Loreto Normanhurst

Concept Proposal and Stage 1

ESD SSDA Report

ESD

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1 Project Introduction

This report supports a State Significant Development Application (SSDA) submitted to the Department of Planning and Environment (DPE) pursuant to Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

This application is SSD by way of clause 8 and schedule 1 under *State Environmental Planning Policy (State and Regional Development) 2011* on the basis that the development is for the purpose of an existing school and has a Capital Investment Value of more than $20 million.

Specifically, this application relates to a staged SSDA within the meaning of Section 4.12 of the EP&A Act, with this application being the Concept Proposal for a new site wide masterplan for the existing Loreto Normanhurst School at 91 – 93 Pennant Hills Road, Normanhurst.

In addition, consent is also sought for the Stage 1 detailed design works for a new on campus student boarding facility, landscaping works, and some demolition works to the buildings between Mary Ward and existing dining room building and associated works to make good existing.

This report has been prepared having regard to the Secretary's Environmental Assessment Requirements issued for the project by DPE, ref no SEAR 8996 issued on 12 January 2018.

- Detail how ESD principles (as defined in clause 7(4) of Schedule 2 of the Environmental Planning and Assessment Regulation 2000) will be incorporated in the design and ongoing operation phases of the development.
- Include a description of the measures that would be implemented to minimise consumption of resources, water (including water sensitive urban design) and energy.
- Demonstrate that the development has been assessed against a suitably accredited rating scheme to meet industry best practice.

1.1 Background

Need for a Campus Masterplan

Loreto Normanhurst is an independent, Catholic day and boarding school for girls from Years 5 to 12. The existing school campus was established in 1897 and has evolved in an organic and ad-hoc manner across the span of a 120 years.

A new campus wide planning approach offers the opportunity to strategically review and plan for the campus' future in a sustainable and efficient manner such that the campus' unique aesthetic and ecological values are best preserved.

The preparation of a campus wide masterplan is also consistent with the School's 'Loreto Normanhurst 2016 - 2020 Strategic Plan' which identified the need for a broader strategic plan to coordinate renewal and orderly development in a feasible and staged manner.

Early Learning Centre (not part of this development application)

A separate DA (D/1227/2018) has been submitted to Hornsby Shire Council on 23 November 2018 for an 80 place Early Learning Centre (ELC) building and the DA is currently under assessment.

The ELC building is consistent with the overall concept masterplan, and was prepared concurrently with the final preferred campus masterplan. However, to meet the School's operational timeframe requirements for the ELC, a separate application was seen to be best pathway to allow the building to be built, fitout and operational by 2021.

1.2 The Site

Loreto Normanhurst is located within the suburb of Normanhurst on Sydney's Upper North Shore approximately 3km south of Hornsby and 25km north of Sydney CBD. The school is located in the local government area of Hornsby Shire Council, approximately 750m south of the Normanhurst Railway Station. The locational context of the site is illustrated at **Figure 1**.

The site comprises the existing campus grounds of the Loreto Normanhurst school at 91 – 93 Pennant Hills Road, Normanhurst. The northern part of the site accommodates much of the school's existing built form, while the rear extent consists of the school's sporting fields, and a portion of largely undeveloped land covered in remnant vegetation.

The campus itself is bound by Pennant Hills Road (to the north), Osborn Road (to the west) and Mount Pleasant Avenue (to the east). Detached dwellings on individual residential lots abut the southern boundary of the site.

An aerial photograph of the site is provided at **Figure 2**.

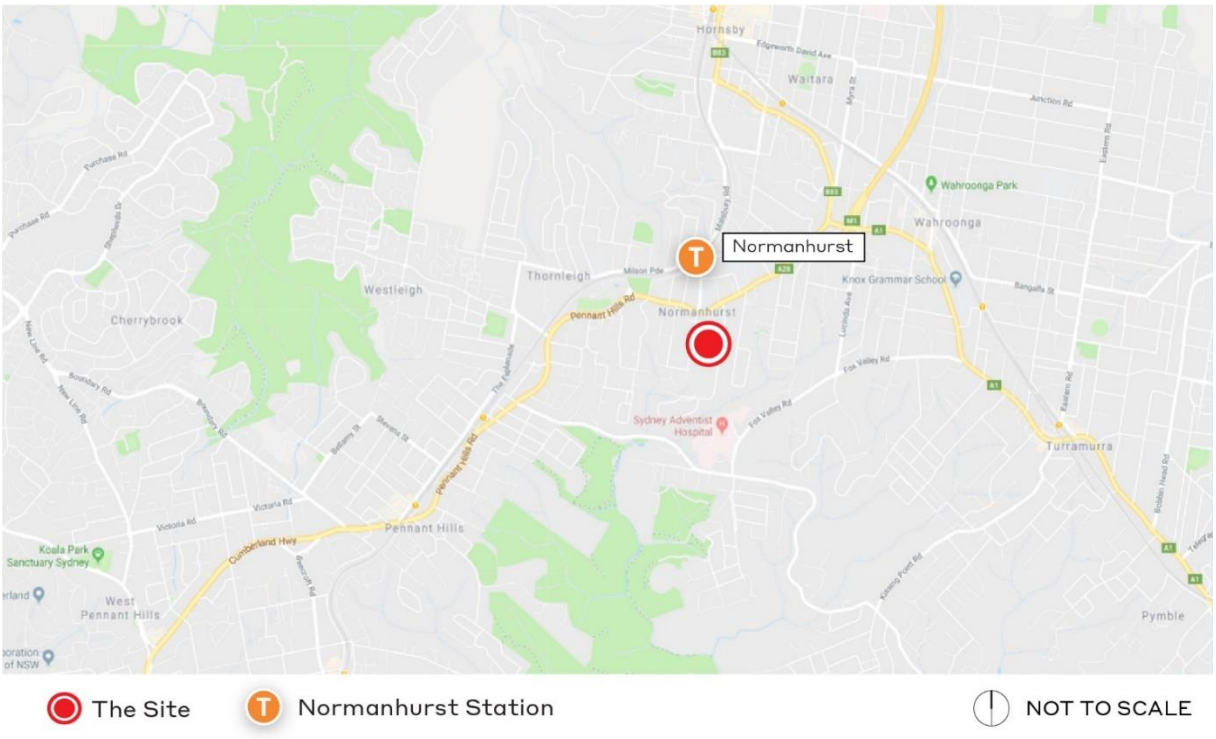


Figure 1 – Loreto Normanhurst Campus Location Context Plan
Source: Ethos Urban

Figure 2 – Aerial Map of the Loreta Normanhurst Campus
Source: AJ+C Architects

1.3 Legal Description and Ownership

The campus comprises several allotments, the legal descriptions of which are provided in **Table 2** below. The existing campus has a site area of approximately 13.02ha. The site in its entirety is owned by the Trustees of the Loreto Property Association.

Table 1 Legal Description

Address	Lot	Plan
16 Mount Pleasant Avenue	Lot 5	DP 1218765
	Lot 16	DP 6612
30 – 62 Mount Pleasant Avenue	Lots 20 – 23 and 25 – 36	DP 6612
	Lot 1	DP 34834
91 – 93 Pennant Hills Road	Lot 1	DP 114580
	Lot 3	DP 1217496
	Lot 1 – Lot 3	DP 1218765
	Lot B	DP327538
24 – 28 Mount Pleasant Avenue	Lot 1	DP 809066
6 Mount Pleasant Avenue	Lot C	DP 366271
14 Mount Pleasant Avenue	Lot 4	DP1218765
89 Pennant Hills Road	Lot 1	DP136156

1.4 Overview of Proposed Development

This application sets out a new campus masterplan for the existing school campus that will guide and shape the development of the school campus for the next 30 years. This SSDA also includes detailed plans for the first stage of the concept proposal (Stage 1 works). Accordingly, consent is sought for the following:

- The concept masterplan, including:
  - Establishment of 11 new building envelopes across the site for education and ancillary uses including student accommodation;
  - Increase of the student number cap by 850 students from 1150 to 2000 students;
  - The open space and landscape design;
  - Pedestrian and circulation arrangements, and
  - Associated car parking provision.
- Detailed consent for Stage 1 works, being:
  - Construction of a new 3 to 6-storey boarding house to accommodate up to 216 boarders.
  - Excavation works to accommodate partially underground carpark and dock facilities within the proposed footprint of the new boarding house facility;
  - Demolition works to buildings between Mary Ward and existing dining room building and associated works to make good existing;
  - Landscaping works and removal and replacement of approximately 50 trees of varying significance; and
  - Augmentation of connection of services and utilities infrastructure.

Figure 3: Stage 1 is highlighted in its context.

2 Masterplan Sustainability Framework

Arup has been engaged by Loreto to provide an overarching sustainability strategy for the master plan which will provide a framework for the future developments in the Normanhurst site.

One of the key objectives of the proposed strategy is to be flexible and adaptable to meet the current and future needs of the School and their Stakeholders.

2.1 Context review

The first step of the development of the Sustainability Strategy for the SSDA Concept Proposal has been a review of the sustainability context.

2.1.1 Compliance - Section J -2016

Section J of the National Construction Code sets the minimum energy efficiency requirements that buildings must meet. There are two ways of proving compliance with Section J;

- Deemed to Satisfy (DtS)
- Alternative Solution (JV3).

The approach for the master plan will be to generally meet the DtS requirements. However major projects will investigate the benefit of using and alternative solution approach to maximise performance and meet the design intent.

The new NCC 2019 Section J will be available in February 2019 and applicable from May 2019. The next projects will be required to meet the new code.

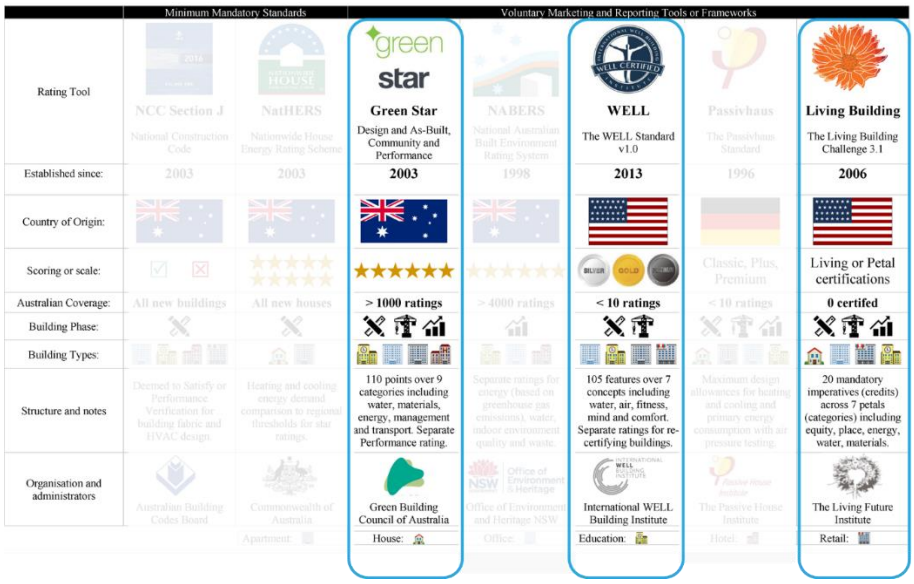
2.1.2 ESD principles of the Environmental Planning and Assessment Regulations 2000

A summary of the ESD principles outlined in Schedule 2, clause 7(4) of the Environmental Planning and Assessment Regulations is as follows:

- Where possible the design is to be developed to avoid serious and irreversible environmental degradation.
- The design is to maintain or enhance the health, diversity and productivity of the environment for future generations.
- The design is to consider ways to conserve biological and ecological diversity.
- Design decision are to be made with the environment in mind, including how the ongoing operation of systems will impact the environment over the course of the projects lifetime.

2.1.3 Sustainability tools

During the development of the master plan sustainability strategy a review was conducted of the available best practice sustainability standards.



Green Star

The Green Building Council of Australia (GBCA) is Australia's leading authority on sustainable buildings and communities. The GBCA was established in 2002 to develop a sustainable property industry in Australia and drive the adoption of sustainable practices. Today, the GBCA operates Australia's only national voluntary, comprehensive sustainability rating system for the built environment – Green Star.

Green Star is an internationally recognized rating system that delivers independent verification of sustainable outcomes throughout the life cycle of the built environment.

The current Green Star version for base building is Green Star – Design & As Built v1.2, which will be used as reference for this project.

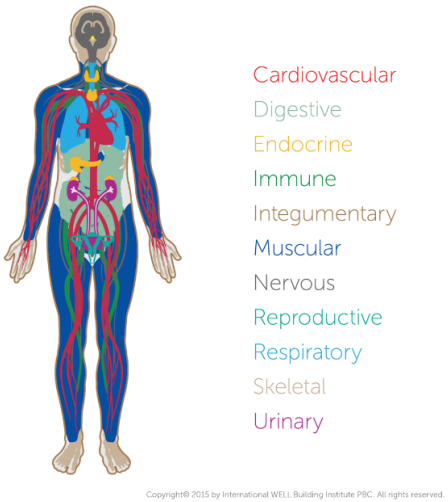
WELL

WELL promotes a holistic view of healthy and enjoyable indoor spaces. The aim of the tool is to provide a way to certify measurable aspects which make healthy a space.

There are ten concepts in WELL v2: Air, Water, Nourishment, Light, Movement, Thermal Comfort, Sound, Materials, Mind and Community

There are 100 points available and 10 innovation extra points.

- WELL Silver Certification: 50 points.
- WELL Gold Certification: 60 points.
- WELL Platinum Certification: 80 points



The Loreto Normanhurst masterplan will consider WELL as a reference tool for the design.

Living Building Challenge

Created in 2006 by the non-profit International Living Future Institute. Most stringent of the three ratings, therefore smaller scale projects have been certified to date.

The living building challenge is divided into 7 petals;

- Place
- Water
- Energy
- Health + Happiness
- Materials
- Equity
- Beauty

Three levels of certification

- Living building Certification – achieve all 7 petals
- Petal Certification – achieve three petals one of which must be Water, Energy or Water
- Zero Energy Certification – Project generates all of its energy on site without combustion.

The LBC will be used as a reference tool for specific projects.

2.1.4 Student Accommodation Benchmarks

During the development of the master plan sustainability strategy benchmarking was conducted on other student accommodation projects.

The outcome was that the highest target currently met in the industry is 5 star Green Star, which is going to be considered as a reference target for the new projects.

Lena Carmel Lodge, ANU

Sustainability Dashboarding

Key Initiatives:

- Greensense View® sustainability software displayed on dashboards, showing live electricity, water and gas use.
- Competitions shown on energy dashboards, by individual floors: students aware day-to-day choices versus building performance
- Sensors & monitoring to encourage students to use the stairs: visualisation of energy saved and physical activity

Approach: Performance

- 5 Star Green Star equivalency

Clayton Campus, Monash

Recycling Water

Key Initiatives:

- Grey water treatment of showers and hand basins for WCs
- Productive garden beds planted with fruit trees and herbs
- Prefabricated construction
- Solar panel array (150kW)

Approach: Certification

- 5 Star Green Star Rating

Campus Living Village, Uni of Melbourne

Renewables & Passive Design Principles

Key Initiatives:

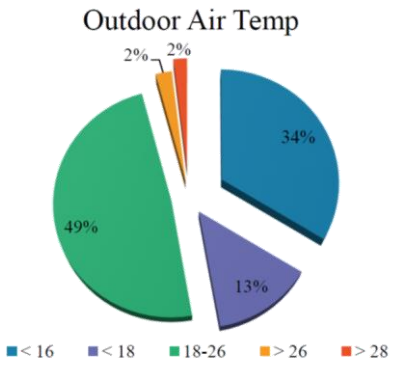
- Roof Solar Panels
- Greywater use for laundries
- Natural ventilation: thermal chimney draws hot air from the corridors and up through the building to naturally ventilate, cool and refresh air quality.
- Passive Principles: Thin building plan
    - Daylight, natural ventilation

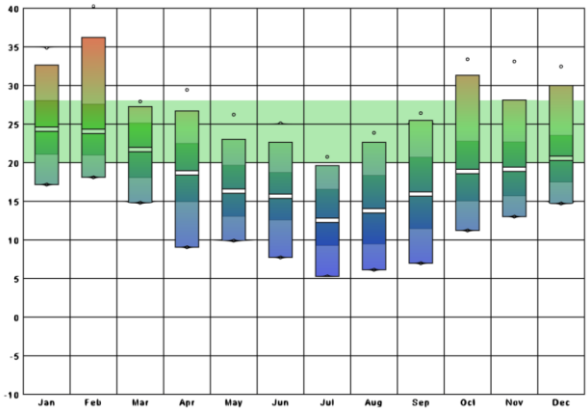
Approach: Certification

- 5 star Green Star Rating

2.1.5 Weather context

The climate in Normanhurst NSW provides a good opportunity for passive low energy design. The majority of the year is within the comfort range and with the use of passive building strategies this can be extended further with minimal need of heating and cooling.





Natural ventilation and adaptive comfort

To maximise the use of passive strategies, the adaptive comfort approach will be considered in the design of the buildings.

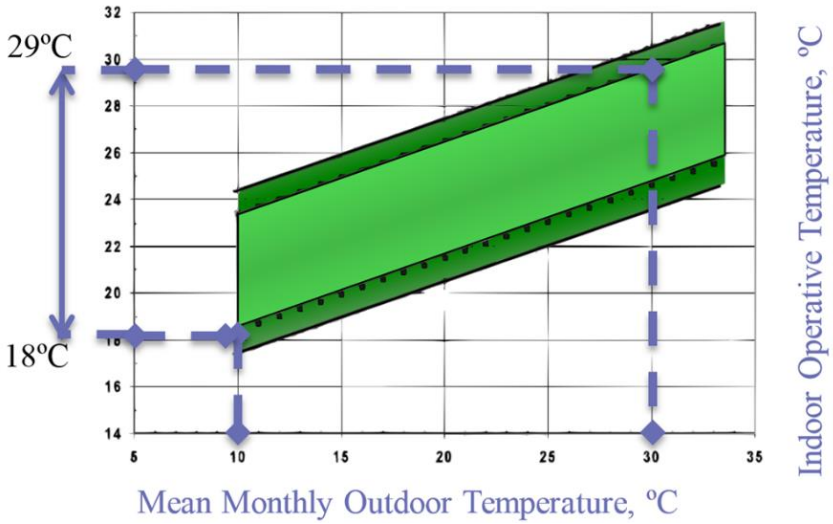
The ASHRAE Standard 55-2013 'Thermal Environmental Conditions for Human Occupancy' uses a thermal comfort model which assumes the acceptable comfort zone varies depending on six primary factors: humidity, air speed, metabolic rate, air temperature, radiant temperature and clothing insulation. According to the ASHRAE 55 Standard, thermal comfort is "the state of mind that expresses satisfaction with the surrounding environment."

ASHRAE suggests an adaptive model, which is based on the outdoor temperature the graph below details what is deemed to be acceptable conditions in a naturally ventilated space for a given outdoor condition. The green bands indicate the ranges of acceptable indoor operative temperature based on mean monthly outdoor temperature.

The Adaptive Comfort model states that peoples thermal comfort range is determined by their thermal history, with a greater weighting on the most recent outdoor temperature. This then gives our comfort range based on a summer average of 30°C and a winter average of 10°C.

Based on the aforementioned Sydney weather data and the adaptive comfort criteria, the design will consider the following temperature limits:

- During hot periods the maximum acceptable Operative Temperature is 28-29°C
- During cold periods the minimum acceptable Operative Temperature is 18-19°C



2.2 Sustainability Framework for the masterplan

Based on the outcomes of the context analysis, the proposed approach for the masterplan is define a Sustainability Strategic Framework, which identifies key priority areas for the master plan.

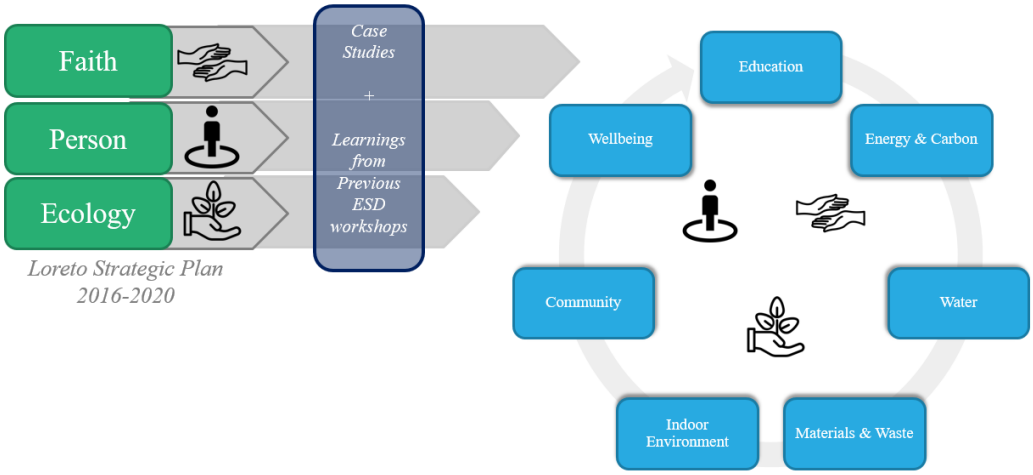


Figure 4: the sustainability strategic framework has been developed in accordance to Loreto Strategic Plan and by engaging with the school's stakeholders

2.2.1 Overarching initiatives

For each priority areas we have identified overarching principles which will be applied to the master plan.

Energy & Carbon

- ✓ Energy metering and monitoring
- ✓ Reduce energy needs with **passive strategies**
- ✓ **Phase out natural gas** in favour of heat pumps
- ✓ Maximise **on site renewable energy**
- ✓ Encourage low carbon transport
- ✓ **Green Power** energy sources

Water

- ✓ **Reduction in potable water** usage across the campus
- ✓ **Reduction in water use overall**, **WSUD**
- ✓ **Water Recycling**

Material & Waste

- ✓ **Reuse existing materials**

- ✓ Certified timber and **other low embodied carbon materials**
- ✓ **Recycled concrete**
- ✓ **Local material sourcing**
- ✓ Responsible steel
- ✓ Design for **Disassembly**

Indoor Environment

- ✓ **Glare control**
- ✓ **Maximise daylight** in teaching spaces and study rooms
- ✓ Improved Air Quality by **increasing fresh air rates and low VOC materials**
- ✓ **Strategic planting** to reduce solar gains and provide shade

Community & Education

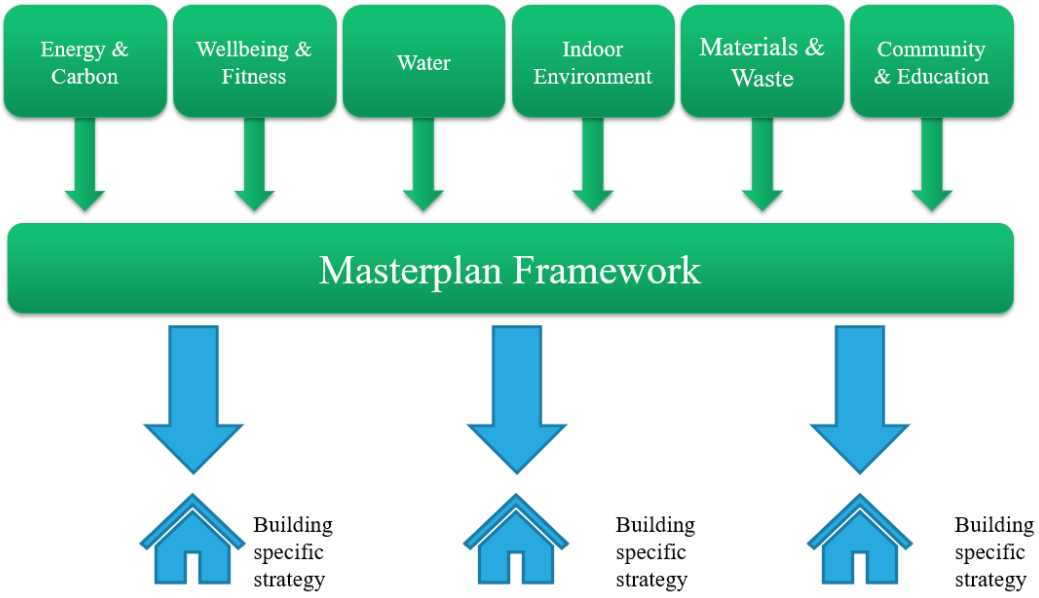
- ✓ Promote opportunities to **embrace cultural diversity and community engagement**
- ✓ Foster opportunities for **innovative thinking through experiences** and showcasing sustainable initiatives

Wellbeing & Fitness

- ✓ Contribute **to positive health outcomes** for the students, the staff and the stakeholders by **promote an active lifestyle**
- ✓ Support the use of **active means of transport** with end of trip facilities, bicycle
- ✓ introduce biophilic elements such as **green infrastructure** for occupant wellbeing

2.2.2 Framework application

The framework will provide a flexible approach to define a sustainability strategy which can be unique for each building based on type, size and priorities.



In this process, Green Star will be used as a reference tool in this approach and the following credits have been identified as high priority for all new developments.

Category	Credit	Item no.	Sub-category
Management	Commissioning and Tuning	2.2	Building Commissioning
		2.3	Building Systems Tuning
	Metering and Monitoring	6	Metering
		6.1	Monitoring Systems
	Operational Waste	8B	Prescriptive Pathway - Facilities
Indoor Environment Quality	Indoor Air Quality	9.2	Provision of Outdoor Air
	Visual Comfort	12	Glare Reduction
	Thermal Comfort	14.1	Thermal Comfort
Transport	Sustainable Transport	17B.4	Active Transport Facilities
Water	Potable Water	18B.1	Sanitary Fixture Efficiency
		18B.2	Rainwater Reuse
		18B.5	Fire System Test Water
Materials	Construction and Demolition Waste	22A	Fixed Benchmark

3 Stage 1 - Boarding House

In addition to the Sustainability Framework, Arup has been supporting the design development of the Boarding House which is part of Stage 1, by detailing a building specific strategy, based on the master plan sustainability framework.

The following sections detail how the master plan sustainability framework will be applied to the boarding house.

The boarding house has been designed to meet the requirements of a **5 Star Green Star certification in principle**. The opportunity to follow a formal certification pathway is currently being investigated.

The following paragraphs highlight the strategies which have been embedded in the design.

3.1 Management

The following management strategies are being considered to improve the project's sustainability by influencing areas where decision making is critical.

- The buildings will undergo a high level of commissioning and tuning upon completion to ensure the building services operate efficiently and to their full potential.
- A best practice formal environmental management plan will be implemented for procedures during construction of the buildings.
- The project will implement best practice waste management system allocating areas, size and collection strategies. This will include the collection and separation of distinct waste streams and the feasibility of off-site waste management.
- Metering and monitoring of energy sources and usage to promote awareness of consumption.

3.2 Indoor Environment Quality

The following indoor environment quality strategies are being investigated to achieve sustainability performance in a manner that also improves the occupant experience of the space.

- For the spaces that are mixed mode or completely mechanically ventilated air quality will be achieved through providing outdoor air at a minimum rate of 50% greater than the minimum required by AS 1668:2:2012 and CO2 concentrations are maintained below 800ppm. This will also allow for a tighter control of the temperature, in fitting with the expectation of these spaces.
- Naturally ventilated spaces are required to have openings greater than 5% of their floor area.
- The acoustic insulation of the buildings will be designed to provide appropriate and comfortable acoustic conditions for occupants.
- Efficient, flicker free lighting.
- The lighting levels and glare reduction will comply with best practice guidelines and targeted ratings.
- Maximise the accessibility to high quality external views.
- Maximise the amount of natural daylight. This provides passive solar heating during winter and increases the solar access to occupants while minimising solar gain during the summer.
- Indoor air quality will be improved by eliminating products, such as paints and carpets that do not meet appropriate minimum VOC standards.
- The buildings design will promote a high level of thermal comfort for occupants by controlling the envelope gains and designing to best practice HVAC standards.

- Lighting will be designed to promote natural circadian rhythm and colour and brightness will be optimised for each of the spaces.
- Water quality is also a key consideration, testing is recommended on the campus to understand if any additional filtration is required.

Daylighting

Daylight is a key component of people's perception and enjoyment of spaces. The project will use daylight factor as guide to the illumination levels, daylight factor is a ratio of the external light level to the internal light level on an overcast day. The following daylight factors will be targeted with a higher level targeting communal spaces that will be more intensively used.

Daylighting targets

	Targeted Daylight Factor
Common areas	3-4%
Bedrooms	2.5-3%

3.3 Energy

Energy is a key sustainability driver of the design of the development. The following strategies will be considered to reduce the consumption of electricity;

Section J

The overall strategy targets an improvement over the DTS Section J requirements for the buildings. The Boarding House designed has been reviewed for section J compliance and a JV3 approach is proposed, given the complexity of the building envelope. The detailed JV3 energy model will be developed during the next phase of the design.

Building Mass, Form, Orientation

Building mass, form, orientation are the first design choice and has one of the largest impacts, improving this at the start plays a key role in providing occupant comfort and reducing the need for mechanical conditioning as well as reducing the challenges and costs in designing the façade of the building. This is even more critical in the student rooms that are naturally ventilated. The following is an outline of the strategies that will be implemented to achieve this.

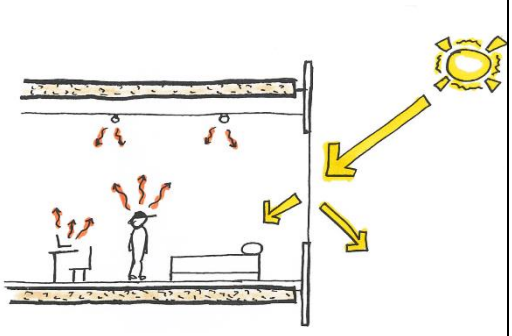
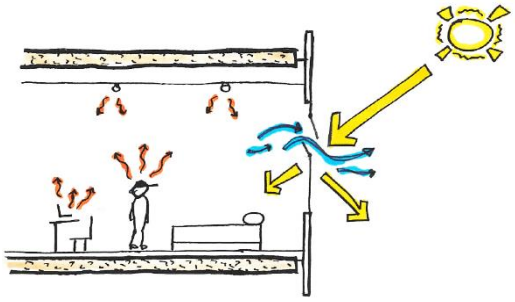
- Optimize facade design to respond to orientation challenge.
- Narrow floor plate to maximise single side and cross flow natural ventilation.
- Allow for high level secure ventilation to utilise night flush and ensure separate daylight and ventilation control along the facade.

Building Envelope and Solar shading

The façade is the key interface between the interior and exterior environment and thus plays a key role in providing occupant comfort and reducing the need for mechanical conditioning. This is even more critical in the student rooms that will be naturally ventilated. The following is an outline of the strategies that will be implemented to achieve this.

- Operable windows for natural ventilation, this will either be double sided or through a sufficiently large single sided opening.
- Shading for the north east and western facades to reduce the solar load in the summer while allowing a certain amount of solar load in winter and the in between seasons.
- Well-sealed and insulated building that can maximise internal gains in the winter and reduce external heat gains in the summer.
- High performance glazing to manage solar and thermal load.

Passive design Strategy

Winter	**Summer**
	
Limited glass area (Max ~12,5% of the floor area) High insulated building envelop → R 2.8-3.0 High Performance Glazing → U 2.8 W/m²K Maximise Internal gains (150 W) Low infiltration (0.5 ACH)	Openings for nat vent →~4% of the floor area Optimised Solar shading High Performance Glazing → G 0.4 Thermal mass Smart comfort control → Digital integration

Mixed mode - Natural ventilation

Natural ventilation and air conditioning will be integrated in the design to allow user to seamlessly move from one strategy to the other.

A comparison of window opening types have been undertaken and louvers will be generally preferred.

Opening Type	Pros	Cons
Window	Familiar to occupants Can be sealed effectively	Difficult to attenuate external noise Need to consider security implications
Louvre	Provides large effective ventilation opening area	Can be difficult to seal Poor insulation performance
Trickle Vent	Minimum aesthetic impact No security issues	Not as effective at passive cooling as louvers or windows – main purpose is to provide minimum outside air

Mechanical Services

It is understood that thermal comfort is of key importance for the developments such as the boarding house, due to the nature of expected occupants. With this in mind, the following mechanical strategies are being investigated to decrease energy consumption while maintaining comfort for occupants:

- Demand driven ventilation to minimise the conditioning of outside air is appropriate locations.
- As HVAC systems contribute to a large percentage of overall energy consumption, minimising this by improving the opportunity for natural ventilation is a key principle in the design.
- CO2 control will be used to minimise fan energy consumption when ventilation is not required.
- Ventilation units will be turned off when the windows are open.
- Air movers will be used to increase comfort while the building is naturally ventilated and reduce demand for air conditioning
- In addition, it is considered the use of high efficiency heat-pumps to replace, gas fired boilers which use fossil fuels.

Lighting, Power and IT Systems

All luminaires are specified as LED to ensure energy efficiency. Occupancy sensors will turn lights off when no one has used the space in a given time. Lighting will be designed to promote wellbeing through considered lighting design and application.

Renewables

Integration of onsite energy generation remains a priority for each of the buildings across the masterplan.

Photovoltaic panels will be integrated in the roof to partially offset energy consumption.

3.4 Water

The sustainable water strategy will focus on reducing potable water consumption through efficient fixtures, alternative sources of water, recycling water and monitoring water use. The following strategies will be considered;

Rainwater

Rainwater harvesting, and reuse will be key to reducing potable water demand. A rainwater harvesting system either located centrally or within the boarding house could act to reduce potable water consumption.

Recycled water will be mainly used to serve irrigation and toilet flushing.

Efficient Fixtures

It is recommended that all fixtures and fittings will be within one star of the highest rating based on the Water Efficiency Labelling and Standards (WELS) scheme and meet the following specification:

- WCs – 3 litre half/4.5 litre full flush
- Urinal – waterless or 0.8L/flush.
- Wash basin taps – 4.5 litre/min
- Showers– 7.5 litre/min

Metering

The boarding house will meter water use for any irrigation and recycled water. Digital water meters will be utilised to monitor water usage, this will also allow water use to be displayed on media screens to engage occupants with sustainability features.

3.5 Materials

The following material selections will be considered to address the consumption of resources within the construction of the building.

- Post-consumer recycled content structural steelwork, reinforcement bars and mesh will be maximised.
- Low VOC materials will be used for flooring, paint, adhesives and sealants.
- Low formaldehyde emission engineered woods produces will be used.
- All thermal insulants will be selected to avoid the use of ozone depleting substances in both their manufacture and composition.
- The development will aim to reduce to construction waste going to landfill by reducing or recycling building materials. Waste management during construction will target best practice recycling rates.
- Use an efficient structure that uses the least amount of material per metre (ie. Using high strength steel)
- Use recycled material where possible (i.e. 30% fly ash replacement in concrete, recycled steel in reinforcement, recycled aluminium / Plastic façade)
- Adopt techniques that use less materials (.e. waterless urinals, wireless technology)
- Minimise internal finishes (i.e. use exposed ceilings where possible)
- Use durable and low maintenance materials
- Implement smart technologies and Wi-Fi devices into the building to reduce cabling
- Implement green partitions and walls
- Use materials that offset carbon (i.e. timber). Timber is to be from FSC-certified, recycled or plantation or re-growth forests which are sustainability managed
- Consider prefabricated elements to avoid the layering of facades
- A Waste Management Plan (WMP) will be required prior to construction in line with the City of Sydney Policy for Waste Minimisation in New Developments.

3.6 Land Use, Ecology & Biodiversity

The following techniques are being applied to the site wide landscaping strategy to increase the ecological value of the site.

Low irrigation landscape will be maximised in the selection of plants.

3.7 Emissions

The following strategies are being considered to reduce the environmental impacts of common building emissions.

- Care will be taken to minimise the potential emissions from refrigerants for the mechanical systems.
- The use of greenery will mitigate potential urban heat island effect.
- Storm water across the site will be treated to reduce the levels of pollutants leaving the site.

4 Conclusions

Arup has prepared this document on behalf of Loreto Normanhurst to aid the description of its Concept Proposal and Stage 1 to be assessed by the Department of Planning as part of a State Significant Development Application.

Arup has been engaged by Loreto Normanhurst to ensure that the development encompasses sustainability initiatives that exceed standard practice for school developments, with initiatives addressing areas that form a holistic approach to sustainability as outlined in the previous section.

Therefore, we trust that this report summarises that the overall ESD design strategy for the site and its buildings has been developed to respond to the Secretary's Environmental Assessment Requirements (SEARs), dated 12th January 2018.