MOSMAN HIGH SCHOOL UPGRADE

745 MILITARY ROAD, LOT 1 DP: 1268793

MOSMAN, NSW

ESD REPORT

FOR

STATE SIGNIFICANT DEVELOPMENT APPLICATION (SSDA)

MULTIPLEX CONSTRUCTIONS PTY LTD

Client

EMF GRIFFITHS

Sustainability Consultants

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EXECUTIVE SUMMARY

EMF Griffiths have been engaged by Multiplex Australasia Pty Ltd as ESD Consultants to prepare this ESD report in support of the State Significant Development Application (SSDA) for the Mosman High School Upgrade project (the project).

This report provides an outline of the Ecologically Sustainable Development (ESD) initiatives included in the project as well as future commitments to ensure best practice design and construction in regard to ecologically Sustainable Development (ESD).

The project is led by School Infrastructure NSW (SINSW) and comprises a new four (4) storey building and associated landscaping works. The new building includes additional general learning spaces, canteen, library, staff rooms, administration areas, and arts and sports facilities. For SSDA, the schematic design proposal for the new building and associated landscaping works of selected areas of the existing school facilities are the subject of this report.

The project is subject to the following sustainability policies and regulations: -

- National Construction Code (NCC 2019) Section J for Energy Efficiency.
- Government Resource Efficiency Policy (GREP).
- School Infrastructure NSW Educational Facilities Standards and Guidelines (EFSG) (15/04/2020), comprising a collection of Design Guides (DGs) and Specification Guides (SGs).
- The objectives of the Department of Planning, Industry and Environment (DPIE).

The above documents contain provisions that translate into best practice sustainable design targets and objectives for the project, requiring to develop a series of ESD strategies from early design phase. This SSDA report captures the ESD strategies in place in a first instance for the SSDA stage and outlines the ESD strategies that will guide project design as it evolves, demonstrating how the project addresses the SEARs requirements issued by the Department of Planning, Industry and Environment (DPIE).

The project has been benchmarked with a 4-star Green Star – Design & As Built v1.3 rating to ensure that best practice in sustainable design is achieved and demonstrated. The Green Star pathway is provided in Appendix A.

The project is subject to the requirements from SINSW's Design Guide 02 (DG02) Ecologically Sustainable Development, which sets the mandatory ESD provisions that need to be addressed. DG02 requires to include ESD principles to a level that the building could be benchmarked to achieve a 4-star Green Star rating, which is considered to be best practice within the Australian building industry. In this case, the Green Star strategy is based on an "equivalence" of Green Star outcome without formal certification by the Green Building Council of Australia (GBCA).

Key ESD initiatives included in the project are: -

- A building design that is responsive to the local climate and includes passive design measures to provide high quality indoor environments that are thermally comfortable and have adequate access to fresh air and natural light.
- Façade optimisation to ensure the project meets the energy efficiency requirements of NCC 2019 Section J while providing adequate levels of daylight and visual connection to nature.
- Measures to reduce potable water consumption including water efficient fixtures and fittings and a rainwater tank to enable rainwater reuse for irrigation.
- Measures to reduce energy consumption including energy efficient building systems and controls, including LED lighting and efficient mechanical systems coupled with occupancy sensors.
- A landscaping strategy that focuses on the retention of existing trees and provides adequate shading and a diversity of spaces for equitable access to outdoor play and learning.
- Provisions for the future installation of a **45.4 kW** PV system by SINSW.

SECTION 1

INTRODUCTION

SECTION 1.0 INTRODUCTION

1.1 PURPOSE OF THIS REPORT

This report identifies and responds to relevant government policy, targets, and requirements pertinent to the Mosman High School Upgrade project (the project). Its primary purpose is to detail how the project addresses Item 8 'Ecologically Sustainable Development' (ESD) of the Secretary's Environmental Assessment Requirements (SEARs) issued by the Department of Planning, Industry and Environment (DPIE).

This report forms part of the Environmental Impact Statement documentation required to meet the SEARs.

1.2 CONTENTS OF THIS REPORT

This report describes the ESD initiatives that have been investigated and included in the project as well as the ESD initiatives to be considered in future development phases to achieve and demonstrate national best practice in sustainable development. This includes benchmarking the project against a 4-star Green Star – Design & As Built v1.3 rating and demonstration of project alignment with the ESD strategies from the Government Architect NSW (GANSW) Environmental Design for Schools Manual.

1.3 PROJECT OVERVIEW

School Infrastructure NSW (SINSW) are planning a major upgrade at Mosman High School to bring students the latest educational facilities, support the growing local community and deliver on an election commitment announced in the 2018/19 Budget.

Mosman High School is a secondary school in the Chatswood Secondary School cluster. Early planning works have been undertaken by SINSW to assess the case for change at the school, concluding that a capital intervention is required to ensure functional and operational facilities are provided.

Mosman High School has experienced an increase in enrolment pressures and this trend is anticipated to continue as per the forecast modelling through to the year 2036 and beyond. This is mainly due to the unprecedented rise of student movement from private to public schools within Sydney's North Shore and a growing population.

The current multipurpose hall core and teaching spaces are significantly undersized and are in poor condition. Given the current enrolment pressures, current core facilities will not sustain future growth and conditions will likely worsen. Staff rooms are also significantly undersized. The current number of forty-nine (49) teaching spaces will not sustain future enrolment growth and a lack of action may result in future enrolment pressures and growing vulnerability to existing school assets. Limited teaching spaces at the school inhibits opportunities for student learning.

Mosman High School is severely restricted in student outdoor space. The current average of outdoor play space per student is 5.5m^2, in comparison to the Chatswood Secondary School cluster average of 16m^2. This also prevents the installation of additional demountables on site to alleviate the pressures.

The project proposes upgrades to Mosman High School to increase the capacity and deliver contemporary facilities to support high-quality educational outcomes to approximately one thousand two hundred (1,200) students to address enrolment growth and meet the needs of students within the local community.

1.4 DESCRIPTION OF WORKS

Development consent is sought for the following works: -

- Demolition of Building B, Building C and part Building E.
- Removal of existing sports court and surrounding retaining walls and nominated trees.
- Construction of a new part three (3) / part four (4) storey school building **plus lift overrun and not enclosure to rooftop multi-court** (Building G) on the corner of Military Road and Belmont Road providing: -
    - Administration and staff facilities.
    - Multipurpose gym/hall.
    - Library.
    - Canteen facilities.

- General and senior learning units.
- Science learning unit.
- Health / PE and performing arts unit.
- Learning and admin support unit.

- Associated landscaping works including new outdoor play areas, a rooftop play space and rooftop **multi-purpose** court.
- **Relocation of the main pedestrian entrance from Military Road to Belmont Road.**

A detailed project description is provided within the Environmental Impact Statement for the project.

1.5 SITE DESCRIPTION

The site is located on **745** Military Road, **Lot 1 DP: 1268793,** Mosman, NSW, on coastal land in the centre of the business and shopping district of Mosman, within the Mosman Council Local Government Area (LGA). The campus is bound by Belmont Rd (North), Military Rd (East), Avenue Rd (South) and Gladstone Ave (West). The immediate surrounding environment of the site is majority residential with Balmoral to the East, Cremorne to the West, Clifton Gardens to the South and Georges Heights to the Southeast. The site possesses notable surrounding views accessible from the site, including coastline vies to the East, providing a contact with nature; with the Balmoral coast only 5 km from the site.

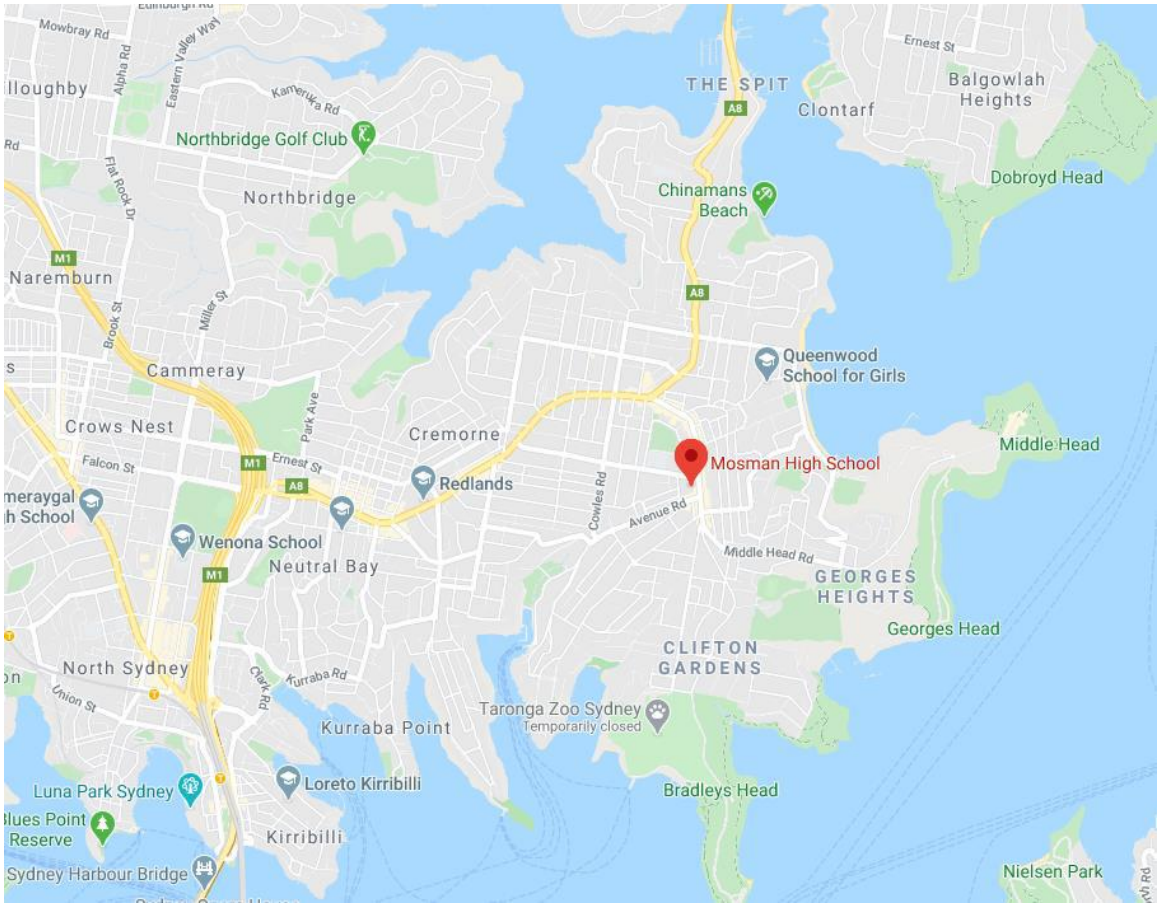

Figure 1: Site Location with Surrounding Suburbs (Source: Google Maps)

A magnified image of the project site is seen in Figure 2, with the school boundary in red, surrounded by retail and residential area. Within the Mosman High School campus.

Figure 2: Mosman High School Aerial Image of Site (Source: DJRD)

1.6 SITE CLIMATE

The site is a coastal climate with mean minimum annual temperature ranging from 10.5˚C in winter to 20.6˚C in summer; and mean maximum annual temperature ranging from 17.3˚C in winter to 24.8˚C in summer. Figure 3 below shows twenty-five (25) year average temperature data.

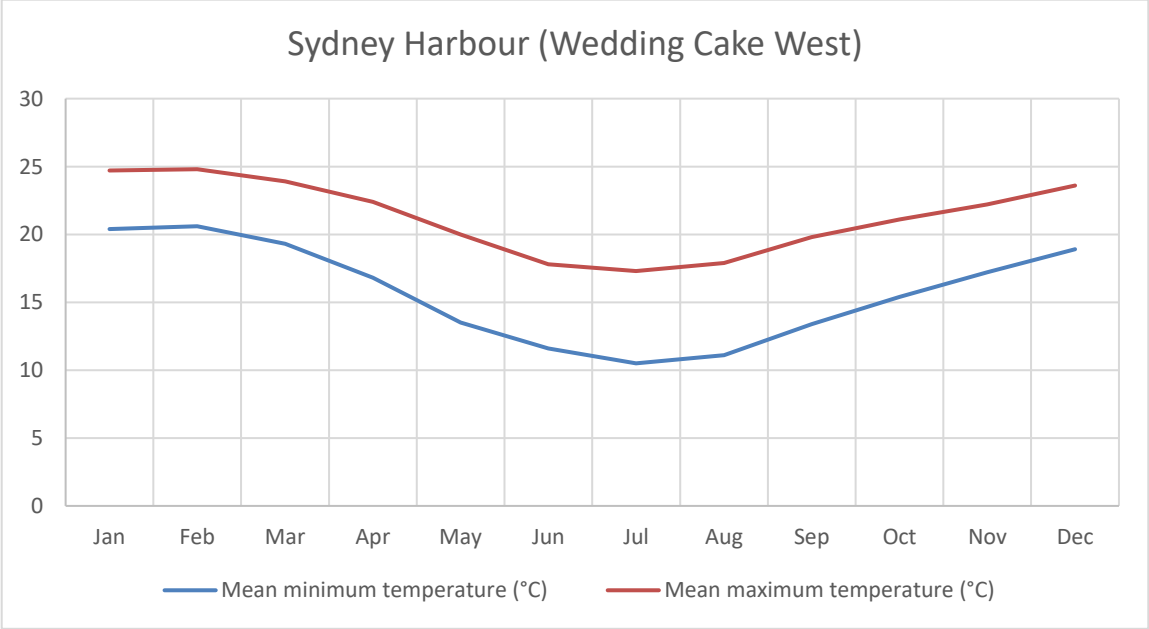

Figure 3: Sydney Harbour (Wedding Cake West) Temperature Data for Years 1997 – 2021.

Based on the Bureau of Meteorology (BOM) Sydney Harbour (Wedding Cake West), the monthly average 9am wind speed ranges from 15.8-19.3 km/h in Southwest to West direction, compared with an increase at 3pm to a monthly average wind speed of 20.1-27.6 km/h blowing in generally a Northeast direction.

Rainwater data from the Observatory Hill weather station indicates an annual average rainfall amount in the range of 821.8 -1551.2mm. 2020 data is shown in Figure 4.

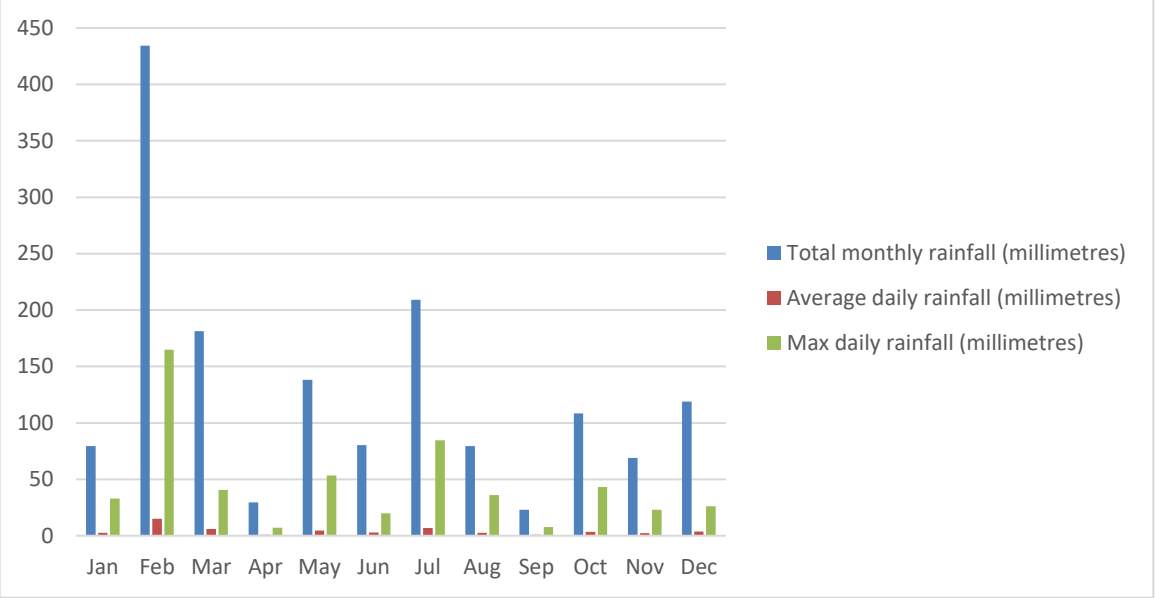

Figure 4: Sydney Harbour (Observatory Hill) Rainfall Data for 2020.

SECTION 2

ASSESSMENT REQUIREMENTS AND DESIGN RESPONSE

SECTION 2.0 ASSESSMENT REQUIREMENTS AND DESIGN RESPONSE

2.1 SEARS REQUIREMENTS

The Department of Planning, Industry and Environment (DPIE) have issued Secretary's Environmental Assessment Requirements (SEARs) to the Applicant for the preparation of an Environmental Impact Statements (EIS) for the proposed development. This report has been prepared having regard to Item 8 Ecologically Sustainable Development of the SEARs, as detailed below: -

SEARs Requirement	Relevant Section of Report
Detail how ESD principles (as defined in clause 7(4) of Schedule 2 of the Regulation) will be incorporated in the design and ongoing operation phases of the development.	2.4
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.	2.5
Demonstrate how environmental design will be achieved in accordance with the GANSW Environmental Design in Schools Manual (https://www.governmentarchitect.nsw.gov.au/guidance/environmentaldesign-in-schools)	2.6, Appendix B
Include preliminary consideration of building performance and mitigation of climate change, including consideration of Green Star Performance.	2.7
Include an assessment against an accredited ESD rating system or an equivalent program of ESD performance. This should include a minimum rating scheme target level.	2.7, Appendix A
Provide a statement regarding how the design of the future development is responsive to the CSIRO projected impacts of climate change, specifically: - • *Hotter days and more frequent heatwave events.* • *Extended drought periods.* • *More extreme rainfall events.* • *Gustier wind conditions.* • *How these will inform landscape design, material selection and social equity aspects (respite/shelter areas).*	2.8

2.2 GENERAL BUILDING DESIGN

The energy consumption of a building can amount to its largest environmental impact. Sustainable design techniques focus on reduction of energy consumption by energy efficient practices, passive design, and cleaner energy production/renewable energy to reduce CO_2 emissions to the atmosphere.

The benefits of an energy efficient building are reduced operating costs, a healthier indoor environment, reduced liability, and recognition of being environmentally responsible. Therefore, in a first instance, the project will incorporate multiple design and operational initiatives to address energy targets.

The aim of passive building performance is to reduce reliance on energy of any source, this means preventing excessive heat entering the building during summer or being lost during winter and/or the need for artificial lighting. To this end, the project has considered general building form, orientation, and shading, as well as roof space for renewable energy as required: -

- The orientation and shading have been considered to ensure solar gain is managed appropriately for heating and cooling.

- Orientation and façade design will consider daylighting requirements and views for improved cognition, health and wellbeing of students, teachers, and staff. Deep plan forms have been avoided so natural lighting is most effective.
- The building is being designed to meet the stringent energy efficiency requirements of NCC 2019 Section J. This applies to both building fabric and services, including insulation, glazing, and shading which will be designed to ensure spaces require minimal additional heating and cooling.
- The proposed design provides spatial allowance for a **45.4 kW** rooftop photovoltaic electricity system to be incorporated to reduce greenhouse gas emissions and reliance on mains power.

2.3 SITE IMPACT

The site is currently built upon with the existing facility. In increasing the built form on the site, the Project Team has considered how this will affect the following: -

- Heat island effect.
- Ecological impact, in particular landscaping for increased ecological value and conservation of existing trees.
- Site emissions (light pollution).

The Project Team has reviewed how landscaping is incorporated into the ESD strategy to ensure the site's contribution to heat island effect is mitigated.

Additionally, the new building will provide rainwater collection and reuse through a proposed 5kL rainwater tank to help reduce the pressure on stormwater systems.

2.4 ESD PRINCIPLES

The proposed development has sought to incorporate the principles of ecologically sustainable development (ESD), as defined in Clause 7(4) of Schedule 2 of the Environmental Planning & Assessment Regulation (2000).

The table below quotes the ESD principles from the regulation and outlines the project's response to each principle.

Item	ESD Principle	Project Response
(a)	**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.*	Adequate due diligence has been conducted to understand the local environment and investigate any risks the project may pose. The proposed development will be constructed on previously developed land, as it a redevelopment of the existing school. During the design and construction phases, the main contractor will implement an Environmental Management Plan (EMP) demonstrating formalised systematic and methodical approach to environmentally friendly construction that answers to site specific environmental risks and hazards. Project ESD responses align with the targeted initiatives under Green Star scorecard, refer to Appendix A. Threats of serious or irreversible damage on the local environment have not been identified.
(b)	**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.*	The proposed development ensures the health, diversity and productivity of the environment are maintained through the implementation of passive and active design measures that reduce operational energy and water use from the project. Energy consumption will be designed to achieve compliance to the National Construction Code NCC 2019 Section J requirements. The reduction in water use will be established through high

Item	ESD Principle	Project Response
		WELS rated water fixtures and fittings, and provision of a rainwater capture and reuse system. Waste generated during the construction phase will be separated in multiple streams to enable recycling and reuse with a consequent reduction in the amount of waste sent to landfill. Reducing energy, water and waste ensures that the health, diversity, and productivity of the environment is maintained for the benefit of future generations.
(c)	**Conservation of Biological Diversity and Ecological Integrity** *Namely, that conservation of biological diversity and ecological integrity should be a fundamental consideration.*	The proposed development being in previously developed land alleviates much of the biological diversity concern for the development. Tree preservation has been established as a high project priority and most trees will be retained. In addition, new trees and vegetation will be planted as part of the landscaping strategy to increase tree canopy cover and ecological value. During the design phase an Environmental Management Plan (EMP) will be developed to ensure that construction works do not adversely affect the biological diversity and ecological integrity of the site, including for example, measures to protect existing trees. The EMP will be monitored via an Environmental Management System (EMS) to ensure adherence by all contractors and mitigate any risks to the environment. Consideration of climate risks will help future proof the development to withstand the effects of climate change; detailed more in Section 2.5.
(d)	**Improved Valuation, Pricing, and Incentive Mechanisms** *Namely, that environmental factors should be included in the valuation of assets and services, such as—* *(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.*	The valuation of the project's assets and services consider environmental factors through the implementation of various ESD initiatives. Environmental aspects are key criteria in the design and selection of building systems and materials. For example, the building façade is being designed for good daylighting, thermal comfort, glare mitigation and energy performance rather than the lowest cost façade system. The mechanical system, lift(s) and lighting system are being designed for low energy consumption and their components will be selected considering whole-of-life costs, i.e., including operational energy use in the equation. Materials will be selected based on the Educational Facilities Standards and Guidelines (EFSG) which are based on a whole-of-life approach that incorporates environmental aspects. Environmental goals of the project are determined by the 4-star Green Star equivalent benchmarking of the project, specific initiatives are identified in the Green Star Scorecard (see Appendix A).

2.5 IMPROVING ENVIRONMENTAL PERFORMANCE AND REDUCING ECOLOGICAL IMPACT

The project has been designed in line with national best practice sustainable building principles to improve environmental performance and to reduce ecological impact.

An integrated approach to ESD, whereby all Design Team members are aware of the incremental effect of their actions on the overall project, is by far the most effective path to achieving a strong ESD outcome. Passive design and active systems can be implemented to enhance a building's performance, but unless the fundamentals have been addressed, the optimum outcome cannot be assured. In addition, occupant wellbeing is of utmost consideration especially considering the function of the project as a secondary school facility.

The Project Team is committed to achieving and/or subject to the following sustainability policies and regulations which provide the project's framework for improving environmental performance and reducing ecological impact: -

- The aforementioned EP&A Regulation clauses.
- GANSW Environmental Design in Schools manual.
- A 4-star "equivalent" Green Star outcome without formal certification by the Green Building Council of Australia (GBCA).
- National Construction Code (NCC 2019) Section J for Energy Efficiency.
- Government Resource Efficiency Policy (GREP).
- School Infrastructure NSW Educational Facilities Standards and Guidelines (EFSG) (15/04/2020).
- The objectives of the Department of Planning, Industry and Environment (DPIE) as captured in the SEARs requirements.

At the SSDA stage, the following key ESD measures have been implemented to ensure the above policies and targets are achieved: -

- Benchmarking to 4-star Green Star – Design & As Built v1.3 which is considered in the industry to be equivalent to national best practice level of sustainability. The Green Star strategy includes waste reduction design measures through the development of an Operational Waste Management Plan (OWMP) and establishment of targets for the reduction of construction waste sent to landfill.

  The Green Star strategy also includes the development of a climate adaptation plan to future proof the development to the impacts of climate change and increase resilience to natural hazards.

  The implementation of sustainable and low carbon materials will be guided by the Green Star requirements for the 'Responsible Building Materials' credit.

  Energy efficient design will be achieved through a combination of passive design measures, energy efficient building systems and provisions for the future implementation of on-site renewable energy generation. Water efficient design will be achieved through water efficient fixtures and fittings, and water sensitive design measures such as the provision of a rainwater tank to enable rainwater reuse for drip irrigation, and low water vegetation.

  The Green Star strategy includes targeting the credits below. Refer to Appendix A for a credit outline: -

  - Commitment to performance.
  - Responsible construction practices.
  - Operational waste.
  - GHG emissions reduction.
  - Access by public transport.
  - Potable water reduction.
  - Responsible building materials.
  - Ecological value.
  - Reuse of land.
  - Contamination and hazardous materials.
  - Stormwater.
  - Light pollution.
  - Microbial control.

- Compliance with the following Educational Facilities Standards and Guidelines which include best practice measures specific to school development: -
  - DG02 Ecologically Sustainable Development.
  - DG03 Site factors.
  - DG04 Heat loss / gain.
  - DG05 Air movement.
  - DG07 Sun control.
  - DG12 Natural light.
  - DG20 Fabric.
  - DG48 Hazardous materials.
  - DG53 Water.
  - DG55 Cooling policy.
  - DG56 Heating.
  - DG57 Ventilation.
  - DG63 Lighting.
  - DG66 Photovoltaic power generator.
  - DG76 Window blinds.
  - DG90 Landscape design.
  - DG95 Stormwater.
- The development will integrate energy efficient building services and façade design such that compliance to NCC 2019 Section J will be achieved, which embodies onerous improvement requirement from the previous version of the code (NCC 2016 Section J).

The design has adopted passive cooling and heating design strategies to reduce the energy demand and GHG emissions, reducing the building demand on mechanical HVAC systems. The visual comfort of the primary spaces has also been considered to reduce the amount of artificial lighting and increasing comfort within the space.

Key highlights of the building services are summarised as below. These are to be read in conjunction to the Green Star Scorecard in Appendix A – Green Star Scorecard.

2.5.1 **Passive Cooling and Heating Design**

The design has adopted and will continue to adopt passive cooling and heating design principles to reduce the building's reliance on mechanical HVAC system and artificial lighting. This may include rationalising the extent of the glazing (i.e., window to wall ratio %), implementation of external shading as necessary to limit solar penetration in summer to reduce the heat load from the façade, and the possible use of natural ventilation in occupied spaces to provide adequate thermal comfort and pleasant indoor environment quality, whilst taking advantage of the coastal breezes.

2.5.2 **Mechanical Services**

All building services will be designed to achieve compliance to NCC 2019 Section J. The following mechanical strategies will be considered for implementation: -

- All mechanical equipment to be efficient, subject to life cycle costing analysis outcomes.
- Manual control overrides are to be provided where automated system is present.
- Mechanical system to consist of a centralised plant configuration where appropriate, which allows for diversity and improves energy efficiency.
- Ductwork/pipework systems to be designed to reduce system pressure losses and reduce fan and pump motor power.
- Variable speed motors to be provided for ventilation fans, where suited.
- Variable speed pumps to be provided where suited.
- Where applicable, refrigerants with low ozone depletion potential and low global warming potential to be specified.

2.5.3 Electrical Services

The Project Team will work to implement electrical services that assist energy efficient design, as detailed below, subject to detailed design of the project: -

- Robust, long-life LED lighting with automatic lighting control system to reduce energy wastage – lighting control strategies may include implementation of area dimming, time clock, daylight sensors or PIDs.
- Internal blinds / screens to decrease glare from sunlight through the viewing facades while allowing access to views and increased daylight into the nominated area.
- Electrical equipment to be specified to be energy efficient to reduce building electricity consumption.
- Major energy uses to be sub-metered by end use, and function area.
- Energy and water monitoring screen to be provided at commonly accessed locations of the school (e.g., staff office areas, common walkway, or main sports hall entry) to display energy and water consumption with student friendly infographics for education purposes.
- Solar photovoltaics (PV) system to be considered on the school site's available roof space.

2.5.4 Hydraulics Services

The Project Team will implement the hydraulics services that assist water efficient design as detailed below, subject to detailed design of the project: -

- Potable water using fixtures to be high efficiency rated by WELS. Specification of fittings to be confirmed in the detailed design.
- Rainwater harvesting and drip irrigation to be implemented to reduce potable water consumption.
- Potable water sub-metering to be considered to reduce wastage through identifying leaks or poor operational performance.
- High efficiency, **localised** domestic hot water **units** to be specified.

2.5.5 Sustainable Materials and Reducing Waste

The Project Team will take into consideration the sustainable strategies outlined below regarding materiality, waste reduction design measures, future proofing, and use of sustainable and low-carbon materials.

Specification of materials or means to reduce waste will be confirmed in the detailed design: -

- Specifying low VOC emitting materials to improve indoor air quality.
- Specifying engineered wood products with low or no formaldehyde limits.
- Applying life cycle assessment principles and learnings in relation to: -
  - Specifying sustainable concrete and steel (such as Portland cement replacement, captured/reclaimed water for mix water, and recycled aggregates and steel manufactured from energy-reducing processes).
  - Minimising mass or volume of materials.
  - Implementing sound procurement practices.
- Pipe material selection based on current best practice such that: -
  - PVC-u to be specified based on the GBCA guidelines.
  - Polyethylene material to be specified for pressure water and gas services, as Polyethylene is recyclable and has significantly lower environmental impact than the alternative ductile iron material.
  - Pipe bedding materials to be specified to be locally sourced, where practical.
- Selecting permanent formworks, flooring, blinds and cables with no PVC or PVC products that comply to GBCA's best practice guidelines for PVC.
- Prioritising locally sourced materials and procuring salvaged and/or recycled materials.

- Specifying materials sourced with cradle-to-cradle credentials.
- Efficient selection of materials to limit off-cut wastage during construction.

2.6 GANSW ENVIRONMENTAL DESIGN IN SCHOOLS

The Government Architect NSW (GANSW) has released the *Better Placed - Environmental Design in Schools* manual to provide a holistic understanding of environmental design for schools. The manual presents strategies for passive design as well as other key opportunities for making positive, sustainable change in the building or running of a school. It includes a set of guidelines and strategies to follow as part of the design process: -

- Use passive cooling and heating.
- Re-design learning experiences.
- Communicate careful use of resources.
- Control heat gain.
- Combine water sensitive design.
- Improve energy efficiency.
- Encourage physical activity.
- Learn outdoors.
- Share environmental knowledge.
- Share community assets.
- Contribute to the local environment
- Understand the importance of trees

The measures and project responses within the GANSW that are relevant to the Mosman High school development are provided in Appendix B – GANSW Alignment. The responses also link back to relevant EP&A Regulation clauses and Green Star credits that have similar design initiatives and intent. Key design initiatives can be noticed in the previous Section 2.5.

2.7 PRELIMINARY CONSIDERATION OF BUILDING PERFORMANCE AND ESD RATING SCHEME

Preliminary consideration of building performance for the proposed development is reflected by applying passive sustainable design principles and achieving the minimum performance requirements stipulated under NCC 2019 Section J.

The building's sustainable design and management practices are further supplemented by consideration of the design practices stipulated in the Green Star Design & As Built v 1.3 rating tool.

2.7.1 **NCC 2019 – Section J Requirements**

Section J of the NCC requires that the building fabric and services of the proposed development reduce the generation of greenhouse gas emissions associated with the operation of the building.

The NCC requires buildings to use energy efficiently. This requirement is defined in Volume 1 of the NCC under Section J "Energy Efficiency". There are six (6) subsections, J1 to J8, which focus on separate aspects of energy efficiency. J1 and J3 relate to the building's fabric and envelope and J5 to J8 relate to the building services.

Compliance can be demonstrated by meeting the Deemed-To-Satisfy (DTS) provisions or by applying one of the Verification Methods outlined in the NCC. The Verification Methods are generally applied to buildings to which the DTS provisions are not immediately applicable.

The JV3 Verification Method demonstrates compliance with Clause JP1 and is the approach that will be adopted for Mosman High School Upgrade project. In order to establish compliance with Section J JP1 using the JV3 Verification Method, the energy consumption of the proposed development must be less than the energy consumption of a 'reference building'. Section J compliance then ensures that the proposed building has good energy performance.

While Section J compliance is a policy requirement, meeting the stringent requirements of NCC 2019 – Section J will also contribute to the project aspirations to reduce operational energy consumption.

2.7.2 Green Star Design & As Built v1.3

Green Star is an environmental rating tool that evaluates ESD performance of buildings measured across a number of criteria including energy and water efficiency, Indoor Environment Quality (IEQ) and resource conservation. Green Star was created to: -

- Establish a common language and standard of measurement for green buildings.
- Promote integrated, whole-building design.
- Identify building life-cycle impacts.
- Raise awareness of green building benefits.
- Recognise environmental leadership.
- Transform the built environment to reduce the environmental impact of development.

Green Star includes a wide range of initiatives, most of which are well aligned with the SINSW sustainability objectives as captured in the Educational Facilities Standards and Guidelines. Green Star also includes initiatives that are of limited relevance in the public school sector and formal recognition of Green Star compliance has the potential to divert resources away from focusing on the specific ESD aspirations for this project.

Therefore, the approach is to adopt the general framework of Green Star, but formal recognition or Green Building Council of Australia certification is not being sought. This approach, which is consistent with DG02 - Ecologically Sustainable Development, provides flexibility to tailor the methodology in a manner that best suits this project, without being constrained by some of the Green Star limitations.

A 4-star Green Star outcome requires a minimum of forty-five (45) points at completion. To allow for contingency and unforeseen circumstances, the Mosman High School strategy targets a minimum of fifty (50) points, providing a three (3) point buffer to demonstrate the project is commensurate to a 4-star Green Star building.

The Green Star equivalence approach pursued for the project allows using the Green Star tools as a benchmark to ensure that best practice ESD is implemented in the design as well as commissioning and operational initiatives that result in good sustainability outcomes, but without incurring in the expense associated with formal certification.

The project team has developed a Green Star Scorecard to reflect an equivalent 4-star Green Star Design & As-Built v1.3 pathway. This scorecard is provided in Appendix A and outlines the initiatives that will be implemented in the project to demonstrate it is commensurate to Australian best practice.

To meet the targeted points under the GHG emissions credit, the proposed building design (including project building fabric and services) must perform better than those of an equivalent benchmark building (which is 10% improvement on the reference building). Therefore, the proposed building services shall be more energy efficient and perform better than a conventional building.

2.8 CLIMATE CHANGE RESILIENCE

According to the CSIRO's projected impacts of climate change for the project site include hotter days and more frequent heatwave events, extended drought periods, more extreme rainfall events and gustier wind conditions.

The Mosman High School Upgrade project has considered the projected effects of climate change and incorporated measures to future proof the development and increase its resilience. Landscape design, material selection and social equity aspects of the project have considered these effects as per the table below: -

Projected Climate Change Effect	Project Response
Hotter days and more frequent heatwave events	The Project Team acknowledges projected hotter days and more frequent heatwave events for the site and have incorporated a range of measures to ensure adequate thermal conditions can still be achieved even during extreme heat conditions. Key measures include: - • Avoiding reliance solely on natural ventilation to achieve adequate indoor thermal conditions. While natural ventilation is encouraged and has been implemented where feasible as part of the design, the increasing air temperatures require that mechanical air conditioning and ventilation systems are provided to cater for hotter days. As such, all general learning spaces will be air conditioned. • Façade design will include adequate sun shading, insulation and glazing to ensure thermal load from the sun is limited in summer while allowed in winter. • Most existing trees on Military Rd and Belmont Rd will be preserved to help cool the building façade and the school grounds in hotter days. • Landscaping strategy includes adequate shading throughout and targets increased tree canopy cover to provide shelter and respite spaces on school grounds. • Selection of cool roofing and paving materials will be a key consideration to assist with thermal management.
Extended drought periods	Water conservation measures have been implemented to reduce potable water consumption and assist in combating extended drought periods: - • The hydraulic design includes a rainwater harvesting tank to enable a rainwater reuse for irrigation. • Low water landscape vegetation has been selected. • Potable water fixtures and fittings to be of high efficiency and WELS rated. • Potable water submetering to be considered to reduce wastage through identifying leaks, or poor operational performances.
More extreme rainfall events and gustier wind conditions	The project incorporates the following measures in response to increased rainfall and gustier conditions: - • The project has been considering the 1:100 flooding event in regard to building location and drainage strategy. • Adequately reinforced façade components will be required to withstand increased rainfall and gustier conditions. • Tree maintenance will be critical to ensure that trees do not represent a hazard in extreme weather conditions.

APPENDIX A

GREEN STAR PATHWAY

APPENDIX A GREEN STAR PATHWAY

The following table summarises the points that are included as part of the Green Star Design & As-Built v1.3 4-star equivalency strategy for Mosman High School Upgrade project.

The final make-up of targeted points may change as the design and construction progresses, but the commitment is to achieve all points labelled as 'required' and at least sixty (45) points at completion, which is in line with a 4-star Green Star outcome. Required credits must be achieved and hence cannot be value engineered in further development phases.

CATEGORY / CREDIT	CODE	CREDIT CRITERIA	POINTS AVAILABLE	POINTS TARGETED	TYPE
Management					
Green Star Accredited Professional	1.0	Green Star Accredited Professional	1	1	
Commissioning and Tuning	2.0	Environmental Performance Targets	-	Complies	Required
	2.1	Services and Maintainability Review	1	1	Required
	2.2	Building Commissioning	1		
	2.3	Building Systems Tuning	1		
	2.4	Independent Commissioning Agent	1		
Adaptation and Resilience	3.1	Implementation of a Climate Adaptation Plan	2	2	
Building Information	4.0	Building Information	1	1	Required
Commitment to Performance	5.1	Environmental Building Performance	1	1	
	5.2	End of Life Waste Performance	1	1	
Metering and Monitoring	6.0	Metering	-		
	6.1	Monitoring Systems	1		
Construction Environmental Management	7.0	Environmental Management Plan	-	Complies	Required
	7.1	Formalised Management System	1	1	Required
	7.2	High Quality Staff Support	1		
Operational Waste	8A	Performance Pathway – Specialist Plan	1	1	Required
Total			14	9	

Indoor Environment Quality					
Indoor Air Quality	9.1	Ventilation System Attributes	1	1	Required
	9.2	Provision of Outdoor Air	2		
	9.3	Exhaust or Elimination of Pollutants	1	1	Required
Acoustic Comfort	10.1	Internal Noise Levels	1	1	Required
	10.2	Reverberation	1	1	
	10.3	Acoustic Separation	1		
Lighting Comfort	11.0	Minimum Lighting Comfort	-	Complies	Required
	11.1	General Illuminance and Glare Reduction	1	1	Required

CATEGORY / CREDIT	CODE	CREDIT CRITERIA	POINTS AVAILABLE	POINTS TARGETED	TYPE
	11.2	Surface Illuminance	1		
	11.3	Localised Lighting Control	1		
Visual Comfort	12.0	Glare Reduction	-	Complies	Required
	12.1	Daylight	2		
	12.2	Views	1	1	
Indoor Pollutants	13.1	Paints, Adhesives, Sealants and Carpets	1	1	Required
	13.2	Engineered Wood Products	1	1	Required
Thermal Comfort	14.1	Thermal Comfort	1	1	Required
	14.2	Advanced Thermal Comfort	1		
Total			17	9	

Energy					
Greenhouse Gas Emissions	15E.0	Conditional Requirement: Reference Building Pathway	-	Complies	Required
	15E.1	Modelled Performance Pathway	20	2	
Peak Electricity Demand Reduction	16B	Modelled Performance: Reference Building	2		
Total			22	2	

Transport					
Sustainable Transport	17B.1	Access by Public Transport	3	1	
	17B.2	Reduced Car Parking Provision	1		
	17B.3	Low Emission Vehicle Infrastructure	1		
	17B.4	Active Transport Facilities	1		
	17B.5	Walkable Neighbourhoods	1	1	
Total			7	2	

Water					
Potable Water	18B.1	Sanitary Fixture Efficiency	1	1	Required
	18B.2	Rainwater Reuse	1	1	
	18B.3	Heat Rejection	1	2	
	18B.4	Landscape Irrigation	1	1	Required
	18B.5	Fire Protection System Test Water	1	1	
Total			6	6	

CATEGORY / CREDIT	CODE	CREDIT CRITERIA	POINTS AVAILABLE	POINTS TARGETED	TYPE
Materials					
Life Cycle Impacts	19A.1	Life Cycle Assessment	7	1	
	19A.2	Additional Life Cycle Impact Reporting			
Responsible Building Materials	20.1	Structural and Reinforcing Steel	1	1	Required
	20.2	Timber Products	1	1	Required
	20.3	Permanent Formwork, Pipes, Flooring, Blinds and Cables	1	1	
Sustainable Products	21	Product Transparency and Sustainability	3		
Construction and Demolition Waste	22B	Percentage Benchmark	1	1	
Total			14	5	

Land Use and Ecology			6		
Ecological Value	23.0	Minimum Requirement: Endangered and Vulnerable Species and Communities	-	Complies	
	23.1	Ecological Value	3	1	
Sustainable Sites	24.0	Conditional Requirement	-	Complies	
	24.1	Reuse of Land	1	1	
	24.2	Contamination and Hazardous Materials	1	1	
Heat Island Effect	25	Heat Island Effect Reduction	1		
Total			6	3	

Emissions			5		
Stormwater	26.1	Reduced Peak Discharge	1	1	
	26.2	Reduced Pollution Targets	1	1	
Light Pollution	27.0	Minimum Requirement: Light Pollution to Neighbouring Bodies	-	Complies	Required
	27.1	Light Pollution to Night Sky	1	1	Required
Microbial Control	28	Microbial Control	1	1	
Refrigerant Impacts	29	Refrigerant Impacts	1		
Total			5	4	

CATEGORY / CREDIT	CODE	CREDIT CRITERIA	POINTS AVAILABLE	POINTS TARGETED	TYPE
Innovation*			10		
Innovation	30	1) Low VOC paints 2) Community benefits (shared facilities) 3) Integrating healthy environments (healthy canteens) 4) Culture, heritage and identity 5) Universal design 6) Financial transparency 7) Reconciliation action plan 8) Green cleaning 9) Design review 10) Amenity space	10	10	
Total			10	10	

	POINTS TARGETED
TOTAL	50

Table 1: Points Targeted for the Green Star Design & As Built v1.3 Uncertified Outcomes

This Green Star strategy will continue to be refined as the project moves into detailed design, as well as documenting alignment with the SINSW's sustainability aspirations.

APPENDIX B

GANSW ALIGNMENT

APPENDIX B GANSW's ENVIRONMENTAL DESING IN SCHOOLS: STRATEGIES FOR ENVIRONMENTAL DESIGN

Category / Subcategory	Strategy	Description	Project response
Simple Changes for School Rooms			
1. Use passive cooling and heating	Start with the windows	In summer, natural air flow can be a very effective way to cool indoor spaces at a fraction of the cost of mechanical cooling. For the best cooling effect, open windows on opposite sides of a room to get crossflow ventilation. This will push hot air outside. Well-ventilated classrooms can also assist in preventing mould and removing pollutants. If you have window coverings, use them to block out unwanted summer sun (east-facing windows in the morning, and west-facing windows in the afternoon). In winter, close window coverings at the end of the day to help rooms stay warmer overnight.	Building plan depths have been reduced from previous schematic design (reference scheme) to increase opportunities for natural ventilation. Operable windows will be provided in all classroom to allow natural ventilation. Where cross ventilation is restricted, at least one whole wall of operable windows will be provided for air movement as required in the Educational Facilities Standards and Guidelines (EFSG).
	Use fans to move air around	If you have ceiling fans, you can use them to control the room temperature by moving air around. In summer, with the windows open, ceiling fans can help to push hot air outside. In winter, with the windows shut, if you have high ceilings and mechanical heating, ceiling fans can help to make a room feel warmer by gently pushing warm air down from the ceiling level.	Ceiling fans will be provided in all classrooms. Ceiling fans will be interlocked to lighting motion sensors in addition to fan controllers so that ceiling fans are turned off where no presence is detected.
	Use air conditioning efficiently	If you do use mechanical heating or cooling, keep the set temperatures within a narrow range. For optimal use, set the temperature to 18 degrees in winter and 25 degrees in summer. These temperatures will be comfortable – and by keeping within this range you can save money on running costs. If possible, use a timer to ensure the unit is not left on after hours.	Thermal comfort and indoor air quality will be controlled automatically within best practice set points for schools as specified in the EFSG. A prominent green light will highlight to occupants when conditions are suited to opening windows and doors to utilise natural ventilation. A prominent blue light will highlight to occupants when the air conditioning is operating. The lights will be clearly labelled with trafolyte labels as follows: - • Green light – "External conditions are suited to opening windows and doors". • Blue light – "Air conditioning is operating. Windows and doors should be closed". Temperature and CO_2 sensors will be installed within the space. Controls will be designed to minimise energy consumption – e.g.: by minimising over cooling

Category / Subcategory	Strategy	Description	Project response
			and heating and automatically switching off when the space is unoccupied.
2. Re-design learning experiences	Create noisy and quiet spaces	You can change your classroom's acoustic environment by including soft furnishings or surfaces, like wall treatments or floor rugs. These may need to be incorporated alongside passive strategies, for example, opening windows. Consider zoning the use of spaces relative to noisy or quiet activities. For example, quiet reading areas require different acoustic qualities than spaces for dynamic collaboration and are best with some form of separation between them.	Bets practice acoustics will be achieved through a combination of soft furnishing and surfaces, and window and wall specification. The acoustic design of rooms and spaces will address the following parameters from DG11, which contain best practice noise guidelines for school spaces: - • Internal noise levels. • Room acoustics (principally reverberation time). • Noise emission (to the environment). • Room to room noise control.
	Bring plants into the classroom	Biophilic design is the practice of incorporating natural materials, natural light, vegetation, nature views and other experiences of nature into buildings. This can improve indoor air quality and benefit student learning outcomes.	The majority of indoor spaces have direct views to nature to unlock health benefits of biophilic design. Surrounding views accessible from the site include coastline vies to the east, which provide contact with nature. To increase natural light penetration, building depths have been reduced in comparison to the reference scheme. Facade design will focus on optimising window wall ratios and glazing performance to maximise daylighting levels in general learning spaces while still achieving compliance with Section J requirements. Provision of indoor plants is an operational initiative which has been enabled through adequate daylight penetration.
	Expose building services	Simple strategies such as colour coding exposed pipework can be used to help students become more aware of building services like heating or water supply. This can be a step-in learning about how we use resources to control our environments.	Opportunities for exposed ceilings will be explored at detailed design phase.
	Work outside	Consider conducting some classes outside in the shaded parts of the school grounds, to get students engaged with nature in their school playgrounds.	The following outdoor learning spaces have been provided: - • Level 1 Outdoor Learning - 82sqm. • Level 2 Outdoor Learning - 83sqm. • Level 3 Outdoor Learning - 206sqm. • Level 3 Informal outdoor play / learning - 462sqm.

Category / Subcategory	Strategy	Description	Project response
			• Level 4 Roof play court / informal learning - 678sqm
3. Communicate careful use of resources	Find ways to save more	Encourage staff and students to use less water and take responsibility for the school's overall water usage. Install simple signage to remind students to reduce their water usage. Make sure lighting and other electrical equipment is used economically and switched off when it's not in use.	The building includes extensive energy and water conservation strategies as well as provisions for the future installation of a PV system by the school. These efficiency measures and on-sire renewable energy generation can be used by the school to underpin a signage / education campaign to engage students and further reduce resource consumption. Efficiency measures include water efficient fixtures and fittings, and energy efficient LED lighting coupled with motion sensors with built-in timers which turn off lighting by default to reduce energy wastage to a minimum.
	Display data	Collating and displaying data on energy and water usage and waste generation can help the school community to monitor their usage and consider how to improve environmental conditions. This can be done through incorporating signage into your buildings, or by installing sensors that monitor air quality, movement (to control lights), or daylight entering the building (through louvres). Data can be brought into lessons including maths, science or Human Society and its Environment (HSIE).	CO_2 sensor control is to be provided for all outside air systems to enable demand-controlled ventilation within all air conditioned areas (except in small spaces where CO_2 control is not practical). Lighting motion sensors will be provided to avoid energy wastage. Energy consumption is logged in a portal by the energy retailer and access is provided to the school principal, enabling a data collation and display strategy by the school.
Adapting Your School Buildings			
1. Control heat gain	Glazing film	Adding glazing film on west-facing windows can reduce heat gain through the glass.	Size and amount of windows, as well as glazing performance are being carefully considered in the design to provide maximum efficiency and a balance between the ESD factors such as maximising daylight in rooms but avoiding unnecessary solar heat gain and thermal loss.
	Internal blinds	Blinds can be adjusted to control the amount of unwanted direct sunlight coming into an internal space. A combination of 'block out' and translucent blinds are most suitable. Schools should consider adjustable shading to allow variable sunlight in spring and autumn.	Window blinds will be provided to all external windows to facilitate brownout, control glare, and provide visual privacy.

Category / Subcategory	Strategy	Description	Project response
	External sun shading	For controlling heat gain, external shading is generally more effective than glazing film on windows or internal blinds. It can effectively control the amount of direct sunlight and natural light entering rooms. Northern sides of buildings can have horizontal shading, while west-facing aspects can have vertical shading, or may benefit from vertical fins. The design of the shading needs to vary depending on the aspect, and may need to vary between seasons, depending on your local climate. Shading should not restrict views from windows or block natural light when it is needed.	Direct sunlight access into spaces will be controlled to reduce unwanted heat gain and the adverse effects of glare. Where necessary, sun exclusion and glare control will be achieved by the use of elements such as sunshades, eave extensions, vertical blades and the like. On exposed facades subject to direct sunlight, external window shading will be considered as part of the building design.
	Natural shading	Trees that shade walls and windows can help to cool internal spaces. Solar transmission can be as low as 20% for a mature tree in the summer. Before planting trees, schools should check the EFSG for suitable distances between trees and buildings.	Existing trees on Military Road and Belmont Road will provide shading on northern and eastern facades of the building. The landscaping strategy includes deciduous tree plantings to the west to block direct sun light in summer and allow it in winter. The landscape strategy not only contributes to shading of building facades, but also provides a comfortable micro-climate both within the building and on school grounds.
2. Combine water-sensitive design	Greywater tanks	Where possible install greywater tanks and re-use the water for gardening or flushing toilets. Special detergents should be avoided so the water can be effectively re-used. Greywater is not fit for drinking.	Space is constrained so the water conservation strategy focuses on efficient water fixtures and fittings, and rainwater collection and reuse as opposed to greywater which requires significantly more treatment and maintenance. A 5kL rainwater tank will be provided to enable rainwater collection and reuse for irrigation.
	Water efficiency	Understanding water use and adopting water sensitive strategies can make a big difference to your school. Look at your school fixtures and toilets to ensure they are water-efficient, make sure they are not dripping, and plant low-irrigation trees. All of these water-efficient features can be displayed through signage to make staff and students aware of the potential water savings for their school.	Water efficient WELS rated fixtures and fittings will be provided as per EFSG requirements to reduce water consumption. The landscaping strategy includes native vegetation which has lower irrigation requirements and has higher ecological value. A rainwater tank will be provided to enable rainwater reuse for irrigation.

Category / Subcategory	Strategy	Description	Project response
3. Improve your energy efficiency	Insulation	Understand how your school buildings are insulated. This helps to retain heat in winter, and reduce heat gain in summer. Insulation can be put in the ceilings, walls and under the floor of your buildings. Specialist consultants such as architects and environmental consultants can help select the appropriate insulation if you are renovating or replacing a roof or walls.	Insulation will be carefully assessed and included in building walls, floors and ceilings to: - • Achieve NCC 2019 Section J compliance. • Reduce heat transfer through the building envelope. • Reduce sound transfer through the building envelope. Roofs will have one layer of double-sided foil laid under bulk insulation such as polyester or mineral wool with a 1.5 R-value. This will provide an initial level of thermal insulation and can reduce sound levels from rain and hail by damping vibration. Additional bulk insulation will be placed above the ceiling in order to reduce heat loss or gain and meet BCA insulation requirements.
	Air leaks	Check for air leaks, for example where air conditioning units are attached to building materials. This is one of the simplest upgrades you can make and will improve comfort while reducing energy bills.	Comprehensive commissioning will be undertaken in line with SINSW commissioning requirements. Any defects identified during the commissioning phase, including air leaks, will be resolved.
	Solar panels	Solar panels (installed on the correct orientation) can lower energy costs and be a source of power generation on your school site. Discuss this with your asset management unit within SINSW.	The building includes spatial provision for the installation of up to a 41kW rooftop PV system by the school.
Activating Your School Grounds			
1. Encourage physical activity	Walking and cycling	Active travel plays a vital role in getting kids active as part of their daily routine and setting up good habits for life. Increasing community education and awareness also plays a role, encouraging solutions that include the whole family, schools, and government agencies. Active lifestyles help to reduce car dependency, pollution, carbon emissions, and traffic congestion in your local area. Provide end-of-trip facilities for staff, and bike racks for staff and students. Bike workshop spaces could also be installed to teach students how to repair and maintain their bikes. National programs such as Ride2School Day and National Walk Safely to School Day are great ways to promote active travel.	The new building has placed a strong focus on supporting healthy and active principles and movement. It includes large spaces for fitness and fostering an active lifestyle: - • A gymnasium / hall with associated change rooms and showers. • Fitness / dance lab. • Fitness general learning spaces. • COLA and informal play spaces on roof. • Large roof play court space. Vertical transport has been designed to promote use of stairs,

Category / Subcategory	Strategy	Description	Project response
			with lift provided only for accessibility. Existing bicycle parking spaces are being retained to promote active transport for students and staff.
2. Learn outdoors	Covered outdoor learning areas	Covered outdoor learning areas provide shade and shelter for learning and recreation. These can be sited and designed to make the school environment more diverse and promote students' engagement with nature and outdoors.	A large existing covered outdoor learning area (COLA) is being retained to provide shelter for learning and recreation. Additional COLAs being provided: - • 82sqm on Level 1. • 83sqm on Level 2. • 206sqm on Level 3.
	Soft landscaping	Introducing turf, shrubs, flowers, and native planting can enliven outdoor learning areas and improve spaces for play. Including raised planter beds with small trees and shrubs can provide shade and outdoor seating for students. Soft landscaping can make a big improvement to learning areas, without involving construction. Selecting dry-weather resistant trees and plants that are locally native to your area reduces the need for watering. Local councils are often able to provide advice. Remember to use mulch in planters to help retain water within the soil.	The landscape design includes a diversity of softscaped spaces to provide multiple outdoor play and learning opportunities, including trees, shrubs, flowers, and native planting. Open lawn areas are also provided to the central courtyard of the school offering open space for active play, games and gathering. The open lawn areas are complimented with shade trees creating generous shady areas that provide respite from the sun and a quieter place to gather.
3. Share environmental knowledge	Learning about our natural and cultural environment	Aboriginal people have a long heritage of connecting with our land and caring for Country. Recognising and celebrating the heritage and culture of a school's specific location can help students to understand and learn more about their past, present, and future. For example, "Welcome to Country" could be incorporated at the school entrance, and Aboriginal Elders yarning circles can be used to celebrate cultural heritage and double as an outdoor learning space. Interpretive signage referencing Aboriginal words, places, animals, and plants can enhance a student's connection to their natural and cultural environment.	The landscape proposal includes a Native Orchard as a garden classroom where the students can participate in the life cycle of a garden - planting, watering, weeding, harvesting, pruning and composting. It is also a place where exploration and imaginative play are encouraged. A library terrace envisaged as a learning garden is included as part of the proposed landscape works, designed to provide a number of different areas where students can study by themselves or in small groups.

Category / Subcategory	Strategy	Description	Project response
	Learning from the community	Engaging community elders, including Aboriginal Elders, helps to develop strong associations with cultural diversity and heritage, and can give members of the school community a sense of ownership and shared responsibility for their immediate environment. Many schools can use their food gardens to acknowledge local cultural groups. Indigenous landscaping can promote understanding of bush tucker, Aboriginal seasonal changes, and the relationships between plants and animals.	Aboriginal cultural heritage due diligence investigations have been undertaken to inform the development. A consultation strategy will be developed by SINSW to ensure the community has input on the project.
	Community gardens	School gardens can be open to the community, creating a shared zone for students, the school community and the broader community to work together and share knowledge. School gardens and gardening activities can provide the focus for many lessons. We can learn from our local, diverse communities.	The proposed landscape design includes a diversity of garden spaces that could be open to the community. This however is an operational decision.
4. Share community assets	Open schools	As our cities densify, open public space becomes increasingly important for communities. Creating shared spaces or green open spaces, accessible to the community outside school hours, improves social cohesion and benefits the wider community. Schools may reconsider the attributes of their perimeter fencing and secure line strategies to help with shared space provision. This may lead to new community spaces that are accessible, maintained, and managed by the school and its community. School grounds could provide green, open spaces for many local residents.	The proposed design allows for access control to enable community access to spaces that could be shared while keeping secure areas of the building not intended for community use. Spaces that could be open to the community include sports facilities, school grounds and arts spaces. This is an operational decision.
5. Contribute to the local environment	Capturing run-off	School grounds can be designed to capture rainwater, e.g., through a rainwater garden. Stormwater can be filtered, reducing run-off and capturing the water to enhance landscaping.	A 5kL rainwater collection tank is included in the design. Rainwater will be collected from non-transitable areas for reuse in irrigation.
	Cooling the air temperature	School grounds can improve the heat-island effect by providing shade and porous, natural ground materials. Replacing hard outdoor surfaces such as asphalt with soft landscaping and permeable paving can also reduce heat gain, as well as improving stormwater run-off. Trees, green walls, and vegetation can help reduce urban heat-island effects by shading building surfaces, deflecting radiation from	The landscaping strategy has considered mitigation of heat island effect through increasing tree canopy cover and providing extended vegetation and shade. Lighter surfaces will be preferred over darker surfaces which absorb heat and increase their temperature.

Category / Subcategory	Strategy	Description	Project response
		the sun, and releasing moisture into the atmosphere.	
	Supporting biodiversity	Grounds can provide habitat for plants, animals, birds, and insects, supporting local biodiversity. Biodiverse gardens and plants can improve climate resilience, water supply, pollination, food, shelter, and health outcomes for your school.	The site is within a highly urbanised landscape that has been developed since the colonisation and sprawl of Sydney Harbour. The landscape proposal incorporates new vegetation that will support local biodiversity.
6. Understand the importance of trees	Our schools are part of a green network	Trees also play a role in climate-proofing our neighbourhoods and supporting human health and wellbeing. The network of trees across our schools performs a critical function for our environment and provides an array of health benefits including limiting exposure to sun and improving mental health. The GANSW Urban Tree Canopy Manual provides targets for tree canopy coverage for the whole of NSW. Schools can play an important part in helping local areas to meet these targets.	A tree canopy cover target has been established for the site.
	Heating, cooling, and shade	Trees provide natural shade and cooling – an essential component in reducing the heat-island effect. They influence ambient temperatures around buildings by providing shading from the sun and shelter from dominant winds, which can reduce energy usage for both heating and cooling. Trees also improve air quality, absorb carbon and rainfall, cool local environments, and support wildlife.	Most existing trees are being retained. Additional trees are being provided as part of the landscaping works to provide shade and assist with heat management on school grounds. Materials will be selected considering their thermal performance. Deciduous trees will be planted to the west to enable thermal management of western facade. Deciduous trees block the sun in summer while allowing it during winter by shedding their leaves.
	Maintaining healthy trees	Mature planting in our schools provides natural shade and cooling. Establishing tree management and maintenance priorities with your school staff and incorporating student activities can foster ownership of trees as essential elements of environmental design.	An arboricultural study has been undertaken to outline the health, condition, and stability of existing trees as well as the viability for retention within the context of proposed development works.

Category / Subcategory	Strategy	Description	Project response
	Choosing the right tree to plant	Choosing the right trees for your school based on your location and climate will improve the chance of your trees growing into a mature landscape. It is important to consider: ——What benefits do you want from the tree? These might include shade, colour, habitat, or other attributes. Do you want a deciduous tree or an evergreen tree? ——What will the mature tree look like? Consider tree size, texture, colour, and seasonal changes in relation to your buildings and landscape. ——Are there attributes you need to avoid, like pollen, or trees that are too large or block light? ——Which types of trees grow well and belong in your area? Will you plant the same types, or choose species that add diversity to the local tree population? ——Is the site right for tree planting? Consider soil type, amount of sun, available space above and below ground, impact on surrounding spaces and buildings.	A landscape architect has been engaged to develop a landscaping strategy that carefully selected trees that are responsive to the architecture and climate of the site, provide shade to school grounds and buildings, and support biodiversity. Refer to Landscape report.