • Efficient heating, ventilation and cooling - common area automated control, economiser on an air-conditioning (using outside air in active and mixed mode) • Commissioning and tuning requirements to be incorporated into the design for nominated building systems to assure high efficiency • Incorporating passive design measures to minimise energy consumption – shading, blinds • High-performance double-glazing windows and curtain wall • High-performance thermal insulation for building fabric • Energy meters for individual units, common areas, major uses and sources • Building Management System to monitor, control, and optimise energy usage at the operational stage • High efficiency boilers to provide heating hot water • Use of renewable energy by solar panels installation will be considered • For the building roof areas use of low SRI material or provision of solar panels to minimise heat island effect	SEARs (Secretary's Environmental Assessment Requirements), EP&A, SMCSSR, NCC, NABERS, NSDCP, GS
Water	• Efficient fittings and fixtures based on Water Efficiency Labelling and Standards (WELS), and/or sensor operated taps • Fire protection system to be design as a closed loop with water recirculation during testing • Rainwater harvesting and used with flush fixtures • Water meters for individual units, common areas, major uses and sources • Building Management System to monitor, control, and optimise water usage at the operational stage • Green roof or the landscaping to be design as a xeriscape garden, otherwise designed to reduce the consumption of potable water	SEARs (Secretary's Environmental Assessment Requirements), EP&A, SMCSSR, NCC, NABERS, NSDCP, GS

Waste	• The minimisation of waste through efficient design and material selections • Waste Management Plan will be reflected in the design of the building's facilities to provide adequate solutions for waste segregation and recycling • Waste Management Plan at the construction stage to minimise, reuse and recycle construction materials • Operational Waste Management Plan to be incorporated also for the operational stage	SEARs (Secretary's Environmental Assessment Requirements), EP&A, SMCSSR, NSDCP, GS
Materials	• Building materials will be selected considering the following qualities: durability, responsible sourcing, sustainable supply chain, low TVOC content, low formaldehyde emissions, • 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 • Building's steel will be sourced from a responsible steelmaker and will be produced using energy-reducing processed in its manufacture • Timber, if used within the design, will be certified by a forest certification scheme or will be from a reused source	SEARs (Secretary's Environmental Assessment Requirements), EP&A, SMCSSR, NSDCP, GS
Indoor Environment Quality	• 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 • Efficient heating, ventilating and air-conditioning (HVAC) system to assure high level of thermal comfort • Ventilation system • Provisions of outside air flow rates above the minimum regulatory requirements will be considered • Use of low Volatile Organic Content (VOC) and low formaldehyde materials to reduce air pollution • Reduction of internal ambient noise level by appropriate HVAC design and acoustic insulation from external noises • Lighting fixtures providing good colour quality and equipped with high frequency ballasts and high-Intensity discharge, where relevant • Glare control through selected systems and devices, blinds, screen and fixed devices, where relevant • Maximising areas with adequate daylight and views	SMCSSR, NSDCP, GS

Transport	• Provision of Active Transport Facilities - bicycle parking and associated end-of-trip facilities – showers and lockers • Provision of amenities for walkable neighbourhoods • Good access to public transport	SMCSSR, NSDCP, GS
Ecology, Biodiversity, Land Use	• Ecological value of the site is considered to be improved by the green roofs and/or vertical gardens supporting biodiversity of the site • Re-use of the previously developed site • Incorporation of remediation strategy, where relevant and where contaminants are detected	SMCSSR, GS
Emissions	• Rainwater collection and use for flush fixtures to reduce water discharge • Reduced impact refrigerants • External lighting designed to reduce light pollution of a night sky	SMCSSR, NSDCP, GS
Climate Change Resilience	• Climate Adaptation Plan will be developed for the project • Solutions to be included into the building design and construction that specifically address the risk assessment component of the plan	SMCSSR, NSDCP, GS

Summary

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

- *Secretary's Environmental Assessment Requirements issued on 24 February 2021*
- *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 v1.3*

A number of sustainability initiatives were considered and reviewed to be incorporated in the Crows Nest Site C OSD design to enhance its environmental performance.

NABERS Energy and Water rating tool were used to identify targets for energy and water efficiency.

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

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

This report addressed all relevant ESD requirements of the Secretary's Environmental Assessment Requirements (SEARs), issued for the Crows Nest OSD on 24 February 2021.

Appendix A

Bicycle Parking and End-of-trip Facilities

Table 12 Bicycle Parking and End-of-trip Facilities Requirements

Site C – Office (Class 5 Building)	Required Bicycle Parking		Required End-of-trip Facilities	
* Assumed 270 occupants * Visitors	18 for occup. 7 for visitors	21 for occup. 4 for visitors	2 showers 25 lockers	6 showers 26 lockers
Total	**25**	**25**	2 showers 25 lockers	**6 showers** **26 lockers**
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 C – OFFICE

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

Assumptions for Base Building Assessment:

- NLA: 2,500 m^2
- Hours each week with occupancy levels of 20% or more 50 hrs/week
- Net Lettable Area of the building 2,500 m^2

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	199,513	kWh per annum
Gas	79,805	MJ per annum
Coal	-	kg per annum
Diesel	-	L per annum

Max total energy use in MJ	**798,051**	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	**194,671**	kg CO2 per annum
Max greenhouse emissions intensity (raw), Scope 1, 2 & 3	**78**	kg CO2/m2 per annum
Electricity greenhouse emissions (raw), Scope 1, 2 & 3	**189,537**	kg CO2 per annum
Gas greenhouse emissions (raw), Scope 1, 2 & 3	**5,134**	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	**169,708**	kg CO2 per annum
Max greenhouse emissions intensity (raw), Scope 1 & 2	**68**	kg CO2/m2 per annum
Electricity greenhouse emissions (raw), Scope 1 & 2	**165,596**	kg CO2 per annum
Gas greenhouse emissions (raw), Scope 1 & 2	**4,112**	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

1,704 kL/year

0.682 kL/m²

Appendix C

Green Star Scorecard: Site C – COMMERCIAL

Site C – COMMERCIAL – OFFICE BUILDING

Targeted Rating: Green Star 5 STAR - Australian Excellence

Table 13 Green Star Scorecard for Commercial Building – Site C – As verified through formal Green Star D&AB v1.3 Design Review

Category / Credit	Aim of the Credit	Code	Credit Criteria	Points Available	Points Targeted
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	
		2.4	Independent Commissioning Agent	1	
Adaptation and Resilience	To encourage and recognise projects that are resilient to the impacts of a changing climate and natural disasters.	3.1	Implementation of a Climate Adaptation Plan	2	2
Building Information	To recognise the development and provision of building information that facilitates understanding of a building's systems, operation and maintenance requirements, and environmental targets to enable the optimised performance.	4.1	Building Information	1	1
Commitment to Performance	To recognise practices that encourage building owners, building occupants and facilities management teams to set targets and monitor environmental performance in a collaborative way.	5.1	Environmental Building Performance	1	1
		5.2	End of Life Waste Performance	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	1
		8B	Prescriptive Pathway - Facilities	-	

			Total	**14**	**11**
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**
Greenhouse Gas Emissions	A. Prescriptive Pathway	15A.0	Conditional Requirement: Prescriptive Pathway	-	Complies
		15A.1	Building Envelope	1	1
		15A.2	Wall-Glazing Construction	1	
		15A.3	Lighting	1	1
		15A.4	Ventilation and Air Conditioning	1	1
		15A.5	Domestic Hot Water	1	1
		15A.6	Transition Plan	1	
		15A.7	Fuel Switching	1	
		15A.8	On-Site Storage	1	
		15A.9	Vertical Transportation	1	1
		15A.10	Off-Site Renewables	5	

Peak Electricity Demand Reduction	Performance Pathway	16A	Prescriptive Pathway - On-site Energy Generation	1	
			Total	**11**	**5**
Sustainable Transport	Prescriptive Pathway	17B.1	Access by Public Transport	3	3
		17B.2	Reduced Car Parking Provision	1	1
		17B.3	Low Emission Vehicle Infrastructure	1	
		17B.4	Active Transport Facilities	1	1
		17B.5	Walkable Neighbourhoods	1	1
			Total	**7**	**6**
Potable Water	Performance Pathway	18A.1	Potable Water - Performance Pathway	12	6.2
			Total	**12**	**6.2**
Life Cycle Impacts	Performance Pathway - Life Cycle Assessment	19A.1	Comparative Life Cycle Assessment	6	3.4
		19A.2	Additional Life Cycle Impact Reporting	4	2
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	
		22B	Percentage Benchmark	1	1
			Total	**14**	**12.4**
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	2
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	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	1
			Total	**6**	**5**
Stormwater	To reward projects that minimise peak stormwater flows and reduce pollutants entering public sewer infrastructure.	26.1	Stormwater Peak Discharge	1	1
		26.2	Stormwater Pollution Targets	1	1
Light Pollution	To reward projects that minimise light pollution.	27.0	Light Pollution to Neighbouring Bodies	-	Complies
		27.1	Light Pollution to Night Sky	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	
			Total	**5**	**4**
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		
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		2
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		1
			Total	**10**	**4**
Green Star Rating Scale Best Practice 4 STAR: 45 – 59 points Australian Excellence 5 STAR: 60 – 75 points World Leadership 6 STAR: 75+ points			**CORE POINTS**	**100**	**62.0**
			INNOVATION POINTS	**10**	**4.0**
			TOTAL SCORE TARGETED		**66.0**