# 173-183 Rickard Road, Leppington (SSD-99319962)

## Ecologically Sustainable Design Assessment

### Leppington (1) 88 Development Pty Ltd

Prepared by:
**SLR Consulting Australia**

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## Revision Record

| Revision | Date | Prepared By | Checked By | Authorised By |
|---|---|---|---|---|
| R02-v1.0 | 9 June 2026 | Mark Hobday | Dr Neihad Al-Khalidy | Dr Neihad Al-Khalidy |
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# Basis of Report

This report has been prepared by SLR Consulting Australia (SLR) with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with Leppington (1) 88 Development Pty Ltd (the Client). Information reported herein is based on the interpretation of data collected, which has been accepted in good faith as being accurate and valid.

This report is for the exclusive use of the Client. No warranties or guarantees are expressed or should be inferred by any third parties. This report may not be relied upon by other parties without written consent from SLR.

SLR disclaims any responsibility to the Client and others in respect of any matters outside the agreed scope of the work.

# Executive Summary

SLR Consulting Australia Pty Ltd (SLR) has been engaged by Leppington (1) 88 Development Pty Ltd (the Applicant) to provide a qualitative Ecologically Sustainable Design (ESD) assessment for the proposed mixed-use residential development located at 173-183 Rickard Road, Leppington (the Site).

In accordance with the technical requirements of the Secretary's Environmental Assessment Requirements (SEARs) and in support of the State Significant Development Application (SSDA) SSD-99319962, a detailed response to associated SEARS requirements is summarised in the table below.

**Table 1 SEARS ESD Requirements and Responses**

| Item for inclusion | Action and Report Location |
|---|---|
| 1. Identify how ESD principles (as defined in section 193 of the EP&A Regulation) are incorporated in the design and ongoing operation of the development. | Section 3 details how ESD principles as defined in clause 7 (4) of Schedule 2 of the Environmental Planning and Assessment Regulation 2000 (reproduced in Clause 193 of the 2022 revision of the regulation) and up to date legislation are being incorporated in the design, construction, and operation phases of the project.<br><br>In terms of Precautionary Principle, the project does not present threat of serious or irreversible environmental damage. The project conducted all required environmental studies and incorporated adaptability and resilience measures in the design.<br><br>Inter-generational equity, the health, diversity and productivity of the environment are enhanced for the benefit of future generations via a number of initiatives including large PV solar installation, sustainable materials, reduced waste, reduced heat islands, etc. Refer **Section 3.0** for all other initiatives.<br><br>From a conservation of biological diversity and ecological integrity perspective, the project satisfies all environmental and statutory provisions requirements and will maintain the existing ecological structures (species and ecosystems, etc) for the proposed site and provide additional native vegetation planting and reduced stormwater runoff the site.<br><br>Environmental goals have been established and achieved using recognised rating tools. A Quantity Surveyor (QS) will be engaged to ensure that the project will remain on budget and all sustainability measures in the current study are implemented.<br><br>The proposed ESD initiatives will help to achieve significant reductions in the energy, waste and water required by the development both in building and operation and will deliver improved valuation and beneficial outcome. |

| Item for inclusion | Action and Report Location |
|---|---|
| | • The proposed residential development will enjoy a high level of energy efficiency gaining an average 7 NatHERS star rating.<br>• The residential development also meets and exceeds BASIX targets in Water 50% (Target 40) and in Energy 68% (Target 61).<br>• The proposed 320 kW rooftop PV system, along with the passive design strategies and technical energy-efficiency measures outlined in Section 3, will significantly reduce operational energy demand. As all renewable electricity generated on-site will be consumed directly within the building, battery energy storage is not considered appropriate for this development. |
| 2. Where relevant, provide an assessment against the standards for non-residential development set-out in Chapter 3 of State Environmental Planning Policy (Sustainable Buildings) 2022 | The following design considerations have been implemented to address Chapter 3.2.(1) of SEPP 2022:<br>• The project is committed to entering a NABERS Agreement to Rate for the hotel component and targeting 4.0-star NABERS Energy and 3.0-star NABERS Water ratings.<br>• The hotel component is proposed to achieve over 20% GHG emission reduction via the proposed passive design and active energy efficiency initiatives with PV solar system when compared with NABERS market standard 3 Star rating.<br>• The reliance on artificial lighting and mechanical ventilation has been reduced via passive design, daylight glazing, natural ventilation of apartments and control systems.<br>• More than 80% of the predicted construction waste arising from the development will be recycled. Refer Section 3.8.<br>• The embodied emissions attributable to the development will be quantified by the QS.<br>Building tuning is proposed to be conducted by the builder, and SLR recommends that quarterly reviews of actual building energy and water consumption be carried out once the buildings are operational to check the actual energy and water usage and savings and verify that all systems are performing at their optimum efficiency. This will provide an opportunity for the systems to be tuned to optimise time schedules to best match occupant needs and system performance while satisfying the sustainability target for the project. |

The development includes many ecologically sustainable design features. This report provides an overview of these features.

The following ESD and energy efficiency features are proposed to be included in the design:

- The proposed development will incorporate passive and active energy-saving measures such as operable windows to enhance natural ventilation through the apartments, where appropriate;
    - 63% (208 out of 327) of apartments are naturally cross ventilated in the first nine storeys of the building. Apartments at ten storeys or greater are deemed to be cross ventilated only if any enclosure of the balconies at these levels allows adequate natural ventilation and cannot be fully enclosed.
- The form dictated by the site has been designed to maximise the solar access of residential units;
    - 71% (1070 out of 1493) of apartments will achieve 2 hours solar access across the assessment window. (Minimum allowed 70%).
    - 9% (147 out of 1493) of apartments will achieve no solar access across the assessment window. (Maximum allowed 15%).
- Thermal mass - Concrete slab construction is proposed for all floors throughout the development - concrete has amongst the highest thermal mass capacity of a range of common building products. The proposed development's external walls, structural internal walls, and slabs should be predominantly high thermal mass materials.
- LED energy-efficient lighting for all spaces;
- Centralised energy-efficient electric air sourced heat pump hot water systems;
- Gearless traction with variable voltage variable frequency (VVVF) motor lifts with regenerative drive;
- Individual ducted 1-phase air-conditioning systems for all living areas and bedrooms in the dwelling units with 4.5 (Average Star) for heating and cooling requirements;
- Dishwasher units to be installed within each residential dwelling. The dishwasher units are to have an energy efficiency rating of at least 4.5 stars;
- Clothes dryer units to be installed within each residential dwelling. The clothes dryer units are to have an energy efficiency rating of at least 5 stars;
- Water efficient bathroom and kitchen fittings;
    - All residential kitchen and bathroom taps are 5 star;
    - All shower heads are 4 star (>6 but <=7.5 L/min);
    - All residential toilet flushing systems are 4 star;
    - All residential dishwashers are 4 star;
- In addition, the project considers rainwater reuse for irrigation purposes;
- Light efficiency measures in the lobby using time clock and motion sensors;
- Low levels of volatile organic compounds (VOC) paints and floor coverings and low formaldehyde wood products where possible;
- Use of materials with high SRI values for roofing and terrace pavements.

- The project is committed to provision for future installation of EV chargers in 100% of car parking spaces.
- 1980 bicycle parking and storage spaces are proposed to be included in the development to help minimise the requirement for individual motorised transport amd to support the use of low emission transportation opportunities by the users and occupants.
- Landscaped areas are within the residential development throughout the designated communal areas. Proposed planting provides added cooling during the summer months through the leaf transpiration process and is also useful for wind amelioration;
- Plant species within the development would be predominantly indigenous species that can tolerate low water to reduce maintenance requirements;
- Atleast 20% of the roof area of a building will be allocated for the installation of solar photovoltaic panels. SLR recommends the installation of the below solar PV system.
    - A 320 kW PV solar system is recommended to reduce greenhouse gas emissions.
    - A 320 kW PV solar system is indicated to offset approximately 459.2 MWh/year of energy usage.
    - The estimated greenhouse gas CO2 emission saving is approximately 307.2 t.CO2/annum.
- The proposed residential development will enjoy a high level of thermal comfort gaining an average 7 NatHERS star rating.
- The residential development also meets and exceeds BASIX targets in Water 50% (Target 40) and in Energy 68% (Target 61).
- The development's hotel component is targeting to achieve 4-star NABERS Energy and 3-star NABERS Water ratings.

The report body contains recommendations regarding other ESD features, such as a mechanical ventilation system, domestic hot water, other appliances, and operational waste. These features are proposed to help achieve significant reductions in energy and water required by the development both in building and operation, in addition to ensuring that the residential units are pleasant spaces to reside.

It is recommended that the proposed ESD initiatives continue to be developed and implemented, and the performance benchmarks be met during the detailed design phase, as the design of building services progresses and becomes more refined.

By implementing all energy efficiency measures described in Section 3 of this report and targeting a 4-star NABERS Energy rating, the proposed hotel areas intend to achieve over 20% GHG emission reduction when compared with the NABERS market standard 3 Star Energy rating.

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# 1.0 Introduction

This Ecologically Sustainable Design (ESD) assessment has been prepared by SLR Consulting Australia Pty Ltd (SLR) on behalf of Leppington (1) 88 Development Pty Ltd (the Applicant) to address the project-specific Secretary's Environmental Assessment Requirements (SEARs) issued the proposed State Significant Development Application (SSDA) SSD-99319962 for the proposed residential development located at 173-183 Rickard Road, Leppington.

The ESD report has been prepared in a standard form considering the following aspects of the development.

- Identify how ESD principles are incorporated in the design and ongoing operation of the development.
- Demonstrate how the development is proposed to meet or exceed the relevant industry-recognised building sustainability and environmental performance standards.

The initiatives suggested throughout this report have been included as opportunities for the project team to adopt ESD initiatives that provide both direct and indirect benefits to the proposed development.

## 1.1 Site Description

The development is located at 173-183 Rickard Road, Leppington (the Site) and is located within the Southwest Growth Area (**SWGA**) within the Camden Local Government Area (**LGA**)

The project seeks detailed development consent for the construction of a mixed-use development to deliver Leppington Civic Centre, comprising shop top housing to support residential development and commercial land uses at 173-183 Rickard Road, Leppington.

Specifically, the SSDA seeks consent for:

- Demolition and earthworks to prepare the site for future development.
- Delivery of new roads and approximately 6,500 sqm of open space.
- Delivery of 8 residential buildings to accommodate a total of 1493 units, comprising of:
    - Build to Sell Apartments: 864
    - Build to Rent Apartments: 412
    - Affordable Apartments 217 (representing circa 15% of total residential yield)
- Delivery of a 156-key hotel (non-residential).
- Approximately 40,500 sqm of non-residential Gross Floor Area (GFA).
- Loading and car parking facilities on the lower ground and basement levels.

The proposed development is supported by concurrent rezoning application to seek amendments to Appendix 5 Camden Growth Centres Precinct Plan within the *State Environmental Planning Policy (Precincts – Western Parkland City) 2021* pursuant to the concurrent rezoning process through the Housing Delivery Authority (**HDA**) planning pathway. This concurrent rezoning will provide the rezoning and variations to development standards required to facilitate the delivery of the Leppington Civic Centre and Leppington Town Centre, generally in accordance with the Leppington Town Centre State-Assessed Rezoning Proposal (**SARP**).

The site is bordered by Rickard Road to the east, Leppington station to the north, low-rise developments and grasslands in all other directions refer **Figure 1**.

**Figure 1 Project Site Location**

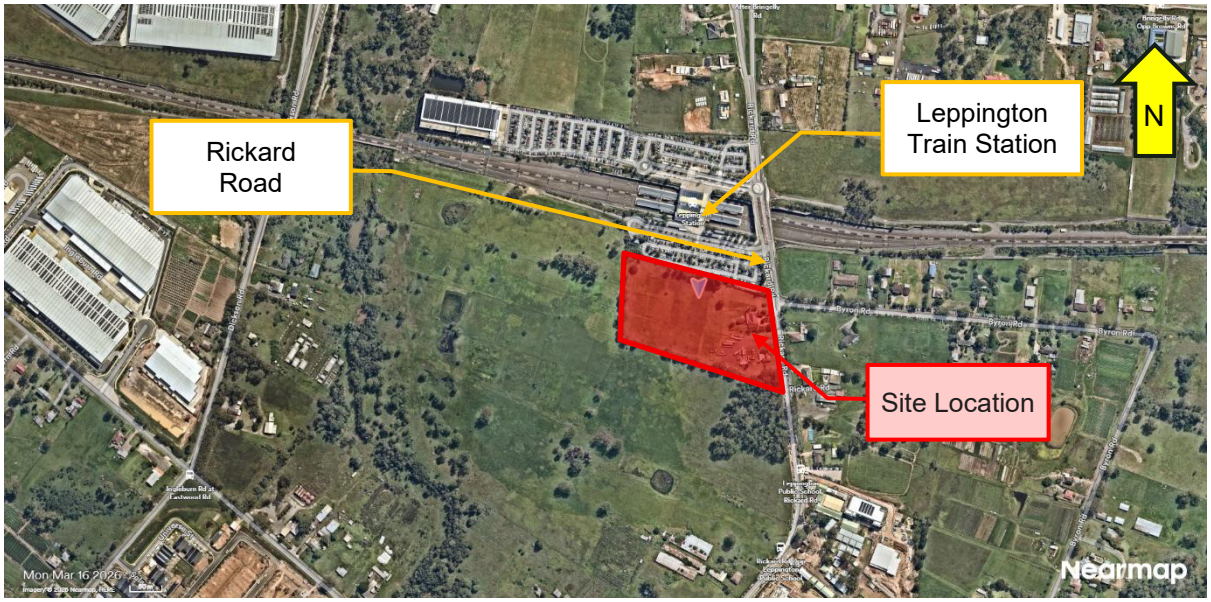



*Image: Courtesy Nearmap, May 2026*

## 1.2 Development Description

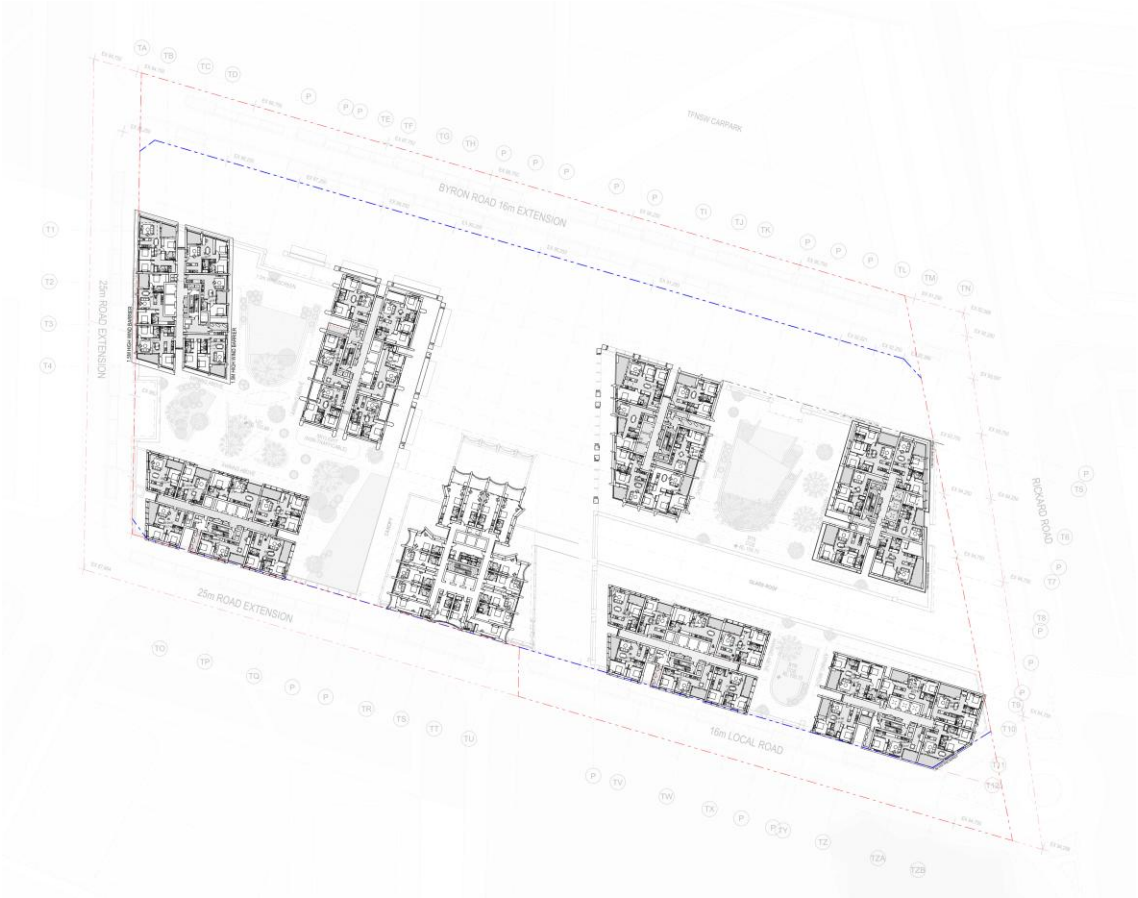
The SSDA seeks detailed consent for the following works:

- Approval of a Concurrent Rezoning Amendment: To facilitate the built form proposed under SSD- 99319962, concurrent amendments are sought to the WPC SEPP pursuant to the concurrent rezoning process facilitated by the HDA planning pathway. This concurrent rezoning seeks to vary existing controls under the WPC, whilst also seeking broad alignment with the LTC SARP which is expected to be finalised by DPHI mid-2026. Specifically, the project seeks to amend the WPC SEPP as follows:
    - Amend the Land Zoning Map to rezone the site from B3 Commercial Centre to MU1 Mixed Use.
    - Amend Clause 4.3 to increase the height of buildings control from 24m to 138.5m.
    - Introduce a floor space ratio control of 5.8:1 for the entire site, equates to approximately 188,000sqm of GFA.
    - Incorporating a site-specific provision, requiring the provision of a minimum of 6,500sqm of public open space
- State Significant Development consent for the proposed development: The SSDA seeks detailed consent for the following works:
    - Demolition of existing structures, clearing of vegetation and site preparation works across the site.
    - Subdivision of the site to create separate lots and road reserves.
    - Bulk earthworks and civil infrastructure works across the site.
    - Construction of an internal street (road) network.
    - Construction of 8 residential buildings to accommodate a total of 1493 units, comprising of:
        - Build to Sell Apartments: 864

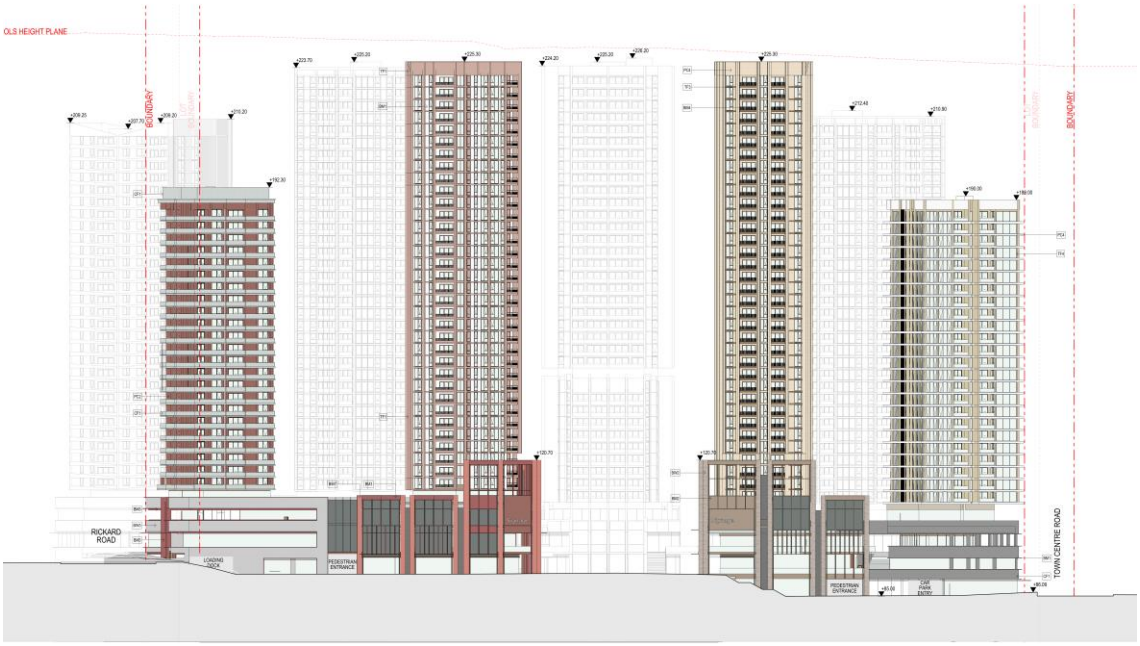
    - Build to Rent Apartments: 412
    - Affordable Apartments 217 (representing circa 15% of total residential yield)
- Delivery of approximately 40,500m2 of non-residential floor space, including:
    - Hotel (with ancillary function spaces)
    - Centre-based child care facility, accommodating approx. 70 children.
    - Pub (licensed)
    - Shop – neighbourhood supermarket, discount department store (DDS), other retail
    - Retail liquor store
    - Food and beverage premises
    - Vehicle repair station – Tyre and auto, carwash
    - Recreation facility (indoor) – Indoor swim school, Gym
- Delivery of retail and residential parking spaces across seven (7) basement levels
- Delivery of an active and connected public domain, including:
    - Approximately 6,500sqm of public open space in the form of north-south and east-west linear parks that connect with the broader town centre.
    - communal open space for all residential occupants and visitors.
- Street landscaping, tree planting and public domain works throughout the site.
- Installation of building signage to support wayfinding and building identification across the precinct. A representative site masterplan of the proposed development upon completion is shown below.

## Figure 2 Site Masterplan

## Typical Plan




## North Elevation



# 2.0 Ecologically Sustainable Design

The concept of Ecologically Sustainable Development (ESD) was outlined in “Our Common Future”, the report of the 1987 United Nations World Commission on the Environment and Development (the Brundtland Commission). It defined Sustainable Development as,

“Development that meets the needs of the present without compromising the ability of future generation to meet their own needs”.

This concept was adopted within Australia in 1990 when the Council of Australian Governments endorsed a National Strategy for Ecologically Sustainable Development. The Commonwealth Government suggested the following definition for ESD in Australia:

“Using, conserving and enhancing the community's resources so that ecological processes, on which life depends, are maintained, and the total quality of life, now and in the future, can be increased”.

Put simply, ESD is development which aims to meet the needs of Australians today, while conserving our ecosystems for the benefit of future generations. To do this, it is necessary to develop ways of using those environmental resources which form the basis of our economy in a way which maintains and, where possible, improves their range, variety and quality.

The National Strategy for Ecologically Sustainable Development notes that there is no identifiable point where it can be said that ESD has been achieved. The strategy further states that there are two main features which distinguish an ecologically sustainable approach to development:

- We need to consider, in an integrated way, the wider economic, social and environmental implications of our decisions and actions for Australia, the international community and the biosphere; and
- We need to take a long-term rather than short-term view when taking those decisions and actions.

Ultimately ESD should lead to changes in our patterns of resource use, including improvements in the quality of our air, land and water, and in the development of new, environmentally friendly products and processes.

National Strategy for ESD Objectives and Guiding Principles are elaborated below.

The National Strategy for ESD sets its core objectives as:

- To enhance individual and community well-being and welfare by following a path of economic development that safeguards the welfare of future generations.
- To provide for equity within and between generations.
- To protect biological diversity and maintain essential ecological processes and life-support systems.

The Guiding Principles of the National Strategy for ESD are documented as:

- Decision making processes should effectively integrate both long and short-term economic, environmental, social and equity considerations.
- Where 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.
- The global dimension of environmental impacts of actions and policies should be recognised and considered.

- The need to develop a strong, growing and diversified economy which can enhance the capacity for environmental protection should be recognised.
- The need to maintain and enhance international competitiveness in an environmentally sound manner should be recognised.
- Cost effective and flexible policy instruments should be adopted, such as improved valuation, pricing and incentive mechanisms.
- Decisions and actions should provide for broad community involvement on issues which affect them.

These guiding principles and core objectives need to be considered as a package. No objective or principle should predominate over the others. A balanced approach is required that considers all these objectives and principles to pursue the goal of ESD.

## 2.1 Specific Requirements for Compliance

Specifications for environmental design measures required for the proposed site are detailed below:

### 2.1.1 ESD Measures for Consideration

- National Construction Code 2022 – Section J requirements
- BASIX Certification for the Residential Component.
- Camden Growth Centre Precincts DCP 2025
- Camden Local Environmental Plan 2010.
- The Planning Secretary's Environmental Assessment Requirements (SEARS) for State Significant Development Application (SSDA) SSD-99319962:
    - Identify how ESD principles (as defined in Section 193 of the EP&A Regulation) are incorporated in the design and ongoing operation of the development.

      The principles of ESD in accordance with Section 193 of the EP&A Regulation, are defined in this NSW legislation as follows:

      *(a) the precautionary principle,*

      *(b) inter-generational equity,*

      *(c) conservation of biological diversity and ecological integrity,*

      *(d) improved valuation, pricing and incentive mechanisms.*

      These principles are further paraphrased and elaborated in Section 2.0 above.
    - Where relevant, provide an assessment against the standards for non-residential development set-out in Chapter 3 of State Environmental Planning Policy (Sustainable Buildings) 2022
- In addition, if the development includes large commercial development types (offices with a net lettable area of at least 1,000m$^2$, hotel or motel with at least 100 rooms, or serviced apartments of at least 100 apartments) provide:
    - A NABERS Agreement to Rate that demonstrates the large commercial areas of the development are capable of achieving the standards for water use specified in Schedule 3 of SEPP (Sustainable Buildings) 2022. A separate agreement is required for each large commercial use.

- A NABERS Agreement to Rate or Commitment Agreement that demonstrates the large commercial areas of the development are capable of achieving the standards for energy use specified in Schedule 3 of SEPP (Sustainable Buildings) 2022. A separate agreement is required for each large commercial area.

- The State Environmental Planning Policy (SEPP) Sustainable Buildings
  - Non-residential spaces should target the following:
    - the minimisation of waste from associated demolition and construction, including by the choice and reuse of building materials,
    - a reduction in peak demand for electricity, including through the use of energy efficient technology,
    - a reduction in the reliance on artificial lighting and mechanical heating and cooling through passive design,
    - the generation and storage of renewable energy,
    - the metering and monitoring of energy consumption,
    - the minimisation of the consumption of potable water.
    - the embodied emissions attributable to the development have been quantified.
    - the minimisation of the use of on-site fossil fuels.
    - large commercial development (as defined below) is to be capable of achieving the following standards for energy and water use;
      - Hotel premises (>100 apartments), 4-star NABERS energy and 3-star NABERS water ratings.
  - Residential spaces should satisfy the following-
    - the embodied emissions attributable to the development have been quantified.

- Apartment Design Guidelines for residential areas
  - Living rooms and private open spaces of at least 70% of apartments in a building receive a minimum of 2 hours direct sunlight between 9 am and 3 pm at mid-winter in the Sydney Metropolitan Area and in the Newcastle and Wollongong local government areas.
  - In all other areas, living rooms and private open spaces of at least 70% of the apartments in a building receive a minimum of 3 hours direct sunlight between 9 am and 3 pm at mid-winter.
  - A maximum of 15% of apartments in a building receive no direct sunlight between 9 am and 3 pm at mid-winter.
  - At least 60% of apartments are naturally cross ventilated in the first nine storeys of the building. Apartments at ten storeys or greater are deemed to be cross ventilated only if any enclosure of the balconies at these levels allows adequate natural ventilation and cannot be fully enclosed.

    Building depth, which support natural ventilation typically range from 10 to 18 meters.

# 3.0 ESD Initiatives Considered for the Proposed Development

In order to achieve a structured integrated approach to ESD, a series of indicators and strategic goals have been identified at the outset to be communicated to the design team. SLR Consulting, as the project's ESD consultant, has applied these principles to all aspects of the development ensuring a best possible ESD outcome.

ESD indicators identified for the proposed concept plan are:

- Passive design features
- Landscaping
- Building construction
- Active energy efficiency
- Water
- Transport
- Indoor environmental quality
- Operational waste management
- Renewable energy options

The following sections below outline the ESD initiatives to be committed for the proposed development.

## 3.1 Passive Design Features

Passive energy efficiency refers to the choice of building materials, the placement of external facades and fenestration to effectively utilise solar energy for heating when required, and minimise solar gains when appropriate, thus 'passively' reducing the artificial heating and cooling requirements of the building. While high cooling and heating loads are typical in summer and winter months respectively, a good balance of heating and cooling load reduction techniques is required to facilitate a development with efficient passive design.

### 3.1.1 Site Analysis and Layout

A key objective should be to optimise site conditions and minimise energy consumed for cooling and heating loads through proper selection of building orientation and internal layout. The following points are noted with respect to the siting of the proposed development.

- As opposed to new developments on the outer fringes of the city which require significant investment in new roads, sewerage, lighting and power the proposed development site will have immediate access to all of these;
- The proposed development provides a large number of units with access to daylighting;
- The proposed development provides good design to promote natural ventilation;
- The proposed development provides landscaped area and open space.

### 3.1.2 Solar Access

One of the objectives of energy conservation is to minimise the heating and cooling requirements of buildings. Sunlight should preferably be able to penetrate the building in winter and be excluded from the building in summer. The form dictated by the site has been designed to maximise the solar access of residential units by:

- Maximising solar exposure of every residential apartment. The height and units' layouts will allow excellent solar exposure from at least 2 directions to the majority of the apartments throughout the day, year-round.
- Ensuring that primary facade glazing is attached to all "living zone" rooms for all apartments (i.e. living room, bedrooms etc.). With proper attention to design details (e.g. glazing seals), these rooms can act as highly efficient solar collectors especially during winter months.
- Incorporating deep balconies to reduce summer thermal loads on the residential units.

The Apartment Design Guide - Part 04 is relevant to the assessment of the daylight access into residential components of the project. The above guide states that:

- Living rooms and private open spaces of at least 70% of apartments in a building receive a minimum of 2 hours direct sunlight between 9 am and 3 pm at mid-winter in the Sydney Metropolitan Area and in the Newcastle and Wollongong local government areas.
- In all other areas, living rooms and private open spaces of at least 70% of the apartments in a building receive a minimum of 3 hours direct sunlight between 9 am and 3 pm at mid-winter.
- A maximum of 15% of apartments in a building receive no direct sunlight between 9 am and 3 pm at mid-winter.

The development Class 2 apartment buildings have been assessed by the project Architect for solar access to the site between 9.00 am and 3.00 pm on the winter solstice. The following conclusions have been reached from the solar access study:

  - 71% (1070 out of 1493) of apartments will achieve 2 hours solar access across the assessment window. (Minimum allowed 70%).
  - 9% (147 out of 1493) of apartments will achieve no solar access across the assessment window. (Maximum allowed 15%).

### 3.1.3 Natural Ventilation

Wind-induced natural ventilation works on the straightforward principle of differential pressure. If a building envelope has multiple openings and there exists a pressure difference between those openings, e.g. the wind pressure at one opening is greater than the pressure at the other openings; airflow will be pushed through the building in the direction positive to negative.

The resulting amount of airflow through the building envelope will be a function of the magnitude of the pressure differential, size of the various building openings and degree of "blockage" in between.

#### 3.1.3.1 Residential Apartments

The most important role of natural ventilation in the context of the residential apartments is to remove accumulated heat gain during periods of overheating. In this case, ventilation is intended to achieve predicted rates of volumetric air change. Also important during the summer months is the role of ventilation in directly improving the perception of thermal comfort by occupants of a space. This is achieved when moving air aids the evaporation of perspiration by passing over the skin. If there is some air movement, most people will tolerate somewhat higher temperatures.

Heat build-up within apartments through daytime summer temperatures can be quickly purged with the availability of suitable breeze at the site.

The ADG encourages cross ventilation to be assisted by the building design. Building design should enable ventilation to be controlled, where comfort levels are maintained for the occupants during the summer and winter extremes. Locations of windows and openings within the apartment are to be suitably in line, where possible, with each other on opposite sides of the room. It is recommended that building openings be designed such that cross-ventilation is maximised, to minimise heat gain in summer.

Ventilation of building is achieved by permanent openings, windows, doors or other devices which have an aggregate opening or openable size of not less than 5% of the floor area of the ventilated room. The provision of ceiling fans for use in summer months is also encouraged.

In winter it is important to close off heated areas that need warming. The opportunity to open and close balcony doors will allow adequate control to moderate the impact of any higher than comfortable winds. It is recommended that the following initiatives are also incorporated to minimise heat leakage from the building:

- Design detailing of the glazing interface to the window framing system and the provision of adequate sealing in accordance with the National Construction Code (NCC).
- Doors leading to hallways, stairwells and non-common use areas provided with draught excluders to limit heat losses during winter months.
- Doors located throughout the development in general-use areas, such as access ways to/from the building, fitted with door closers where it is deemed that their opening will have an adverse effect on heat loss during winter.

ADG specifies the following rules of thumb:

- At least 60% of apartments are naturally cross ventilated in the first nine storeys of the building. Apartments at ten storeys or greater are deemed to be cross ventilated

only if any enclosure of the balconies at these levels allows adequate natural ventilation and cannot be fully enclosed.

- Building depth, which support natural ventilation typically range from 10 to 18 meters.
- Developments, which seek to vary from the minimum standards, must demonstrate how natural ventilation can be satisfactorily achieved, particularly in relation to habitable rooms.

The development Class 2 apartment buildings have been assessed by the project Architect to confirm that the design complies with relevant ADG requirements. The following conclusions have been reached from the ventilation study:

- 63% (208 out of 327) of apartments are naturally cross ventilated in the first nine storeys of the building. Apartments at ten storeys or greater are deemed to be cross ventilated only if any enclosure of the balconies at these levels allows adequate natural ventilation and cannot be fully enclosed.

## 3.2 Landscaping

The following points are noted with respect to the landscaping of the proposed development:

- The proposed landscaping plans (refer below figure) shows deep soil and planters. The use of trees and perimeter planting for shading is very effective in reducing the reflection of heat and light onto the building from surrounding paved areas. Planting also provides added cooling during the summer months through the leaf transpiration process.
- Most of the trees provided to the perimeter of the site will be evergreen trees, providing year-round wind, heat and solar mitigation.

**Figure 3 Landscaping Masterplan**

## 3.3 Building Construction

Materials with low embodied carbon are those that require minimal energy and resources during their extraction, manufacturing, transportation, and installation processes. By choosing these materials, mixed-use projects can significantly reduce their overall carbon footprint and contribute to more sustainable construction practices.

It is recommended that the development considers the use of low embodied carbon materials such as concrete and steel with recycled content.

### 3.3.1 Building Massing

The proposed development will have a compact form requiring less heating and cooling than low-rise buildings that would tend to sprawl out over a site. Apartments will “share” heat with their adjacent neighbours and so gain and lose less heat to the external environment.

### 3.3.2 Building Materials

#### 3.3.2.1 Walls

It is recommended that external walls are autoclaved aerated concrete (AAC) veneer.. The use of this wall system is proposed to reduce the insulation required due to the inherent R value of the wall system. The insulation required will be determined by the NCC and Section J calculations.

It is recommended that intra-tenancy walls are to be lightweight plasterboard on stud or AAC panel with light steel frame and acoustic insulation where required. This is advantageous from a building life-cycle perspective, as it maximises the adaptive reuse potential when a building reaches the end of its intended use.

#### 3.3.2.2 Roof

It is proposed to use concrete roof with plasterboard ceiling construction for all apartments and commercial areas throughout the building. Insulation is to be provided to roof/ceiling areas exposed to open air above. The insulation required will be determined by the NCC NatHERS and Section J calculations. Waterproofing membrane will also be provided as part of the roof.

#### 3.3.2.3 Glazing

Performance Glazing is recommended for most units and commercial areas; this will reduce the solar heat gain mostly on the western and eastern facades where low angle solar rays penetrate beneath shading devices. The glazing required will be determined by the NCC NatHERS modelling and Section J calculations.

#### 3.3.2.4 Floor and Thermal Mass

Concrete slab construction is to be used for all floors throughout the development in accordance with NatHERS and NCC Section J requirements. Concrete has amongst the highest thermal mass capacity among a range of common building products, as presented in the below table.

Generally, denser materials have higher mass which has the ability to store heat energy and then release it slowly to the room. This storage effectively smoothens out daily temperature

variations within conditioned spaces, with corresponding reductions in both heating and cooling loads. Insulation is to be provided to floor areas exposed to open air.

**Table 2 Indicative Thermal Mass Values of Various Materials**

| Material | Thickness (mm) | Thermal Mass ($kJ/m^2.K$) |
|---|---|---|
| Dolerite (Rock / Stone) | 200 | 433 |
| 10-31 Solid Brick | 190 | 410 |
| Concrete | 100 | 221 |
| Concrete block | 90 | 194 |
| 10.01 regular brick | 90 | 151 |
| Clay brick (3.5 kg solid + 0.5 kg mortar) | 110 | 142 |
| Aerated concrete block | 100 | 50 |
| Fibre cement sheet (compressed) | 18 | 32 |
| Wood flooring (hardwood) | 19 | 25 |
| Weatherboard (softwood) | 15 | 16 |
| Fibre cement sheet | 6 | 8 |
| Plasterboard | 10 | 8 |
| Glass | 3 | 6 |
| Expanded polystyrene (EPS-class SL) | 50 | 1.8 |
| Cork | 6 | 1.6 |
| Rockwool (batts) | 50 | 1.5 |
| Fibreglass (batts) | 50 | 0.5 |
| Air | 50 | 0.5 |

### 3.3.3 Building Sealing

The purpose of sealing is to ensure that additional heating and cooling loads will not be introduced through building leakage.

A seal to restrict air infiltration must be fitted to each edge of an external door, operable external window or the like when serving a conditioned space in the proposed development. The seal may be a foam or rubber compressible strip, fibrous seal or the like.

The bathroom/toilet and laundry exhaust fans in the proposed development must be fitted with a sealing device such as a self-closing damper or the like.

### 3.3.4 Heat Island Effect Mitigation

The urban heat island (UHI) effect refers to the phenomenon where urban areas experience significantly higher temperatures than their surrounding rural regions, primarily due to human activities and the concentration of heat-absorbing surfaces like concrete and asphalt.

As cities grow and natural landscapes are replaced with buildings and roads, the heat island effect intensifies, leading to increased energy consumption, elevated emissions, and heightened health risks during heatwaves.

To mitigate this, it is recommended that light coloured roofing and wall materials of Solar Reflective Index (SRI) of 50 or more is considered for the development.

Similarly, for unshaded hardscapes and pavements, it is recommended that materials with initial SRI value of at least 39 are considered.

The proposed development includes significant shading structures including fins, awnings and large tree canopies which create overshadowing for hard surfaces to assist in urban heat island mitigation.

**Figure 4 Roof Terrace Pavements with High SRI Materials**

## 3.4 Active Energy Efficiency

Active energy efficiency is achieved by putting in place energy efficient electrical items such as air-conditioning systems, artificial lighting to reduce the energy usage of the building.

### 3.4.1 Mechanical Ventilation and Air Conditioning

Where mechanical ventilation is required, the use of energy efficiency measures will be fully explored during detailed design. These measures include linking mechanical ventilation to manual switching where allowable under the NCC and using individual fans rather than a common ducted ventilation system with constant operation. These initiatives will provide significant savings in energy use and associated operational energy costs of the development.

- Individual 1-phase ducted air-conditioning systems are recommended for all living areas and bedrooms in the dwelling units with 4.5 Star (Average Star) for heating and cooling requirements.
- Air conditioning systems for retail and hotel areas with a proposed Coefficient of Performance (COP) of greater than 4 for cooling and 4 for heating.
- Energy end use of more than 15kVA or more is recommended to be submetered. All electricity and water meters in the commercial buildings will be connected to a Building Management System (BMS) to allow data analysis. The monitoring system will be designed to have the capability to generate reports on a monthly and/or as required basis for energy and water meters.
- An air-conditioning unit or system must:
    - Be capable of being inactivated when the building served is not occupied; and
    - Thermostatically control the temperature of each zone or area when serving more than one zone
    - Provides the required mechanical ventilation, other than in climate zone 1 or where dehumidification control is needed, must have an outdoor air economy cycle if the total air flow rate of any airside component of an air-conditioning system is greater than or equal to the figures in Table J6D3 of NCC 2022.
    - When two or more air-conditioning systems serve the same space, they must use control sequences that prevent the systems from operating in opposing heating and cooling modes.
    - Contains more than one water heater, chiller or coil, must be capable of stopping the flow of water to those not operating; and with an airflow of more than 1000 L/s, must have a variable speed fan when its supply air quantity is capable of being varied;
- A mechanical ventilation system must be capable of being deactivated when the building or part of the building served by that system is not occupied.

### 3.4.2 Domestic Hot Water

Centralised energy efficient electric air sourced heat pump hot water system is recommended for water heating within the proposed development.

### 3.4.3 Lifts

Gearless traction with variable voltage variable frequency (VVVF) motor with regenerative drive is recommended for lifts within the proposed development.

### 3.4.4 Lighting

#### 3.4.4.1 Natural Lighting

The proposed development maximises daylighting opportunities in most units, therefore minimising the use of artificial lighting.

#### 3.4.4.2 Artificial Lighting

Household lighting energy use in Australia is increasing due to the construction of larger homes and the installation of more light fittings per home. It is estimated that most homes could readily reduce the amount of energy they use for lighting by 50% or more.

Lighting installations require a design that properly considers the conservation of scarce energy resources. Sustainable lighting design ensures that illuminance is not excessive, that the switching arrangements are such that unnecessary illumination may be turned off and that the illumination is provided in an efficient manner.

There are additional energy losses associated with inefficient lamps and lighting losses associated with luminaries. Consequently, a lighting design which uses the most efficient lamp types and the least number of luminaries for a given design illuminance will be more efficient and usually have a lower capital cost.

It is likely that the lighting to be used within the development will incorporate LED lamps generally. It is recommended that the following lighting features be incorporated into the development to minimise energy consumption due to lighting:

- Maximise use of LED and minimise or where possible eliminate the use of halogen down lights, as LED are much more efficient than halogen lighting.
- The external lights are operated on a combination of daylights sensors and time clock.
- Use of lighting systems incorporating appropriate switching zones, time clock control and motion sensors is also proposed to optimise energy efficiency for lighting.

Furthermore, the project will comply with the NCC requirements of maximum illumination power densities.

### 3.4.5 Appliances

For BASIX compliance, the below measures for energy performance in residential appliances have been included:

- 4.5-star energy efficient dishwashers;
- 5-star energy efficient clothes dryer; and
- Provision of gas or induction cooktop and electric oven.

### 3.4.6 PV Solar Green Initiatives

As the worldwide demand for fuel increases, alternative and renewable energy sources are emerging as economical and sustainable. Alternative renewable energy sources are becoming more attractive options because of increased global demand for fuels, environmental responsibility, affordability and new local, state and federal government legislations.

Based on the NCC2022 requirement, at least 20% of the roof area of a building must be allocated for the installation of solar photovoltaic panels. SLR recommends the installation of the below solar PV system.

- A 320 kW PV solar system is recommended to reduce greenhouse gas emissions.
- A 320 kW PV solar system is indicated to offset approximately 459.2 MWh/year of energy usage.
- The estimated greenhouse gas CO2 emission saving is approximately 307.2 t.CO2/annum.

This will be further evaluated as the design progresses.

**Figure 5 PV Solar on Roof**

### 3.4.7 Electrification and Green Power Initiative

Electrification of the proposed buildings will allow for a streamlined energy system powered increasingly by renewable sources and improves compatibility with future grid decarbonisation.

It is also recommended that a high percentage of “Greenpower” should be made available to occupants, providing the opportunity to contribute to a reduction in total greenhouse gas

emissions produced by the proposed development. Greenpower is produced from environmentally friendly renewable energy sources such as solar, wind, water and biomass.

When a Greenpower product is selected by the owner, the energy supplier commits to buying a certain amount of electricity from approved new renewable energy sources. The financial accounts of Greenpower suppliers are audited independently. This makes a clear distinction between the services provided by standard energy suppliers and the more sustainable service offered through Greenpower options.

The National Greenpower website[1] states that “Australian households generate almost one-fifth of Australia's greenhouse pollution through everyday activities such as transport and household energy use”. The average household in Australia emits over seven to eight tonnes of greenhouse pollution each year through energy use alone. This is because most households source their electricity from burning coal and other fossil fuels. By choosing accredited Greenpower, up to 100% of a household's energy usage can be generated from renewable sources.

## 3.5 Water

Australians use more than one million litres of freshwater per person each year (source: Green Building Council of Australia 2006).

In addition to increased water use efficiency, new developments can reduce potable water demand by residents, and visitors through the provision of an on-site alternative water supply. There are three principal forms of alternative water supply that may be considered:

- Reticulation of reclaimed water to the site
- Rainwater/stormwater storage and reuse
- Grey water storage and reuse.

It is recommended that the above types of alternate water supply be explored where applicable for use in landscape irrigation and fire services, reducing the demand for potable water.

Appropriate rainwater/stormwater tanks are recommended to be considered in the design.

### 3.5.1 Water Efficiency

The minimum sustainable standard for water efficient fixtures and fittings is 3 star. To achieve greater than the standard level, following water efficient fixtures and fittings are recommended for the proposed site:

- All residential kitchen and bathroom taps are 5 star;
- All shower heads are 4 star (>6 but <=7.5 L/min);
- All residential toilet flushing systems are 4 star; and
- All residential dishwashers are 4 star.

Implementation of the above recommendations will assist in reducing the water consumption.

[1] http://www.greenpower.gov.au

### 3.5.2 Landscape Irrigation

Based on international best practice guidelines, it is generally recommended that either 90% of the water requirement for landscape irrigation is sourced from on-site rainwater collection or recycled water. Alternatively, best practice would also be achieved with the installation of a water efficient irrigation system comprising subsoil drip systems and automatic timers with rainwater or soil moisture sensor control override.

The landscape design should focus on using native coastal and other drought resistant species that rely primarily on rainwater for their water needs. The following is recommended to be incorporated into the development to minimise water consumption for landscape irrigation.

- Native coastal and other drought resistant species that rely primarily on rainwater for their water needs where appropriate and possible.
- Indigenous species are recommended to comprise over 30% of the provided landscaping.

## 3.6 Transport

When designing a sustainable development, it is important to minimise the use of individual motorised transport where possible and thus enhance energy savings and environmental impact through reduced fossil fuel consumption and improved regional air quality. This can be achieved by encouraging the use of energy efficient public transport that is immediately at hand, reducing car parking facilities, and providing adequate bicycle storage facilities to minimise the requirement for individual motorised transport.

The surrounding local context of the site is depicted below.

**Figure 6 Public Transport Connections**

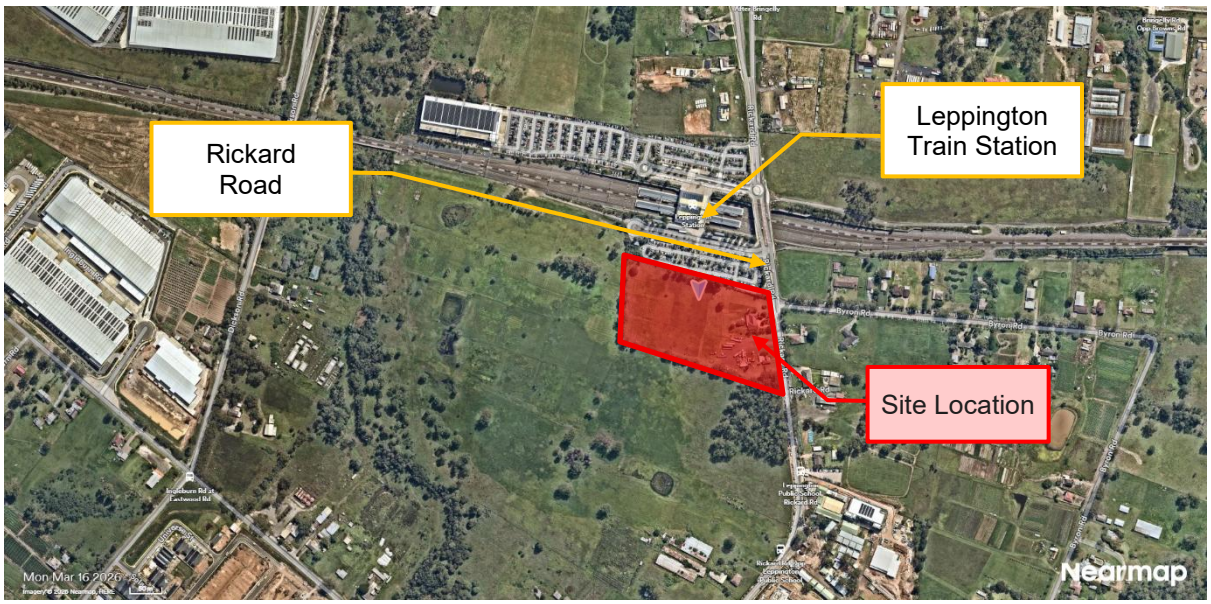



*Image: Courtesy Nearmap, April 2026*

### 3.6.1 Commuting Using Public Transport

Developments that are within close proximity of good transport nodes with frequent service should be encouraged. The proposed building is located near mass transit and will allow more people to take public transportation to keep their automobiles off the road.

The proposed development is located near mass transit options (Leppington Station). The proposed development will encourage occupants and users of the development to use public transportation and minimise automobile use.

### 3.6.2 Provision of Car Parking

Transport emissions are one of the largest contributors of greenhouse gas emissions in Australia.

The project is committed to provision for future installation of EV chargers in 100% of car parking spaces.

### 3.6.3 Facilitation of Pedestrian and Non-motorised Transport

1980 bicycle parking and storage spaces are proposed to be included in the development to help minimise the requirement for individual motorised transport amd to support the use of low emission transportation opportunities by the users and occupants.

Sufficient recreational opportunities are easily accessible to occupants, eliminating the requirement for long-distance motorised transport for most recreational activities. This would be a positive feature of the development with regards to sustainability as this clearly avoids greenhouse gas emissions that would otherwise have been produced if residents had to travel long distances for recreational activities.

## 3.7 Indoor Environmental Quality

Achieving enhanced Indoor Environment Quality (IEQ) ensures that the building and building services are designed and managed to benefit the health and well-being of building occupants and visitors.

### 3.7.1 Asbestos

It is recommended that Asbestos identification and removal procedures be included in the site Environmental Management Plan (EMP) where required.

### 3.7.2 Internal Noise Levels

Internal noise levels are a significant factor in determining occupant and customer satisfaction and well-being. The aim of controlling internal noise levels is to encourage and recognise buildings that are designed to maintain internal noise levels at an appropriate level. Further information can be found in the Acoustic Report developed for the project.

### 3.7.3 Carbon Monoxide Monitoring and Control

Elevated carbon monoxide (CO) levels are indicative of inadequate ventilation, affecting the quality of air within an enclosed occupied space, and the health of the occupants. CO monitoring systems can detect elevated concentrations of CO and automatically adjust ventilation supply rates before indoor air quality becomes problematic.

SLR Consulting recommends investigating a CO monitoring system to the internal carpark areas where appropriate to satisfy NCC requirements.

### 3.7.4 Paints and Floor Coverings

SLR recommends the use of paints and floor coverings with low levels of volatile organic compounds (VOC) and low formaldehyde wood products where possible.

## 3.8 Waste Management

An Operational Waste and Recycling Management Plan is a minimum requirement to meet sustainable building design best practice. The Waste and Recycling Management Plan includes:

- Separate waste and recycling streams;
- Transfer of material to common storage area;
- Communal storage areas;
- Frequency of collection; and
- Signage and educational initiatives for occupants.

A Waste Management Plan is recommended to track all waste going offsite to show that at least 80% of all construction waste is re-used or recycled.

## 3.9 Monitoring and Reporting

Once the project is completed, all committed sustainability-related measures need to be commissioned and tuned to ensure all services operate to their full potential and as designed.

For the hotel component, the building tuning is recommended to be provided by service contractors and overseen by an independent assessor, at least once a month within the Defects Liability Period (DLP) period to ensure that services are operating effectively and efficiently.

### 3.9.1 Energy & Water Review and Audit

Energy and water usage review and management plan should be undertaken and implemented within the first few months of operation to ensure energy and water management is sufficient for the development's needs. A breakdown of energy and water usage per month at the Project Site will help to measure the development's baseline energy and water use and assess what appliances, equipment, and processes are consuming energy and water.

An energy and water review is also necessary for the assessment of utilisation to further identify opportunities for improvement. Energy and water usage data obtained during the review process may be used to establish key performance indicators and annual energy and water targets for the Project.

An energy and water audit and management review should also be undertaken on a half-yearly basis to ensure employees are following energy savings procedures correctly. Where audits show that energy and water savings procedures are not carried out effectively, additional employee training should be undertaken, and signage and procedures re-examined.

The Energy and Water Management Plan should be progressively improved and updated on an annual basis, or as required, to reflect changes to the Energy Management System and to promote continual improvement of energy management at the Project Site.

It is the responsibility of the facility manager to routinely check energy and water savings procedures are undertaken correctly (i.e. lighting turned off while areas of the development are not in use). The facility manager should also ensure all monitoring and audit results are well documented and carried out as specified in the Energy and Water Management Plan.

# 4.0 Conclusion

SLR Consulting Australia Pty Ltd (SLR) has been engaged by Leppington (1) 88 Development Pty Ltd (the Applicant) to provide a qualitative Ecologically Sustainable Design (ESD) assessment for the proposed mixed-use residential development located at 173-183 Rickard Road, Leppington (the Site).

In accordance with the technical requirements of the Secretary's Environmental Assessment Requirements (SEARs) and in support of the State Significant Development Application (SSDA) SSD-99319962, a detailed response to associated SEARS requirements is summarised in the table below.

**Table 3 SEARS ESD Requirements and Responses**

| Item for inclusion | Action and Report Location |
|---|---|
| 3. Identify how ESD principles (as defined in section 193 of the EP&A Regulation) are incorporated in the design and ongoing operation of the development. | Section 3 details how ESD principles as defined in clause 7 (4) of Schedule 2 of the Environmental Planning and Assessment Regulation 2000 (reproduced in Clause 193 of the 2022 revision of the regulation) and up to date legislation are being incorporated in the design, construction, and operation phases of the project.<br><br>In terms of Precautionary Principle, the project does not present threat of serious or irreversible environmental damage. The project conducted all required environmental studies and incorporated adaptability and resilience measures in the design.<br><br>Inter-generational equity, the health, diversity and productivity of the environment are enhanced for the benefit of future generations via a number of initiatives including large PV solar installation, sustainable materials, reduced waste, reduced heat islands, etc. Refer **Section 3.0** for all other initiatives.<br><br>From a conservation of biological diversity and ecological integrity perspective, the project satisfies all environmental and statutory provisions requirements and will maintain the existing ecological structures (species and ecosystems, etc) for the proposed site and provide additional native vegetation planting and reduced stormwater runoff the site.<br><br>Environmental goals have been established and achieved using recognised rating tools. A Quantity Surveyor (QS) will be engaged to ensure that the project will remain on budget and all sustainability measures in the current study are implemented.<br><br>The proposed ESD initiatives will help to achieve significant reductions in the energy, waste and water required by the development both in building and operation and will deliver improved valuation and beneficial outcome. |

| Item for inclusion | Action and Report Location |
|---|---|
| | • The proposed residential development will enjoy a high level of energy efficiency gaining an average 7 NatHERS star rating.<br>• The residential development also meets and exceeds BASIX targets in Water 50% (Target 40) and in Energy 68% (Target 61).<br>• The proposed 320 kW rooftop PV system, along with the passive design strategies and technical energy-efficiency measures outlined in Section 3, will significantly reduce operational energy demand. As all renewable electricity generated on-site will be consumed directly within the building, battery energy storage is not considered appropriate for this development. |
| 4. Where relevant, provide an assessment against the standards for non-residential development set-out in Chapter 3 of State Environmental Planning Policy (Sustainable Buildings) 2022 | The following design considerations have been implemented to address Chapter 3.2.(1) of SEPP 2022:<br>• The project is committed to entering a NABERS Agreement to Rate for the hotel component and targeting 4.0-star NABERS Energy and 3.0-star NABERS Water ratings.<br>• The hotel component is proposed to achieve over 20% GHG emission reduction via the proposed passive design and active energy efficiency initiatives with PV solar system when compared with NABERS market standard 3 Star rating.<br>• The reliance on artificial lighting and mechanical ventilation has been reduced via passive design, daylight glazing, natural ventilation of apartments and control systems.<br>• More than 80% of the predicted construction waste arising from the development will be recycled. Refer Section 3.8.<br>• The embodied emissions attributable to the development will be quantified by the QS.<br>Building tuning is proposed to be conducted by the builder, and SLR recommends that quarterly reviews of actual building energy and water consumption be carried out once the buildings are operational to check the actual energy and water usage and savings and verify that all systems are performing at their optimum efficiency. This will provide an opportunity for the systems to be tuned to optimise time schedules to best match occupant needs and system performance while satisfying the sustainability target for the project. |

The development includes many ecologically sustainable design features. This report provides an overview of these features.

The following ESD and energy efficiency features are proposed to be included in the design:

- The proposed development will incorporate passive and active energy-saving measures such as operable windows to enhance natural ventilation through the apartments, where appropriate;
    - 63% (208 out of 327) of apartments are naturally cross ventilated in the first nine storeys of the building. Apartments at ten storeys or greater are deemed to be cross ventilated only if any enclosure of the balconies at these levels allows adequate natural ventilation and cannot be fully enclosed.
- The form dictated by the site has been designed to maximise the solar access of residential units;
    - 71% (1070 out of 1493) of apartments will achieve 2 hours solar access across the assessment window. (Minimum allowed 70%).
    - 9% (147 out of 1493) of apartments will achieve no solar access across the assessment window. (Maximum allowed 15%).
- Thermal mass - Concrete slab construction is proposed for all floors throughout the development - concrete has amongst the highest thermal mass capacity of a range of common building products. The proposed development's external walls, structural internal walls, and slabs should be predominantly high thermal mass materials.
- LED energy-efficient lighting for all spaces;
- Centralised energy-efficient electric air sourced heat pump hot water systems;
- Gearless traction with variable voltage variable frequency (VVVF) motor lifts with regenerative drive;
- Individual ducted 1-phase air-conditioning systems for all living areas and bedrooms in the dwelling units with 4.5 (Average Star) for heating and cooling requirements;
- Dishwasher units to be installed within each residential dwelling. The dishwasher units are to have an energy efficiency rating of at least 4.5 stars;
- Clothes dryer units to be installed within each residential dwelling. The clothes dryer units are to have an energy efficiency rating of at least 5 stars;
- Water efficient bathroom and kitchen fittings;
    - All residential kitchen and bathroom taps are 5 star;
    - All shower heads are 4 star (>6 but <=7.5 L/min);
    - All residential toilet flushing systems are 4 star; and
    - All residential dishwashers are 4 star.
- In addition, the project considers rainwater reuse for irrigation purposes;
- Light efficiency measures in the lobby using time clock and motion sensors;
- Low levels of volatile organic compounds (VOC) paints and floor coverings and low formaldehyde wood products where possible;
- Use of materials with high SRI values for roofing and terrace pavements.

- The project is committed to provision for future installation of EV chargers in 100% of car parking spaces.
- 1980 bicycle parking and storage spaces are proposed to be included in the development to help minimise the requirement for individual motorised transport amd to support the use of low emission transportation opportunities by the users and occupants.
- Landscaped areas are within the residential development throughout the designated communal areas. Proposed planting provides added cooling during the summer months through the leaf transpiration process and is also useful for wind amelioration;
- Plant species within the development would be predominantly indigenous species that can tolerate low water to reduce maintenance requirements;
- Based on the NCC2022 requirement, at least 20% of the roof area of a building must be allocated for the installation of solar photovoltaic panels. SLR recommends the installation of the below solar PV system.
    - A 320 kW PV solar system is recommended to reduce greenhouse gas emissions.
    - A 320 kW PV solar system is indicated to offset approximately 459.2 MWh/year of energy usage.
    - The estimated greenhouse gas CO2 emission saving is approximately 307.2 t.CO2/annum.
- The proposed residential development will enjoy a high level of thermal comfort gaining an average 7 NatHERS star rating.
- The residential development also meets and exceeds BASIX targets in Water 50% (Target 40) and in Energy 68% (Target 61).
- The development's hotel component is targeting to achieve 4-star NABERS Energy and 3-star NABERS Water ratings.

The report body contains recommendations regarding other ESD features, such as a mechanical ventilation system, domestic hot water, other appliances, and operational waste. These features are proposed to help achieve significant reductions in energy and water required by the development both in building and operation, in addition to ensuring that the residential units are pleasant spaces to reside.

It is recommended that the proposed ESD initiatives continue to be developed and implemented, and the performance benchmarks be met during the detailed design phase, as the design of building services progresses and becomes more refined.

By implementing all energy efficiency measures described in Section 3 of this report and targeting a 4-star NABERS Energy rating, the proposed hotel areas intend to achieve over 20% GHG emission reduction when compared with the NABERS market standard 3 Star Energy rating.

and recommended technologies, the project is well-positioned to significantly reduce its environmental impact and align with evolving sustainability standards. These efforts not only contribute to long-term cost savings and energy resilience but also underscore the project's role as a forward-thinking model for sustainable development in the region.

# Appendix A Net Zero Statement

# 5.0 Net Zero Statement

SLR Consulting has been engaged by Leppington (1) 88 Development Pty Ltd to prepare a Net Zero Statement for the development located in Leppington, NSW. This statement outlines the strategies and design measures aimed at achieving net zero operational emissions, aligning with the project's commitment to sustainability and carbon reduction to support the target of achieving net-zero emissions by 2050 as set by NSW Climate and Energy Action. By integrating high-performance building systems, renewable energy solutions, and energy-efficient practices, the project seeks to minimize greenhouse gas emissions, lower operational costs, and support a sustainable built environment for future generations.

## 5.1 Net Zero Compliance

Energy Efficiency is achieved through compliance to National Construction Code (NCC) 2022 provisions for Energy Efficiency under Section J. The objective of the NCC Section J is to reduce greenhouse gas emissions by efficiently using energy in buildings.

In addition, for the hotel component, energy efficiency is also exemplified by targeting 4-star NABERS Energy rating.

## 5.2 Measures leading to Net Zero Outcome

Based on the above targets set, the following are the net zero efficiency measures proposed for the project:

SLR has assessed the potential for the installation of a Photo Voltaic (PV) Solar Power System for the Site.

- It is recommended that at least 320 kW PV solar system be installed on the roof to significantly reduce the carbon footprint for the proposed development.
    - A 320 kW PV solar system is indicated to offset approximately 459.2 MWh/year of energy usage.
    - The estimated greenhouse gas CO2 emission saving is approximately 307.2 t.CO2/annum.
- The following recommendations are made to minimise cooling and heating loads for the conditioned areas:
    - All external walls, internal walls and roofs to have thermally insulated constructions compliant with NCC requirements for all air-conditioned areas.
    - High-performance glazing to NCC requirements for all air-conditioned areas.
- Use of materials with high SRI values for roofing and terrace pavements.
- Lighting control in accordance with NCC requirements.
- The air conditioning system with a proposed Coefficient of Performance (COP) of 4.5 Star for cooling and heating.
- HVAC Control – Space temperature indoor condition is 22.5±1.5°C DB
- Humidity 40% – 60% (uncontrolled).

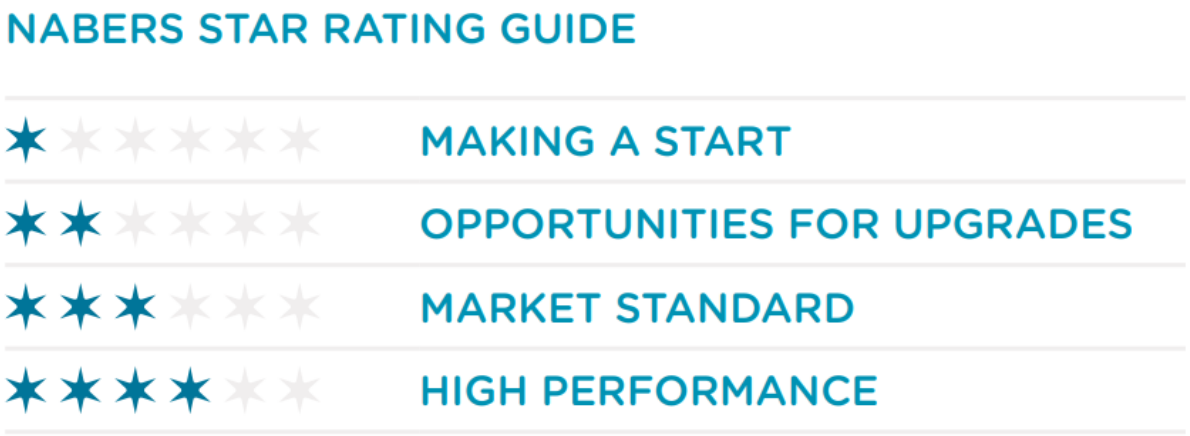
### 5.2.1 NatHERS rating and BASIX Compliance for the Residential Component

- The proposed residential development will enjoy a high level of thermal comfort gaining an average 7 NatHERS star rating.
- The development also meets or exceeds BASIX targets in Water 50% (Target 40) and in Energy 68% (Target 61).

### 5.2.2 NABERS for the Hotel Component

By targeting 4-Stars NABERS Energy, the hotel component is proposed to achieve over 20% GHG emission reduction via the proposed passive design and active energy efficiency initiatives with PV solar system when compared with standard 3 Star rating.

**Figure 7: NABERS Star Rating Guide Extract**




### 5.2.3 Green Energy

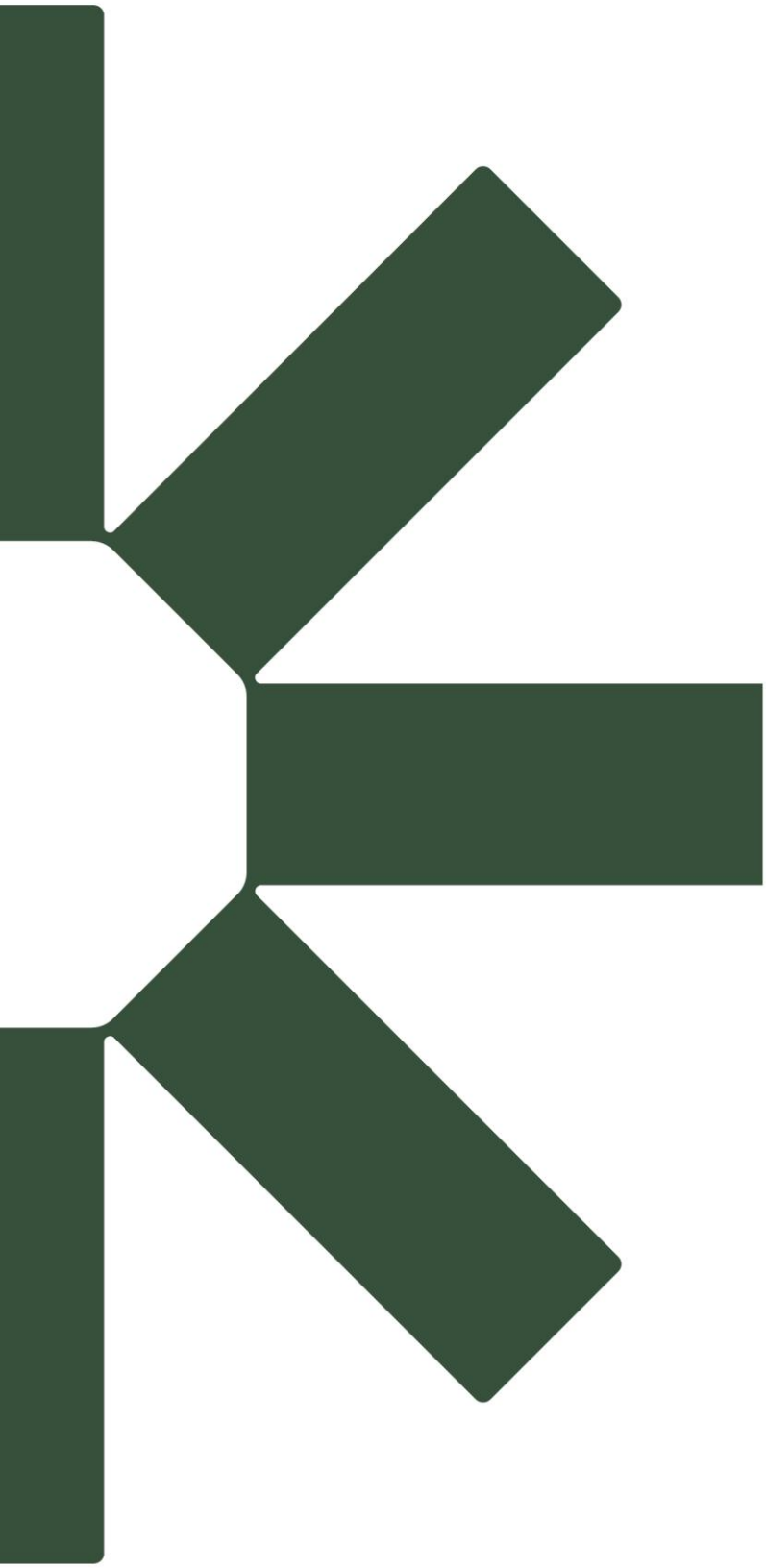
Green Power plays a crucial role in achieving net zero emissions goals by providing renewable electricity that offsets conventional grid energy, which often relies on fossil fuels. By sourcing Green Power, a project can effectively balance its energy consumption with clean energy inputs, significantly reducing its carbon footprint. Green Power typically includes energy from solar, wind, hydro, and biomass sources, all of which have minimal environmental impacts compared to traditional energy generation. Integrating Green Power into a development ensures that even when on-site renewable generation, such as solar panels, may not fully meet demand, the energy needed is still sourced from a renewable supply, supporting net zero objectives.

Moreover, Green Power aligns with broader sustainability commitments by encouraging the growth and expansion of renewable energy markets. As more organizations and developments invest in Green Power, the demand drives investment in renewable infrastructure, which in turn helps reduce the cost and increase the accessibility of renewable energy options. For this project, choosing Green Power as part of its energy strategy not only aids in achieving net zero emissions but also signals a commitment to climate-conscious development, contributing to a cleaner energy future.

## 5.3 Conclusion

In summary, this Net Zero Statement demonstrates a clear pathway for the development to achieve its target of achieving net-zero emissions by 2050 as set by NSW Climate and Energy Action operational energy goals. Through the adoption of targeted design strategies

and recommended technologies, the project is well-positioned to significantly reduce its environmental impact and align with evolving sustainability standards. These efforts not only contribute to long-term cost savings and energy resilience but also underscore the project's role as a forward-thinking model for sustainable development in the region.



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