

Pendle Hill High School

Environmentally Sustainable Development Report

School Infrastructure NSW

Reference: 507914

Application Number: SSD-9579147

Revision: 2

2021-03-31



Document control record

Cover image: Concept proposal by *Architectus*

Document prepared by:

Aurecon Australasia Pty Ltd

ABN 54 005 139 873

Level 5, 116 Military Road

Neutral Bay NSW 2089

PO Box 538

Neutral Bay NSW 2089

Australia

T +61 2 9465 5599

F +61 2 9465 5598

E sydney@aurecongroup.com

W aurecongroup.com

A person using Aurecon documents or data accepts the risk of:

- a) Using the documents or data in electronic form without requesting and checking them for accuracy against the original hard copy version.
- b) Using the documents or data for any purpose not agreed to in writing by Aurecon.

Document control							aurecon
Report title		Environmentally Sustainable Development Report					
Document code		REP-ESD-0001	Project number		507914		
File path		https://aurecongroup.sharepoint.com/sites/507914/5 Deliver Design/01 - Pendle Hill HS/501 Engineering/Calculations and Analysis/ESD/Reports/210304 Draft PHHS SSD Sustainability Report.docx					
Client		School Infrastructure NSW					
Client contact		Katy Johnson	Client reference		7068TO01		
Rev	Date	Revision details/status	Author	Reviewer	Verifier (if required)	Approver	
0	2021-03-05	Draft for comment	MM	MG	MG	PD	
1	2021-03-17	Response to feedback	MM	MG	MG	PD	
2	2021-03-31	Final	MM	MG	MG	PD	
Current revision		2					

Approval			
Author signature		Approver signature	
Name		Name	
Title		Title	
Maeve Molins		Phuc Do	
Sustainability Consultant		Project Leader	

Executive Summary

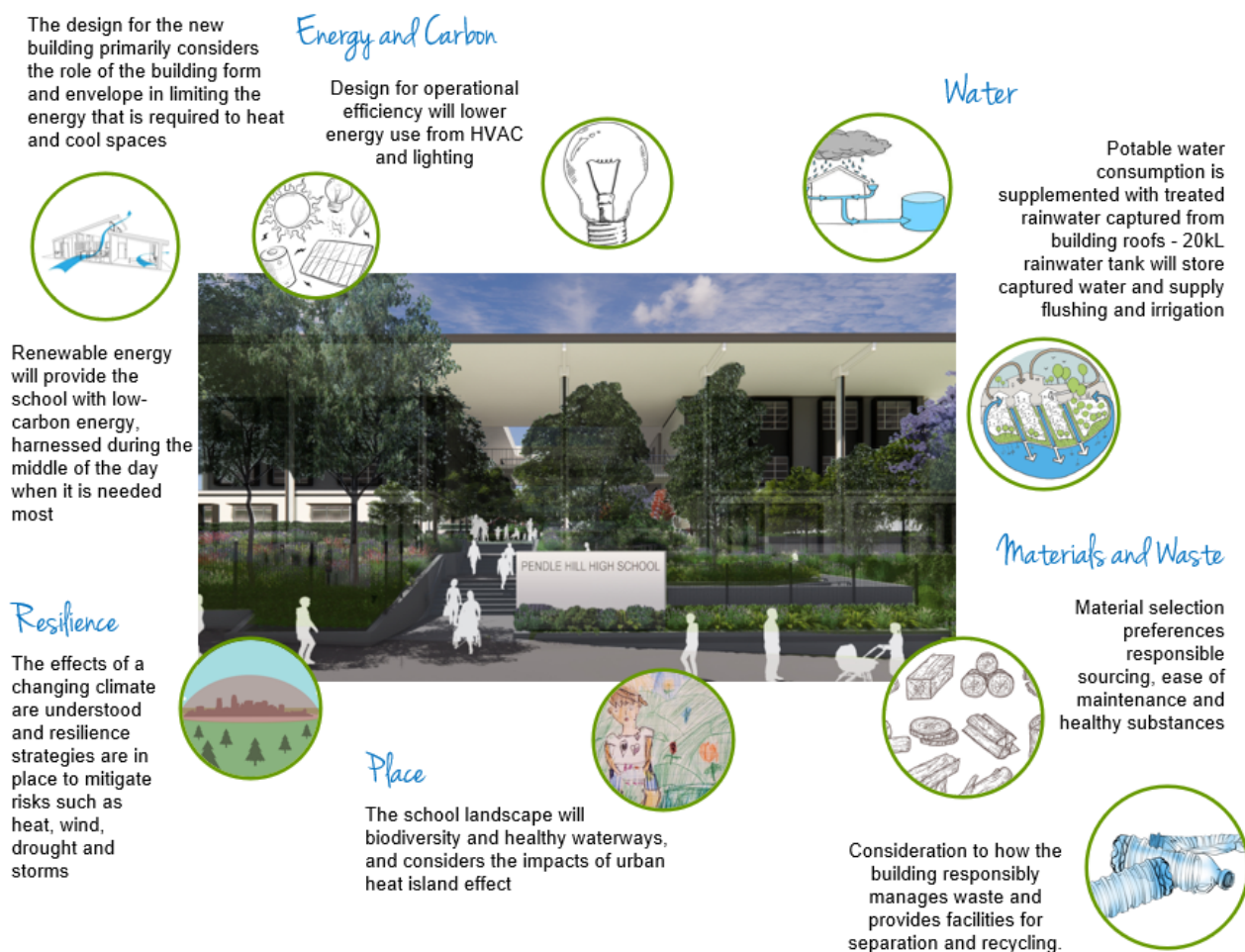
Sustainable Design plays an important role in how NSW Schools are designed and constructed and delivers ongoing benefits to students and the school operators.

Sustainability is a broad term that covers both the environmental performance of schools and the health and wellbeing of students and staff.

This report is written in support of a State Significant Development Application for a new building proposed for Pendle Hill High School in Sydney's Western Suburbs.

The chapters of this report address the sustainability strategy and practical initiatives adopted for the project and details how all Secretary's Environmental Assessment Requirements (SEARS) will be met by the project.

The key sustainability themes for Pendle Hill High School are illustrated below:



Contents



1	Introduction.....	1
1.1	Project Introduction.....	1
1.2	Site Introduction.....	2
2	Secretary’s Environmental Assessment Requirements (SEARS).....	3
3	Sustainable Development Principles.....	4
3.1	Holistic principles for Sustainability	4
3.2	Sustainability Benchmarking	5
4	Other Sustainability References	6
4.1	Other Reference Documents.....	7
5	Green Star	8
6	Energy and Carbon.....	9
6.1	Building Fabric and Passive design	9
6.2	HVAC Strategy & Mixed Mode Ventilation	10
6.2.1	Mechanical heating/cooling mode	10
6.2.2	Natural ventilation mode.....	10
6.3	Efficient Lighting	11
6.4	Renewable Energy	11
7	Integrated Water Management	13
7.1	Water Sources.....	13
7.2	Water Efficiency.....	14
7.3	Rainwater Reuse	14
7.4	Water Sensitive Urban Design	15
8	Resources	17
8.1	Sustainable Materials	17
8.2	Waste Management	18
9	Transport.....	19
9.1	Site Context and catchment area	19
9.2	Bicycle and Scooter Parking Provision.....	20
9.3	End-of-Trip Facilities.....	20
9.4	Public Transport	20
9.5	Green Star Transport.....	20
10	Resilience	21
10.1	Climate Risks for the site.....	21
10.1.1	Data Acknowledgement	21
10.2	Project Adaptation	22

Appendices



Appendix A.....	23
-----------------	----

Figures

Figure 1 Building H – North East perspective (Fulton Trotter Architects)	1
Figure 2 Regional Context.....	2
Figure 3 Site Plan of existing Pendle Hill High School layout indicating proposed Building H	2
Figure 4 Examples of passive design strategies promoted in the GA NSW Guidelines	9
Figure 5 Indicative light system proposed and natural ventilation illustration (SI NSW, GA NSW)	10
Figure 6 Daily Consumption pattern for the existing school	11
Figure 7 Indicative Rooftop PV Layout.....	12
Figure 8 Water Sankey Diagram showing water uses	13
Figure 9 Extract from Hydraulic Services design indicating location of rainwater system	14
Figure 10 Rainwater Reuse System Schematic.....	15
Figure 11 'Ocean Guard' GPT	15
Figure 12 Storm Filter System.....	16
Figure 13 Key material selection principles that should inform the materials used in the school.	17
Figure 14 Catchment Area indicating walking distances.....	19
Figure 15 Pendle Hill High School Adaptation Strategies	22

Tables

Table 1 ESD SEARS	3
Table 2 WELS requirements for fixtures	14
Table 3 Stormwater treatment – MUSIC modelling results	16
Table 4 Estimated Diversion & reduction targets for waste streams (courtesy of EcCell OWMP)	18
Table 5 Climate Risks for Westmead Schools based on projections for the Sydney Region (source: CSIRO/BOM)	21



1 Introduction

1.1 Project Introduction

Aurecon have been engaged by School Infrastructure NSW (SINSW) to provide sustainable design services for a new building “Building H” located at Pendle Hill High School, an existing school which initially opened in 1965.

The Building supports the schools increasing population size and creates a new cultural heart for the school in the form of a new Learning Resource Centre (Library) with places, connections, and inclusion for all members of the learning community.

The redevelopment will provide:

- Construction of a new three-storey courtyard building on Binalong Road comprising two (2) three-storey wings under a connected roof which will accommodate a library, staff unit, lecture theatre, multimedia and senior learning spaces, administration unit and student amenities
- External transport infrastructure upgrade works
- New covered walkways and upgraded landscaping; and
- New hard stand areas for bicycle parking

The Building is two storeys high and consist of two wings (North and South) connected by external, undercover walkways.

The building works will also provide a new entrance to the school on Binalong road as depicted in Figure 1.



Figure 1 Building H –Perspective from Binalong Rd (Fulton Trotter Architects)



1.2 Site Introduction

The School is in Toongabbie, approximately 30 kilometres west of the Sydney central business district. The site fronts Binalong Road (East), Knox Street (south) and Cornock Avenue to the west of the school.

The site for Building H has been selected as part of the existing Oval to the West of the School and will be accessed via the new entrance on Binalong Road

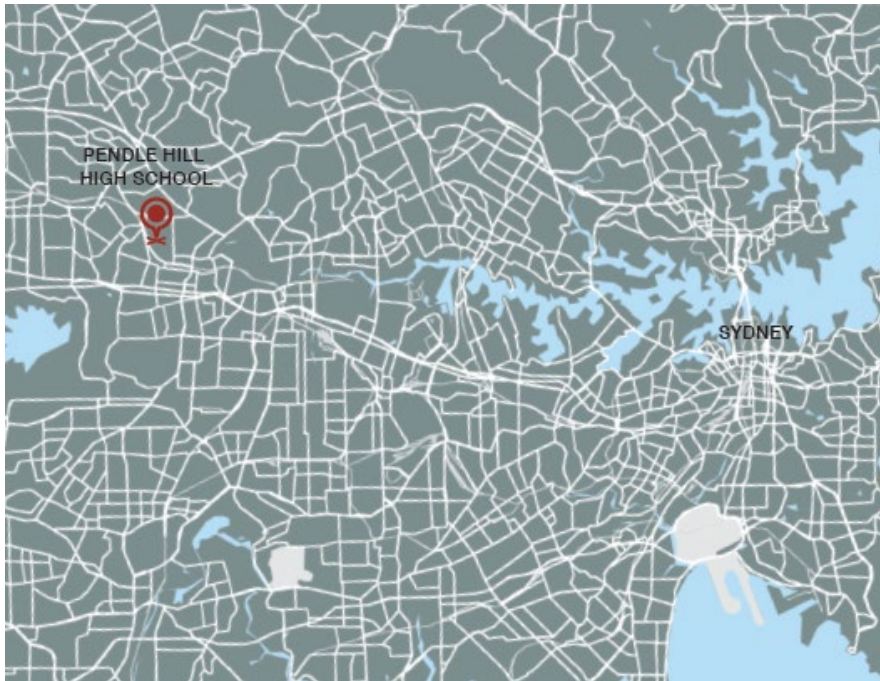


Figure 2 Regional Context



Figure 3 Site Plan of existing Pendle Hill High School layout indicating proposed Building H



2 Secretary's Environmental Assessment Requirements (SEARS)

This report supports a State Significant development application, and as such responds to the SEARS issued for the site in October 2020.

The SEARS covered in this report are those of Part 7. Ecologically Sustainable Development (ESD) (Table 1)

Table 1 ESD SEARS

SEARS requirement		Reference
A	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.	Chapter 3: Sustainable Development Principles
B	proposed measures to minimise consumption of resources, water (including water sensitive urban design) and energy.	Energy: Chapter 6 Water: Chapter 7 Resources: Chapter 8
C	how the 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.	National Best Practice: Chapter 5 Green Star Energy: Chapter 6 Water: Chapter 7 Resources: Chapter 8
D	how environmental design will be achieved in accordance with the GANSW Environmental Design in Schools Manual (GANSW, 2018).	Chapter 6 – Energy
E	an assessment against an accredited ESD rating system or an equivalent program of ESD performance. This should include a minimum rating scheme target level.	Chapter 5: Green Star Appendix A: Green Star Pathway
F	a statement regarding how the design of the future development is responsive to the CSIRO projected impacts of climate change.	Chapter 10: Resilience
G	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.	Chapter 7: Water
Key Reference documents		
Parramatta Development Control Plan 2011		✓
The Greater Sydney Region Plan - A Metropolis of Three Cities		✓
NSW and ACT Government Regional Climate Modelling (NARClIM) climate change projections.		✓



3 Sustainable Development Principles

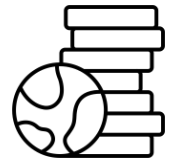
3.1 Holistic principles for Sustainability

SINSW takes a holistic view of sustainable development and requires the conserving and enhancing of human societies to be considered, along with ecological conservation and enhancement. SINSW draws its core principles from federal and state legislation on Ecologically Sustainable Development (ESD) and draws from international literature regarding Sustainable Development (SD), such as the 1987 Brundtland Report *Our Common Future* and the UN Sustainable Development Goals.

The Precautionary Principle

Taking preventive action in the face of uncertainty

- From the early schematic design phase, the project has considered environmental and social impacts decision making processes. This includes a strategy to mitigate climate change through energy efficiency and renewable energy.
- The project has considered projected climate risks for the region and a Climate Change Adaptation strategy has been prepared (refer to Section 10 – Resilience)



Inter-Generational Equity and Conservation of Biological and socio-cultural Diversity and Ecological and socio-cultural Integrity

Meeting the needs of the present without compromising the ability of future generations to meet their needs

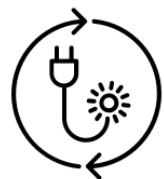
- The school's design will seek to optimize environmental, social, and cultural performance.
- The school will create comfortable and productive learning spaces for the next generation of students and seek to showcase any sustainability initiatives to promote learning.



Improved valuation, pricing, and incentive mechanisms

Considering the whole of project benefits to determine the expected return on investment for investment in sustainability.

- The design acknowledges that expenditure in sustainability initiatives will provide return on investment over the life of the building. The expected payback will be factored into final sizing for PV system and rainwater tanks. Refer to Chapters 6 and 7.





3.2 Sustainability Benchmarking

The project will demonstrate alignment with 'National Best practice'

The design achieves this through:

✓ 5 Star Green Star – Design & As Built v1.3 rating

This represents 'Australian Best Practice' and, through certification with the GBCA promotes transparency of sustainability targets as all claims must be independently assessed.



✓ Alignment with key State planning policies

Alignment with NSW Planning legislation and guidelines such as the NSW Government Resource Efficiency Policy and the NSW Climate Change Framework that provide regional context and promote a best practice approach to sustainability and climate change.

✓ Early integration of sustainability and ongoing involvement

Sustainability impact has been used to decision making in the school's design from the early stages, to take advantage of opportunities to make simple changes to promote sustainability.

✓ Educational Facilities Standards and Guidelines – Ecologically Sustainable Design Guidelines.

The EFSG has been developed specifically for NSW Public Schools and sets a standardised approach to sustainability that represents the best value for money and project environmental outcomes across a holistic range of areas. These guidelines promote the latest best practice in schools and are regularly updated as benchmarks shift.



4 Other Sustainability References

Educational Facilities Standards and Guidelines

NSW Department of Education - Educational Facilities Standards and Guidelines (EFSG) DG02 includes requirements for Ecologically Sustainable Development.

These Guidelines apply specific design/construction criteria to embed minimum sustainability outcomes for new schools in NSW.

They also ensure alignment of new schools with other NSW Government policies described below



NSW Government Resource Efficiency Policy (GREP)

This is a key policy for NSW Government agencies to implement the Whole of government targets for energy efficiency, renewable energy and efficient management of water and waste.



NSW Climate Change Policy Framework

This Policy sets in place the NSW Government's objective is for NSW to be more resilient to a changing climate. This includes a specific direction to Reduce risks and damage to public and private assets in NSW arising from climate change



National Construction Code Section J 2019

Section J includes mandatory energy efficiency requirements for new and refurbished buildings. This report covers concept stage considerations for the deemed to satisfy (DtS) for Parts 1-3 of Section J. Under DG 2.0 New schools must not only meet but exceed Section J by 10%.

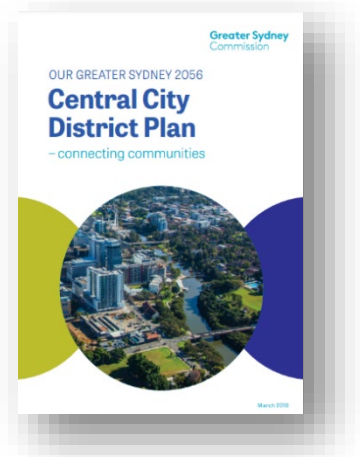




Greater Sydney Commission - Our Greater Sydney 2056 - Central City District Plan

This sets out the strategic planning priorities for Greater Sydney, focusing on the 'Central District' which covers the Parramatta, Hills and Cumberland Districts

This Plan sets out sustainability priorities for planning new buildings and infrastructure which, at a building scale includes a focus on reducing carbon emissions managing water and waste (N19), and adapting to the impacts of urban and natural hazards and climate change (N20)



Parramatta City Council

Westmead Schools must comply with Council's Development Control Plan (DCP) 2011. Part 3.3 covers 'Environmental Amenity' which requires that new develop take steps to manage biodiversity, energy efficiency water conservation and effective management of Stormwater.



4.1 Other Reference Documents

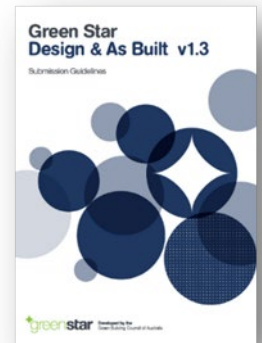
- Preliminary Schematic Design Plans by Fulton Trotter Architects
- Landscape Design package by Ground Ink
- Aurecon Engineering Concept Design Report
- TTW - Transport and Accessibility Impact Assessment
- EcCel Environmental – Waste Management Plan



5 Green Star

Key points:

- Pendle Hill Building H is targeting a 5 Star- Green Star rating, through formal certification with the GBCA.
- The 5 Star commitment will see the school implement sustainable design and construction throughout the delivery process, which must be validate through a third-party assessment post practical completion
- A pathway has been developed for the project and a number of initiatives have been implemented within the schematic design



Pendle Hill Building H is targeting a **5 Star- Green Star rating**, through formal certification with the GBCA. A Green Star pathway has been developed for the building and coordinated through the schematic design. Refer to Appendix A – Green Star Pathway.

As detailed in the pathway, the school's design includes sustainable design initiatives that are recognised in Green Star including:

- **Management:** Climate Change Adaptation, Energy Metering and Monitoring, Operational waste
- **Indoor Environment Quality:** High quality daylit spaces, with window shading to promote visual comfort Mixed mode ventilation
- **Energy:** Solar PV array on roof, 10% improvement on Section J requirements for overall energy consumption of the building, LED lighting
- **Transport:** Provision of Bike parking spaces for students and showers and lockers to encourage staff to walk or cycle
- **Water:** Rainwater used for toilet flushing and irrigation
- **Emissions:** Post development peak Stormwater discharge not to exceed the pre-development peak discharge for flows up to the 2-year ARI and Stormwater pollution reduction initiatives – including Gross Pollutant Trap and tertiary treatment (storm filter system).
- **Ecology:** Increased vegetation/landscaped elements – improved 'ecological value' and heat island effect mitigation
- **Innovation:** Design for Manufacture and Assembly (DfMA), Healthy Canteen Policy, Access for People with Disabilities



6 Energy and Carbon

Key points:

- Efficiency will be promoted through building services strategy allows for efficient lighting and HVAC
- Passive design of glazing and shading and allowance for natural ventilation mode improves the buildings ability to be operated efficiently
- The current scheme allows for Solar PV on the roof, this should be maximised up to 99kW as far as possible as the school's energy consumption is expected to coincide with PV generation (i.e. during daylight hours)

6.1 Building Fabric and Passive design

Building Fabric plays a significant role in responding to the operational energy that will be used by a building.

This has informed the design of the school and considerations have been made to passive strategies that will promote comfortable conditions whilst limiting reliance on mechanical systems for heating and cooling where possible (Refer to 6.2)

Passive design concepts outlined in the GA NSW's 'Environmental Design in Schools' Guidelines have been considered and applied to the building's design.

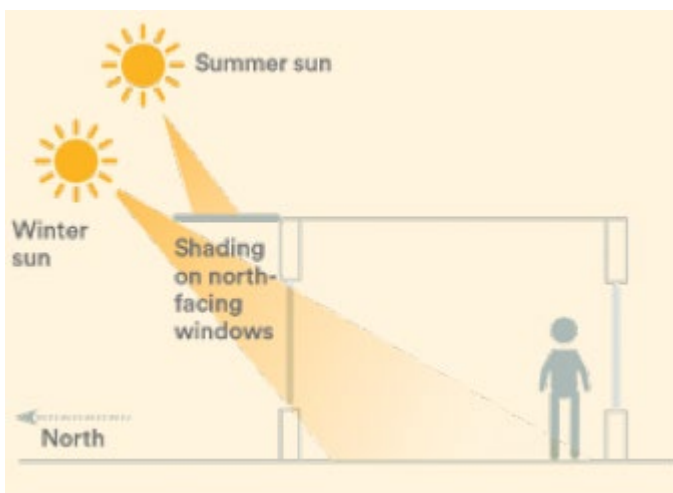


Figure 4 Examples of passive design strategies promoted in the GA NSW Guidelines

Passive design strategies that will be implemented on Building H include:

- Limiting window to wall ratio on each orientation
- **Shading design** to promote passive heating in winter and restrict heat in summer (ie. depicted in Figure 3). This has been determined using sun path diagrams to optimise the shading angle for each orientation.
- Total System **SHGC** of 0.4 to limit solar heat gain
- **U value** will be determined at the next stage of the design following development of window sizes however it is recommended to allow for a high performance single glazed option that can allow for operable windows in line with the mixed mode strategy.



6.2 HVAC Strategy & Mixed Mode Ventilation

A mixed-mode strategy is proposed for the school to balance both comfort and efficiency and take advantage of suitable outside temperatures to reduce reliance on air conditioning.

6.2.1 Mechanical heating/cooling mode

The air conditioning system will operate during periods where the outside temperature is too hot or too cold.

It is proposed that a VRF system with ducted indoor units is used to serve the air-conditioned spaces for all new buildings.

It is proposed to install a heat recovery unit which serves to temper the outside air and reduce the outside air heating and cooling loads. This system is 100% outside air and does not recirculate air, which is expected to achieve Green Star requirements to increase outside air provisions for mechanically ventilated systems.

6.2.2 Natural ventilation mode

Fresh and free-flowing air in our learning environments can impact student concentration levels (GA NSW 2018)

The proposed mixed mode ventilation strategy is to prefer operable glazing to enable the use of natural ventilation where the temperature allows this.

A coloured light system is proposed (Figure 5) in line with the EFSG Control requirements which is connected to a sensor and is capable of changing colour based on outside temperature, informing building users of the suitability of the conditions to operate natural ventilation mode.

The local climatic conditions suggest:

- A large number of hours are within a reasonable range for natural ventilation, with hours tending to be too cold than too hot.
- The percentage of hours applicable to natural ventilation increase drastically when a wider temperature range is adopted.

Window selection shall allow for window system that will have as much window open area as possible, louvers, bifold, lift up window etc.



Figure 5 Indicative light system proposed and natural ventilation illustration (SI NSW, GA NSW)



6.3 Efficient Lighting

It is proposed that new lighting provided will be LED type luminaire fittings, generally 4000K colour temperature. This offers efficient lighting that will meet or exceed Section J efficiency requirements.

To further limit lighting electricity consumption, motion sensor control is proposed to limit lighting in occupied spaces, which will also be accompanied by manual local switches for user control.

The lighting system shall use DALI communication protocol to control each luminaire. This allows each luminaire to be addressed individually switched and dimmed to provide the highest level of control to the building occupants.

6.4 Renewable Energy

On site generation through PV will be installed on the Building H roof, as required by the EFSG, and recognised in Green Star credit 15E.

This represents a good opportunity to supply the school through clean energy, which is expected to be cost effective given the school will use most of its energy in daylight hours.

Metering data for the calendar year 2019 was obtained from Endeavour Energy for the existing school to determine the daily average consumption patterns. This is shown in below in Figure 6.

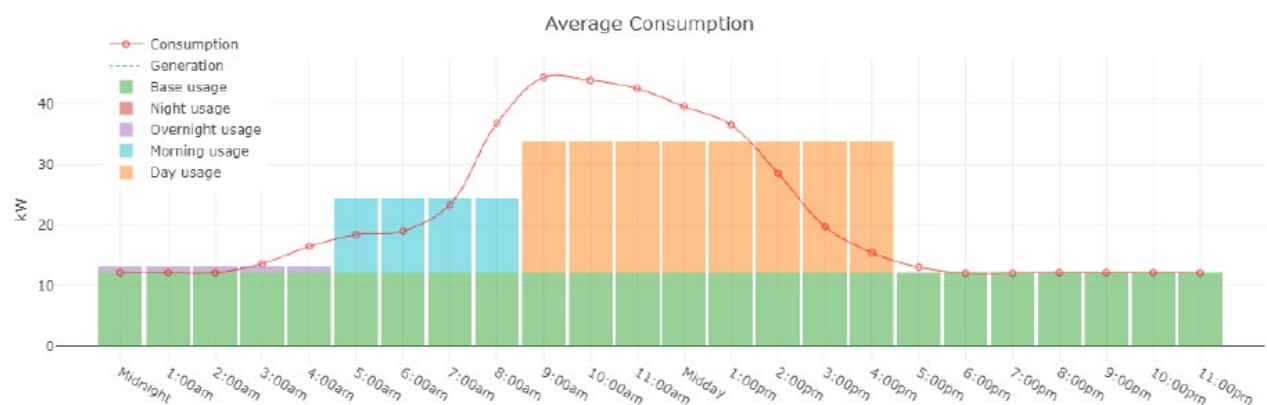


Figure 6 Daily Consumption pattern for the existing school

The Electrical Services Engineer has as such determined that a maximum array size of 99kW is feasible for the roof of Building H. Under the discounted payback method the payback period is expected to be 4.9 years.

The current design (Figure 7) allows for this to be achieved through the installation of 294 panels (340W) The roof angle is 4 degrees, and with Panels to be tilted extra 10 degrees to give total of 14-degree tilt for self-cleaning.

Due to some existing mature trees, some shading may be present, and is currently under investigation. It is expected that if some panels need to be removed due to this shading, that the 99kW can still be achieved through less panels at a higher wattage per panel e.g. 400kW.

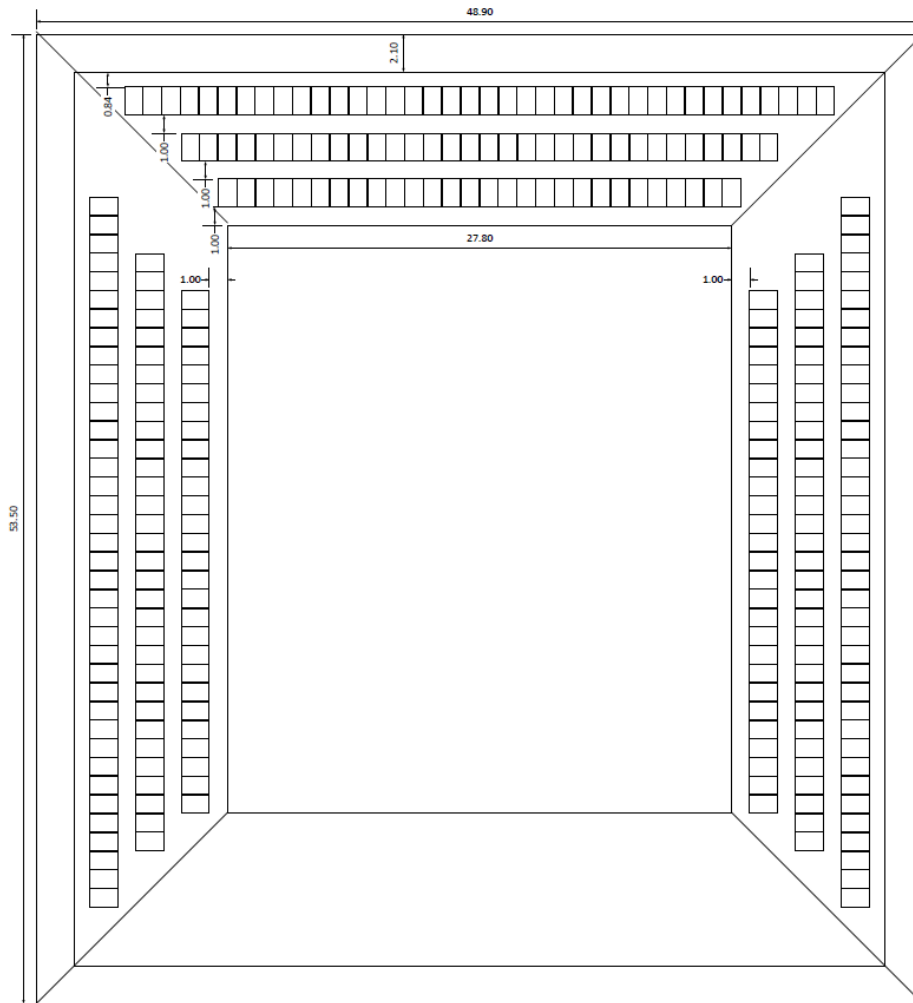


Figure 7 Indicative Rooftop PV Layout



7 Integrated Water Management

Key points:

- A 10kL rainwater tank is proposed to capture water from the impervious roof areas and supply flushing and landscaping, aligning to Parramatta City Council and EFSG requirements for alternative water sources
- Fixture selection in future design stages must adhere to GREP and Green Star requirements for flow efficiency

It is a principle in the NSW GREP and Schools Infrastructure Sustainability Strategy to minimise reliance on potable water. This will be achieved through design strategies that promote efficiency and substitution of potable water with alternate water sources such as reused rainwater.

7.1 Water Sources

Water consumption for the refurbished school will include:

- **Potable Sources:** Taps/showers, drinking water and water for use in cooking/classrooms and kitchenettes
- **Non-potable sources:** Flush fixtures (toilets/urinals), landscape irrigation

This is visually summarised in the concept Sankey diagram below

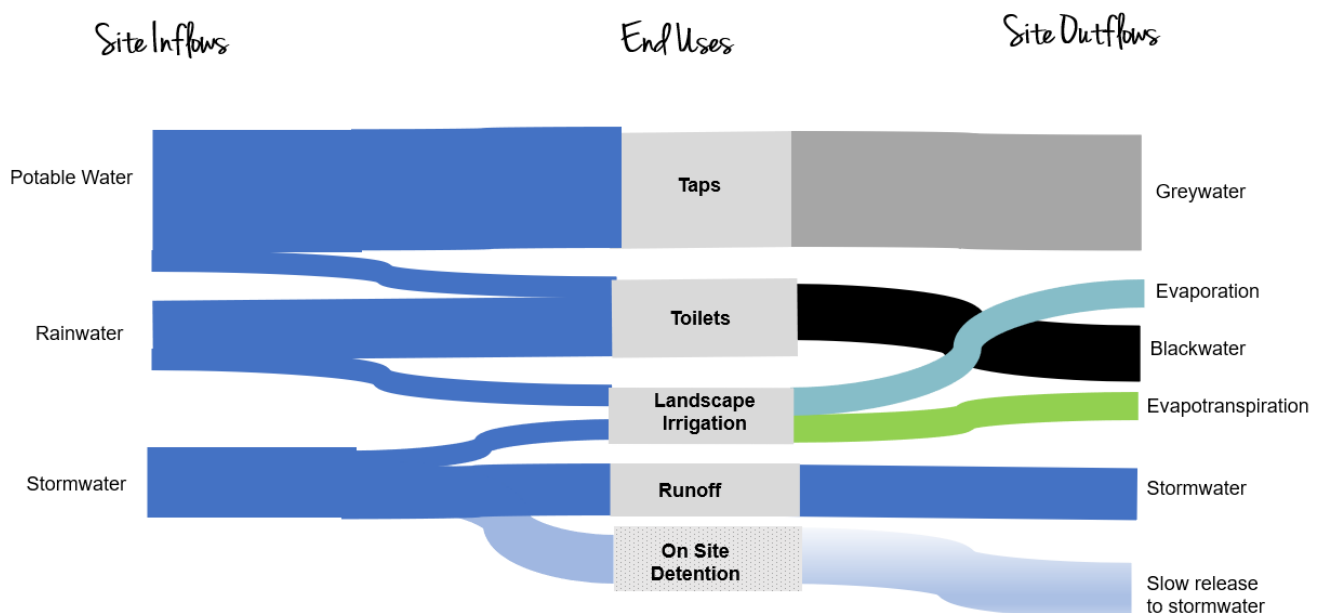


Figure 8 Water Sankey Diagram showing water uses

The following targets are required for Green Star level of achievement, noting that this is also required as per DG2.4.1 and Part W3 of the NSW Government Resource Efficiency Policy.

Fixture type	Minimum rating
Taps	5 Star
Toilets	4 Star
Urinals	5 Star
Dishwashers	5 Stars
Showers	3 or 4 Star but less than 7.5L/s

7.3 Rainwater Reuse

The Hydraulic Services Concept Design has allowed for a new 10kL tank located at the North West corner of the building (Refer to Figure 9)

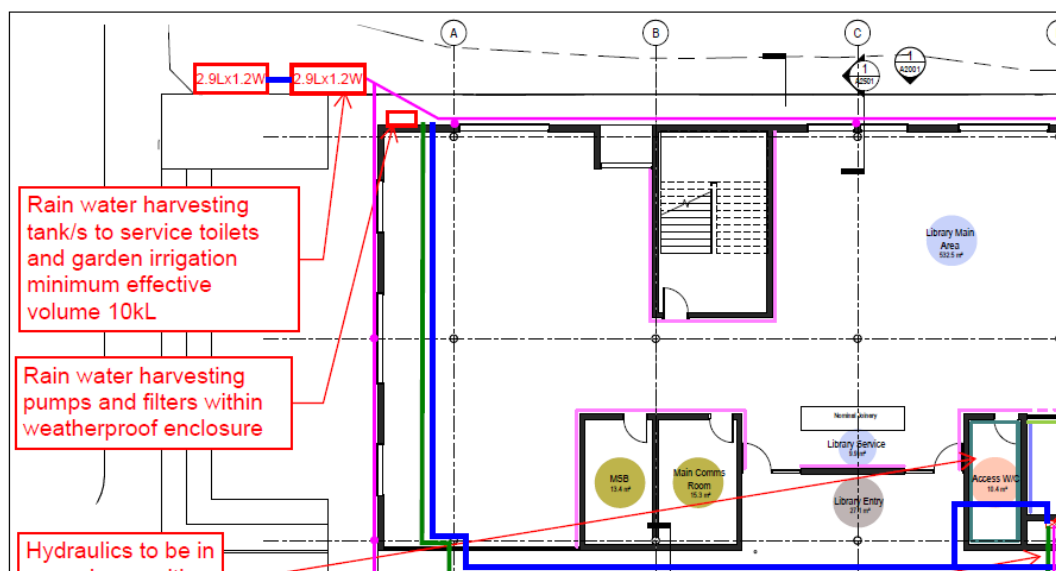


Figure 9 Extract from Hydraulic Services design indicating location of rainwater system



The harvested rainwater will be filtered and then pump reticulated to all available non-potable water uses. Specifically, to irrigation systems, toilets and urinals where applicable for each proposed building (indicated in Figure 10).

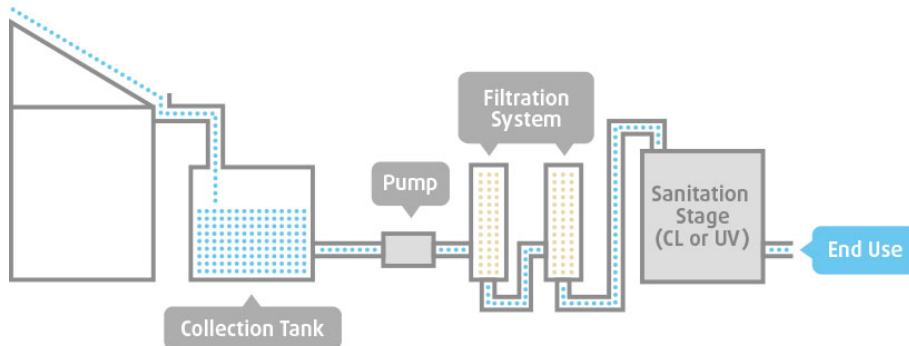


Figure 10 Rainwater Reuse System Schematic

7.4 Water Sensitive Urban Design

Water sensitive urban design (WSUD) initiatives will be implemented at the site in accordance with the following principles

Detention and Water Quantity: the school will capture and slowly release water leaving the site to compensate for the increased fraction imperviousness of the school grounds.

This is proposed through the following means:

- An OSD tank will be capable of slowly releasing water over time, to manage major storm events. The OSD system shall be sized as a 243m³ tank - proposed to be constructed as a concrete underground tank system adjacent to Binalong Road.
- As stated in part 7.3 rainwater storage will also allow for capture and re-use of water rather than it exiting the site via the stormwater system.

Quality: measures will be taken to treat stormwater before it leaves the site, reducing pollution and environmental harm from nutrient build-up. This shall be achieved through the installation of the following:

- A gross pollutant trap (GPT) - Ocean Guard 200µm (Figure 11) consists of a filtration bag, filtration cage and flow which work together to maximise the flow treated and pollutants captured.



Figure 11 'Ocean Guard' GPT



- A tertiary or polishing treatment system - “690mm PSorb Cartridge Storm filters” - this filters runoff through the filter inert and ion exchange media to remove key pollutants, as pictured in Figure 12.

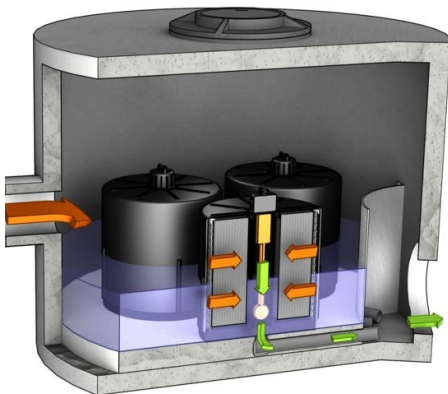


Figure 12 Storm Filter System

The effectiveness of the proposed system was tested through development of a MUSIC model. The results are shown in Table 3. For further detail refer to Aurecon Stormwater Management Plan.

This also aligns with the outcomes of Credit 16 in green Star.

Table 3 Stormwater treatment – MUSIC modelling results

	% Reduction Targets	% Reduction (Developed Case)
Gross Pollutants (GP)	90	100
Total Suspended Solids (TSS)	85	90.2
Total Phosphorus (TP)	60	66.9
Total Nitrogen (TN)	45	45.2



8 Resources

Key points:

- SI NSW promotes resource efficiency through planning, design and material procurement in schools.
- At the point of material selection, sustainability objectives from Green Star and SI NSW's EFSG will form part of the selection criteria.
- The new building will provide a spatial allowance to effectively manage waste streams expected to be generated throughout the operation.

8.1 Sustainable Materials

Sustainability will be considered during material selection in the detailed design phase to limit the project's consumption of natural resources, and promote healthy indoor environments

The EFSG encourages materials that adequately and economically perform their intended functions and have lower adverse environmental impacts throughout their life cycle whilst maintaining good health qualities and avoiding exposure to toxins such as Volatile Organic Compounds.

The EFSG Sustainable Material requirements align to what is required in Green Star, however some additional considerations will be required by the tool.

Accordingly, key sustainability factors for material selection are summarised in Figure 13.



Figure 13 Key material selection principles that should inform the materials used in the school.



8.2 Waste Management

Waste planning for the school will promote operational waste efficiency and the reduction of waste sent to landfill.

A waste specialist has been engaged to provide input as to how systems within the school will support waste diversion targets.

These are provided in Table 4.

Table 4 Estimated Diversion & reduction targets for waste streams (courtesy of EcCell OWMP)

Waste	Diversion rate target	Reduction target
General Waste	80%	10%
Paper & Cardboard	80%	10%
Containers Recycling	80%	10%

A waste storage area will be provided in an external, accessible area and will include sufficient space to store waste and recyclables for a weekly collection.

In line with Green Star, an additional waste stream (either e-waste or organics) will be collected and stored in an appropriate area.

9 Transport

Key points:

- SI NSW has an interest in reducing transport related emissions through sustainable transport initiatives in schools
- Around half the current student population travels to the site via walking or public transport
- The new building will seek out opportunities to increase this in the design development, including bike parking and walking/cycling infrastructure improvements.

9.1 Site Context and catchment area

The Transport Planner (TTW) has provided an indication of the school catchment and walking distance catchments for the 400m, 800m, 1200m, and 2400m walk (shown in Figure 14). These are roughly equivalent to the 5-minute, 10-minute, 15-minute, and 30-minute walk respectively.

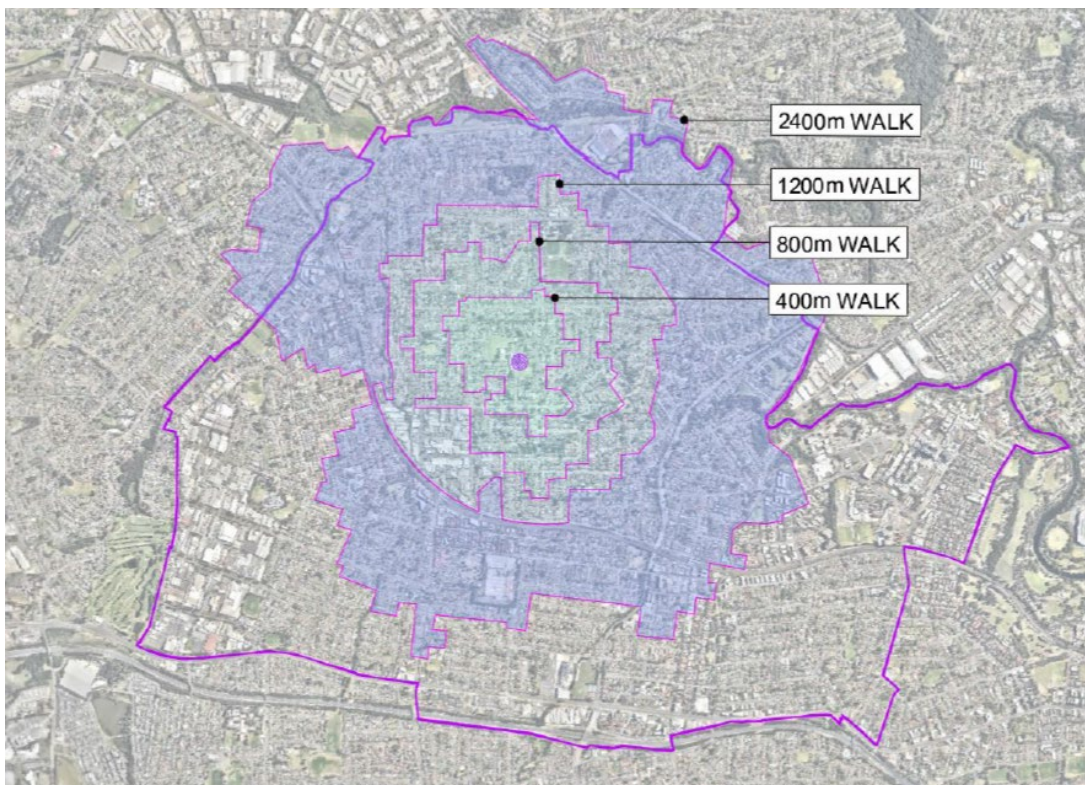


Figure 14 Catchment Area indicating walking distances

An online travel survey designed by the Transport Planner's TTW was distributed to students, staff and parents/carers at Pendle Hill High School in late 2020 to understand the ways in which students from the catchment travel to and from school.



9.2 Bicycle and Scooter Parking Provision

Bicycle and scooter storage areas are proposed to be provided with a capacity of 130 spaces, which would allow for an overall cyclist mode split of approximately 10% of students.

The final location and configuration (including selection of storage products such as bike rails) will be finalised prior to construction and will be in accordance with Australian Standard AS2890.3. The final configuration of 130 spaces would include portions of bicycle and scooter **parking and** would also include a portion of staff bicycle parking in a secure lockable zone. The remainder of parking for students is anticipated to be standard bike rails with students providing their own locks or security devices.

As children aged 16 years and under are legally permitted to cycle on pedestrian footpaths, pedestrian upgrades around the site will also benefit student cyclists.

9.3 End-of-Trip Facilities

End-of-trip facilities are proposed to be provided for staff in the form of 1 shower with a change area, plus provision of 10 lockers for personal storage. The final location and configuration of the end-of-trip facilities will be finalised prior to construction.

9.4 Public Transport

The site is accessible by bus and train, and currently around 26% of students at Pendle Hill travel to school via public transport.

Around 20% of the existing student travel to/from school via bus - Bus routes that serve the school include 711 and 708.

Around 6% of students arrive by train, noting that the walking distance to the train stop is over 1km and therefore no ideal to arrive quickly. Train routes T1, T5 and T7 lines service two nearby stations; Pendle Hill Train station which is located 1.3 kilometres from the site and Toongabbie Train station which is located approximately 1.7 kilometres from the site.

9.5 Green Star Transport

The project will be recognised in Green Star for sustainable transport initiatives the promote the use of public transport and active transport and limit the need for private vehicles to

A school specific approach has been developed by the GBCA to recognise the planning process and transport initiatives within schools that are aligned with the sustainability approach.

This approach rewards Green Star points for the implementation of the SINSW Schools Transport Assessment process detailed below

The assessment process is guided by 8 principles:

- 1) Students achieve daily physical activity requirements through active travel to school
- 2) Multi-modal transport planning and infrastructure provision to school is prioritised
- 3) Transport stakeholders are consulted with early and regularly
- 4) Supporting infrastructure is installed to the school and on-site
- 5) Traffic disruption to the school and community during construction is minimised
- 6) A commitment is made to a visible, funded, feasible Travel Plan
- 7) School Transport Plan is monitored and evaluated regularly
- 8) Consistency and quality of deliverables is increased.



10 Resilience

10.1 Climate Risks for the site






An increasingly important factor in the sustainable development of schools is the resilience of the site-specific climate change effects that have already been projected based on the current emissions scenarios.

Aurecon have review climate data available for the East Coast south sub-cluster available from the CSIRO and BOM. This data is (CMIP3 data and CMIP5 data) has been made available through the Coupled Model Intercomparison Project developed by the World Climate Research Programme (WCRP)

Climate Change will have considerable impacts to the conditions that today's buildings will be subject to in the future. Resilience to the projected climate change scenarios will play a role in the design of Pendle Hill at Each stage.

Climate Change risks that will affect the development are detailed in Table 5.

Table 5 Climate Risks for Westmead Schools based on projections for the Sydney Region (source: CSIRO/BOM)

Projected Climate Risks for Sydney	
TEMPERATURE 	Increase in Average Temperature: The annually averaged warming is projected to be 0.5 to 1.3°C by 2030 Extreme Temperatures: Substantial increase in the temperature reached on hot days and the frequency of hot days and the duration of warm spells
PRECIPITATION 	Precipitation: Decreases in winter rainfall are projected Extreme Rainfall: Increased Intensity of extreme rainfall events Drought: Time spent in drought is projected to increase.
STORMS 	Lightning: 5-6% increase in global lighting frequency for every 1°C global temperature change Cyclones: Increase in proportion of categories 3 to 5 cyclones Wind: Existing research is limited
HAIL 	Hail: Significant increase in hail days over the Sydney area is predicted – an increase of around 6 hail days per year by 2070
BUSHFIRE 	Bushfires: Harsher fire-weather climate is projected for the future, these may have indirect risks

10.1.1 Data Acknowledgement

We acknowledge the World Climate Research Programme's Working Group on Coupled Modelling, which is responsible for CMIP, and we thank the climate modelling groups for producing and making available their model output. For CMIP the U.S. Department of Energy's Program for Climate Model Diagnosis and Intercomparison provides coordinating support and led development of software infrastructure in partnership with the Global Organization for Earth System Science Portals.

10.2 Project Adaptation

To improve the design of the development to be resilient to the conditions that the development will be subject to in the future, climate change risks and potential adaptation strategies have been identified. A high-level summary of the risks and adaptation strategies applicable to the school are shown in Figure 15.

As the design develops, input into how the design responds to and mitigates these risks is recommended to ensure a robust approach to building the school resilience. At the next stage of the project it is recommended to complete a detailed climate adaption risk assessment and adaptation report.

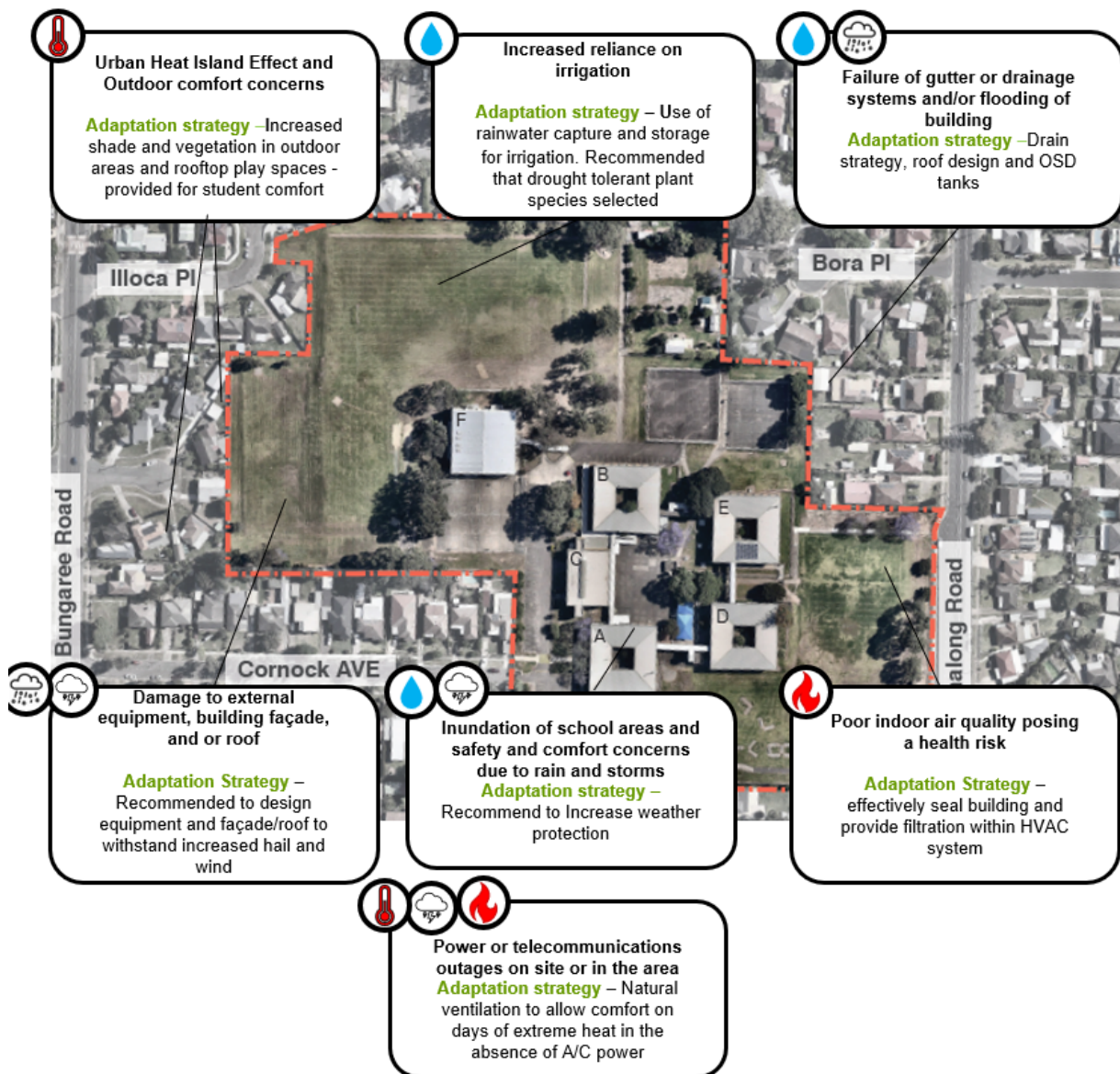
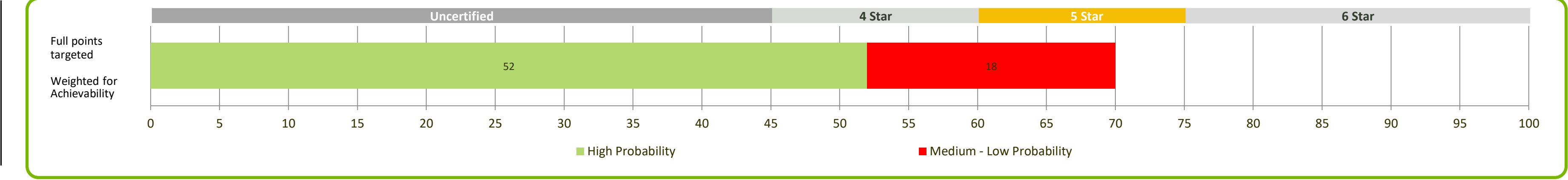


Figure 15 Pendle Hill High School Adaptation Strategies



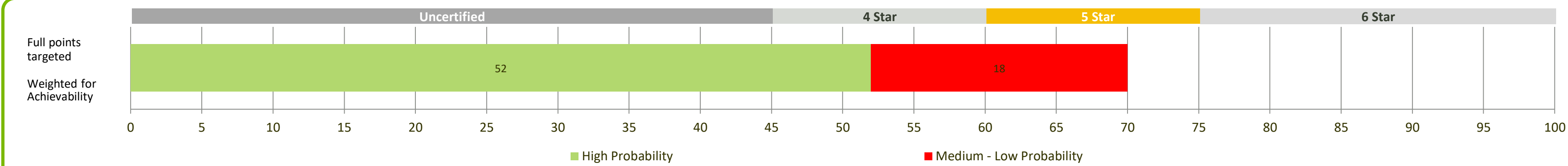
Appendix A

Green Star Pathway

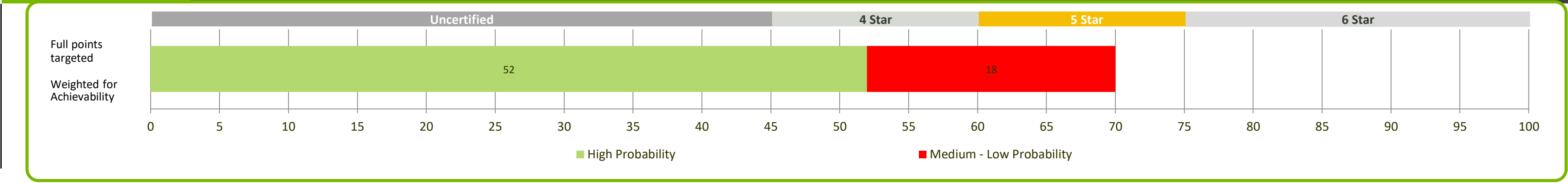


Credit No.	Credit	#	Criteria	Requirement	Available points	High Achievability	Low-Medium Achievability	Not recommended	Responsibility	General discussion
						Recommended outcome for PHHS and achievable within reasonable cost/effort	May require further investigation/significant cost or imposes certain design limitations	Not recommended/ achievable for PHHS		
MANAGEMENT	1 Green Star Accredited Professional	1.0	Accredited Professional	1 point is available where a Green Star Accredited Professional – Design & As Built (GSAP) has been contractually engaged to provide advice, support and information related to Green Star principles, structure, timing and processes, at all stages of the project, leading to certification.	1	1			School Infrastructure	
		2.0	Minimum Credit Requirement: Environmental Performance Targets	In order for the minimum requirement to be met, documented targets for the environmental performance of the project must be set.	Conditional for credit	Anticipated			MEP/ESD/School Infrastructure	Requires the development of a 'Design Intent Report' or 'Owner's project Requirements'
		2.1	Services and Maintainability Review	1 point is available where a comprehensive services and maintainability review of the project is performed.	1	1			Head Contractor	Include in Contractor Specification
	2 Commissioning and Tuning	2.2	Building Commissioning	1 point is available where comprehensive pre-commissioning and commissioning activities are performed for all nominated building systems.	1		1		Head Contractor	Air tightness testing is required for this credit, will incur significant additional costs above standard commissioning and testing.
		2.3	Building Tuning Systems	1 point is available where a tuning process is in place that addresses all nominated building systems.	1	1			Head Contractor	Include in Contractor Specification
		2.4	Independent Commissioning Agent	1 additional point is available for utilisation of an Independent Commissioning Agent (ICA) to advise, monitor, and verify the commissioning and tuning of the nominated building systems throughout the design, tender, construction, commissioning and tuning phases.	1	1			School Infrastructure	GBCA approved Schools to target credit using the Commissioning and Temporary Schools Program Team in lieu of engaging a dedicated independent commissioning agent for each project on the following condition; Refer GBCA Response R-14422
	3 Adaption and Resilience	3.1	Implementation of a Climate Adaptation Plan	2 points are available where: • A project specific Climate Adaptation Plan has been developed in accordance with a recognised standard; and • Solutions have been included into the building design and construction that specifically addresses the risk assessment component of the adaptation plan.	2	2			School Infrastructure /ESD	Must develop a Climate Change Adaptation Plan in accordance with Australian Standard and implement specific responses to all 'high' risks.
	4 Building Information	4.2	Building Information	1 point is available where: • Comprehensive operations and maintenance information is developed and made available to the facilities management team; and • Relevant and current building user information is developed and made available to all relevant stakeholders.	1	1			Head Contractor	Typically common practice - Contractor must develop comprehensive O + M information.
	5 Commitment to Performance	5.1	Environmental Building Performance	1 point is available where there is a commitment to set targets and measure results for the construction waste from end-of-life of interior fitout or other building attributes.	1	1			School Infrastructure	SI obligation - must develop building performance reporting strategy. To be discussed if currently in place.
		5.2	End of Life Waste Performance	1 point is available where there is a commitment to set targets and measure results for the construction waste from end-of-life of interior fitout or other building attributes.	1	1			School Infrastructure	SI NSW to commit to extending the life of internal fitout for 10 years (excluding general wear and tear)
	6 Metering and Monitoring	6.0	Minimum Credit Requirement: Metering Strategy	1 point is available where there is a commitment to set targets and measure results for the environmental performance of the building.	Conditional for credit	Anticipated			Electrical	Generally standard practice for metering strategy
		6.1	Monitoring Strategy	1 point is available where there is a commitment to set targets and measure results for the environmental performance of the building.	1	1			Electrical	Requires monitoring system to capture and process data produced by the installed energy and water meters - provide real time data to management and report on consumption trends etc.
		7.0	Minimum Credit Requirement: Environmental Management Plan	To qualify for this credit, it is a minimum requirement that environmental impacts are managed during construction by implementing a best practice environmental management plan.	Conditional for credit	Anticipated			Head Contractor	Contractor Requirement
	7 Responsible Construction Practices	7.1	Environmental Management System	1 point is available where the 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.	1	1			Head Contractor	Contractor Requirement
		7.2	High Quality Staff Support	1 point is available where high quality staff support practices are in place that: • Promote positive mental and physical health outcomes of site activities and culture of site workers, through programs and solutions on site; and • Enhance site workers' knowledge on sustainable practices through on-site, off-site, or online education programs.	1	1			Head Contractor	Contractor Requirement
8	Operational Waste	8.B	Prescriptive Pathway - Facilities	1 point is available where facilities are in place to collect and separate distinct waste streams, and where these facilities meet best practice access requirements for collection by the relevant waste contractor.	1	1			Architect/Waste Consultant	Best Practice Waste Management facilities - storage of recyclables sized for expected waste generation, adequate access for removal etc
Management Total (unweighted)					14	13	1	0		
INDOOR ENVIRONMENTAL QUALITY	9 Indoor Air Quality	9.1	Ventilation System Attributes	1 point is available where: • The entry of outdoor pollutants is mitigated; • The system is designed for ease of maintenance and cleaning; and • The system has been cleaned prior to occupation and use.	1	1			Mechanical	Minimum separation distances between pollution sources and outdoor air intakes required as per ASHRAE design standards - typically not challenging - Leigh to review. Must provide access to both side of heating coils, cooling coils, filters etc for cleaning and maintenance - the proposed VRF only has filters - access to be provided in mech design.
		9.2	Provision of Outdoor Air	2 points are available where the nominated area is provided with sufficient outdoor air to ensure levels of indoor pollutants are maintained at acceptable levels. Options are available for mechanically and naturally ventilated buildings and for outdoor air provision or contaminant monitoring.	2	2			Mechanical	Two points targeted as natural ventilation via louvres provided for outside air.
		9.3	Exhaust or Elimination of Pollutants	1 point is available where nominated pollutants, such as those arising from printing equipment, cooking processes and equipment, and vehicle exhaust, are limited by either removing the source of pollutants from the nominated area, or exhausting the pollutants directly to the outside while limiting their entry into other areas of the project.	1	1			Mechanical	Pollutants from printing, photocopying shall be eliminated through printer/photocopier selection. Pollutants from cooking n/a - canteen only has basic heating facilities - no stove or oven. Pollutants from vehicles n/a - no car parks.
	10 Acoustic Comfort	10.1	Internal Noise Levels	1 point is available where internal ambient noise levels in the nominated area are suitable and relevant to the activity type in the room. This includes all sound generated by the building systems and any external noise ingress.	1		1		Acoustics & MEP	Minimise noise intrusion from constant external sources (e.g. road) and services - requires acoustic consultant review to confirm achievability
		10.2	Reverberation	1 point is available where the nominated area has been built to reduce the persistence of sound to a level suitable to the activities in the space.	1		1		Acoustics	Reverberation times in the lower band of times specified in the Australian Standard AS2107:2016 - requires acoustic consultant review to confirm achievability
		10.3	Acoustic Separation	1 point is available where the nominated enclosed spaces have been built to minimise crosstalk between rooms and between rooms and open areas.	1		1		Acoustics	Wall Construction to minimise sound travelling between private rooms. Rw 45 for partitions R2 35 for partitions with door (Rw) from 30 to 35 for glazed operable walls between enclosed spaces only. (Refer GBCA TQ R-14112) Requires acoustic consultant review to confirm achievability.
	11 Lighting Comfort	11.0	Minimum Credit Requirement: Lighting Comfort	The minimum requirement is met where lights are flicker-free and accurately address the perception of colour in the space.	Conditional for credit	Anticipated			Electrical/Lighting	Typically standard practice. Compliance anticipated, to be reviewed against area definition
		11.1	General Illuminance and Glare Reduction	1 point is available where, in the nominated area: • Lighting levels and quality comply with best practice guidelines; and • Glare is eliminated.	1	1			Electrical/Lighting	Typically standard practice. Compliance anticipated, to be reviewed against area definition
		11.2	Surface Illuminance	1 point is available where, in the nominated area, a combination of lighting and surfaces improve uniformity of lighting to give visual interest.	1		1		Electrical/Lighting/Architect	Can be challenging to achieve surface reflectance for ceilings of at least 0.75 - pending architectural intent
		11.3	Localised Lighting Control	1 point is available where, in the nominated area, occupants have the ability to control the lighting in their immediate environment.	1	1			Electrical/Lighting	Localised control is generally good practice for school environment- DALI system proposed currently.
	12 Visual Comfort	12.0	Minimum Credit Requirement: Glare Reduction	The minimum requirement is met where the glare in the nominated area from sunlight through all viewing façades is reduced through a combination of blinds, screens, fixed devices, or other means.	Conditional for credit	Anticipated			Architect	Internal Blinds to be included
		12.1	Daylight	Up to 2 points are available where a percentage of the nominated area receives high levels of daylight: • For 40% of the nominated area – 1 point; • For 60% of the nominated area – 2 points.	2		1	1	Architect	Recommended outcome, however may not be achieved due to depth of space, daylight modelling required to confirm.
		12.2	Views	1 point is available where 60% of the nominated area has a clear line-of-sight to a high quality internal or external view.	1		1		Architect	Recommended outcome - views calculations required to confirm
	13 Indoor Pollutants	13.1	Paints, Adhesives, Sealants and Carpets	1 point is available where at least 95% of all internally applied paints, adhesives, sealants and carpets meet stipulated 'Total VOC Limits', or, where no paints, adhesives, sealants or carpets are used in the building.	1	1			Head Contractor	Alignment with EFSG selection requirements
		13.2	Engineered Wood Products	1 point is available where at least 95% of all engineered wood products meet stipulated formaldehyde limits or no new engineered wood products are used in the building.	1	1			Head Contractor	Alignment with EFSG selection requirements

PROJECT TITLE: Pendle Hill HS
DOCUMENT: Green Star - Design & As Built v1.3 Credit Summary
REVISION: Rev2
AUTHOR: Maeve Molins
DATE: 5/03/2021



Credit No.	Credit	#	Criteria	Requirement	Available points	High Achievability	Low-Medium Achievability	Not recommended	Responsibility	General discussion	
ENERGY	14 Thermal Comfort	14.1	Thermal Comfort	1 point is available where a high degree of thermal comfort is provided to occupants in the space, equivalent to 80% of all occupants being satisfied in the space.	1		1		Architect/ESD/Mechanical	Should be achievable with attention to WWR, shading and glazing - thermal comfort modelling required to confirm.	
		14.2	Advanced Thermal Comfort	1 additional point is available where a high degree of thermal comfort is provided to occupants in the space, equivalent to 90% of all occupants being satisfied in the space.	1			1		Typically challenging to achieve	
	Indoor Environment Quality Total					17	8	7	2		
	15 Greenhouse Gas Emissions	15.0	Conditional Requirement	The minimum Deemed-to-Satisfy performance requirements stipulated within Part J1 of the NCC have been exceeded by at least 5%, and compliance with other applicable DTS requirements of Section J of the NCC must be achieved by the project.	Conditional Requirement, must be achieved in order to be awarded a Green Star rating						Achievable through good mechanical design and good practice envelope.
		15.0.1	Building Fabric								10% improvement on Section J DTS.
		15.0.2	Glazing								10% improvement on Section J DTS
		15.0.3	Minimum Point Threshold								N/A - 4 Star rating.
		15.A	GHG Emissions Reduction - Prescriptive Pathway	Up to 10 points are available where the project's GHG emissions have been reduced by employing 'best practice' building attributes.							
		15A.1	Building Envelope	1	1			Architect	10% improvement on Section J DTS - already EFGS requirement		
		15A.2	Wall-Glazing Construction and Retail Display Glazing	1	1			Architect	10% improvement on Section J DTS - already EFGS requirement		
		15A.3	Lighting	1	1			Electrical	Illumination power max 90% on allowed power in Section J Automated lighting control system		
		15A.4	Ventilation and Air Conditioning	1	1			Mechanical	Improve on Section J DTS efficiency for fans, pumps etc		
		15A.5	Domestic Hot Water	1		1		Hydraulics	Must not install gas for DHW - must be powered by: Renewable Energy, Electric Heat Pump (min COP 3.5), waste heat/heat recovery		
		15A.6	Transition Plan	1			1		Must develop plan to phase out fossil fuels by 2030		
		15A.7	Fuel Switching	1		1	1		15% annual energy sourced from on site renewables		
		15A.8	On-Site Storage	1					Could be achieved with battery		
		15A.9	Vertical Transportation	1					N/A		
		15A.10	Off-Site Renewables	2					Commitment to procure Off site Renewable energy		
16	Peak Electricity Demand Reduction	16.A	Prescriptive Pathway - On-site Energy Generation	1 out of 2 points are available where it is demonstrated that the use of on-site electricity generation systems reduces the total peak electricity demand by at least 15%	2		1	1		PV with battery likely required to achieve credit	
Energy Total					22	4	3	15			
TRANSPORT	17 Sustainable Transport	17.B	Prescriptive Pathway	Up to 7 out of 10 points are available where projects provide access to sustainable transport infrastructure as demonstrated using specified prescriptive criteria							
		17.B1	Access By Public Transport	3				1		Unlikely to achieved based on current GS criteria. To be discussed with GBCA/Sl if alternate criteria can be applied for a high school. Transport Calculator requested off the GBCA	
		17.B2	Reduced Car Parking	1			1		Transport	Must achieve reduction of car parking spaces for the proposed building, when compared to the allowance provided in the Submission Guidelines. Advice sought in regards to number of new/existing parking spaces at the school.	
		17.B3	Low Emission Vehicle Infrastructure	1			1		Transport	5% of parking is dedicated to electric vehicles and charging infrastructure is provided for each space, or 15% dedicated to motorcycles and small cars. To be discussed with GBCA/Sl if alternate criteria can be applied for a high school.	
		17.B4	Active Transport Facilities	1			1		Transport	Could be achieved with provision bike parking for staff and students 7.5% of staff (must include showers) 40% of students	
		17.B5	Walkable Neighbourhood	1				1		Cannot be achieved based on current credit criteria. To be discussed with GBCA/Sl if alternate criteria can be applied for a high school.	
		Transport Total					10	0	3	7	
WATER	18 Potable Water	18.B	Prescriptive Pathway	Up to 6 out of 12 points are available where it is demonstrated that the building's potable water consumption has been reduced through best practice water saving design features.							
		18.B1	Sanitary Fixture Efficiency	1	1			ESD/Architect	Must meet WELS rating for taps, showers, toilets, urinals, washing machines and dishwashers. Aligns with EFGS.		
		18.B2	Rainwater Reuse	1	1			Hydraulics	Would require increase in current rainwater tank capacity - current proposed 10kL		
		18.B3	Heat Rejection	2	2			Mechanical	no water based heat rejection		
		18.B4	Landscape Irrigation	1	1			Landscape Consultant	Drip irrigation with moisture sensor override or no potable water used for landscaping.		
		18.B5	Fire System Test Water	1		1		Fire Protection	Store or recirculate 80% of test water for use on site.		
Water Total					12	5	1	6			
MATERIALS	19 Life Cycle Impacts	19.B	Prescriptive Pathway - Life Cycle Impacts	Up to 5 points are available where the project reduces the amount of building materials used. The following options are included in this pathway: Concrete; Steel; Building Reuse; and Structural Timber.							
		19B.1	Concrete	3	2			Head Contractor/Structural	Reduce Portland Cement content and use recycled water and aggregates in concrete mix		
		19B.2	Steel	1	1			Head Contractor/Structural	Reduce steel mass (compared to a reference case)		
		19B.3	Building Reuse	4			4		NA - new building		
		19B.4	Structural Timber	3			3		Understood that timber structure is not being considered.		
	20 Responsible Building Materials	20.1	Steel	1	1			Head Contractor	Include in Contractor Specification		
		20.2	Timber	1	1			Head Contractor	Include in Contractor Specification		
		20.3	Cables, Pipes, Floors and Blinds	1	1			Head Contractor	Include in Contractor Specification		
	21 Sustainable Products	21.1	Product Transparency and Sustainability	Up to 3 points are available when a proportion of all materials used in the project meet transparency and sustainability requirements under one of the following initiatives: A. Reused Products; B. Recycled Content Products; C. Environmental Product Declarations; D. Third-Party Certification; or E. Stewardship Programs. Points are calculated based on specified benchmarks for the percentage of compliant products used in the project.	3	1	2		Head Contractor	Include in Contractor Specification	
	22 Construction and Demolition Waste	22.B	Percentage Benchmark	1 point is available where the construction waste going to landfill is reduced by either: A. Minimising the total amount of waste sent to landfill when compared against a typical building OR B. Diverting a significant amount of waste from going to landfill as a proportion of waste generated.	1	1			Head Contractor	Include in Contractor Specification - Best Practice Construction Waste Management.	
Materials Total					14	8	2	4			
LAND USE & ECOLOGY	23 Ecological Value	23.0	Minimum Credit Requirement: Endangered, Threatened or Vulnerable Species	To meet the minimum requirement for this credit, the project must demonstrate that no critically endangered, endangered, or vulnerable species, or ecological communities were present on the site at time of purchase.	Conditional for credit	Anticipated					
		23.1	Ecological Value	Up to 3 points are awarded where the ecological value of the site is improved by the project. The number of points awarded is determined by the Ecological Value Calculator based on a comparison of the condition of the site before and after design/construction.	3			3		Challenging due to Greenfield Site	
	24 Sustainable Sites	24.0	Conditional Requirement	Conditional Requirement, must be achieved in order to be awarded a Green Star rating							
		24.1	Reuse of Land	1 point is available where 75% of the site was Previously Developed Land at the date of site purchase or (for previously owned land) at the project's Green Star registration date.	1			1		Challenging due to Greenfield Site	
		24.2	Contamination and Hazardous Materials	1 point is available where the site, or an existing building, was previously contaminated and the site has been remediated in accordance with a best practice remediation strategy.	1			1		It is understood there is no contamination on the site	
25 Heat Island Effect	25.0	Heat Island Effect Reduction	1 point is available where at least 75% of the total project site area comprises building or landscaping elements that reduce the impact of the heat island effect.	1	1			Architect/Landscape	Achieved through light coloured roof, shading, vegetation and external material selection (light/reflective materials)		
Land Use & Ecology Total					6	1	0	5			



Credit No.	Credit	#	Criteria	Requirement	Available points	High Achievability	Low-Medium Achievability	Not recommended	Responsibility	General discussion	
EMISSIONS	26 Stormwater	26.1	Reduced Peak Discharge	1 point is available where the post-development peak event discharge from the site does not exceed the pre-development peak event discharge.	1	1			Civil		
		26.2	Reduced Pollution Targets	1 additional point is available, where the first point has been achieved and all stormwater discharged from site meets specified Pollution Reduction Targets.	1	1			Civil		
	27 Light Pollution	27.0	Minimum Credit Requirement: Light Pollution to Neighbouring Bodies	For the project to be awarded a point for this credit, the project must comply with AS 4282:1997 Control of the Obtrusive Effects of Outdoor Lighting.	Conditional for credit	Anticipated			Electrical/Lighting	The project will comply with AS4282 'Control of the Obtrusive Effects of Outdoor Lighting.'	
		27.1	Light Pollution to Night Sky	1 point is available where it can be demonstrated that a specified reduction in light pollution has been achieved by the project. Two options are available for demonstrating a reduction in light pollution.	1	1			Electrical/Lighting		
	28 Microbial Control	28.B	Legionella Impacts from Cooling Systems	1 point is available where: - The building is naturally ventilated; or - The building has waterless heat-rejection systems; or - The building has water-based heat rejection systems that includes measures for Legionella control and Risk Management.	1	1			Mechanical	No water based heat rejection	
	29 Refrigerant Impacts	29.0	Refrigerant Impacts	1 point is awarded where one of the following criteria is achieved: - The combined Total System Direct Environmental Impact (TSDEI) of the refrigerant systems in the building is less than 15; or - The combined TSDEI of the refrigerant systems is between 15 and 35, AND a leak detection system with automated refrigerant recovery is in place - All refrigerants in the project have an ozone depletion potential of zero, and a global warming potential of 10 or less; or - Where there are no refrigerants employed by nominated building systems, this point is awarded.	1		1		Mechanical	Can be cost prohibitive with VRF system - multiple indoor units - each one would require leak detection system. Mechanical engineer to investigate options with manufacturers for using low impacts refrigerants - however typically this is not commercially viable.	
Emissions Total					5	4	1	0			
INNOVATION	30 Innovation	Innovative Technology or Process			10	The project meets the aims of an existing credit using a technology or process that is considered innovative in Australia or the world.				note: GBCA approval should be sought for all innovation claims other than 30D 'Innovation Challenge'	
		30 A	Onsite Renewables Up to two points may be rewarded in the Innovation Category for installing renewable energy sources on site. - One point for 5% contribution - Two points for 10% contribution (maximum)			2			Expected to be met by 99KW system		
		Market Transformation									
		30 B	DIMA Innovation Opportunity to reward design strategies that minimise the need for internal refurbishment. Subject to GBCA approval.			1					
		Improving on GS Benchmarks									
		30 C	Timber Furniture				1		Suggested approach to include any timber furniture. Recommended following further investigation		
		Innovation Challenge									
		Community Benefits	The project can target any of the current Innovation Challenges that are published on the GBCA website. Alternatively, where the project addresses a sustainability issue not included within any of the credits in the existing Green Star rating tools, projects may propose a new Innovation Challenge.								
			1				i.e. Use of facilities by community groups GBCA approved schools to target using the Schools Infrastructure policy 'Community Use of School Facilities' and the 'Share Our Spaces' program guide in lieu of a Needs Analysis Report. Refer GBCA TQ R14478				
			Financial Transparency				1				
			30 D	Local Procurement			1			Employment of construction staff from local area	
		Universal Design				1			GBCA approves schools to target Universal Design, providing the Education Facilities Sustainable Guidelines (EFSG) in lieu of a needs analysis report.		
		Reconciliation Action Plan	1			DoE have a RAP - concepts should be embedded in the design & construction of the school - Refer GBCA FAQ 00101 can use an organisation Reconciliation Action Plan (RAP) to demonstrate compliance with the Innovation Challenge - Compliance requirements. The registered Green Star project must demonstrate a relationship to, and a role in delivering, the action items within the organisational RAP.					
	Healthy Environments - Healthy Canteen			1	Refer GBCA R-14476						
30E	Global Sustainability			Project teams may adopt an approved credit from a Global Green Building rating tool that addresses a sustainability issue that is currently outside the scope of this Green Star rating tool.							
		Quality of Amenities			1	The project can target Green Star - Interiors v1.1 credit 14A Quality of Amenities for one (1) innovation point by replacing the needs analysis with the requirements set out in the Education Facilities Sustainable Guidelines (EFSG) Accommodation - Staff Room and Annex. The project team still need to demonstrate how the staff room provides quality and universally accessible spaces for teachers to enjoy. GBCA TQ R-09652					
Innovation Points Targeted					10	9	2				
Innovation Award Total					10	9	0	1			
Total Credits					100	43	18	39	61		
Total Credits with Innovation					110	52	18	40	70		

Document prepared by

Aurecon Australasia Pty Ltd

ABN 54 005 139 873

Level 5, 116 Military Road

Neutral Bay NSW 2089

PO Box 538

Neutral Bay NSW 2089

Australia

T +61 2 9465 5599

F +61 2 9465 5598

E sydney@aurecongroup.com

W aurecongroup.com

