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# Ecological Sustainable Development (ESD) Report for SSD - 16858710

## Pacific Brook Christian School

## 72-74 Maitland Street, Muswellbrook

**Prepared for: Pacific Brook Christian School Ltd.**

**Project No.: NSW200034**

**Revision No.: 03**



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## REVISIONS

| Revision | Date | Purpose | Prepared By | Approved By |
|---|---|---|---|---|
| 01 | 28/05/2021 | Preliminary for review | T. Zheng | W.M |
| 02 | 07/07/2021 | SSDA Submission | T. Zheng | W.M |
| 03 | 11/11/2024 | Revised submission – impact of climate change response | T. Zheng | W.M |
| | | | | |

| Review Panel | |
|---|---|
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Unless otherwise advised, the parties who have undertaken the Review and Endorsement confirm that the information contained in this document adequately describes the conditions of the site located at corner of Seaview St, Prospect Rd and Victoria St, Summer Hill, NSW.

# Table of Contents

# Appendices

# 1 Executive Summary

## 1.1 Background

The following report has been prepared by ACOR Consultants to support the State Significant Development Application (SSDA 16858710) prepared by NBRS Architecture for the Pacific Brook Christian School.

Pacific Brook Christian School proposes the staged construction of a new school at 72-74 Maitland Street, Muswellbrook, presently stage 1(see Figure 3) which makes up a significant portion of the masterplan.

The development consists of an independent, junior, middle and senior school facility for multipurpose, hope school, play areas, Library and school labs with capacity to accommodate 140 students and 16 staff. Development is bound by Muswellbrook Golf Course along the north eastern boundary, Maitland Street along the south western boundary and residential properties to the south eastern boundary (see Figure 1). The site address is 72-74 Maitland Street and is legally described as Lot 100 in Deposited Plan (DP) 1261496 (see Figure 2).

This report identifies and summarises the Ecologically Sustainable Design (ESD) initiatives under the Secretary's Environmental Assessment Requirements (SEARs) checklist date 30th April 2021 with matters pertinent in the design of the proposed Pacific Brook Christian School.

The report also examines the principles of Ecologically Sustainable Design (as defined in clause 7(4) of Schedule 2 of the Environmental Planning and Assessment Regulation 2000) and demonstrate ways on how it will be incorporated in the design and on-going operation phases of the development.

The report is to accompany the State Significant Development Application (SSDA 16858710) submission to the NSW Department of Planning, Industry and Environment. This report should be read in conjunction with the Architectural design drawings and other consultant design reports submitted as part of the SSDA.

The building is classified as Class 9b (school) and 5 (office), in Climate Zone 6.


Figure 1 Aerial Image of Site Boundary

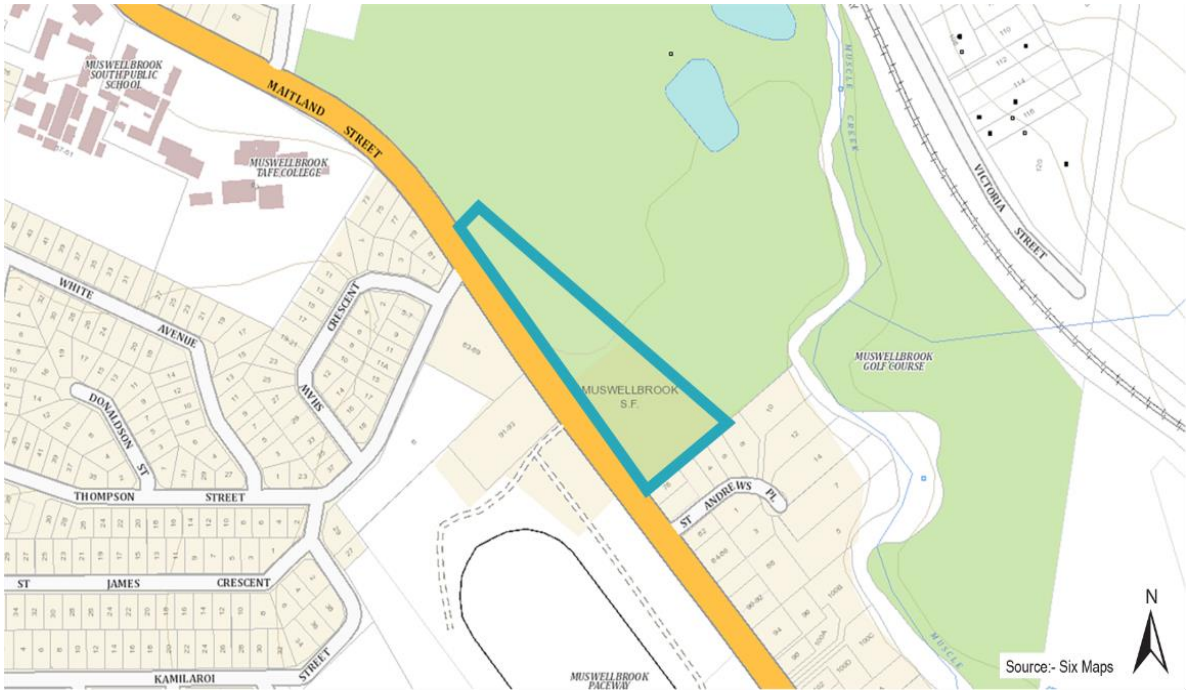



Figure 2 Site Context

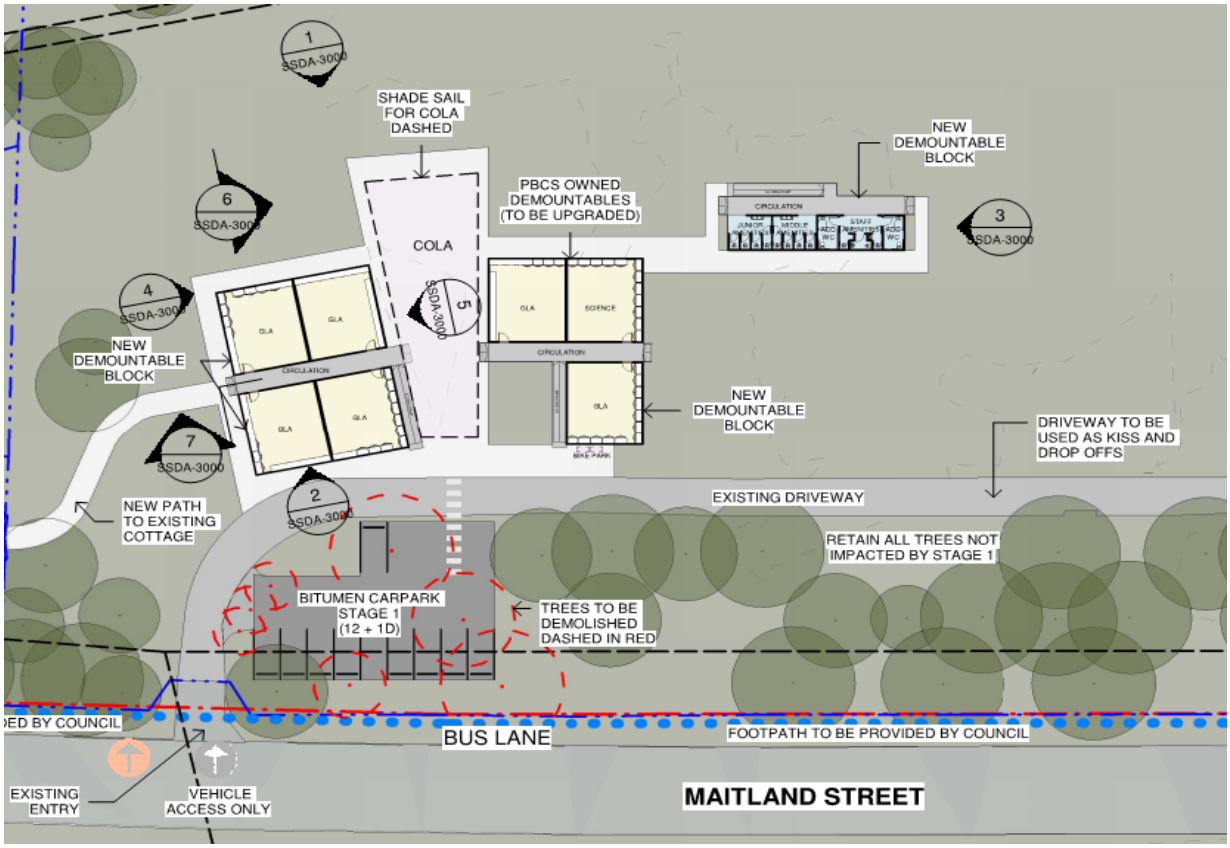



Figure 3 Current staging plan (Stage 1)

# 2 Project Overview

## 2.1 Aims and Objectives

The following objectives have been identified as forming the basis for the establishment of a new school constructed on site comprising of:

- Demolition of existing structures in accordance with the demolition DA for the construction of a school.
- Masterplan for several single and two storey buildings.
- Sports and recreational areas and amenities.
- Create an education precinct to create a high-quality teaching and learning environment for staff and students.
- Provide good on-site internal road access, onsite car parking and surrounding traffic functions in the precinct.
- Ensure minimal environmental impact.
- Maintain the significant green fields assets and provide opportunities for new outdoor environments.
- Ensure development is compatible with surrounding development and the local context.
- Create a safe environment to support and nurture student growth.

The site and proposed design are considered to meet the objectives of the project as it allows for development on land that has been previously used for educational purposes.

## 2.2 Description of the Proposal

The proposed development seeks detailed built form approval of new teaching and educational facilities, as detailed below:

- New one(1) and two (2) storey buildings to accommodate contemporary, flexible teaching and learning spaces.
- Upgrade site access infrastructure for students, with adequacy of pedestrian, bicycles and public transport infrastructure to accommodate future development.
- New school drop-off and pick-up zone with new bus bays and queuing facilities.
- New design multipurpose basketball court, library and hope school with secure play areas, intergraded class, community areas and amenities.
- New Junior, middle and senior school classrooms and multipurpose areas with layout and façade envelop to suit local street scape and topography with high quality design and built form.

# 3 Secretary's Environmental Assessment Requirements (SEARs)

## 3.1 Requirement Guidelines

This report acknowledges the SEARs with reference to section 9 of the documents for the following list of requirements under "Ecologically Sustainable Development (ESD)".

- Detail how the 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 framework for how the future development will be designed to consider and reflect national best practice sustainable building principles to improve environmental performance and reduce ecological impact. This should be based on a materiality assessment and include waste reduction design measures, future proofing, use of sustainable and low carbon materials, energy and water efficient design (including water sensitive urban design) and technology and use of renewable energy.
- The Integration of water management plan detailing any proposed alternative water supplies, proposed end uses of potable and non-potable water and water sensitive design.
- Demonstrate how environmental design will be achieved in accordance with the GANSW Environmental Design in Schools manual.
- Preliminary consideration of building performance and mitigation of NAR climate change, including consideration of Greenstar Performance.
- Provide assessment against an accredited ESD rating system, e.g. Green Star.
- Statement regarding how the design of the future development is responsive to CSIRO projected impacts of climate change.

# 4 Sustainable Design Initiatives

## 4.1 General

Pacific Brook Christian School project team is committed to achieving sustainability outcomes in the design, construction, and operation phases of the development. The following objectives will be incorporated into the project to minimise consumption of resources and help achieve environmental design intent in accordance with environmental design in school manual under government architecture NSW (GANSW) and in compliance with the objectives of SEARs requirements and best practices.

## 4.2 Green Star Accredited Professional

All engaged of the design team will undertake a sustainability workshop presented by a Green Star Accredited Professional to provide advice on achieving the sustainability targets of the project. The sustainability professional will provide guidance throughout the project on specifications, material and product selection and commissioning and tuning.

## 4.3 Commissioning and Building Tuning

The services design team will provide detailed commissioning procedures including controls descriptive to ensure the development is commissioned correctly. Quarterly tuning of building services is to be undertaken in the first year of operation and regular tuning of controls is to be undertaken throughout operation to maintain a high-performance building.

## 4.4 Shading and Daylighting

NBRS Architecture are to provide building shading element consisting of perforated mesh, reveals and overhang. The external shading scheme helps increase natural daylight whilst minimising unwanted passive solar heat gain and glare for the building.

The new development of buildings shall provide passive design features, allowing for enriched daylighting and greater access to external views for occupants. Additional daylighting reduces the reliance on artificial light and benefits alertness, mood and productivity. External views provide a connection to nature and the campus sports ovals and help to create an environment encouraging constructive learning.

Highs levels of daylights reduce the need for artificial lighting, this reducing energy consumption.

## 4.5 Impact of Refrigerant Materials

It is proposed that any Air Conditioning equipment is based on an refrigerant type with an Ozone Depletion Potential (ODP) of 0 and with a minimal Global Warming Potential (GWP).

HVAC design using local Direct Expansion systems will aim to keep total System Direct Environmental Impact (TSDEI) of the refrigerant systems in the buildings to less than 15 to ensure the environmental impacts of refrigeration and air conditioning equipment are minimised.

## 4.6 Metering

Energy and water meters shall be provided on all major usages of water and electricity. The data from these meters will be monitored and recorded centrally. This data will then be used to assist with benchmarking and tuning the buildings to ensure that energy and water consumption is reduced or minimised.

## 4.7 Domestic Hot Water

Energy efficient options for generation and reticulation of Domestic Hot Water (DHW) will be investigated further through the concept design phase. The design options may be incorporate a central gas fired plant or air-cooled heat pumps. Gas boosted is to be investigated if a gas option is to be implemented.

All major hot water usages will be metered.

## 4.8 Lighting Control

Lighting in all areas/rooms (except small storage rooms) will be controlled by movement sensors. External lighting will be controlled via a daylight sensor (PE cell) and timer.

Lighting aims to achieve a 10% improvement over BCA Section J6 lighting power density allowances ($W/m^2$) predominantly using LEDs. This improvement reduces the environmental impact of the building.

## 4.9 Waste Recycling

During the construction and demolition phases of the project, it is proposed that minimum of 80% of waste by mass shall be recycled.

Centralised waste and recycling bin systems shall be provided for the building during operation as well as a dedicated storage area for the separation and collection of recyclable wastes.

## 4.10 Building/Public information display

All relevant information about the design and operation of the building's environmental features will be transferred to the occupants via the Building Users' Guide.

Internal building digital signage and interactive screens will be considered for public information display of welcome messages, student information marketing etc.

Digital screens will also help achieve a paperless environment by reducing the need for print materials and labour costs for the service and maintenance of traditional solid display boards.

## 4.11 Quality of Internal Air

Adequate natural ventilation via openable doors and windows, permeable airways and permanent openings in façades are proposed to the common spaces and major transient areas of the buildings.

All classrooms, and large façade common areas, shall be provided with mechanical ventilation through local façade penetrations for each level, to ensure adequate fresh air for all learning and teaching spaces whilst minimizing thermal leakage from air-conditioned zones. Heat exchangers and carbon $CO_2$ controls shall be implemented where required to reduce energy consumption of HVAC equipment and to ensure sufficient levels of outside air are entering the space to maintain high IAQ levels.

Adequate natural ventilation to spaces reduces the operational requirements for mechanical cooling systems and thereby reduces greenhouse gas emissions.

## 4.12 Peak Electricity Demand Reduction

The proposed PV (photovoltaic) panels on the roofs of the new school buildings shall be provided to further reduce ongoing energy costs and reduce Greenhouse gas emissions.

The area of roof that could potentially accommodate PV panels is relatively large and, at times of peak solar periods, this might satisfy a significant proportion of the electrical usage of the school and reduce peak demand from power grid.

## 4.13 Material Life Cycle

Materials for building adhesives, sealants, flooring and paint products will be selected to contain low or no Volatile Organic Compounds (VOCs) and all engineered wood products used in exposed or concealed applications are specified to contain low or no formaldehyde to avoid harmful emissions that can cause illness and discomfort for occupants.

Internal furnishings within the buildings will be selected considering their recycled content, embodied energy, end-of-life recyclability and reduction of carbon foot print to minimise environmental impact in production.

Low VOC products assist in providing more healthy working and learning spaces for students and staffs, and are known to reduce instances of sick building syndrome.

## 4.14 Materials and Products

Materials and products specified for the development will be preferred to meet GBCA certification requirements, for example “Ecospecifier”, FSC or Good Environmental Choice Australia related products. Products meeting these certification requirements will confidently reduce environmental impacts and waste from furnishings over the life of the buildings.

Building’s structural and reinforcing steel will be specified to be sourced from a responsible steel maker and a percentage will be required to be recycled.

Where practical, concrete shall be specified to include for the use of recycled aggregate or manufactured sand and reduced quantities of Portland cement to reduce environmental impacts of concrete production and embodied energy.

## 4.15 Storm Water and Non-Potable Use

In conjunction to the outcome for the identification of an adequate and secure water supply to site, it is proposed that the development shall include storm water storage, water quality measures and nominated discharge to provide sufficient capacity for irrigation requirements and ensure the site does unduly affect the potable water demand from the Authority infrastructure.

This will help alleviate environment impacts by reducing dependency on mains water supply, reduce negatives effects of storm water runoff, and minimise water consumption and costs.

## 4.16 Water Sensitive Urban Design

The design of external areas will implement best practices of water sensitive landscaping and urban design, including permeable paving and indigenous low water usage plants to increase stormwater retention. The carbon sequestration of the plants on the exposed surfaces will also combat climate change contributions.

Water efficient fixtures and fittings will be implemented to reduce water consumption in accordance with the Australian Government’s Water Efficiency Labelling Scheme (WELS) by the use of 5 Star rated fixtures and fittings.

## 4.17 Landscaping

Local indigenous planting will be provided to the development in accordance with Aboriginal culture heritage values identified under the Environment Impact Statement (EIS). Indigenous plants are to be selected for drought resistant and allow for reduced water consumption.

## 4.18 Operational Consumables

Strategies and purchasing requiring for consumables will be developed and actioned by the School to ensure operational and maintenance purchasing is preferably sourced from sustainable suppliers. Consumables will comply with the requirements initiated during the design and construction phases.

A commitment to reduce waste at end life is being developed by the School.

## 4.19 Projected Impacts of Climate Change

The development is aware of the following projected climate change impacts and mitigation of these predicted changes will be addressed during detailed design:

- Hotter Days and Extreme heat waves.
- Extended Drought Periods.
- Extreme Rainfall Events.
- Gustier Wind Conditions.
- Effects on material selection, landscape design and social equity.

CSIRO advises that "…*that over coming decades Australia will experience:*

- *Further increase in temperatures, with more extremely hot days and fewer extremely cool days.*
- *Ongoing sea level rise.*
- *Further warming and acidification of the oceans around Australia.*
- *More frequent, extensive, intense and longer-lasting marine heatwaves, suggesting in turn more frequent and severe bleaching events on the Great Barrier Reef, and potentially the loss of many types of coral throughout the tropical reef systems of Australia and globally.*
- *A decrease in cool-season rainfall across many regions of southern Australia, with more time spent in drought.*
- *More intense heavy rainfall throughout Australia, particularly for short-duration extreme rainfall events.*
- *An increase in the number of high fire weather danger days and a longer fire season for southern and eastern Australia.*
- *Fewer tropical cyclones, but a greater proportion of high-intensity storms, with ongoing large variations from year to year."*

In relation to the above advice from CSIRO, the development has addressed these items as follows:

**Increase In Temperatures**

As average ambient temperatures rise, it will be increasingly important to consider the solar radiation exposure of classrooms to first minimise the thermal load within internal spaces via glazing elements. This is the first "line of defence" in thermal comfort considerations – excluding ambient loads where practical.

Further, the performance of the thermal envelopes of new buildings must anticipate that the rise in ambient temperatures. Insulation elements to roofs, walls and any elevated floors above ground must at least accord with insulation requirements stipulated in NCC/BCA and should be assessed for increased performance where practical.

The effectiveness of thermal envelopes directly impacts the effectiveness of any comfort conditioning equipment and the operating costs – financial and environmental – that result.

**Fewer Extremely Cool Days**

This is not expected to significantly affect building designs at this project site. The performance of building envelopes will be governed by summertime load considerations. It is likely that energy demands for heating of school spaces will progressively diminish. This is likely to be advantageous for teaching environments.

**Ongoing Sea Level Rise**

Not considered relevant to this site.

### Warming And Acidification of The Oceans

Not considered relevant to this site.

### Longer-Lasting Marine Heatwaves

Not considered relevant to this site.

### Decrease In Cool-Season Rainfall

This trend will impact on the natural landscape surrounding the school's structures. The ability of flora to withstand periods of limited natural rainfall will be a key consideration for the Landscape design team.

The safe retention of rainwater from roof surfaces for the purposes of irrigation is considered a practical measure for a school environment. Further, if this infrastructure is placed overtly it can assist in the education of children about the preciousness on our natural water sources. It may act to normalise a desirable attitude that water is to be valued, used appropriately and not wasted.

### More Intense Heavy Rainfall

The safe management of storm water flows is increasingly challenging. For the proposed structures and pavements at this site, there is unlikely to be a high safety risk associated with overland flow events from water collected on hard surfaces within the property boundaries.

The use of two-level structures minimises the roof areas and there is a high proportion of natural grassed surfaces proposed. However, normal design considerations will be undertaken to mitigate against water accumulation within the immediate areas of the school buildings to ensure that storm water events do not create safety risks to staff and students.

### Increase in the Number of High Fire Weather Danger Days

It is not anticipated that the proposed facility would be used as an asset for community shelter in the event of a catastrophic bushfire event. If this were a consideration, then a "hardening" of building structures and services would likely be required.

However, where the surrounding landscape can be reasonably controlled, then the selection of flora should be mindful of risks associated with environmental fire loads.

The site is bounded by a golf course to the north-eastern boundary and urban structures with showgrounds behind on the south-western boundary. This site is not expected to be within an area of exceptional bushfire risk.

### High-Intensity Storms

In addition to high-intensity rainfall events, it is expected that high windspeed events will occur in greater frequency and these will reasonably coincide with school occupation hours. The design of building facades and roofs will need to be cognisant of these increasing risks and engineers will need to judge reasonable safety factors within their designs to accommodate for future wind loadings.

Whilst cyclonic events are not anticipated, similar windspeeds for short intervals are periodically likely to occur. The safety of building occupants with respect to the risk of falling debris from mature trees will be a relevant consideration at this site. The proposed location of new structures is typically well set back from the clustering of mature trees.

# 5 Environment Planning Assessment Regulation

The following list of Clause 7(4) of Schedule 2 Environmental Planning and Assessment Regulation 2000 have been incorporated into the design and on-going operation phases of the development as follows:

## 5.1 The Precautionary Principle

*Namely, that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation. In the application of the precautionary principle, public and private decisions should be guided by:*

*i. Careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment, and;*

*ii. An assessment of the risk-weighted consequences of various options.*

**Project Response**

The proposed development will be designed with the view to ensure suitability is incorporated through a broad range of ESD goals in service design, building construction and operations. The development team will ensure that building minimises the impact on the environment.

A strong emphasis on electrical and mechanical design including minimising energy and water use, building materials, environment friendly refrigerants and maximising controls efficiencies etc will be taken into account to prevent irreversible damage to the environmental. In addition, Pacific Brook Christian School will be guided to explore the use of renewable energy sources. Best possible design practices with a requirement to exceed BCA/NCC Section J – Energy Efficiency Targets by a minimum 10%.

Design will be referenced to guidelines under Australian Green Building Council Green Star benchmarks, and GANSW Environmental Design in Schools manual to help drive a balanced approach with risk weighted assessment.

The proposed building embraces sustainable design principles to maximise where possible natural daylight and natural ventilation. The orientation and massing of built form allows daylight into the building. Roof material and columns will be carefully selected, and the retaining of existing landscaping contributes to the cooling of the immediate environment.

Building construction will be expected to be resource efficient, cost-effective and to deliver enhanced sustainability benefits with respect to impacts on the environment and health and well-being of students and staff for the best possible learning facilities.

List of items with possible effects on environment are categorised to the following:

- Management
- Building Envelope
- Services Installations (MEP)
- Lighting
- Water
- Materials
- Waste
- Landscaping

## 5.2 Inter-generational equity

*Namely, that the present generation should ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations.*

**Project Response**

The new development is expected to be highly beneficial for the local central coast school community of the future generation.

Pacific Brook Christian School – The new school establishment Project indicates significant development to allow for future growth of core student population, aiming to provide good access to sport & recreational facilities with easy internal road access and onsite parking.

Pacific Brook Christian School aim to enhance overall campus amenity and provide further opportunities for a diverse and contemporary learning environment. Major upgrades will provide strong circulation access to multilevel access around campus. The proposed redevelopment will be for junior to senior schools providing multipurpose room use for the student and staff population for assembly, community, examinations and performances.

## 5.3 Conservation of biological diversity and ecological integrity

*Namely, that conservation of biological diversity and ecological integrity should be a fundamental consideration.*

**Pacific Brook Christian School Assessment**

It is expected the development will have minimal ecological impact as the proposed works are demolition of existing structure in accordance with demolition DA for construction of school. No specific SEARs provided for this project from preliminary environment assessment documents prepared by Abel Ecology (date 9 November 2020). The landscape design will be designed to strengthen and diversify the existing landscaping by introducing new specimen planting that reinforces the quantity and legibility of the existing established landscape pattern.

## 5.4 Improved valuation, pricing and incentive mechanisms

i. *polluter pays, that is, those who generate pollution and waste should bear the cost of containment, avoidance or abatement,*
ii. *the users of goods and services should pay prices based on the full life cycle of costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any waste,*
iii. *environmental goals, having been established, should be pursued in the most cost-effective way, by establishing incentive structures, including market mechanisms, that enable those best placed to maximise benefits or minimise costs to develop their own solutions and responses to environmental problems.*

**Project Response**

The mechanical, electrical and plumbing service design of this development will employ lifecycle costing to determine the optimum strategy with regards to major items of plant and equipment, with decisions being made based on whole of life costs rather than capital expenditure only.

PV panels, use of natural and low GWP refrigerant. Natural cross ventilation, natural lighting shall be explored and potentially employed on the project.

Internal building digital signage and possible interactive screens will be implemented for public display of welcome messages, student information and marketing etc.

Selection of durable, attractive and robust building materials although having a higher upfront cost, will have long term benefits in providing an easy to maintain building and lowering maintenance costs. Products will be sourced from sustainably grown sources and suppliers of these products, for example, timber products.

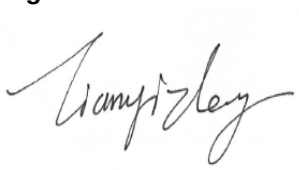
# 6 Demonstration of Accredited Rating Scheme

The development has been assessed against the Green Star Design and As Built Rating Tool, for the purposes of overview and to help achieve best industry practice. A table has been included in Appendix A that summaries the credits that would be achieved should a rating be undertaken.

Current project score target is 50 which would achieve an informal 4 Green Star rating for Australian Best Practice. Additional targets points may be pursued to increase star rating upon further review.

I am an appropriately qualified and competent person operating with >15 years industry experience in the field of HVAC design, installation and ESD analysis and as such qualified to assess building compliance in respect to ESD and appropriate performance-based requirements.

**Signature:**



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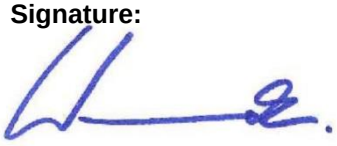

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# Appendix A - Greenstar Scorecard