Attachment A13

Ecologically Sustainable Development Report - 15-25 Hunter and 105-107 Pitt Street, Sydney

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MILLIGAN GROUP

15-21 HUNTER STREET AND 105-107 PITT STREET, SYDNEY

ESD CONCEPT REPORT

OCTOBER 2021

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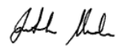
Reviewed by:	Jonathan Alexander	15 October 2021	
Approved by:	Katie Fallowfield	15 October 2021	

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EXECUTIVE SUMMARY

This Project has been prepared by WSP in support of a Planning Proposal to amend the Sydney Local Environmental Plan 2012 (Sydney LEP). This report has been prepared on behalf of Milligan Group Pty Ltd (the Proponent) and its related entities and consultants, representatives and agents and FT Sydney Pty Ltd as trustee for FT Sydney Unit Trust. It relates to an amalgamated site at 15-21 Hunter Street and 105-107 Pitt Street (the Site).

The purpose of this Planning Proposal is to amend the site's Floor Space Ratio (FSR) development standard, and the Maximum Building Height to align with the Martin Place Sun Access Plane contained within the concurrent Central Sydney Planning Proposal.

This Planning Proposal supports the City of Sydney Council's draft Central Sydney Planning Strategy (Draft CSPS) by unlocking additional employment generating floor space within a designated tower cluster. The proposed Sydney LEP amendment is part of the broader redevelopment plan for the site to facilitate a new commercial office tower. It will also facilitate significant public benefits through additional site activation and embellishment of the public domain.

The Planning Proposal is accompanied by amendments to the Sydney Development Control Plan 2012 (Sydney DCP). The site specific DCP amendments reflect the proposed outcome to provide a podium tower scheme.

This is reflected in the accompanying reference design prepared by Bates Smart which serves as a baseline proof of concept for this Planning Proposal. This 2,108m2 strategic site presents a unique opportunity to deliver a landmark premium commercial office tower that will exhibit design excellence and offer significant employment opportunities for global Sydney.

The uplift being sought is consistent with the strategic intent of the draft CSPS, which contains the City's requirements and expectations for projects pursuing this pathway. Following the Planning Proposal, the planning approval pathway involves a competitive design process and a detailed Development Application. As such, this report reflects the concept stage of the proposal, and may be embellished as the detailed design and required works evolve.

This Ecologically Sustainable Development (ESD) Concept Report details the initiatives that the Project will be implementing to deliver the objectives of:

- Sydney Local Environmental Plan 2012 (Sydney LEP 2012)
- Sydney Development Control Plan 2012 (Sydney DCP 2012)
- Central Sydney Planning Strategy – draft currently on exhibition (Draft CSPS)
- Proposed Amendments to the Sydney DCP 2012 (Sydney DCP Amendments)
- Amendments to the Competitive Design Policy

The project team have worked to ensure the development will reduce its energy consumption through onsite strategies. The energy strategy will be underpinned by achieving very high standards within the National Australian Built Environment Rating System (NABERS), targeting 5.5 stars in the commercial area of the building.

In addition, the entire development will implement a range of other sustainability initiatives including a strategy to reduce waste. A range of initiatives are proposed to contribute to the goal of diverting waste from landfill.

The development will also include other measures to ensure a holistic sustainable strategy for the development, such as the following:

- Highly efficient water fittings and fixtures to ensure water consumption is reduced as far as possible, and supplemented with rainwater harvesting;
- Procurement of materials that have low environmental impacts;
- Enhanced site ecology through high quality landscape design; and
- Ensuring design that mitigates or adapts to climate change impacts

The first sections of the report describe the project proposal in more detail, along with detailing the planning policies which have helped shape the sustainability strategy for the development. The ESD concept strategy then provides an overview of measures and initiatives that are proposed for the building to deliver a high performing, highly sustainable development that meets policy compliance requirements.

As the Project progresses, the way that the targets are met may alter slightly to provide the best possible design outcomes for the development. At this early stage, however, the project team are satisfied that the ESD initiatives, which are beyond current best practice, are achievable within the scheme.

Figure 1 Indicative reference design (by Bates Smart)

1 INTRODUCTION

1.1 PROJECT DESCRIPTION

The proposal seeks to amend planning controls applying to the site to allow a future development that will comprise a commercial tower with retail on the ground floor with an overall approximate total Gross Building Area (GBA) of 70,447m^2. The Planning Proposal involves seeking to modify the height and floor space ratio (FSR) limits on the site and this will be accompanied by a proof of concept building envelope and reference design. Following the Planning Proposal, there will be a design excellence competition and a Stage 2 DA. The ESD Strategy will be further refined and developed as the detailed design progresses.

The Site is ideally suited to the proposed use, being strategically located in the middle of City of Sydney's CBD on the corner of Hunter street and Pitt street. The proposed LEP amendment can facilitate a building with 51 storeys with 6 additional basement levels. The proposed area breakdown according to intended use is shown in the Table below.

Table 1 Breakdown of areas based on the indicative reference scheme

Use	Building Class (in accordance with NCC 2019 Building Code of Australia)	Area (NLA)
Office	Class 5	35,146m^2
Food Market	Class 6	701m^2
F+B	Class 6	935m^2
Health + Wellness	Class 6	1,295m^2
Gym	Class 9	1,295m^2

The proposed basement levels will provide:

- Car parking provision;
- Motorbike parking spaces;
- Bicycle parking spaces for staff and visitors as well as end of trip (EoT) facilities;
- Gym;
- Retail space;
- Loading dock and waste storage room; and
- Plant and equipment areas.

While the reference scheme represents one design for the proposed tower, the project will be subject to a full competitive design process in accordance with the requirements of Sydney LEP 2012.

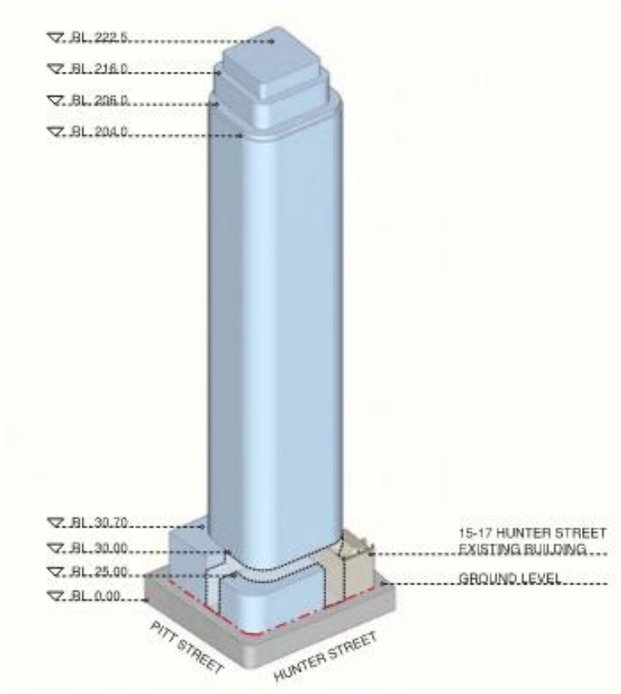

Figure 2 Indicative north east view for the reference design (by Bates Smart)

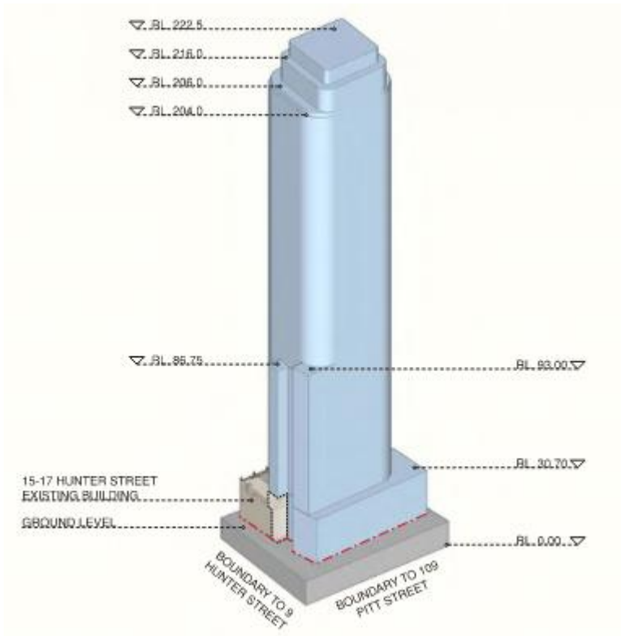

Figure 3 Indicative south west view for the reference design (by Bates Smart)

2 ESD POLICY AND DRIVERS

Several sustainability frameworks exist at a global, federal, state and local level that have been used to provide the context for goals, objectives and targets for the ESD approach for the Project.

2.1 GLOBAL

2.1.1 UNITED NATIONS SUSTAINABLE DEVELOPMENT GOALS

The United Nations prioritises 17 Sustainable Development Goals as part of a Sustainable Development Agenda with the purpose of transforming our world by ending poverty, protecting the planet and ensuring prosperity for all. Each goal has specific targets to be achieved by 2030 with six of these seventeen goals advocating for climate change and resource demand reduction initiatives. To achieve these goals, change is sought for from governments, the private sector and civil society. The main goals relevant to the proposed development include:

- Goal 7: Affordable and clean energy
- Goal 11: Sustainable cities and communities
- Goal 12: Responsible consumption and production
- Goal 13: Climate action

2.2 FEDERAL

The Paris Agreement is an international agreement with a central aim to:

> *"Strengthen the global response to the threat of climate change by keeping global temperature rise this century well below 2 degrees Celsius above pre-industrial levels and to pursue other efforts to limit the temperature increase even further to 1.5 degrees Celsius." (United Nations, 2017)*

Australia became a signatory to the Paris Agreement on 22 April 2016, which came into force on 9 November 2016. Ratification occurred thirty days after the date that parties which make up an estimated 55% of the total global Greenhouse Gas (GHG) emissions chose to become signatories. Under the Paris Agreement, Australia has committed to reducing emissions to 26-28% on 2005 levels by 2030. The Australian government aims to meet these commitments by 'Direct Action Policies' created with the objective of reducing emissions, increasing energy productivity and improving environmental health. These reduction targets have set the benchmark in which each state has developed their own climate positive strategies with an emphasis on either meeting or exceeding this target.

2.3 STATE

The policy framework for considering sustainability outcomes for the proposed development includes the following:

- NSW Climate Change Policy Framework, which seeks to achieve net zero emissions by 2050 and for NSW to be more resilient to a changing climate;
- Smart Cities Plan call for us to become smarter investors in out cities' infrastructure through the coordination and driving of smarter city policy and smart technology to improve the sustainability of our cities and to drive innovation; and
- Future Transport strategy which sets the framework to working towards environmental sustainability, securing energy reliability and affordability, and managing a resilient transport system.

2.4 LOCAL

2.4.1 GREATER SYDNEY COMMISSION EASTERN CITY DISTRICT PLAN

The Greater Sydney Commission Eastern City District Plan is a 20-year plan to manage growth in the context of economic, social and environmental matters designed to achieve the 40-year vision for Greater Sydney. The District Plan contains the planning priorities and actions for implementing the Greater Sydney Region Plan, A Metropolis of Three Cities, at a district level and is a bridge between regional and local planning. It outlines a city in landscape, an efficient city, and a resilient city as the sustainability directions for the District. The table below summarises the key priorities of the District Plan.

A CITY IN LANDSCAPE	AN EFFICIENT CITY	A RESILIENT CITY
• **Protecting and improving the health and enjoyment of Sydney Harbour and the District's waterways** • **Protecting and enhancing bushland and biodiversity** • **Protecting and enhancing scenic and cultural landscapes** • **Increasing urban tree canopy cover and delivering Green Grid connections** • **Delivering high quality open space**	Reducing carbon emissions and managing energy, water, and waste efficiently	Adapting to the impacts of urban and natural hazards, and climate change

2.4.2 CITY OF SYDNEY

The City of Sydney has set very high standards for sustainable development. There are several in-force and draft plans, policies and guidelines at the local level that are applicable to the Project. These are[1]:

- Sydney Local Environmental Plan 2012 (Sydney LEP 2012)
- Sydney Development Control Plan 2012 (Sydney DCP 2012)
- Central Sydney Planning Strategy – draft currently on exhibition (Draft CSPS)
- Proposed Amendments to the Sydney DCP 2012 (Sydney DCP Amendments)
- Amendments to the Competitive Design Policy

[1] Source: *15-21 Hunter Street and 105-107 Pitt Street, Sydney, Planning Proposal Ecologically Sustainable Development – City of Sydney Requirements and Expectations*, Ethos Urban, 1 July 2020

- Draft Guideline for Site Specific Planning Proposals in Central Sydney

2.4.2.1 LOCAL ENVIRONMENT PLAN 2012 (LEP)

One of the main aims of the LEP is to promote ecologically sustainable development. The LEP also describes the requirements surrounding "design excellence" which apply to developments planning to exceed height and floor space ratio restrictions outlined in the Sydney DCP 2012. In considering whether the development exhibits design excellence, the consent authority must have regard to the following:

- Whether a high standard of architectural design, materials and detailing appropriate to the building type and location will be achieved.
- Environmental impacts, such as sustainable design, overshadowing and solar access, visual and acoustic privacy, noise, wind, and reflectivity.
- The achievement of the principles of ecologically sustainable development.
- Pedestrian, cycle, vehicular and service access, and circulation requirements, including the permeability of any pedestrian network.

It is understood that no numerical ESD requirement is proposed to be mandated in the Sydney LEP 2012 resulting from the proposed changes, but a direction for achievement of 'best practice' in accordance with NABERS Energy is proposed to be required for tower cluster projects.

2.4.3 SYDNEY DEVELOPMENT CONTROL PLAN 2012

The Sydney development control plan sets out objectives and controls to provide a framework for the application of ESD principles in the design, construction and operation of buildings across Sydney local government area. Section 3-6 of the DCP details the specific areas that must be addressed by development proposals to demonstrate a sustainably designed building. Implementing these principles means that the development will be designed and constructed so that it complies with the following objectives:

(a) Greenhouse gas emissions will be reduced;

(b) The use of cogeneration and tri-generation systems will be increased;

(c) Energy that is used will be renewable and low carbon;

(d) Potable water use will be reduced;

(e) Development can adapt to climate change;

(f) Waste will be reduced;

(g) Recycling of waste and use of products from recycled sources will be increased;

(h) Indoor environmental quality will be improved;

(i) The environmental impact from building materials will be reduced through reduction, re-use and recycling of materials, resources, and building components; and

(j) The biodiversity will be improved.

Under the energy amendments to the DCP 2012, applications for new developments containing office premises with a net lettable area of 1,000sqm or more are to be submitted with documentation confirming that the building will support a base building NABERS Energy Commitment Agreement of 5.5 stars with the NSW Department of Planning, Industry and Environment.

In addition, all new water fittings and fixtures such as showerheads, water tap outlets, urinals, and toilet cisterns using best practice Water Efficiency Labelling Scheme (WELS) star rating available at the time of development.

It is understood that minimal amendments are proposed to the DCP 2012.

2.4.4 DRAFT CENTRAL SYDNEY PLANNING STRATEGY

The Central Sydney Planning Strategy (CSPS) is a draft strategy prepared by City of Sydney to ensure strong planning controls are in place to guide the growth of Central Sydney. One of the objectives related to floor space is the requirement for Planning Proposals to ensure that a commitment is made to achieve sustainable development above minimum requirements.

Objectives and actions from the draft CSPS relevant to the ESD strategy of the Project include:

- Major new development areas to commit to be zero-net energy or climate positive;
- Buildings are to be designed to achieve the highest possible thermal comfort levels and performance criteria through passive means;
- Mechanical heating and cooling are to be avoided, or when used, to be best-in class energy efficient;
- Buildings are to maximise the use and generation of local renewable energy;
- New major developments are to include capacity to generate 10% of their total energy on site using renewable sources; and
- Require best practice water efficiency design.

The CSPS is still in draft, however the ESD aspirations within the draft CSPS have been reviewed and used to inform the proposed ESD Strategy for the project. WSP confirms that the current ESD strategy exceeds current best practice.

2.4.5 DESIGN EXCELLENCE AND BETTER PLACED

The term “design excellence” is often used within LEPs and elsewhere to describe an expected or required level of design quality of a building or project. In these cases, the definition of design excellence is consistent across planning legislation where it is often summarised as ‘the highest standard of architectural, urban and landscape design’. More recently, design excellence has been used within statutory regulations to describe or trigger other processes, including competitive review of a project by an established Design Review Panel.

‘Design excellence’ emerged as a term in the City of Sydney in 2000, where it was used to describe competitive design process to be undertaken at the concept design stage of new projects in return for additional Floor Space Ratio or building height. The competitive process is aimed at both lifting the design quality of significant buildings and diversifying the field of architectural practices engaged in their design.

The Project intends to exceed height restrictions of the Sydney LEP 2012. Under these circumstances, it is mandatory that the building demonstrate “design excellence”. The design policy, “Better Placed”, developed by the Government Architect department of NSW, sets the standard for “design excellence” for NSW developments including projects that are required to undertake competitive design excellence processes. Better Placed provides a set of objectives, encouraging good design outcomes including those aimed at environmental sustainability and responsiveness, such as:

- Effective design that can create ongoing savings through reduced energy and water demand;
- Adaptable buildings that adjust to changing requirements over time, without requiring significant changes or replacement;
- Energy-efficient buildings that are more comfortable for people, in temperature, air quality, access to natural light and fresh air;
- Spaces and buildings which use locally sourced materials that encompass less energy in transport and production, reducing the environmental impact

The environmental initiatives to assist the Project in achieving these targets are outlined in Section 4 of this report.

3 ESD RATING TOOLS

3.1 TOOLS TO DRIVE SUSTAINABLE OUTCOMES

To achieve the goals, objectives and targets of the sustainability frameworks outlined in Section 2, the following compulsory and voluntary initiatives and programs have been considered:

- National Construction Code (NCC) 2019 Section J;
- NABERS; and
- Green Star Design and As Built.

3.1.1 NCC 2019 SECTION J COMPLIANCE

Section J Energy Efficiency of the NCC has recently been revised and the updated version was released in May 2019. A package of measures for Volume One focusses on delivering ~ 35% reduction in energy consumption across commercial buildings. The focus shifts from energy-based metrics to a GHG metric to provide a more holistic view of a building's environmental impact.

The 2019 updates to Section J also include Green Star and NABERS pathway options for demonstrating NCC compliance to reflect the broad use of these rating tools and reduce the level of duplication of similar assessment processes across the industry. Section J Energy Efficiency is relevant to the Project and sets mandatory requirements for:

- The design of the building envelope and services, and provision of equipment and appliances to minimise energy use and GHG consumption;
- The design of the building envelope to maximise thermal comfort performance; and
- The provision of adequate facilities for energy monitoring.

The Council encourages development to exceed these mandatory requirements, where feasible.

3.1.2 NABERS

Launched in 1999, NABERS is a voluntary[2] rating tool that may be used to measure a building's energy consumption, carbon emissions, water consumption, and waste production for comparison against similar buildings.

The key principles of NABERS are divided into metrics, including calculation methodologies and rating scales that make up a NABERS rating; methods, including the system for managing the rating process, rules and quality assurance; and governance, including responsibilities for the oversight of the scheme, and stakeholder engagement principles (NABERS, 2016).

As outlined in Section 2.4.4 of Sydney's DCP 2012, the commercial office component of the development will be required to achieve a NABERS rating of 5.5 stars. In addition, the Draft Guidelines for Site Specific Planning Policies in Central Sydney, requires that a NABERS Energy Commitment Agreement of at least 5.5 stars for office and 4.5 star for hotel is achieved in all new developmentss exceeding the FSR and/or height limits. A Commitment Agreement is a contract signed by a developer or owner to commit to design, build and commission a building to achieve a specific NABERS energy rating and involves measuring actual energy consumption during the first year of operation, which ensures performance aligns more closely with design. This is demonstrated in the graphic below.

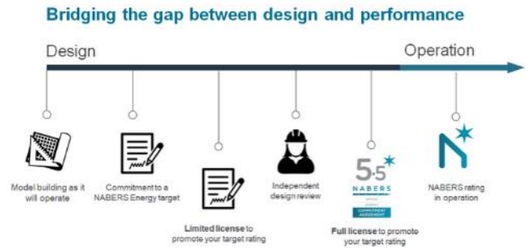

Figure 4 - Commitment Agreement Process

3.1.3 GREEN STAR DESIGN AND AS BUILT

Green Star is a voluntary environmental rating system that assesses holistic sustainability attributes in the design, construction and operation of buildings, fit outs and communities. Administered by the Green Building Council of Australia (GBCA), it provides third party certification of the environmental design and operation of buildings in Australia. Points are awarded to the project when it complies with a range of credits and sums them up to achieve a final star rating. The Green Star tool considers the following key sustainability attributes:

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

Projects target credits under each of these categories. Each credit is worth between 1 and 20 points, with the total number of points available being 100 (plus 10 innovation points). A star rating is awarded depending on the total number of points awarded to the completed project, as follows:

- 4 Star – Australian Best Practice: 45 - 59 points
- 5 Star – Australian Excellence: 60 - 74 points
- 6 Star – World Leadership: 75+ point

The DCP recommends the use of an environmental rating tool, such as Green Star, in the absence of comprehensive government standards however this is not a policy requirement. At this stage of the Project, a Green Star rating has not been pursued. The Green Star tool promotes a holistic approach to ESD, this is also achieved in the development through demonstrating compliance with section 3.6 of the DCP (2012) through addressing items a – j of the policy, as detailed in section 2.4.4 of this report. Furthermore, the Green Star tool is undergoing significant change and the version that would be applicable to the Project will be confirmed at the time of Green Star registration (typically after Stage 2 DA).

[2] Except for office spaces under the Commercial Building Disclosure (CBD) Program, which requires a Building Energy Efficiency Certificate (BEEC) as demonstrated using the NABERS Energy for offices rating.

4 ESD CONCEPT STRATEGY

The proposed building is subject to the highest standards of ESD. The following section sets out the sustainability strategy for meeting these standards and for demonstrating design excellence from a sustainability perspective.

4.1 ENERGY AND GHG EMISSIONS

The reduction of GHG emissions in the built environment is a major focus at global, federal, state, and local levels to curb the impacts of climate change. Improving energy efficiency leads to a reduction in carbon emissions and reduces the consumption of finite resources.

The strategy for emissions reduction is to follow a "Lean, Clean, Green" approach, balancing immediate environmental and economic performance with long term deep cut emissions potential. This approach has delivered opportunities to maximise development opportunities while minimising carbon footprint.

- **Lean** | Prioritising passive design, to mitigate the demand for resources through design of natural and passive lighting and ventilation
- **Clean** | Selection of efficient equipment to deliver further improvements
- **Green** | Selection of green technology to reduce remaining carbon emissions

The proposed development will target a 5.5 Star Base Building NABERS Energy rating with an aspiration to be net zero carbon ready as far as practically achievable with on-site measures. These energy targets will be met using on site energy efficiency measures and renewable energy technologies to reduce energy consumption, and will considerably exceed NCC Section J requirements for energy efficiency, building fabric, and glazing. For high rise commercial buildings, due to the limited roof area for solar PVs, net zero carbon in operation can only be achieved through the procurement of off-site renewable energy and purchasing carbon offsets in addition to on-site measures.

The following initiatives are proposed to ensure the Project reduces its carbon emissions as far as possible with on-site measures:

- High efficiency HVAC
- High performance facade
- High efficiency LED lighting
- High efficiency lifts (A class) providing maximum amenity at reduced energy burden
- Roof mounted PV systems in all locations where feasible, and consideration of façade integrated PV systems, to offset grid energy and minimise peak energy demands
- Incorporation of commissioning, maintenance and building tuning into the project programme
- Incorporation of ongoing monitoring trends from energy metering

Several options have been considered to ensure energy has been reduced as far as possible through the building design, building services and through the application of renewable energy technology. Future-proofing is discussed further in section 4.1.6 Adaptable Design.

The following analysis has been qualitatively and/or quantitatively assessed:

- Optimisation of window to wall ratio on NCC 2019 compliance
- Assessment of solar hot water (SHW) systems compared to solar photovoltaic (PV) systems
- Integration of PV systems

This analysis has been undertaken on the preliminary scheme issued by FJMT Architects dated 27/02/2020. And the results are discussed below.

4.1.1 WINDOW TO WALL RATIO ANALYSIS

Analysis of window to wall ratios (WWR) has been undertaken for the office. This design has been analysed through the Beta NCC 2019 façade calculator as a 'deemed to satisfy' approach to determine the likely WWRs will be required to demonstrate a minimum level of performance and compliant glazing systems.

At this early stage of design, several assumptions have been made in regards to the window areas and shading extent on the facades. These are as follows:

- **Office window and wall area:** Walls (floor to ceiling) are assumed to be 3.5m tall with the maximum window height reaching 3.0m. The length of glazing is assumed to be the same length as the façade across all orientations, except where the core is against the façade.
- **Shading extent:** Shading is assumed extent 400mm horizontally, 100mm above the window head. Should the shading extent increase beyond these dimensions the resulting SHGC values will become less stringent.

The following tables indicate the resulting glazing U-Values and SHGC requirements to demonstrate compliance with NCC 2019 Part J2, given the assumptions described above.

Table 2 Office indicative building fabric and glazing requirements

WINDOW HEIGHT	WWR	WALL R-VALUE[1]	GLAZING U-VALUE[2]	GLAZING SHGC
2.1m *(600mm off floor level with 300mm below ceiling lining)*	60%	1.00	2.67	0.23
2.5m *(500mm off floor level and level with ceiling lining)*	70%		2.40	0.20
3.0m *(on floor level and level with ceiling lining)*	80%		2.17	0.16

[1] The wall performance calculations should allow for the impact of thermal bridging and will need to be calculated as per the methodology presented in NZS 4214.

[2] Glazing and wall U-value requirements are interconnected and so performance can be traded between them. A higher performance in the glazing or wall U-value can result in a less stringent requirement in the other.

RECOMMENDATION

We recommend a WWR of 60% for the commercial areas. This will allow the specification of practical glazing systems, even when pursuing JV1-3 compliance pathways. To achieve more favourable design conditions, it is recommended that greater than 400mm horizontal overhangs are provided to each window where possible on the north, east and west facades (or equivalent shading provision), to reduce loads and achieve 'design excellence', as well as a 'net zero ready' building design aspiration.

It is recommended at Development Application stage for this project, a Performance Solution JV3 is undertaken for both the retail and office areas. This assessment is an holistic assessment of the building envelope design by accounting for better performing construction elements in the model and thereby compensating for elements that may not satisfy the prescriptive

DTS requirements. This approach more accurately assesses highly-glazed sections of façade, and better recognises shading such as from adjacent structures and architectural articulations of the proposed design.

4.1.2 SHADING

Shading systems will be provided to meet the fabric solar requirements. This has been modelled as a conventional shading horizontal shading element in Section 4.1.1 above. The requirements can be achieved through conventional horizontal or vertical shading systems, integrated PV facade systems, closed cavity façade systems among others or any combination of the above.

The shading systems will be investigated in more detail during future stages of the project and will consider the impact of the shading system on façade performance requirements, façade depth, GFA and the incorporation of any façade PV systems.

4.1.3 PHOTOVOLATIC ANALYSIS

PV systems will be integral in the 'design excellence' and 'net zero ready' design strategy for the Project. Currently, it has been estimated that if PVs are installed on the roof space above the plantroom, this will equate to a system size of approximately 93.7kW. These panels will have optimum tilt and orientation to the north. The terrace area on L49 also provides further opportunities for incorporation of PVs to act as shades. The final inclusion of PVs will depend on detailed calculations and coordination with architectural intent for L49.

Table 3 Photovoltaic systems descriptions

SYSTEM	DESCRIPTION	AVAILABLE AREA (SQM)	SIZE (KW)	OVERSHADOWING RISK
Rooftop	Area of roof ~80% of roof top above the plant room allowing for other services	600	93.7	None
Terrace shade	Area of terrace at L49 outside the F&B lobby to the north	145	22.5	None

Other opportunities to incorporate more PV panels exist, in particular on the façade of the building to act as shading or on the terraces on Levels 18 and 34, however detailed analysis would need to be undertaken in future stages to assess the overshadowing risk from surrounding buildings and also from the building itself (for the terraces).

Other building integrated PV systems are available and could be investigated to meet the performance levels calculated. Further investigation could consider building integrated PV systems including integrating PV into the shading, glazing or opaque facade systems. The investigations should consider the service design life of any façade integrated PV as they will generally have a shorter service design life than a conventional façade system. This could result in requiring the replacement of facades elements before their individual service life if integrated with PV and therefore impact lifetime cost and sustainability outcomes.

These systems were analysed and produced the following results:

Table 4 Individual generation and energy and emissions reductions

SYSTEM	ANNUAL GENERATION	ENERGY REDUCTION	EMISSIONS REDUCTION
Rooftop	134,547 kWh	6.97%	8.18%
Terrace shade	32,291 kWh	1.67%	1.96%

Cumulatively, installing these one after another product the following results:

Table 5 Cumulative totals of generation and energy and emissions reductions

SYSTEM	ANNUAL GENERATION	ENERGY REDUCTION	EMISSIONS REDUCTION
Rooftop	134,547 kWh	6.97%	8.18%
Terrace shade	166,838 kWh	8.65%	10.14%

RECOMMENDATION

We recommend installing PV panels on the roof above the plantroom. This area is currently not overshadowed and unlikely to be overshadowed in the foreseeable future. This would allow for ~6.97% of operational carbon emissions to be offset using onsite renewable energy generation. This represents a significant achievement for a high-rise building, and would assist considerably in achieving the required NABERS Energy ratings, as well as making a strong case for 'design excellence' and 'net zero ready'. We also recommend that further opportunities to incorporate PVs should be investigated but should be coordinated and aligned with the architectural intent.

4.1.3.1 COMPARISON OF SOLAR HOT WATER AND SOLAR PV

Solar hot water and solar PV systems were investigated qualitatively to consider their respective potential contribution to reducing energy and carbon associated with the development operations. A brief investigation of two systems is outlined below:

Table 6 Solar systems descriptions

	SOLAR HOT WATER SYSTEM	SOLAR PHOTOVOLTAIC SYSTEM
System description	Rooftop evacuated tubes with hot water tank and electric or gas boost.	PV panels with inverter
Efficiency	~90-70%	~19-24%
Storage potential	Integrated storage	Storage considered separately
System losses	Significant across long pipe spans	Minimal within development
Design life	10 years	30 years

Considering the scale of the building it is unlikely that a solar hot water system would be suitable for use within the proposed development, primarily as it would involve a significant uplift in pumping energy.

RECOMMENDATION

From this high-level analysis, it is recommended that PV systems are prioritised over solar hot water systems. It is recommended in general to maximise installation of PV systems.

4.1.4 METERING

Electrical sub metering is to be provided for significant end uses that would consume more than 100kVA. This may include plant rooms, car parks, lift and large areas that require high intensity lighting. Metering of energy consumption can assist considerably in ensuring that energy used in operation is measured and monitored so that it can be reduced. This is also an important aspect of the NABERS rating. The meters will be connected to a central BMS, which will record the water use and will produce reports (hourly, daily, monthly and annual) to enable the effective monitoring of water consumption.

4.1.5 ADAPTABLE DESIGN

Adaptability of the building through design that considers 'future-proofing' options have been included in the energy strategy. This allows for plant and equipment, that is efficient now, to be replaced with higher performing technology that may have a lower carbon impact in future. Specifically, this relates to the use of heat pumps, which are inherently more efficient than traditional gas fired boilers, however due to using electricity as the fuel source, can lead to a higher carbon impact than boilers as a result of the current carbon intensity of the grid. This will however change over time as the grid is decarbonised through the grid fuel mix changing to incorporate significantly more renewable energy sources.

At this early stage of the project, it is important to consider how HVAC / plant room design can allow for this in terms of spatial requirements along with access to enable removal and installation of different plant, and how this would link into the existing distribution systems.

A further option worthy of investigation for 'net zero ready' would be to install a central heat-pump domestic hot water system on plant levels in contact with the ambient temperature and electric boosters closer to end uses to minimise pipe losses. This initiative will result in energy savings, however will have a higher carbon footprint (with current carbon factors) and cost but with a building design ready for the transition to a low carbon economy and the increase in gas prices.

4.1.6 ENERGY AND EMISSIONS BENCHMARKS

Indicative calculations have been undertaken for the development to investigate the potential for energy and emissions improvement. The benchmark energy consumption has been established based on the area breakdown provided by Bates Smart and results from energy modelling from a similar high rise tower in Sydney CBD. Further energy calculations will need to be undertaken for this project during Stage 2 DA and Detailed Design stages.

The reference energy calculations were based on a NCC 2019 compliant reference building of the same construction and modelled per the following scopes for each building use:

- Office: NABERS Office Base Building Rating (89% of NLA)
- Food Market, F+B, Health + Wellness and Gym: NCC 2019 (Base Building) (11% of NLA)

The benchmark energy consumption and has been compared against the reference building with the following improvements:

- Best practice variable air volume (VAV) system for office and innovation
- High efficiency chiller and cooling plant
- Condensing hot water heaters
- Installation of Class A efficiency lifts

Further improvements in lighting and heating plants for DHW and HHW are possible however at potentially large expense, reduced amenity and/or emissions increases against todays metrics. These measures are not recommended to implement currently in the design, however allowances should be considered for their implementation once they become viable:

- More efficient LED lighting design beyond standard practice LED design. Recommend consideration of adaptation of design once new generation of LEDs are developed or easily adjustable design to allow for efficient placement of light fittings and lighting controls.
- Heat pumps for HHW and DHW. Recommend consideration of supply temperatures and riser sizes to allow for the future installation of heat pumps once the grid becomes less emissions intensive and heat pump technology develops.

Based on the analysis of these models, a breakdown of energy and emissions intensities for the development has been determined. This can be seen for energy and emissions respectively in Figure 5 and Figure 6 below.

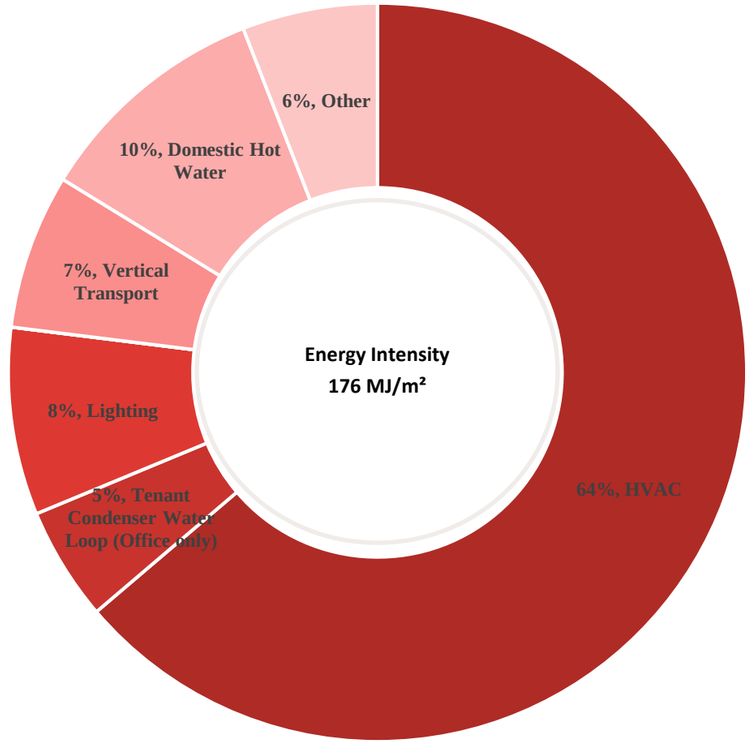

Figure 5 Energy Intensity Breakdown before Renewable Energy

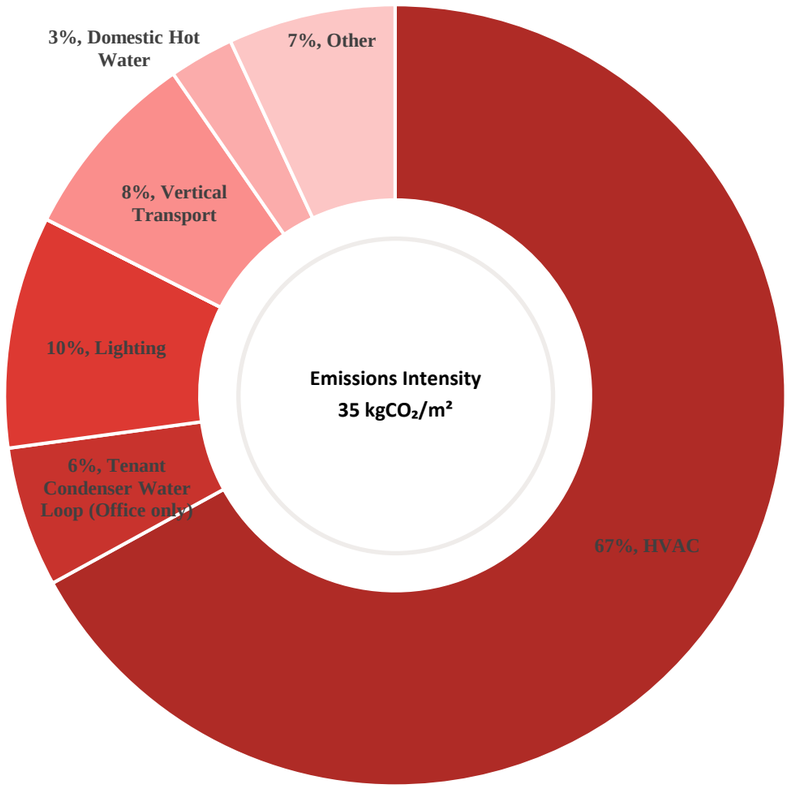

Figure 6 Emissions Intensity Breakdown before Renewable Energy

This is further represented in the table below indicating the energy and emissions intensity of each element within the development. This indicates that the most energy and carbon intensive aspects of the base building is HVAC. It is recommended that these energy uses be prioritised for energy improvements in order to reduce the emissions associated with the development over time.

Table 4-7 Emissions Intensity Breakdown before Renewable Energy

BUILDING ELEMENT	ENERGY INTENSITY	PERCENTAGE OF TOTAL	EMISSIONS INTENSITY	PERCENTAGE OF TOTAL
HVAC	114.06 MJ/m²	65%	23.89 kgCO₂/m²	68%
Tenant Condenser Water Loop	6.63 MJ/m²	4%	1.55 kgCO₂/m²	4%
Lighting	14.54 MJ/m²	8%	3.39 kgCO₂/m²	10%
Vertical Transport	12.22 MJ/m²	7%	2.85 kgCO₂/m²	8%
Domestic Hot Water	18.32 MJ/m²	10%	0.95 kgCO₂/m²	3%
Other	10.61 MJ/m²	6%	2.48 kgCO₂/m²	7%
Total	**176.39 MJ/m²**		**35.11 kgCO₂/m²**	

The predicted energy intensity for the office portion of the development is 44.4 kWh/year/m² of GFA. This is in line with the planning controls outlined by the Central Sydney Planning Framework on net zero energy performance standards (maximum 45 kWh/year/m² of GFA). The predicted energy results have also been benchmarked against the NABERS rating tools for base building offices, assuming that all of the PV generation will be supplying the base building electricity demand. Table 8 indicates the ratings achieved without PV, with roof top PV only and through introducing PV's on the terrace on L49 as well.

Table 8 Base building NABERS Energy results for the office

RATING TOOL	WITHOUT PV	WITH ROOFTOP PV	WITH ROOFTOP + L49 TERRACE PV
Base building NABERS Energy - office	5.5 Star with 23% buffer *14% additional improvement required for next star rating*	5.5 Star with 30% buffer *5% additional improvement required for next star rating*	5.5 Star with 32% buffer *3% additional improvement required for next star rating*

The Figure below illustrates individual and cumulative reduction of emissions attributed to the installation of each of the PV arrays on top of the efficiency achieved by the proposed energy efficiency measures against the reference building.

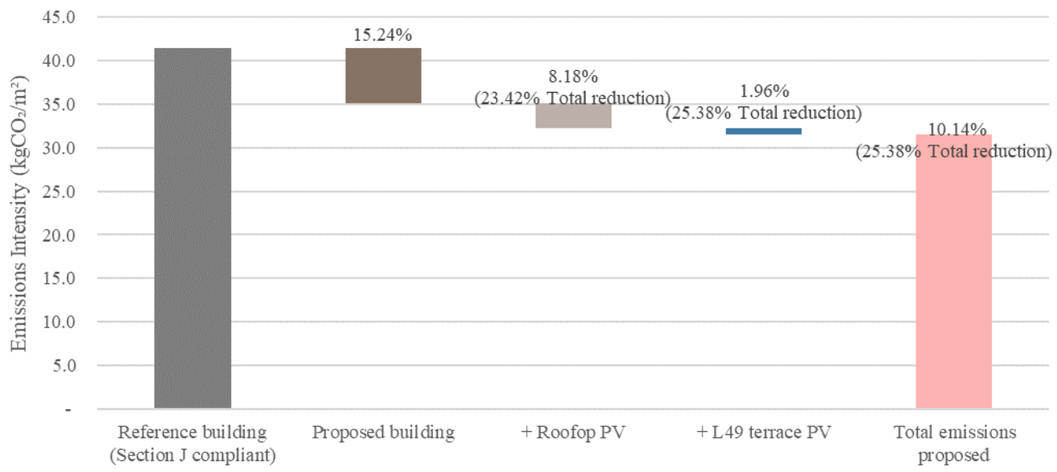

Figure 7 Cumulative emissions reductions across proposed building and PV options

This analysis has therefore shown that it is feasible to achieve at least a 23% reduction in emissions onsite, compared to a Section J compliant building, demonstrating that the building can perform significantly better than minimum compliance.

To further support the net zero energy buildings pathway by City of Sydney, a detailed energy model of the building will be developed by the sustainability consultant and opportunities for further reductions, in consultation with the project team will be identified.

The project will also aim to be fully electrified (i.e. there will not be gas combustion on site). The feasibility of this will be determined at the next design stage, where spatial and substation requirements will be reviewed in detail. If any gas or other fossil fuels are used on site, a transition plan to electrification will be prepared and until the building is fully electric, the emissions from onsite fossil fuel combustion will be offset by purchasing carbon offsets during operation.

4.2 WASTE

Reducing waste and increasing recycling rates are a key priority for the City of Sydney. The Project will achieve exceptionally high rates of resource recovery.

The following initiatives have been designed to ensure waste generation is reduced as far as possible, and that recycling rates are maximised. They also exceed the relevant waste requirements in the Sydney DCP 2012.

A waste management plan would be prepared for the construction phase of the project to inform and monitor the performance of waste management process and increase the diversion of waste from landfill. This would be prepared in accordance with the City of Sydney's requirements

An operational waste management plan (OWMP) has been prepared to improve waste management practices at the site during operation. Some of the strategies included in the OWMP are:

- Using 110L bins for general waste,
- Using separate bins for glass and office paper,
- Using baler for cardboard,
- Installing a food organics digester which processes organic waste via anaerobic process, and the resultant product is just CO2 and greywater, with no residual waste
- Providing storage for bulky goods and strip-out waste,
- Providing dedicated areas for reusable items,
- Using oil vat in the waste room on the ground floor for used cooking oil for F+B areas, and
- Educating tenants through good communication and signage.

The sizing, configuration and location of waste rooms in the development will ensure that waste is separated and collection locations are accessible to waste collection services.

This approach is expected to divert a significant proportion of operational waste from landfill, however is largely dependent on behaviours of those occupying the building. There will therefore be an emphasis on of building occupants.

4.3 WATER

Water scarcity is a major concern for Australia's growing population due to changing weather patterns that are occurring because of climate change. The water strategy for the building will be to first reduce consumption through maximised efficiency. The next step will be to include metering and monitoring to capture any leaks or unusual uses. The final step in the water strategy will be to supply non-potable uses with water from alternate sources, such as rainwater. The limited roof area means there will be limited rainfall available, especially in predicted climate change scenarios where rainfall patterns will change, resulting in longer dry periods and more intense rainfall. Therefore, it will be essential to optimise the first two strategies to maximise water use efficiency.

The following objectives are proposed to demonstrate policy compliance and to address Sydney DCP objectives d and e.

- To achieve water efficiency there will be a heavy emphasis on the efficiency of the water fixtures and fittings. Recommended WELs ratings are provided in Table 9.

Table 9 Recommended water fixture and fittings efficiencies

FIXTURE	WELS RATING AND FLOR/FLUSH RATE
Toilets	4 Star 3/4.5L dual flush
Kitchen and bathroom taps	6 Star – 4.5L/min
Showers	4 Star – no more than 7.5L/min
Dishwashers	5 Star

- Commit to the installation of a rainwater tank, from which rainwater can be feasibly collected and plumbed to appropriate end uses. With a small roof area and relatively tall building, the rainwater supply is expected to meet only a small proportion of non-potable needs, which could include either toilets and urinals, landscape irrigation and / or cooling towers (if applicable). The strategy for rainwater reuse can be addressed through detailed design, however space for the tank will need to be allowed for and the possibility of dual reticulation piping throughout the building should be considered, in the event that rainwater is required to be connected to all toilets and also for connection to future district recycled water network provided by the City of Sydney. The optimal tank size taking into consideration roof area, available rainfall and climate change scenarios will be determined in detailed design.

METERING

- Meters will be installed for all major water uses in the buildings, such as the make-up lines to cooling towers, irrigation systems, toilets, and other major uses.

- Water meters will be connected to a central BMS, which will record the water use and will produce reports (hourly, daily, monthly and annual) to enable the effective monitoring of water consumption.

COOLING TOWERS

Where cooling towers are used, they are to be connected to a:

- Recirculating cooling water loop; and
- Conductivity meter so that the blow down or bleed off system in a cooling tower can be automated based on conductivity. This ensures that the water is being re-circulated an optimum number of times before being discharged to the sewer.

4.4 MATERIALS

The targeted selection of materials with low environmental impacts can greatly contribute to sustainable outcomes and can also reduce total embodied carbon and improve indoor air quality for occupants.

The following initiatives are proposed for the Project. They would also help to address Sydney DCP objectives a, e, f, g, h and i.

- Hybrid timber and concrete construction is proposed for the Project to reduce its embodied carbon. Detailed embodied carbon calculation will be undertaken at a later design stage to quantify the benefit in embodied carbon reduction.
- Encourage the re-use of products where possible including repairing and recovering if necessary
- Use building materials, fittings and finishes that: have been recycled; are made from or incorporate recycled materials; and have been certified as sustainable or ‘environmentally friendly’ by a recognised third party certification scheme
- External materials and colour palette would be of light colours to minimise urban heat island effect

4.5 INDOOR ENVIRONMENT QUALITY

Occupant comfort is a growing focal point of ESD policies both locally and internationally. ESD initiatives that support the improvement of indoor environment quality quite often go hand-in hand with ESD initiatives in other areas including energy, water and materials.

The following initiatives are proposed to address the Sydney DCP objectives a and h.

- Flicker free lighting that accurately addresses the perception of colour
- Optimized building layout to ensure greater access to daylight and high quality external views
- Glare reduction from the installation of blinds or shading devices that can be controlled by the occupant
- Provide high rates of outdoor air to reduce the level of indoor pollutants
- Consider the use of natural or mixed mode natural ventilation where appropriate
- Use paints, sealants and floor coverings with low levels of volatile organic compounds (VOC) and wood products with low formaldehyde

4.6 BIODIVERSITY

Appropriate landscaping can improve urban ecology and enhance the users experience of a space. It has been evidenced to support better health and wellbeing outcomes for occupants and visitorss.

The following landscape design elements are proposed to address Sydney DCP objective j:

- The sky lobbies will feature planting designed to improve air quality and wellbeing of those using the space.
- Use native vegetation as opposed to exotic species in terraces and other applicable areas, which encourage native wildlife and have lower water requirements
- The implementation of vegetation to reduce the causes and impacts of the urban heat island effect and contribute to achieving the Government Architect NSW draft Tree Canopy Guide, that forms part of the Draft Greener Places Guide of 15% cover in CBD areas.

4.7 TRANSPORT

Reducing individual car use and promoting alternative means of transport leads to minimising GHG emissions, reducing traffic congestion, improving air quality and encouraging active transport as a means of mobility. The Site is ideally suited to sustainable forms of transport due to its proximity to range of public transport services including an array of bus routes, rail and light rail options.

In addition, the site is conveniently located to various cycling infrastructure, along with footpaths providing safe and efficient connections for pedestrians.

The following initiatives will support Sydney DCP objectives and Sustainable Sydney 2030 targets which aim to increase the use of public and active modes of transport.

- The building benefits from its proximity to excellent public transport services.
- The building will aspire to include electric vehicle charging stations - or allow for their implementation at a later stage.
- The development will provide bicycle racks and end of trip facilities for staff to encourage cycling and pedestrian travel.

4.8 CLIMATE CHANGE

The impacts of climate change are starting to be seen and would become more extreme throughout the life of the development. The following initiatives would help to address Sydney DCP 2012 objectives a, c, d, e, f, g, i and j.

Design adaptations are to be embedded to improve the resilience of the development to climate change, this includes initiatives such as those set out below:

- Low carbon building design, including future proofing strategies for replacement of plant and equipment with technologies that may become more efficient in future
- Building design that is resilient to changing temperatures that may eventuate in future
- Reducing the urban heat island effect of the building
- Reduced use of resources and materials in the design of the building
- Reduced consumption of potable water
- Diversion of operational waste from landfill to more productive uses and reuse

5 CONCLUSIONS AND ESD RESPONSE SUMMARY

This ESD Concept Report has set out how the proposed concept at 15 Hunter street has considered sustainable design strategies from the outset of the project. This has been achieved through the holistic approach to sustainable design detailed in this report, with a strong focus on energy efficiency and low carbon design strategies, waste diversion and reduced water consumption. The concept is therefore targeting exceptionally high ESD standards as prescribed in the policies, plans and guidelines by the City of Sydney.

A summary of the project requirements and aspirations in provided in the Table in the next page. The project will seek to exceed minimum requirements as encouraged by City of Sydney's current and draft plans, policies and guidelines and to demonstrate "design excellence" as required by the Sydney LEP.

Table 10 Project ESD Summary

	MINIMUM TARGET	STRATEGY	ASPIRATION	STRATEGIES TO BE INVESTIGATED
Energy and greenhouse gas emissions	NABERS Energy 5.5 (Applicable to Class 5 only) Exceed Section J compliance requirements	Efficient building envelope through passive design, best practice HVAC systems, lights, lifts, BMS, domestic hot water heating and potentially incorporation of PVs	Net zero ready	Investigation of PV inclusion on terraces and integrating them into building shading system Fully electric heating, cooling and domestic hot water
Water	Reduce potable water demand	Water efficient fixtures and fittings, rainwater tank, xeriscape gardens or provision of sub-soil irrigation system with moisture sensors	Seek a certified 4 stars NABERS Water rating in operation (Applicable to Class 5 only)	The target could be achieved with the identified initiatives under the minimum target for Water
Climate change	Undertake a climate change risk assessment	Incorporate design adaptation in accordance with the climate change assessment to avoid any high or extreme risks	N/A	N/A
Waste	Reduce construction waste	Divert a minimum of 80% construction and demolition waste from landfill	Maximise diversion from landfill	Divert a minimum of 90% construction and demolition waste from landfill
	Reduce operational waste	Develop a waste management plan. Provision of bins adequate space for separation and storage of different streams for operational waste	Near zero waste to landfill	Investigate circular economy principles for incorporation in the design of the building for operational waste management
Indoor environment quality	Improved environment quality	Low emitting materials, enhanced visual and lighting comfort	Use of natural or mixed mode ventilation Increased outside air provision	Operable windows 50% increase in outside air
Materials	Use materials with low environmental impact	Re-use materials or use materials with recycled content or third party certification	6% of materials used on the project (by cost) are either reused, have at least 30% recycled content or have Environmental Product Declarations	Environmental Product Declaration for Concrete 30% Portland Cement reduction through cementitious replacement materials, such as fly ash
Biodiversity	Improve biodiversity	Plants on terraces Use of native plants	Urban agriculture	Provide native edible plants on terraces
Transport	Encourage alternative modes of transport	End of trip facilities	Help with decarbonisation of private vehicles	Infrastructure for electric vehicle charging points

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