Sydney Olympic Park new high school

SSDA ESD Report

Prepared for: School Infrastructure NSW C/- Roberts Co

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Revision

Revision	Date	Comment	Prepared By	Approved By
1	11.03.2021	Preliminary SDP	ZDU	ALK
2	08.04.2021	Updated Preliminary SDP	ZDU	ALK
3	22.04.2021	Updated Since BDAR Waived SDP	ZDU	ALK
4	22.06.2021	Issued for DA	ZDU	RD
5	05.08.2021	Updated Pro-Forma	ZDU	RD
6	11.08.2021	Updated addressing RCo Comments	ZDU	JOC
7	20.08.2021	SSDA	ZDU	JOC
8	14.09.2021	SSDA Updated	ZDU	JOC
9	22.12.2021	SSDA_04	JOC	JOC
10	25.03.2022	SSDA_04 updated w Pro Forma Rev 7	ZDU	JOC

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1. SEARS Requirements

DPIE has issued Secretary's Environmental Assessment Requirements (SEARs) for the proposed development.

Ecologically Sustainable Development SEARs	Comment / Reference
Identify how ESD principles (as defined in clause 7(4) of Schedule 2 of the Regulation) would be incorporated in the design and ongoing operation phases of the development. Schedule 2 7(4) of the Environmental Planning and Assessment Regulation 2000 states: *"The principles of ecologically sustainable development are as follows:* *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,* *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,* *c) conservation of biological diversity and ecological integrity, namely, that conservation of biological diversity and ecological integrity should be a fundamental consideration,* *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."*	Refer to Section 4 of this report. Section 4 outlines each of the ESD targets which in whole respond to this SEAR.
Identify proposed measures to minimise consumption of resources, water (including water sensitive urban design) and energy	Refer to Section 4 of this report.
Identify how the future development would 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.	Refer to Section 4 & Section of this report.
Identify how environmental design will be achieved in accordance with the GANSW Environmental Design in Schools Manual (GANSW, 2018)	Refer to Section 4.1 and Appendix A of this report.
Provide an assessment against an accredited ESD rating system or an equivalent program of ESD performance. This should include a minimum rating scheme target level.	Refer to Section 4.1 and Appendix A of this report.
Provide a statement regarding how the design of the development is responsive to the NARCliM projected impacts of climate change	Refer to Section 4.3 of this report
Provide an Integrated Water Management Plan detailing any proposed alternative water supplies, proposed end uses of potable and non-potable water, and water sensitive urban design	Refer to Section 4.2.2 and Section 4.4 of this report

2. Executive Summary

This ESD SSDA Report has been prepared on behalf of School Infrastructure (SI) NSW care of Roberts Co. for the proposed development of Sydney Olympic Park new high school - located at Burroway Rd, Wentworth Point, New South Wales, 2127. The Darug people are the traditional owners of the land along the Cumberland Plains. The site is situated on the traditional lands of the Wann clan.

This report provides an overview of the proposed Sustainable Development (SD) principles and sustainability initiatives to be included within the project, outlines the sustainability targets for the project, identifies the Ecologically Sustainable Design (ESD) rating tool benchmarked against, lists the ESD initiatives undertaken by the project and provides details of the pathways that will be utilised to achieve the set target.

Information contained within this report has been prepared in consideration with:

- The Secretary's Environmental Assessment Requirements (SEARs) for this development.
    - Building design response statement to NARCliM projections
    - Integrated Water Management Plan
- Educational Facilities Standards and Guidelines (EFSG) Sustainability Requirements.
- NCC 2019 Section J Amendment 1 Compliance
- Certified 4 Star Green Star Design & As-Built v1.3.
- Schools Infrastructure NSW Sustainability Initiatives
- Auburn Local Environment Plan 2010
- Wentworth Point Precinct Development Control Plan 2014

In coordination with the above, the project will implement several sustainable design principles and includes initiatives designed to mitigate the environmental impact of the following:

- **Energy & Carbon**– including on-site renewable energy and improved energy efficiency across the buildings and its associated sources.
- **Water Management** – including water reuse, reduced potable water demand and improved stormwater quality.
- **Health & Wellbeing** – improving indoor air quality, maximising daylight, providing comfortable amenities and active transport facilities.
- **Materials**– considering the whole of life impact of materials and considering their retention and selection to minimise harm to the environment, including efficiency and construction.
- **Resilience** – including a site-specific climate change risk assessment and adaptation plan.

The following sections detail the development's specific sustainable design response in more detail.

3. Proposal

The proposed development is for the construction of a school whereby the project is known as Sydney Olympic Park new high school. The school is to be constructed in a single stage and occupied in two stages. The SSD application seeks consent for both Stage 1 and Stage 2.

Stage 1 will provide for a Stream 5 high school catering for up to 850 students. Stage 2 will bring the school up to a Stream 9 school capability catering for up to 1,530 students.

The design features a main six-storey building as well as a hall building for sports and performance.

The play space required to meet the needs of Stage 1 can be generally accommodated on site within the 9,511sqm available. In order for Stage 2 to commence operation, additional play space is required to accommodate the increased student numbers. This additional play space will be provided by a future playing field to the north, which will be subject to a Joint Use Arrangement and available for public use outside school hours.

The remainder of the peninsula (TfNSW land) is under review and will be subject to a separate approval process. Redevelopment of this land will include a new access road off Burroway Road along the eastern boundary of the subject site, which will feature car parking, drop-off zones and waste zones for the school. Commencement of Stage 2 is reliant upon delivery of this road.

4. Site Description

The proposed development is located within the peninsula of Wentworth Point at 7-11 Burroway Road, Wentworth Point, legally known as Lot 1 DP1276305.

The site forms part of the Wentworth Point Planned Precinct, which was rezoned in 2014 for the purposes of high density residential, public recreation, school and business purposes.

The site is approximately 9,511sqm in area, with a frontage of approximately 91m to Burroway Road. It currently contains vacant land, which is cleared of all past development, and almost entirely cleared of native vegetation.

The surrounding area is generally characterised by high rise residential and mixed-use developments. The site is directly adjacent to the Wentworth Point Peninsula Park and immediately east of Wentworth Point Public School.

Figure 1 - Site Aerial Map, Source: Mecone

5. Project ESD Drivers

The following section presents an overview of the applicable drivers for this project. In pursuit of the ESD design principles, Sydney Olympic Park new high school development will pursue design excellence benchmarked against number of frameworks.

The projects commitment to ESD is displayed by addressing the following:

- The Secretary's Environmental Assessment Requirements (SEARs) for this development.
- Educational Facilities Standards and Guidelines (EFSG) Sustainability Requirements.
- NCC 2019 Section J Amendment 1 Compliance
- Certified 4 Star Green Star Design & As-Built v1.3.
- Schools Infrastructure NSW Sustainability Initiatives
- Auburn Local Environment Plan 2010
- Wentworth Point Precinct Development Control Plan 2014

Figure 2 - Woods Bagot Render

5.1 Educational Facilities Standards and Guidelines (EFSG)

The Educational Facilities Standards and Guidelines outline several ESD principles in DG02: Ecologically Sustainable Development including:

- 02.02 - Use of NSW Government Resource Efficiency Policy to drive efficiency in energy and water use, minimise waste and improving air quality
- 02.03 – Energy consumption is predicted to be at least 10% lower than if built to minimum compliance with NCC requirements. This may be achieved through:
    - Use of natural daylighting
    - Inclusion of daylight sensors and zoning
    - External shading to reduce direct solar radiation
    - Use of energy efficient LED lighting
    - Energy efficient appliances in accordance with the GREP
    - Solar photovoltaic system to offset power consumption
- 02.04 – Reduction of potable water use through:
    - Use of water efficient appliances and fittings
    - Rainwater harvesting for irrigation or toilet flushing
    - Stormwater management to minimise pollutants in waterways
- 02.05 – Use of sustainable materials including:
    - Those that have lower adverse environmental impacts throughout their life cycle
    - Contain reduced or no hazardous substances
    - Reduce demand for rare or non-renewable resources
    - Have low embodied energy and water
    - Recycled materials
- 02.06 – Ecological conservation through best practice design, material use, systems, and operational methodology
- 02.07 – Waste management through re-use and recycling of materials and use of building materials which can be disassembled for re-use
- 02.08 – Climate change adaptation to adaptively respond to climate changes over time
- 02.09 – Sustainability benchmarking to include principles to a level that the building could be benchmarked to achieve a 4 Star Green Star rating.

5.2 NCC Section J – Energy Efficiency

The project will be required to demonstrate compliance with the new provisions outlined within NCC Section J 2019 amendment 1.

Section J outlines minimum performance requirements including,

- Maximum greenhouse gas emissions (GHG) levels; and
- Minimum thermal envelope performance for building elements such as walls, floors, roof, and external glazing; and
- Treatment of thermal bridging across construction systems; and
- Minimum performance requirements for building sealing; and
- Maximum lighting power densities for internal lighting design; and
- Minimum performance levels for building air-conditioning and ventilation systems; and
- Minimum requirements for energy and water metering; and
- Minimum requirements for energy and water data collection; and
- Minimum access for maintenance requirements.

The proposed new performance standards for Section J (2019) will increase the thermal performance requirements for code compliant façade designs, meaning consideration must be shown for exposed glazing included within the façade design.

5.3 Schools Infrastructure NSW Sustainability Initiatives

The following priorities have been outlined by SINSW as sustainability initiatives. These priorities are supported by mandatory minimum requirements in the School Infrastructure design (DGs) and specification guides (SGs) and thus implemented throughout all SINSW schools, including SOPHS.

Priority 1: Climate Action - Do our part to counteract climate change.

i. DG62 Power

ii. DG65 Special Electrical Systems

iii. DG65 Controls

iv. SG951 Energy conservation: Lighting

v. SG933 Energy efficiency appliances and equipment, solar PV systems

Priority 2: Give back more than we take - Own our impact and pursue intergenerational equity.

i. DG66 Photovoltaic-Solar Power Generator

ii. DG53 Water

iii. DG53 Roof water harvesting, tank storage

iv. DG95 Stormwater

v. SG811 and SG812 Water conservation: water efficient appliances

vi. SG821 Stormwater management

vii. Provision of bubblers and taps to encourage water drinking and less waste

viii. DG01 Whole of life considerations

ix. DG48 Hazardous Materials

x. SG185 Sustainable materials: Timber

xi. DG40 and SG671 Sustainable materials: low VOC

xii. DG48 Waste management

xiii. Environmental management (GC21 Edition 2 Conditions of Tendering)

xiv. Aboriginal employment (NSW Gov Aboriginal Procurement Policy and DOE Reconciliation Action Plan)

xv. Inclusive employment (NSW Gov Diversity and Inclusion Strategy 2018-2022)

xvi. Increasing SME participation in government procurement (NSW Gov Small and Medium Enterprises and Regional Procurement Policy)

xvii. Additional learning opportunities (Design for Manufacture and Assembly)

xviii. Joint/community use (Master Planning Guidelines)

xix. Aboriginal participation (GC21 Edition 2 Preliminaries and GC21 Edition 2 Conditions of Tendering)

xx. Skills development and training (GC21 Edition 2 Conditions of Tendering)

Priority 3: Resilience - Play our role in enabling NSW communities to withstand and adapt to change.

i. Stakeholder engagement is required for all capital projects via technical stakeholder groups and broader community consultation. (Green Star - Communities v1.1)

ii. An independent design review is undertaken on all SINSW projects by an independent technical stakeholder group and the EFSG and Design Advisory teams at SINSW. (Green Star - Communities v1.1)

iii. SINSW has commissioning procedures (EFSG 65.18, PV Inverter Commissioning Manual, DG64.04, DG63.06, DG65.03, SG812, SG933, SG1011)

iv. SINSW Commissioning and Temporary Schools Program reviews the design and commissioning.

v. DG02.08 Climate Change Adaptation

vi. Local employment and materials (NSW Government Small and Medium Enterprise and Regional Procurement Policy)

Priority 4: Unlocking individual potential - Relentlessly and holistically pursue equity of opportunity.

i. DG05 Air Movement

ii. DG07 Sun Control

iii. DG11 Acoustics

iv. DG55 Cooling Policy

v. DG63 Lighting

vi. Encouragement of healthy lifestyles and wellbeing (Rapid Transport Assessment)

vii. Improve nutrition through provision of canteen (DOE Nutrition in Schools Policy)

viii. Planting of food plants (GA Environmental Design in Schools)

ix. Promote physical activity through the provision of quality open space (EFSG)

x. Healthy places that provide adequate open play space provision, wayfinding and improved public spaces. (Green Star - Communities v1.1)

xi. Access to fresh food is provided on all SINSW projects through the healthy canteen program. Some projects also include productive landscape. (Green Star - Communities v1.1)

xii. Safe places, it is an EFSG requirement for projects to incorporate crime prevention through environmental design (CPTED) principles. (Green Star - Communities v1.1)

xiii. Safe and inclusive sanitation (GAO Design Guide for Schools)

xiv. Accessibility (EFSG DG06)

xv. Elimination of racism (DOE Anti-Racism Policy)

xvi. Consideration of the aboriginal cultural history for the site to reflect and incorporate into the design considerations (Government Architect – Designing with Country)

xvii. Recognition of indigenous heritage and communities (Masterplan Report) in school design (Government Architect – Designing with Country)

xviii. Culture, heritage and identity, which is assessed and interpreted as part of the SINSW development process. (Green Star - Communities v1.1)

xix. The design of schools should respond to and enhance the positive qualities of the setting, landscape and heritage, including Aboriginal cultural heritage. (SEPP Schedule 4, Design Quality Principle 1)

5.4 Auburn Local Environment Plan 2010

Although the project now resides within the City of Parramatta Council, it formerly resided within Auburn City Council and remains under the Auburn Local Environment Plan (LEP) 2010. The following ESD related excerpts have been extracted.

Overall Aims of the LEP:

- to foster integrated, sustainable development that contributes to Auburn's environmental, social, and physical well-being,
- to integrate principles of ecologically sustainable development into land use controls,
- to protect, maintain and enhance the natural ecosystems, including watercourses, wetlands, and riparian land,

Each of these aims are addressed by the EFSG and Green Star Pathway attached in Appendix A.

Additional local provisions

Auburn LEP has included these additional local provisions:

- Acid Sulphate Soils
- Earthworks
- Water Protection
- Foreshore Building Line

There are associated maps which display the above additional local provision's zoning. None of the above local provisions overlap with the project site, thus these provisions are not a requirement to adhere to the Auburn LEP.

5.5 Wentworth Point Precinct Development Control Plan 2014

Generally, projects within Wentworth Point must align with the Wentworth Point Precinct Development Control Plan (DCP). Since Sydney Olympic Park new high school is a state significant development, the SEAR's for the project outweigh the LEP and DCP for the area. When applicable, the project should try to adhere to the local constraints. The following excerpt has been extracted from the DCP, (5.0 Sustainability and Environmental Management, pg31)

5.0 Sustainability and Environmental Management

5.1 Sustainability

Objectives:

- To increase energy efficiency.
- To reduce reliance on potable water.
- To be climatically responsive and maximise advantages provided by the precincts north facing waterfront location including access to winter sunlight and cooling summer breezes.
- To reduce waste and increase the reuse and recycling of materials.

Controls:

- The re-use of grey water and provision of dual water reticulation systems is encouraged where possible.
- Development adjacent to the waterfront that faces north should optimise the amount of glazing on the northern façade and incorporate deep and extensive balconies.
- Public amenities are to use water and energy efficient fittings.

5.2 Water Management

Objectives:

- To reduce stormwater quantity and improve stormwater quality prior to it exiting the precinct.
- To reduce reliance on potable water for use in irrigations systems.
- To reduce the risk to human life and property from flooding to acceptable levels.
- To ensure resilience to climate change and potential future sea level rise.

Controls:

- Development incorporates water management measures generally in accordance with Figure 3.
- Development incorporates a suite of other water sensitive urban design measures, those that replicate natural water cycle processes, in the public domain and within blocks such as:
    - on-site water detention
    - bio-retention systems
    - swales
    - gully baskets
    - stormwater quality improvement devices

- permeable pavements; and
- collection of rainwater for use in irrigation systems in the public domain, including streets, parks, and private communal recreation areas.

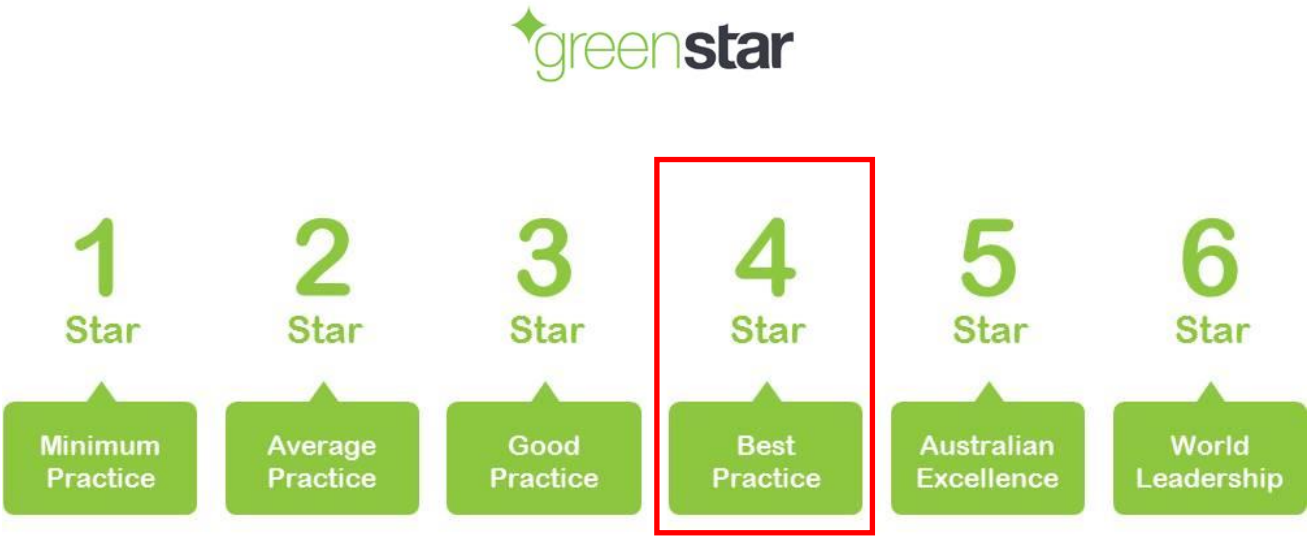
- The following stormwater targets are to be met for the entire precinct:
  - 90% reduction in the post-development average annual gross pollutant load
  - 85% reduction in the post-development average annual total suspended solids (TSS) load
  - 65% reduction in the post-development average annual total phosphorus (TP) load
  - 45% reduction in the post-development average annual total nitrogen (TN) load
- Hard paved surfaces within the peninsula park and along the foreshore promenade are to maintain permeability.
- Development complies with the flood risk management provisions of the Auburn LEP 2010.
- Development applications are to demonstrate that proposed changes to the landform will not result in increased stormwater runoff to adjoining sites.

Figure 3 – Water management (source: Wentworth Point DCP 2014)

6. Project Sustainability Design Response

The following sections document the project's response to the ESD requirements outlined in the sections above. It is noted that several the ESD requirements are duplicated within the applicable drivers for this project and the responses below may apply to multiple requirements.

6.1 Sustainable Development Framework – Best Practice



The SEARs requirements call for the identification of a framework which reflects 'national best practice sustainable building principles' as a minimum performance requirement. Sydney Olympic Park new high school proposes to exceed this requirement so that it is benchmarked against 'Best Practice' as a minimum performance requirement.

This development proposes to implement two complementary sustainability frameworks by:

- **Targeting a certified 4 Star rating under the *Green Star Design & As Built v1.3* rating tool, and**
- **Implementing the ESD principles outlined in the *Educational Facilities Standards and Guidelines (EFSG).***

It is noted that the two frameworks have similar ESD goals and therefore overlap in several categories and initiatives. Where variances occur between the two frameworks in terms of the rigor and benchmarks detailed, the most stringent one shall take place.

Historically, project team teams have responded to this requirement by benchmarking their performance against *Green Star Design & As Built*, published by the Green Building Council of Australia. Widely considered as the benchmark environmental assessment tool within the Australian Property Industry, Green Star is an independent accreditation framework which delivers sustainable built outcomes throughout the project lifecycle. Due to typology and applicable NCC version, the tool most suited to this project is the "Green Star Design & As Built v1.3" tool.

Provisional Green Star matrix and EFSG pathway demonstrating the project's ability to achieve the minimum 4 Star Green Star outcome is included in **Appendix A** of this report.

Note, the provisional list of initiatives will be subject to further amendment during project detailed design phase following development approval.

6.2 ESD Opportunities & Initiatives

The following section identifies ESD opportunities and initiatives for consideration on the project. These initiatives are required to achieve the 4 Star Green Star rated outcome or required to fulfill the EFSG requirements or both.

The main initiatives have been outlined in this section and are separated in the below categories. Note this is not inclusive of all initiatives required to achieve a Green Star rating and EFSG compliance. Refer to **Appendix A** for the complete pathways and schedules.

- **Energy & Carbon**
- **Water Management**
- **Health & Wellbeing**
- **Materials**
- **Resilience**

6.2.1 Energy & Carbon

A variety of energy efficiency measures are applicable to the proposed school. These energy efficiency measures shall form the part of the final design and operation of the spaces. The final strategy will always be a combination of sustainability, operational feasibility, architectural intent, and site-specific appropriateness.

Initiative	Description	Green Star	EFSG	GREP
Passive Design Strategy	• Building Fabric compliance with Section J 2019 without reliance on PV Systems offset. • To includes low window to wall ratio (e.g., 30-50% max.), appropriate shading and high performing thermal materials	15E.1	DG2.03 DG04 DG05 DG12	
Building at least 10% more efficient than one compliant with the NCC	• The energy consumption reduction must be achieved without including renewable energy generation in the calculation. • This shall be achieved based on the below individual initiatives.	15E.1	DG2.3	E4
Efficient lighting	• LED lighting and controls to achieve a minimum 20% improvement on illumination power densities in comparison to NCC 2019 Section J6 allowances.	15E.1	DG2.03.1	
Efficient HVAC Systems	• High performance HVAC systems with a focus on energy efficiency to be selected. • Mixed mode system with natural ventilation integration. Consideration of this should be made in the next design phase subject to cost impact on the project.	15E.1	DG2.03	

Initiative	Description	Green Star	EFSG	GREP
	• Minimum 5% improvement on EER (energy efficiency) for heat rejection units in comparison to MEPS. • Minimum 15% improvement on input power for fans in comparison to NCC 2019 DtS requirements of Part J5.4 (b). • All systems to be electric (no gas allowed). • All heat rejection systems to be air-cooled (waterless) systems.	15E.5.2 18B.3		
On-site Renewable Energy – PV System	• PV System to generate a minimum of 30% of the overall school energy demand.	15E.2	DG2.3.4 DG66	E5
Off-site Renewable Energy - GreenPower	• Site must have a PPA in place to purchase 6% of sites overall energy consumption from an accredited GreenPower provider.			E6
Efficient Appliances and Equipment	• Energy Efficient IT Equipment (e.g., monitors) and Appliances (e.g., TVs, fridges, dishwashers) to be within one star of the highest energy star rating of the comparable equipment class.	15E.2	DG2.3.3	E3
Building Air Tightness	• Air permeability targets and strategy to be incorporated early on in design and air permeability testing to be completed at PC stage to measure performance.	2.2	DG20.03	

6.2.2 Water Management

Given the recent drought events in Australia, potable water is a precious resource, and the project is seeking to minimize the use of this water as far as possible. The initiatives to be implemented include:

Initiative	Description	Green Star	EFSG	GREP
Efficient water fixtures	• High WELS rated water fittings including taps, WCs, showers, and urinals in line with NSW Government Resource Energy Policy and Green Star requirements.	18A.1	DG2.4.1	
Rainwater reuse for irrigation and toilet flushing	• On-site rainwater harvesting & reuse will reduce the site potable water demand and reduce discharge levels and maintain the overall health & ecological integrity of receiving water bodies	18A.1	DG2.4.2	
Air cooled heat rejection systems	• No water to be used for heat rejection system. HVAC systems to be all electric and air cooled.	18A.1	-	
Fire Test Water Reuse	• Where schools are required to install a sprinkler system for fire safety, a closed loop system must be installed to capture and reuse the testing water.	18A.1	DG2.4.2	
Stormwater Management	• The post-development peak Average Recurrence Interval (ARI) event discharge from the site shall not exceed the pre-development peak ARI event discharge. • All stormwater discharged from site meets specified pollution reduction targets stipulated in Green Star.	26	DG2.4.2	
Landscape design & irrigation	• Landscape design shall focus on the inclusion of local, indigenous species with drought tolerant capability. • If irrigation system is installed, the application of sub-soil landscape irrigation is recommended.	18A.1	DG2.06 DG90	
Report on water use	• To report on water-use where data is available			W1

6.2.3 Health & Wellbeing

Consideration of the indoor air quality, general comfort (e.g., lighting, acoustics, thermal) will improve the overall aesthetic, promote a healthier lifestyle thus encouraging learning for students.

Initiative	Description	Green Star	EFSG	GREP
Low VOC & formaldehyde Materials	• Low-VOC paints, sealants, adhesives, carpets, to limit emissions of dangerous volatile components and minimise health impacts of students and staff. • Selection of engineered wood products with low formaldehyde levels in accordance with industry best practice standards	13.1	DG2.5	A2
Enhanced air quality	• Sources of pollutants (printing, photocopying, cooking and vehicle) compliant with minimum emissions standards or be exhausted directly to outside.	9.3	DG57	A2
Access to daylight and views	• Access to natural daylight and quality views are to be maximised as much as possible. Orientation of home bases to achieve high levels of natural daylight and glazing to allow visual connection to outdoors. • Reduce glare through a combination of blinds, screens, fixed devices, or other means	12.0 12.1 12.2	DG2.3.1 D2.10	
Lighting Comfort	• Design of electric lighting to achieve appropriate and uniform lighting levels in line with AS 1680. • Improved uniformity of lighting based on combination of finishes selection and lighting design.	11.1 11.2	DG12 DG07	
Acoustic Comfort	• Appropriate Internal ambient noise levels (Green Star compliant) based on good façade design and selection of mechanical equipment. • Appropriate Reverberation levels (Green Star compliant) based on right selection of finishes, likely including acoustic treated ceiling and acoustic panels. • Appropriate acoustic separation between rooms by application of high performing acoustic partitions (e.g., Rw45).	10.1 10.2 10.3	DG11	
Thermal Comfort	• Mixed mode system with natural ventilation integration. Consideration of this should be made in the next design phase subject to cost impact on the project. • Conditioned spaces to achieve a predicted mean vote (PMV) of +/- 0.5 for 95% of occupied hours. This equates to 90% of occupant satisfaction.	14.1 14.2	DG55	
Active transport facilities	• Bicycle parking and associated facilities (e.g., showers and lockers) to be provided to students and staff.	17	-	

Initiative	Description	Green Star	EFSG	GREP
	Quantities and further directions to be outlined in a project specific Green Travel Plan.			

6.2.4 Resilience

The production of materials uses large amounts of natural resources, water, and energy, as well as needing to be transported long distances to the development site – which is also associated to a large carbon footprint. The responsible use and management of natural resources is key for a sustainable future. The following initiatives have been specified to minimize this impact:

Initiative	Description	Green Star	EFSG
Climate Change Adaptation Plan	• Assessment of project risks associated with the predicted impacts of Climate Change to be undertaken to ensure the project design allows for suitable provisions for the predicted impact of climate change scenarios.	3	DG2.08
Heat Island Effect	• 75% of the total project site area comprises of elements to reduce heat island effect - vegetation, light colour roof (SRI > 82), shading.	25	DG2.08

6.2.5 Materials

The production of materials uses large amounts of natural resources, water, and energy, as well as needing to be transported long distances to the development site – which is also associated to a large carbon footprint. The responsible use and management of natural resources is key for a sustainable future. The following initiatives have been specified to minimize this impact:

Initiative	Description	Green Star	EFSG	GREP
Reducing Whole of Life Environmental Impacts	• Whole of building Life Cycle Assessment to be completed to inform design on where the environmental impacts hotspots are and material selection to be thoroughly reviewed so that the school whole of life environmental impacts are reduced. • Potential initiatives include Concrete Portland Cement reduction, Steel product with low carbon footprint, use of recycled products, preference for products with Environmental Product Declaration, etc. • Materials and products which include reused content, environmental product declarations, third party sustainability certifications or product stewardship programs.	19	DG2.03 DG2.04 DG2.05 DG2.07	
Use of Responsible Materials	• Structural and Reinforcing Steel to be sourced from a Responsible Steel Maker and to be produced using low energy processes. • FSC Certified Timber • Best practice PVC plastics in formwork, piping, blinds, cables, and conduits. • PVC generally has a reputation for damaging the environment in their production, both upstream and downstream of the manufacturing process and the use of Best Practice PVC will minimise these impacts	20	DG2.5.1	
Waste Management	• A target of 90% of construction and demolition waste will be diverted from landfill. • Operational Waste Management Plan to be developed to establish operational waste targets, identify opportunities for reuse and recycling and make adequate provision of facilitates to accommodate for the OWMP. • Report on 3 waste streams by volume and cost.	22 08	DG2.7.1 DG2.7.2	P1

6.3 Principles of Ecologically Sustainable Design

In response to the expected SEARs requirements, the principles of ecologically sustainable development (as documented within the Environmental Planning and Assessment Regulation 2000) are defined within Section above. The following provides a direct response to the specific principles a) through d) as follows:

a) The Precautionary Principle:

It is recommended that an appropriately qualified professional undertakes investigation to determine if the natural features of this site are habitat to local and native wide-life, and or threatened and endangered species. Stantec has not visited site, though we suggest that the probability of irreversible environmental damage because of refurbishing Sydney Olympic Park new high school would likely be low, should the ESD principles listed throughout this document be factored into design.

Primarily, the proposed new and refurbished buildings will be located on a previously developed land within an established urban area. The risk of creating environmental damage to aspects such as waterways, water table, native habitat, and other biological features is considered low.

If the ESD principles set out in the applicable regulatory policies, plans, controls, and Australian best-practice guidelines are considered, supported, and acted upon to satisfy their objective, serious or irreversible environmental damage is not foreseen.

b) Inter-generational equity:

The proposed development approaches inter-generational equity with respect to ecological sustainability by minimising the consumption of resources whilst providing both an education facility and workplace which will ensure the health and well-being of students, staff, and visitors into the future. The project has objectives that place lower demand on resources (energy, water, materials) in construction and operation, when compared to standard practice, by introducing Australian best-practice energy, water, and materials conservation measures. These objectives and corresponding initiatives set-out to use today's resources in a manner that enables future generations to meet their own needs using equivalent resources.

c) Conservation of biological diversity and ecological integrity:

Because the proposed development is situated on previously developed land it can be assumed there is limited biological diversity present. However, the sustainability targets to be set for the project will aim to improve conservation of resources meaning that the proposed development is likely to have a smaller gross biological and ecological footprint than equivalent projects in standard practice.

d) Improved valuation, pricing, and incentive mechanisms:

This project will integrate several initiatives which aim to internalise pollution and other undesirable environmental outcomes. Contractors will be requested to provide and abide by an Environmental Management Plan and Environmental Management System which are in accordance with NSW Environmental Management Systems Guidelines or a similar standard. This places a value on environmentally responsible building practices and places a form of "polluter pays" onto the contractors to ensure they are held responsible for the environmental management of the building site as they complete their work.

The costs associated with the construction waste will be borne by the project team. They shall be required to target 90% recycling of construction waste. This may have a greater financial cost to the project; however, it provides a more accurate reflection of the full life cycle costs of the materials which were on the site, and the waste from the new materials because of the construction.

The costs of producing the following pollution: sewage, landfill waste, and CO_2 emissions are partially borne by the project team and accounted for in the project's sustainability initiatives. The project has voluntarily elected to:

- improve water consumption efficiency, thereby paying to reduce production of sewage; and
- reduce energy consumption, which means solutions to reducing CO_2 emissions will be paid to be investigated during the design phase; and
- recycle waste streams in the construction and operation of the project, which will cost more than standard practice where all material waste is directed to landfill.

6.4 NARCliM – Future Climate Projections Summary and Design Response

6.4.1 Metropolitan Sydney Summary

Famous for its large natural harbour and its status as a global city, the Metropolitan Sydney Region encompasses the Cumberland Plain and extends west to the Blue Mountains in the Great Dividing Range. The Metropolitan Sydney Region extends from Broken Bay in the north to Garie Beach in the Royal National Park in the south. With over 4 million people, the Metropolitan Sydney Region is the most populous region in New South Wales. NARCliM's modelling is on a regional basis. Sydney Olympic Park new high school is located within the Metropolitan Sydney Region; thus, the corresponding region has been analysed.

6.4.2 Temperature Projections

2020-2039

Mean temperatures are projected to rise by 0.7 ºC by 2030. The increases are occurring across the region. All models show there are no declines in mean temperatures across Metropolitan Sydney.

2060-2079

Mean temperatures are projected to rise by 1.9 ºC by 2070. The greatest increases are being seen during summer and spring. All models show there are no declines in mean temperatures across the Metropolitan Region.

6.4.3 Heat Projections

Units are the change in number of days a year maximum temperature > 35˚C

2020-2039 +3.9 days, mostly to occur in summer.

Hots days are projected to increase across the region by an average of 4 days per year by 2030. The greatest increases are seen in the central part of the region near Penrith during summer and spring, where they are projected to experience an additional 5-10 more days per year. There is little change along the coast.

2060-79 +10.4 days, mostly to occur in summer but will see more hot days in spring also.

Hots days are projected to increase across the region by an average of 11 days per year by 2070. The greatest increases are seen in the central part of the region from Picton to north of Wiseman's Ferry and out to Katoomba. These regions are projected to have additional 10-20 hot days per year.

Project's Design Responses to Temperature & Heat Projections:

Since NARCliM's projections are showing an overall increase in temperature, the project's design responses for climate predictions of temperature and heat significantly overlap. They are outlined below:

Building Envelope

- Provide a mixture of high-performance glazed façade systems, external shading device and minimize East/West facing to assist with reduced air-conditioning energy consumption and promote thermal comfort to inhabitable spaces.

Project Design

- Consider the provision of outdoor refuge with adequate horizontal shadings for outdoor occupants and visitors for adequate shading and blocking summer sun, while allowing winter sunlight underneath.
- Add landscaping and trees with drinking water fountains in multiple external spots around development.
- Use of light-coloured roof.
- Reduce hard surfaces and increase landscaping.

Mechanical

- Size air-conditioning systems to be enough with spare capacities for efficient operation whilst providing thermal comfort to conditioned spaces.
- Amend building comfort expectations (temperature bands) during peak temperature days and educate occupants for tolerance the wider temperature bands.
- Position systems in well shaded, insulated areas.
- Include heat recovery in system.
- Provide the appropriate design such as insulation to keep mechanical plant efficient.

6.4.4 Rainfall Projections

2020-2039

By 2030 there is little change in annual rainfall. Rainfall is projected to increase across the region during autumn with the largest increase seen north of Wiseman's Ferry. Rainfall is variable across the region during the other seasons.

The projected annual rainfall increase for the region is +1.7%

2060-2079

Annual rainfall is projected to increase by 2070. Increases are projected across the whole region for summer and autumn. Winter and spring rainfall is more variable, with a slight decrease in rainfall in the Blue Mountains during winter.

The projected annual rainfall increase for the region is +8.9%

Project's Design Response to Rainfall Projections:

Although an average increase in annual rainfall is expected, rainfall is expected to come infrequent short downpours. Therefore, water conservation management between rain events and flood management are important and have been addressed below.

Water Conservation:

- Design air-conditioning system with waterless /hybrid towers
- Use of drought tolerant and native plants (over 40%)
- Provide subsoil irrigation system to improve watering effectiveness.
- Design rainwater tanks for rainwater reuse for landscape irrigation
- Provide multiple alternative water sources e.g., greywater, rainwater

- Water efficient appliances

Flood Mitigation:

- Provide safer access routes that are above the peak flood levels.
- Provide multiple access routes to the site.
- Provide early warning system for a risk of a flood.
- Design stormwater system to cope with extreme rain events over 20-year.
- Design above ground stormwater system to cope with 100-year extreme rainfall.
- Incorporate best practice maintenance strategies for stormwater system with considering the worst scenario for 2070.
- Install additional power sources such as back-up generators or battery storage located above the PMF heights, to ensure they are not flood-affected and capable of power provision to the development under extreme flood events.
- Use of permeable paving.

6.4.5 Fire Projections

2020-2039

+0 Changes in number of days a year FFDI > 50

Forest Fire Danger Index (FFDI) is used in NSW to quantify fire weather. The FFDI combines observations of temperature, humidity, and wind speed. Fire weather is classified as severe when the FFDI is above 50. By 2030 severe fire weather is projected to have a slight increase in summer and along the Blue Mountains during spring. Decreases are projected during autumn and across the Sydney Basin in spring. Declines during Autumn are likely due to increases in rainfall. These increases are seen during the peak fire risk season (summer).

2060-79

+0.6 Changes in number of days a year FFDI > 50

Forest Fire Danger Index (FFDI) is used in NSW to quantify fire weather. The FFDI combines observations of temperature, humidity, and wind speed. Fire weather is classified as severe when the FFDI is above 50. Severe fire weather is projected to increase during summer and spring by 2070. Declines are projected for autumn and winter. These increases are being seen during the peak prescribed burning season (spring) and peak fire risk season (summer).

Project's Design Response to Fire Projections:

- Provide additional filtration for carbon filters and smoke removal.
- Provisions of compliant fire and life safety design of the building to protect fire and life safety strategy (e.g., provisions of exits and egress, fire sprinkler and hydrant systems, smoke hazard management, etc.)
- Provide multiple access routes to the site

6.4.6 Risk Matrix for SOPHS as a response to NARClim Projections

Risk	2020-2039	2060-2079	Comment	Design Response
Extreme temperatures within the building causing discomfort to indoor occupants.	Low	Medium	Peak temperatures increasing and becoming more common creating larger loads upon HVAC to maintain thermal comfort inside. Also, can lead to deterioration and failure of HVAC equipment.	High performance building envelope and façade, Size HVAC with spare capacity to withstand peak temperature days
Increase in temperatures causing discomfort to occupants outdoors.	Medium	High	Peak temperatures increasing and becoming more common creating outdoor amenity space to exceed thermal comfort.	Consider the provision of outdoor refuge with adequate shading for blocking summer sun, while allowing winter sunlight underneath. Use of trees in outdoor amenities for localised evaporative cool from transpiration.
Heat island effect	Low	Low	Site is surrounded by the Parramatta River. Sea breeze will be experienced around the site. Minimal density of condenser heat rejection within vicinity. Hence the risk level considered low.	To reduce UHI during peak days, the project will include a light-coloured roof (SRI>82), reduce hard surfaces where possible and increased landscaping
Access to site blocked, preventing or restricting access and egress to the site caused by flooding.	Medium	High	Many incidents of Wentworth point flooding due to its natural landscape formation. The soils of site are of alluvial origin and are characterised by localised flooding, a high erosion hazard, saline subsoil, seasonal waterlogging. Lack of access to site from Hill St seems common.	Ensure multiple access points to site
Structural integrity of the buildings undermined by extreme weather events	Medium	Medium	Again, instances of flooding in the area with high erosion soils make for relatively dynamic landscape.	Structural works to plan foundations accordingly
Failure of building use due to flood inundation	Low	Medium	Since the site rests on the Parramatta River, there will always a risk of flood inundation. Since the amount of rainfall in projected to increase in intensity, the PMV levels have risk of	The PMF with allowance for climate change is 2.94m AHD, the ground floor RL is 4.0m, thus significantly reducing the chances of flood inundation from the Parramatta River.
Increased costs of mains potable water due to hotter and drier climate	Low	Low	Projections depict hotter drier climate with short intense storms. This suggests water scarcity between storms and therefore an increase in price.	30 kL Rainwater to be implemented for irrigation and toilet water flushing.
Access to site blocked, preventing or restricting access to the site caused by bushfire	Low	Low	Due to the nature of the site, being surrounded by river and wetlands, localised bushfire is highly unlikely as there is little fuel in the area.	Ensure multiple access points to site

6.5 Integrated Water Management Plan

Sydney Olympic Park new high school is stringently following the Educational Facilities Standards and Guidelines. These guidelines holistically outline how an educational facility can mitigate their potable water consumption. The project has proposed a 30kL rainwater tank to use for irrigation. The following initiatives will be pursued by the project and can be treated as the project's integrated water management plan.

6.5.1 Potable water conservation

The following are to be implemented on school sites where possible:

- Manual flush urinal systems: New and replacement urinals shall use manual in lieu of automatic flushing mechanisms. A microwave-activated urinal flushing system may be used as an alternative.
- Water conserving taps: Wherever possible and practical, use metal flow control valves and /or push down taps with preset flow limits.

6.5.2 Fixture efficiency

All products must be rated to AS 6400 to the following minimum WELS ratings:

- Tapware to 5-star flow rating requirements
- Showers to have 3.5-star flow rating requirements
- Water Closet Pans to 4-star flow rating requirements
- Flow restrictors can be used to minimise water usage and wastage for staff amenities
- Taps with timed flow can be used to minimise water usage and wastage in student amenities.

6.5.3 Hydraulic services

Hydraulic services should:

- Support sustainable design principles including reducing water consumption and waste production.
- Appropriately treat any trade waste to ensure minimal environmental impact.
- Be accessible and serviceable - easy to maintain with minimal impact on school use when maintenance is being performed.
- Use products with a long-life span – many hydraulic services are concealed so durability is essential.

6.5.4 Water sub-metering

In addition to the main water meter for the site provide sub meters for the following:

- Mixed irrigation systems
- Laboratory buildings
- Amenities blocks
- Canteens
- Any other major water uses on the site

6.5.5 Rainwater collection

It is Department of Education's policy to include roof water harvesting and tank storage in new schools and to encourage it where practical in existing schools, to reduce the demand on drinking water supplies. Tank water can connect to drip irrigation systems for adjacent landscape/gardens with the major preference being for gravity fed supply to minimise ongoing maintenance.

6.5.6 Fire system water reuse

Where schools are required to install a sprinkler system for fire safety, it is recommended to install a closed loop system to capture and reuse fire systems testing and maintenance water, or by using an alternative non-potable water source.

6.5.7 Ground water

Where ground water is available for use for irrigation purposes, enquiries should be undertaken with DPIE to determine the suitability of a ground water system

6.5.8 Stormwater management

Aim to minimise the transportation of toxicants to waterways and other offsite environments and maintain the existing hydrological regimes.

6.6 Reconciliation Action Plan

SINSW is currently liaising with Burramatta Aboriginal Education Consultative Group to commence consultation meeting to establish the projects reconciliation pathway/design.

7. Summary

Ecologically Sustainable Development is a driving consideration in the development of the proposed Sydney Olympic Park new high school. As described, the project will incorporate several ESD and environmentally conscious initiatives in both design and operation aimed at ensuring the principles of sustainable development are both demonstrated and achieved in accordance with the project drivers. This will be benchmarked in an independent third-party certification scheme – Green Star.

The development's commitment to reducing the overall environmental impact is evident of the holistic approach taken to long-term sustainability. Documented initiatives cover categories including:

- The Secretary's Environmental Assessment Requirements (SEARs) for this development.
    - Building design response statement to NARCliM projections
    - Integrated Water Management Plan
- Educational Facilities Standards and Guidelines (EFSG) Sustainability Requirements.
- NCC 2019 Section J Amendment 1 Compliance
- Certified 4 Star Green Star Design & As-Built v1.3.
- Schools Infrastructure NSW Sustainability Initiatives
- Auburn Local Environment Plan 2010
- Wentworth Point Precinct Development Control Plan 2014

This development proposes to implement two complementary sustainability frameworks by:

- **Targeting a certified 4 Star rating under the *Green Star Design & As Built v1.3* rating tool, and**
- **Implementing the ESD principles outlined in the *Educational Facilities Standards and Guidelines (EFSG).***

Additional supporting information is provided within the Appendices of this report.

We trust this Ecologically Sustainable Development report provides sufficient overview of the project plan to environmentally sustainable design and the sustainability vision for the proposed Sydney Olympic Park new high school project.

Appendix A Green Star pathway – 4 Star

Green Star - Design & As Built Pathway

Project:	SOPHS - Sydney Olympic Park new high school
Targeted Rating:	4 Star - 4 Star - Best Practice
Revision	3

ZDU+JOC | 301350520
22/12/2021
Design & As Built v1.3

Points Available	**100**
Points Required	45
4 Star Pathway Points Targeted	59
Safety Margin	14
Rating Achieved	**4 Stars**

Category/Credit	Code	Credit Criteria	Points Available	4 Star - Points Targeted	Credit Cost Indicator	Credit Risk	Consultant Input: Architect	Mechanical	Electrical	Hydraulics / Fire	Waste	Acoustic	Landscape Architect	Civil	Structural	Sustainability	Head Contactor / Builder	SINSW	Responsibility	Compliance Requirements
Management			14	9	Compared to BAU $<20,000 $$<100,000 $$$>100,000															
Green Star Accredited Professional (GSAP)	1.0	Accredited Professional	1	1	$$	LOW										x			Stantec	Appoint GSAP at all stages of the project, leading to certification
Commissioning and Tuning	2.0	Environmental Performance Targets	Mandatory for this Credit	Complies	$	LOW		x	x	x						x	x		-	Design Intent Report to be produced by Stantec outlining the requirements and targets for the site.
	2.1	Services and Maintainability Review	1	1	$	MED	x	x	x	x							x		RCo	Review required by Head Contractor and design team during design stage. Stantec to review currently available documentation and verify if that's sufficient.
	2.2	Building Commissioning	1	0	$$	N/A		x	x	x							x		Rco	This credit would require building air tightness in addition to BAU commissioning. Suggest this may be an expensive addition to the development. Potential for innovations based on performance - requirements are relatively relaxed
	2.3	Building Systems Tuning	1	1	$$	MED		x	x	x							x		Rco SINSW	Commitment to tuning the building for 12 months post completion. To tie into commissioning/handover
	2.4	Independent Commissioning Agent (ICA)	1	0	$$	N/A											x		RCo	
Adaptation and Resilience	3.0	Implementation of a Climate Adaptation Plan	2	0	$	LOW										x			ESD Consultant	

Building Information	4.0	Building Information	1	1	$	MED		x	x	x							x	R	RCo	Provide operations and maintenance (O&M) information and log book to facilities management team and stakeholders and Provide building user information to all relevant stakeholders
Commitment to Performance	5.1	Environmental Building Performance	1	1	$	LOW										x	x	R	SINSW	Set, measure and report for at least 2 building performance metrics i.e. energy, water, waste and IEQ
	5.2	End of Life Waste Performance	1	1	$	LOW	x											R	SINSW	Commitment to reduce demolition waste at end of life of interior fitout or base building component.
Metering and Monitoring	6.0	Metering	Mandatory for this Credit	Complies	$$	N/A		x	x	x									RCo Mechanical Electrical Hydraulic	Install accessible meters to monitor building energy and water consumption. Meters must comply with the current National Measurement Regulations and NABERS rating protocol Small Buildings - Where the building's Gross Floor Area (excluding car parking areas) is smaller than 1000 m^2, unless specialist equipment is present in the building, a single meter for energy and a single meter for water will comply with this minimum requirement
	6.1	Monitoring Systems	1	-	$$	N/A		x	x	x									RCo Mechanical Electrical Hydraulic	Auto monitoring system to capture, process and present data
Responsible Building Practices	7.0	Environmental Management Plan (EMP)	Mandatory for this Credit	-	$	LOW											x		Rco	Develop and implement a best practice EMP
	7.1	Formalised Environmental Management System	1	1	$	LOW											x		RCo	A responsible party for the site has a formalised approach to planning, implementing and auditing is in place during construction, to ensure conformance with the EMP
	7.2	High Quality Staff Support	1	1	$	MED											x		RCo	Promote mental and physical health of staff and train up in sustainability practices through on-site, off-site and/or online classes
Operational Waste	8A	Performance Pathway	1	1	$	LOW	x				x						x		RCo Waste Consultant	Qualified waste consultant prepares and Implements an Operational Waste Management Plan (OWMP) which is then reflected in design of building facilities
	8B	Prescriptive Pathway	-	N/A		N/A														Project team to comply with the following: ● separation of waste streams ● dedicated waste storage area
Category/Credit	**Code**	**Credit Criteria**	**Points Available**	**Points Targeted**															**Responsibility**	**Compliance Requirements**
Indoor Environment Quality			17	11																
	9.1	Ventilation System Attributes	1	1	$	MED		x											Mechanical	● Minimise outdoor air pollutants ● Design HVAC for ease of maintenance ● Clean prior to occupation ASHRAE Standard 62.1:2013 is referenced

Indoor Air Quality	9.2	Provision of Outdoor Air	2	0	$$	N/A			x											Mechanical	1 point - Outdoor air is provided at a rate 50% greater than min required by AS 1668.2:2012 or maintain CO_2 concentrations below 800ppm 2 points - Outdoor air is provided at a rate 100% greater than min required by AS 1668.2:2012 or maintain CO_2 concentrations below 700ppm ●Naturally ventilated spaces must meet the requirements of AS 1668.4-2012
	9.3	Exhaust or Elimination of Pollutants	1	1	$	LOW	x	x												Mechanical	Sources of pollutants (printing, photocopying) compliant with minimum emissions standards or be exhausted directly to outside
Acoustic Comfort	10.1	Internal Noise Levels	1	1	$$	LOW	x					x								Acoustic	Internal ambient noise levels no more than 5db(A) above lower figure in table 1 of AS/NZA 2107:2016 Compliance shall be demonstrated through measurement provided by a qualified acoustic consultant
	10.2	Reverberation	1	1	$$	MED	x					x								Acoustic	Reverberation time below max stated in table 1 of AS/NZS 2107:2016 Compliance shall be demonstrated through measurement
	10.3	Acoustic Separation	1	0	$$	N/A	x					x								Acoustic	Reduce noise transmission between enclosed spaces Rw of at least 35 for partitions with doors and at least 45 for partitions without a door
Lighting Comfort	11.0	Minimum Lighting Comfort	Mandatory for this Credit	-	$	HIGH				x										Electrical	Lights in the nominated area (all primary and secondary spaces) are Flicker-free lights and min Colour Rendering Index (CRI) of 80 Requires 12-bit drivers for LED Lights
	11.1	General Illuminance and Glare Reduction	1	1	$	LOW				x										Electrical	Lighting levels and quality comply with the GBCA best practice guidelines and Glare reduction
	11.2	Surface Illuminance	1	0	$$	N/A	x			x										Architect Electrical	Combination of lighting and surfaces improve uniformity of lighting
	11.3	Localised Lighting Control	1		$$	N/A				x										Electrical	Occupants are be able to control the lighting in their immediate environment Example of immediate environment: ● open-plan office - light shone on the workstation ● residential unit - light hitting the work surface in the kitchen where food is prepared
	12.0	Glare Reduction	Mandatory for this Credit	N/A	$$	LOW	x										x			Architect ESD	Reduce glare through a combination of blinds, screens, fixed devices, or other means
	12.1	Daylight	2	1	$	MED	x										x			Architect ESD	● 1 point - 40% of the nominated area (all primary spaces) receives high levels of daylight ● 2 points - 60% of the nominated area (all primary spaces) receives high levels of daylight

Visual Comfort	12.2	Views	1	1	$	LOW	x									x			Architect ESD	60% of the nominated area (all primary spaces) has to have a clear line of sight to a high quality internal or external view External View – A high quality external view must extend to the outside towards natural elements such as large bodies of vegetation, a body of water, frequent movement of (people, vehicles, or animals) or sky Internal View - A high quality internal view is defined as a view towards an area that is landscaped or contains a water feature, or an atrium
Indoor Pollutants	13.1	Paints, Adhesives, Sealants and Carpets	1	1	$	LOW	x	x	x	x						x	x		RCo Architect Services Consultants	No paints, adhesives, sealants or carpets are used in the building or 95% of all internal paints, adhesives, sealants and carpets meet total VOC limits
	13.2	Engineered Wood Products	1	1	$$	LOW	x										x		Rco Architect & Service Consultant (Joinery)	No new engineered wood products are used in the building or At least 95% of all engineered wood products meet formaldehyde emission limits
Thermal Comfort	14.1	Thermal Comfort	1	1	$	LOW		x								x			Rco Mechanical ESD	80% of occupants satisfied - equivalent to PMV between -1 and +1
	14.2	Advanced Thermal Comfort	1	1	$$	MED		x								x			Rco Mechanical ESD	90% of occupants satisfied - equivalent to PMV between -0.5 and +0.5
Category/Credit	**Code**	**Credit Criteria**	**Points Available**	**Points Targeted**															**Responsibility**	**Compliance Requirements**
Energy			22	10																
Greenhouse Gas Emissions	15E.0	Conditional Requirement: Reference Building Pathway	Mandatory for this Credit and Certification	-	-	LOW		x	x	x						x	x		ESD RCo Architect Services Consultants	Projects targeting: ● 4 Star - Proposed building must achieve 10% improvement on NCC Section J reference building. Equivalent to GBCA Benchmark Building ● 5 Star - Minimum points threshold = 3 points ● 6 Star - Minimum points threshold = 6 points
	15E.1	Reference Building Pathway	20	8	$$$	MED	x									x		x	ESD RCo Architect Services Consultants	Points awarded for emissions reduction: ● Building fabric relative to NCC Section J to Reference Building - 1 point for 5%, 2 point for 10%, 3 point for 15%, max. 4 point for 20% ● Proposed building relative to GBCA Benchmark Building - 1.6 point for 10%, 3.2 point for 20%, 4.8 point for 30%, 6.4 point for 40% etc.

	15E.5.2	Fuel Switching	2	0	$$$	HIGH																		x	ESD RCo Architect Services Consultants	Points awarded for no fossil fuel burnt on site: * Minor amount for cooking allowed, but 100% electric systems installed for DHW + Heating
	16A	Prescriptive Pathway - On-site Energy Generation	2		$$$	N/A																			-	1 point - On-site electricity generation systems reduces the total peak electricity demand by at least 15%
Peak Electricity Demand Reduction	16B	Performance Pathway - Reference Building	2	2	$$$	MED		x														x	x		RCo Head Contractor	Project's predicted peak electricity demand has been reduced below that of a Reference Building: ● 1 point - 20% reduction ● 2 points - 30% reduction

Category/Credit	Code	Credit Criteria	Points Available	Points Targeted																				Responsibility	Compliance Requirements
Transport			10	4																						
Sustainable Transport	17A.1	Performance Pathway	10	4	$$	HIGH																	x		ESD Transport Consultant	● The Travel Plan or Transport Plan must be developed by a suitably qualified transport professional ● Completion of the Sustainable Transport Calculator ● Most appropriate for suburban or regional projects

Category/Credit	Code	Credit Criteria	Points Available	Points Targeted																				Responsibility	Compliance Requirements
Water			12	6																						
Potable Water	18A.1	Performance Pathway	12	6	$$	MED		x	x			x				x									ESD Hydraulics Fire Landscape & Mechanical	Completion of the Green Star Potable Water Calculator

Category/Credit	Code	Credit Criteria	Points Available	Points Targeted														Responsibility	Compliance Requirements
Materials			14	6															
Life Cycle Impacts	19B.1	Concrete	3	1	$$	MED									x	x	x	ESD RCo Structural	Portland cement content reduction measured by mass compared to the reference case ● 1 point - 30% content reduction ● 2 points - 40% content reduction Water reduction - 0.5 point mix water for all concrete used in the project contains at least 50% captured or reclaimed water Aggregates Reduction - 0.5 point ● at least 40% of coarse aggregate in the concrete is crushed slag aggregate or another alternative materials and does not increase the use of Portland cement by over 5 kg/m^3 of concrete or ● At least 25% of fine aggregate (sand) inputs in the concrete are manufactured sand or other alternative and does not increase the use of Portland cement by over 5 kg/m^3 of concrete ● **Concrete masonry, including core-filled, is excluded** This credit is not applicable if cost of all poured concrete is less than 1% of project contract value
	19B.2	Steel	1		$$	MED									x	x	x	ESD RCo Structural	Steel framed building - Reduced Mass of Steel Framing to compared standard practice ● High strength steel or ● 5% reduction in mass of steel frame used Concrete framed building - Reduced Use of Steel Reinforcement compared to standard practice ● 5% reduction in the mass of reinforcing steel used This credit is not applicable if cost of structural and reinforcing steels is less than 1% of project contract value
	19B.3	Building Reuse	4	N/A	$	N/A									x		x	-	Façade Reuse ● 1 point - at least 50% (by area) of the building façade is retained ● 2 points - at least 80% (by area) of the building façade is retained Structure Reuse ● 1 point - at least 30% (by mass) of the existing major structure is retained ● 2 points - at least 60% (by mass) of the existing major structure is retained ● 5% reduction in the mass of reinforcing steel used This credit is not applicable if total GFA of the original building(s) is less than 20% of the GFA of the new building that replaces it
	19B.4	Structural Timber	3	N/A	$$$	N/A										x		-	The minimum requirement is met where all structural timber (30% or more of the building's GFA) used in the building is responsibly sourced Proportion of structural timbers ● 1 point - 30% of the building's GFA ● 2 points - 70% of the building's GFA ● 3 points - 90% of the building's GFA

Responsible Building Materials	20.1	Structural and Reinforcing Steel	1	1	$$	MED										x		x		Rco Structural	95% of steel (by mass) sourced from responsible steel maker and For steel framed buildings - at least 60% of the fabricated structural steelwork is supplied by a steel fabricator/steel contractor accredited to the Environmental Sustainability Charter of the Australian Steel Institute (ASI) For concrete framed buildings - at least 60% (by mass) of all reinforcing bar and mesh is produced using energy-reducing processed in its manufacture
	20.2	Timber Products	1	-	$$	N/A												x		RCo	95% (by cost) of all timber used is certified or reused
	20.3	Permanent Formwork, Pipes, Flooring, Blinds and Cables	1	1	$$	LOW	x	x	x	x								x		RCo Mechanical Electrical Hydraulic Structural	90% (by cost) of all permanent formwork, pipes, flooring, blinds and cables should not contain PVC or meet GBCA best practice guidelines for PVC
Sustainable Products	21.0	Product Transparency and Sustainability	3	2	$$	MED												x		RCo	● Proportion of all materials (by cost) used in the project meet transparency and sustainability requirements under one of the following: Reused Products; Recycled Content Products; Environmental Product Declarations; Third-Party Certification; Stewardship Programs ● 1 point - 3% Compliant products ● 2 points - 6% Compliant products ● 3 points - 9% Compliant products ● Completion of the GBCA Sustainable Products Calculator
Construction and Demolition Waste	22.0	Reporting Accuracy	Mandatory for this Credit	-	$	MED					x							x		RCo Waste Contractor	All waste contractors and waste processing facilities that provide waste management and reporting services must demonstrate compliance with *Green Star Construction and Demolition Waste Reporting Criteria*
	22A	Fixed Benchmark	1	N/A		N/A														-	
	22B	Percentage Benchmark	1	1	$	LOW												x		RCo Waste Contractor	● 90% of construction and demolition waste generated to be diverted from landfill or ● Less than 10kg/m^2 of GFA goes to landfill

Category/Credit	Code	Credit Criteria	Points Available	Points Targeted														Responsibility	Compliance Requirements
Land Use & Ecology			6	3															
Ecological Value	23.0	Endangered, Threatened or Vulnerable Species	Mandatory for this Credit	-	$	LOW								x		x		X	RCo SINSW Lanscape	No critically endangered or vulnerable species or ecological communities were present on site at the date of site purchase or option contract
	23.1	Ecological Value	3	1	$$$	LOW	x							x		x		x	RCo SINSW Lanscape	● Improve ecological value of the site from before state ● Completion of the Ecological Value Calculator ● 1 point - 0.01 improvement in value ● 2 points - 0.10 improvement in value ● 3 points - 0.02 improvement in value

	24.0	Conditional Requirement	Mandatory for this Credit and Certification	-	$	LOW													X	SINSW	Site did not include old growth forest, prime agricultural land, wetland of high national importance or impact on matters of national significance
Sustainable Sites	24.1	Reuse of Land	1	1	$	LOW													x	SINSW	● 75% of the site was previously developed land at the date of site purchase or ● The project is a building extension, and 75% of the extension (including landscaping) falls within an area of the site that was 'previously developed land'
	24.2	Contamination and Hazardous Materials	1		$$	HIGH												x	x	RCo SINSW	Environmental site assessment concludes site is contaminated and is to be remediated prior to development
Heat Island Effect	25.0	Heat Island Effect Reduction	1	1	$$	MED	x					x								Architect Landscape Architect	75% of the total project site area comprises of elements to reduce heat island effect - vegetation, light colour roof, shading

Category/Credit	Code	Credit Criteria	Points Available	Points Targeted				Responsibility	Compliance Requirements
Emissions			5	3					
Stormwater	26.1	Stormwater Peak Discharge	1	1	$	LOW	x	Civil	Post-development peak average recurrence interval (ARI) event discharge from site does not exceed pre-development
	26.2	Stormwater Pollution Targets	1	1	$$	LOW	x	Civil	Additional point awarded for stormwater site discharge to meet GBCA pollution reduction targets
Light Pollution	27.0	Light Pollution to Neighbouring Bodies	Mandatory for this Credit	-	$	LOW	x	Electrical	Compliance requirement - AS 4282:1997
	27.1	Light Pollution to Night Sky	1	0	$	MED	x x	Electrical Landscape	No external luminaire has an upward light output ratio (ULOR) that exceeds 5% relative to actual mounted orientation or Direct illuminance from external luminaries does not produce an initial point illuminance value greater than 0.5 lux to site boundary and 0.1 lux to 4.5m beyond site into night sky
Microbial Control	28.0	Legionella Impacts from Cooling Systems	1	1	$$	LOW	x	Mechanical	Building naturally ventilated or Has waterless heat rejection system or Has water-based heat rejection systems that includes measures for Legionella control and Risk Management
Refrigerant Impacts	29.0	Refrigerant Impacts	1	-	$$	HIGH	x	-	● Total system direct environmental impact (TSDEI) of refrigerant systems is less than 15 or ● Calculated TSDEI is between 15 and 35 with leak detection system in place with automated refrigerant recovery or ● Refrigerants have ozone depletion potential (ODP) of 0 and global warming potential (GWP) of 10 or less

Category/Credit	Code	Credit Criteria	Points Available	Points Targeted		Responsibility	Compliance Requirements
Innovation			10	7			
Improving on Green Star Benchmarks		Greenhouse Gas Emissions	2	1	MED		On-site energy renewable systems produce 15% more energy than what is required by the building
		Construction and Demolition Waste	1	-	N/A	-	Waste going to landfill meets a fixed benchmark of 5kg/m^2 of GFA
		Stormwater	1	1	MED	-	Exceeding Stormwater Pollution Targets
	30D	Indoor Pollutants	1	-	N/A	-	One or more indoor plant with a soil area of at least 500cm^2 (0.05 m^2) are required per 10m^2 of nominated area
	30D	Community Benefits	1	1	MED		A 'needs analysis' of the surrounding community is required but TQ has been approved on using community use of schools facilities policy instead. Still community engagement activities and a plan is required.

Innovation Challenge	30D	Integrating Healthy Environments	1	1	MED		Research report behind Healthy Canteen Policy Evidence of roll out of policy in initial schools and expansion into all schools. Evidence that it has been incorporated into the school under assessment
	30D	RAP	1	1	MED		Compliance based on DoE's RAP
	30D	Universal Design	1	1	MED	-	EFSG DG19 Access for People With Disabilities, supporting how design has been enhanced against the National Construction Code (NCC) • Accessibility plan (or similar) developed for the project. • Drawings or photos demonstrating the accessibility initiatives that have been carried out for the project.
	30D	Powered by Renewables	3		N/A	Head Contractor/Electrical	1 point available for 15% of annual consumption sourced from renewables. 2 points for 30%. Another point available for electricity storage procurement/installation
Global Sustainability	30E	Amenity Space	1		N/A	Head Contractor	Compliance demonstrated using staff room amenities but still needs to be documented as per credit requirements (TQ)
	30E	Green Cleaning	1	1	MED	Head Contractor	

Appendix B EFSG Pathway

PROJECT:	SOPHS	17/08/2021 - 4 Star Green D&AB Equivalent for SSDA					Consultant Input													
Theme & objective from SINSW's Sustainable School Infrastructure Strategy	Indicator	Sustainability initiatives / requirements from the EFSG This is an extract only from the relevant EFSG. For full requirements refer to https://efsg.det.nsw.edu.au/welcome	EFSG type	Crossover with Green Star	Standard evidence to demonstrate compliance	Has this been implemented in the project? Y or N	Architect	Façade	Mechanical	Electrical	Hydraulics / Fire	Waste	Acoustic	Landscape Architect	Civil	Structural	Head Contactor / Builder	SINSW	ESD/Sustainability	Project Team member responsible for Providing Eviendence Compliance with EFSG requirements
Energy & carbon	EC1: Energy efficiency	**Improvement over NCC** Building is designed and built so that energy consumption is predicted to be at least 10% lower than if build to minimum compliance with NCC requirements. Reduction to be achieved without including renewable energy generation in the calc.	Mandatory	DAB c15E.0 GHG Emissions Reduction - Conditional Requirement	1. Energy modelling report / Predictive energy modelling and thermal comfort assessment. Report needs to show at least 10% improvement of building over minimum NCC requirements; and 2. As-built evidence that model is an accurate representation of the building, e.g. drawings; and 3. Specifications / calculations supporting modelling inputs, e.g. window energy rating scheme certificates, calculated R-values of walls, roofs, etc. 4. As an alternative to 2 and 3 above, a Statement by energy modeller confirming that the moel accurately represents the building.	Y	X		X	X	X								X	ESD
Energy & carbon	EC1: Energy efficiency	**Energy conservation** Design and construct all school buildings within the parameters specified in the: - Government Energy Management Program (GEMP) - NSW Public Works Energy Manual for Buildings - Building Code of Australia (BCA) Section J for Energy Efficiency The GEMP recognises that savings must be made in energy usage and maintenance to maintain the program of capital works. The NSW Public Energy Manual for Buildings provides an energy-saving strategy by identifying aspects of the building and services where reductions in operating and maintenance costs can be made through proper selection of: - Building fabric - Insulation materials - Shading and ventilation - Services and control It also requires the formulation of an energy impact statement.	Mandatory	DAB c15 GHG Emissions Reduction	1) Energy impact statement	Y	X	X	X	X	X								X	ESD
Energy & carbon	EC1: Energy efficiency	**Daylighting** - Maximise natural daylight in all habitable spaces to reduce energy usage through windows and skylights - Including daylight sensors in rooms to reduce light output or turn off light when sufficient daylight is provided within the space - When the space is large and perimeter lighting is adjacent to windows, perimeter lighting is on a separate zone to make maximum use of daylight	Mandatory	DAB c15 GHG Emissions Reduction	1. Daylight modelling report demonstrating how natural daylight has been maximised in all habitable spaces; and 2. As built drawings demonstrating that the model accurately represents the building (i.e. window size and location; skylights installed, etc.); and 3. Specifications supporting inputs used in modelling (e.g. skylights and glass specs)	Y	X	X		X									X	ESD
Energy & carbon	EC1: Energy efficiency	**Shading devices** On exposed facades subject to direct sunlight, external window shading has been considered as part of the building design	Mandatory	DAB c15 GHG Emissions Reduction	1. As built drawings	Y	X	X											X	Architect
Energy & carbon	EC1: Energy efficiency	**Lighting energy conservation** Lighting system must have timed or sensor feedback functionality for energy conservation	Mandatory	DAB c15 GHG Emissions Reduction	1. As built mechanical drawings / statement from head contractor	Y				X										ESD (Energy Modelling and Daylight Report) Electrical Contractor (Lighting As-builts and Specifications)
Energy & carbon	EC1: Energy efficiency	**Energy efficient lighting** - LED lighting must be installed - The design of the lighting systems and the selection of fittings is to be undertaken based on a Whole of Life approach - System must support sustainable design principles including reducing energy consumption - Use light sources lamps and control gear with a long life	Mandatory	DAB c15 GHG Emissions Reduction	1. As built electrical drawings	Y				X										ESD (Energy Modelling and Daylight Report) Electrical Contractor (Lighting As-builts and Specifications)
Energy & carbon	EC1: Energy efficiency	**Maximum illumination power densities** Section J part 6 of the National Construction Code provides tables that define the maximum illumination power density that is acceptable in various locations. This, and all other elements of Section J part 6 should be applied appropriately.	Mandatory	DAB c15 GHG Emissions Reduction	1) Lighting drawings 2) Lighting specifications / schedules 3) Lighting modelling report showing compliant power densities	Y				X										Electrical Contractor
Energy & carbon	EC1: Energy efficiency	**Lighting control** The required communication protocol for the luminaires is DALI. The following systems for the control of luminaires fitted with DALI control gear are considered acceptable: - Diginet Rapix suite of products. - Clipsal C-bus suite of products - Philips Dynalite suite of products - KNX based systems Systems must be designed to be as simple as possible. This simplicity must extend from the topography to ease of use. It is a specific requirement that programming of any control system must be relatively simple and not limited to costly specialist consultants. Allowances should be made in system design specifications for user group training of control systems and for the programming of the system as part of the commissioning and hand over process. All equipment and manuals necessary to operate and maintain the system must be provided to the school and Asset Management	Mandatory	DAB c15 GHG Emissions Reduction DAB c4 Building Information	1) Commissioning report 2) Confirmation from AMU that all relevant manuals have been handed over	Y				X										Electrical Contractor Commissioning Agent (Electrical Contractor)
Energy & carbon	EC1: Energy efficiency	**Constant light output / Daylighting** -Constant Light Output (CLO) systems consisting of dimming luminaires and light level sensors are highly recommended as they are effective in maintaining the required illuminance values. CLO systems ensure that the lit environment remains compliant at the lowest possible Watts per square metre for the reasonable operating life of the luminaires. Maintained illuminance values required for design compliance will result in areas being over-lit for a large proportion of their operating life without a CLO system. - Sensors can be fitted to each luminaire or by utilising sensors that control groups of luminaires. - Once in operation a CLO system delivers compliant light levels over the life of a system by reducing the light through dimming and ramping the levels up over the lifespan of the luminaire. These systems should be seamless and invisible in operation to users of the locations. - Daylight Harvesting can be delivered as a component of a CLO system and requires no additional hardware above and beyond that required for a CLO to operate. - Daylight harvesting is recommended in areas where there is a rapid transition from natural day light to a dark environment, such as when entering a multi deck or underground car park from a street in full daylight, or in a classroom where daylight from windows is within the field of view.	Mandatory	DAB c15 GHG Emissions Reduction	1) Lighting drawings 2) Lighting modelling report showing compliant power densities	TBC				X										Electrical Contractor

Energy & carbon	EC1: Energy efficiency	**Switching strategy** - Local switching should be provided where it is identified that the users can benefit from manual operation of the lighting and other lighting automation technology is considered cost prohibitive. The switching should be clearly marked and robust. - Achieve energy efficient switching in Schools by: The use of multiple switching groups Automatic control of these groups to operate as follows: Controlled luminaires are to automatically turn-off nominally 3 minutes after the bell sounds. Turn-off is to be in two steps other than in small rooms, one step after 3 minutes and the second group 2 minutes later (5 min). If the lighting is required for the next period, occupants of that room can prevent the lights turning off by pressing the ON switch/es after the bell sounds. The luminaires in each room can be turned off at any time by pressing the OFF switch/es. The off signal is to be capable of transmission at the end of normal school hours or at other selected times without the bells sounding, with the lighting turning off in two steps (other than in small rooms).	Negotiable / TBC	DAB c15 GHG Emissions Reduction	1) Electrical & lighting drawings showing switching groups and automatic controls	Y				X											Electrical Contractor
Energy & carbon	EC1: Energy efficiency	**Energy efficient HVAC system** HVAC system must have timed or sensor feedback functionality for energy conservation Systems shall be designed to minimise energy consumption. System design / equipment selection is to be based on whole of life cost analysis. Specifically air conditioning equipment should: - support sustainable design principles including reducing energy consumption; and - be easily accessible and serviceable – easy to maintain with minimal impact on school operations / activities when maintenance is being performed. All new school buildings are to be designed to meet or exceed the requirements of building regulations for conditioned spaces	Mandatory	DAB c15 GHG Emissions Reduction	1. As built mechanical drawings / statement from head contractor; 2. Whole of life cost analysis demonstrating systems were selected based on WOL performance.	Y			X										X		ESD (Energy Modelling) Mechanical Contractor(Mech As-builts) Mechanical Contractor(WOL)
Energy & carbon	EC1: Energy efficiency	**Energy efficient appliances & equipment** Electrical equipment must be at least 0.5 stars above the market average star rating or comply with high efficiency standards specified in the GREP	Mandatory	DAB c15 GHG Emissions Reduction	1. Schedule of appliances and equipment with their star ratings or performance standards, signed by head contractor or architect. All appliances and equipment required in the GREP must be listed, incl air conditioning equipment, electric motors, transformers, etc.	Y	X			X							X				Architect (FFE) SINSW - (O&Ms)
Energy & carbon	EC1: Energy efficiency	**Heat loss/gain** Building/HVAC design must consider: - Climate/ micro-climate: This data shall come from the current AIRAH handbook and where a specific area is not referenced in the handbook, the Bureau of Meteorology statistics shall be utilised. - Orientation: exposure to sun(solar) and wind - Natural Ventilation and cross ventilation - Insulation, thermal capacity and time lag of building fabric. - Energy and Resources Cost: Initial and on-going, of heating and cooling. Reduced energy consumption provides future cost savings and a reduced carbon footprint. - Activities / Equipment that may produce excess heat. Energy modelling software is to be used to determine heating and cooling loads as part of the Whole of Life analysis that is to be undertaken. (i.e. Camel or Carrier).	Mandatory	DAB c15 GHG Emissions Reduction	1. Thermal modelling report 2. As built evidence demonstrating that model is an accurate representation of the building 3. Specifications/ calculations supporting modelling inputs	Y	X	X	X									X		ESD
Energy & carbon	EC1: Energy efficiency	**Passive design** The need for active cooling and heating shall be minimised by employing passive / sustainable design principles. Windows: The size and proportions of windows need to be 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 etc. Roofing: The colour selected will have an impact on the thermal performance. Light colours will reflect more of the sun's heat and darker colours absorb more of the sun's heat, which will be transferred into the roof structure. Orientation (as close to True North as possible). With appropriate shading, this will provide a balanced approach to reducing summer heat ingress and encouraging solar warmth during winter. Appropriate glazing/ shading strategy (related to orientation and local environment), Depending on the climate, windows would be minimised on southern, eastern & western elevations with external shading on western and eastern facades). Use of thermal mass (to stabilise internal temperatures). Insulation: maximise insulation in line with	Mandatory / Recommended	DAB c15 GHG Emissions Reduction	1. Thermal modelling report 2. As built evidence demonstrating measures implemented to reduce need for active cooling / heating 3. Passive design report by Architect listing all passive design initiatives implemented	Y	X	X										X		ESD Architect
Energy & carbon	EC1: Energy efficiency	**Ventilation strategy** A ventilation strategy is to be developed to ensure that sufficient ventilation is provided to all spaces to meet the requirements of the BCA/NCC and associated standards. Specifically ventilation equipment should: - Support sustainable design principles including reducing energy consumption - Be accessible and serviceable - easy to maintain with minimal impact on school use when maintenance is being performed	Mandatory	DAB c15 GHG Emissions Reduction	1) Cooling system strategy including WOL analysis 2) Concept plans 3) Construction drawings 4) Trade-based specification 5) As built drawings	Y	X		X									X		ESD (Thermal Comfort) Mechanical Contractor(Mech docs)
Energy & carbon	EC1: Energy efficiency	**Natural ventilation** - Is required to all classrooms for comfort in summer and to maintain a healthy indoor environment. - Where cross ventilation may be restricted (i.e. where rooms are located on each side of a corridor, at least one whole wall of operable windows plus ceiling fans are required, to provide air movement. - Some windows need to be operable in driving rain and so must be protected with appropriately designed weather hoods, eaves overhang or other method of protection.	Mandatory	DAB c15 GHG Emissions Reduction	As built drawings demonstrating windows have been installed as required.	Y	X		X									X		ESD Architect
Energy & carbon	EC1: Energy efficiency	**Mechanically assisted cross-ventilation** In two storey blocks where cross flow ventilation is not possible to the lower floor, mechanically assisted cross ventilation is to be provided to the lower floor learning spaces nominated in the EFSG. The ventilation system is to be sized to provide at least 7 air changes per hour. The system is to be thermostatically controlled to activate when room temperature exceeds 28 deg C and is to run continuously until the room temperature drops below 27 deg C. Additionally the system is not to be activated unless the outdoor temperature is lower than the indoor temperature and is to be immediately de-activated as soon as the outdoor temperature exceeds indoor air temperature. Provide programmable seven-day time clock and 0-2 hrs adjustable after-hour timer to control each mechanically assisted exhaust ventilation system.	Mandatory	DAB c15 GHG Emissions Reduction	As built mechanical drawings and specifications Extracts from commissioning report	TBC	X		X											Mechanical Contractor Mechanical Design Consultant (Mech docs)
Energy & carbon	EC1: Energy efficiency	**Ceiling void ventilation** Provide ventilation so as to remove hot air build-up in large enclosed roof spaces. Roof mounted turbo ventilators are an approved method. - The size and number of ventilators to be included will depend upon the volume and use of the individual rooms and the local climatic conditions to provide suitable air changes and room cross ventilation. - Provide a minimum of two roof ventilators to each Secondary General Learning Space or a Primary Home Base unless otherwise directed, or other number recommended by the manufacturer for the size of the space (whichever is the greater). - Ventilator throat diameter to be no less than 400mm.	Mandatory	DAB c15 GHG Emissions Reduction	As built mechanical drawings demonstrating ventilation has been installed as required.	TBC	X		X											Mechanical Contractor
Energy & carbon	EC1: Energy efficiency	**Roof ventilator control** Provide controls for the operation of the motorised dampers on the roof ventilators. Generally one switch is required for each space within the school where roof ventilators are installed	Mandatory	DAB c15 GHG Emissions Reduction	Mechanical / electrical drawings showing controls	TBC	X		X											Mechanical Contractor

Energy & carbon	EC1: Energy efficiency	**Wind powered roof ventilators** School buildings can use wind powered roof ventilators with dampers to provide effective summer ventilation. Design to suit local ambient climatic conditions to ensure correct sizes, locations and numbers are provided for each particular application. Co-ordinate the locations of ventilators with the ceiling fans to achieve effective air movement. Fan assisted ventilators should also be considered on days of low wind Provide a wall mounted switch to open /close the damper.	Mandatory	DAB c15 GHG Emissions Reduction	As built mechanical drawings showing location of roof ventilators if installed	TBC	X		X												Mechanical Contractor
Energy & carbon	EC1: Energy efficiency	**Ventilation in sanitary spaces** - Greater air circulation than that required by building regulations is required, with sufficient natural ventilation or mechanical ventilation, to disperse odours and /or humidity. - Cross ventilation is to be used where possible. - Provide mechanical ventilation to all Disabled Toilets. - Operate the system by time control equipment (time switches or run-on timers as appropriate).	Mandatory	DAB c15 GHG Emissions Reduction	As built mechanical drawings demonstrating ventilation has been installed as required.	Y	X		X												Mechanical Contractor
Energy & carbon	EC1: Energy efficiency	**Ventilation in storage spaces** - Permanent air ventilation openings are to be provided (without compromising security), to prevent concentration of odours.	Mandatory	DAB c15 GHG Emissions Reduction	As built mechanical drawings demonstrating ventilation has been installed as required.	Y	X		X												Mechanical Contractor
Energy & carbon	EC1: Energy efficiency	**Ventilation in permanent learning spaces and libraries** Where feasible / practical: - Ceiling fans shall be installed where ceiling height is equal to or greater than 2,700mm. - Wall fans shall be installed where ceiling heights are less than 2,700mm	Mandatory	DAB c15 GHG Emissions Reduction	As built drawings demonstrating ceiling/wall fans have been installed as required.	TBC	X		X	X									X	Electrical Contractor
Energy & carbon	EC1: Energy efficiency	**Indoor environment controls** - Both the thermal comfort and indoor air quality shall be controlled automatically within specified parameters. - Controls shall be simple and intuitive to use. - A prominent green light shall highlight to occupants when conditions are suited to opening windows and doors to utilise natural ventilation. - A prominent blue light shall highlight to occupants when the air conditioning is operating. - The lights shall 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 CO2 sensors are to be installed within the space and be readily accessible for maintenance. - Sensors must be located so as to accurately record the actual room temperature and indoor air quality (CO2). - Controls shall be designed to minimise energy consumption – e.g.: by minimising over cooling and heating and automatically switching off when the space is unoccupied. - Controls shall be designed so that the system/s will shut down automatically if a room is unoccupied for greater than 10 minutes (except in specific cases such as designated computer rooms). - Controls shall be properly labelled and suitably located in the space (preferably near the light switch) and incorporate: + a key operated auto / manual / off switch; and + a push on / push off adjustable hour run timer. The run timer shall be adjustable from 1 to 4 hours and initially be set at 2 hours	Mandatory	DAB c15 GHG Emissions Reduction	1) As built evidence demonstrating controls have been installed as required. 2) Commissioning report / statement by head contractor confirming controls have been set as required	Y			X												Mechanical Contractor
Energy & carbon	EC1: Energy efficiency	**Access for maintenance** All systems and equipment that is installed within a school is to be provided with suitable access to ensure that this equipment is safely and efficiently maintainable. In order to ensure that maintenance is available, on the completion of all buildings, drawings are to be provided showing the completed (As Built) building including all equipment and equipment access arrangements. **Communication services** DoE requires a 4 hour on-site training session for up to four persons on the use of the SCS. Training is to be accompanied by appropriate documentation and a video that demonstrates operation of the system and its components, including patching, cable management for voice, video and data of the SCS installed on site. Include explanation of detailed drawings left on site. The video / CD ROM may be generated from the on-site training for future use by DoE school staff. The Project Manager will, in consultation with the School Principal, nominate the timing of this session together with the number of attendees. Manuals are to be handed to the school during the training session. Include in copies of all cabling test reports and the (minimum) 20-year warranty certificate the manual. As built documentation and manufacturers warranty and test results are required **Building user's guide** Produce a Building User's Guide to enable the client to understand the building systems and operate systems to maximise efficiency. This must: - Clearly and concisely describe the operation of building and its services - Detail a reasonable maintenance program - Advise the user of the most suitable replacements for consumables	Mandatory	DAB c4 Building Information	1) As built drawings including all equipment access arrangements for maintenance 2) Training records 3) Operation manuals 4) Manufacturers warranties and cabling test reports 5) Building user's guide	Y	X		X	X	X					X				All Hydraulic Contractor (Hyd) Mechanical ContractorAir (Mech) Electrical Contractor (Elec) Fire Contractor (Fire) Fall Arrest System Contractor RP
Energy & carbon	EC2: Scope 1 & 2 emissions	**Renewable energy** A grid connected solar PV system must be installed Where feasible, PV systems shall be installed to offset as much of the electricity consumed by the school as is practicable	Mandatory	DAB c15 GHG Emissions Reduction; DAB c16 Peak Electricity Demand Reduction	1) As installed drawings of PV system 2) Energy modelling report showing renewable energy generation	Y				X							X	X	X		Architect Electrical Contractor ESD
Energy & carbon	EC2: Scope 1 & 2 emissions	**Energy storage** Battery used as energy storage of grid or solar energy may be used for grid forming, grid support, peak-demand management and load shifting, and self-consumption of renewable electricity. Energy storage is substantiated when: - there is historical evidence of grid outages and a need for backup power; - there are critical loads which require an uninterruptible power supply or backup power supply; - It is economical for energy storage systems to supplement or replace an existing backup generator (financial assessment required); - the DNSP requires that the energy storage be implemented; - The financial benefit of the system outweighs the cost of the system. This can be demonstrated by calculating and showing that the Levelised Cost of Electricity (LCOE) from a battery energy system with a certain operation regime is less than the retail tariff rate experienced at the site, or by showing that the BESS can reduce energy cost at the site and achieve a payback period of 8 years or less.	Mandatory	DAB c15 GHG Emissions Reduction; DAB c16 Peak Electricity Demand Reduction	1) As installed drawings of battery storage system	N				X								X			SINSW
Energy & carbon	EC2: Scope 1 & 2 emissions	**Heaters** In rooms where reverse cycle air conditioning is installed gas heaters shall not be provided. The only exception to this may be in the coldest parts of the state where reverse cycle air conditioning may be unable to provide effective heating. Heating equipment should: - Support sustainable design principles including reducing energy consumption - Be accessible and serviceable - easy to maintain with minimal impact on school use when maintenance is being performed	Mandatory	DAB c15 GHG Emissions Reduction	1) If reverse cycle air conditioning is installed, confirmation that gas heaters are not installed, OR 2) Evidence that the gas heaters installed are energy efficient	Y			X	X											Hydraulic Contractor Mechanical Contractor Architect
Energy & carbon	EC2: Scope 1 & 2 emissions	**Water heaters** - Hot water and tempered water generation for schools should be carefully considered to ensure that a Whole of Life assessment is undertaken to minimise life cycle costs - Environmentally friendly options such as solar heating (if vandal resistant), high efficiency instantaneous gas and heat pumps are preferred energy sources to minimise energy consumption.	Mandatory	DAB c15 GHG Emissions Reduction	1. WOL cost assessment for hot water systems 2. Hydraulic drawings/schematics showing installed DHW systems	Y					X					X					Hydraulic Contractor
Energy & carbon	EC3: Scope 3 emissions	Transport plan	N/A	DAB c17 Sustainable Transport		Y										X	X			SINSW/ SINSW PM

Energy & carbon	EC3: Scope 3 emissions	**Bicycle storage** Provide 1 space for every 20 students to AS2890.3 standard	TBC	DAB c17 Sustainable Transport		Y	X															SINSW/ SINSW PM Architect
Water	W1: Water use efficiency	**Potable water conservation** The following are to be implemented on school sites where possible: Manual flush urinal systems: New and replacement urinals shall use manual in lieu of automatic flushing mechanisms. A microwave-activated urinal flushing system may be used as an alternative. Water conserving taps: Wherever possible and practical, use metal flow control valves and /or push down taps with pre set flow limits.	Mandatory	DAB c18 Potable Water	1. Schedule of fixtures and fittings showing type of urinals and taps installed are as required	Y	X				X											Hydraulic Contractor Architect
Water	W1: Water use efficiency	**Fixture efficiency** All products must be rated to AS 6400 to the following minimum WELS ratings: - Tapware to 5 star flow rating requirements - Showers to have 3 star flow rating requirements - Water Closet Pans to 4 star flow rating requirements - Flow restrictors can be used to minimise water usage and wastage for staff amenities - Taps with timed flow can be used to minimise water usage and wastage in student amenities. In any case, all fixtures and fittings must be at least the average WELS star rating by product type. Where WELS rating is not available, use the alternative WaterMark rating scheme.	Mandatory	DAB c18B.1 Potable Water - Sanitary Fixture Efficiency	1. Schedules of materials, fixtures, fittings and equipment with WELS/WaterMark ratings, demonstrating compliance and identifying those with flow restrictors and timed flow.	Y	X				X											Hydraulic Contractor Architect
Water	W1: Water use efficiency	**Hydraulic services** Hydraulic services should: - Support sustainable design principles including reducing water consumption and waste production. - Appropriately treat any trade waste to ensure minimal environmental impact - Be accessible and serviceable - easy to maintain with minimal impact on school use when maintenance is being performed - Use products with a long life span – many hydraulic services are concealed so durability is essential	Mandatory	DAB c18 Potable Water	1) Hydraulic report showing sustainability initiatives implemented to reduce potable water consumption 2) As built drawings showing trade waste arrestors	Y					X											Hydraulic Contractor
Water	W1: Water use efficiency	**Water sub-metering** In addition to the main water meter for the site provide sub meters for the following: - Mixed irrigation systems - Laboratory buildings - Amenities blocks - Canteens - Any other major water use on the site	Mandatory		1) As built hydraulic drawings	Y					X											Hydraulic Contractor
Water	W2 – Proportion of potable vs non-potable water	**Rainwater collection** It is DoE policy to include roof water harvesting and tank storage in new schools and to encourage it where practical in existing schools, to reduce the demand on drinking water supplies. Tank water can connect to drip irrigation systems for adjacent landscape/gardens with the major preference being for gravity fed supply to minimise ongoing maintenance.	Mandatory	DAB c18B.2 Rainwater Reuse	1) As built hydraulic drawings showing tank connection to end uses and capacity	Y	X				X											Hydraulic Contractor Architect
Water	W2 – Proportion of potable vs non-potable water	**Fire system water reuse** Where schools are required to install a sprinkler system for fire safety, it is recommended to install a closed loop system to capture and reuse fire systems testing and maintenance water, or by using an alternative non-potable water source.	Optional	DAB c18B.5 Fire System Test Water	Fire engineering report	Y					X											Fire Contractor (Fire Eng Statement)
Water	W2 – Proportion of potable vs non-potable water	**Ground water** Where ground water is available for use for irrigation purposes, enquiries should be undertaken with DPIE to determine the suitability of a ground water system.	Mandatory	DAB c18 Potable Water	1. Relevant due diligence report / investigation	N/A					X						X	X				Hydraulic Contractor
Water	W3 – Responsible water discharge	**Stormwater management** Aim to minimise the transportation of toxicants to waterways and other offsite environments, and maintain the existing hydrological regimes.	Mandatory	DAB c26 Stormwater	Stormwater modelling report showing stormwater pollution and flows. Civil / Hydraulic drawings showing management measures. Water sensitive urban design report (if WSUD was use4)	Y								X								Structural Engineer
Water	W3 – Responsible water discharge	**Trade waste** Arrestors for acid, grease, plaster and clay of adequate capacity must be installed to treat wastewater from science laboratories, kitchens, art rooms and canteens as required in DG52.	Mandatory	Not covered in Green Star	1) As built drawings showing trade waste arrestors or 2) Letter by Hydraulic Engineer confirming arrestor have been installed as required	Y					X											Hydraulic Contractor
Waste & materials	WM1: Materials selection and use	**Life cycle assessment (environmental)** Environmental impacts of products and materials has been assessed and inform material selection	Recommended	DAB c19A - Life cycle assessment	Life cycle assessment report	TBC	X	X	X	X	X						X		X			ESD RP Electrical Contractor Mechanical Contractor Hydraulic Contractor
Waste & materials	WM1: Materials selection and use	**Whole of life costing (WOL)** Total cost of ownership (TCO) assessment / Analysis of direct and indirect costs and benefits / Life cycle costing analysis When calculating the whole of life cost for the different materials / building elements or systems, the following must be considered: - the total initial capital cost of the system/s – including design, project management, builder and building services works in connections etc. - resources (energy and where applicable water) consumption. - Maintenance. - the replacement of component parts. - disposal costs - ecological sustainable options - durability - vandalism - safety The whole of life cost shall be calculated over the estimated life of the asset/s.	Recommended	GSC c20 - Return on Investment	Life cycle costing report for relevant system	Y	X	X	X	X	X					X	X	X	X			Mechanical Contractor (WOL) Architect SINSW Business Cases
Waste & materials	WM1: Materials selection and use	**Sustainable materials** The use of the following materials in construction is encouraged: - Materials that have lower adverse environmental impacts throughout their life cycle; - Reduce the demand for rare or non-renewable resources; - Have low embodied energy and water; - Are made from or contain recycled materials or can be recycled at the end of their useful life.	Optional	DAB c21 Sustainable Products	Environmental Product Declarations of products / materials used; Product certificates (like GECA, FSC, et3) Suppliers' declarations confirming recycled contents in products Bill of quantities	TBC	X	X	X	X	X						X		X			ESD RP Electrical Contractor Mechanical Contractor Hydraulic Contractor

Waste & materials	WM1: Materials selection and use	**Sustainable timber** - Use only recycled timber, engineered and glued timber composite products, timber from plantations or from sustainably managed regrowth forests. - All timber used is to be termite (white ant) resistant or treated to be termite resistant to the appropriate hazard level.	Mandatory	DAB c20.2 Responsible Building Materials - Timber	1. Evidence of chain of custody 2. Bill of quantities	Y	X								X	X		X						Structural Engineer ESD Architect Timber Flooring Contractor Structural Timber Contractor
Waste & materials	WM1: Materials selection and use	**Built for disassembly** Consider the use of building materials which are able to be disassembled for re-use, in conjunction with considerations for the addition and removal of accommodation over time.	Mandatory			Y	X	X								X									Architect Façade Contractor Structural Engineer
Waste & materials	WM1: Materials selection and use	**Concrete** - Use materials complying with AS based on the Whole of Life approach to materials selection. - Do not use breccia or dolerite in concrete mixes. - Fly ash is a manufacturing bi-product that can be used as a cement replacement but should limited to a maximum of 20% by weight of cement content.	Mandatory	DAB c19B.1	Structural specifications and drawings Structural Engineer's report showing %cement replacement	Y									X	X								Concrete Contractor Structural Engineer
Waste & materials	WM2 – Resource efficient school operations	**Operational waste** Consider opportunities for re-use and recycling of materials in the operation of the facilities	Mandatory	DAB c8 Operational Waste	Operational waste management plan Operational waste reports showing diversion rates	Y					X					X								SINSW
Waste & materials	WM2 – Resource efficient school operations	**Building flexibility** Position structural members considering the future flexibility of the structure. Avoid ad hoc placing of columns internally, giving preference to uniformity in layout. Design all internal walls as non-load bearing to enable future flexibility.	Mandatory	Not covered in Green Star	As built drawings or statement by relevant professional	Y	X								X									Architect Structural Engineer
Waste & materials	WM3 – Responsible management of waste	**Construction waste** Consider opportunities for re-use and recycling of materials in the construction phase	Mandatory	DAB c22 Construction and Demolition Waste	Construction waste reports showing percentage of waste re-used and recycled (diverted from landfill)	Y					X					X								Waste Contractor RP
Waste & materials	WM3 – Responsible management of waste	**Operational waste** A waste storage area must be included in all new school sites, with the provision of space for the separation of waste and receptacles for multiple waste streams, including: - general rubbish, - co-mingled recycling, - paper and cardboard, - secure waste, and - green waste. Safe methods for vehicle access and the transfer of waste must also be considered.	Mandatory	DAB c8 Operational Waste	As-built drawings showing location of waste storage area	Y	X				X													SINSW Architect
Place	P1 – Green infrastructure	**Environmental conservation education** The design of the facilities provide unique and valuable environmental conservation learning opportunities and effective environmental modelling to the wider community.	Mandatory		Statement / Report by qualified ecologist	Y	X							X		X	X							Architect Urban Planner/ Landscape/Ecologist Architect
Place	P1 – Green infrastructure	**Productive landscape** Consider including opportunities for development of community garden within the site and relationships with community groups for this to occur.	Optional	GSC c14.2 Local Food Production	Site plan demonstrating location and size of community garden	TBC	X							X		X	X							Landscape Architect
Place	P1 – Green infrastructure	**Drinking water catchment protection** For developments within drinking water catchment areas, a water cycle management study is to be included with the Development Application for Education Facility developments involving: - Agriculture facilities - Biosolids and effluent re-use schemes - Sewerage systems or works (including package sewerage treatment plants) - Stormwater or works involving the disposal of untreated runoff	Mandatory	GSC c24 Integrated Water Cycle	1. Water cycle management study 2. Evidence that recommendations in the study have been followed / implemented	N/A				X			X	X	X	X								Hydraulic Engineer Hydraulic Contractor Civil Engineering Consultant
Place	P2 – Community & heritage connections	**Site investigations for place making / community connections** The following detailed reports/ surveys/ information should be considered in developing the business case: - Local environment/ character - Climate and microclimate - Heritage significance / impact - Appraisal of physical and visual factors affecting site development - Available transport/ road infrastructure servicing the site - Geo-technical and Soil reports will be required for each site to investigate the suitability of the topsoil and anticipated sub-grade materials for horticultural purposes. - Testing for toxic residues must be undertaken in all areas identified as being a possible risk - i.e. filled or dumped ground.	Negotiable	GSC c12 Culture, Heritage and Identity DAB 24.2 Contamination and Hazardous Materials	1) Relevant reports/surveys developed (these ideally include recommendations for further development stages) 2) Evidence demonstrating recommendations / best practice solutions have been implemented/addressed.	Y	X							X	X	X	X	X						ESD Landscape Architect Architect SINSW Hazard Material Contractor RP (Section B Report/ RAP)
Place	P2 – Community & heritage connections	**Sense of place** The following design principles to every landscape zone of the school. - A healthy and safe landscape - A sense of place - A sustainable landscape - A low maintenance landscape	TBC	Not covered in Green Star	1) Landscape design report 2) Landscape drawings	Y	X							X		X								Landscape Architect Urban Planner Architect
Place	P2 – Community & heritage connections	**Community use of facilities** Some school facilities are used out of hours for activities such as weekend church groups, sport events and public meetings. Liaise with the Project Director to gain an understanding of any shared use, or community use arrangements that are being considered for the site. New schools should be designed so that direct access to the open play space, fields , hall and gym can be achieved without the public gaining access to the buildings.	TBC	DAB c30B Community Benefits	1. Confirmation by the Architect that direct access has been provided to open space and any other facilities that could be shared with the community. 2) A list of community engagement activities undertaken to develop a community benefits strategy. 3) Plans clearly outlining how the outcomes from the community benefits strategy have been implemented in the project 4) Joint-use or lease agreements where already in place	Y	X										X							SINSW Architect
Place	P2 – Community & heritage connections	Reconciliation action plan	N/A	DAB c30D Reconciliation Action Plan	1) DoE's Reconciliation Action Plan 2) Evidence of the project's relationship with the RAP, e.g. actions implemented in line with RAP, etc.	Y	X										X							SINSW Architect
Place	P3 – Welcoming learning spaces	**Daylighting** Maximise natural daylight in all habitable spaces to improve indoor amenity and create a pleasant environment.	Mandatory	DAB c12 Visual Comfort	1. Daylight modelling report demonstrating how natural daylight has been maximised in all habitable spaces; and 2. As built drawings demonstrating that the model accurately represents the building (i.e. window size and location; skylights installed, etc.); and 3. Specifications supporting inputs used in modelling (e.g. skylights and glass specs)	Y	X												X					ESD

Place	P3 – Welcoming learning spaces	**Daylight glare control** Discomforting glare and brightness contrasts must be avoided. It is recommended to: - Exclude direct sunlight from all learning spaces, libraries, administrative offices and staff studies for the period of 9.00am to 3.30pm including Eastern Daylight Saving Time between 21st September to 21st March (equinoxes). Elimination of direct sunlight into the spaces will also reduce unwanted heat gain in summer. - Exclude direct sunlight from desk level in all learning spaces between 9am and 3:30pm. Sun exclusion and glare control can be achieved by the use of elements such as; Sun shades, eave extensions, vertical blades and the like. Glare should only be controlled by blinds as a last resort. Prepare sun diagrams in the design phase as a minimum requirement.	Mandatory	DAB c12.0 Glare Reduction	1. Daylight glare modelling report / sun diagrams showing direct sunlight has been excluded as required. 2. Drawings supporting inputs of model, showing location of blinds and any other glare control device	Y	X										X	ESD
Place	P3 – Welcoming learning spaces	**Lighting comfort** - Consider the furniture layouts to determine the orientation of luminaires. Especially when positioning luminaires in Materials Technology spaces to ensure adequate illumination on machines and work surfaces; - avoid potential stroboscopic effects and avoid shadows from ductwork - Mount luminaires as high as possible, but generally no higher than 4000mm AFFL (excluding Gymnasiums and Halls), to improve luminance uniformity and reduce direct glare in the direction of normal view - The standard lamp colour temperature is 4,000°K, except in certain toilet areas where the Design Guide requires the use of blue colours - Compliance with the uniformity requirements of the applicable standard should be demonstrated by the presentation of the output from lighting design software. - Unified Glare Rating (UGR) must be calculated using design software and compliant with the maximum recommended in AS/NZS 1680.1:2006	Mandatory	DAB c11 Lighting Comfort	1) Lighting drawings 2) Architectural drawings 3) Lighting specifications / schedules 4) Product data sheets 5) Isolux plot drawings 6) Lighting modelling report showing compliant uniformity and UGRs	Y	X			X							X	Electrical Contractor
Place	P3 – Welcoming learning spaces	**Lighting modelling** Lighting designs should be carried out utilising industry standard lighting design software such as AGI32, Dialux or Relux. Modelling must provide output that clearly demonstrates that the proposed design is compliant with the standards including but not limited to the following parameters: - Maintained illuminance values (average, maximum and minimum) on horizontal surfaces such as floors or working planes as required, broken down to identify the parameters defined in AS/NZS1680.4 or AS/NZS1158 as applicable - Maintained illuminance values (average, maximum and minimum) on vertical surfaces such as walls, shelves or racks as required, broken down to identify the parameters defined in AS/NZS1680.4 or AS/NZS1158 as applicable - Unified Glare Rating (UGR) as defined by AS/NZS1680, - Uniformity as defined by the applicable standard for indoor or outdoor illumination, - Lighting power density in System Watts/m2	Mandatory	DAB c11.1 General Illuminance and Glare Reduction	Lighting modelling report confirming compliance with required standards and parameters	Y				X							X	Electrical Contractor
Place	P3 – Welcoming learning spaces	**External access lighting** External Access Lighting shall be provided to illuminate building entrances, footpaths, sheltered walkways, roadways and car park. External Access Lighting must: - Be minimal and designed to prevent glare to pedestrians, nearby residents and to motorists. Evidence of compliance with AS4282, AS/NZS 1158 and other applicable Australian Standards must be provided by the designer. - Be located so as to link various sources of illumination such as street lighting (for carpark and roadways) and internal security lighting (for footpaths, walkways and entrances). - Illuminate building entry doors. - Highlight 'accident-prone' areas such as changes in level, stairs and ramps. - Provide vertical illumination.	Mandatory	DAB c27.0 Light Pollution to Neighbouring Bodies	1) As built drawings indicating the location of all external luminaires 2) Letter by lighting designer describing glare prevention measures	Y				X			X					Electrical Contractor
Place	P3 – Welcoming learning spaces	**Thermal comfort** The inclusion of active cooling within school facilities is directed by the Department's Air Cooling policy: 2.1 Schools with a long term average mean maximum January temperature of 33 oC and above: Generally, air conditioning is to be provided to all school buildings. 2.2 Schools with a long term average mean maximum January temperature of below 33oC: Air conditioning is to be installed in all permanent learning spaces and libraries forming part of each projects scope. - Thermal modelling is undertaken to demonstrate that learning spaces and libraries have been designed to achieve a predicted mean vote (PMV) of +/- 1 for 95% of occupied hours	Mandatory	DAB c14 Thermal Comfort	1) Mechanical drawings showing HVAC systems installed, or 2) Confirmation from sub-contractors that services have been installed and commissioned as required; and 3) Modelling report showing required PMV is achieved. Modelling report to be done in line with methodology described in Draft thermal comfort and indoor air quality interim performance brief for DG55	Y	X	X	X								X	ESD Mechanical Contractor Commissioning Agent Façade Contractor
Place	P3 – Welcoming learning spaces	**Background noise levels** - HVAC systems shall be designed in accordance with the recommended internal noise levels noted in table 1 of DG55.02. The noise levels are the result from the cumulative contribution of traffic noise (via the façade) PLUS the building air-conditioning /ventilation systems. The noise measurement and documentation must be provided by a qualified acoustic consultant and in accordance with AS/NZS 2107. Noise measurement must account for all internal and external noise including noise arising from building services equipment, noise emission from outdoor sources such as traffic, and (where known) noise from industrial process. Occupancy noise is excluded. Compliance shall be demonstrated through measurement, and the measurements shall be conducted in at least 10% of the spaces in the nominated area. The selection of representative spaces must be justified and must consider how the spaces are considered to be the most conservative with respect to both internal, and external noise sources. The range of measurement locations shall be representative of all spaces available within the nominated area. All relevant building systems must be in operation at the time of measurement. Projects less than 500m2 Gross Floor Area (GFA) must account for measurements conducted in at least 95% of spaces within the nominated area. - Enclosed circulation areas should be acoustically absorptive	Mandatory	DAB c10.1 Internal Noise Levels	1. Road, rail, aircraft, industrial and rain noise assessment as per DG11.02 2. Report by qualified acoustics consultant demonstrating noise measurements are compliant.	Y	X		X			X						Acoustic Consultant/Contractor
Place	P3 – Welcoming learning spaces	**Room-to-room noise control** The following elements have prescriptive acoustic performance or construction requirements: - Operable walls (between general learning areas, all schools): Rw 45 - Entry doors to occupied teaching, music, drama and sports spaces: Solid core, minimum 35 mm thick with acoustic weather (where external) seals on all rebated closing faces. Gap at floor to be minimized. - Internal glazed sections in walls and vision panels in or adjacent to internal doors: minimum 10.38 mm laminated glass. In some situations acoustic windows may be needed for satisfactory noise separation. - Construction separating wastewater pipework from occupied spaces: Rw 40 - Where adjacent to an occupied space (and not serving that space), hydraulic supply pipework and wastewater pipework shall be separated from the adjacent occupied space. Construction between the adjacent spaces in this instance shall be a 'staggered stud' arrangement or otherwise discontinuous.	Mandatory	DAB c10.3 Acoustic Separation	1. Detailed drawings including the acoustic design specification of operable walls, entry doors, internal glazed sections, etc. OR 2. Statement by a qualified acoustics consultant confirming compliance	Y	X					X						Acoustic Consultant/Contractor
Place	P3 – Welcoming learning spaces	**Noise emissions** Generally noise emission to the environment from mechanical services noise sources (such as air conditioners) are the subject of a development consent conditions. In NSW the development consent conditions will refer to the Industrial Noise Policy (INP) or Local Council requirement. Where no condition regarding noise sources exists for a school development, noise emission from such sources should be designed, in-principle, to satisfy the requirements of the Industrial Noise Policy.	Optional	Not covered in Green Star		Y			X			X					Acoustic Consultant/Contractor Architect

Place	P3 – Welcoming learning spaces	**Acoustic post-occupancy evaluation** Post Occupancy evaluations are often undertaken to assess the performance of recently completed or existing facilities. Where a Post Occupancy Evaluation is to be undertaken it should be conducted by the project team or acoustic engineer and should be undertaken of selected acoustic parameters only. Evaluation may include: - Internal noise levels, - Room acoustics, - Noise emission, - Room-to-room acoustics performance	Optional	GSP c13 Internal Noise Levels	1. Commitment by SI to conduct acoustic post-occupancy evaluation	Y						X			X	X			SINSW Acoustic Consultant/Contractor RP
Place	P3 – Welcoming learning spaces	**Low VOC-emitting materials** All surface coatings, and other Volatile Organic Compound (VOC) emitting products including adhesives, sealants, carpets and carpet underlays, must be made from Low-VOC emission materials. In terms of surface coatings, the Australian Paint Approval Scheme's (APAS) VOC limits for Low VOC paints or lower are to be used	Mandatory	DAB c13 Indoor Pollutants	Product specifications, certificates, safety datasheets that demonstrate low-VOC contents Bill of quantities	Y	X								X		X		RP
Place	P3 – Welcoming learning spaces	**Low formaldehyde-emitting materials** Only low formaldehyde-emitting engineered wood products should be used, such as those that meet the Australian Standards for formaldehyde emission limit E1 (NICNAS classification) or lower.	Mandatory	DAB c13 Indoor Pollutants	Product specifications, certificates, safety datasheets that demonstrate low-formaldehyde contents Bill of quantities	Y	X								X		X		RP
Place	P3 – Welcoming learning spaces	**Ventilation in printing rooms** The ventilation system is to be designed to serve the whole room and is not intended to provide localised exhaust at equipment. - Discharge air from the ventilation unit to the outside of the building via a vermin proofed louvre. - Draw make-up air from inside the building through wall or door grilles. - Locate the inlet/s and exhaust to achieve good airflow across the room in plan and elevation to pick up all machine emissions. -Ensure the airflow doesn't draw equipment emissions across operator's face. -Note that the room door in many schools may be left open in normal daily operation. Allow for this when locating the exhaust fan so that cross ventilation is achieved with make-up air drawn through the door opening. - Required speed range: minimum of 6 air changes per hour and maximum of 15 air changes per hour.	Mandatory	DAB c9.3 Exhaust or Elimination of Pollutants	1. Mechanical drawings and specifications showing compliant printing room ventilation	Y	X		X										SINSW (printer Specs) Mechanical Contractor
Place	P3 – Welcoming learning spaces	**Chemical store ventilation** - Provide mechanical exhaust system with high and low level exhaust points to all chemical stores, with a minimum of 15 air changes per hour flow rate. - Discharge air according to the requirements of BCA. The discharge outlet is to be fitted with bird wire mesh. - Provide make up air to all chemical stores, (to replace exhausted air) through openings in an external wall, fitted with weatherproof louvres. All grilles and louvres are to be fitted with vandal proof bars and be fitted with vermin mesh. - For security and fire rating reasons do not use windows/doors or door grilles for air intake. - The chemical stores ventilation systems are to run continuously.	Mandatory	Not covered in Green Star		Y	X		X										Mechanical Contractor
Place	P3 – Welcoming learning spaces	**Pesticide free environments** Schools are designed, constructed and maintained, without using chemicals for termite and other pest control. No chemical pesticides and germicide to be used. Preventive treatments to be by physical means and careful design to minimise risk	Mandatory	Not covered in Green Star	Statement by head contractor that no pesticides or termites have been used.	Y									X				RP
Place	P3 – Welcoming learning spaces	**Green cleaning**	N/A	GSP c6 Green Cleaning	1) WEB Clean School User Guide 2) Green Cleaning specifications	N/A										X			SINSW or N/A
Place	P3 – Welcoming learning spaces	**Fly free indoors** Fly screening must be provided in all schools to the doors, windows and other openings in food preparation, biology, and non-water-closet toilet spaces or where specifically nominated in the EFSG. Schools in localities where fly incidence constitutes a health hazard (especially trachoma or other nuisance) will require fly screens to all opening sashes.	Mandatory	Not covered in Green Star	As-built drawings showing fly screening has been provided as required	Y	X	X							X				Architect
Place	P3 – Welcoming learning spaces	**Indoor CO2 levels** For mechanically ventilated spaces: 1. Outdoor air ventilation rates are in accordance with requirements of AS 1668.2. 2. Mechanical ventilation systems shall be linked to CO2 sensors to provide demand-controlled ventilation within each space to ensure that CO2 levels are maintained below the required CO2 threshold. 3. Mechanical ventilation systems shall be designed to provide adequate access for maintenance and cleaning. 4. Ventilation systems are designed to maintain an average daily CO2 concentration as per the latest NCC code, and so that the maximum concentration does not exceed 1,500ppm for more than 20 consecutive minutes in each day. 5. The required outdoor air ventilation rates and CO2 concentrations shall be maintained without the need for any human intervention e.g. the opening of windows or external louvres. 6. Ventilation systems shall be designed minimise the entry of outdoor pollutants through ensuring that the ventilation system design is in accordance with the relevant parts of AS 1668.2. and ASHRAE Standard 62.1. 7. Where local sources of pollutants are present e.g. photocopiers, minimum exhaust ventilation flow rates should be provided in accordance with AS1668.2: Table B1.	Mandatory	DAB c9 Indoor Air Quality	Mechanical drawings and specifications Extracts from commissioning report	Y			X										Mechanical Contractor
Place	P3 – Welcoming learning spaces	**Ecological conservation** School sites must conserve for future generations, the biological diversity of genetic materials, species and ecosystems on that site - Consider including opportunities to preserve or re-establish native flora and create new landscapes through liaising with local government authorities, Landcare and environmental groups, and the use of native low water use plants. - Where practicable, retain both existing native and exotic trees and flora, plus under storey native vegetation, in accordance with any 'Fauna and Flora' study, Environmental Impact Statement recommendations and local authority (Council) tree preservation orders.	Mandatory	DAB c23 Ecological Value GSC c29 Ecological Value (incl Biodiversity Enhancement)	1) Biodiversity or ecological assessment / local flora and fauna survey 2) Biodiversity management plan describing measures for the conservation and protection of threatened species or communities, biodiversity enhancement, tree protection, etc. 3) Evidence demonstrating measures have been implemented to protect and enhance endangered species / ecological communities identified; to preserve or re-establish native flora; etc.	Y							X		X				Landscape Architect Ecological Report
Place	P3 – Welcoming learning spaces	**Accessibility** -All new facilities must meet current DTS provisions of the NCC and the associated standards. Generally AS 1428.1 is the minimum design standard for access and mobility. However, it is DoE's policy that any enhanced requirements noted in AS 1428.2 be incorporated in any new design. -Additionally, DoE have enhanced circulation requirements as noted in DG / CIRCULATION - Provide hearing augmentation system for areas that have amplification, generally within Gymnasium, libraries, movement studios and Communal Halls, provide a system to assist the aurally challenged to hear music and speech within the main auditorium and on the stage - Provide the International Symbol for Deafness to indicate that an assistive hearing device is installed.	Mandatory	DAB 30D Universal design	1) Accessibility plan 2) As-built drawings or other evidence demonstrating that minimum and enhanced accessibility requirements have been provided for walkways, corridors, ramps, etc. 3) Photographic or other evidence of signage installed	Y	X								X				Access Consultant RP

Place	P3 – Welcoming learning spaces	**Weather protection** Circulation areas provided between administrative, staff and all student spaces (except Agriculture), should be protected from sun, rain and unfavourable winds.	Mandatory	Not covered in Green Star	As built drawings showing circulation areas are protected as required	Y	X															Architect
Place	P3 – Welcoming learning spaces	**Open play space** Open play space must be provided for students to access during recess, lunch breaks and for outdoor learning. Open play space can be comprised of - Paved and grassed areas - Rooftops and terraces - Covered outdoor areas The designated open play space must be easily monitored and managed by school staff. Where a joint use agreement can be negotiated with a local council or land owner, the required play space can be located off-site, providing the facilities are - In close proximity to the school - Easily accessible - Safe and secure Designs must aim to achieve a minimum of 10m2 per student. Where this figure is not achievable the proposed m2 per student of the completed project must not be less than the existing m2 per student currently on the site.	Mandatory	Not covered in Green Star	Plan view drawings showing provision of open space	Y	X															Architect
Place	P3 – Welcoming learning spaces	**Staff room**	N/A	GSI c Amenity Space	1) Extracts from the EFSG requirements for staff rooms 2) Evidence of staff room delivered accordingly	Y	X															Architect
Place	P3 – Welcoming learning spaces	**Healthy canteen policy**	N/A	DAB c30D Integrating Healthy Environments	1) Research report behind Healthy Canteen Policy 2) Evidence that policy initiative has been incorporated into the school under assessment.	TBC												X				SINSW
Place	P3 – Welcoming learning spaces	**Safety by design** - The Work Health and Safety Act and the Department of Education principles of student safety and welfare mandate the avoidance of accidents through careful design of facilities - The designer must ensure, so far as is reasonably practicable, that the plant, substance or structure is designed to minimise risks to the health and safety of all parties who will work on a site connected with its design as well as the end users of the facility. - An important part of the Safety by Design principle is recording the risk assessments that are conducted during the design and providing to the client, owners, any users/occupiers of the facilities and those who will be building or maintaining the facilities, details of risks and hazards identified. - The design of facilities should not only be inherently safe but visually and pragmatically safe and not tempt students or the general public into unsafe practice. Examples: Glazing: The safety of occupants is paramount where glass is being used, especially in areas subject to human impact. All glazing types and thickness are to comply with the relevant AS as a minimum. Hot water: To minimise scalding risk all hand basins, showers and the kitchen sink in practical activities areas serving IO/IS classes, require "warm" rather than "hot" water provided at a specified temperature, by mixing hot and cold water through a Thermostatic Mixing Valve. (Note: Tempering Valves are not permitted in schools) Drinking water tanks: Ensure rainwater is not collected from areas containing lead materials. All coating materials used inside the reservoir must be suitable for drinking water and guaranteed against liner leakage for a period of 20 years. A filtering and UV system to be provided where drinking water tanks are present.	Mandatory	Not covered in Green Star	1. Safety risk assessments 2. Short report identifying safety-by-design principles incorporated / Sign off by head contractor confirming all mandatory requirements in DG14 have been addressed. 3. Manufacturer's certificate to AS/NZS 4020 for tanks	Y	X	X	X	X	X			X		X	X			All Services Design Consultants
Place	P3 – Welcoming learning spaces	**Microbial control** As a measure to prevent legionella, heated water to hand basins, showers etc. shall be stored at temperature above 65 C. Thermostatic mixing valves are to be used for tempered water generation at each point of use. Valves need to comply with microbe disinfection requirements - "Code of Practice for Thermostatic Mixing Valves NSW" as approved by the NSW Health Department.	Mandatory	DAB c28 Microbial Control	1. Letter by hydraulic engineer confirming hot water is stored above 65 deg and that valves comply with code of practice.	Y			X		X											Mechanical Contractor Hydraulic Contractor
Place	P3 – Welcoming learning spaces	**Security** Safety in Design and Crime Prevention Through Environmental Design (CPTED) principles are to be implemented in project planning stage. Advice on the electronic surveillance systems can be sought early in the design phase. CCTV systems are required in several locations where indicated in the Rooms and Spaces Technical Data table, including: - Secondary clinic - Primary sick bay - Library	TBC	GSC c15 Safe Places	1) Crime risk assessment or equivalent 2) Evidence of designing out crime principles implemented 3) Security services plans, schedules and forms by School Security Unit (SSU) 4) SSU specification and evidence of input on project specification	TBC	X			X							X	X			SINSW/ SINSW PM Electrical Contractor Architect CPTED Design Consultant
Place	P3 – Welcoming learning spaces	**Hazardous materials** Where a new school is to be developed a Hazardous materials study is to be conducted, including: - Asbestos Containing Materials (ACM) - Synthetic Mineral Fibres (SMF) - Polychlorinated Biphenyl's (PCB) - Lead Paint - Ozone Depleting Substances Any existing structures and all parts of the site should be examined in order to determine the presence of hazardous materials before commencement of any renovation or demolition. Inspection should be conducted by organisations with the National Association of Testing Authorities (NATA) accreditation complying with the requirements of AS/NZS ISO.IEC 17020 for the inspection of hazardous materials (HazMat) including asbestos. Hazardous Materials inspection reports should be produced in accordance with the requirements of the various Safe Work Australia "Codes of Practice" for the management and control of hazardous substances. Where hazardous materials are found a Hazardous Materials Management Plan should be prepared	Mandatory	DAB 24.2 Contamination and Hazardous Materials	1. Hazardous materials study / site inspection report / survey 2. Management plans for hazardous materials identified 3. Remediation strategies implemented 4. Environmental auditor certificates / clearance certificates	Y										X				RP Hazardous Material Contractor
Place	P3 – Welcoming learning spaces	**Digital infrastructure** New buildings and refurbishments are required to provide a common wireless solution compatible across the school, providing a consistent user experience and support mechanism. This involves the replacement of existing legacy wireless equipment, such as wireless access points and site switches	Mandatory	GSC c22.2 Digital Infrastructure	1) Contracts describing the network infrastructure specification and operational requirements	Y				X							X			Electrical Contractor
Resilience	R1 – Preparation for shocks	**Site investigations for resilience** The following detailed reports/ surveys/ information should be considered in developing the business case: - Slope, drainage and erosion issues including flood risks (if any) - Geotechnical and soil conditions - Airborne pollutants - Bushfire risks - Appraisal of available services infrastructure An environmental risk report will be required for developments proposed within sensitive natural environments or sites subject to natural risks (i.e. flood prone sites, bush fire areas).	Negotiable	DAB c3 Adaptation and Resilience	1) Detailed reports or surveys developed 2) Environmental risk report 3) Evidence demonstrating recommendations have been implemented and risks addressed through design responses.	Y								X		X	X	X			Surveyor ESD Structural Engineer

Resilience	R1 – Preparation for shocks	**Bushfire protection** Development applications on bush fire prone land must be accompanied by a Bush Fire Assessment Report demonstrating compliance with the aim and objectives of Planning for Bush Fire Protection and the specific objectives and performance criteria for the land use proposed. Local Authorities and the Rural Fire Service can provide advice on the design of buildings in bush fire prone areas. The Building Code of Australia and AS3959 "Construction of buildings in bushfire-prone areas" set out the requirements for buildings which are within close proximity to a defined bush fire zone. Mandatory landscape management strategies: - Keep the amount of fuel (leaves, twigs, logs, dead grass) in the vicinity of buildings to a minimum. - Ensure trees are located at away from buildings to avoid branches overhanging and leaves collecting on roofs. - Do not plant shrubs against buildings. - The crowns of trees planted on the hazard side of the development should not be contiguous. - Plant fire resistant trees and shrubs on the hazard side of the development to reduce the potential impact of wind, fire intensity, radiant heat, and rate of spread as well as intercepting burning embers. - Avoid combustible fencing materials. - Provide irrigation and garden sprinklers to water areas near the buildings (subject to water authority approval).	Mandatory	DAB c3 Adaptation and Resilience	1) Bush fire assessment report 2) Statement by Architect / fire consultant outlining building strategies implemented in line with BCA and AS3959. 3) Bush fire management plan outlining management strategies implemented 4) Landscape plans detailing bush fire management measures implemented	Y										X	X	X	ESD
Resilience	R2 – Preparation for stresses	**Response to climate risks** Consideration to be given to how sites and school communities will be able to adaptively respond to climate change over time, especially for projects involving vulnerable communities e.g. climate generating exacerbated flood, storm surge, inundation, heatwaves, bush fires, extreme storm and weather events.	Mandatory	DAB c3 Adaptation and Resilience	1) Climate risk assessment, and 2) Climate adaptation plan 3) Emergency management plan	Y	X											X	ESD SINSW

Y	74
N	1
NA	3
TBC	11

Design with
community in mind

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