

# ESD REPORT

APPENDIX Q





# Sydney Metro City & South West

## Victoria Cross Over Station

### Development:

ESD report

<b>Applicable to:</b>	Sydney Metro City & Southwest
<b>Author:</b>	AECOM Australia Pty Ltd
<b>Owner</b>	Transport for NSW
<b>Status:</b>	Final
<b>Version:</b>	5
<b>Date of issue:</b>	16 May 2018
<b>Review date:</b>	16 May 2018
© Sydney Metro 2018	

## Table of Contents

<b>1.0</b>	<b>Introduction .....</b>	<b>3</b>
1.1	Purpose of this report .....	3
1.2	Overview of the Sydney Metro in its context .....	4
1.3	Planning relationship between Victoria Cross Station and the OSD .....	6
1.4	The Site .....	8
1.5	Overview of the proposed development .....	9
<b>2.0</b>	<b>Scope of assessment.....</b>	<b>12</b>
<b>3.0</b>	<b>Sustainability requirements and market drivers .....</b>	<b>13</b>
3.1	Building Code of Australia – Section J .....	13
3.2	Secretary’s Environmental Assessment Requirements .....	13
3.3	EP&A Regulation 2000 - ESD Principles .....	13
3.4	North Sydney Council .....	14
3.5	Sydney Metro City & Southwest sustainability requirements .....	18
3.5.1	Sydney Metro City & Southwest sustainability strategy .....	18
3.5.2	Sydney Metro sustainability objectives.....	18
3.5.3	Sydney Metro proposed sustainability initiatives for OSD .....	20
3.6	Rating Tools .....	21
3.6.1	National Australian Built Environment Rating System (NABERS)21	
3.6.2	Green Star Design & As-Built.....	22
3.6.3	The WELL Building Standard.....	22
3.6.4	Net Zero Carbon Offset Standard 2017.....	23
3.7	Other market drivers and trends .....	23
3.7.1	Changes to building codes and standards .....	23
3.7.2	Transition to Net Zero .....	24
3.7.3	Electric vehicle uptake .....	24
3.7.4	Health & wellbeing .....	24
3.7.5	Community and social sustainability .....	24
3.8	Benchmarking of similar development .....	25
<b>4.0</b>	<b>Response to the SEARS .....</b>	<b>27</b>
4.1	EP&A Regulation 2000 .....	27
4.2	The ESD framework .....	28
<b>5.0</b>	<b>ESD Strategies and Design Features.....</b>	<b>30</b>
<b>6.0</b>	<b>Conclusion.....</b>	<b>36</b>
<b>Appendix A.....</b>	<b>End of trip facilities .....</b>	<b>37</b>

---

## 1.0 Introduction

### 1.1 Purpose of this report

This report supports a concept State Significant Development Application (concept SSD Application) submitted to the Department of Planning and Environment (DP&E) 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.

Transport for NSW (TfNSW) is seeking to secure concept approval for a commercial office tower above the Victoria Cross Station, otherwise known as the over station development (OSD). The concept SSD Application seeks consent for a building envelope and its use as a commercial premises (office, business and retail), maximum building height, maximum gross floor area, pedestrian and vehicular access, circulation arrangements and associated car parking, future subdivision (if required) and the strategies and design parameters for the future detailed design of development.

TfNSW 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 DP&E on 9 January 2017.

As the development is within a rail corridor, is associated with railway infrastructure and is for commercial premises 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).

This report has been prepared to outline key Ecologically Sustainable Design (ESD) requirements and drivers and the proposed project specific ESD Framework which defines the principles that will be incorporated into the future design, construction and operation of OSD. This report also specifically responds to the Secretary's Environmental Assessment Requirements (SEARs) issued for the concept SSD Application on 30<sup>th</sup> November 2017 which states that the Environmental Impact Statement (EIS) is to address the following requirements:

- Detail how ESD principles (as defined in clause 7(4) Schedule 2 of the EP&A Regulation 2000) will be incorporated in the design, construction and ongoing operation of the development
- Include a framework for how the proposed development will reflect best practice sustainable building principles to improve environmental performance, including energy and water efficient design, technology and use of renewable energy
- ESD Statement (incorporating a sustainability framework)

## 1.2 Overview of the Sydney Metro in its context

The New South Wales (NSW) Government is implementing *Sydney's Rail Future*, a plan to transform and modernise Sydney's rail network so that it can grow with the city's population and meet the needs of customers in the future (Transport for NSW, 2012). Sydney Metro is a new standalone rail network identified in *Sydney's Rail Future*.

Sydney Metro is Australia's biggest public transport project, consisting of Sydney Metro Northwest (Stage 1), which is due for completion in 2019 and Sydney Metro City & Southwest (Stage 2), which is due for completion in 2024 (Refer to **Figure 1**).



**Figure 1:** Sydney Metro alignment map

Stage 2 of Sydney Metro includes the construction and operation of a new metro rail line from Chatswood, under Sydney Harbour through Sydney's CBD to Sydenham and on to Bankstown through the conversion of the existing line to metro standards.

The project also involves the delivery of seven (7) new metro stations, including at North Sydney. Once completed, Sydney Metro will have the ultimate capacity for 30 trains an hour (one every two minutes) through the CBD in each direction - a level of service never seen before in Sydney.

On 9 January 2017, the Minister for Planning approved the Sydney Metro City & Southwest - Chatswood to Sydenham application lodged by TfNSW as a Critical State Significant Infrastructure project (reference SSI 15\_7400), hereafter referred to as the CSSI Approval.

The CSSI Approval includes all physical work required to construct the CSSI, including the demolition of existing buildings and structures on each site. Importantly, the CSSI Approval also includes provision for the construction of below and above ground structures and other components of the future OSD (including building infrastructure and space for future lift cores, plant rooms, access, parking and building services, as relevant to each site). The rationale for this delivery approach, as identified within the CSSI application is to enable the OSD to be more efficiently built and appropriately integrated into the metro station structure.

The EIS for the Chatswood to Sydenham component of the City & Southwest project identified that the OSD would be subject to a separate assessment process.

Since the CSSI Approval was issued, Sydney Metro has lodged four modification applications with DP&E to amend the CSSI Approval as outlined below:

- Modification 1- Victoria Cross and Artarmon Substation which involves relocation of the Victoria Cross northern services building from 194-196A Miller Street to 50 McLaren Street together with inclusion of a new station entrance at this location referred to as Victoria Cross North. 52 McLaren Street would also be used to support construction of these works. The modification also involves the relocation of the substation at Artarmon from Butchers Lane to 98 – 104 Reserve Road. This modification application was approved on 18 October 2017.
- Modification 2- Central Walk which involves additional works at Central Railway Station including construction of a new eastern concourse, a new eastern entry, and upgrades to suburban platforms. This modification application was approved on 21 December 2017.
- Modification 3 - Martin Place Station which involves changes to the Sydney Metro Martin Place Station to align with the Unsolicited Proposal by Macquarie Group Limited (Macquarie) for the development of the station precinct. The proposed modification involves a larger reconfigured station layout, provision of a new unpaid concourse link and retention of the existing MLC pedestrian link and works to connect into the Sydney Metro Martin Place Station. It is noted that if the Macquarie proposal does not proceed, the original station design remains approved. This modification application was approved on 22 March 2018.
- Modification 4 - Sydenham Station and Sydney Metro Trains Facility South which incorporates Sydenham Station and precinct works, the Sydney Metro Trains Facility South, works to Sydney Water's Sydenham Pit and Drainage Pumping Station and ancillary infrastructure and track and signalling works into the approved project. This modification application was approved on 13 December 2017.

Given the modifications, the CSSI Approval is now approved to operate to Sydenham Station and also includes the upgrade of Sydenham Station.

The remainder of Stage 2 of the City & Southwest project (Sydenham to Bankstown) proposes the conversion of the existing heavy rail line and the upgrade of the existing railway stations along this alignment to metro standards. This part of the project, referred to

as the Sydenham to Bankstown Upgrade, is the subject of a separate CSSI Application (Application No. SSI 17\_8256) which is currently being assessed by DP&E.

### 1.3 Planning relationship between Victoria Cross Station and the OSD

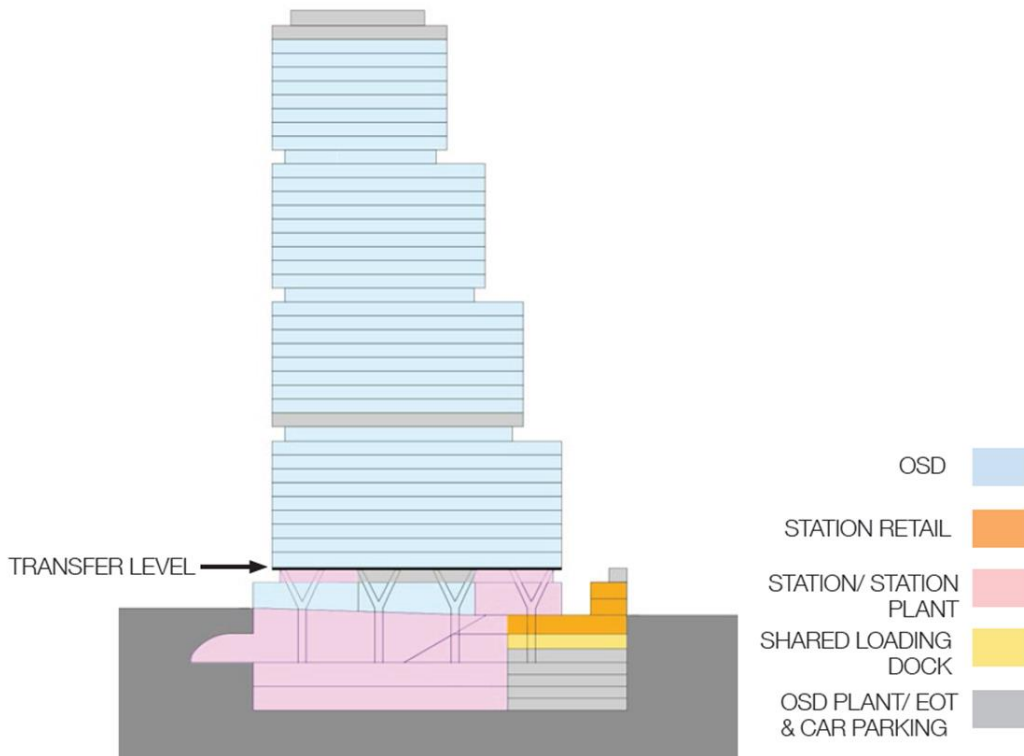
While the Victoria Cross Station and OSD will form an Integrated Station Development, the planning pathways defined under the *Environmental Planning & Assessment Act 1979* require separate approval for each component of the development. In this regard, the approved station works (CSSI Approval) are 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.

For clarity, the approved station works under the CSSI Approval include the construction of below and above ground structures necessary for delivering the station and also enabling construction of the integrated OSD. This includes but is not limited to:

- Demolition of existing development
- Excavation
- Station structure including concourse and platforms
- Lobbies
- Retail spaces within the station building
- Public domain improvements
- Pedestrian through-site link
- Access arrangements including vertical transport such as escalators and lifts
- Structural and service elements and the relevant space provisioning necessary for constructing OSD, such as columns and beams, space for lift cores, plant rooms, access, parking, retail and building services.

The vertical extent of the approved station works above ground level is defined by the 'transfer slab' level (which for Victoria Cross is defined by RL 82), above which would sit the OSD. This delineation is illustrated in **Figure 2**.





**Figure 2:** Delineation between Metro station and OSD

The CSSI Approval also establishes the general concept for the ground plane of Victoria Cross Station including access strategies for commuters, pedestrians and workers. In this regard, pedestrian access to the station would be from Miller and Denison Streets and the commercial lobby would be accessed from Miller Street. Retail uses (approved under the CSSI Approval) would be located on the ground floor of the development at both the Miller Street and Denison Street levels activating the through-site link. Separate consent would be sought in the future for the fit-out and specific use of this retail space.

Since the issue of the CSSI Approval, TfNSW has undertaken sufficient design work to determine the space planning and general layout for the station and identification of those spaces within the station area that would be available for the OSD. In addition, design work has been undertaken to determine the technical requirements for the structural integration of the OSD with the station. This level of design work has informed the concept proposal for the OSD. It is noted that ongoing design development of the works to be delivered under the CSSI Approval would continue with a view to developing an Interchange Access Plan (IAP) and Station Design Precinct Plan (SDPP) for Victoria Cross Station to satisfy Conditions E92 and E101 of the CSSI Approval.

The public domain improvement works around the site would be delivered as part of the CSSI Approval.

## 1.4 The Site

The Victoria Cross OSD site is located at the southeast corner of the intersection of Miller and Berry Streets, North Sydney, above the southern portal of the future Victoria Cross Station (refer to **Figure 3** below). The site is located in North Sydney CBD, which is identified as part of Sydney’s “Harbour CBD” (along with Sydney CBD) in the *Greater Sydney Region Plan (2018)*. It is the third largest office market in Sydney and is a key component of Sydney’s Global Economic Corridor.



**Figure 3:** Victoria Cross Station location plan

The site is located in the North Sydney Local Government Area approximately 3km north of Sydney CBD, 5km southeast of Chatswood and 2km southeast of St Leonards.

The site (refer to **Figure 4**) is irregular in shape, has a total area of approximately 4,815 square metres and has street frontages of approximately 37 metres to Berry Street, 34 metres to Denison Street and 102 metres to Miller Street.

The site comprises the following properties:

- 155–167 Miller Street                      SP 35644 (formerly Tower Square)
- 181 Miller Street                            Lot 15 in DP 69345, Lot 1 & Lot 2 DP 123056  
and Lot 10 in DP 70667
- 187 Miller Street                            Lot A in DP 160018
- 189 Miller Street                            Lot 1 in DP 633088
- Formerly part 65 Berry Street            Lot 1 in DP 1230458



**Figure 4:** The Site

## 1.5 Overview of the proposed development

This concept SSD Application comprises the first stage of the Victoria Cross OSD project. It will be followed by a detailed SSD Application for the design and construction of the OSD to be lodged by the successful contractor who is awarded the contract to deliver the Integrated Station Development.

This concept SSD Application seeks approval for the planning and development framework and strategies to inform the future detailed design of the OSD. It specifically seeks approval for the following:

- A building envelope as illustrated in **Figure 5**
- A maximum building height of RL 230 or 168 metres (approximately 42 storeys, comprising 40 commercial storeys and 2 additional storeys for the roof top plant) for the high rise portion of building envelope and RL 118 or 55 metres (approximately 13 storeys) for the lower rise eastern portion of the building envelope
- A maximum gross floor area (GFA) of 60,000 square metres for the OSD component, which is equivalent to a floor space ratio of 12.46:1
- Use of the building envelope area for commercial premises including commercial office, retail and business premises

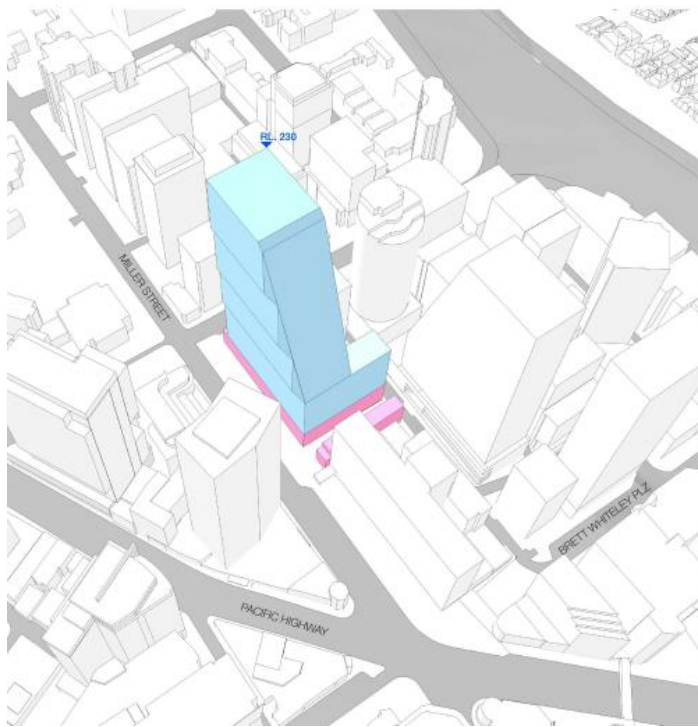
- Use of the conceptual OSD space provisioning within the footprint of the CSSI Approval (both above and below ground), including the OSD lobby and associated retail space, basement parking, end-of-trip facilities, services and back-of-house facilities
- Car parking for a maximum of 150 parking spaces over four basement levels with an additional 11 parking spaces allocated to the station retail approved under the terms of the CSSI Approval
- Loading, vehicle and pedestrian access arrangements from Denison Street
- Strategies for utility and services provision
- Strategies for the management of stormwater and drainage
- A strategy for the achievement of ecologically sustainable development
- Indicative signage zones
- A strategy for public art
- A design excellence framework
- The future subdivision of parts of the OSD footprint (if required).

The total GFA for the Integrated Station Development including the station GFA (i.e. retail, station circulation and associated facilities) and the OSD GFA is 67,000 square metres and is equivalent to a FSR of 13.9:1.

A drawing illustrating the proposed building envelope is provided in **Figure 5**. The concept SSD Application includes an indicative design for the OSD to demonstrate one potential design solution within the proposed building envelope (refer to **Figure 6**).

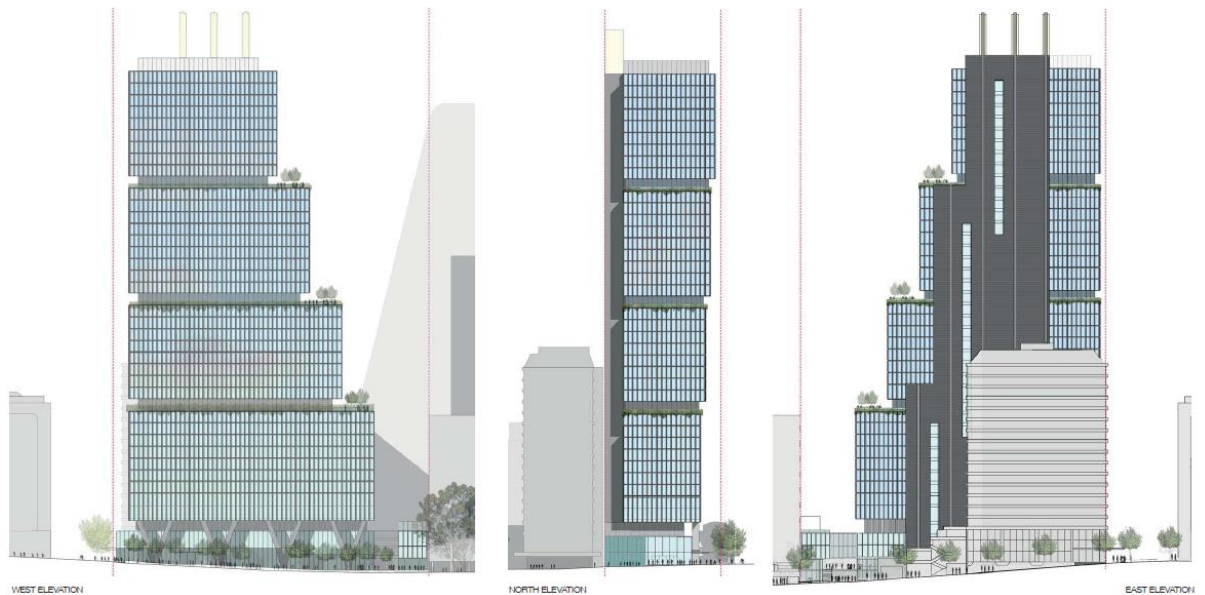
Victoria Cross Station is to be a key station on the future Sydney Metro network, providing access to the growing North Sydney Central Business District (CBD). The proposal combines the Metro station with a significant commercial office tower, contributing to the North Sydney skyline. The OSD would assist in strengthening the role of North Sydney as a key component of Sydney's global economic arc and would contribute to the diversity, amenity and commercial sustainability of the CBD.

It is noted that Victoria Cross services building and new station entrance at Victoria Cross North do not form part of the concept SSD Application.



- VICTORIA CROSS STATION  
CSSI APPROVAL - INCLUDES  
STRUCTURE AND BUILDING  
INFRASTRUCTURE AND  
SPACE FOR LIFT CORES,  
ACCESS, PARKING, RETAIL  
AND BUILDING SERVICES  
FOR THE FUTURE OSD
  
- OSD CONCEPT SSDA  
ENVELOPE INCLUDES  
OSD AREAS INSIDE THE  
CSSI 'SHELL'  
BELOW GROUND AND IN  
THE PODIUM LEVELS

**Figure 5:** Proposed Victoria Cross OSD building envelope



**Figure 6:** Victoria Cross indicative OSD building design

## 2.0 Scope of assessment

This report is based on the Indicative OSD Design drawings (Revision 1) and area schedule provided by TfNSW (thereafter referred to as the Indicative OSD Design).

This report documents the key Ecologically Sustainable Design (ESD) requirements and drivers and the proposed project specific ESD Framework which defines the principles that will be incorporated into the future design, construction and operation of the OSD.

The scope of the report does not include the works that are being delivered as part of the CSSI approval; namely, the station and retail space.

### 3.0 Sustainability requirements and market drivers

The relevant regulations (incl. state and local planning requirements), Sydney Metro policies, rating tools (e.g. Green Star) and other market drivers which will collectively influence the sustainability response for the development are summarised as follows:

#### 3.1 Building Code of Australia – Section J

The Building Code of Australia (BCA) 2017 includes mandatory minimum energy performance requirements for buildings (Class 5) in Section J. The objective is to reduce building greenhouse gas emissions by efficiently using operational energy. Section J is focused on establishing minimum acceptable practice in the building industry.

The building must meet the Deemed\_to\_Satisfy (DTS) requirements as set out in NCC BCA Section J. This will set the minimum requirements for building fabric, glazing, building sealing, HVAC and light and power provisions. If the DTS requirements cannot be met, a Performance Solution of the building design must be shown as compliant using an Assessment Method such as simulation modelling in accordance with the JV3 Verification Method. Due to the broader sustainability objectives being targeted by the project (incl. NABERS Energy and Green Star) the building and services will in many cases set performance that is superior to the minimum level needed to meet Section J.

#### 3.2 Secretary's Environmental Assessment Requirements

The SEARs issued for the Victoria Cross concept SSD Application requires that the EIS shall:

- Detail how ESD principles (as defined in clause 7(4) of Schedule 2 of the Environmental Planning and Assessment Regulation 2000 (EP&A Regulation 2000) will be incorporated in the design, construction and ongoing operation of the development; and
- Include a framework for how the proposed development will reflect best practice sustainable building principles to improve environmental performance, including energy and water efficient design and technology and use of renewable energy.

#### 3.3 EP&A Regulation 2000 - ESD Principles

In Schedule 2 of the EP&A Regulation, clause (1) subclause (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 principles of ecologically sustainable development in clause (1)(4) are as follows:

- (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.
- (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
- (c) Conservation of biological diversity and ecological integrity, namely, that conservation of biological diversity and ecological integrity should be a fundamental consideration
- (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, 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.

### 3.4 North Sydney Council

The North Sydney Development Control Plan 2013 sustainability provisions applicable to the development are summarised in **Table 1**.



**Table 1:** North Sydney DCP 2013 ESD-relevant Clauses

Section	Objectives
<b>Part B Section 2.6 – Efficient Use of Resources</b>	
<b>2.6.1 Energy Efficiency</b>	<ul style="list-style-type: none"> <li>O.1 To ensure that developments minimise their use of non-renewable energy resources.</li> <li>O.2 To ensure that buildings are designed such that the air conditioning plant meets performance requirements while minimising energy usage.</li> <li>O.3 To encourage the use of energy efficient lighting.</li> </ul>
<b>2.6.2 Passive solar design</b>	<ul style="list-style-type: none"> <li>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.</li> </ul>
<b>2.6.3 Thermal mass and insulation</b>	<ul style="list-style-type: none"> <li>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.</li> </ul>
<b>2.6.4 Natural ventilation</b>	<ul style="list-style-type: none"> <li>O.1 Not Applicable</li> <li>O.2 To reduce energy consumption by minimising the use of mechanical ventilation, particularly air conditioning.</li> <li>O.3 To ensure that workers are provided with direct access to fresh air and to assist in promoting thermal comfort for occupants.</li> </ul>
<b>2.6.5 Water Conservation</b>	<ul style="list-style-type: none"> <li>O.1 To minimise the use of potable water.</li> <li>O.2 To encourage the reuse of greywater, rainwater and stormwater.</li> </ul>
<b>2.6.6 Waste Management &amp; Minimisation</b>	<ul style="list-style-type: none"> <li>O.1 To minimise material usage and waste during building, construction and demolition.</li> <li>O.2 To minimise the level of waste during operation, reduce new building material usage and minimise volume of demolition materials.</li> </ul>
<b>2.6.7 Stormwater management</b>	<ul style="list-style-type: none"> <li>O.1 To mimic pre-development or natural drainage systems through the incorporation of WSUD on-site.</li> <li>O.2 To protect watersheds by minimising stormwater discharge and maximising stormwater quality.</li> <li>O.3 To minimise off-site localised flooding or stormwater inundation.</li> </ul>
<b>2.6.8 Building Material</b>	<ul style="list-style-type: none"> <li>O.1 To encourage the use of materials which have a low environmental impact during their life cycle.</li> <li>O.2 To encourage the use of toxin free material to minimise the health impact of materials used indoors.</li> <li>O.3 To maximise the energy efficiency of buildings.</li> </ul>
<b>2.6.11 Hot water systems</b>	<ul style="list-style-type: none"> <li>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.</li> </ul>

Section	Objectives
<b>2.6.12 Green roofs</b>	<p>O.1 To provide accessible roof space providing increased amenity for the occupants and visitors of the building.</p> <p>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).</p> <p>O.3 To provide space to accommodate renewable energy production.</p> <p>O.4 To improve stormwater management by controlling both the quality and flow of stormwater.</p> <p>O.5 To increase biodiversity by the use of plant material, and in particular to promote food production where appropriate.</p> <p>O.6 To protect the building structure by increasing its thermal protection. This will also help to reduce internal heating and cooling requirements.</p>
<b>Part B Section 10 – Car Parking and Transport</b>	
<b>10.2 Parking Provision</b>	<p>O.1 To ensure that sufficient car parking is provided on-site to cater for the users of the development.</p> <p>O.2 To minimise the reliance on private car usage.</p> <p>O.3 To facilitate the use of public and alternative transport modes including walking and cycling.</p> <p><b>Provisions:</b> Parking provisions detailed in Table B10.2 for non-residential in the DCP.</p>
<b>10.2.2 Car Share Schemes</b>	<p>O.1 To minimise the impact on the safety and efficiency of existing roads.</p> <p><b>Provisions:</b> Considerations for car share schemes and limiting impact on parking provision are provided.</p>
<b>10.5 Bicycle Parking and Associated Facilities</b>	<p>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.</p> <p><b>Provisions:</b> 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.</p> <p>Refer to <b>Appendix A</b> for comparison between DCP and Green Star requirements.</p>
<b>10.6 Green Travel Plans</b>	<p>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.</p> <p><b>Provisions:</b> Green Travel plans are to be submitted for non-residential developments with floor space &gt;2000m<sup>2</sup>. The DCP provides further guidance on requirements and content of the green travel plan.</p>

<b>Part B Section 19 - Waste Minimisation &amp; Management</b>	
<b>19.1.1 General Objectives</b>	<p>The DCP has several objectives that address the treatment, disposal and processing of demolition, operational and construction waste involved during the project.</p> <p>O.1 Reduce the demand for waste disposal.</p> <p>O.2 Maximise reuse and recycling of building and construction materials, as well as household, industrial and commercial waste.</p> <p>O.3 Assist in achieving Federal and State Government waste minimisation targets in accordance with regional waste plans.</p> <p>O.4 Minimise the overall environmental impacts of waste.</p> <p>O.5 Require source separation, design and location standards which complement waste collection and management services offered by Council and private providers.</p> <p>O.6 Encourage building design and construction techniques which will minimise future waste generation.</p>
<b>19.2 Demolition Waste</b>	O.1 To ensure that the reuse and recycling of demolition materials is maximised.
<b>19.3 Construction Waste</b>	O.1 Waste generation is minimised and reuse and recycling of construction materials is maximised in construction projects.
<b>19.4 Waste Facilities and Management</b>	O.1 Design buildings to encourage waste minimisation (source separation, reuse and recycling).
<b>Part C Area Character Statements</b>	
<b>2.0 - North Sydney Planning Area</b>	<p>Efficient Use of Resources</p> <ul style="list-style-type: none"> <li>• Energy efficient design and life cycle assessment of buildings enable the conservation of natural resources and minimisation of use of non-renewable energy resources.</li> <li>• Stormwater runoff is minimised, and recycled on-site where possible.</li> </ul>

### 3.5 Sydney Metro City & Southwest sustainability requirements

#### 3.5.1 Sydney Metro City & Southwest sustainability strategy

The Sydney Metro City & Southwest Sustainability Strategy focuses on the design, construction and operation of Sydney Metro City & Southwest, but also references the Indicative OSD Design as follows:

Sydney Metro will be seeking best-practice sustainable design and governance outcomes for the indicative OSD design, including:

- Achieving high benchmarks using Green Star Design and As Built ratings and Green Star Communities ratings where appropriate.
- Achieving high benchmarks using NABERS and BASIX ratings
- Site specific responses to the Project's sustainability objectives
- Investigation and inclusion of affordable housing where appropriate.

The Strategy is available on the Sydney Metro website<sup>1</sup>

#### 3.5.2 Sydney Metro sustainability objectives

Sydney Metro’s sustainability objectives adopted for the City & Southwest Metro project are provided in **Table 2** below.

**Table 2:** Sustainability objectives

Theme	Objective
Governance	Demonstrate a high level of performance against objectives and appropriate benchmarks.
	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.
	Reduce energy use and carbon emissions during construction.
	Reduce energy use and carbon emissions during operations.
	Support innovative and cost effective approaches to energy efficiency, low-carbon / renewable energy sources and energy procurement.
Pollution Control	Reduce sources of pollution and optimise control at source to avoid environmental harm.
Climate change resilience	Infrastructure and operations will be resilient to the impacts of climate change.

<sup>1</sup> <https://www.sydneymetro.info/documents>

Resources - Water Efficiency	Minimise use of potable water.
	Maximise opportunities for reuse of rainwater, stormwater, wastewater and groundwater.
Resources - Waste & Materials	Minimise waste through the project lifecycle.
	Reduce materials consumption.
	Consider embodied impacts in materials selection.
	Maximise beneficial reuse of spoil.
Biodiversity Conservation	Protect and create biodiversity through appropriate planning, management and financial controls.
Heritage Conservation	Protect and promote heritage through appropriate design, planning, and management controls.
Liveability	Promote improved public transport patronage by maximising connectivity and interchange capabilities.
	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.
	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.
	Consider 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.
Workforce development	Increase opportunities for employment of local people, participation of local businesses, and participation of SMEs.
	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 requirements, and supporting vocational career development through apprenticeships and traineeships.
Economic	Consider adopting a Whole of Life Costing model to maximise sustainability benefits.

	Optimise development opportunities for residual land.
	Capture sustainability benefits in the business case for the project.

### 3.5.3 Sydney Metro proposed sustainability initiatives for OSD

Sydney Metro’s proposed sustainability initiatives that are applicable to a commercial development at the Victoria Cross Station site are shown in the following **Table 3**.

**Table 3:** Sydney Metro proposed sustainability initiatives

Theme	Objective	Sustainability initiatives for the Indicative OSD design
Governance	Demonstrate a high level of performance against objectives and appropriate benchmarks.	<ul style="list-style-type: none"> <li>• Aim for best-practice.</li> <li>• Demonstrate a market-leading level of performance using building sustainability rating tools:               <ul style="list-style-type: none"> <li>◦ Indicative 5 Star Green Star Commercial.</li> </ul> </li> <li>• Develop and implement a sustainability plan.</li> </ul>
Carbon & Energy Management	Reduce energy use and carbon emissions during construction.	<ul style="list-style-type: none"> <li>• Minimise greenhouse gas emissions generated during construction.</li> </ul>
	Reduce energy use and carbon emissions during operations.	<ul style="list-style-type: none"> <li>• Minimum 5 Star NABERS Energy for commercial buildings.</li> <li>• Energy efficient lighting, heating, ventilation and cooling.</li> <li>• Incorporate 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>• Consider inclusion of renewable energy generation.</li> </ul>
Pollution Control	Reduce sources of pollution and optimise control at source to avoid environmental harm.	<ul style="list-style-type: none"> <li>• Develop and implement a construction environmental management plan during construction, in accordance with the planning approval.</li> </ul>
Climate change resilience	Infrastructure and operations will be resilient to the impacts of climate change.	<ul style="list-style-type: none"> <li>• Design for resilience to the impacts of climate change.</li> </ul>
Resources – Water	Minimise use of potable water.	<ul style="list-style-type: none"> <li>• Water-efficient fittings and fixtures.</li> </ul>

Theme	Objective	Sustainability initiatives for the Indicative OSD design
Efficiency	Maximise opportunities for reuse of rainwater, stormwater, wastewater and groundwater.	<ul style="list-style-type: none"> <li>Incorporate rainwater harvesting and reuse where feasible.</li> </ul>
Resources – Waste & Materials	Minimise waste through the project lifecycle.	<ul style="list-style-type: none"> <li>Recycling and reuse of construction and demolition waste (90%).</li> </ul>
	Consider embodied impacts in materials selection.	<ul style="list-style-type: none"> <li>Consider embodied impacts in materials selection.</li> <li>Use responsibly sourced construction materials.</li> </ul>
Biodiversity Conservation	Protect and create biodiversity through appropriate planning, management and financial controls.	<ul style="list-style-type: none"> <li>Consider opportunities for enhancing ecological value (e.g. green roofs / facades and landscaping).</li> </ul>
Heritage Conservation	Protect and promote heritage through appropriate design, planning, and management controls.	<ul style="list-style-type: none"> <li>Comply with planning approval requirements in relation to heritage.</li> </ul>
Liveability	Promote improved public transport patronage by maximising connectivity and interchange capabilities.	<ul style="list-style-type: none"> <li>Provide bike parking and end of trip and encourage use of Metro and other public transport modes.</li> </ul>
Supply Chain	Influence contractors, subcontractors and materials suppliers to adopt sustainability objectives in their works and procurement.	<ul style="list-style-type: none"> <li>Develop and implement a sustainable procurement strategy for the construction stage.</li> </ul>

### 3.6 Rating Tools

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

NABERS is a national rating system measuring the environmental performance of Australian buildings and tenancies. NABERS ratings for office buildings and tenancies include NABERS Energy, NABERS Water (whole buildings only), NABERS Waste and NABERS Indoor Environment.

The NABERS tools can be used to rate building performance on a rating scale from 0 to 6 stars. This star rating represents the building’s actual operational performance, assessed using 12 months of measured performance information. A 6 star rating demonstrates

market-leading performance, while a 1 star rating indicates that the building has considerable scope for improvement.

### 3.6.2 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

Green Star rating tools rate built environment performance on a scale from 0 to 6 stars, in a similar fashion to NABERS tools, with certified ratings available for 4 stars and upward. The Green Star – Design & As Built tool assesses the sustainability attributes of a building primarily through nine different categories:

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

The current Design & As Built tool version is 1.2 and tool updates are scheduled for release annually.

### 3.6.3 The WELL Building Standard

The WELL Building Standard is an evidence-based system for measuring, certifying, and monitoring the performance of building features that impact health and well-being. It acts as a performance-based standard which merges best practices in design and construction with evidence-based health and wellness interventions. It is administered by the International WELL Building Institute (IWBI), a public benefit corporation with the mission to improve human health and well-being through the built environment. The WELL Building Standard offers three levels of WELL Certification.





The WELL Building Standard assesses a project's performance against 7 different categories of wellness concepts, including:

- Air
- Water
- Nourishment
- Light
- Fitness
- Comfort
- Mind

### 3.6.4 Net Zero Carbon Offset Standard 2017

The National Carbon Offset Standard (NCOS) provides a benchmark for businesses and other organisations voluntarily seeking to be carbon neutral for their operations, products, services or events. This Standard sets out requirements for achieving carbon neutrality, based on a rigorous and transparent framework that is based on relevant international standards and tailored to the Australian context.

Businesses and other organisations wishing to achieve their carbon neutral certified status may consider participating in the Carbon Neutral Program, administered by the Australian Government Department of the Environment. To be carbon neutral means that the net emissions associated with an organisation's activities are equal to zero.

## 3.7 Other market drivers and trends

There are a number of market and industry drivers that will influence the building design and operation. Decisions can be made in the current pre-approval and future planning stages to pre-emptively neutralise perceived risks and turn them into opportunities to maximise sustainable outcomes for the Victoria Cross OSD. These anticipated changes are listed below.

### 3.7.1 Changes to building codes and standards

Driven by the Government's commitment to reduce its emissions by 26-28% on 2005 levels by 2030 and the National Energy Productivity Plan, the National Construction Code is expected to increase design stringency under Section J of the Building Code of Australia. The proposed changes are projected to reduce energy consumption of new buildings in the

order of 40%<sup>2</sup> and will involve a number of changes including new constraints on the allowable window-to-wall ratios, glazing, thermal insulation and thermal bridging properties.

### 3.7.2 Transition to Net Zero

Like many other countries who are signatories to the Paris Climate Agreement, Australia has committed to becoming net zero by 2050. Buildings are a major contributor to resource depletion and carbon emissions and have a significant role to play in reducing the transition to net zero economies. There are growing policy platforms to encourage buildings to become net zero. Achieving net zero requires an efficient building running on green power with remaining carbon emissions (from waste, gas, water and transport) being reduced and then offset using carbon credits. Furthermore, the future evolution of rating tools such as Green Star will likely increase the emphasis on achieving net zero outcomes for buildings. It is anticipated that changes to Green Star will include restrictions on fossil fuel use in buildings. The project will therefore need to consider fossil fuel use and the net zero target as part of the ongoing design.

### 3.7.3 Electric vehicle uptake

Electric vehicles (EV) have rapidly developed from concept to market emergence, with prices declining every year. While currently only forming 0.2% of annual vehicle sales in 2015 in Australia, this is anticipated to increase sharply in coming years as cost of production declines, along with the improvements in availability and range capacity of EVs, and developments in public charging infrastructure. Considerations should be made for the provision of electric vehicle charging infrastructure in the future development.

### 3.7.4 Health & wellbeing

More and more research has shown growing links between the built environment and the health of the population, increasing the demand for certain building types (e.g. commercial offices) to include features that improve productivity and support health and wellbeing of staff. This has also been shown in various planning policies and sustainability rating tools, which have also supported a number of features designed to improve health (Indoor Environmental Quality and Active Transport). Sustainable building designs are now going beyond purely environmental considerations and becoming more inclusive of a focus on health and wellbeing. Rating tools dedicated to health and wellness are now emerging and future planning policies can be expected to increasingly look to support built environment design features that can improve people's health and reduce chronic disease occurrences.

### 3.7.5 Community and social sustainability

With global urbanisation taking place at a rapid rate, governments and cities are starting to pay more attention to the sustainability attributes of the planning, design and construction of new projects. This involves the delivery of projects that offer diverse, affordable, inclusive,

---

<sup>2</sup> Australian Building Codes Board, NCC 2019 Review of Section J, <https://www.abcb.gov.au/Resources/Videos/NCC-2019-Review-of-Section-J>

well connected and healthy places to live, work and play as well as encourage opportunities for business diversity, efficiency, innovation and economic development.

### 3.8 Benchmarking of similar development

**Table 4:** Case studies of best practices and benchmarked projects in sustainability

Project Name & Description	Ratings Targeted/ Achieved	Best Practice Sustainability Features
177 Pacific Highway – High-rise Commercial Office (Local - Sydney)	<ul style="list-style-type: none"> <li>5 Star Green Star Office V3 As-Built Rating</li> <li>NABERS Energy Base Building 5.5 Star</li> </ul>	<ul style="list-style-type: none"> <li>Low system pressure and high efficiency air handling systems</li> <li>Low SHGC glazing</li> <li>Mixed-mode HVAC system for entrance lobby</li> <li>Rainwater capture and reuse system</li> </ul>
Eclipse Tower – Commercial Office (Local – Sydney)	<ul style="list-style-type: none"> <li>5 Star Green Star Office V2 As-Built Rating</li> <li>NABERS Energy Base Building 5 Star</li> </ul>	<ul style="list-style-type: none"> <li>Low temperature VAV system</li> <li>Low SHGC glazing</li> </ul>
Collins Square Tower 2 – Commercial Office (State - Melbourne)	<ul style="list-style-type: none"> <li>5 Star Green Star Office V3 As-Built Rating</li> <li>NABERS Energy Base Building 5.5 Star</li> </ul>	<ul style="list-style-type: none"> <li>Stacked micro-turbines</li> <li>Rainwater capture and reuse system</li> <li>Low temperature VAV system</li> </ul>
DUO – Mixed-use development involving office, hotel, retail and residential components (International-Singapore)	<ul style="list-style-type: none"> <li>Singapore BCA Green Mark Award (Platinum) – DUO Tower and DUO Galleria</li> <li>Singapore BCA Green Mark Award (Gold Plus) – DUO Residences</li> <li>Singapore BCA Green Mark Award (Gold Plus) – DUO Hotel</li> </ul>	<ul style="list-style-type: none"> <li>Honeycomb façade offers natural sun shading, combined with high performance glazing to reduce solar heat gain</li> <li>Concave building massing captures and channels wind flows throughout the site to foster cool microclimates</li> <li>Naturally ventilated retail corridors allow cooling land breezes to permeate the building and reduce cooling loads</li> <li>Lush greenery podium offers a landscape replacement that lowers internal temperatures while increasing oxygen levels</li> </ul>
Asia Square Tower 1 & 2 – Mixed-use development involving office, retail and food and beverage space (International – Singapore)	<ul style="list-style-type: none"> <li>USGBC LEED Platinum CS (core and shell) award for Tower 1 and precertification for Tower 2</li> <li>Singapore BCA Green Mark Award (Platinum)</li> </ul>	<ul style="list-style-type: none"> <li>224kW-peak rooftop solar photovoltaic system</li> <li>Biodiesel generation plant that produces electricity for the tower</li> <li>Triple low-E coating double glazing with insulated spandrels for the building façade to reduce solar heat gains</li> </ul>
One Bryant Park – Commercial Office Tower	<ul style="list-style-type: none"> <li>USGBC LEED Platinum Rating</li> </ul>	<ul style="list-style-type: none"> <li>4.6MW co-generation plant provides approximately 65% of the building’s energy</li> <li>Extensive greywater retention and recycling</li> </ul>

Project Name & Description	Ratings Targeted/ Achieved	Best Practice Sustainability Features
(International – New York)		system <ul style="list-style-type: none"> <li>• Usage of blast furnace slag-based concrete for construction</li> <li>• Thermal storage system at cellar level produces ice at night where electricity rates are less costly to reduce peak daytime loads</li> </ul>
Cross rail- Paddington Triangle – Mixed-use development involving office, and retail (International-London)	<ul style="list-style-type: none"> <li>• Targeting BREEAM Excellent rating</li> <li>• Targeting an Energy Performance Certificate Rating ‘B’</li> </ul>	<ul style="list-style-type: none"> <li>• Vertical solar-shading slatted louvres</li> <li>• Ground source heat pumps couple with thermal piles to deliver low carbon heating and cooling into the building</li> <li>• Water attenuation with storage tanks</li> <li>• 24% of energy requirements of proposed development will be generated from renewable sources</li> </ul>

## 4.0 Response to the SEARS

The response to the SEARS detailed in **Section 3.2** is as follows:

### 4.1 EP&A Regulation 2000

The EP&A Regulation ESD Principles will be met as follows:

**Table 5:** EP&A Regulation 2000

EP&A Regulation Requirement	Methodology/Approach
Precautionary Principle	The OSD and surrounds will be designed to avoid where practicable damage to the environment. An ESD framework (refer below) will guide the design, construction and ultimately the operation of the OSD by adopting strategies aimed to reduce energy and water consumption, limit carbon emissions, encourage use of responsible materials, reduce waste and limit other forms of emissions from the OSD including light pollution. The OSD will also target a number of environmental and sustainability ratings which are benchmarks achieved through a measurable demonstration of reduced impact and harm to the environment.
Intergenerational equity	The development will seek to benefit present and future generations through increased health and environmental benefits associated with reductions in road emissions and pollution, enhanced health through improved active transport networks and creating a space that can be utilised and accessed by all ages, cultures and abilities. The OSD will include a high standard of Indoor Environmental Quality (IEQ) provisions to improve indoor air quality and enhance the internal building environment for the occupants benefit.
Conservation of biological diversity and ecological integrity	The site is already developed with limited biological and ecological value. The design for the OSD will include strategies that aim to maintain the current level and where practical strategies will be implemented to enhance the ecological and biological value.
Improved valuation, pricing and incentive mechanisms	The OSD is targeting high levels of sustainability performance which will impose additional upfront costs to the development but will ultimately result in increased asset value with improved financial and environmental life cycle performance. As part of the ESD framework (refer below) it is recommended that life cycle costing form part of the overall integrated project decision making and assessment of major building components and systems to maximise sustainability benefits and create long term value both monetary and non-monetary to building owners, occupants and other stakeholders.

## 4.2 The ESD framework

The ESD Framework for the development is intended to enable incorporation of best practice sustainable building principles that respond to both policy and emerging market trends such as grid decarbonisation and transition to a net zero carbon economy. To inform the ESD Framework, the following sustainability policies and regulatory requirements have also been considered:

- EP&A Regulation 2000
- Building Code of Australia – Section J
- Sydney Metro City & Southwest sustainability objectives and proposed initiatives
- North Sydney Development Control Plan
- Rating Tools:
  - National Australian Built Environment Rating System
  - Green Star Design & As-Built v1.2
  - The WELL Building Standard
  - Net Zero Carbon Offset Standard

The project specific framework core objectives and visions are detailed below in **Table 6**.

**Table 6:** Project sustainability framework

Theme	Objective
Leadership and Governance	Demonstrate leadership by embedding sustainability objectives into decision making and setting high levels of performance against objectives and appropriate benchmarks.
Rating Tools	The OSD should target minimum ratings as follows, 5 Star Green Star design (most current version available at time of project registration), 5 Star NABERS Energy (Office Base Building) and 4 Star NABERS Water (Office). The OSD design should also seek to improve upon minimum ratings where practicable, and consider adoption of ratings using the WELL Building Standard and Net Zero Carbon Standard.
Energy and Carbon	Implement leading practice energy conservation practices through passive design and energy efficiency strategies. Consider implementation of low or zero carbon energy technologies to reduce carbon emissions. Improve the shift toward lower carbon transport through low carbon transport initiatives. Consider alternatives to gas systems.
Water	Reduce use of potable water and maximise opportunities for capture and reuse of rainwater and stormwater for non-potable uses.
Waste and Materials	Minimise waste through the project lifecycle. Reduce materials consumption. Consider embodied impacts in materials selection. Contractors, subcontractors and materials suppliers to adopt sustainability objectives in their works and procurement.
Ecology and Biodiversity	Protect and enhance natural ecosystems through built form, landscaping and water sensitive urban design features. Use trees for shade and microclimate enhancements.
Emissions	Reduce sources of pollution and emissions to limit environmental harm.

Theme	Objective
Climate change resilience	The OSD and associated external areas and infrastructure will be resilient to the impacts of climate change.
Health and Wellbeing	The OSD design is to include features to support high levels of indoor environmental quality but also broader health based initiatives that encourage healthy eating and active living.
Social / Community Benefit	Ensure community and local stakeholder engagement and involvement in the development of the project and contribute to the delivery of legacy projects to benefit local communities. Increase opportunities for employment of local people, indigenous workers and businesses, female representation in non-traditional trades and participation of local businesses. Make a positive contribution to community health and well-being.
Economic	Sustainability benefits are to be a component and consideration for business case for the project. Use a Whole of Life Costing model for integrated project decision making and assessment of major building components and systems to maximise sustainability benefits and create long term value both monetary and non-monetary to building owners, occupants and other stakeholders.

This concept SSD Application is for an OSD building envelope (refer to **Section 1.5**). The proposed ESD Framework will inform the future detailed SSD Application to construct the final OSD.

## 5.0 ESD Strategies and Design Features

This section provides a summary of potential ESD strategies that can be implemented in response to the project-specific ESD framework. These strategies are reflective of the general level of design development to date and have been summarised in **Table 7** below. The intention is for these to be considered and developed further in future development applications for the construction to ensure that the proposed development will reflect best practice sustainable building principles to improve environmental performance, including energy and water efficient design and technology, and use of renewable energy. Two levels of performance have been identified in **Table 7**.

- Proposed targets and features which sets out proposed minimum standards of performance and indicative design features; and
- World's best practice / innovation, which outline opportunities for higher sustainability benchmarks to be achieved, subject to feasibility analysis in future stages of the project.

Table 7: Sustainability Strategies

Element	Proposed targets and indicative features	World best practice/ innovation
<b>Code Requirements</b>	<ul style="list-style-type: none"> <li>• Building and services design to exceed BCA Section J minimum requirements</li> </ul>	
<b>Rating Tools</b>	<ul style="list-style-type: none"> <li>• Min. 5 Star Green Star Design</li> <li>• Min. 5 Star NABERS Energy (Office Base Building)</li> <li>• Min. 4 Star NABERS Water (Office)</li> </ul>	<ul style="list-style-type: none"> <li>• OSD design to investigate uplift to 6 Star Green Star, 5.5 Star NABERS Energy and 4.5 to 5 Star NABERS Water</li> <li>• WELL Rating (Commercial)</li> <li>• Net Zero Carbon</li> </ul>



Element	Proposed targets and indicative features	World best practice/ innovation
<b>Façade</b>	<ul style="list-style-type: none"> <li>High performance double glazing system in a curtain wall façade with passive solar design features to improve building thermal performance</li> <li>High performance thermal insulation installed for building fabric to reduce HVAC energy requirements</li> <li>External building and site elements such as roofing and landscaping to be made from materials of low SRI values to minimize project contribution to the 'heat island effect'</li> <li>Building air tightness testing</li> </ul>	<ul style="list-style-type: none"> <li>Consideration of Building Integrated PV</li> <li>Utilising a double-skin glass façade design</li> </ul>
<b>Building Management</b>	<ul style="list-style-type: none"> <li>Integrated BMS system to facilitate management of the asset</li> <li>Water and energy metering and monitoring systems</li> <li>Independent Commissioning agent to provide commissioning advice and monitor and verify the commissioning and tuning of nominated building systems</li> <li>Building user guides / interactive information</li> </ul>	<ul style="list-style-type: none"> <li>Smart building asset management systems</li> </ul>
<b>Lighting and Power</b>	<ul style="list-style-type: none"> <li>LED lighting installations for buildings</li> <li>Lighting control systems including time scheduling, localised on/off control and lighting level adjustments to cater to daylighting effects and occupant preferences</li> <li>Zoned carpark lighting layout with timed motion detection dimming control to reduce lighting energy consumption in times of low use</li> </ul>	<ul style="list-style-type: none"> <li>SMART lighting incorporating user interface and data capture capabilities</li> </ul>

Element	Proposed targets and indicative features	World best practice/ innovation
<b>HVAC</b>	<ul style="list-style-type: none"> <li>High efficiency water cooled chiller plant and hot water systems</li> <li>Air distribution via low temperature variable air volume system serving the floors</li> <li>Dedicated / separate air handling systems to serve the perimeter zones and interior zones</li> <li>Variable speed motors on all pumps and fans</li> <li>CO<sub>2</sub> sensors and outside air modulation systems used to determine the amount of fresh air delivered to the building</li> </ul>	<ul style="list-style-type: none"> <li>Incorporation of ground source heat / thermal pile heat rejection to reduce plant sizing and free up floor space</li> </ul>
<b>Emissions</b>	<ul style="list-style-type: none"> <li>Reduced impact refrigerants</li> <li>External lighting to be designed to have reduced light spill effects</li> </ul>	<ul style="list-style-type: none"> <li>No refrigerants used in the project</li> <li>Refrigerant leak detection and capture system / or natural refrigerants used in the project</li> </ul>
<b>Renewable energy / systems</b>	<ul style="list-style-type: none"> <li>Consideration of onsite renewable energy generation such as a roof mounted photovoltaic system (subject to feasibility analysis)</li> </ul>	<ul style="list-style-type: none"> <li>Building Integrated PV</li> <li>Renewable energy purchased through green power</li> </ul>

Element	Proposed targets and indicative features	World best practice/ innovation
<p><b>Water</b></p>	<ul style="list-style-type: none"> <li>Water efficient fixtures</li> <li>Rainwater harvesting system</li> <li>Stormwater (see note below) management through improving flows from the site, water sensitive urban design principles and water treatment systems where feasible.</li> </ul> <p><i>Note: All ground level connections are not part of this application, but are part of the CSSI Approval for the Victoria Cross Station. This application is for connections into the approved system only.</i></p>	<ul style="list-style-type: none"> <li>Consideration of on-site small scale treatment of grey or black water treatment</li> </ul>
<p><b>Materials</b></p>	<ul style="list-style-type: none"> <li>Reduced Portland cement use</li> <li>Recycled timber, steel and concrete</li> <li>Low TVOC content and low formaldehyde emission materials</li> <li>Sustainable timber procurement</li> <li>Low/ zero PVC-containing cable, piping, flooring and blind products</li> </ul>	<ul style="list-style-type: none"> <li>Consider using structural timber e.g. cross-laminated timber in sections of the building where practicable</li> <li>Life cycle assessment / design</li> <li>Responsible material sourcing through Environmental Product Declarations, Third-party Certification Schemes and Stewardship Programs</li> <li>Ultra-low TVOC products (&lt;5g/L content)</li> </ul>
<p><b>Operational Waste</b></p>	<ul style="list-style-type: none"> <li>Waste room sized to handle general waste and recyclable waste streams</li> </ul>	<ul style="list-style-type: none"> <li>Vacuum waste system to reduce storage requirements</li> </ul>

Element	Proposed targets and indicative features	World best practice/ innovation
<p><b>Construction Management</b></p>	<ul style="list-style-type: none"> <li>Establish a target for diversion of construction and demolition waste from landfill for recycling (indicative minimum 90%)</li> <li>Site specific Environmental Management Plan (EMP)</li> </ul>	<ul style="list-style-type: none"> <li>Site-specific sustainability training to educate contractors and subcontractors</li> <li>Contractor programs to promote positive and mental wellbeing for occupants/ staff</li> <li>High Performance Site Offices</li> </ul>
<p><b>Transport</b></p>	<ul style="list-style-type: none"> <li>Consider dedicated parking spaces for low emission vehicles</li> <li>Car share provision</li> <li>Cyclist parking and end of trip facilities to be provided (determined in accordance with both the DCP and Green Star requirements). Note that the DCP requires more bike racks and EOT facilities than Green Star and this has been used to determine the current provision (<b>Appendix A</b>).</li> </ul>	<ul style="list-style-type: none"> <li>Dedicated electric vehicle spaces and charging infrastructure</li> </ul>
<p><b>Health and Wellbeing features</b></p>	<ul style="list-style-type: none"> <li>Thermal comfort provided through passive and active measures such as building fabric performance optimising radiant surface temperatures coupled with a well-controlled HVAC system optimising internal conditions</li> <li>Visual amenity supported through a combination of natural daylighting and appropriate artificial lighting</li> <li>Protection from noise achieved through building envelopes and suitably attenuated mechanical services design</li> <li>All materials to be low TVOC content and low formaldehyde emission to improve indoor air quality</li> </ul>	<ul style="list-style-type: none"> <li>Ultra-low TVOC products (&lt;5g/L content)</li> <li>Active design strategies through placement of interconnecting stairs</li> </ul>

Element	Proposed targets and indicative features	World best practice/ innovation
<b>Commissioning and Handover</b>	<ul style="list-style-type: none"> <li>• Building commissioning and tuning</li> <li>• Building air tightness testing</li> </ul>	<ul style="list-style-type: none"> <li>• Soft Landings framework</li> </ul>

## 6.0 Conclusion

AECOM has reviewed the applicable ESD requirements including statutory obligations defined by the Building Code of Australia Section J, EP&A Regulation, SEARS and North Sydney Development Control Plan. The Sydney Metro City and Southwest Project sustainability objectives also assist in defining a number of sustainability considerations. Current sustainability rating tools and emerging market drivers and trends have also been reviewed and considered.

These requirements, rating tools and market drivers have collectively been used to develop a project specific ESD Framework as outlined in **Section 4.2**. This proposed ESD Framework will inform the detailed SSD Application to construct the future OSD. On the basis of this review, the proposal is capable of complying with the applicable ESD requirements and statutory obligations.

Initial sustainability strategies for the future OSD have also been nominated and are summarised in **Section 5.0**. These strategies include:

- High-performing building envelope elements and façade materials
- Energy-efficient lighting devices and smart control systems
- Comprehensive building operations and facilities management practices
- Energy and water metering and monitoring systems
- Appropriate stormwater and potable water reduction measures
- Utilisation of low-emissions materials and use recycled materials where possible
- Implementation of responsible construction practices that manage environmental impacts and reduce construction and demolition waste; and
- Operational waste management through recycling and waste handling facilities and procedures.

## Appendix A

### End of trip facilities

This section has been prepared to compare the end of trip facilities requirements proposed by the North Sydney DCP and the Green Star Design & As-Built v1.2 rating tool. Bike racks and end of trip facility provision is determined based on building occupancy and floor areas.

Based on the assumptions of the Victoria Cross indicative OSD design Area Schedule.

**Table A1.1:** Area Schedule

	GFA (sqm)	NLAO (sqm)	NLAR (sqm)
Commercial Use	59,500	54,000	n/a
Retail Use	5,000	n/a	4,250

### North Sydney DCP Requirements

The North Sydney Council DCP requirements are as follows:

**Table A1.2:** North Sydney Council DCP 2013 End of Trip Requirements Assessment\*

Land Use	North Sydney Council DCP 2013					Proposed Space
	Rate		Office Spaces	Retail Spaces	Required Spaces	
	Office Use 59,500m <sup>2</sup>	Retail Use 5,000m <sup>2</sup> (including 500m <sup>2</sup> of OSD retail)				
Bicycle parking – occupants	1 space / 150m <sup>2</sup> GFA	1 space / 25m <sup>2</sup> GFA	397	200	798	802
Bicycle parking – visitors	1 space / 400m <sup>2</sup> GFA	2+1 space / 100m <sup>2</sup> GFA	149	2+50		
Bicycle Lockers	1 Personal Locker for each parking space		798		798	802
Showers and Change Cubicles	2 Shower and change cubicles for 11 – 20 or more bicycle spaces + 2 shower and change cubicles for each additional 20 bicycle parking spaces		80		80	82

\*Source: AECOM Traffic and Transport Report

**Table A1.3:** Green Star Design & As-Built v1.2 End-of-Trip requirements assessment

End of Trip Item	Green Star Design and As Built v1.2				Total Required Provision
	Rate / Requirement		Commercial provision	Retail Provision	
	Commercial	Retail			
Bicycle parking – regular occupants <sup>1</sup>	Secure bicycle parking for regular occupants is provided for 7.5% of total regular occupants		405	6	411
Showers <sup>2</sup>	8 showers (for first 500) + 2 per extra 250 occupants	2 for occupant number between 13-49	48	2	50
Lockers <sup>3</sup>	1.2 per 1 bicycle space		486	7	493
Bicycle parking – visitors <sup>4</sup>	1 visitor space per 750m <sup>2</sup> NLA	1 space per 500m <sup>2</sup> GLA	72	9	81

1. Regular occupants are defined in Green Star as the population of people that regularly work, study or live in the building. For Office, this is calculated as 1 per 10m<sup>2</sup> of NLA (based on BCA occupancy rates table D1.13 and AS1668.2-2012) = 5,400. For Retail, this assumed to be 1 per 60m<sup>2</sup> GLA (based on occupancy defined in Green Star Retail tool) = 71. In the absence of a specified GLA, the retail NLAR as nominated by the architects (dated 18.01.2018) has been used in place of the GLA. Note that as design progresses End of Trip allocation will be to be based on actual occupancy as determined by BCA consultant.
2. Based on Green Star table 17B.4.3 where occupancy exceeds 500, the number of showers is calculated by 8 plus an additional 2 per extra 250 occupants; while lockers are 1.2 per 1 bicycle space.
3. Secure lockers should be adequately sized to accommodate normal office clothing, i.e. should not be significantly smaller than 80cm tall by 25cm wide (for box lockers) or 180cm tall by 40cm wide (for 'L-shaped' double lockers) as per the Legacy Green Star Rating Tools Office v3 and Retail v1.
4. Visitors have been determined as per the Legacy Green Star Rating Tools Office v3 (1 visitor space per 750 m<sup>2</sup> NLA) and Retail v1 (1 space per 500 m<sup>2</sup> GLA).

**Table A1.4:** End of trip facilities requirements

Standard	Regular Occupants EOT Facilities			Visitors EOT Facilities
	Bicycle Racks	Showers	Lockers	Bicycle Racks
North Sydney 2013 DCP	600	82	802	202
Green Star Design & As-Built v1.2	411	50	493	81



As shown from the comparison, North Sydney DCP 2013 requires more end of trip facilities than Green Star. The current Indicative OSD Design includes EOT as per the DCP 2013. As such Green Star criteria will also be satisfied.

*This page has intentionally been left blank*