If a building becomes architecture, then it is art. Clearly, if a building is not functionally and technically in order, then it isn't architecture either – it's just a building.
Arne Jacobsen

Mechanical Engineering
Lighting Design
Sustainable Design
Electrical Engineering

Copenhagen
London
Sydney
Canberra
Hong Kong
New York

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SUSTAINABLE DESIGN

STEENSEN VARMING

Marsden Park new high school and Melonba new primary school Ecologically Sustainable Development Report

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1.0 Executive Summary

This report has been prepared by Steensen Varming on behalf of the Applicant. It accompanies an Environmental Impact Statement (EIS) in support of State Significant Development (SSD- 41372302) for Marsden Park new high school (MPHS) and Melonba new primary school (MPS).

The purpose of this report is to summarise the Environmentally Sustainable Design (ESD) initiatives adopted for the MPHS and MPS, explain how the project has addressed the SEARs and, provide an overview of how the proposed design is responding to sustainable planning. The project is aspiring to target a 5 Star Green Star rating with the Green Star Design and As Built v1.3 tool.

At present, both schools are separately registered with the GBCA to target a Green Star certification. The aspiration is for the GBCA to allow each school to be registered under the Multiple Building Single Rating (MBSR) Campus Approach. The current direction is to keep the primary and secondary schools as separate projects until it can be confirmed that they will be delivered (designed & built) as one project. The feasibility of combining both into one campus/precinct may be looked at in the future. This will have to be confirmed by SINSW as the project progresses. Regardless, the selection of Green Star strategies is currently the same for both schools.

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2.0 Project Background

Project title	Marsden Park new high school and Melonba new primary school (SSD-41372302)
School titles	• Marsden Park new high school • Melonba new primary school
School references when referred to in text	• new high school in Marsden Park • new primary school in Melonba
Project citation (As per DPE Website)	New primary school and new high school to cater for 3,000 students and 219 staff
Project description	Construction of two new schools, new high school in Marsden Park and new primary school in Melonba, located at 20 Kaluta Avenue and 10 Swallowtail Street, Melonba. Marsden Park new high school is a new secondary school comprising: • 97 general learning spaces (GLS) and specialist teaching spaces; • Three supported education learning unit (SELU) rooms; • School hall, and lecture and movement studio; • Administration spaces; • Staff and student facilities; • Library; • Canteen; • Sports courts; • Playing field; • Landscaping and outdoor learning areas; • Covered outdoor learning area (COLA); and • Car parking (shared with Melonba new primary school). Melonba new primary school will comprise: • 44 GLS; • Three SELU rooms; • Administration and staff facilities; • Canteen; • Multi-purpose hall; • Library; • Out of School Hours Care (OSHC); • COLA; • Outdoor play areas including sports courts; and • Landscaped outdoor learning areas.
Site address	• Marsden Park new high school, 20 Kaluta Avenue, Melonba NSW 2765 • Melonba new primary school, 10 Swallowtail Street, Melonba NSW 2765
Allotments	Lot 30 DP 1237735
Site area	6.00 hectares: • Marsden Park new high school = 4 hectares • Melonba new primary school = 2 hectares
Site description	The site is located at 20 Kaluta Avenue and 10 Swallowtail Street, Melonba, which is within the Central River City Precinct and Blacktown Local Government Area (LGA). The site is irregular in shape and is sited between two tributaries of Little Creek. The site is generally level but has a gentle fall from the south-eastern corner (RL23) to the north western corner (RL19.5). The site contains no vegetation other than grass and is currently fenced to prevent unauthorised access.

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Surrounding development	To the north, east and south of the site is emerging and recently completed low density residential development comprising one and two storey dwellings. To the west of the site is an open space area (which serves a drainage function) and beyond this is Little Creek, a tributary to South Creek that flows north to the Hawkesbury River. Further to the south is an area zoned as B2 Local Centre, which has not yet been developed. The next phase of residential development in the area is located on the western side of Little Creek and is currently in the bulk earthworks phase to create the street network.
Local government area	Blacktown City Council
Aboriginal country	Dharug Nation
Road frontages	Elara Boulevard (northern boundary) Kaluta Avenue – Collector Road (eastern boundary) Swallowtail Street (southern boundary) Galah Street (western boundary)
School capacity	3,000 students: • Marsden Park new high school = 2,000 students • Melonba new primary school = 1,000 students
Staff capacity	219 full time equivalent (FTE) staff: • Marsden Park new high school: 127.9 teaching staff + 22.8 administration and support staff = 150.7 staff • Melonba new primary school = 58.5 teaching staff + 9.4 administration and support staff = 67.9 staff
School access	• New high school in Marsden Park primary pedestrian access will be from Kaluta Avenue. • New primary school in Melonba primary pedestrian access will be from Swallowtail Street. • Car parking for both schools will be accessed via Galah Street. • Kiss and drip facility located on Swallowtail Street and Kaluta Avenue. • Bus laydown located on Kaluta Avenue.
Parking provision	Parking spaces: • Total = 142 (including 2 adaptable spaces) – staff parking only • Marsden Park new high school students = 0 • Visitor spaces = 0 • Marsden Park new high school bike spaces = 84 • Melonba new primary school bike spaces = 60
Floor area	Gross Floor Area: • Total = 26,745m² • Marsden Park new high school = 19,230m² • Melonba new primary school = 7,515m² Outdoor Play space: • Total = 30,000m² • Marsden Park new high school = 20,000m² • Melonba new primary school = 10,000m² Play space per student: • Total = 10m² per student • Marsden Park new high school = 10m² per student Melonba new primary school = 10m² per student
Client and application	School Infrastructure NSW
Early works (Not included in this SSDA)	Installation of an electricity substation on Kaluta Avenue

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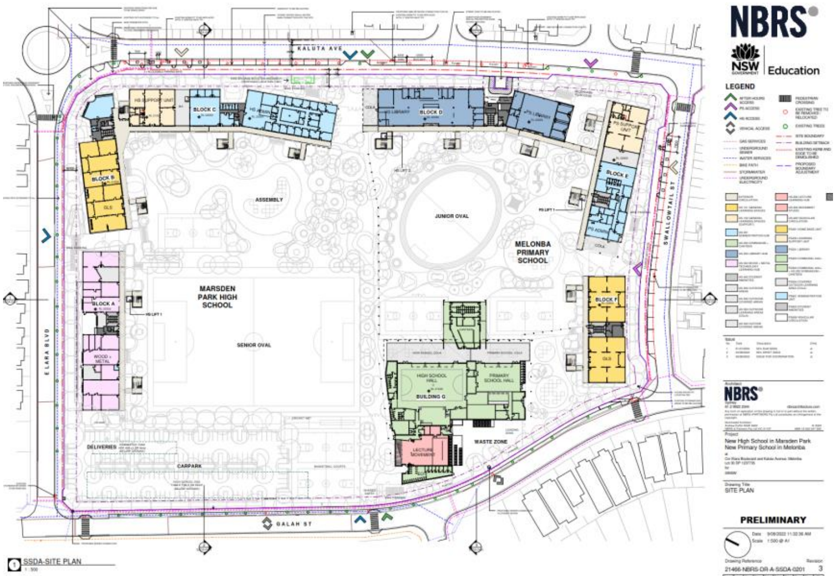
Aerial view of current site location area.



Preliminary SD Site Plan by NBRS Architects.

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3.0 Response to SEARs

This report is required by the Secretary's Environmental Assessment Requirements (SEARs). This table identifies the relevant SEARs requirement/s and corresponding reference/s within this report.

Table 1 – SEARs Requirements and Relevant Response and References

SEARs Requirements	**Project Response and reference in Report**
Ecologically Sustainable Development (ESD)	
Identify how ESD principles (as defined in section 193 of the EP&A Regulation) are be incorporated in the design and ongoing operation of the development.	The ESD initiatives proposed for the project aim to reduce the environmental impacts typically associated with buildings during the construction and ongoing operation of the building. The project utilises a resource hierarchy approach, with emphasis on avoiding, then reduction of energy, water, waste, and materials. The outcome of the resource hierarchy approach is to ensure the project aligns with the principles of ecological sustainable development (Section 193) of the Environmental Planning and Assessment Regulation 2021. **Refer to Section 3.1 and to 5**
Demonstrate how the development will meet or exceed the relevant industry recognised building sustainability and environmental performance standards, and integrate environmental design strategies in accordance with the Environmental Design in Schools Manual.	An assessment against the Green Star D&AB v1.3 has been undertaken. The project aspires to achieve a 5 Star certified rating under the Green Star D&AB v1.3 tool. The GANSW Environmental Design in Schools Manual has been considered as part of the design guidelines used for this project. This guidance Manual also shares goals and targets with the EFSG and Green Star both of which have been considered for this project. **Refer to Section 4 and 5**
Demonstrate how the development minimises greenhouse gas emissions (reflecting the Government's goal of net zero emissions by 2050) and consumption of energy, water (including water sensitive urban design) and material resources.	The minimisation of GHG emissions and consumption of energy, water and material resources are demonstrated in Section 5.0. **Refer to Section 5**

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3.1 Project Response to section 193 of the EP&A Regulation 2021

The ESD initiatives proposed for MPHS and MPS aim to reduce the environmental impacts typically associated with buildings during the construction and ongoing operation of the building. The project utilises a resource hierarchy approach, with emphasis on avoiding, then reducing the use of energy, water, materials etc.

To ensure a sustainable outcome, the following are key strategies being considered within the proposed design:

- Design high quality spaces to promote comfortable and productive learning environments, while supporting the functional demand of the building, i.e. a learning / teaching environment. Key design emphasis is on achieving optimised Indoor Environmental Quality (IEQ) and occupant comfort (including optimised indoor air quality, thermal, acoustic and visual comfort)
- Incorporate a high-performance building envelope, to ensure energy efficiency as well as occupant comfort (including thermal, visual, and acoustic comfort)
- Incorporate appropriate passive and active design strategies to ensure a low-energy as well as low-maintenance design outcome
- Adopt water sensitive urban design principles
- Adopt practices to minimise demolition, construction and operational waste including recycling of demolition and construction waste.
- Utilise environmentally preferable materials

The outcome of the resource hierarchy approach is to ensure the project aligns with the ecological sustainable development principles of section 193 of the Environmental Planning and Assessment Regulation 2021 and the four key principles and our response listed below.

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Principle	Project Response
The Precautionary Principle 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. Decisions should be guided by: (i) Careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment; (ii) An assessment of the risk-weighted consequences of various options.	The project site has been selected to minimise the amount of greenfield / park land that will be used. The landscape strategy has been developed to enhance the environmental performance of the land, including integration of native plant species and incorporation of water sensitive urban design features to passively manage storm water falling on the site and enhance biodiversity.
Inter-Generational Equity The present generation should ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations.	The project will minimise the impact on the environment through: Resource efficiency measures and selected low embodied carbon materials and using recycled materials where possible Energy, water and waste reduction and conservation measures to reduce consumption of resources. Landscape strategies and WSUD features to enhance biodiversity and the site's ability to passively control stormwater Connection to country – Integration of indigenous and aboriginal design considerations and features.
Conservation of Biological Diversity and Ecological Integrity Conservation of biological diversity and ecological integrity should be a fundamental consideration.	The landscape strategy considers the protection of existing ecological features in the locality, and the design will enhance the overall biodiversity and ecological performance of the site.
Improved Valuation, Pricing and Incentive Mechanisms Environmental factors should be included in the valuation of assets and services, such as: (i) 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.	A sustainability strategy is being developed for the project to assess a wide range of sustainability strategies between the client, design team and stakeholders. Strategies have been developed to achieve the highest sustainability and environmental performance while aiming to remain within budget and minimise high costs.

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4.0 Targets / Benchmarks

In addition to the Secretary's Environmental Assessment Requirements (SEARs), the following environmental targets are aspired by MPHS and MPS

- Exceed the requirements of Section-J of the National Construction Code (NCC) for energy-efficiency in building fabric and building services / systems.
- Demonstrate good design through early-stage modelling and guidance, in general accordance with the best practice standards and guidelines;
- Align with new Government Architects NSW school guidelines such as:
    - Better Placed Design Guide;
    - Design Guide for Schools;
    - Environmental Design in Schools;
    - Greener Places;
    - Aligning movement and place;
- Align with Educational Facilities Standards & Guidelines.

4.1 NCC Section-J

Section-J of the National Construction Code (Previously known as the Building Code of Australia) 2019 relates to "energy efficiency of buildings". Section J is a minimum performance target for standard buildings and specifies minimum performance targets known as deemed-to-satisfy (DTS) requirements, for building fabric and services. The proposed school projects aim to exceed the DTS requirements of Section-J, this will be further developed during Schematic Design phase.

4.2 Green Star

As a minimum, aspire to achieve a 5 Star Green Star Design and As Built v1.3 Rating. This is considered by the Green Building Council of Australia (GBCA) as aligning Australian Excellence outcome.

The Green Star rating tool is a framework developed by the Green Building Council of Australia (GBCA) and is categorised in 9 sustainability categories which are:

- Management
- Indoor environment quality
- Energy
- Transport
- Water
- Materials
- Land Use and Ecology
- Emissions
- Innovation

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5.0 Sustainability Approach

Sustainable building design involves a holistic and integrated design approach, which builds on an increased awareness of site opportunities, form and function, to encompass and target a broad range of sustainable design initiatives.

For the MPHS and MPS, the key priorities to support the functional demand i.e. a learning / teaching environment, are as follows:

- The promotion of natural daylight;
- High levels of IAQ (Indoor Air Quality);
- Thermal, Visual and Acoustic comfort;
- Resource conservation (energy, water, and waste);
- The creation of an integrated community resource; and
- The development of the building and surrounds as a teaching tool.

The promotion of natural daylight – There is a direct correlation between access to daylight and student performance, attention, productivity, and general wellbeing. The project will aim to maximize daylight availability while taking into consideration heat gains and glare concerns.

Excellent Indoor Air Quality (IAQ) – In a similar manner to daylight, there is proven correlation between student performance, occupant wellbeing, student attendance and staff retention. Key strategies considered include:

- Increased levels of outside air through the promotion of mixed mode or natural ventilation strategies and increased outdoor air allowances.
- Mould prevention through the avoidance of thermal bridges, condensation and effective strategies in ventilation, odour and pollution control.
- Low pollutant emitting materials selections such as low VOC paints, adhesives, sealants, composite woods etc.

Excellent Thermal, Visual and Acoustic comfort:

- Thermal comfort: To ensure teachers, students and administrators are not subject to unacceptable extremes in temperature as they teach, learn and work.
- Visual comfort: To ensure the quality of light is supportive of visual tasks such as reading and presenting. In design for natural daylight, consideration must be given to daylight uniformity, penetration depth, solar heat ingress and glare control.
- Acoustic comfort: To ensure effective communication can always be achieved, noise from ventilation systems, external and internal disruptive noise affecting classrooms is minimised.

Resource conservation (energy, water and waste) – In delivering on the functional demands of an educational building (high levels of daylight, thermal comfort, visual comfort, and IAQ), incurs resource use through the optimisation of these attributes. These are to be supported with minimal consumption of energy and water resources, or the generation of waste and pollution in demolition, construction, and operation of the building. Our approach to resource conservation is based on applying a "hierarchy" methodology as outlined in Section 5.1.

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The creation of an integrated community resource – The School will play a role within the local community through the use of shared facilities (auditoriums, sport facilities and open spaces), facilitating events such as community gatherings, sports events and community events;

The development of the building and surrounds as a teaching tool – Students develop greater knowledge retention, understanding and awareness, when they have the opportunity to interact directly with their environment through the mediums of touch, sight and feel, compared to the traditional textbook learning.

The above approach has been taken to ensure the ESD strategies proposed meet the SEARs and targets/benchmarks discussed in the previous section.

The following sections provide a high-level overview of the strategies considered.

5.1 Resource Conservation

This section provides an overview of the resource conservation measures.

5.1.1 Energy

The proposed approach to sustainability and energy related systems is based on applying an "energy hierarchy" methodology.

This methodology has the reduction of energy use as its priority, and then seeks to meet the remaining energy demand by the most efficient means available, before the inclusion of on-site generation and procurement of green power.

The following energy initiatives will be considered, and their individual merits will be assessed further during future design stages:

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- **Building Form** has been designed with consideration of façade access for greater access to natural daylight and opportunity for natural ventilation, within the constraints of the site.
- **Passive design principles** will be employed to respond to environmental conditions of the building including orientation, solar access, prevailing winds, seasonal and diurnal temperatures changes.
- **Building envelope performance** (airtightness and thermal) will be enhanced by prefabrication where possible.
- **A Mixed Mode Ventilation strategy** will be accessed for improved indoor air quality, whilst also reducing energy consumption associated with air-conditioning. When external and internal conditions are favourable, external windows to each building / space can open to facilitate natural ventilation.
- **Building energy performance improvement –** Aiming to exceed minimum NCC compliance by 10%.
- **Energy efficient LED lighting, zoning, controls and site co-ordination** for both internal and external lighting systems are to be designed.
- **Occupancy controls** will be provided to spaces so that AV, lighting and mechanical systems can be shut down both manually and automatically when unoccupied where appropriate.
- **Performance glazing** – Glazing should be selected to optimise performance, admitting as much daylight as possible, while controlling the transmission of solar heat and thermal conduction
- **Glazing ratio** – Glazing ratios need to achieve an equilibrium between allowing daylight to enter buildings while reducing solar and conductive heat gains
- **Glazing position** – Windows should be positioned to block unwanted solar radiation, while allowing visible light and possibility for natural ventilation
- **External Shading** – Helps restrict unwanted heat gains within spaces, while allowing daylight access. Deciduous trees can also help shade direct solar ingress. Abundant external shading is being included in the project.
- **Building air tightness** – Doors should be designed to close automatically to reduce unwanted heat transfer during peak summer and winter conditions. Consider revolving doors where applicable to maintain air tightness
- **Thermal Mass** – Exposed thermal mass can reduce the rate of change of temperatures within buildings and reduce the peak heating and cooling demands
- **A Solar photovoltaic (PV) array** can be located on rooftops. Energy generated onsite can be reused onsite.
- **High efficiency HVAC (Heating, Ventilation & Air-conditioning)** systems to be incorporated.
- **CO2 monitoring** in the appropriate control of outdoor air provisions.
- **Metering and Monitoring** of energy, water and air quality to promote healthy environment and save energy and resources.
- **Building Management Systems** to link to sensors and meters, with the ability to control lighting, hydraulic and mechanical systems and reduce energy usage.
- **Comprehensive System Commissioning** to ensure the building functions as designed.
- **Promote** the switch to renewable energy and building electrification.

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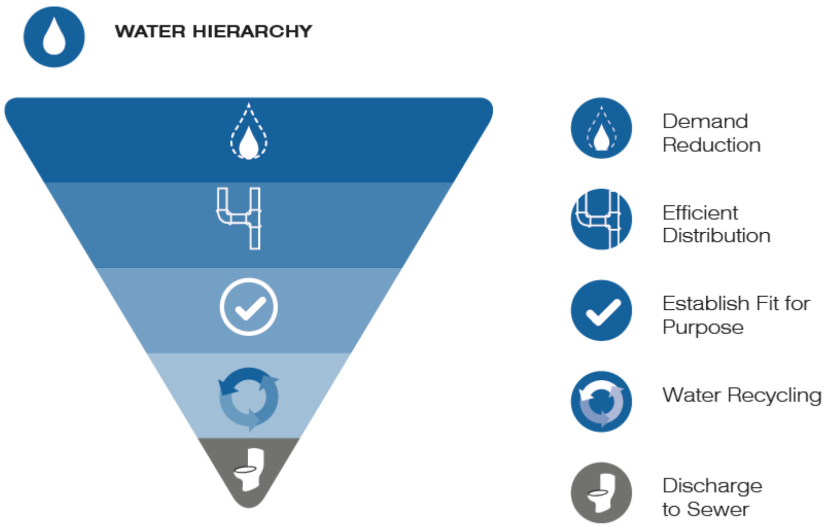
5.1.2 Water

The following hierarchy and strategies will be applied:



The following water initiatives have been proposed and their individual merits will be assessed further during future design stages:

- **Water efficient fixtures / fittings will be specified.** These include fittings such as taps, showerheads, toilets, zip taps, dishwashers etc certified under the WELS rating scheme.
- **Rainwater Reuse** - Rainwater collection and reuse systems will be accessed. Reuse options include landscape irrigation and toilet flushing.
- **Fire Systems test water** capture and storage for re-use using the rainwater tank will be assessed.
- **Efficient water management** including water reuse, wastewater management, leaks detection, water monitoring and managing.
- **Drip and demand-controlled irrigation** to optimise irrigation supply.
- **Native species of plants** and low water demand landscape design strategies.

5.1.3 Materials and Waste

Selection of environmentally preferable materials is a key priority for the project, because building materials consume energy and natural resources during its manufacture and for their transportation to the construction site. Choices of materials and construction methods can significantly change the amount of energy embodied in the structure of a building. Regarding waste, a waste consultant has been engaged to prepare a Waste Management Plan for the schools. Refer to the Waste Consultant report (Construction & Demolition Waste Management Plan) for further detail.

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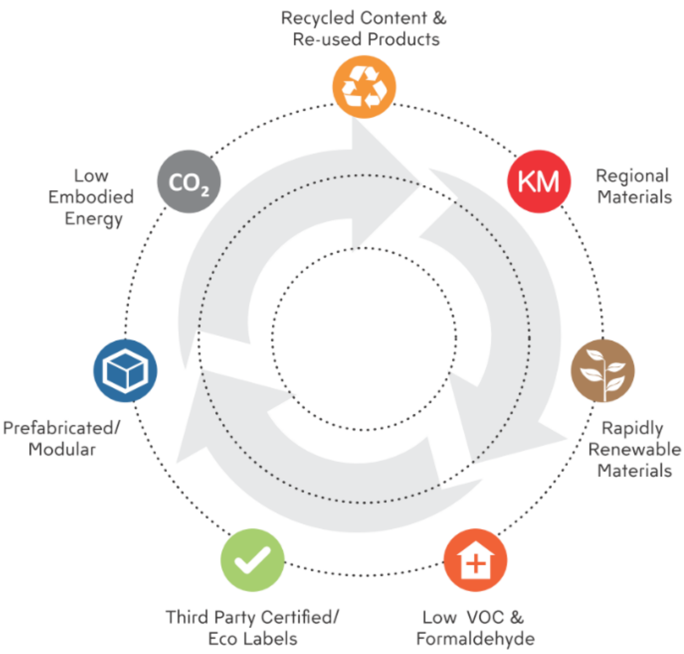

Low-impact construction methods such as prefabrication shall be considered where possible. Prefabricated structures built in purpose-built factories are less labour intensive, more time efficient, and produce less waste compared to traditional onsite construction methods. Raw materials and construction elements are not exposed to the elements, which ensures high quality in the final building, and the construction process is less weather dependant.

Preference will be given to materials that contain high-recycled content and/or are highly recyclable. The following material initiatives have been considered and their individual merits will be assessed further during future design stages:

- **Sustainable timber** – Timber products used for concrete formwork, structure, wall linings, flooring and joinery will be sourced where possible from reused, post-consumer recycled or FSC-certified, or PEFC certified timber.
- **Steel** – will be specified to meet specific strength grades, energy-reducing manufacturing technologies, and off-site fabrication. Steel will also be sourced with a proportion of the fabricated structural steelwork via a steel contractor accredited by the Environmental Sustainability Charter of the Australian Steel Institute.
- **Recycled concrete** – The project aims to reduce the use of Portland cement through substitutions. Fine and coarse aggregate inputs are to be sourced from manufactured sand or other alternative materials, and the amount of Portland cement will be reduced within the concrete mix.
- **High recycled content or recyclability** – Furniture items with high recycled or recyclability content to be considered.
- **Site waste management plan**. During the demolition and construction phase, a project-specific site waste management plan (WMP) will be developed and implemented, for recycling of demolition and construction waste.

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5.2 Emissions

The following initiatives have been considered and their individual merits will be assessed further during future design stages:

Proposed design aims to reduce of all forms of emissions, including watercourse pollution, light pollution, and ozone depletion.

- **Water Sensitive Urban Design (WSUD)** integrates water cycle management with urban planning and design. The aim of WSUD is to manage the impacts of storm water run-off from the development to protect and improve waterway health by replicating the natural water cycle. As part of the WSUD, the development will aim to incorporate rainwater reuse and storm water management.

- **Storm water pollution prevention -** This would include implementation of measures to prevent storm water contamination, to control sedimentation and erosion during construction and operation of the building. The storm water drainage system can prevent storm water contamination, control sedimentation and erosion during construction and operation of the building.

- **Pollution of night sky** will be minimised by ensuring that the electric lighting within the site will not cause any direct beam of light into the night sky. Light pollution can disturb the habitat of migratory birds and impacts the behaviour of nocturnal animals in the site vicinity.

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5.3 Resilience

The project will seek to identify and develop strategies to increase the resilience of the Campus in response to potential risks arising from climate change.
The latest available global climate models show that in the coming decades,

Australia is projected to experience the following:

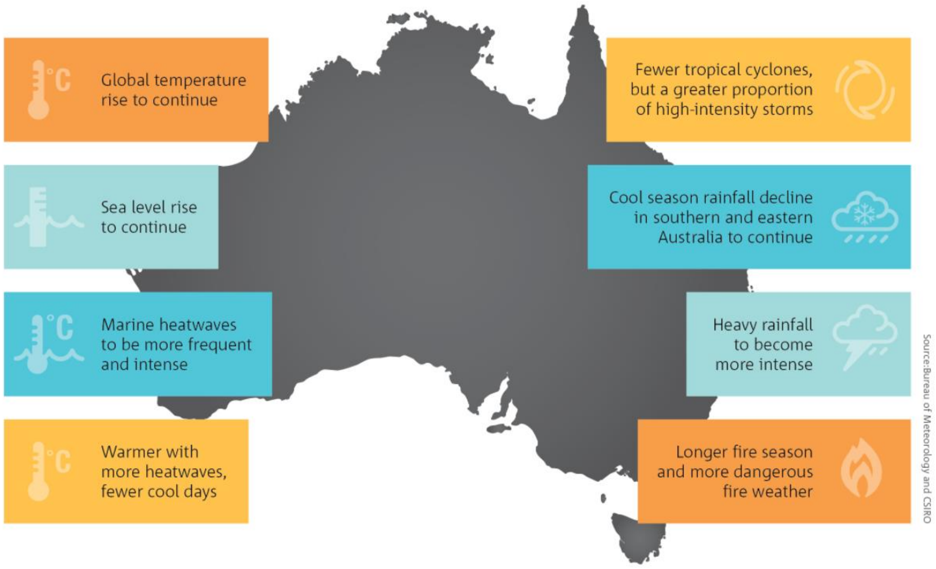

Figure 4: Summary diagram of climate projections for Australia. CSIRO and Bureau of Meteorology. Source: CSIRO

The below climatic variables will be considered to develop a resilience strategy for the Campus.

- Temperature
- Precipitation
- Fire weather/Bushfires
- Drought
- Flood
- Solar Radiation
- Relative Humidity
- Evapotranspiration
- Soil Moisture
- Wind
- Sea-level rise
- Cyclones

A high-level assessment of possible Climate Change impacts has been carried out during this stage to assess how the public realm design and services strategy will respond to future expected climate conditions. An overview of predicted future conditions and the project's response is presented below.

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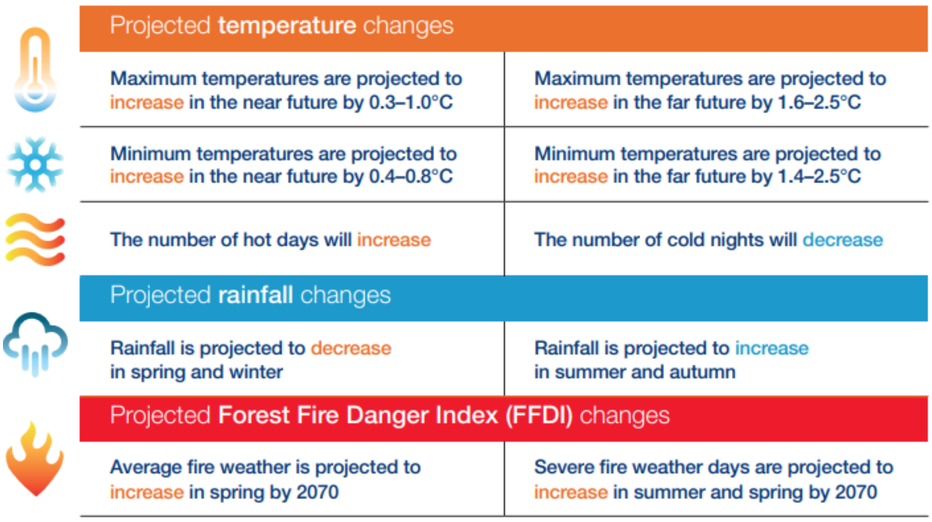
Australia's climate has seen gradually increasing average temperatures over the past century, with an increase of just over 1ºC since 1910. Most of this increase has occurred since 1950 and 8 of Australia's top ten warmest years on record have occurred since 2005. It has also seen an increase in the number of extreme temperature days (days where temperatures exceed the 99th percentile of each month from 1910-2017).

This trend is predicted to continue, and the extent of the warming will be based on global emissions scenarios. The current projections (source: Adapt NSW) are as follows:

Climate Projections for:	Near future (2020-39) Annual:	Long term (2090) Annual:
Change in mean temperature	+0.65°C	+1.94°C
Change in rainfall	+1.7%	+8.9%
High fire danger days	+0.0	+0.6
Hot days over 35°C	+3.9	+10.4

5.4 NARClim projected impacts of climate change

To assess the climate projections for the region, the NSW and ACT Regional Climate Modelling (NARCliM) project has been considered. Charmhaven is between the Sydney Metropolitan and Hunter Areas, which given the diverse topography of the region results in a large range of climates.
NARCliM Climate change projections are presented for the near future (2020-2039) and far future (2060-2079), compared to the baseline modelled climate (1990–2009). The projections are based on simulations from a combination of twelve climate models run to provide detailed future climate information for NSW and the ACT considering temperature, hot days, cold nights, rainfall, and fire weather.
While all projections will be considered, given the life span of the project projections for the far future (2060-79) will be considered in more detail. The diagram below summarizes the main trends regarding climate change projections for the area:



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The table on below summarizes a high-level review of climate change risks and a review of how the design can address these risks.

Climate Impact	Risk	Response / Design Considerations
Increase in **hailstorms**	Blocking gutters / Damage to buildings / Injury to visitors	Maintenance management plan / predictive maintenance / Visitor Management Plan **Passive design optimisation** to reduce impact of extreme temperatures
Increase in **extreme hot days and average temperatures**	Stress on electricity network / **blackouts** Increased **internal temperatures** Greater **energy consumption** Higher **peak loads** Accelerated **degradation of materials**	**Redundancy** built into cooling capacity **Thermal Storage** – manages peak loads **Durable materials** selection **Mechanical System** to be able to respond to extreme temperatures
Increased **drought duration**	Restrictions to **water supply** **Damage to landscape** and higher maintenance costs	**No water-based heat rejection** to be used **On-site efficiency measures** to reduce potable water demand **Drought resistant planting** selection
Increased **fire weather**	**Smoke from bushfires** causing health impacts **Damage to powerlines** impact supply	**Back-up power** systems & **onsite generation** **Filtration** for air intakes into buildings
Increased **rainfall variability And flooding**	Damage to buildings, landscape, and infrastructure. Flooding impacts	**Sustainable urban drainage** features will capture, treat, store stormwater, and reduce outflow. **Predictive / forecast management** of water storage
Increased **storm intensity**	Blowing debris causing property damage and safety risks Interruption of waste collection services	**Durability** of materials selection **Predictive management** planning in even of large storm events

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Considering the above, the project will analyse key risks arising from climate change projections for the parts of the project affected, as well as mitigation strategies to eliminate or reduce such risks as much as possible.

Key strategies to consider include:

- Passive Design Optimisation for buildings. (Increasing insulation R-values / Glazing ratios and performance / Shading / Air tightness / Heat recovery / etc.)
- Allow for natural ventilation and good air flow in indoor and outdoor areas to allow for some increase in temperatures during peak times while maintaining comfortable conditions.
- Increase in plant capacity in buildings to accommodate increased temperatures.
- Provision of trees and covered walkways for shading to connect outdoor spaces with buildings.
- Use of soft landscape to reduce the heat island effect and improve outdoor thermal comfort. Were possible include cool paving with high albedo surface and hardscaping and roofing materials with high Solar Reflectance Index (SRI) being mindful of glare.
- Include planting around parking and other areas adjacent to hardscaped areas to improve shading and to reduce the heat island effect.
- For landscaping, select native species with low water requirements.
- Include Water Sustainable Urban Design features such as bioswales, raingardens, permeable paving, and attenuation tanks in paving systems to contribute towards natural absorption and water detention against potential increased storm events.
- Collect and reuse rainwater from roofs to be used for irrigation and potentially other uses if possible.
- Reduce Water consumption through efficient irrigation systems and efficient water fixtures.
- Design hardscape levels to allow for passive irrigation.
- Selection of robust materials.
- Include shading around external plant areas for improved cooling performance.
- Maximise landscaping
- Include onsite energy generation where possible (On roofs and other structures such as shading).

5.5 Additional Key Measures

The following measures are being considered for the schools. These measures are intended to reduce the environmental impacts associated with the construction of new buildings.

- **Environmental Management Plan (EMP)** – An EMP will be developed and implemented for the construction stage, including demolition and excavation, to address environmental, worker health and safety and community risks. The EMP is a project specific plan and developed using State and Federal Guidelines and standards. The main contractor will implement an Environmental Management System certified to the ISO 14001 standard to ensure the objectives of the EMP are met.

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- **Site waste management plan** – During the demolition and construction phase, the development of a project-specific site waste management plan (WMP) will be assessed to reduce recycling of demolition and construction waste.
- **Comprehensive commissioning** – pre-commissioning, commissioning, and quality monitoring for all building services to be considered.
- **Waste storage** will be provided dedicated to the separation and collection of recyclable waste.
- **Cycle parking and end of trip facilities** – Inclusion of bicycle parking racks, and end of trip facilities for staff are being considered.
- **Biophilia** – Encourage students to have a strong connection with Nature by maximising views to the outside through classroom arrangement looking out to play space.

5.6 Green Star Targets & Score Summary

This section will present the current status of achievement against the 5 Star Green Star rating target the project is aspiring to meet.

GBCA's Green Star Design & As Built v1.3 Evaluation tool is being used during the design process to consolidate the targeted credits and define the overall score. The selection of the credits targeted has been based on the following:

- ESD target requirements
- Review of site, context, and proposed design
- Opportunities & constraints identified within the current design
- Key ESD specific considerations (As described in Sections 5.1 to 5.5)
- Alignment with School's Infrastructure Educational Facilities Standards & Guidelines (EFSG)

The project team have discussed the project sustainability targets and their application to the project. The strategies were discussed during two ESD workshops undertaken on 10/05/2021 and 15/07/2022 and through ongoing consultation with the design team. The outcome from these workshops, and subsequent discussions with the design team assisted in reviewing and classifying each credit into one of the following three categories:

- Targeted Points, (Low risk)
- Stretch Points (High to medium risk / TBC with project team)
- Not targeted / not achievable.

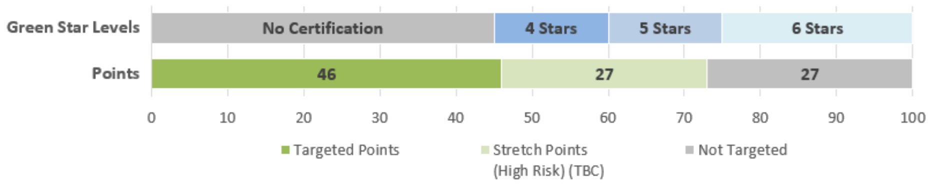
As the process progresses, some items will be confirmed, some will require more work, other will be pursued though specifications and contractor requirements.

We recommend additional points are targeted over and above the minimum points required to achieve a certain rating. Buffer points are recommended as a safety against loss of points which can occur during the design and construction stages. This is to allow for some variation during the design and construction period.

Requirement	Score
Minimum points required to achieve a 5 Star Rating	60
Minimum buffer points required	5
Total minimum score at tender	65

The current assessment process identified low risk items worth 46 points and stretch points items to be confirmed worth 27 points (totalling 73 points). There is a sensible buffer above minimum threshold at this stage to reduce the risk of noncompliance and achieve the aspirations set for the project.

The points are currently being investigated and further design development is needed to provide more confidence in the score when sensible for the project. A summary of the score distribution is presented below:



Green Star Score Summary per category

Category	Available Points	Targeted Points	Stretch Points	Total Points
Management	14	11	3	14
Indoor environmental quality	17	12	2	14
Energy	22	2	6	8
Transport	10	-	10	10
Water	12	5	0	5
Materials	14	5	1	6
Land use & ecology	6	-	2	2
Emissions	5	4	0	4
Innovation	10	7	3	10
Total	**110**	**46**	**27**	**73**
5 star Target	**60**	**Fail**		**Pass**

As the project progresses and more points can be confirmed, enough points will be shifted from the stretch points category to the targeted points category to meet the 5 Star Certification the project is aspiring to meet.

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6.0 Conclusion

This report provides a list of recommended sustainability strategies and an ESD approach for MPHS and MPS in line with the project brief and the schematic design proposed.
The following steps are recommended to help further consolidate a set of sustainability strategies and targets and embed these into the project:

- Review of the Stretch Points to determine achievability and further coordination with design teams for strategy development as design develops at the end of SD stage and subsequent stages.
- Teams to carry out or finalise calculations, modelling or analysis required to support strategies and achieve Targeted Points (e.g., JV3, daylight, views, and energy modelling, water calculations and climate risk assessment.)
- Coordination with QS to ensure any cost impact from required strategies is included within the cost plan and within the procurement requirements
- Finalise set of strategies to be agreed by the design team, stakeholders and SINSW to confirm the required performance standards will be met.