Upgrades to Chatswood Public School and Chatswood High School

Appendix 28 - Ecologically Sustainable Development Report

SSD 9483
Prepared by Building Services Engineers
For School Infrastructure NSW, Department of Education

Artists impression of upgrades to Chatswood Public School

Ecologically Sustainable Design (ESD) SEARs Report

Upgrades to Chatswood Public School and Chatswood High School

Prepared For:

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Prepared By:

Building Services Engineers

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Building Services Engineers
Level 2, 168 Edward Street
Brisbane QLD 4000
07 3210 0044
mail@bse.com.au

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1. Executive Summary

BSE has been engaged by to undertake the required Ecologically Sustainable Design (ESD) assessments and provide a sustainability report for the proposed upgrades to Chatswood Public School and Chatswood High School at Chatswood NSW.

The principles of ecologically sustainable design will be an integral consideration throughout this development. This report summarises the ESD provisions for the development which demonstrate commitment to environmental sustainability.

The sustainability targets for the development will be achieved in an integrated and staged approach through minimising the need for energy consumption (via passive measures) and then consumption optimisation (energy efficiency) and use of renewable resources where required.

The initiatives presented in this report demonstrate a wide range of measures which will result in high levels of environmental performance and also improvement of occupants' health, productivity, comfort and satisfaction.

Aiming at leading practice in energy and environmental targets, the project architect and building services design team will maximise energy efficiency in an integrated and staged approach:

Load Reduction (minimising the need for resource consumption e.g. energy, water and material)	Passive Design
	Building fabric improvements
	Maximise use of natural lighting
	Maximise use of Natural ventilation
Optimising energy and water consumption	High efficiency Heating, Ventilation and Air Conditioning
	High efficiency lighting
	High efficiency hot water systems
	High efficiency appliances
Use of renewable resources (renewable energy and rainwater harvesting)	Application of Solar Energy or Solar thermal systems where practical
	Rainwater harvesting

Benchmarking and compliance requirements:

The development will meet and outperform the following regulatory sustainability requirements:

- Standard Secretary's Environmental Assessment Requirements (SEARs) – ESD requirements
- NCC 2016 Section J (Energy Efficiency – will be assessed as part of the NCC Section J JV3)

Sustainability targets beyond the minimum requirements

Although not seeking formal rating certification, where feasible, the design team will also consider the sustainable design principles based on the following sustainability tool.

- Green Star Design & As Built Tool – Green Building Council of Australian.

As designed assessment against the Green Star requirements has been provided to address the SEARs and demonstrate the proposed building design is consistent with Australian best practice ESD principles (indicated below):

- Integrated Design Approach
- Greenhouse gas emission reduction
- Community
- Community Facilities
- Sustainability Displays
- Management
- Environmental Ratings and Involvement of a GSAP
- Commissioning Clauses
- Building Tuning
- Building User's Guide
- Environmental Management Plan
- Waste Management System
- Environmental Management and Maintenance
- Indoor Environmental Quality (IEQ) Initiatives
- Thermal Comfort
- Effective Daylighting / Natural Lighting
- Natural Ventilation
- Volatile Organic Compounds (VOC)
- Formaldehyde Minimisation
- Energy Conservation Initiatives
- Passive Design
- Building Envelope
- Energy Efficient Systems and Services
- Renewable Energy – Solar Photovoltaic (PV) System
- Transport sustainability measures
- Water Conservation and Management Initiatives

A framework for ensuring the proposed ESD measures are incorporated in the as-built design is currently being developed and will be provided to DPIE prior to determination.

While the Green Star – Design & As Built tool has been used as a framework to demonstrate best practice and the project has been designed to that standard, formal Green Star certification by the Green Building Council of Australia will not be proposed as part of the SSD.

2. Introduction

The design team recognise the importance of sustainable developments in terms of environmental preservation, occupants' health, safety and wellbeing, as well as in terms of greenhouse gases emissions reduction.

The project architect, consultants and contractors will strive to design and construct the building based on the Environmentally Sustainable Design (ESD) principles which outperforms the minimum NCC Section J requirements.

The facade and floor plans are designed with the vision to give occupants the very best in terms of passive heating and passive cooling. This, when combined with other energy efficiency strategies (listed later in the report) will lead to low energy demands for the apartments and base building and therefore lower greenhouse gas emissions during the life of this development.

Natural lighting and natural ventilation will be utilised very effectively throughout the development. In addition to thermal comfort, energy and water efficiency, the proposed building design will provide sustainable and efficient operation to the occupants.

The proposed sustainable design initiatives will not only improve the building services life but are low-cost, low maintenance and reliable, especially when compared to often prohibitively complex and expensive retrofits. Furthermore, the passive design principles will facilitate a low-energy and cost-effective operation for the occupants.

The following are some of the design initiatives which will improve the environmental performance of the development and deliver long term energy efficiency during the life of the building.

- Optimising the size of the mechanical plant to ensure the plant is working at its peak efficiency and minimise the capital cost of the plant;
- Having high efficiency lighting and air conditioning equipment will reduce the energy consumption of the buildings;
- Variable Speed Drives (VSD) controls the speed of pumps, fans and other mechanical plant to ensure that they are only using as much power as it is needed;
- Commissioning of all services equipment to ensure their correct operation;
- A high-performance façade will limit the heat entering the buildings, reducing air conditioning system sizes and the energy use over the year;
- A mixed mode approach allowing the buildings to be naturally ventilated when outdoor conditions are suitable allowing significant energy reduction by not requiring the air conditioning system to operate at all times;
- Emission reductions and material optimisation;
- Maximise use of non-toxic building materials;
- Maximise use of materials that are recyclable;
- Minimise Waste in Construction;
- Minimise Waste in Operation.
- Renewable Energy generation – Solar PV

3. Benchmarking

The development will meet and outperform the following regulatory sustainability requirements:

- Standard Secretary's Environmental Assessment Requirements (SEARs) – ESD requirements
- NCC 2016 Section J (Energy Efficiency – will be assessed as part of the NCC Section J JV3)

Sustainability targets beyond the minimum requirements:

Although not seeking formal rating certification, where feasible, the design team will also consider the sustainable design principles based on the following sustainability tool.

- Green Star Design & As Built Tool – Developed by Green Building Council of Australian

3.1. Response to SEARs

The ESD SEAR's report is required by the Secretary's Environmental Assessment Requirements (SEARs). This table identifies the SEARs and relevant reference within this report.

SEARs Items	Project Response
Detail how ESD principles (as defined in clause 7(4) of Schedule 2 of the Regulation) will be incorporated in the design and ongoing operation phases of the development	The sustainability targets for Chatswood Education will be achieved in an integrated and staged approach through first minimising the need for energy consumption (via passive measures) and then consumption optimisation (energy efficiency) and use of renewable resources where required. The outcome of this staged approach is to ensure the schools aligns with the ecological sustainable development principles of Clause 7(4) of Schedule 2 of the Environmental Planning and Assessment Regulation 2000. Refer to section 5 (ESD measures) and Appendix B (Green Star Matrix) of this report for further details about the proposed sustainability measures which will be incorporated in the design and ongoing operation phases of the development
Include a framework for how the future development will be designed to consider and reflect national best practice sustainable building principles to improve environmental performance and reduce ecological impact. This should be based on a materiality assessment and include waste reduction design measures, future proofing, use of sustainable and low-carbon materials, energy and water efficient design (including water sensitive urban design) and technology and use of renewable energy.	Chatswood Education is targeting a 4 Star Green Star rating utilising the Green Building Council of Australia's (GBCA) Design and As-built rating tool version 1.2. A 4 Star Green Star rating is considered 'Australian excellence' level. Green Star rating tools include the following nine separate environmental impact categories, Management; Indoor Environment Quality; Energy; Transport; Water; Materials; Land Use and Ecology; Emissions, and Innovation. Refer to section 5 (ESD measures) and Appendix B (Green Star Matrix) of this report for further details about the proposed sustainability measures.
Include preliminary consideration of building performance and mitigation of climate change, including consideration of Green Star Performance.	Building performance will be considered in the design of Chatswood Education. Section 5, and Appendix B (Green Star matrix) provides building performance measures considered to reduce resource consumption and carbon emissions, and impact on climate change. Green Star Performance has been considered in line with the project briefing requirements to target a 4-star Green Star rating.

Provide a statement regarding how the design of the future development is responsive to the CSIRO projected impacts of climate change, specifically: ▪ hotter days and more frequent heatwave events ▪ extended drought periods ▪ more extreme rainfall events ▪ gustier wind conditions ▪ how these will inform landscape design, material selection and social equity aspects (respite/shelter areas).	A climate change adaptation study has been undertaken to identify the climate risks in response to the projected impacts. Actions and design strategies have been identified to lower the impacts and the associated risk levels. The climate change design response is provided in Appendix A of this report. The plan is based on NSW and ACT Government Regional Climate Modelling (NARCliM) climate change projections.

3.2. National Construction Code (NCC) Section J

Section J of the NCC sets regulations for energy efficiencies for all types of buildings with respect to the building's construction, design and activity.

The objective of the NCC Section J is to reduce the greenhouse gas emissions. Section J requires that a building, including its services, must have features to the degree necessary that facilitate the efficient use of energy.

The NCC offers two compliance methods that differ in complexity and flexibility. The two compliance methods are:

- Deemed-to-Satisfy (DTS) Compliance
- JV3 – Verification using a referenced building.

The Deemed-to-Satisfy Provisions in Section J of the NCC 2016 include the following 8 components.

- Part J1 - Building Fabric – Minimum thermal performance constructions for roofs, ceilings, roof lights, walls, glazing and floors in the relevant climate zone.
- Part J2 - Blank in NCC 2019
- Part J5 - Air-Conditioning and – Provisions to reduce the loss of conditioned air and restrict unwanted infiltration to a building.
- Part J4 – Blank in NCC 2019
- Part J5 - Air-Conditioning and Ventilation Systems – Requirements to ensure these services are used and use energy in an efficient manner.
- Part J6 - Artificial Lighting and Power – Requirements for lighting and power to ensure energy is used efficiently within a building.
- Part J7 - Hot Water Supply – Restrictions for hot water supply design except for solar systems within climate zones 1, 2 and 3.
- Part J8 - Facilities for Energy Monitoring

The development will meet and outperform the NCC energy efficiency requirements of Part J. A section J report will be prepared for the development once the design is further developed.

3.3. Green Building Council of Australia Design Framework

Overview

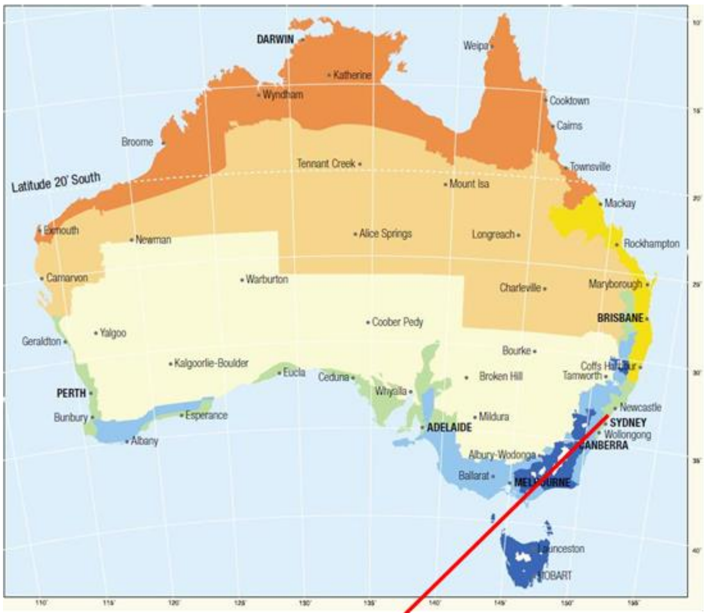
The Green Building Council of Australia's provides an internationally recognised system to assess sustainable outcomes throughout the life cycle of the built environment. It was developed by the Australian Building Industry through the Green Building Council of Australia (GBCA), which is now the nation's leading authority on sustainable buildings and communities. Although the Project is utilizing the EFSG to benchmark the project to Industry Best Practice Sustainability there are a number of initiatives covered by the Green Star tool that are additional to the requirement of the EFSG. As such the project is looking to implement some additional elements drawn from this tool to more holistically address some elements of Ecologically Sustainable Design Principles. This section provides a brief summary of the additional elements drawn from the Green Star tool being applied for the upgrades to Chatswood Public School and Chatswood High School.

The Green Star system incorporates ESD principals across nine major categories:

- Management
- Indoor Environment Quality
- Energy
- Transport
- Water
- Materials
- Land Use and Ecology
- Emissions
- Innovation

4. Development Location

The development is located in Chatswood NSW which is within the NCC climate zone 5 (warm temperate). The main building classification for the building is Class 9b.



ZONE	DESCRIPTION
1	High humid summer, warm winter
2	Warm humid summer, mild winter
3	Hot dry summer, warm winter
4	Hot dry summer, cool winter
5	Warm temperate
6	Mild temperate
7	Cool temperate
8	Alpine

5. Ecologically Sustainable Design (ESD) Initiatives

The principles of ecologically sustainable development are an integral consideration in design and construction of proposed development and also in assessing its benefits and impacts.

The design team will focus on a wide range of ESD strategies which will result in high levels of environmental performance and an increment on occupant's health, productivity, comfort and satisfaction.

5.1 Integrated Design Approach

The integrated design process is a process by which all of the design variables that affect one another are considered together and resolved in an optimal fashion. Often referred to as holistic design, this approach considers the development as a whole with the emphasis on integrating the different aspects of building's design.

5.2 Greenhouse gas emission reduction

Greenhouse gas emission reduction is achieved in a staged approach:

- First, reduction in overall energy consumption through demand reduction, passive design and energy efficiency, then;
- Reduction in electricity and gas utility consumption by utilising waste products, rainwater harvesting and renewable energy technologies (where feasible).

The integrated response to energy proposed for this project is summarised below:

1. Load Reduction and Passive Design
2. System Efficiency
3. Capture Waste
4. Renewable Energy (where feasible)

Energy consumption will be reduced through the efficient design of lighting, air-conditioning and ventilation systems, as well as energy efficient water heating and renewable energy technologies (where feasible). The development will consider Greenhouse gas emission reduction in design and operation through utilising energy conservation measures suitable for the development.

The following sections of the report outline the sustainability initiatives that will be considered and further developed by the design team during the detailed design stages.

5.3 Community

As presented in Section 1 community engagement and amenity will be a guiding concept for the ESD strategy. Specific initiatives to be investigated are detailed in this section.

5.3.1 Community Facilities

Facilities which attract and support members of the community could include:

- Provide free WiFi and areas suitable for study, reading and personal device use,
- Battery charging ports for mobile devices – connected to solar.
- Drinking water tap to refill water bottles.

5.3.2 Sustainability Displays

Real-time displays can be used to tell the story of Chatswood Education ESD efforts in terms of energy savings, water savings, any renewable energy generation, waste reduction, and other initiatives. These can be simple, engaging and can help raise the profile of the school as an environmentally responsible facility and engage community interest in sustainability. The displays could also be used to introduce and explain any innovative ESD solutions.

Generally, displays can utilise existing screens (such as poster boards or kiosks) with the data capture, graphic design and dynamic displays managed by an external service provider to the school's specifications on an annual subscription basis. An example for another facility is shown below.

Example in-centre information display.

Data Acquisition

Automated data is acquired via direct export from the existing Building Management System. In addition, local weather data will be acquired via the internet from the closest BoM weather station.

Data displays could include:

- Direct from existing meters and sensors
- Next day billing data from utility or meter data agent
- Manual data entry, e.g. of waste recycling rates or facility's environmental performance targets.

Data Processing

Greensense provides hosted data warehousing, processing and analytics. Data is stored and processed in real time and the resulting information is communicated to the information displays via the internet.

Data Presentation

Feedback on the environmental performance of the facility will be provided to visitors via digital poster boards. These will be custom designed incorporating the facility's branding. The poster boards will display (e.g.):

- Solar PV system performance, including electricity generated and greenhouse gas emissions avoided
- Rainwater harvesting and re-use and total potable water saved
- Local weather conditions
- Energy use – tagreted vs. real time for each space
- Thermal comfort: targeted vs. real time / historical
- Status of equitpment e.g. in heating or cooling mode, or ventilation on or off.

5.4 Management

The initiatives under the management category promote the adoption of environmental principles from project inception, design and construction phases to the operation of the building and its systems.

This category aims to highlight the importance of a holistic and integrated approach to constructing a building with good environmental performance. The following measures are some of the initiatives targeted within the management category and are subject to further design development. These initiatives aim to reduce environmental impacts at construction and operational stages as well as to maximise building performance at commissioning.

5.4.1 Environmental Ratings and Involvement of a GSAP

Environmental rating schemes such as Green Star (Australia), LEED (US), Living Building Challenge (US) or BREEAM (UK) are used to create a marketable environmental credential based on achievement of a recognised benchmark. Ratings can be useful for marketing to the students and for demonstrating ESD achievement for planning submissions.

Green Star is the most recognised rating scheme in Australia, with hundreds of certified buildings, mostly office buildings. The new Green Star – Design and As-Built chosen as an appropriate benchmark for the project.

Green Star includes a range of categories under which credits are available. Points are scored under each credit, and the total score is used to determine a final rating; 45-59 points for 4 Star, indicating Best Practice, 60-74 points for 5 Star, indicating Australian Excellence; and 75 or more points for 6 Star, indicating World Leadership. The categories are as follows:

- Management
- Indoor environment quality
- Energy
- Water
- Transport
- Materials
- Land use and ecology
- Emissions
- Innovation

It is recommended to involve a Green Star Accredited Professional (GSAP) as part of the design to prepare the necessary ESD guidelines. The ESD consultant from BSE (author of this report) is a Green Star Accredited Professional.

5.4.2 Commissioning Clauses

Commissioning of building systems to a high standard, with independent oversight, will ensure that a quality process is followed and provide an outside review of the practicalities of the design. An extended building tuning period should be undertaken following defects liability period to ensure that systems are performing as intended, taking into account different seasonal variables, and that any need for recommissioning is identified and carried out.

To adopt commissioning and handover initiatives that ensure that all building services can operate to optimal design potential, such as:

- Where possible, comprehensive pre-commissioning, commissioning, and quality monitoring to be contractually required to be performed for all building services (BMS, mechanical, electrical and hydraulic).

5.4.3 Building Tuning

After handover, the building owner is expected to implement tuning of all building systems and undertake full re-commissioning 12 months after practical completion;

5.4.4 Building User's Guide

To produce a Building User's / Occupant's Guide, information management that enables building users / occupants to optimise the building's environmental performance during its operation;

5.4.5 Environmental Management Plan

The contractor is expected to adhere to a comprehensive Environmental Management Plan (EMP) for the works. Contractors are recommended to be ISO 14001:2004 certified. Environmental management plans and systems should be implemented to ensure that demolition and construction activities appropriately manage and mitigate environmental impacts.

5.4.6 Waste Management System

To encourage and facilitate effective waste management once the development is in operation, sufficient spatial provision will be made to allow for the effective separation of waste from recycling. Dedicated waste recycling rooms allow space for the separation and storage of recyclable waste during the building's operation, allowing for the following waste streams to be separated:

- Glass;
- Cardboard;
- Paper;
- Organics.
- Plastics,
- Metals.

Waste management solutions are varied and dependant on the extent of commitment of the end user. Recycling, reuse and composting are examples of waste management options.

5.4.7 Environmental Management and Maintenance

Effective environmental and waste management will be implemented throughout the demolition, construction and operational stages of this development.

The EMP shall include a Waste Management Plan, specifying recycling targets for demolition and construction waste. It is recommended that construction and demolition contracts stipulate a minimum 90% target for diversion of waste from landfill. This may be achieved through recycling or reuse.

- Identification of appropriate waste sub-contractors for recycling, costs of collection and timing of collection service;
- Participation in waste minimisation training for contractors and sub-contractors;
- Published waste minimisation plan to reduce site waste to landfill;

Provision of separate waste skips for cardboard, timber, metal, soft plastic, polystyrene, insulation, concrete, glass and bricks.

5.5 Indoor Environmental Quality (IEQ) Initiatives

Indoor Environmental Quality initiatives consider the wellbeing of occupants, addressing factors such as heating, ventilating and air conditioning (HVAC), lighting, indoor air quality and building attributes, all of which contribute to good indoor environmental quality.

The following measures are some of the initiatives targeted within the IEQ category for further consideration and development during detailed design.

- Improvement of outside air rate by providing at a rate greater than AS1668.2 requirements. Air-conditioning system will be installed with carbon dioxide monitoring and control to ensure sufficient outside is delivered to occupants.
- Optimisation of the air quality by improving air change effectiveness
- Maximisation of natural lighting level to the building occupants
- Minimisation of the contribution and levels of Volatile Organic Compounds (VOCs) via the use of low VOC paints, adhesives and sealants, carpets and flooring.
- All engineered wood products to be used in the development will have low formaldehyde emission.
- High efficiency lighting system with suitable luminance levels to avoid causing discomfort and strain for the occupants. All fluorescent luminaries are to be installed with high frequency ballasts to avoid discomfort caused by low frequency flicker.
- External Views: The design allows unobstructed external views for the majority of occupied spaces;
- Internal noise level at an appropriate level to ensure the occupants' satisfaction and wellbeing.

5.5.1 Thermal Comfort

Thermal comfort can be provided by passive and mechanical means. Passive design initiatives will be considered before the design of the mechanical systems to reduce operational energy costs, with potential reductions in the air conditioning size and ongoing maintenance.

Thermal comfort is a function of the following factors:

- Radiant temperature (45% of net comfort effect);
- Air temperature and humidity (35% of net comfort effect);
- Air movement, clothing and activity (20% of net comfort effect).

Passive heating and cooling design strategies which will improve occupant thermal comfort include:

- Roof insulation not only reduces heat gain and loss, but will also moderate radiant temperatures from the walls, floor and ceiling;
- Building facades with high performance glazing and window frames will have a combination of external shading and high-performance glass to reduce heat transfer and radiant temperatures in proximity to the windows.

Indoor areas will be designed to be protected from excessive summer solar radiation, reducing radiant heat loads on the space, but still providing enough daylight during appropriate times of the year to improve comfort levels.

5.5.2 Effective Daylighting / Natural Lighting

Daylighting is the architectural and services design to allow maximum daylight penetration into a building whilst minimizing heat gain and thereby reducing indoor lighting loads.

The level of natural light in the building is primarily determined by the extent and type of glazing, and the depth of the building floor plate. Extent of glazing must be optimised to allow maximum daylight, views, and winter sun, while minimising uncomfortable glare and excessive solar heat gains in summer. Glazing should be selected with a high Visual Light Transmission to maximise daylight penetration.

Daylighting strategies will be considered to allow effective control of indoor lighting levels whilst minimising power consumption for the building. High level of architectural input regarding design, orientation and external shading will be considered to effectively maximise natural lighting for the building.

Daylighting strategies combined with dimmable lighting systems will allow high control of indoor lighting levels whilst minimising power consumption for the building.

5.5.3 Natural Ventilation

The Natural Ventilation mode is a fundamental aspect of the energy and the indoor environmental strategies. It is anticipated that when exterior conditions are suitable, occupants will utilise the operable windows and doors to the facade which will provide natural ventilation.

The proposed building design reflects this intention by sizing the window openings to allow effective natural ventilation, restoring thermal comfort. The design of the window, when open will allow the introduction and extraction of air through operable windows.

The materials specification of the windows and doors shall consider issues relating to durability, aesthetics and integration with other façade elements. The final selection of the glass and window system will be subject to detailed design phase of the project.

5.5.4 Volatile Organic Compounds (VOC) & Formaldehyde Minimisation

To ensure long term comfort of occupants, all due care will be taken to minimise VOC and formaldehydes used within the building. Maintaining VOC limits below the recommended levels will assist in reducing any potential detrimental impacts on occupant health arising from products which may emit volatile pollutants.

VOC's are commonly found in carpets, paints, adhesives and sealants uses in construction and extensive exposure to VOC's can cause Sick Building Syndrome effects (eye, nose and skin irritation, headaches lethargy etc.).

Formaldehydes are found within composite wood products and extensive exposure can cause irritation to eyes, nose and throat, lead to skin ailments and respiratory system ailments such as asthma.

Where possible, contamination of indoor air by common indoor pollutants will be minimised in this development by careful material selection, including:

- Use of low-VOC and water-based paints rather than oil-based paints, stains or sealants, reducing indoor air contamination and consequent side-effects including sick-building syndrome and respiratory problems;
- Selection of low-VOC carpets and adhesives;
- Selection of low formaldehyde composite wood products, avoiding the carcinogenic effects of formaldehyde off-gassing.

5.6 Energy Conservation Initiatives

It is essential to ensure the building is designed and built to minimise energy consumption and reduce or eliminate greenhouse gas emission to the atmosphere. Energy performance is considered by the design team as a crucial issue.

The energy conservation initiatives aim to reduce the overall energy consumption for the project directly contributing to greenhouse gas emissions and energy production capacity.

Greenhouse reductions are achieved in a staged approach:

- Reduction in overall energy consumption through demand reduction and energy efficiency.
- Reduction in electricity and gas utility consumption by utilising waste products and renewable energy technologies.

Several strategies will be assessed and put in place to minimise energy consumption.

The integrated energy strategies being considered for the development include:

Load reduction	Passive Design
	Mixed mode AC systems
	Maximise use of natural lighting
	Energy efficient equipment
	Water efficiency in hot water systems
Building Services System Efficiency	High Efficiency in Heating, ventilation and Air Conditioning
	High efficiency LED
	High efficiency hydraulic services
	High efficiency appliances
Renewable Energy	Solar PV (if deemed feasible by the design team)

5.6.1 Passive Design

The development will utilise passive design to minimise the amount of air-conditioning required and therefore significantly reduce the building's energy consumption and greenhouse performance. A building's form, fabric and orientation will have the biggest influence on its thermal comfort and environmental performance. The following factors will be considered in the detailed stages of the design:

- Orientation
- Shading
- Structure
- Insulation
- Glazing

5.6.2 Building Envelope

The building envelope will be designed to reduce heating and cooling requirements through passive design principles. The role of the building envelope is to block solar gains from penetrating the building fabric in summer while optimising daylight and minimising glare. The glazing performance and shading configuration for each orientation will be optimised to ensure that thermal comfort is achieved, and solar gains are adequate for the efficient operation of the mechanical system.

Insulation

The building envelope will be treated with the required levels of thermal insulation to reduce heat gains in hot days and to minimise heat losses in cold days through conduction. This will have significant impact on reducing energy consumption.

Insulation reduces the heat transfer between the internal and external conditions. Adequate insulation will be allowed for the ceilings, floors and walls to reduce the heating and cooling load of the building and to reduce the ongoing operational costs. This has a twofold saving through a smaller mechanical system capacity along with operating energy consumption reduction.

All insulations installed are required to meet NCC and AS/NZ 4859.1 and the builder is required to ensure compliance, during construction.

The thermal insulation requirements will be compliant with the minimum NCC Section J requirements.

Glazing and Window Framing

Adequate performance glass will be provided to reduce excessive heat gains in hot conditions, increasing periods when natural ventilation will be able to restore thermal comfort, and therefore reducing the frequency of air conditioning use.

The following glazing parameters will be considered:

- U-Value: a measure of how much heat is passed through the glass.
- Solar Heat Gain Coefficient (SHGC)
- Visible Light Transmission (VLT): the percentage of visible light transmitted by the glass.

Where possible, the glazing will have a low SHGC to avoid heat gains in the summer, and a low U-value to reduce losses in the winter through the glass. The performance of the proposed glazing systems (glass and frame) are required to comply with NFRC100-2001 conditions and using the tested AFRC values.

Consideration will be given to incorporating effective shading features into the design to avoid the necessity for low shading coefficients in the glass, which usually also decrease the visible light transmission (VLT) of the glass. To maximise the natural daylight within the building, VLT should be as high as possible.

Glazing properties will be specified in conjunction with the shading arrangement on each orientation to control solar loads imposed on the mechanical systems, ensuring thermal comfort, optimising daylight penetration and preventing glare. This strategy will effectively minimise direct solar loads whilst maximising daylight penetration and access to views.

To reduce heat losses in cold days, especially at night, the use of blinds will limit the contact between the internal air and the glass, therefore reducing heat losses by conduction.

The glazing performance requirements shall comply with the minimum NCC Section J requirements.

5.6.3 Energy Efficient Systems and Services

The mechanical and electrical systems for the building will be developed to minimise the need for plant equipment and will be designed to be responsive to the immediate climatic conditions.

Energy consumption will be reduced through the efficient design of lighting, air-conditioning, hot water and ventilation systems. The following energy efficiency initiatives will be further investigated and where feasible incorporated in the building services design.

Efficient Artificial Lighting

Lighting efficiency is important in maintaining low energy consumption for reuse projects. Lighting consumption for a facility such as this could account between 15-25% of the estimated energy use of the facility.

High efficiency lighting and effective control initiatives such as daylight and movement sensors will be considered to reduce artificial lighting energy consumption and allow maximum advantage to be taken of natural lighting.

Lighting power density is required to meet AS1680 and NCC requirements. Energy efficiency for the internal lighting throughout the building is required to be in accordance with NCC energy efficiency requirements and the following.

- High quality LED lighting where applicable;
- Lighting control system based on smart zoning, occupancy profiles and operational hours, dimming controls and timers.

Photoelectric (PE) / Photodiode sensors or similar controls to detect when external lighting should switch on and off to reduce the energy consumption associated with external lighting where possible.

No external lighting is to be installed such that any direct light beam results into the night sky either generated from within the site. The path of any direct light's angle of incidence that is directed to the sky must be obstructed by a non-transparent surface and the lighting design and is to comply with AS4282 'Control of the Obtrusive Effects of Outdoor Lighting.

Efficient Heating, Ventilation & Air-Conditioning (HVAC)

Heating and cooling of the building accounts for a large portion of the building's energy use throughout the year. Selection of highly efficient HVAC equipment with high performance levels not only minimises energy consumption, but also reduces operational energy costs.

The design of the mechanical services will be to industry Best Practise Standards. An emphasis will be placed on providing low energy Heating Ventilation Air Conditioning (HVAC) systems and strategies. To ensure the energy efficient performance of HVAC systems specified and installed mechanical plant will be of high quality and supplied by leading industry manufacturers.

The energy efficiency of HVAC system is required to meet the minimum requirements of the National Construction Code (NCC), Green Star provisions where feasible and relevant Australian Standards including but not limited to AS1668.1, AS1668.2, AS 1682 and AS3666.

The following energy initiatives will be further considered in the detailed design phase:

- Where appropriate, mixed mode ventilation will be used as an effective way to reduce air condition periods when natural ventilation is sufficient to maintain comfort conditions inside the space.
- The air conditioning strategy is optimized to reduce energy consumption and maximize efficiency. For example, by moderating the amount of fresh air relative to the number of people in the space, through the

use of CO_2 detectors. The system will be zoned to increase the flexibility in the use of different spaces and reduce overall consumption.

- Variable speed drives will be provided to fans and pumps where feasible.
- Full outside air cycle will be provided to all air handling systems.
- Building commissioning and building tuning to be undertaken to ensure that the building systems function as required to achieve energy efficiency design targets.

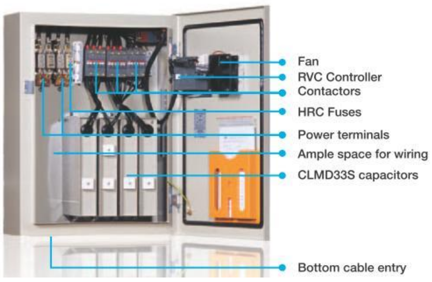
All refrigerant plant will be specified such that the refrigerant type has Zero Ozone Depletion Potential (ODP).

When outside conditions are not favourable for the natural ventilation mode of operation, the mechanical system shall deliver thermal comfort when spaces are occupied.

Manually operable windows will allow bedrooms and living rooms to be naturally ventilated when external temperature conditions are favourable. During periods when external temperature conditions prevent the opening of windows or during hot nights when acoustic issues will limit the opening of windows, a dedicated reverse cycle heat pump refrigerant

Common area ventilation systems are to include variable speed modes where appropriate and are to be linked to light switches where feasible to limit the extent of operation and improve energy efficiency of these areas.

Power Factor Correction



To reduce maximum kVA demand on the electricity grid and lower the demand charges, power factor correction units will be provided at the main switch board(s) in accordance with the NSW Installation and Service Rules.

The power factor correction units proposed will improve the power to a factor of 0.98 or higher.

Monitoring & reporting

To enable effective monitoring and tracking of energy and water consumption, sub-metering will be considered for systems with major energy use, to help identify areas of inefficiency with potential for improvement.

Metering is to be provided throughout the building and central services for all major building plant and equipment. An effective monitoring system is to be provided to monitor energy and water consumption throughout the building as required.

Ongoing reporting may allow the manager of the facility to set goals for energy consumption reductions and attributed energy costs to particular uses. By monitoring energy, losses and wastage can be identified, therefore improving the overall performance of the building in operation. This initiative is subject to further design development and review.

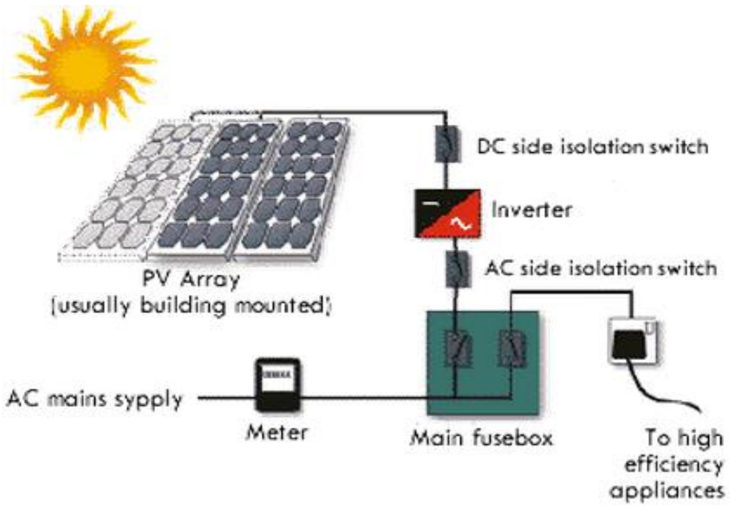
Hot Water Systems

High efficiency gas hot water systems will be used to provide the Domestic Hot Water demands for the facility.

5.6.4 Renewable Energy – Solar Photovoltaic (PV) System

Photovoltaic (solar PV) is a common and widely accepted technology to generate electricity onsite. The generated electricity can be harnessed and used to power any number of devices. It is proposed that the PV panels are mounted on the roof where they will be out of sight and produce the optimum energy output.

PV modules have a very long lifetime with many manufacturers guaranteeing an output of at least 80% of manufactured capacity for 20 years. Another benefit of PV is that it can be installed in various system sizes and the modular design of the systems allows retro-fitting of additional panels if required in the future.



There are generally three types of solar panels available: mono-crystalline (proposed for this development), poly-crystalline and amorphous. Each of these have their advantages and disadvantages and efficiencies range from 6% for amorphous to 19% for mono-crystalline.

A 100 kW PV system may be considered for the development. The exact sizing, configuration and final design will be completed during the design stage.

The expected renewable energy generation by the system is approx. 142.3 MWh per annum.

Solar PV - System Components

The Photovoltaic (PV) system may consist of the following main components or of equal capacity.

Total nominal power:	**100 kW**
Approx. roof space requirements:	**800 m^2**
Estimated Capital Costs (without battery):	**$110,000 (Exc GST) after rebates**
Estimated Payback Period:	**< 5 yrs**

Components	Brand, Model & Quantity
PV Inverter	SMA – Quantity: (4-5) x 20kW
PV Panels	LG - Neon 330 – capacity: 330W - Quantity: 302 Approx.
Battery storage	Tesla Powerpack or other similar systems
PV mounting frame and system balance	Quantity: depending on the requirements and final design

5.7 Transport sustainability measures

The use of transport (both private and commercial) is a major contributor to environmental pollution and the excessive consumption of natural resources. The following sustainable transport principles are recommended.

- Improve amenity for active transport users (pedestrians and cyclists), with attention paid to the needs of specific user groups likely to have a greater reliance on active transport such as students and staff.
- Promote nearby cyclist facilities to enhance the uptake of cyclists to the site.
- Integrate transport initiatives into community engagement and communication strategies.

Given the site location of the development, the occupants will be able to take advantage of local public transport networks and available facilities around the site such as retail shops.

The following measures are some of the initiatives recommended to reduce dependence on motorised vehicles, encouraging walking, cycling and the use of mass public transport.

- **Cyclist facilities:** provision of bicycle racks; where possible adequately sized and fully equipped secure cyclist facilities with change room and showers are to be provided to promote the use of cycling to work.
- **Public Transport:** The building is close to public transport with a number of bus routes served; building occupants are encouraged to use mass transport to travel to work.
- **Trip Reduction:** The development is located adjacent to a number of local amenities, reducing the need for trips;
- **Fuel efficient vehicles:** encouraging the use of more fuel-efficient vehicles by providing adequate parking spaces at prime parking spot solely dedicated for use by small cars, car-pool participants or other alternative fuel vehicles.

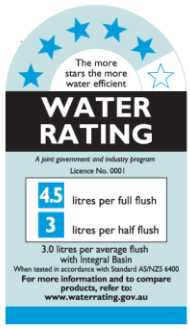
5.8 Water Conservation and Management Initiatives

The water conservation category aims to reduce the overall water potable consumption and provide effective mechanisms for recycling of water uses on site.

The approach to water efficiency for the development will focus on reducing water demand through conservation measures and water reuse systems. Water conservation strategies proposed for this project include:

- Reducing the potable water consumed within the development through demand management.
- Substituting mains water required to meet this demand by utilising alternative sources such as rainwater.

5.8.1 Demand Management



Strategies to minimise consumption include water-efficient fittings and fixtures, water-efficient appliances and low-water use air-conditioning and irrigation systems. In order to reduce the overall water consumption for this development, the following initiatives will be considered.

All water fixtures to be installed to the building are to be water efficient and where possible exceed the BASIX requirements. The following criteria are provided as a guide and subject to further design development.

Water Fixtures	Hand wash basins – 6 Star WELS;
	Kitchen taps (where provided) – 6 Star WELS;
	Showerheads (where provided) – 3 Star WELS or higher;
	Toilets – 4 Star WELS or higher;
Appliances	Dishwashers (where provided) – 4 Star WELS or higher
Air Conditioning	Minimise use of water-cooled systems
Landscape Irrigation (where applicable)	Native and water efficient species
	Sub-surface irrigation
	Rainwater usage for landscape (2 x 3000 L tanks)

5.8.2 Landscape Selection

The use of native, drought-resistant planting will be considered to reduce water consumption used in irrigation. Sub-soil irrigation systems should be considered where non-native species are selected.

5.8.3 Rainwater collection and recycling

In order to reduce the impacts of stormwater runoff from the site, the following stormwater management strategies will be considered:

- Rainwater capture from rooftops for reuse in buildings reducing stormwater runoff as well as mains potable water use.
- The use of permeable surfaces to be considered where suitable, allowing stormwater to seep directly into the earth and reducing stormwater flows off-site.

Collecting rainwater from roof runoff is a common way to recycle water. In addition to saving potable water, it allows preparation for times of low rainfall, so landscapes will be maintained throughout the year. It also reduces loads on storm water systems because roof runoff is not flushed into the drains. Rainwater will be collected from roof runoff and piped to storage tanks and will be used on site.

Ultra-violet (UV) treatment is the disinfection process of passing water by a special light source. Immersed in the water in a protective transparent sleeve, the special light source emits UV waves that can inactivate harmful microorganisms. This method of treatment is growing in popularity because it does not require the addition of chemicals.

Rainwater harvesting will be achieved through two (2) off 3,000 L rainwater tanks on the Cent Avenue Site. Harvested water will be used for landscape irrigation.

This strategy will assist to significantly reduce the potable water consumption for the facility.

5.8.4 Water consumption monitoring and reporting

Where practical, it is recommended that all major water uses within the building to be provided with water meters. This includes central services, rainwater tanks, irrigation systems, potable water, non-potable water sources.

Water monitoring will assist to identify abnormal usage patterns usually associated with leaks, helping to reduce the considerable water lost in this way. In addition, it would also allow to measure and verify the impact of any water efficiency measures implemented in the facilities.

5.10 Materials

This category aims to reduce the consumption of natural resources and encourage the reuse of materials. The various environmental and human health impacts arising from building materials are reduced when special attention is given to the selection of ecologically preferable materials.

To minimise the environmental impact of the development, preference will be given to environmentally responsible materials during the selection process, according to the following principles:

- Avoidance of ecologically sensitive products (such as scarce minerals and old-growth forest)
- Selection of materials with a low embodied energy and high recycled content;
- Low toxicity material selection;
- Low impact on the indoor environment;
- Durability, flexibility and recyclability;
- Emissions in manufacture and composition, including greenhouse gases and ozone depleting substances;
- Waste reduction
- Provisions for appropriate recycling storage space that facilitates recycling

The targeted initiatives will reduce embodied energy and environmental impacts caused by the whole life cycle of building materials.

5.10.1 Reuse and Conservation of materials

Where possible reuse the building material to conserve embodied energy and water. By conserving the building fabric or structure the waste volumes are significantly reduced for the development.

5.10.2 New Materials

Material specifications for the project will consider elements of sustainability that relate to the following factors of durability, embodied energies, renewable sources content, ease of manufacturing, ability to be recycled / reused / reconditioned, maintenance, local availability, VOC content, emission production, affordability and toxicity.

Where feasible the materials specified for this project are to consider the above environmental measures through a comparison between different product types and manufacturers where possible. The design team is to adopt this approach in assessing suppliers and products for the development.

Interiors finishes will consider the concentration of Volatile Organic Compounds with products for adhesives, paints, carpets and floor sealants. The design team will work with suppliers and contractors to identify opportunities to reduce the level of VOC's within products and finishes.

5.10.3 Materials with Ozone Depletion Potential

Selection of insulation will be targeted to minimise Ozone Depletion Potential (ODP).

5.10.4 Operational Waste Minimisation

To encourage and facilitate effective waste management once the facility is in operation, sufficient spatial provision will be made to allow for the effective separation of waste from recycling. Dedicated waste recycling rooms allow space for the separation and storage of recyclable waste during the building's operation, allowing for the following waste streams to be separated:

- Glass;

- Cardboard;
- Paper;
- Organics.
- Plastics,
- Metals.

Waste management solutions are varied and dependant on the extent of commitment of the end user. Recycling, reuse and composting are examples of waste management options.

The following waste streams have currently been identified:

- Office waste
- Paper and cardboard
- Plastics
- PET bottles and containers, cans and glass
- Compostable material
- Grease and fats
- Cigarette butts
- Light tubes
- Toxic or hazardous materials
- Foam
- Cleaning products and other substances going down drains
- Composting of organic waste from the restaurant, for re-use within the Greenhouse.

5.10.5 Timber

Where possible, timber will be supplied from sustainable sources including Forestry Stewardship Council (FCS) certified plantation timbers and recycled products. No timber (either solid or veneer form) will be sourced from rainforests or old-growth forests.

5.10.6 PVC Minimisation

PVC is being phased out in the European Union, as there is widespread evidence to its harmful environmental impact, particularly during disposal or fire. PVC is used in almost all electrical and data cabling and for drainage pipework. Alternatives to PVC products will be used where feasible:

- HDPE and polypropylene pipe work instead of PVC pipe for water supply and drainage systems;
- Linoleum and other natural products instead of vinyl floor coverings;
- Composite materials for electrical cabling.

5.10.7 Land Use and Ecology

This initiative refers to improvements through Reuse of Land or Change of Ecological Value. The site has been previously built on and is not a Greenfield. The new development will aim to enhance permeable area and vegetation improving the ecological value of the site.

5.10.8 Emissions

In addition to the reduction in greenhouse emissions as a result of lower on-site energy usage, emissions to land, air and water will be minimised. The following measures are some of the initiatives targeted within the emissions category:

- Where available, thermal insulation products should be selected which have a low Ozone Depletion Potential in their manufacture and composition, reducing the impacts of insulation on the atmosphere;
- Where feasible, refrigerants will have an Ozone Depletion Potential of zero; and integrated refrigerant leak detection will ensure early identification of leaks;
- Estimated wastewater discharge to sewer will be significantly reduced relative to a standard building through the implementation of water efficiency measures;
- Watercourse Pollution: Design that minimises stormwater run-off to and the pollution of the natural watercourses.
- Light Pollution: No light beam will be directed upwards or outside the building. External lighting will be in accordance with AS 4282-1997. This will assist to minimise interference and disturbance to neighbouring properties and wildlife.

6. Disclaimer

This report is prepared using the information described above and inputs from other consultants. Whilst BSE has endeavoured to ensure the information used is accurate, no responsibility or liability to any third party is accepted for any loss or damage arising out of the use of this report by any third party. Any third party wishing to act upon any material contained in this report should first contact BSE for detailed advice which will take into account that party's particular requirements.

Computer performance assessment provides an estimate of building performance. This estimate is based on a necessarily simplified and idealised version of the building that does not and cannot fully represent all the intricacies of the building once built. As a result, simulation results only represent an interpretation of the potential performance of the building. No guarantee or warrantee of building performance in practice can be based on simulation results alone. BSE and its employees and agents shall not be liable for any loss arising because of, any person using or relying on the Report and whether caused by reason or error, negligent act or omission in the report. The draft BASIX assessment has been prepared indicatively and using the limited architectural and building services design with the view to conduct a detailed assessment once the design is further developed.

Performance of the completed building may be significantly affected by the quality of construction; the quality of commissioning, ongoing management of the building, and the way the building is operated, monitored and maintained.

APPENDIX A – Climate Change Design Response

Climate Change Design Response

Upgrades to Chatswood Public School and Chatswood High School

Prepared For:

Schools Infrastructure NSW

Prepared By:

Building Services Engineers

Document Issue	Version / 4
Document Date	16 Mar 2020

Building Services Engineers
Level 2, 168 Edward Street
Brisbane QLD 4000
07 3210 0044
mail@bse.com.au

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BUILDING SERVICES ENGINEERS
TRUE PARTNERS

Status

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Issued to:	Schools Infrastructure NSW		

Contents

1. Executive Summary

The proposed development includes upgrades to Chatswood Public School and Chatswood High School located at Centennial Avenue and Pacific Highway, Chatswood which consists of upgrades to existing buildings and the demolition and construction of new school buildings.

BSE has been engaged to provide a statement on how the climate change projections are likely to impact the Chatswood Education Precinct development and to nominate potential design considerations to minimise these impacts.

Climate change is likely to pose risks to the facility and infrastructure through changes in temperature, rainfall and the increased occurrence or intensity of extreme weather events. Understanding climate change projections provides an opportunity to assess such risks and in order to mitigate economic, environmental and social impacts.

A range of climate change-related risks have been identified. Adaptation actions were proposed for these risks rated as “Critical” or “High”. These are summarised below (also see Section 2.2.3).

Risk Statement	Initial Risk	Residual Risk	Action requiring implementation	Design / Operations	Proposed Responsibility
Accelerated structural material fatigue and degradation of façades, leading to increased maintenance and repair costs	High	Low	Review material datasheets for in-service temperature range and allow for a nominal tolerance on peak temperatures based on today's values. Select materials which have a higher temperature tolerance if required.	Design	Façades Engineer, Structural Engineer
Water restrictions during prolonged droughts leading to inability to deliver core services.	High	Low	Develop a Drought Management Plan. Water restrictions would likely be signposted well in advance. Consider alternative water supply.	Operations	Facilities Manager
Parapet roof retains water due to blockage in symphonic drainage system leading to structural failure.	High	Medium	Check the design includes overflow outlets in parapet. Add to design if required.	Design	Hydraulic Engineer
Parapet roof retains water due to insufficient capacity in the symphonic drainage system leading to structural failure.	High	Medium	Check whether capacity of overflow slots and drainage system is sufficient to allow for increased rainfall intensity. Increase either/both if required.	Design	Hydraulic Engineer, Architect
Onsite Water Detention Tank (OSD) cannot deal with increased flows leading to overflow and flooding of basement.	High	Medium	Ensure secondary overflow system provided and check if systems can manage increased flows. Implement further measures if required.	Design	Civil Engineer

Overland flow of water leads to pooling around sub-station and switch room causing electrical failure and power outage.	Critical	Medium	Primary storm water drainage system to be designed to cater for a minimum of a 100- year storm. System to also have full backup of either piped overflow or overland flow designed to a higher storm intensity. Consider other feasible mitigation measures as required.	Design	Hydraulic Engineer, Architect, Electrical Engineer
Mechanical plant on the roof (if any) are damaged by extreme hail event leading to failure of ventilation system.	High	Medium	Consider options for protecting the mechanical plant in design. Implement if required.	Design	Mechanical Engineer

This information should be added to the overall project risk register, with actions implemented as part of the design.

2. Climate Change

2.1. NARCliM Climate Change Projections

The information provided in this report follows the climate change projections based on the NSW and ACT Regional Climate Modelling (NARCliM) project. NARCliM is a multi-agency research partnership between the NSW and ACT governments and the Climate Change Research Centre at the University of NSW. NSW Government funding comes from the Office of Environment and Heritage (OEH), Sydney Catchment Authority, Sydney Water, Hunter Water, NSW Office of Water, Transport for NSW, and the Department of Primary Industries.

Climate change projections are presented for the near future (2030) and far future (2070), compared to the baseline climate (1990–2009). The projections are based on simulations from a suite of twelve climate models run to provide detailed future climate information for NSW and the ACT.

The climate change projections are made for the following 5 parameters:

1. Temperature extremes
2. Hot days
3. Cold nights
4. Rainfall
5. Fire weather

Reference: https://climatechange.environment.nsw.gov.au/

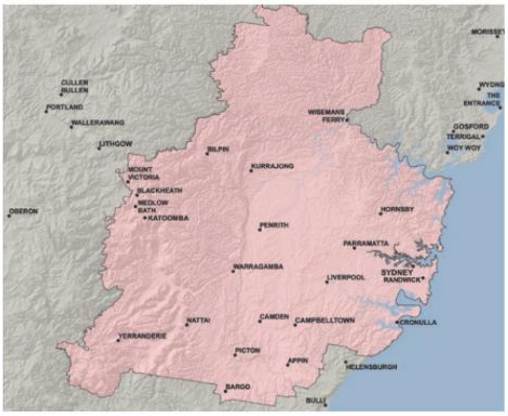
NSW Office of Environment and Heritage (OEH)

2.1.1. Temperature

Chatswood Education Precinct is expected to experience an increase in all temperature variables (average, maximum and minimum) for the near future and the far future

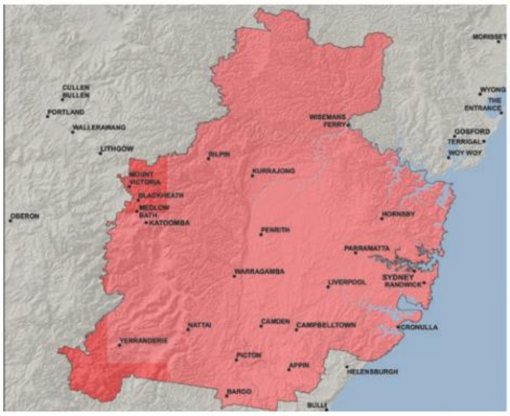
- Maximum temperatures are projected to increase by 0.7°C in the near future and up to 1.9°C in the far future. Spring will experience the greatest change in maximum temperatures, increasing by up to 2.2°C in the far future. Increased maximum temperatures are known to impact human health through heat stress and increasing the number of heatwave events.
- Minimum temperatures are projected to increase by 0.6°C in the near future up to 2°C in the far future. Increased overnight temperatures (minimum temperatures) can have a considerable effect on human health.

Near future change in maximum temperature



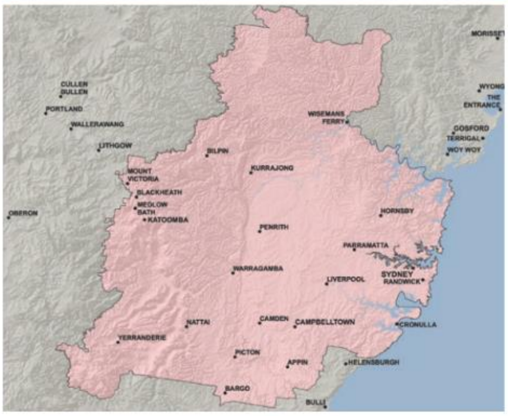
Near future (2020–2039) change in annual average maximum temperature, compared to the baseline period (1990–2009).

Far future change in maximum temperature



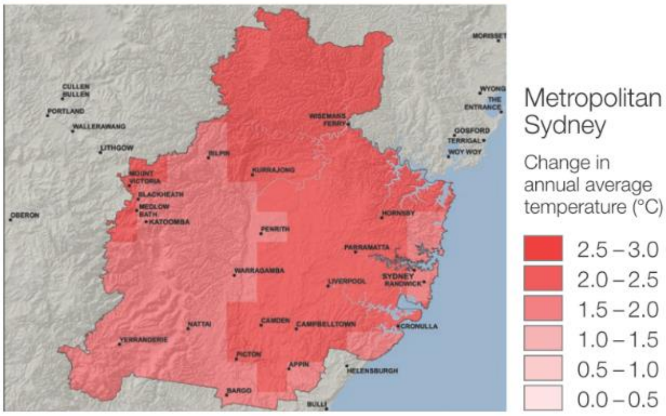
Far future (2060–2079) change in annual average maximum temperature, compared to the baseline period (1990–2009).

Near future change in minimum temperature



Near future (2020–2039) change in annual average minimum temperature, compared to the baseline period (1990–2009).

Far future change in minimum temperature



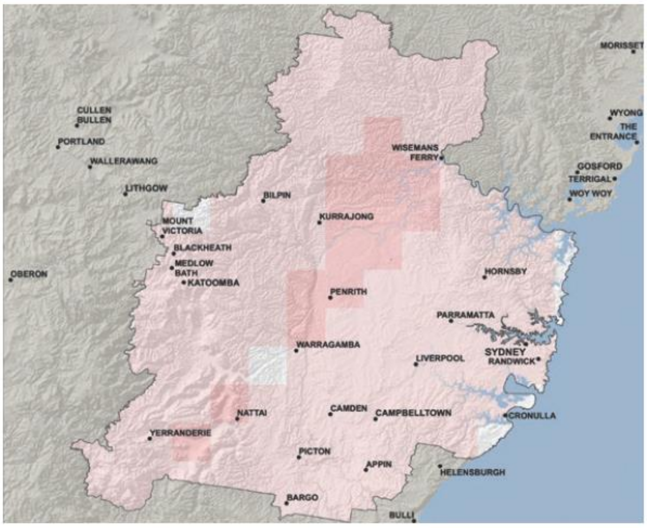
Far future (2060–2079) change in annual average minimum temperature, compared to the baseline period (1990–2009).

2.1.2. Hot days (days per year above 35°C)

Currently Chatswood experiences fewer than 10 days above 35°C each year. Seasonal changes are likely to have considerable impacts on bushfire danger, infrastructure development and native species diversity.

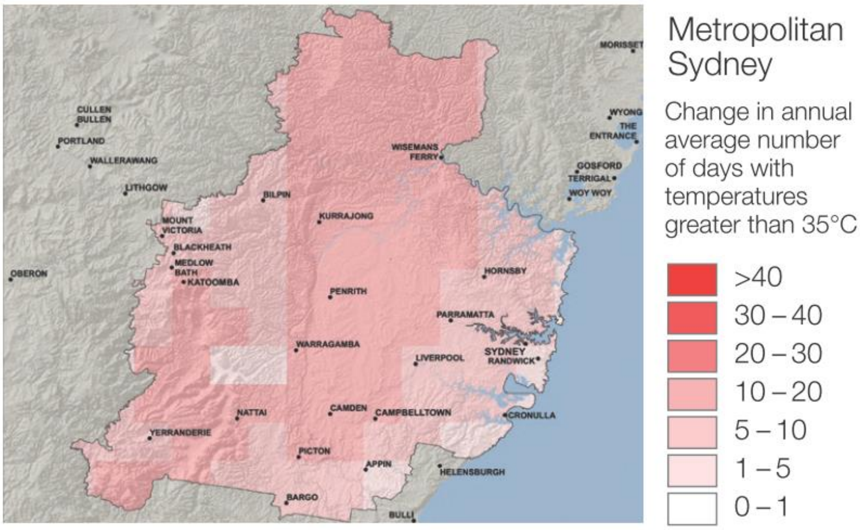
- The facility is expected to experience more hot days in the near future and in the far future.
- These increases in hot days are projected to occur mainly in spring and summer although in the far future hot days are also extending into autumn.

Near future change in days per year above 35°C



Near future (2020–2039) projected changes in the number of days per year with maximum temperatures above 35°C.

Far future change in days per year above 35°C



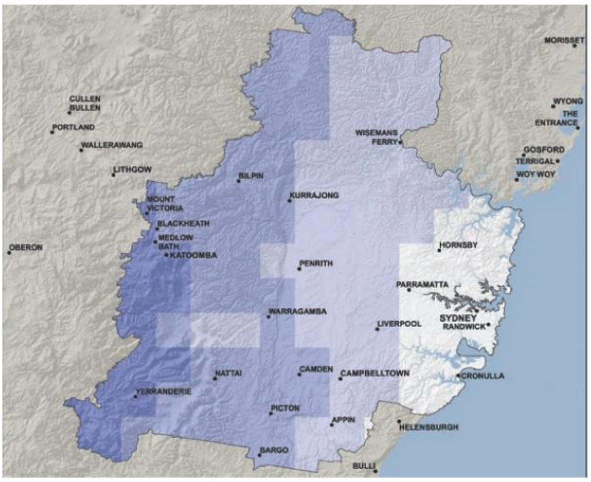
Far future (2060–2079) projected changes in the number of days per year with maximum temperatures above 35°C.

2.1.3. Cold nights (days per year below 2°C)

Most of the emphasis on changes in temperatures from climate change has been on hot days and maximum temperatures, but changes in cold nights are equally important in the maintenance of our natural ecosystems and agricultural/horticultural industries. For example, some common temperate fruit species require sufficiently cold winters to produce flower buds.

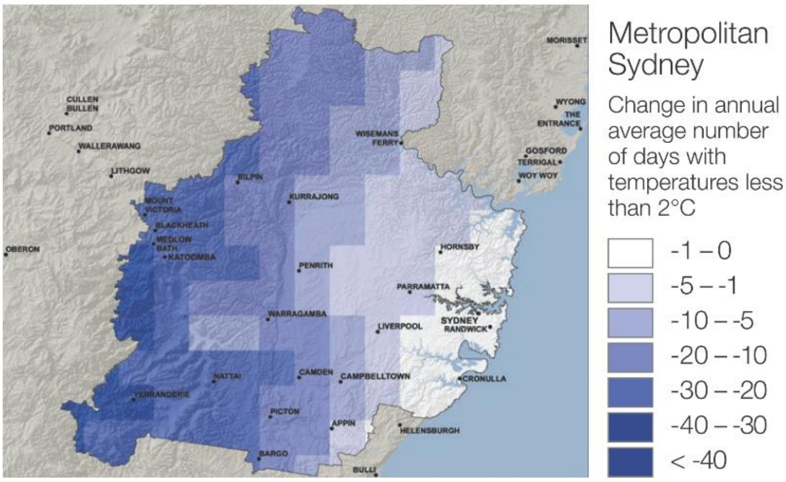
- NARCliM projections suggest that Chatswood will not see a considerable decrease in cold nights (see the white areas in the map).
- The greatest decreases across Metropolitan Sydney are projected to occur in the south-west and in the Blue Mountains, with decreases of up to 20 nights by 2030 and more than 40 fewer cold nights by 2070.

Near future change in number of cold nights (below 2°C) per year



Near future (2020–2039) projected changes in the number of nights per year with minimum temperatures below 2°C, compared to the baseline period (1990–2009).

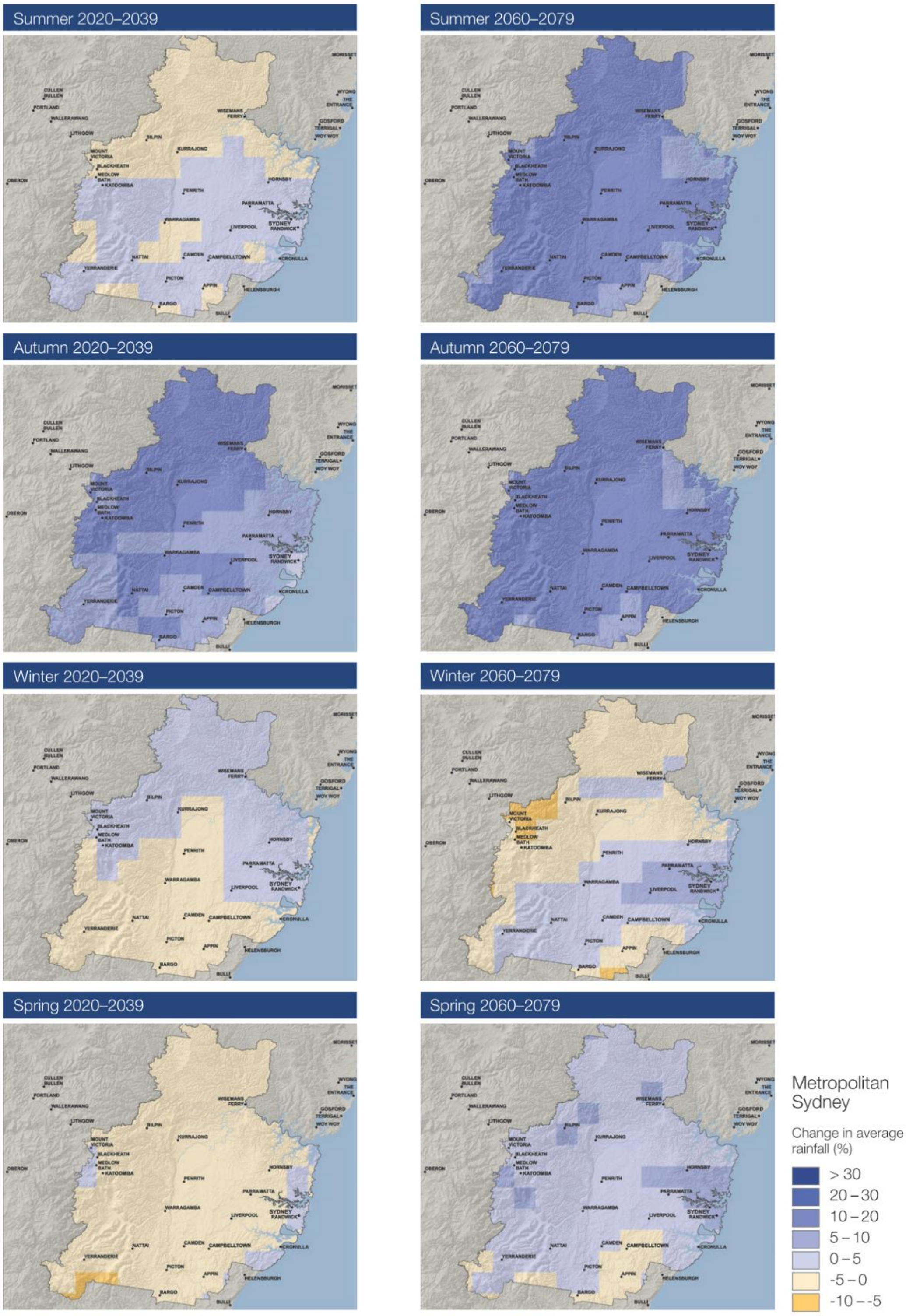
Far future change in number of cold nights (below 2°C) per year



Far future (2060–2079) projected changes in the number of nights per year with minimum temperatures below 2°C, compared to the baseline period (1990–2009).

2.1.4. Rainfall

Changes in rainfall patterns have the potential for widespread impacts. Seasonal shifts can often impact native species' reproductive cycles as well as impacting agricultural productivity, for example crops that are reliant on winter rains for peak growth. The majority of models (8 out of 12) agree that autumn rainfall will increase in the near future and the far future (7 out of 12). Rainfall is projected to increase in autumn.



Near future (2020–2039) projected changes in average rainfall by season.

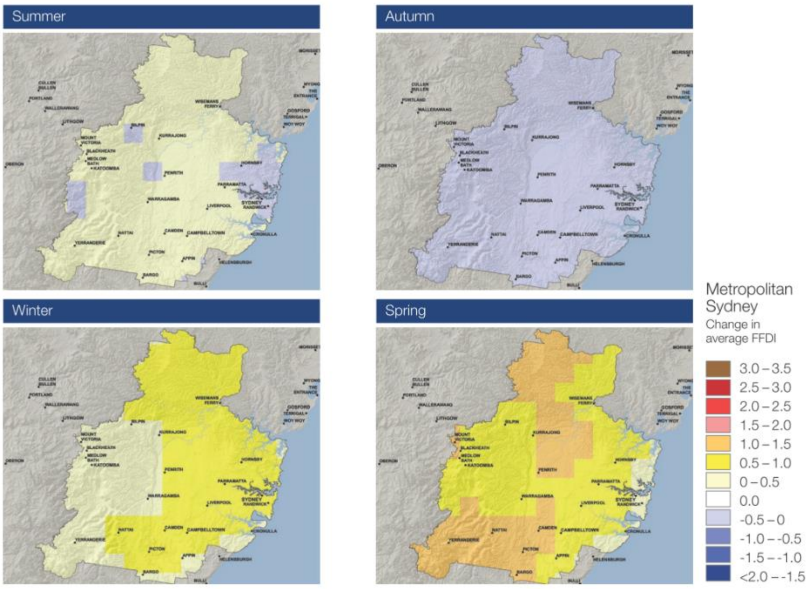
Far future (2060–2079) projected changes in average rainfall by season.

2.1.5. Fire weather

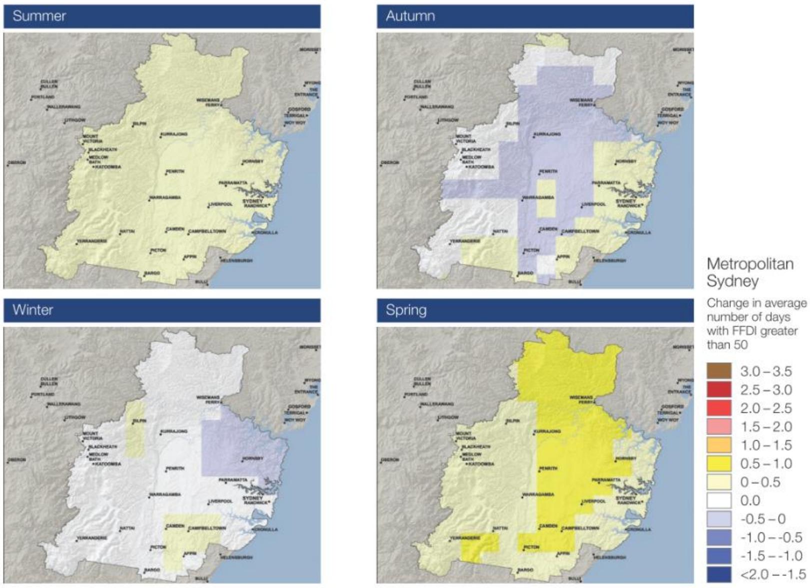
The Bureau of Meteorology issues Fire Weather Warnings when the FFDI (Forest Fire Danger Index) is forecast to be over 50. High FFDI values are also considered by the Rural Fire Service when declaring a Total Fire Ban.

Projected regional climate changes

- Metropolitan Sydney is expected to experience an increase in average and severe fire weather in the near future and the far future (directly and indirectly affecting the facility in Chatswood, e.g. smoke and air pollution).
- The increases are projected mainly in summer and spring in the far future. These changes are projected in prescribed burning periods (spring) and the peak fire risk season (summer).
- The majority of models (7 out of 12) project an increase of severe fire weather in spring in the near future, with a greater confidence in the increase in the far future.



Far future (2060–2079) projected changes in average daily FFDI, compared to the baseline period (1990–2009).



Far future (2060–2079) projected changes in average annual number of days with a FFDI greater than 50, compared to the baseline period (1990–2009).

2.2. Climate Change Adaptation Plan

The climate change adaptation plan involves three key steps to develop risks and mitigation strategies collaboratively with key project stakeholders.

1. Review of the development and context
2. Risk analysis
3. Mitigation Strategies

2.2.1. Risk Assessment Framework

To assess risks systematically, a likelihood scale was used to determine how likely a risk was to occur, followed by consequence assessment. The first stage of the assessment is to define the likelihood of a given risk. The likelihood level can be described as the frequency or probability for a risk to occur.

Risk likelihood matrix:

Likelihood	**Almost Certain** expected in most circumstances
	Likely will probably occur in most circumstances
	Possible might occur at some time
	Unlikely could occur at some time
	Rare may occur, only in exceptional circumstances

Example Consequence Scale and Success Criteria (AGO 2007):

	Public Safety	Local Economy and Growth	Community and Lifestyle	Environment and Sustainability	Financial /Time Program/Budgets
Catastrophic	Large numbers of serious injuries or loss of life	Precinct decline leading to widespread business failure	The area is considered very unattractive, moribund and unable to support its community	Major widespread loss of environmental amenity and progressive irrecoverable environmental damage	Loss or increased cost of 50% or greater of annual budget.
Major	Isolated instances of serious injuries or loss of lives	Precinct stagnation such that businesses are unable to thrive	Severe and widespread decline in services and quality of life within the community	Severe loss of environmental amenity and a danger of continuing environmental damage	Loss or increased cost of 25%-50% of annual budget.
Moderate	Small numbers of injuries	Significant general reduction in precinct economic performance	General applicable decline in services	Isolated but significant instances of environmental damage that might be reversed with intensive efforts	Loss or increased cost of 10%-25% of annual budget

Minor	Serious near misses or minor injuries	Isolated areas in precinct decline	Isolated but noticeable examples of decline in services	Minor instances of environmental damage that could be reversed	Loss or increased cost of 5% to 10% of annual budget
Insignificant	Appearance of a threat but no actual harm	Minor shortfall to forecast growth	There would be minor areas in which the region was unable to maintain its current services	No environmental damage	Loss or increased cost of less than 5% of annual budget

Risk likelihood and consequence were then combined using the risk assessment matrix in Table below, leading to the systematic development of a risk rating used to prioritise risk management strategies.

Example Risk matrix:

Show	**Matrix Score**				
Risk Rating Number + Name	Insignificant	Minor	Moderate	Major	Catastrophic
Almost Certain	Medium	High	High	Critical	Critical
Likely	Medium	Medium	High	Critical	Critical
Possible	Low	Medium	Medium	High	Critical
Unlikely	Low	Low	Medium	Medium	High
Rare	Low	Low	Low	Medium	High

Risk management strategies aim to reduce risk levels by reducing either likelihood or consequence of the risk, or both. The objective is to develop cost-effective options for treating/controlling each identified risk and minimise its impact to the project.

Show	**Matrix Score**				
Risk Rating Number + Name	Insignificant	Minor	Moderate	Major	Catastrophic
Almost Certain	Medium	High	High	Critical	Critical
Likely	Medium	Medium	High	Critical	Critical
Possible	Low	Medium	Medium	High	Critical
Unlikely	Low	Low	Medium	Medium	High
Rare	Low	Low	Low	Medium	High

2.2.2. Risk Assessment outcomes

Climate variable	Risk Statement	Likelihood	Consequence	Level of Risk	Adaptation actions	Residual Likelihood	Residual Consequence	Residual level of Risk
Increase in hot days	Accelerated structural material fatigue and degradation of facades leading to increased maintenance and repair costs	Rare	Catastrophic	High	Select materials which have a higher temperature tolerance if required. Review material datasheets for in-service temperature range and allow for increase in peak temperatures.	Rare	Moderate	Low
Increased rainfall variability	Parapet roof retains water due to blockage in syphonic drainage system leading to structural failure.	Possible	Major	High	Check the design includes overflow outlets in parapet. Add to design if required.	Rare	Major	Medium
Increased rainfall variability	Parapet roof retains water due to insufficient capacity in the syphonic drainage system leading to structural failure.	Possible	Major	High	Overflow systems in place in the form of overflow slots. The capacity of these can be increased if required to allow for increased rainfall intensity.	Rare	Major	Medium

Climate variable	Risk Statement	Likelihood	Consequence	Level of Risk	Adaptation actions	Residual Likelihood	Residual Consequence	Residual level of Risk
Increased rainfall variability	Onsite Water Detention Tank (OSD) cannot deal with increased flows leading to overflow and flooding of basement.	Possible	Major	High	If necessary, overflow system to be provided. Hydraulic engineers to check if systems can manage the increased flows and implement further measures if required.	Rare	Major	Medium
Increased rainfall variability	Overland flow of water leads to pooling around sub-station and switch room, causing electrical failure and power outage.	Possible	Catastrophic	Critical	Primary storm water drainage system to be designed to cater for a minimum of a 100-year storm. System to also have full backup of either piped overflow or overland flow designed to a higher storm intensity. Consider other feasible mitigation measure as required.	Rare	Major	Medium
Increased intensity of storm events	Mechanical plant on the roof (if any) are damaged by extreme hail event leading to failure of ventilation system.	Possible	Major	High	Consider options for protecting the mechanical plant in design. Implement if required.	Rare	Major	Medium

Climate variable	Risk Statement	Likelihood	Consequence	Level of Risk	Adaptation actions	Residual Likelihood	Residual Consequence	Residual level of Risk
Increased intensity of storm events	Severe hail blocking roof drains causing increased water ingress into building envelope and potential structural impacts, leading to increased maintenance costs	Possible	Major	High	Screen outlets with hail guards. Planned overflow slots should allow rain to overflow for all but the most severe hail events.	Rare	Major	Medium
Increased intensity of storm events	Airborne debris causing damage to exterior building elements and increased maintenance costs.	Possible	Major	High	Check wind load thresholds in engineering for façade and glazing. If required, adopt heat treated glazing for greater impact strength.	Rare	Major	Medium
Increased intensity of storm events	Wind driven rain penetrates podium level and retail spaces creating slip hazards for public circulation spaces.	Likely	Moderate	High	Consider in design and highlight risk for building managers. Include wet weather management plan in facilities management contract.	Rare	Moderate	Low
Increased fire weather	Smoke ingress into facility via HVAC system causing increased employee and patient health risks	Almost certain	Major	Critical	Evacuation plan to be developed by FM company, including use of link to the hospital for particularly vulnerable patients. Consider use of non-latching outside air smoke detectors to shut down outside air systems in the event of a bushfire situation. Adjustment to mechanical services design and air filtration as necessary.	Almost certain	Insignificant	Medium

2.2.3. Recommendations

Many of the potential risks to the building are already addressed by existing design features of the building or are being explored as an immediate consequence of this process. All those identified through the workshop and subsequent discussions as requiring additional action are set out in table below, along with responsibility for those actions.

This information should be added to the overall project risk register, with actions implemented and recorded, and subsequently reported in the Green Star documentation.

Summary of adaptation actions required to achieve revised risk rating:

Risk Statement	Initial Risk	Residual Risk	Action requiring implementation	Design / Operations	Proposed Responsibility
Accelerated structural material fatigue and degradation of façades, leading to increased maintenance and repair costs	High	Low	Review material datasheets for in-service temperature range and allow for a nominal tolerance on peak temperatures based on today's values. Select materials which have a higher temperature tolerance if required.	Design	Façades Engineer, Structural Engineer
Water restrictions during prolonged droughts leading to inability to deliver core services.	High	Low	Develop a Drought Management Plan. Water restrictions would likely be signposted well in advance. Consider alternative water supply.	Operations	Facilities Manager
Parapet roof retains water due to blockage in symphonic drainage system leading to structural failure.	High	Medium	Check the design includes overflow outlets in parapet. Add to design if required.	Design	Hydraulic Engineer
Parapet roof retains water due to insufficient capacity in the symphonic drainage system leading to structural failure.	High	Medium	Check whether capacity of overflow slots and drainage system is sufficient to allow for increased rainfall intensity. Increase either/both if required.	Design	Hydraulic Engineer, Architect

Onsite Water Detention Tank (OSD) cannot deal with increased flows leading to overflow and flooding of basement.	High	Medium	Ensure secondary overflow system provided and check if systems can manage increased flows. Implement further measures if required.	Design	Civil Engineer
Overland flow of water leads to pooling around sub-station and switch room, causing electrical failure and power outage.	Critical	Medium	Primary storm water drainage system to be designed to cater for a minimum of a 100- year storm. System to also have full backup of either piped overflow or overland flow designed to a higher storm intensity. Consider other feasible mitigation measures as required.	Design	Hydraulic Engineer, Architect, Electrical Engineer, Civil Engineer
Mechanical plant on the roof (if any) are damaged by extreme hail event leading to failure of ventilation system.	High	Medium	Consider options for protecting the mechanical plant in design. Implement if required.	Design	Mechanical Engineer

Severe hail blocking roof drains causing increased water ingress into building envelope and potential structural impacts, leading to increased maintenance costs	High	Medium	Screen outlets with hail guards.	Design	Hydraulic Engineer
Airborne debris causing damage to exterior building elements and increased maintenance costs - particularly discussed potential increase in wind loadings due to CC.	High	Medium	Check wind load thresholds in engineering for façade and glazing. Adopt heat treated glazing for greater impact strength if required.	Design	Façades Engineer, Structural Engineer
Wind driven rain penetrates podium level and retail spaces creating slip hazards for public circulation spaces.	High	Low	Consider in design and highlight risk for building managers. Include wet weather management plan in facilities management contract.	Design and operations	Architects and Facilities Manager
Smoke ingress into facility via HVAC system causing increased employee and patient health risks	Critical	Medium	Evacuation plan to be developed by FM company, including use of link to the hospital for particularly vulnerable patients. Consider use of non-latching outside air smoke detectors to shut down outside air systems in the event of a bushfire situation. Adjustment to mechanical services design and air filtration as necessary.	Design and operations	Mechanical Engineer, Facilities Manager, Owner

3. Disclaimer

This report is prepared using the information described above and inputs from other consultants. Whilst BSE has endeavoured to ensure the information used is accurate, no responsibility or liability to any third party is accepted for any loss or damage arising out of the use of this report by any third party. Any third party wishing to act upon any material contained in this report should first contact BSE for detailed advice which will take into account that party's particular requirements.

Computer modelling and projections provide an estimate of future performance. This estimate is based on a necessarily simplified and idealised version of the variables that does not and cannot fully represent all the intricacies of the real life. As a result, simulation results only represent an interpretation of the potential performance. No guarantee or warrantee of the performance in practice can be based on simulation results alone. BSE and its employees and agents shall not be liable for any loss arising because of, any person using or relying on the report and whether caused by reason or error, negligent act or omission in the report.

4. References

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APPENDIX B– Green Star Matrix

GREEN STAR SCORECARD & REQUIREMENTS	PROJECT: UPGRADES TO CHATSWOOD PUBLIC SCHOOL & CHATSWOOD HIGH SCHOOL	GREEN STAR TARGET: 4 STAR (MINIMUM SCORES REQUIRED: 45)
Document revision: 1.3 Date: 17.Apr.2019	ADDRESS: CHATSWOOD NSW 2067	SCORES TARGETED: 49 (4 STAR WITH 4 BUFFER POINTS)

Note: details below are provided as a guide only, where required the project team shall refer to the Green Star Design and As-built submission guidelines v1.2 for further details.

CATEGORY / CREDIT	AIM OF THE CREDIT / SELECTION	CODE	CREDIT CRITERIA	POINTS AVAILABLE	POINTS TARGETED	Compliance Requirements Note:	Design Submission Documentation	As Built Submission Documentation
Management				14				
Green Star Accredited Professional	To recognise the appointment and active involvement of a Green Star Accredited Professional in order to ensure that the rating tool is applied effectively and as intended.	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	0	1.0.1 The GSAP must be enrolled in the Green Building Council of Australia's CPD program and have current accreditation from schematic design to practicalcompletion	Submission Template*inclusive GSAP name(s), contact details and dates ofappointment.*As well as a Summary of the involvement of the GSAP in theproject.	Submission Template*inclusive GSAP name(s), contact details and dates ofappointment.*As well as a Summary of the involvement of the GSAP in theproject.
						1.0.2 The GSAP must provide advice and support to ensure that the project team has access to information covering Green Star principles, structure, timing and processincluding: Eligibility, Environmental Categories, Point allocation and scores, Documentation and Compliance Requirements, Technical Clarifications and Credit Interpretation Requests, Certification process, Green Star branding and marketing rules	Letter of appointment from the client or head contractor* confirming the appointment of a GSAP in the project. The letter must include a scope of works as per the Compliance Requirements section of the credit. The contract or letter should confirm that the GSAP is appointed from schematic design until practicalcompletion.	Letter of appointment from the client or head contractor* confirming the appointment of a GSAP in the project. The letter must include a scope of works as per the Compliance Requirements section of the credit. The contract or letter should confirm that the GSAP is appointed from schematic design until practicalcompletion.
						1.0.3 The GSAP must deliver at least one workshop to the project team covering the topics above. It is expected that this workshop will be of most benefit at projectinception.		Sample Meeting minutes demonstrating input from theGSAP
						1.0.3 The GSAP must deliver at least one workshop to the project team covering the topics above. It is expected that this workshop will be of most benefit at projectinception.		Letter from the Client confirming that the GSAP satisfactorily fulfilled his/her engagement responsibilities as per the scope of works and requirements of this credit.
						1.0.5 The GSAP must be nominated as the 'Project Contact' for the purpose of communication with the Green Building Council of Australia. This may be done through the project's registration process or informing the project's CaseManager		N/A
Commissioning and Tuning	To encourage and recognise commissioning, handover and tuning initiatives that ensure all building services operate to their full potential.	2.0	Environmental Performance Targets:In order for the minimum requirement to be met, documented targets for the environmental performance of the project must be set.	-	TO COMPLY	2.0: Development (early in the design phase) of a design intent report or an owner's project requirements (OPR) document.	•Submission Template (1 Submission Template for all sub sections of 2. Commissioining & Tuning and evidence to support claims made in the Submission Template •Design intent report or an owner's project requirements (OPR) document;This document must be prepared by the design team (and ICA project team where applicable) at the design phase stage and outline at least the following items: Description of the basic functions, operations, and maintenance of the nominated building systemsincluding A description of its intended operation and maintenance requirements;and A list of what the main components are (including controls), their operation and the importance of their efficient use.The targets for the project energy and water consumption and energy and water budgets for all nominated buildingsystems.Description of how energy, water, and aspects of indoor environment quality are metered and monitored. This includes a meter diagram that illustrates how energy and water budgets are confirmed in operation	N/A
		2.1	Services and Maintainability Review: 1 point is available where a comprehensive services and maintainability review of the project is performed	1	1	Project team must demonstrate that a comprehensive services and maintainability review has been conducted, led by the head contractor or the owner's representative (or the ICA where applicable), during the design stage and prior to construction.The services and maintainability review is to facilitate input from the design team, the facilities manager and operations staff (if known), and any relevant suppliers and subcontractors (if engaged). The review must address the following aspects for all nominated building systems:Commissionability;Controllability;Maintainability;Operability, including 'Fitness for Purpose';andSafety	.The services and maintainability review and its outcomes must be summarised in a 'Service and Maintainability Report'. This report must be agreed and signed off by the involved parties. Action items resulting from this review shall be incorporated in the design intent report or OPR as outlined in 2.0. Information on the requirements of this review are outlined in the approved standards and guidelines (refer to Guidance section); Indicate within the Service and Maintainability Report where the service and maintainability review is summarised as outlined in 2.2. The relevant sections must be highlighted.	N/A
		2.2	Building Commissioning: 1 point is available where comprehensive pre-commissioning and commissioning activities are performed for all nominated building systems.	1	1	One (1) point is awarded when a project team can demonstrate that the pre-commissioning and commissioning activities have been performed based on the approved standards and guidelines (refer to the Guidance section). The person responsible for the commissioning of the nominated services must have specific and demonstrable knowledge of the types of systems to be commissioned. As an example, a general sub- contractor is unlikely to be able to fill this role. If the Project Team has significant reason to believe that air permeability testing is not appropriate for the project type, please submit a Technical Query to the GBCA.	2.2.1 Commissioning Specification The contractual tender or construction documentation must list the commissioning requirements for each system. It is not sufficient to state that systems must be commissioned to the relevant standard. Instead, the documentation must: •List the design parameters for each system; •List the required commissioning activities; •Define how each system is intended to operate; and •List the acceptable tolerances during commissioning. Contractual documentation must clearly indicate divisions of responsibilities, pre-commissioning procedures, commissioning requirements, witnessing requirements, phased completion requirements (if needed), post occupancy checks, and any training requirements for the operator.	•Extract(s) from the Commissioning Report demonstrating that comprehensive pre- commissioning activities and commissioning activities have been performed as outlined in 2.2. The relevant sections must be highlighted.
							2.2.2Commissioning Plan A commissioning plan shall be developed and include at least the following, the: •Objectives, or basis, of the design; •Scope of the commissioning plan; •Commissioning team list, the individual responsibilities and interface matrix; •General sequence of commissioning; •Proposed commissioning procedures; •Witnessing requirements; •Commissioning program; and •Requirements for subcontractor commissioning manuals. For a project to claim this criterion, the commissioning must have taken place in accordance with the requirements laid out in the contractual documentation and the commissioning plan. The commissioning report must certify that this is the case, and be signed by the designer, the head or main contractor, the commissioning manager (or ICA), and the project manager (or owner's representative).	2.2.2Commissioning Plan A commissioning plan shall be developed and include at least the following, the: •Objectives, or basis, of the design; •Scope of the commissioning plan; •Commissioning team list, the individual responsibilities and interface matrix; •General sequence of commissioning; •Proposed commissioning procedures; •Witnessing requirements; •Commissioning program; and •Requirements for subcontractor commissioning manuals. For a project to claim this criterion, the commissioning must have taken place in accordance with the requirements laid out in the contractual documentation and the commissioning plan. The commissioning report must certify that this is the case, and be signed by the designer, the head or main contractor, the commissioning manager (or ICA), and the project manager (or owner's representative).

Responsible Party (Design Submission Documentation)

Item	Building owner (NSW Dep. of Edu)	Builder	Architect (Architectus)	Structural Consultant (Wood & Grieves	Mechanical Consultant (BSE)	Electrical Consultant (BSE)	Hydraulics/Fire Consultant (Wood&Gri	Mechanical Contractor	BMS / Control Contractor	Electrical Contractor	Hydraulics / Fire Contractor	ESD Consultant (BSE)	Landscape Architect (Oculus)	Ecologist	Acoustic Consultant (BSE)	Civil (Wood & Grieves)	Quantity Surveyor (WT Partnership)
1.0.1		x															
1.0.2	x	x															
1.0.3																	
1.0.3																	
1.0.5																	
2.0	x	x	x		x	x	x				x						
2.1		x	x		x	x	x				x						
2.2.1		x	x		x	x	x				x						
2.2.2		x	x		x	x	x				x						

Responsible Party (As Built Submission Documentation)

Item	Building owner (NSW Dep. of Edu)	Builder	Architect (Architectus)	Structural Consultant (Wood & Grieves	Mechanical Consultant (BSE)	Electrical Consultant (BSE)	Hydraulics/Fire Consultant (Wood&Gri	Mechanical Contractor	BMS / Control Contractor	Electrical Contractor	Hydraulics / Fire Contractor	ESD Consultant (BSE)	Landscape Architect (Oculus)	Ecologist	Acoustic Consultant (BSE)	Civil (Wood & Grieves)	Quantity Surveyor (WT Partnership)
1.0.1		x															
1.0.2	x	x															
1.0.3		x										x					
1.0.3	x	x															
1.0.5																	
2.0																	
2.1																	
2.2.1		x						x	x	x	x						
2.2.2		x	x		x	x	x				x						

GREEN STAR SCORECARD & REQUIREMENTS | **PROJECT: UPGRADES TO CHATSWOOD PUBLIC SCHOOL & CHATSWOOD HIGH SCHOOL** | **GREEN STAR TARGET: 4 STAR (MINIMUM SCORES REQUIRED: 45)**

Document revision: 1.3 **Date: 17.Apr.2019** | **ADDRESS: CHATSWOOD NSW 2067** | **SCORES TARGETED: 49 (4 STAR WITH 4 BUFFER POINTS)**

Note: details below are provided as a guide only, where required the project team shall refer to the Green Star Design and As-built submission guidelines v1.2 for further details.

CATEGORY / CREDIT	AIM OF THE CREDIT / SELECTION	CODE	CREDIT CRITERIA	POINTS AVAILABLE	POINTS TARGETED	Compliance Requirements Note:	Design Submission Documentation	Responsible Party																	As Built Submission Documentation	Responsible Party																
								Building owner (NSW Dep. of Edu)	Builder	Architect (Architectus)	Structural Consultant (Wood & Grieves	Mechanical Consultant (BSE)	Electrical Consultant (BSE)	Hydraulics/Fire Consultant (Wood&Gri	Mechanical Contractor	BMS / Control Contractor	Electrical Contractor	Hydraulics / Fire Contractor	ESD Consultant (BSE)	Landscape Architect (Oculus)	Ecologist	Acoustic Consultant (BSE)	Civil (Wood & Grieves)	Quantity Surveyor (WT Partnership)		Building owner (NSW Dep. of Edu)	Builder	Architect (Architectus)	Structural Consultant (Wood & Grieves	Mechanical Consultant (BSE)	Electrical Consultant (BSE)	Hydraulics/Fire Consultant (Wood&Gri	Mechanical Contractor	BMS / Control Contractor	Electrical Contractor	Hydraulics / Fire Contractor	ESD Consultant (BSE)	Landscape Architect (Oculus)	Ecologist	Acoustic Consultant (BSE)	Civil (Wood & Grieves)	Quantity Surveyor (WT Partnership)
							N/A																		2.2.3 Air Permeability Performance Testing An air permeability test must be carried out by a suitably qualified practitioner, in accordance with an approved standard, over a minimum area of the building. The test results must not exceed a maximum air permeability rate in order for this credit element to be awarded. This credit element applies to all building types irrespective of the conditioning strategy. Testing is equally relevant to mechanically ventilated (e.g. more efficient HVAC systems) and mixed-mode / naturally-ventilated buildings (e.g. control of airflow). • Whole building air tightness testing report detailing of test methodology, air flow rates and statement of the building air permeability achieved. Signed confirmation from the testing practitioner and main contractor that the results have been sighted.								x									
		2.3	Building Systems Tuning: 1 point is available where a tuning process is in place that addresses all nominated building systems.	1	1	One (1) point is awarded where, following practical completion and prior to occupation, the owner/client has formally committed to a tuning process for all nominated building systems. At a minimum, the commitment must include quarterly adjustments and measurement for the first 12 months after occupation and a review of building system manufacturer warranties. The scope of the tuning works will determine the relevant tuning period. The building tuning process will require the analysis of data from the monitoring systems and assessment of feedback from occupants on building conditions. During the tuning period, the owner/client must commit to take steps to adjust nominated building systems to account for all identified deficiencies.	•Building Tuning Commitment or contract demonstrating that there is a requirement for a building tuning process as outlined in the 2.3. The relevant sections must be highlighted.								x	x	x	x							The commitment from the building owner must confirm that there is a requirement for a building tuning process and responsibilities are assigned to have all nominated building systems tuned after practical completion. This commitment can be included in the Commissioning Plan or provided as a separate document from the building owner. The commitment must include at least the following: •Operating and Maintenance Manuals have been developed in accordance with approved standards and guidelines (refer to Guidance); •A building tuning manual, or a building tuning plan, has been developed in accordance with the approved standards and guidelines; •A building tuning team has been created including the facilities manager, the owner's representative and the ICA (if applicable). The head contractor and the services design professionals are available to address specific tuning issues where required; and •The owner has engaged parties to tune the nominated systems. This engagement includes requirements for: Verification that nominated systems are performing to their design potential at full and part load conditions; Reviews of environmental performance against the environmental targets; Collection of user feedback to match the system performance with the occupant's needs; Adjustment of all the systems to account for all deficiencies discovered; and Management, communication, and assignment of responsibilities for the tuning process within the team.								x	x	x	x						
		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	This point can only be awarded if at least one of the credit requirements for 2.1, 2.2 or 2.3 has been achieved. One (1) point is awarded where an Independent Commissioning Agent (ICA) has been appointed to advise, monitor, and verify the commissioning and tuning of the nominated building systems throughout the design, tender, construction, commissioning and tuning phases. When this point is claimed, the specified commissioning requirements must be overseen by a qualified independent commissioning professional (separate from the design team) who is engaged directly by the client/building owner and reports directly to the owner (or the owner's representative). An Independent Commissioning Agent (ICA) fulfils the roles of this criterion. A facilities manager employed by the client qualified in the commissioning of these systems also fulfils the roles of this criterion.	•CV of the Independent Commissioning Agent detailing the qualifications and experience relevant to the project.		x																N/A		x															
Adaptation and Resilience	To encourage and recognise projects that are resilient to the impacts of a changing climate and natural disasters.	3	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 address the risk assessment component of the plan.	2		A suitably qualified professional is required to develop a project-specific Climate Adaptation Plan (3.0.1 to 3.0.5). For the purposes of this credit, a suitably qualified professional is defined as someone with a formal tertiary Environmental Science, Environmental Engineering, Planning or similar qualification; or may alternatively include persons with previous experience developing Climate Adaptation Plans, familiarity with the recognised Standards and demonstrated ability to assess climate change scenarios.	Project teams must submit the following documentation: •Submission Template for Section 3.0.1 - 3.0.5 •Evidence to support claims made in the Submission Template •CV of the professional that developed the Climate Adaptation Plan.		x																Project teams must submit the following documentation: •Submission Template for Section 3.0.1 - 3.0.5 •Evidence to support claims made in the Submission Template		x															
						3.0.1Climate Adaptation Plan The Climate Adaptation Plan must contain as a minimum the following information: •Summary of the project's characteristics (site, location, climatic characteristics); •Assessment of climate change scenarios and impacts on the project using at least two time scales (e.g. 2030, 2040, 2050 or 2070), relevant to the projects anticipated lifespan. This must include a summary of potential direct and indirect climate change impacts (environmental, social and economic) on the project; •Identification of the potential risks (likelihood and consequence) for the project and the potential risks to people. This risk assessment is to be based on a recognised standard (see 3.0.4); •A list of actions and responsibilities for all 'high' and 'extreme' risks identified; and •Details of stakeholder consultation that was undertaken during plan preparation and how the issues raised have been incorporated.																																				
					0	3.0.2Developing Climate Change Scenarios Prior to undertaking the 'Initial Assessment', the Australian Greenhouse Office (AGO) Guide calls for climate change scenarios to be developed and reviewed (Section 4.2). The scenarios used by the project team must be sourced from the Intergovernmental Panel on Climate Change (IPCC) endorsed Global Circulation Models (GCMs) and may include: •CSIRO projections; •State or Federal climate projections; or •Projections determined by a more detailed climate model. The project must justify the selection of the climate scenario and emissions scenario used.																																				

GREEN STAR SCORECARD & REQUIREMENTS	PROJECT: UPGRADES TO CHATSWOOD PUBLIC SCHOOL & CHATSWOOD HIGH SCHOOL	GREEN STAR TARGET: 4 STAR (MINIMUM SCORES REQUIRED: 45)
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CATEGORY / CREDIT	AIM OF THE CREDIT / SELECTION	CODE	CREDIT CRITERIA	POINTS AVAILABLE	POINTS TARGETED	Compliance Requirements Note:	Design Submission Documentation	Responsible Party: Building owner (NSW Dep. of Edu)	Builder	Architect (Architectus)	Structural Consultant (Wood & Grieves)	Mechanical Consultant (BSE)	Electrical Consultant (BSE)	Hydraulics/Fire Consultant (Wood&Gri	Mechanical Contractor	BMS / Control Contractor	Electrical Contractor	Hydraulics / Fire Contractor	ESD Consultant (BSE)	Landscape Architect (Oculus)	Ecologist	Acoustic Consultant (BSE)	Civil (Wood & Grieves)	Quantity Surveyor (WT Partnership)	As Built Submission Documentation	Responsible Party: Building owner (NSW Dep. of Edu)	Builder	Architect (Architectus)	Structural Consultant (Wood & Grieves)	Mechanical Consultant (BSE)	Electrical Consultant (BSE)	Hydraulics/Fire Consultant (Wood&Gri	Mechanical Contractor	BMS / Control Contractor	Electrical Contractor	Hydraulics / Fire Contractor	ESD Consultant (BSE)	Landscape Architect (Oculus)	Ecologist	Acoustic Consultant (BSE)	Civil (Wood & Grieves)	Quantity Surveyor (WT Partnership)
						3.0.3 Recognised Standards For the purposes of this credit, the recognised standards are listed below: •AS 5334:2013 Climate Change Adaptation for Settlements and Infrastructure; or The following two standards when combined: •ISO 31000-2009 – Risk Management – Principles and Guidance; and •The AGO's Climate Change Risks and Impacts: A Guide for Government and Business. Should project teams wish to demonstrate compliance using an equivalent alternate standard or framework, a Technical Query may be submitted to the GBCA to confirm equivalency.	•Climate Adaptation Plan (or relevant extracts) demonstrating compliance with 3.01 to 3.04 •Drawings and specifications demonstrating design responses to the Climate Adaptation Plan.		x	x	x	x	x	x											•Climate Adaptation Plan (or relevant extracts) demonstrating compliance with 3.01 to 3.04 •Drawings and specifications demonstrating design responses to the Climate Adaptation Plan. •Commissioning report or other technical document demonstrating design responses to the Climate Adaptation Plan.		x	x	x	x	x	x										
						3.0.4Risk Assessment The project team is required to undertake the 'Initial Assessment' outlined in Sections 4-6 of the AGO Guide. The ISO 31000 Standard must be used for further guidance in undertaking the risk analysis process prescribed in Sections 5.1-5.6 of the AGO Guide. The consequence/success criteria in the AGO Guide have been refined to be more applicable at the development scale and are provided in the Guidance section of this credit. Alternatively, organisations may use internal corporate success/criteria tables. Alternatively, the project team may follow the approach within AS 5334:2013 for buildings. The analysis must include a discussion of all climate change elements described and follow the risk analysis and mitigation sections of the standard. The assessment of climate change impacts must address a minimum of two time scales (e.g. 2030, 2040, 2050 or 2070) relevant to the anticipated building lifespan for the primary effects of temperature, precipitation and sea-level rise. The plan must then consider the secondary effects of relative humidity, drought/flood, wind, cyclones and bushfire as a minimum.																																					
						3.0.5Implementation of the Climate Adaptation Plan The project team must ensure that: •At least two risk items identified in the risk assessment component of the Climate Adaptation Plan are addressed by specific design responses; and •All risk items identified as 'high' or 'extreme' are addressed by specific design responses.																																					
Building Information	To recognise the development and provision of building information that facilitates understanding of a building's systems, operation and maintenance requirements, and environmental targets to enable the optimised performance.	4.0	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	The requirements of this credit are project-specific and based on the complexity of the systems designed and installed within the building. The information provided to the building's facilities management team and users should focus on the nominated systems, as defined by the project team. One (1) point is awarded where the project team can demonstrate that: 1.Comprehensive operations and maintenance (O&M) information is available to the facilities management team. Compliance may be demonstrated with one document that includes operations and maintenance information (in accordance with 4.0.1) and the building log book information (in accordance with 4.0.2), or a number of separate documents that contain the same information. 2.Current building user information is available to all relevant stakeholders, in accordance with 4.0.3 and 4.0.4. For additional detail on the content of building user information, please see the Guidance section	Project teams must submit the following documentation: •Submission Template, for items 4.0.1 - 4.0.4 •Evidence to support claims made in the Submission Template (refer below)		x	x		x	x	x											Project teams must submit the following documentation: •Submission Template, for items 4.0.1 - 4.0.4 •Evidence to support claims made in the Submission Template (refer below)		x	x					x	x	x							
						4.0.1Operations and Maintenance Information The project team must confirm that operations and maintenance information is provided for all nominated building systems and that the following criteria are achieved: •Appropriate content for all nominated building systems is readily available; •The appropriate user group has access to the information they require to deliver best practice environmental outcomes; and •Guidance on keeping information up–to-date is provided to the facilities management team in these documents.	•Owner's project requirements document, or an equivalent document, defining the nominated building systems.	x	x																Operations and maintenance information in accordance with 4.0.1.		x	x					x	x	x	x						
						4.0.2Building Log Book The project team must develop a building log book to present to the building owner before practical completion of the project. For more information on the building log book, please see the Guidance section. The building log book must: •Be developed in line with CIBSE TM31: Building Log Book Toolkit; •Cover all nominated building systems; and •Include links or references to all relevant operations and maintenance information.	Building log book in accordance with 4.0.2.				x	x	x	x											Building log book in accordance with 4.0.2.		x						x	x	x	x						
						4.0.3Format of Building User Information Building user information is a source of up-to-date, relevant information for the building user. The information must address the intended use of all nominated systems within the building. The amount and details of building user information must be relevant to the project's audience. For example, if the premises are owner-occupied, the information provided to users must be geared towards general staff that occupy the space. If the space is leased from a landlord, the information provided must also be geared towards the person responsible for the management of the tenanted space; this may be a tenant representative or an office manager. Building user information must be able to be updated and edited by the facilities management team, or other appropriate stakeholder group, to ensure it remains current and relevant to users throughout the life of the building. While there are no specific requirements for the content that must be presented, the Guidance section outlines the typical information that should be presented to different user groups	N/A																		•Building user information and (if required) supporting user documents or other supporting information demonstrating that building user information initiatives have been installed, are accessible to all users, and whose format and content complies with 4.0.3. This information may be presented through a combination of screenshots, printouts, or links to online information accessible to GBCA Certified Assessors.	x	x			x	x	x	x	x	x	x						
						4.0.4Delivery of Building User Information All building user information must be available to the building owner and facilities management team at the time of practical completion. It is acknowledged that ongoing tuning may require updates to building user information and its content may change beyond practical completion. The method of delivery of the information provided may differ based on the target audience. However, due to the live nature of building user information it must be provided in a digital format and made available through any combination of digital signage or interactive information kiosks in high traffic public areas (e.g. building foyer, lift lobby or lift displays), induction or training material, website or intranet, or applications for mobile devices. It must be made clear at the time of submission for certification how this information has been presented to the relevant audience or user group. It is the project team's responsibility to clearly identify the relevant user groups and deliver building user information tailored to their needs.	N/A																		•Confirmation from the fitout owner that the building user information has been provided to the relevant parties and, if appropriate, is installed and is operational, in accordance with 4.0.4.	x	x															

GREEN STAR SCORECARD & REQUIREMENTS | **PROJECT: UPGRADES TO CHATSWOOD PUBLIC SCHOOL & CHATSWOOD HIGH SCHOOL** | **GREEN STAR TARGET: 4 STAR (MINIMUM SCORES REQUIRED: 45)**

Document revision: 1.3 | **Date: 17.Apr.2019** | **ADDRESS: CHATSWOOD NSW 2067** | **SCORES TARGETED: 49 (4 STAR WITH 4 BUFFER POINTS)**

Note: details below are provided as a guide only, where required the project team shall refer to the Green Star Design and As-built submission guidelines v1.2 for further details.

CATEGORY / CREDIT	AIM OF THE CREDIT / SELECTION	CODE	CREDIT CRITERIA	POINTS AVAILABLE	POINTS TARGETED	Compliance Requirements Note:	Design Submission Documentation	Responsible Party: Building owner (NSW Dep. of Edu)	Builder	Architect (Architectus)	Structural Consultant (Wood & Grieves	Mechanical Consultant (BSE)	Electrical Consultant (BSE)	Hydraulics/Fire Consultant (Wood&Gri	Mechanical Contractor	BMS / Control Contractor	Electrical Contractor	Hydraulics / Fire Contractor	ESD Consultant (BSE)	Landscape Architect (Oculus)	Ecologist	Acoustic Consultant (BSE)	Civil (Wood & Grieves)	Quantity Surveyor (WT Partnership)	As Built Submission Documentation	Responsible Party: Building owner (NSW Dep. of Edu)	Builder	Architect (Architectus)	Structural Consultant (Wood & Grieves	Mechanical Consultant (BSE)	Electrical Consultant (BSE)	Hydraulics/Fire Consultant (Wood&Gri	Mechanical Contractor	BMS / Control Contractor	Electrical Contractor	Hydraulics / Fire Contractor	ESD Consultant (BSE)	Landscape Architect (Oculus)	Ecologist	Acoustic Consultant (BSE)	Civil (Wood & Grieves)	Quantity Surveyor (WT Partnership)
Commitment to Performance	To recognise practices that encourage building owners, building occupants and facilities management teams to set targets and monitor environmental performance in a collaborative way.	5.1	Environmental Building Performance: 1 point is available where there is a commitment to set targets and measure results for the environmental performance of the building.	1	0	One (1) point is awarded where at least 80% of the project's gross floor area (GFA), excluding carparking areas, is covered by a commitment to set, measure and report on its environmental performance. A smaller proportion of compliant space may be rewarded partial points on a sliding- scale to one decimal place, e.g. if 40% of the project's GFA is covered 0.5 points are awarded. The methods for demonstrating commitment are defined under 5.1.1 'Building Performance Commitment Options'. The application of environmental building performance targets for different building occupancy and ownership models are defined under 5.1.2 'Application of Performance Targets'. The reporting of performance to stakeholders is defined under 4.1.3 'Performance Reporting'. 5.1.1Building Performance Commitment Options Compliance shall be demonstrated by providing a commitment to either: A.Set, measure and report on building performance metrics, in accordance with 5.1.1A; or B.Commit to achieving a certified operational performance rating for the building, in accordance with 5.1.1B. 5.1.1A Building Performance Metrics For this option, building environmental performance targets must be set, measured, and reported for at least two of the following environmental performance metrics: •Greenhouse gas emissions; •Potable water usage; •Operational waste; and •Indoor environment quality. Greenhouse Gas Emissions or Energy Targets A commitment to greenhouse gas performance must state (as a minimum): •Energy or greenhouse gas performance targets stated in kWh/m2 or kg/CO2/m2 (or other appropriate unit); and •Energy or greenhouse gas performance measurement procedures, including at least quarterly reporting. Potable Water Targets A commitment to potable water performance must state (as a minimum): •Potable water performance targets stated in kL/m2 or kL/person; and •Potable water performance measurement procedures, including at least quarterly reporting. Operational Waste Targets A commitment to operational waste performance must state (as a minimum): •Material generation minimisation targets, stated in mass (kg or g) per m2 or per person; •Landfill diversion minimisation targets, stated as a percentage of total materials generated; and •Performance measurement procedures, including at least quarterly reporting. Indoor Environment Quality Targets A commitment to indoor environment performance must state (as a minimum): •Occupant comfort survey targets, stated as the number of times per year a questionnaire is completed; •HVAC systems maintenance targets, stated in accordance with recognised standards; and •Performance measurement, including at least quarterly reporting, for indoor air quality, thermal comfort or lighting comfort. 5.1.1B Certified Operational Performance Rating For this option, the project team must demonstrate a commitment to achieving a Green Star – Performance rating or at least two NABERS ratings, in accordance with Table 5.1.1B. The results from these ratings are to be used for the measurement and reporting of the environmental performance targets. The Green Star – Performance pathway may only be used by building owners who have registered for a Green Star – Performance rating with the Green Building Council of Australia. In this case, the 'commitment' element of the criterion relates to the commitment by the building owner to participate in achieving the overall building's Green Star – Performance rating. 5.1.2Application of Performance Targets Three separate approaches are available for demonstrating commitment to environmental fitout performance targets. Projects may demonstrate this using one of the models outlined below that is most applicable to their context: •Formal Agreement; •Internal Requirement; and •Strata Management for multi-unit residential. If the project is not adequately described by one of the following options, project teams are invited to submit a technical question (formerly CIR) to the GBCA. Formal Agreement This approach is typically used where the building owner and tenants are separate entities. For this model, the building owner and tenant must jointly agree and commit to targets through formal commitments to each other. This may be achieved through a 'Best Practice Lease' Agreement or similar formal agreement, or a memorandum of understanding. These agreements must address the targets through: •An obligation that the landlord separately monitors the agreed targets of each tenant; •A defined mechanism for setting and monitoring targets; and •A collaborative and non-punitive approach to prevention and rectification, where obligations are not met. This should also detail a flexible, fair and open mechanism to resolve any relevant issues. Where the lease agreements do not include these targets, a separate formal agreement between the tenant and the landlord may be used instead. Internal Requirement This approach is typically used where the building owner and tenant are the same entity. For this model, building owners must commit to environmental performance targets through an internal requirement (policy, guideline, or environmental management plan) that targets are set and measured. This formal commitment must address: •The environmental targets that have been set; and •Performance measurement procedures. Strata Management for Multi-unit Residential For this model, the strata management must commit to environmental performance targets for common areas and services through an internal requirement (policy, guideline, or environmental management plan) that targets are set and measured. This formal commitment must address: •The environmental targets that have been set; and •Performance measurement procedures.	Project teams must submit the following documentation: •Submission Template, for 5.1 - 5.2 •Evidence to support claims made in the Submission Template •Area Schedule listing the areas of each of the relevant formal commitments entered into. •Formal Agreements that describe the stakeholders, targets and duration of agreements or copies of other formal commitment devices. •Green Star – Performance registration email for the building •NABERS rating commitment documentation where applicable.	x	x	x															Project teams must submit the following documentation: •Submission Template, for 5.1 - 5.2 •Evidence to support claims made in the Submission Template •Green Star – Performance credit documentation where applicable.	x	x															

GREEN STAR SCORECARD & REQUIREMENTS	PROJECT: UPGRADES TO CHATSWOOD PUBLIC SCHOOL & CHATSWOOD HIGH SCHOOL	GREEN STAR TARGET: 4 STAR (MINIMUM SCORES REQUIRED: 45)
Document revision: 1.3 Date: 17.Apr.2019	ADDRESS: CHATSWOOD NSW 2067	SCORES TARGETED: 49 (4 STAR WITH 4 BUFFER POINTS)

Note: details below are provided as a guide only, where required the project team shall refer to the Green Star Design and As-built submission guidelines v1.2 for further details.

CATEGORY / CREDIT	AIM OF THE CREDIT / SELECTION	CODE	CREDIT CRITERIA	POINTS AVAILABLE	POINTS TARGETED	Compliance Requirements Note:	Design Submission Documentation	Responsible Party: Building owner (NSW Dep. of Edu)	Builder	Architect (Architectus)	Structural Consultant (Wood & Grieves)	Mechanical Consultant (BSE)	Electrical Consultant (BSE)	Hydraulics/Fire Consultant (Wood&Gri	Mechanical Contractor	BMS / Control Contractor	Electrical Contractor	Hydraulics / Fire Contractor	ESD Consultant (BSE)	Landscape Architect (Oculus)	Ecologist	Acoustic Consultant (BSE)	Civil (Wood & Grieves)	Quantity Surveyor (WT Partnership)	As Built Submission Documentation	Responsible Party: Building owner (NSW Dep. of Edu)	Builder	Architect (Architectus)	Structural Consultant (Wood & Grieves)	Mechanical Consultant (BSE)	Electrical Consultant (BSE)	Hydraulics/Fire Consultant (Wood&Gri	Mechanical Contractor	BMS / Control Contractor	Electrical Contractor	Hydraulics / Fire Contractor	ESD Consultant (BSE)	Landscape Architect (Oculus)	Ecologist	Acoustic Consultant (BSE)	Civil (Wood & Grieves)	Quantity Surveyor (WT Partnership)
						•The environmental targets that have been set; and •Performance measurement procedures. Strata Management for Multi-unit Residential For this model, the strata management must commit to environmental performance targets for common areas and services through an internal requirement (policy, guideline, or environmental management plan) that targets are set and measured. This formal commitment must address: •The environmental targets that have been set; and •Performance measurement procedures. 5.1.3Performance Reporting The results of the performance monitoring shall be reported to relevant stakeholders, at least on a quarterly basis. The project team shall define all relevant stakeholders and the most appropriate reporting methods for each stakeholder group.		x	x	x																x	x															
		5.2	End of Life Waste Performance:1 point is available where there is a commitment to reduce demolition waste at the end of life of an interior fitout or base building component.	1	0	One (1) point is awarded where at least 80% of the project's GFA, excluding carparking areas, has a formal commitment in place to reduce demolition waste at the end of life of an interior fitout or base building component. A smaller proportion of compliant space may be rewarded partial points on a sliding-scale to one decimal place. Compliance must be demonstrated by providing a commitment to either: A.Establish contractual agreements, in accordance with 5.2A; or B.Achieve a certified operational performance rating for the building, addressing waste from refurbishments, in accordance with 5.2B. 5.2A Contractual Agreements For this option, contractual agreements must be in place to demonstrate the credit criteria. Projects may demonstrate this using one of the models outlined below that is most applicable to their context: •Formal Agreement; •Internal Requirement; and •Strata Management for multi-unit residential. If the project is not adequately described by one of these options, project teams are invited to submit a CIR. Formal Agreement This approach is typically used where the building owner and tenants are separate entities. For this model, building owners and tenants must demonstrate a commitment to best practice 'make good' clauses in the lease. The 'make good' clause must follow industry recognised standards or guidelines (such as Greening Make Good, RICS Oceania, and Better Buildings Partnership). This joint commitment to reducing construction waste at the end-of-life of a fitout or base building component must outline: •A mutually agreed methodology for building owner and tenants to follow at the end-of-life of their fit-out or base building component, including clear metrics; and •Performance measurement procedures for building owner and building tenants, including clear reporting procedures. Where the lease agreements do not have best practice 'make good' clauses in place, a separate legal agreement or memorandum of understanding that addresses these requirements may be used. Internal Agreement This approach is typically used where the building owner and tenant are the same entity. For this model, the building owner must commit to extending the life of the interior fitout or finishes to at least 10 years, barring minor wear and tear or minor repairs. Strata Management for Multi-unit Residential For this model, the strata management must commit to extending the life of the finishes to all common areas to at least 10 years, barring minor wear and tear or minor repairs. Internal Agreement This approach is typically used where the building owner and tenant are the same entity. For this model, the building owner must commit to extending the life of the interior fitout or finishes to at least 10 years, barring minor wear and tear or minor repairs. Strata Management for Multi-unit Residential For this model, the strata management must commit to extending the life of the finishes to all common areas to at least 10 years, barring minor wear and tear or minor repairs. 5.2B Certified Operational Performance Rating For this option, the project must commit to achieving the 'Waste from Refurbishments' credit (23) from the Green Star – Performance rating tool. This credit must be used to report on the measured results of the end-of-life waste commitments set by the parties involved.	As per 5.1																																					
		6.0	Metering: To qualify for this credit, it is a minimum requirement that accessible metering be provided to monitor building energy and water consumption, including all energy and water common uses, major uses and sources. The metering is to be accurate and to inform energy consumption practices and reduce wasted energy.	-	TO COMPLY	It is a minimum requirement of this credit that project teams must provide accessible metering to all energy and water common uses and major uses, and to energy and water sources provided by the project. 6.0.1Metering Distinct Uses or Floors Metering shall be provided to allow for monitoring of the relevant areas or functions of the project. In most cases floor-by-floor metering will suffice if the entire floor has a single use. If a floor has multiple uses, the different uses shall be metered. Therefore, should a floor be composed of office space and a seminar room, both spaces shall be separately sub-metered. If a floor has multiple tenants or owners, each tenancy or property shall also be separately sub-metered. Where an energy load for a single item exceeds 5% of the total energy use for the building, or 100kW, it must be independently metered. Supplementary equipment can also be installed on the same measured circuit as the major use item. However, the total combined energy use of any systems connected to the major use item must not contribute more than 10kVA to the overall energy use. Where a common water use consumes 10% of the project's water use, these must be independently metered. For additional detail, refer to the Guidance section. 6.0.2Water and Energy Meters Utility meters must meet metering guidelines under the weights and measures legislation, as outlined under the current National Measurement Regulations. Project teams must verify if existing meters meet these requirements as well as any other utility meters being installed. Non-utility meters (including sub-meters) must follow the same requirements to those described in the most current Validating Non-Utility Meters for NABERS ratings protocol, issued by the NSW Office of Environment and Heritage. Meters must be located in an area that allows regular monitoring and maintenance by facilities managers and other facilities management personnel.	Project teams must submit the following documentation: •Submission Template •Evidence to support claims made in the Submission Template (refer below) •Drawings showing the location of all energy and water meters in the project and the associated energy and water uses; showing how the system is easily accessible to the residents; and confirming the requirements for utility and non-utility meters.						x	x											Project teams must submit the following documentation: •Submission Template •Evidence to support claims made in the Submission Template (refer below) •Drawings showing the location of all energy and water meters in the project and the associated energy and water uses; showing how the system is easily accessible to the residents; and confirming the requirements for utility and non-utility meters.		x				x	x										

GREEN STAR SCORECARD & REQUIREMENTS | **PROJECT: UPGRADES TO CHATSWOOD PUBLIC SCHOOL & CHATSWOOD HIGH SCHOOL** | **GREEN STAR TARGET: 4 STAR (MINIMUM SCORES REQUIRED: 45)**

Document revision: 1.3 **Date: 17.Apr.2019** | **ADDRESS: CHATSWOOD NSW 2067** | **SCORES TARGETED: 49 (4 STAR WITH 4 BUFFER POINTS)**

Note: details below are provided as a guide only, where required the project team shall refer to the Green Star Design and As-built submission guidelines v1.2 for further details.

CATEGORY / CREDIT	AIM OF THE CREDIT / SELECTION	CODE	CREDIT CRITERIA	POINTS AVAILABLE	POINTS TARGETED	Compliance Requirements Note:	Design Submission Documentation	As Built Submission Documentation
Metering and Monitoring	To recognise the implementation of effective energy and water metering and monitoring systems.					6.0.3 Energy Metering Integrity It is a requirement that all meters and metering systems: •Be commissioned and validated in accordance with the most current 'Validating Non-Utility Meters for NABERS Ratings' protocol. Alternative protocols are acceptable provided they are of similar scope and nature. •Be capable of producing alerts if any inaccuracies in the meter network are found. Inaccuracies are defined as in excess of meter tolerances (e.g. 'Class 1' meters shall not have inaccuracies of more than 1% due to metering accuracy class). The Monitoring system is to be continual (15mins to 1hr interval readings) and meter accuracy reconciled to appropriate standards, including, but not limited to, NABERS Protocol or National Measurement Institute (NMI) standards	N/A	•Extracts from Commissioning Report where relevant, showing the automatic monitoring system is operating and has the ability to provide the information required in the Compliance Requirements and demonstrating that all energy sub-meters be validated in accordance with a recognised standard (e.g. NABERS protocol).
						6.0.4 Small Buildings Exception Where the building's Gross Floor Area (excluding carparking areas) is smaller than 1000 m2, 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. If accessible to the building manager, the utility meter is acceptable.		
		6.1	Monitoring Systems: 1 point is available where a monitoring strategy is addressed through a monitoring system, capable of capturing and processing the data produced by the installed energy and water meters, and accurately and clearly presenting data consumption trends.	1	1	One (1) point is awarded where a monitoring system is provided capable of capturing and processing the data produced by the installed energy and water meters. The monitoring system must accurately and clearly present the metered data and include reports on consumption trends, in accordance with the following requirements. 6.1.1Monitoring Strategy The monitoring strategy must be developed in accordance with a recognised Standard, such as CIBSE TM39 Building Energy Metering. Although this Standard has been created to be used for developing energy metering and monitoring strategies, for the purpose of this credit, the same principles described in the Standard shall be used for developing water metering and monitoring strategies. The monitoring strategy must include a metering schedule. This schedule shall address the estimated loads for energy and water and must list: •The incoming input (electricity, gas, water, etc.); •The end use (lighting, HVAC, fans); •The estimated energy consumption for the end use; •Which meter(s) provide the required information; and •The individual estimated end consumption. The monitoring schedule shall also address the location and the type of meter. The end uses shall be estimated and included in the strategy, though if not known at the initial stage, they can be established from the first full month of readings.	•Copy of Monitoring Strategy document specific to the building and including detail described in the Compliance Requirements section of the credit, including description of check sums for integrity calculations.	•Copy of Monitoring Strategy document specific to the building and including detail described in the Compliance Requirements section of the credit, including description of check sums for integrity calculations.
						6.1.2Automatic Monitoring System The project team must provide automatic monitoring systems that record both consumption and demand of energy or water, and are capable of producing reports on hourly, daily, monthly, and annual energy use for all meters. The installed meters must be capable of producing an output that can be transmitted to a central location (either onsite or offsite). This central location must provide data retrieval and reporting mechanisms. As a minimum, the automatic monitoring system must be capable of: •Collecting data from all meters; •Alerting to missing data due to failures; •Recording energy use and water consumption, and providing a reporting capability at user adjustable intervals; •Raising an alarm when the energy or water use increase beyond certain parameters and automatically and instantly issue an alert the facilities manager. ||The process to assess, correct and validate alerts or faults must be detailed and contained in an accessible location;||R2.06.02 •Providing a breakdown of the information by building system (mechanical, electrical, etc.), or by space (or by tenanted floor); •Including the consumption water or energy, the load versus time (load profile), and the power factor (in the case of energy); and •Producing, as a minimum, a quarterly report that is automatically emailed to the facilities manager responsible for the building. For small buildings, this criterion can be met by providing a simple automated metering system that provides an alert to the building manager or owner. Alternatively, offsite monitoring is also acceptable through a central reporting system.	N/A	•Letter of confirmation from the contractor/metering provider/manager demonstrating that the metering systems are continually and automatically monitored by a system that is able to produce alerts if any inaccuracies are found, and that correction and revalidation to any faulty meters are to be carried out; •Automatic monitoring system data sheet describing the systems features and capabilities. In particular, it must describe the system's ability to analyse metering information at regular intervals, i.e. on a daily, weekly, and monthly basis.
Responsible Building Practices	To reward projects that use best practice formal environmental management procedures during construction.	7.0	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.	-	TO COMPLY	It is a minimum requirement of this credit that a project-specific best practice EMP is developed and implemented, to assist the Principal/Head Contractor and its service providers to manage environmental performance, conditions and impacts arising from demolition, excavation and construction. The EMP must cover environmental impacts arising from construction works, and it must be site-specific. Best practice EMPs The EMP must be compliant with best practice guidelines and must be implemented from the beginning of construction works, including any excavation and demolition. The requirements for EMPs, as outlined within the NSW Environmental Management Systems Guidelines, are considered best practice. The edition of the guidelines current at the time of construction must be used.	Project teams must submit the following documentation: •Submission Template, for Section 7.0 - 7.2 •Evidence to support claims made in the Submission Template •Environmental Management Plan (EMP), clearly demonstrating compliance with the requirements of the NSW Environmental Management System Guidelines.	Project teams must submit the following documentation: •Submission Template, for Section 7.0 - 7.2 •Evidence to support claims made in the Submission Template •Confirmation of subcontractor adherence to the EMP requirements that any subcontractors relevant to the project adhered to the EMP provisions at the time of construction works. This may be through a confirmation from the Principal/Head Contractor, or through a policy document stating the process undertaken to ensure compliance.
		7.1	Formalised 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	One (1) point is awarded where project teams demonstrate that a formalised systematic and methodical approach to planning, implementing and auditing is in place during construction, to ensure compliance with the EMP. The plan must be implemented by a responsible party with a formal environmental management system in place. For the purposes of this credit, this is achieved through a formalised environmental management system implemented by the key party responsible for managing the site. There are two compliance pathways for this criterion. Project teams must demonstrate compliance with the pathway specified for the project's contract value, below: •For projects with a contract value less than $10 million, the environmental management system (EMS) must comply with either NSW Environmental Management Systems Guidelines or a recognised standard. •For all other projects, the formalised Environmental Management System must have been independently certified to a recognised standard, such as AS/NZS ISO 14001, BS 7750 or the European Community's EMAS. The certification party must be members of the International Accreditation Forum. In all cases, an auditor report confirming evidence of effective use of the formalised EMS must be provided to demonstrate compliance. An auditor report for the organisation, rather than the site, will suffice. Where nonconformities with the EMS have been recorded, corrective and preventive actions must also be demonstrated to have been applied, in order for credit compliance to be achieved.	•Contractor Formalised Management System (EMS) External Auditor's report confirming formalised management system was in place and operational at the time of construction works. •Contractor ISO 14001 certificate showing the date of issue prior to the commencement of construction works.	•Contractor Formalised Management System (EMS) External Auditor's report confirming formalised management system was in place and operational at the time of construction works.

Responsible Party (Design Submission Documentation)

Item	Building owner (NSW Dep. of Edu)	Builder	Architect (Architectus)	Structural Consultant (Wood & Grieves)	Mechanical Consultant (BSE)	Electrical Consultant (BSE)	Hydraulics/Fire Consultant (Wood&Gri	Mechanical Contractor	BMS / Control Contractor	Electrical Contractor	Hydraulics / Fire Contractor	ESD Consultant (BSE)	Landscape Architect (Oculus)	Ecologist	Acoustic Consultant (BSE)	Civil (Wood & Grieves)	Quantity Surveyor (WT Partnership)
6.0.3		x				x	x										
6.0.4	As required.																
6.1.1		x			x	x											
6.1.2			X														
7.0		x															
7.1		x															

Responsible Party (As Built Submission Documentation)

Item	Building owner (NSW Dep. of Edu)	Builder	Architect (Architectus)	Structural Consultant (Wood & Grieves	Mechanical Consultant (BSE)	Electrical Consultant (BSE)	Hydraulics/Fire Consultant (Wood&Gri	Mechanical Contractor	BMS / Control Contractor	Electrical Contractor	Hydraulics / Fire Contractor	ESD Consultant (BSE)	Landscape Architect (Oculus)	Ecologist	Acoustic Consultant (BSE)	Civil (Wood & Grieves)	Quantity Surveyor (WT Partnership)
6.0.3		x							x	x	x						
6.0.4	As required.																
6.1.1		x			x	x											
6.1.2		x							x	x	x						
7.0		x															
7.1		x															

GREEN STAR SCORECARD & REQUIREMENTS | **PROJECT: UPGRADES TO CHATSWOOD PUBLIC SCHOOL & CHATSWOOD HIGH SCHOOL** | **GREEN STAR TARGET: 4 STAR (MINIMUM SCORES REQUIRED: 45)**

Document revision: 1.3 **Date: 17.Apr.2019** | **ADDRESS: CHATSWOOD NSW 2067** | **SCORES TARGETED: 49 (4 STAR WITH 4 BUFFER POINTS)**

Note: details below are provided as a guide only, where required the project team shall refer to the Green Star Design and As-built submission guidelines v1.2 for further details.

CATEGORY / CREDIT	AIM OF THE CREDIT / SELECTION	CODE	CREDIT CRITERIA	POINTS AVAILABLE	POINTS TARGETED	Compliance Requirements Note:	Design Submission Documentation
		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	0	One (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 in accordance with 7.2.1; and,. •Enhance site workers' knowledge on sustainable practices through on-site, off-site, or online education programs in accordance with 7.2.2. 7.2.1Health Impacts of Site Activities To comply with this requirement, programs and policies in place must go beyond legal requirements for occupational health and safety (OHS) and extend into wellbeing promotion. The responsible party must implement policies and programs to promote health and wellbeing on-site. The programs must target both physical and mental health outcomes. At least three distinct issues, with one of those specifically addressing mental health impacts, must be addressed. Issues that may be considered include: •healthier eating and active living •reduced harmful alcohol and drug and tobacco-free living •increase social cohesion, community, and cultural participation •understanding depression •preventing violence and injury •suicide prevention •decrease psychological distress The responsible party should carry a needs analysis of site workers and contractors to determine appropriate actions. The policies and programs must be relevant to all construction workers on site for the whole duration of construction. A mix of programs is acceptable throughout the duration of construction. A list of suggested programs or policies which could be implemented on the project can be found in the guidance section.	N/A
						7.2.2Knowledge of Sustainable Practices The responsible party must provide training to site workers on project specific sustainable practices and initiatives. The training must include information on any sustainable building certification(s) sought; explain the value of certification; and the role site workers play in delivering a sustainable certified building. The training must be provided to all contractors and subcontractors that were present for at least three days on site. Training can be provided through one, or a combination of: •On-site training, such as by including the items above as part of site induction practices. •Off-site training, such as by providing sustainability training to site workers via a TAFE or similar program within the last 3 years . •Online training, such as by a third party service that can provide training on sustainability topics and track personnel who have taken the relevant materials within the last three years.	N/A
Operational Waste	Performance Pathway	8A	Performance Pathway - Specialist Plan: 1 point is available where a waste professional prepares and implements an Operational Waste Management Plan (OWMP) for the project in accordance with best practice approaches and this is reflected in the building's design.	1	0	One (1) point is awarded where a qualified waste auditor prepares an Operational Waste Management Plan (OWMP) for the building in accordance with best practice approaches. The requirements or recommendations made in the Operational Waste Management Plan must then be reflected in the design of the building's facilities. For information on what qualifications are required to be deemed a qualified waste auditor, please see the Guidance section. OWMPs can influence the amount of waste recycled and generated by occupants, tenants and visitors. For the purposes of this credit, the OWMP must be developed for implementation at the site and building level, and be applicable to the Green Star project boundary. OWMPs are usually implemented by building owners or operators. The OWMP must be developed by a qualified waste auditor. As a minimum, the OWMP must: •Identify the site boundary, the waste streams relevant to the project, and the individual roles responsible for delivering and reviewing the OWMP; •Set diversion from landfill targets and/or targets for reducing total materials generation (general waste materials and recyclable/reusable materials), as well as monitoring and measurement procedures for waste and recycling streams by weight; •Outline methods for encouraging the separation of waste streams, such as bins, storage areas, or recycling facilities in public areas as required; •Identify storage areas for all waste streams and outline best practice safety and access requirements for their collection; •Identify safe methods for vehicle access and transfer of waste; and •Incorporate a review process to assess the success of the OWMP and make improvements, based on operational experience.	Project teams must submit the following documentation: •Submission Template for 8A •Evidence to support claims made in the Submission Template •Operational Waste Management Plan including all relevant compliance requirements as outlined in the Submission Template. •Evidence of Waste Auditor qualifications - CV or project list outlining previous experience and qualifications. •Site Plan and/or Architectural Plans highlighting all relevant areas as referenced by the WMP.
		8B	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	0	One (1) point is awarded where project teams meet all of the following prescriptive requirements. In combination, these requirements are considered a prescriptive approach for achieving best practice outcomes in operational waste management. The three requirements are: •8B.1 Separation of Waste Streams; •8B.2 Dedicated Waste Storage Area; and •8B.3 Access to Waste Storage Area. 8B.1 Separation of Waste Streams Collection bins or storage containers shall be provided for building occupant use to allow for separation of all applicable waste streams. The following waste streams must be provided with separate bins or containers: •General waste going to landfill; •‖Recycling streams to be collected by the building's waste collection service, including paper and cardboard, glass, and plastic. These streams may be collected in separate bins or in the same bin where commingled recycling is available. Commingled recycling is permissible to the extent that is accepted by the waste collection service. For example, if glass and plastic are collected as commingled recycling, then paper and cardboard are still required to have a separate recycling bin or container; ‖R2.08.01 and •At least one other waste stream. This waste stream should further reduce waste being sent to landfill. This may include collecting any of the following waste types: organics, e-waste, batteries etc. These bins or containers must be clearly marked for each stream, to allow for separation of the applicable waste streams. Bins or containers must be evenly distributed throughout the building.	Project teams must submit the following documentation: •Submission Template •Evidence to support claims made in the Submission Template •Site Plan and/or Architectural Plans highlighting all relevant areas as referenced by the WMP, and demonstrating: o8B.1 Separation of Waste Streams; o8B.2 Dedicated Waste Storage Area; and o8B.3 Access to Waste Storage Area.

Responsible Party (Design Submission)

CODE	Building owner (NSW Dep. of Edu)	Builder	Architect (Architectus)	Structural Consultant (Wood & Grieves)	Mechanical Consultant (BSE)	Electrical Consultant (BSE)	Hydraulics/Fire Consultant (Wood&Gri	Mechanical Contractor	BMS / Control Contractor	Electrical Contractor	Hydraulics / Fire Contractor	ESD Consultant (BSE)	Landscape Architect (Oculus)	Ecologist	Acoustic Consultant (BSE)	Civil (Wood & Grieves)	Quantity Surveyor (WT Partnership)
7.2																	
8A		x	x														
8B		x	x														

CODE	As Built Submission Documentation
7.2	•Extracts of evidence detailing the programs and policies implemented to promote health and wellbeing on site. •Evidence detailing the process to manage training, and track workers trained. Examples of evidence include extracts from the training policy, a report from a third-party provider, or similar. •Extracts of training such as screenshots, presentation, or similar, showing the information provided as part of training.
	N/A
8A	Project teams must submit the following documentation: •Submission Template •Evidence to support claims made in the Submission Template •Site Plan and/or Architectural Plans highlighting all relevant areas as referenced by the WMP
8B	Project teams must submit the following documentation: •Submission Template •Evidence to support claims made in the Submission Template •Site Plan and/or Architectural Plans highlighting all relevant areas as referenced by the WMP, and demonstrating: o8B.1 Separation of Waste Streams; o8B.2 Dedicated Waste Storage Area; and o8B.3 Access to Waste Storage Area.

Responsible Party (As Built Submission)

CODE	Building owner (NSW Dep. of Edu)	Builder	Architect (Architectus)	Structural Consultant (Wood & Grieves)	Mechanical Consultant (BSE)	Electrical Consultant (BSE)	Hydraulics/Fire Consultant (Wood&Gri	Mechanical Contractor	BMS / Control Contractor	Electrical Contractor	Hydraulics / Fire Contractor	ESD Consultant (BSE)	Landscape Architect (Oculus)	Ecologist	Acoustic Consultant (BSE)	Civil (Wood & Grieves)	Quantity Surveyor (WT Partnership)
7.2	x	x															
8A		x	x														
8B		x	x														

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Document revision: 1.3 | **Date: 17.Apr.2019** | **ADDRESS: CHATSWOOD NSW 2067** | **SCORES TARGETED: 49 (4 STAR WITH 4 BUFFER POINTS)**

Note: details below are provided as a guide only, where required the project team shall refer to the Green Star Design and As-built submission guidelines v1.2 for further details.

CATEGORY / CREDIT	AIM OF THE CREDIT / SELECTION	CODE	CREDIT CRITERIA	POINTS AVAILABLE	POINTS TARGETED	Compliance Requirements Note:
						8B.2 Dedicated Waste Storage Area A dedicated area for the storage and collection of the applicable waste streams shall be provided. The storage area must be sized to accommodate all bins or containers, for all applicable waste streams, for at least one collection cycle. The calculations used to demonstrate that the area provided is adequately sized to handle the recyclable waste streams specified must be based on: •Waste generated by project; and •Collection frequency for each waste stream. The calculations for waste generation rates must be based on figures outlined within third-party best practice guidelines.It is acceptable to provide more than one dedicated storage area when providing the appropriate waste storage space for the project. However, all storage areas dedicated to recycling must meet all the applicable requirements. 8B.3 Access to Waste Storage Area Access to waste collection areas must adhere to best practices, as outlined within third-party best practice guidelines, in order for this requirement to be met.
Total				14	7	
Indoor Environment Quality				17		
□		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	One (1) point is awarded where project teams demonstrate that the ventilation system meets all of the following conditions: •The entry of outdoor air pollutants is mitigated, in accordance with 9.1.1; •The system is designed for ease of maintenance and cleaning, in accordance with 9.1.2; and •The system has been cleaned prior to occupation and use, in accordance with 9.1.3. 9.1.1Entry of Outdoor Pollutants The entry of outdoor air pollutants to the space must be minimised. The building ventilation systems must be designed to comply with ASHRAE Standard 62.1:2013 in regards to minimum separation distances between pollution sources and outdoor air intakes. Windows, doors, openings, vents, grilles, and skylights are all considered outdoor air intakes for purposes of this credit and must be modelled taking into account their free area. Compliance is to be demonstrated in accordance with the distances specified in Table 5.5.1 of the Standard, however projects must also ensure compliance with any other requirement or guidance nominated within the Standard. Analytical solutions are also acceptable by following the example provided within Appendix F of ASHRAE Standard 62.1. 9.1.2Design for Ease of Maintenance and Cleaning Any mechanical ventilation system within the building, whether existing or new, must be designed to provide adequate access for maintenance, to both sides of all moisture and debris-catching components, within the air distribution system. Moisture-producing and debris-catching components include items such as cooling coils, heating coils, humidifiers and filters in the air handling system. 9.1.3Cleaning Prior to Use and Occupation All new and existing ductwork that serves the building must have been cleaned in accordance with the recognised Standards, see the Guidance section. This includes all ductwork in the base building that serves the building from the air handling unit to the supply vents. If no ductwork exists, these requirements are deemed to be met. Where construction management processes (see the 'Responsible Construction Practices' credit) are in place to ensure that all new ductwork, or ductwork that has been recently cleaned, remains free of moisture and debris until occupation, this ductwork can be considered to be clean. All other ductwork (existing and new) including plenums, filters and fan chambers must be cleaned in accordance with a recognised Standard.
□ Indoor Air Quality	To recognise projects that provide high air quality to occupants.	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	Up to two (2) points are awarded where at least 95% of the nominated area is provided with sufficient outdoor air to ensure that levels of indoor air pollutants are maintained below acceptable levels. For mechanically ventilated or mixed-mode spaces: •One (1) point is awarded where outdoor air is provided at a rate 50% greater than the minimum required by AS 1668.2:2012, or carbon dioxide (CO2) concentrations are maintained below 800ppm; or •Two (2) points are awarded where outdoor air is provided at a rate 100% greater than the minimum required by AS 1668.2:2012, or CO2 concentrations are maintained below 700ppm. For naturally ventilated spaces, two (2) points are awarded where the requirements of AS 1668.4- 2012 are met. The nominated area must be provided with the quantity of outdoor air appropriate for the activities and conditions in the space. The systems provided must not rely on its operation or adjustment by the facility management to achieve the required performance, the credit will only be awarded for permanent building attributes. Demonstrating Compliance Project teams must use one of the following three options for demonstrating compliance with the requirements for each space, depending on the 'primary mode of ventilation'. The primary mode of ventilation is defined as the ventilation system that is expected to operate for at least 70% of occupied hours. Standard hours of occupancy are defined as 50 hours a week or the building's design occupancy. If no single mode of ventilation can be considered the primary mode of ventilation, a combination of methods is acceptable for demonstrating compliance; 9.2A: Comparison to Industry Standards 9.2B Performance- based Approach 9.2C Natural Ventilation Refer Technical Manual for further details
						One (1) point is awarded where project teams demonstrate that pollutants from printing and photocopying equipment, cooking processes and equipment, and vehicle exhaust, are limited from the nominated area by either: A.Removing the source of pollutants, in accordance with 9.3A; or B.Exhausting the pollutants directly to the outside, in accordance with 9.3B. A combination of methods can be used to demonstrate compliance. 9.3A Removing the Source of Pollutants For this option, sources of pollutants, such as printing or photocopy equipment, kitchen stoves or vehicles, must be compliant with minimum emissions standards or not be present within the nominated area. || Where printing and/or photocopying equipment is present within the building, these must be certified in accordance with one of the following test standards: •ECMA-328; •RAL-UZ 171; or •GGPS.003.

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Total																		
Indoor Environment Quality																		
9.1	Project teams must submit the following documentation: •Submission Template, for 9.1 - 9.3 •Evidence to support claims made in the Submission Template •Mechanical drawings for each ventilated space. •Extract from the ventilation system specifi//cation for each system, showing that the project's commissioning requirements are stated in accordance with the relevant codes/guideline. The relevant sections must be highlighted. •Extracts from the Environmental Management Plan that specify ventilation cleaning.		x	x		x												
9.2	N/A																	
	•Extract from the printing and photocopy specification outlining the product certification criteria for all printing or photocopy equipment located throughout the project.		x	x														

CODE	As Built Submission Documentation	Building owner (NSW Dep. of Edu)	Builder	Architect (Architectus)	Structural Consultant (Wood & Grieves	Mechanical Consultant (BSE)	Electrical Consultant (BSE)	Hydraulics/Fire Consultant (Wood&Gri	Mechanical Contractor	BMS / Control Contractor	Electrical Contractor	Hydraulics / Fire Contractor	ESD Consultant (BSE)	Landscape Architect (Oculus)	Ecologist	Acoustic Consultant (BSE)	Civil (Wood & Grieves)	Quantity Surveyor (WT Partnership)
Total																		
Indoor Environment Quality																		
9.1	Project teams must submit the following documentation: •Submission Template, for 9.1 - 9.3 •Evidence to support claims made in the Submission Template •Mechanical drawings for each ventilated space.		x	x					x	x								
9.2	•Extract from the Commissioning Report demonstrating that the HVAC and CO2 monitoring systems are operating as intended. For naturally ventilated areas, this is only relevant where automation systems and the like are included.								x	x								
	•Certificates for printing equipment to ACMA 328, RAL-UZ 171 or GGPS.003 for all printing equipment which is included in the project.		x	x														

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		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	9.3B Exhausting the Pollutants Directly to the Outside For this option, specified sources of pollutants shall be exhausted directly to the outside of the project in accordance with a recognised Standard; and/or physically separated from occupants. The following requirements for printing and photocopy equipment, kitchen cooking processes and equipment, and vehicle exhaust apply. Printing and photocopying equipment All print and photocopy equipment must be located in an enclosed print/photocopy area that is exhausted directly to the outside, or to a dedicated exhaust riser. The exhaust system must not recycle air to other building enclosures, or to the return air duct of the ventilation system. In shell and core buildings (or similar), the provision of the exhaust facility without enclosure will suffice, provided that guidance to the tenant is developed to ensure appropriate installation. Each print/photocopy room must achieve a minimum exhaust ventilation flow rate in accordance with AS 1668.2-2012 (Table B1). The fans must be installed as part of the base building; provision of the fans for future installation (e.g. by a tenant) does not meet the credit criteria Cooking processes and equipment All kitchens must be ventilated in accordance with AS 1668.2:2012. A separate exhaust system must be provided for the kitchen exhaust. The kitchen must be physically separated from the adjacent spaces or have an opening no larger than an area of 2.5m2. A 'kitchen' is defined as a space that includes cooking equipment such as stove tops or ovens, please see the Definitions section. Residential kitchens are not required to be physically separated, but must utilise either: A.A non-recirculating exhaust system, exhausting directly to outside; or B.A recirculating system, with filtration media that has been proven to effectively remove kitchen pollutants. Kitchenettes or tea points with basic tea/coffee making or simple reheat equipment are not included. Cooking equipment employed for the preparation of food which has a power input less than 0.5kW/m2 may be excluded. Vehicle exhaust All pollutants from vehicles in an enclosed space must be exhausted to a dedicated exhaust riser or directly to the outside, in accordance with Section 4 of AS 1668.2-2012. This exhaust system must not recycle air to other enclosures. This requirement is applicable where a combustion engine based vehicle (of all types) is parked or otherwise operated in an enclosed area which is within the project area. Examples include an enclosed or underground carpark, a fire station, an aircraft hangar, a mechanics shop or a warehouse using forklifts. In addition to the exhaust system, the space where the vehicle is located must be physically separated from the rest of the project, a door will suffice.
Acoustic Comfort	To reward projects that provide appropriate and comfortable acoustic conditions for occupants.	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	One (1) point is awarded where project teams demonstrate that internal ambient noise levels in the nominated area are no more than 5dB(A) above the lower figure in the range recommended in Table 1 of AS/NZS2107:2016. || R2.10.01 The noise measurement and documentation must be provided by a qualified acoustic consultant and in accordance with AS/NZS 2107:2016. 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 within the Submission Template 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. || R1.10.01 Provisions for Naturally Ventilated Buildings In naturally ventilated buildings, all measurements must be carried out with natural ventilation openings in the open position. The internal ambient noise levels must be no more than 10dB(A) above the lower figure in the range recommended in Table 1 of AS/NZS 2107:2016. Provisions for Mixed Mode Buildings For purposes of this credit, mixed mode buildings can be treated as mechanically ventilated.
		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	One (1) point is awarded where the reverberation time in the nominated area is below the maximum stated in the 'Recommended Reverberation Time' provided in Table 1 of AS/NZ 2107:2016. Reverberation refers to the persistent prolonged reflections of sound in a space. A technical definition is provided in AS/NZS 2107:2016. For residential projects, this criterion is 'Not Applicable'. Where note 3 of Table 1 AS/NZ 2107:2016 applies and requires that reverberation times be minimised as far as practical, acoustic absorption should be installed in the noise sensitive space. Acoustic absorption should be applied in locations appropriate to the function of the space, and located to maximise the acoustic performance of materials selected. The resulting performance of the installed acoustic absorption, irrespective of quantity or location installed, must result in a reverberation time equivalent to or lower than the reverberation time predicted for treating at least 50% of the combined floor and ceiling area with a material having a noise reduction coefficient (NRC) of at least 0.5. Alternatively, compliance may be demonstrated by treating 50% of the combined floor and ceiling area with a material having a NRC of at least 0.5. Dedicated teaching space must have reverberation times in the lower half of the range specified in Table 1 of AS/NZS 2107:2016. 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 within the Submission Template and must consider how the spaces are considered to be the most conservative. The range of measurement locations shall be representative of all spaces available within the nominated area. All relevant buildings 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
		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	One (1) point is awarded where the project addresses noise transmission in enclosed spaces within the nominated area. Enclosed space is defined as meeting rooms, private offices, classrooms, residential apartments (bounding apartment construction), and any other similar space where it is expected that noise should not carry over from one space to the next. For this specific criterion, where the delivery method of the project is core and shell, then the criteria may be considered 'Not Applicable'. There are three methods for demonstrating compliance with this criterion, refer technical manual.

Responsible Party (Design Submission)

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9.3	•Mechanical drawings for each mechanicnally exhausted space.		x	x		x												
10.1																		
10.2	Project teams must submit the following documentation: •Submission Template, complete for 10.1 - 10.3 •Evidence to support claims made in the Submission Template •Detailed Drawings detailing the acoustic design features relevant to this credit. •Report by a qualified acoustics consultant confirming credit compliance.			x					x							x		
10.3																		

Responsible Party (As Built Submission)

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9.3	•Extract from the Commissioning Report demonstrating that the exhaust air systems are operating as intended. •Mechanical drawings for each mechanicnally exhausted space.		x	x					x	x								
10.1																		
10.2	Project teams must submit the following documentation: •Submission Template, complete for 10.1 - 10.3 •Evidence to support claims made in the Submission Template •Extracts from the commissioning report detailing relevant measured noise levels and target noise levels.	x							x							x		
10.3																		

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Lighting Comfort	To encourage and recognise well-lit spaces that provide a high degree of comfort to users.	11.0	Minimum Lighting Comfort: It is a minimum requirement of this credit that lights in the nominated area are flicker-free and accurately address the perception of colour in the space.	-	TO COMPLY	11.0MINIMUM LIGHTING COMFORT It is a minimum requirement of this credit that lights in the nominated area are flicker-free and accurately address the perception of colour in the space. Flicker-free Lighting Flicker-free lighting refers to luminaires that have either: •A minimum Class A1 & A2 ballast for all fluorescent lighting; •Electronic ballasts for all High Intensity Discharge (HID) lighting; •Electronic drivers that feature 12-bit or greater resolution for all Light-emitting Diode (LED) lighting; or •High frequency ballasts for all other lighting types, including incandescent (incl Halogen, dichroic (e.g. low-voltage downlights), and High-Intensity Discharge (e.g. metal halide, low/high pressure sodium). Colour Quality To address the perception of colour, light sources must have a minimum Colour Rendering Index (CRI) of 80, unless the project team can demonstrate that, in a particular area, the activity is not impeded by a lower CRI. The project team shall support their justification by ensuring their selection complies with the guidance provided in Table 7.2 in AS 1680.1:2006.	
		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	One (1) point is awarded where project teams can demonstrate that for 95% of the nominated area, lighting levels comply with best practice guidelines and glare is eliminated in accordance with the following requirements. 11.1.1 General Illuminance Best practice lighting levels for each task within each space type is defined as lighting with a maintained illuminance that meets the levels recommended in the relevant Standard. Guidance for different space types and activity types are listed in Table 11.1.1 (refer technical manual Compliance with this credit can be demonstrated through modelling or measuring of the whole nominated area or a representative floor or section. Assessment (either modelling or measuring) must be carried out in accordance with Appendix B of AS/NZS 1680.1:2006. The maintained Illuminance values must achieve a uniformity of no less than that specified in Table 3.2of AS 1680.1:2006, with an assumed standard maintenance factor of 0.8. Where recommended maintained illuminance values for a particular space are not specified, the values to be used must relate to the closest type of task as defined in AS/NZS 1680.1:2006 Table 3.1. Residential Spaces For residential spaces, the point is awarded where in living spaces, kitchen, bathrooms and bedrooms: •The lighting design includes or permits general fixed lighting that provides good maintained illuminance values for the entire room; and •The installed fittings all have a rated colour variation not exceeding 3 MacAdam Ellipses (decorative fittings being exempt). 11.1.2 Glare Reduction Glare from lamps must be limited within the nominated area. Three options are provided for demonstrating compliance with this requirement; a performance method, and two prescriptive methods. A combination of methods can be used to demonstrate compliance (refer technical manual)	Project teams must submit the following documentation: •Submission Template, for 11.1 - 11.3; including justification for any exclusion of nominated area or not- applicability of criterion •Evidence to support claims made in the Submission Template •Lighting Drawings •Architectural Drawings •Lighting Specifications/Schedules •Product Data Sheets •Isolux Plot Drawings Where an occupant (tenant) is obliged to install lighting that meets the credit criteria, the following evidence must be submitted: •Extract of a Tenant Fitout Design Guide (or Lease), detailing the requirement; •Signed lease agreement referring to the conditions set by the Tenant Fitout Design Guide OR REFER RIGHT AS-INSTALLED DELIVERABLES
		11.2	Surface Illuminance: 1 point is available where a combination of lighting and surfaces improve uniformity of lighting to give visual interest in the nominated area.	1	1	One (1) point is awarded where project teams can demonstrate that a combination of lighting and surfaces improve uniformity of lighting to give visual interest in the nominated area. There are two options provided for demonstrating compliance with this requirement, a prescriptive method and a performance method, with a third prescriptive method also available for residential spaces. A combination of methods is acceptable for demonstrating compliance (refer technical manual)	
		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	0	One (1) point is awarded where project teams can demonstrate that for 95% of the nominated area, occupants have the ability to control the lighting in their immediate environment. This includes turning the lights on and off and adjusting their light levels. One light can be controlled by one or more individuals, however, the project team must justify why and how, this is conducive to localised control. It is essential for project teams to identify what the 'immediate environment' is. For example, in an open-plan office the immediate environment is the light shone on the workstation; in a residential unit it is the light hitting the work surface in the kitchen where food is prepared. In residential spaces, this requirement can be achieved through the provision of sufficient power outlets for future task lights / lamps around the predicted furniture layouts used in the space. In addition, appropriate task lighting must be provided for kitchens, bathrooms, and service areas. In the case of an integrated fitout incorporating an activity-based working environment, the occupant adjustment of light levels criterion may be achieved where it is demonstrated that a wide variety of working environments provide a variety of lighting conditions, including some with the ability to adjust lighting levels, which are suitable for the activity undertaken in the space. A system is still required throughout the nominated area to turn lights on/off.	
		12.0	Glare Reduction: It is a minimum requirement of this credit that the glare, in the nominated area from sunlight through all viewing façades and skylights is reduced through a combination of blinds, screens, fixed devices, or other means.	-	TO COMPLY	It is a minimum requirement for this credit that glare from sunlight through all viewing façades and skylights in the nominated area is reduced through a combination of blinds, screens, fixed devices, or other means. Three options are provided and a combination of the methods outlined can be used to demonstrate compliance with this minimum requirement. 12.0A Fixed Shading Devices, 12.0B Blinds or Screens 12.0C Daylight Glare Model Refer the technical manual for further details.	

Responsible Party (Design Submission Documentation)

CODE	Building owner (NSW Dep. of Edu)	Builder	Architect (Architectus)	Structural Consultant (Wood & Grieves	Mechanical Consultant (BSE)	Electrical Consultant (BSE)	Hydraulics/Fire Consultant (Wood&Gri	Mechanical Contractor	BMS / Control Contractor	Electrical Contractor	Hydraulics / Fire Contractor	ESD Consultant (BSE)	Landscape Architect (Oculus)	Ecologist	Acoustic Consultant (BSE)	Civil (Wood & Grieves)	Quantity Surveyor (WT Partnership)
11.0–11.3			x			x											
12.0																	

CODE	As Built Submission Documentation
11.0–11.3	Project teams must submit the following documentation: •Submission Template, for 11.1 - 11.3; including justification for any exclusion of nominated area or not- applicability of criterion. •Evidence to support claims made in the Submission Template •Evidence a compliant system has been installed. The following documents may be used to demonstrate compliance: •Lighting Drawings •Architectural Drawings •Lighting Specifications/Schedules •Product Data Sheets •Isolux Plot Drawings
12.0	

Responsible Party (As Built Submission Documentation)

CODE	Building owner (NSW Dep. of Edu)	Builder	Architect (Architectus)	Structural Consultant (Wood & Grieves	Mechanical Consultant (BSE)	Electrical Consultant (BSE)	Hydraulics/Fire Consultant (Wood&Gri	Mechanical Contractor	BMS / Control Contractor	Electrical Contractor	Hydraulics / Fire Contractor	ESD Consultant (BSE)	Landscape Architect (Oculus)	Ecologist	Acoustic Consultant (BSE)	Civil (Wood & Grieves)	Quantity Surveyor (WT Partnership)
11.0–11.3			x							x							
12.0																	

GREEN STAR SCORECARD & REQUIREMENTS	PROJECT: UPGRADES TO CHATSWOOD PUBLIC SCHOOL & CHATSWOOD HIGH SCHOOL	GREEN STAR TARGET: 4 STAR (MINIMUM SCORES REQUIRED: 45)
Document revision: 1.3 Date: 17.Apr.2019	ADDRESS: CHATSWOOD NSW 2067	SCORES TARGETED: 49 (4 STAR WITH 4 BUFFER POINTS)

Note: details below are provided as a guide only, where required the project team shall refer to the Green Star Design and As-built submission guidelines v1.2 for further details.

CATEGORY / CREDIT	AIM OF THE CREDIT / SELECTION	CODE	CREDIT CRITERIA	POINTS AVAILABLE	POINTS TARGETED	Compliance Requirements Note:	Design Submission Documentation	As Built Submission Documentation
□ Visual Comfort	To recognise the delivery of well-lit spaces that provide high levels of visual comfort to building occupants.	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	2	Up to two (2) points are awarded where project teams can demonstrate that a specified proportion of the nominated area receives high levels of daylight. There are three options are provided for demonstrating compliance with this requirement. A combination of methods can be used across the building to demonstrate compliance. 12.1A Prescriptive Methodology - Compliance using Manual Calculations , 12.1B Compliance Using Daylight Factor 12.1C Compliance Using Daylight Autonomy. Refer the technical manual for further details. Demonstrating Compliance Compliance with option 12.1A is demonstrated by calculation, and compliance with options 12.1B and 12.1C is demonstrated by modelling. Compliance for this credit cannot be demonstrated by measurement of actual daylight levels in the building. Permanent partitions must be included within the modelling of this credit. Project teams must define reflectance values to represent the project's design. If values are unknown, refer to a relevant Standard for guidance. Daylight Factor When calculating Daylight Factor, either a CIE overcast sky or CIE uniform sky may be used. The daylight Factor is to be determined either at the finished floor level, or 720mm above FFL Daylight Autonomy Calculations must be completed for at least every hour during the Nominated Hours Requirements for Modelling Project modelling must include shading from any shutters or overhangs. A nearby building or feature (such as a cliff face) must be accounted for in overshadowing where the building height is at least a third of the height of the proposed building design, and, where the angle between the nearest point at the top of that building and the nearest point at the base of the proposed building is greater than the 21 June (winter) midday altitude of the sun. There are a number of dynamic simulation software programs that can be used to show compliance with the credit criteria. Daysim, ESP-r, Lightswitch Wizard, and SPOT (>Ver 4.0) can be used. Where other programs are used, the project team must demonstrate that the software is based on the Radiance simulation engine, and that it uses the statistical sky, the daylight coefficients and Perez All Weather Sky model, or the annual CIE sky simulation algorithms. Shading devices (including blinds) must be modelled as operating the same as the 'Greenhouse Gas Emissions' credit (15). This means they can be modelled as being in a fixed position, or being controlled (automatically or by occupants), providing the same approach is taken between the two credits.	Project teams must submit the following documentation: •Submission Templatefor 12.0 - 12.2, including justification for any exclusion of nominated area or not- applicability of criterion. •Evidence to support claims made in the Submission Template (refer below) •Daylight modelling report showing the daylight factor or daylight illuminance for the claimed spaces and including the following information: □A summary table showing each space or floor, their nominated area, and the compliant area in both square meters and as a percentage basis. □The daylight model showing the amount of floor area that is compliant, and the daylight values. •Daylight glare model (for 12.0C), showing □A description of the methodology used to create the daylight glare model and the software used; □A description of how the selected points for modelling represent the areas that would be effected by glare; □All terms clearly defined; □All names, types, glazing properties, and location of glazing; and □Justification of how the results in the model are equivalent to that of option 12.0A •Drawings showing: □The location of all blinds / shutters. □Any glare control devices. □Access to views. •Manual calculations showing: □The amount of floor area that is compliant for daylight. □The amount of compliant area for views. □The height and length of windows and any area of any skylights. □The lines-of-sight showing that no obstructions exist. □Any internal features or showing that no obstructions exist externally.	Project teams must submit the following documentation: •Submission Template for 12.0 - 12.2, including justification for any exclusion of nominated area or not- applicability of criterion. •Evidence to support claims made in the Submission Template (refer below) •Drawings showing: □The location of all blinds / shutters. □Any glare control devices. □Access to views. •Manual calculations showing: □The amount of floor area that is compliant for daylight. □The amount of compliant area for views. □The height and length of windows and any area of any skylights. □The lines-of-sight showing that no obstructions exist. □Any internal features or showing that no obstructions exist externally.
□			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	One (1) point is awarded where at least 60% of the nominated area has a clear line of sight to a high quality internal or external view. All floor areas within 8m from a compliant view can be considered to meet this credit criterion. The line-of-sight shall be measured by extending a perpendicular line from the view, be it a window, opening or internal view. A line at 45° can be used at the corners of the view. The thickness of the external walls must be taken into account in the calculations. Internal or external columns can be ignored. Refer to the GBCA's Green Star Daylight and Views Hand Calculation Guide for further guidance.		
□ Indoor Pollutants	To recognise projects that safeguard occupant health through the reduction in internal air pollutant levels.	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	All paints, adhesives, sealants, carpets, and engineered wood products used in the building must meet the requirements within each criterion. Emissions for each application must be acquired through recognised testing methods and reported through a recognised datasheet. In the case of paints and adhesives and sealants, theoretical TVOC calculations are also acceptable. This credit applies to new applications used in the building as part of the building contract. Where the fitout is part of the construction contract, all applications in the fitout are included. Unfinished surfaces, as well as reused carpets, existing carpets, and all other flooring products are excluded from this credit. 13.1.1PAINTS, ADHESIVES, AND SEALANTS This requirement is applicable to all internal applications of all types of paints, adhesives or sealants applied on-site, including both exposed and concealed applications. If exterior grade products are used in an internal application then these must also meet the requirements. The following items are excluded from this credit: •Glazing film, tapes, and plumbing pipe cements; •Products used in car parks; •Paints, adhesives and sealants used off-site, for example applied to furniture items in a manufacturing site and later installed in the fitout; and •Adhesives and mastics used for temporary formwork and other temporary installations. Total VOC (TVOC) values must reflect the final ready to use product, inclusive of tints (in the case of paints) and made in grams of VOC per litre (g/L) of ready to use product. There are two methods for demonstrating that a paint, adhesive or sealant complies with this criterion: A.Product certification in accordance with 13.1.1A; or B.Laboratory testing in accordance with 13.1.1B. A combination of methods can be used to demonstrate compliance. ||13.1.1A Product Certification The product is certified under a recognised Product Certification Scheme. The current list of recognised schemes is shown on the GBCA website: http://new.gbca.org.au/product-certification- schemes/. The certificate must be current at the time of project registration or submission and list the relevant product name and model. ||R2.13.01 13.1.1B Laboratory Testing TVOC limits for paints, adhesives or sealants are detailed in Table 13.1.1 (refer the technical manual). Most adhesives and sealants are addressed in the 'General purpose adhesives and sealants' category of the table, unless they clearly belong in the other specialised product categories. 13.1.2CARPETS There are two methods for demonstrating that a carpet complies with this criterion. A combination of methods can be used to demonstrate compliance. 13.1.2A - Product Certification, 13.1.2B - Laboratory Testing . Refer the technical manual.	Project teams must submit the following documentation: •Submission Template for 13.1 - 13.2 •Evidence to support claims made in the Submission Template Recommended Supporting Evidence •Specifications that demonstrate emission levels or formaldehyde contents. •Safety Data Sheets that demonstrate the compliant emission levels or formaldehyde content •Product VOC test certificates that demonstrate emission levels or formaldehyde contents. •Product certificates that demonstrate certification under a recognised product certification scheme or recognised standard	Project teams must submit the following documentation: •Submission Template for 13.1 - 13.2 •Evidence to support claims made in the Submission Template Recommended Supporting Evidence •Invoices and proof of purchase to demonstrate costs of compliant materials. •Bill of Quantities from Quantity Surveyor or Cost planner, demonstrating material costs.

Responsible Party (Design Submission)

CODE	Building owner (NSW Dep. of Edu)	Builder	Architect (Architectus)	Structural Consultant (Wood & Grieves)	Mechanical Consultant (BSE)	Electrical Consultant (BSE)	Hydraulics/Fire Consultant (Wood&Gri	Mechanical Contractor	BMS / Control Contractor	Electrical Contractor	Hydraulics / Fire Contractor	ESD Consultant (BSE)	Landscape Architect (Oculus)	Ecologist	Acoustic Consultant (BSE)	Civil (Wood & Grieves)	Quantity Surveyor (WT Partnership)
12.1			x														
13.1		x	x	x	x	x	x										

Responsible Party (As Built Submission)

CODE	Building owner (NSW Dep. of Edu)	Builder	Architect (Architectus)	Structural Consultant (Wood & Grieves)	Mechanical Consultant (BSE)	Electrical Consultant (BSE)	Hydraulics/Fire Consultant (Wood&Gri	Mechanical Contractor	BMS / Control Contractor	Electrical Contractor	Hydraulics / Fire Contractor	ESD Consultant (BSE)	Landscape Architect (Oculus)	Ecologist	Acoustic Consultant (BSE)	Civil (Wood & Grieves)	Quantity Surveyor (WT Partnership)
12.1		x	x														
13.1		x						x	x	x	x						

GREEN STAR SCORECARD & REQUIREMENTS	PROJECT: UPGRADES TO CHATSWOOD PUBLIC SCHOOL & CHATSWOOD HIGH SCHOOL	GREEN STAR TARGET: 4 STAR (MINIMUM SCORES REQUIRED: 45)
Document revision: 1.3 Date: 17.Apr.2019	ADDRESS: CHATSWOOD NSW 2067	SCORES TARGETED: 49 (4 STAR WITH 4 BUFFER POINTS)

Note: details below are provided as a guide only, where required the project team shall refer to the Green Star Design and As-built submission guidelines v1.2 for further details.

CATEGORY / CREDIT	AIM OF THE CREDIT / SELECTION	CODE	CREDIT CRITERIA	POINTS AVAILABLE	POINTS TARGETED	Compliance Requirements Note:	Design Submission Documentation	Responsible Party: Building owner (NSW Dep. of Edu)	Builder	Architect (Architectus)	Structural Consultant (Wood & Grieves	Mechanical Consultant (BSE)	Electrical Consultant (BSE)	Hydraulics/Fire Consultant (Wood&Gri	Mechanical Contractor	BMS / Control Contractor	Electrical Contractor	Hydraulics / Fire Contractor	ESD Consultant (BSE)	Landscape Architect (Oculus)	Ecologist	Acoustic Consultant (BSE)	Civil (Wood & Grieves)	Quantity Surveyor (WT Partnership)	As Built Submission Documentation	Responsible Party: Building owner (NSW Dep. of Edu)	Builder	Architect (Architectus)	Structural Consultant (Wood & Grieves	Mechanical Consultant (BSE)	Electrical Consultant (BSE)	Hydraulics/Fire Consultant (Wood&Gri	Mechanical Contractor	BMS / Control Contractor	Electrical Contractor	Hydraulics / Fire Contractor	ESD Consultant (BSE)	Landscape Architect (Oculus)	Ecologist	Acoustic Consultant (BSE)	Civil (Wood & Grieves)	Quantity Surveyor (WT Partnership)
		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	13.2ENGINEERED WOOD PRODUCTS One (1) point is awarded where project teams demonstrate that either no new engineered wood products are used in the building, or at least 95% (by area) of all engineered wood products meet the formaldehyde emission limits specified in Table 13.2. There are two methods for demonstrating than an engineered wood product complies: A.Product certification in accordance with 13.2A OR B.Laboratory testing in accordance with 13.2B. A combination of methods can be used to demonstrate compliance. Engineered wood products include particleboard, plywood, Medium Density Fibreboard (MDF), Laminated Veneer Lumber (LVL), High-Pressure Laminate (HPL), Compact Laminate and decorative overlaid wood panels. Timber veneers are excluded. Where only part of a product is composed of an engineered wood product, the limits apply only to that portion of the product, not the entire item. The following applications of engineered wood products are excluded from this credit: •Formwork; •Car park applications; and •Non-engineered wood products such as milled timber. ||13.2A Product Certification The product is certified under a recognised Product Certification Scheme. The current list of recognised schemes is shown on the GBCA website http://new.gbca.org.au/product-certification- schemes/. The certificate must be current at the time of project registration or submission and list the relevant product name and model. ||R2.13.02 13.2B Laboratory Testing All engineered wood products used in the building must meet the relevant limits specified in Table 13.2B (refer technical manual) as per the specified test protocol, or have product specific evidence that it contains no formaldehyde.																																						
Thermal Comfort	To encourage and recognise projects that achieve high levels of 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	0	One (1) point is awarded where project teams demonstrate that, for 95% of the nominated area and 98% of the year, a high degree of thermal comfort is provided. There are a number of options for demonstrating compliance depending on the type of space, as follows: •Naturally ventilated spaces – The internal temperatures in each space are within 80% of Acceptability Limit 1 of ASHRAE Standard 55-2013, in accordance with 14.1.1; •Mechanically ventilated spaces – The space meets specified prescriptive criteria for Thermal Comfort or the Predicted Mean Vote (PMV) levels are between -1 and +1, inclusive, in accordance with 14.1.2; and •Residential spaces – An average NatHERS rating of 7 Stars or greater is achieved, in accordance with 14.1.3. A combination of methods is acceptable. Refer the technical manual for further details.	Project teams must submit the following documentation: •Submission Template •Evidence to support claims made in the Submission Template Recommended Supporting Evidence 14.1.1Naturally Ventilated Spaces •Drawings showing the building's natural ventilation strategy. •Modelling report showing the results of the natural ventilation compliance method. 14.1.2Mechanically Ventilated Spaces •Drawings showing thermal properties of roof, windows, and façade. •Mechanical drawings showing details of the HVAC system and zones. •Modelling report showing the results of the mechanically-ventilated compliance method (14.1.2B only). 14.1.3Residential Spaces •Modelling report showing the results of the NatHERS compliance method.			x	x	x							x						Project teams must submit the following documentation: •Submission Template •Evidence to support claims made in the Submission Template Recommended Supporting Evidence 14.1.2Mechanically Ventilated Spaces •Confirmation from the relevant sub-contractors that all services have been installed and commissioned in line with the listed DTS criteria. •Drawings showing thermal properties of roof, windows, and façade. •Extract(s) from the Commissioning Report demonstrating via commissioning results that the building has been commissioned and the installed systems operate as intended by the design. •Mechanical drawings showing details of the HVAC system and zones. •Modelling report showing the results of the mechanically-ventilated compliance method (14.1.2B only).			x	x	x												
		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	0	One (1) additional point is awarded where project teams demonstrate that, for 95% of the nominated area and 98% of the year, a high degree of thermal comfort is provided. There are a number of methods for demonstrating compliance, as follows: •Naturally ventilated spaces – The internal temperatures in each space are within 90% of Acceptability Limit 1 of ASHRAE Standard 55-2013, in accordance with 14.1.1; •Mechanically ventilated spaces – The Predicted Mean Vote (PMV) levels are between -0.5 and +0.5, inclusive, in accordance with 14.1.2B; or •Residential spaces – An average NatHERS rating of 8 Stars or greater is achieved, in accordance with 14.1.3. A combination of methods is acceptable. By default, this additional point is deemed 'Not Applicable' for retail and industrial projects, given that the majority of the spaces in these buildings will be transitory. For other projects, this point may need to be made 'Not Applicable'. Please contact the GBCA if you believe this should be the case.																																						
Total				**17**	**14**																																					
Energy				**22**																																						
		15A.0	Conditional Requirement: Prescriptive Pathway: Up to 10 points are available where the project's GHG emissions have been reduced by employing 'best practice' building attributes. This pathway may be applied to NCC Class 3 to Class 9 buildings.	-	N/A	Project teams must demonstrate that the minimum Deemed-to-Satisfy performance requirements stipulated within parts J1 and J2 of the NCC have been exceeded by at least 5%.	Project teams must submit the following documentation: Submission Template (for the selected compliance pathway) Completed Green Star – Design & As Built: GHG Emissions Calculator (refer below)		x	x		x	x	x	x				x						Project teams must submit the following documentation: Submission Template (for the selected compliance pathway) Completed Green Star – Design & As Built: GHG Emissions Calculator (refer below)		x	x					x	x	x	x	x					
		15A.1	Building Envelope	1	0	1 point is awarded where the roof and ceiling, walls, and flooring construction achieves a 15% increase on the minimum required R-values specified in J1.3, J1.5 and J1.6.																																						
		15A.2	Glazing	1	0	1 point is awarded where the glazing complies with the following conditions: •For vertical glazing, the total energy used for each orientation and each storey is not greater than 85% of the total allowance according to the Australian Building Codes Board glazing calculator or the calculated aggregated air-conditioning energy value as defined in part J2.4 of the NCC; and •Where there are roof lights, the SHGC and total U-Value of these roof lights exceed the requirements of section J1.4 by 15%.																																						
		15A.3	Lighting	1	0	1 point is awarded where the lighting complies with the following conditions: •The actual installed aggregate illumination power density is 30% less than the maximum illumination power densities defined in Table J6.2a; •Automated lighting control systems, such as occupant detection and daylight adjustment, are provided to 95% of the nominated area; and •For Class 5 and 9a buildings only, the size of individually switched lighting zones does not exceed 100m2 for 95% of the nominated area.																																						

GREEN STAR SCORECARD & REQUIREMENTS | **PROJECT: UPGRADES TO CHATSWOOD PUBLIC SCHOOL & CHATSWOOD HIGH SCHOOL** | **GREEN STAR TARGET: 4 STAR (MINIMUM SCORES REQUIRED: 45)**

Document revision: 1.3 | **Date: 17.Apr.2019** | **ADDRESS: CHATSWOOD NSW 2067** | **SCORES TARGETED: 49 (4 STAR WITH 4 BUFFER POINTS)**

Note: details below are provided as a guide only, where required the project team shall refer to the Green Star Design and As-built submission guidelines v1.2 for further details.

<table>
<tr><th rowspan="2">CATEGORY / CREDIT</th><th rowspan="2">AIM OF THE CREDIT / SELECTION</th><th rowspan="2">CODE</th><th rowspan="2">CREDIT CRITERIA</th><th rowspan="2">POINTS AVAILABLE</th><th rowspan="2">POINTS TARGETED</th><th rowspan="2">Compliance Requirements
Note:</th><th rowspan="2">Design Submission Documentation</th><th colspan="17">Responsible Party</th><th rowspan="2">As Built Submission Documentation</th><th colspan="17">Responsible Party</th></tr>
<tr><th>Building owner (NSW Dep. of Edu)</th><th>Builder</th><th>Architect (Architectus)</th><th>Structural Consultant (Wood & Grieve</th><th>Mechanical Consultant (BSE)</th><th>Electrical Consultant (BSE)</th><th>Hydraulics/Fire Consultant (Wood&Gri</th><th>Mechanical Contractor</th><th>BMS / Control Contractor</th><th>Electrical Contractor</th><th>Hydraulics / Fire Contractor</th><th>ESD Consultant (BSE)</th><th>Landscape Architect (Oculus)</th><th>Ecologist</th><th>Acoustic Consultant (BSE)</th><th>Civil (Wood & Grieves)</th><th>Quantity Surveyor (WT Partnership)</th><th>Building owner (NSW Dep. of Edu)</th><th>Builder</th><th>Architect (Architectus)</th><th>Structural Consultant (Wood & Grieve</th><th>Mechanical Consultant (BSE)</th><th>Electrical Consultant (BSE)</th><th>Hydraulics/Fire Consultant (Wood&Gri</th><th>Mechanical Contractor</th><th>BMS / Control Contractor</th><th>Electrical Contractor</th><th>Hydraulics / Fire Contractor</th><th>ESD Consultant (BSE)</th><th>Landscape Architect (Oculus)</th><th>Ecologist</th><th>Acoustic Consultant (BSE)</th><th>Civil (Wood & Grieves)</th><th>Quantity Surveyor (WT Partnership)</th></tr>
<tr><td rowspan="6">Greenhouse Gas Emissions</td><td rowspan="3">A. Prescriptive Pathway</td><td>15A.4</td><td>Ventilation and Air-conditioning</td><td>1</td><td>0</td><td>1 point is awarded where all spaces comply with the following conditions: Mechanically ventilated spaces
The HVAC systems comply with the following conditions:
•The installed fan motor power and pump power, is at least 15% less that the maximum fan motor power and pump power defined in Tables J5.2 and J5.4a;
•The thermal efficiency of the installed water heater is 15% more than the required minimum as defined in Table J5.4b; and
•The required minimum energy efficiency ratio for packaged air conditioning equipment and refrigerant chillers is at least 15% higher than that specified in:
oNCC Tables J5.4d and J5.4e; or
oMEPS, where Section J does not apply to the equipment capacity.
Naturally Ventilated Spaces
The building is naturally ventilated in accordance with the 'Indoor Air Quality' credit (9).</td><td rowspan="3">15A Prescriptive Pathway
•Documentation showing compliance with all of the applicable Deemed-to-Satisfy requirements of Section J of the NCC*.
•Documentation showing the performance of applicable components (building envelope, glazing, lighting and HVAC) exceeding the minimum NCC requirements by the specified amount. This includes evidence of fabric elements being installed with the specified requirements, including but not limited to:
oWindow Energy Rating Scheme (WERS) certificates; and
oCalculations of wall, roof and floor R-values.
•Drawing(s) identifying the control zone sizes and the luminaire switch and control sensor locations.</td><td rowspan="3"></td><td rowspan="3">x</td><td rowspan="3">x</td><td rowspan="3"></td><td rowspan="3">x</td><td rowspan="3">x</td><td rowspan="3">x</td><td rowspan="3">x</td><td rowspan="3"></td><td rowspan="3"></td><td rowspan="3"></td><td rowspan="3">x</td><td rowspan="3"></td><td rowspan="3"></td><td rowspan="3"></td><td rowspan="3"></td><td rowspan="3"></td><td rowspan="3">15A Prescriptive Pathway
•Extract(s) from the Commissioning Report demonstrating (through supporting evidence) that the lighting system has been commissioned and operates as intended by the design.
•Building sealing test report including details of test methodology and air flow rates, and statement of the building air permeability achieved.
•||Power Purchase Agreement (PPA) identifying the duration of the power supply contract, supply availability (including proportion of GreenPower®) and guaranteed GHG emission factor</td><td rowspan="3"></td><td rowspan="3">x</td><td rowspan="3">x</td><td rowspan="3"></td><td rowspan="3"></td><td rowspan="3"></td><td rowspan="3"></td><td rowspan="3">x</td><td rowspan="3">x</td><td rowspan="3">x</td><td rowspan="3">x</td><td rowspan="3">x</td><td rowspan="3"></td><td rowspan="3"></td><td rowspan="3"></td><td rowspan="3"></td><td rowspan="3"></td></tr>
<tr><td>15A.5</td><td>Domestic Hot Water Systems</td><td>1</td><td>0</td><td>1 point is awarded where domestic hot water systems are powered by one of the following heat sources:
•Renewable Energy (which may include electric/gas boost);
•Natural Gas;
•Electric heat pump (minimum COP 3.5 under design conditions); or
•Waste heat or heat recovered from another process.</td></tr>
<tr><td>15A.6</td><td>Accredited GreenPower</td><td>5</td><td>0</td><td>Projects which have committed to procure GreenPower® products are rewarded additional points for supporting grid-connected renewable energy supply infrastructure.

•2 points are awarded where at least three points in this pathway have been achieved, and a supply contract is in place to procure at least 50% of the building's electricity consumption through accredited GreenPower® products.
•5 points are awarded where at least five points in this pathway have been achieved, and a supply contract is in place to procure 100% of the building's electricity consumption through accredited GreenPower® products.
The length of time of the commitment is for a minimum period of ten years after Practical Completion. Points awarded under this credit element cannot count towards meeting the Minimum Requirement for 5 and 6 star ratings.</td></tr>
<tr><td rowspan="2"></td><td>15B.0</td><td>Conditional Requirement: NatHERS Pathway: Up to 16 points are available where a NatHERS rating and 'best practice' building attributes demonstrate that the predicted building GHG emissions have been reduced compared to a typical dwelling or residence.</td><td>-</td><td>NA</td><td>This method applies to Class 2 multi-unit residential dwellings, the immediate adjacent areas used to access the dwellings, and areas which provide common amenities for use by residents only. This method can be used for projects located in all states and territories.
Class 1 dwellings can also use this method, however, the relevant clauses will need to be adapted to the relevant NCC Section applicable to this class of building. Project teams must demonstrate that the project achieves a minimum NatHERS 0.5-Star rating improvement on the minimum legislated area-weighted average. Each unit must also achieve a minimum NatHERS 0.5-Star rating over the individual rating requirement as specified in Section J0.2a of the NCC.</td><td rowspan="3">•NatHERS report issued to the Building Certifier at time of Building Approval showing a minimum NatHERS 0.5-Star rating improvement on the minimum legislated area-weighted average and worst-case NatHERS star rating for the location.
•Documentation showing compliance for every point claimed in the Submission Template*.
Lighting
•Schedule showing the actual lighting power density of each area being rated and the applicable NCC minimum requirement.
•Drawings identifying the control zones and the luminaire and switch locations

HVAC
•Schedule identifying all air-conditioners installed in the building, their capacities and the manufacturer and model of each.
•Documentation showing the heat load and cooling load for each area served by a heater or air-conditioner.
•Manufacturers' documentation or information from www.energyrating.gov.au confirming the energy star rating applicable to each air-conditioner or heater.
•Documentation demonstrating that each dwelling has been designed to provide effective natural cross ventilation. For naturally ventilated spaces, drawings for each naturally ventilated space showing openings, with dimensions clearly indicated, and ventilation inlets and outlets.

Domestic hot water
•Manufacturers' documentation showing the gross thermal efficiency of the heating appliance.
•Documentation demonstrating that the solar heating system contributes at least 30% of the annual requirement.
•Documentation demonstrating the non-renewable energy sources for all domestic hot water systems</td><td rowspan="2"></td><td rowspan="2"></td><td rowspan="2">x</td><td rowspan="2"></td><td rowspan="2">x</td><td rowspan="2">x</td><td rowspan="2">x</td><td rowspan="2"></td><td rowspan="2"></td><td rowspan="2"></td><td rowspan="2"></td><td rowspan="2">x</td><td rowspan="2"></td><td rowspan="2"></td><td rowspan="2"></td><td rowspan="2"></td><td rowspan="2"></td><td rowspan="2">•Extract(s) from the commissioning report demonstrating (through supporting evidence) that the lighting system has been commissioned and operates as intended by the design.
Building Sealing
•Building sealing test report including details of test methodology and air flow rates, and statement of the building air permeability achieved.

Appliances and Equipment
•Schedule identifying all appliances installed in the building, and the manufacturer and model of each.
•Manufacturers' documentation or information from www.energyrating.gov.au confirming the energy star rating applicable to each product.
•Information from www.energyrating.gov.au confirming the highest energy star rating applicable to each product type.

||GreenPower®
•Power Purchase Agreement (PPA) identifying the duration of the power supply contract, supply availability (including proportion of GreenPower®) and guaranteed GHG emission factor.</td><td rowspan="2"></td><td rowspan="2">x</td><td rowspan="2">x</td><td rowspan="2"></td><td rowspan="2"></td><td rowspan="2"></td><td rowspan="2"></td><td rowspan="2">x</td><td rowspan="2">x</td><td rowspan="2">x</td><td rowspan="2">x</td><td rowspan="2">x</td><td rowspan="2"></td><td rowspan="2"></td><td rowspan="2"></td><td rowspan="2"></td><td rowspan="2"></td></tr>
<tr><td>15B.1</td><td>NatHERS Pathway</td><td>-</td><td>NA</td><td>Up to 16 points are available under this pathway. Points are awarded on a continuous scale for the energy intensity reduction of the dwelling through improved thermal performance; and more efficient lighting, ventilation, building sealing, domestic hot water, and appliances and equipment.
Final rounding to a whole number occurs in the Green Star total score calculation.

Thermal and Energy Performance
Up to six points are awarded when NatHERS is used to predict the project's thermal and energy performance. Points are awarded on the calculated reduction of energy intensity in the base MJ/m² metric rather than the NatHERS star rating score. Design checks for HVAC and natural ventilation are included within these points. Building Services and Appliances
Up to 10 points are awarded if specifications and design checks for lighting, domestic hot waterand appliance efficiencies are also achieved.
A total of 11 points are presented, however a maximum of 10 points may be awarded, refer the technical manual for further information.</td></tr>
<tr><td></td><td>15C.0</td><td>Conditional Requirement: BASIX Pathway: Up to 16 points are available where a BASIX certificate is used to demonstrate that the predicted building GHG emissions have been reduced compared to a dwelling or residence. This pathway may only be applied to residential projects located in New South Wales</td><td>-</td><td>NA</td><td>This method applies to Class 2 multi-unit residential dwellings, the immediate adjacent areas used to access the dwellings and areas which provide common amenities for use by residents only. This method can only be used for projects located in New South Wales.
Class 1 dwellings can also use this method; however, the relevant clauses will need to be adapted to the relevant BASIX compliance criteria applicable to this type of buildings and their construction. Project teams must demonstrate that a BASIX report has been issued to the Building Certifier at time of Building Approval demonstrating that the project aggregate cooling and heating demand, as calculated using a NatHERS-accredited calculation tool, achieves at least a 10% reduction relative to the maximum allowable aggregate heating and cooling energy for the project climate region as per the BASIX thermal comfort compliance criteria. This 10% reduction applies to both development average and to the worst-case dwelling performance.</td><td></td><td>x</td><td>x</td><td></td><td>x</td><td>x</td><td>x</td><td></td><td></td><td></td><td></td><td>x</td><td></td><td></td><td></td><td></td><td></td><td>•BASIX assessment report or certificate issued to the certifying authority at time of Building Approval showing a minimum 10% improvement on the maximum allowable aggregate heating and cooling energy demand for thermal comfort compliance for the location (both area-weighted average and worst-case unit performance).
•BASIX completion receipt.
•Documentation showing compliance for every point claimed in the Submission Template*||R1.15.01

||GreenPower®
•Power Purchase Agreement (PPA) identifying the duration of the power supply contract, supply availability (including proportion of GreenPower®) and guaranteed GHG emission factor</td><td></td><td>x</td><td>x</td><td></td><td></td><td></td><td></td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td></td><td></td><td></td><td></td><td></td></tr>
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GREEN STAR SCORECARD & REQUIREMENTS | **PROJECT: UPGRADES TO CHATSWOOD PUBLIC SCHOOL & CHATSWOOD HIGH SCHOOL** | **GREEN STAR TARGET: 4 STAR (MINIMUM SCORES REQUIRED: 45)**

Document revision: 1.3 | **Date: 17.Apr.2019** | **ADDRESS: CHATSWOOD NSW 2067** | **SCORES TARGETED: 49 (4 STAR WITH 4 BUFFER POINTS)**

Note: details below are provided as a guide only, where required the project team shall refer to the Green Star Design and As-built submission guidelines v1.2 for further details.

								Responsible Party																		Responsible Party																
CATEGORY / CREDIT	AIM OF THE CREDIT / SELECTION	CODE	CREDIT CRITERIA	POINTS AVAILABLE	POINTS TARGETED	Compliance Requirements Note:	Design Submission Documentation	Building owner (NSW Dep. of Edu)	Builder	Architect (Architectus)	Structural Consultant (Wood & Grieves)	Mechanical Consultant (BSE)	Electrical Consultant (BSE)	Hydraulics/Fire Consultant (Wood&Gri	Mechanical Contractor	BMS / Control Contractor	Electrical Contractor	Hydraulics / Fire Contractor	ESD Consultant (BSE)	Landscape Architect (Oculus)	Ecologist	Acoustic Consultant (BSE)	Civil (Wood & Grieves)	Quantity Surveyor (WT Partnership)	As Built Submission Documentation	Building owner (NSW Dep. of Edu)	Builder	Architect (Architectus)	Structural Consultant (Wood & Grieves)	Mechanical Consultant (BSE)	Electrical Consultant (BSE)	Hydraulics/Fire Consultant (Wood&Gri	Mechanical Contractor	BMS / Control Contractor	Electrical Contractor	Hydraulics / Fire Contractor	ESD Consultant (BSE)	Landscape Architect (Oculus)	Ecologist	Acoustic Consultant (BSE)	Civil (Wood & Grieves)	Quantity Surveyor (WT Partnership)
		15C.1	BASIX Pathway	-	NA	Up to 16 points are available under this pathway. Points are awarded on a continuous scale for the greenhouse gas emissions reduction of the project through improved thermal performance, and more efficient building services, appliances and equipment. Performance at least 10% better than the maximum allowable BASIX greenhouse gas emissions rate (i.e. exceeding the Conditional Requirement) is rewarded by the credit.	•BASIX assessment report or certificate issued to the certifying authority at time of Building Approval showing a minimum 10% improvement on the maximum allowable aggregate heating and cooling energy demand for thermal comfort compliance for the location (both area-weighted average and worst-case unit performance). •BASIX completion receipt. •Documentation showing compliance for every point claimed in the Submission Template ||GreenPower® •Power Purchase Agreement (PPA) identifying the duration of the power supply contract, supply availability (including proportion of GreenPower®) and guaranteed GHG emission factor.		x	x		x	x	x					x						•BASIX assessment report or certificate issued to the certifying authority at time of Building Approval showing a minimum 10% improvement on the maximum allowable aggregate heating and cooling energy demand for thermal comfort compliance for the location (both area-weighted average and worst-case unit performance). •BASIX completion receipt. •Documentation showing compliance for every point claimed in the Submission Template ||GreenPower® •Power Purchase Agreement (PPA) identifying the duration of the power supply contract, supply availability (including proportion of GreenPower®) and guaranteed GHG emission factor.		x			x	x	x					x					
		15D.0	Conditional Requirement: NABERS Pathway: Up to 20 points are available where a NABERS Energy Commitment Agreement is used to demonstrate that the predicted building GHG emissions have been reduced compared to an average building.	-	NA	For this pathway, project teams must demonstrate that the project is subject to a NABERS Energy Commitment Agreement for a minimum of 4.5 Stars. This commitment agreement process requires a full peer review of the base building design and associated energy performance simulation assessment by a NABERS-recognised Independent Design Reviewer.	N/A		x	x		x	x	x	x										•Signed copy of the NABERS Energy Commitment Agreement •Independent Design Review report outlining the results to the Energy Efficiency Review of your project. GreenPower® •Power Purchase Agreement (PPA) identifying the duration of the power supply contract, supply availability (including proportion of GreenPower®) and guaranteed GHG emission factor		x	x					x	x	x	x	x					
		15D.1	NABERS Energy Commitment Agreement Pathway	-	NA	Up to 20 points are available when a NABERS Energy Commitment Agreement is used to predict the project's energy and greenhouse gas performance and 100% purchase of accredited GreenPower® is used. Points are awarded on the calculated reduction in the base kgCO2e metric, rather than the NABERS Energy Star score. Performance at, and in excess of, NABERS Energy 4.5-star rating is rewarded by the credit. Points are calculated using the Green Star – Design & As Built: Greenhouse Gas Emissions Calculator. Table 15D.1 provides a guide to the approximate points that can be awarded (refer the technical manual) *The Green Star – Design & As Built: Greenhouse Gas Emissions Calculator must be used to calculate the exact points for the project. Points are awarded on a continuous scale, correct to 1 decimal place for greenhouse gas emissions reduction. Final rounding to a whole number occurs in the Green Star total score calculation. In addition to the above points, projects which have committed to procure GreenPower® products can be rewarded for supporting grid-connected renewable energy supply infrastructure. , for further information please refer the technical manual																																			
		15E.0	Conditional Requirement: Reference Building Pathway: Up to 20 points are available where there is a specified reduction in the predicted energy consumption and GHG emissions of the proposed building. Points are awarded based both on improvements to the building's façade, and on the project's predicted ability to reduce its operating energy consumption and emissions towards 'net zero'.	-	TO COMPLY	This method applies to Class 2 to 9 buildings. Refer to the Energy Consumption and Greenhouse Gas Emissions Calculation Guide for details on how to complete the calculation, including definitions. Project teams must demonstrate that the operational greenhouse gas (GHG) emissions from the Proposed Building are less than those of the equivalent Benchmark Building. The Benchmark Building represents a 10% improvement on the Reference Building. The Reference Building is a building which achieves minimal compliance with the NCC Section J DTS provisions.	•Energy modelling report* in accordance with the Energy Consumption and Greenhouse Gas Emissions Calculation Guide following the structure of the guide and: Clearly identifying all default values used (e.g. occupant density). Clearly identifying all of the assumptions made, design-driven inputs and referencing drawings; whenever assumptions are used, they must be justified and conservative. Clearly corresponding to the design. •Extract(s) from the Specification(s)* demonstrating that all the inputs used in the energy simulation are reflected in the current design. Design Analysis Approach •Design Intent Report (DIR) for the utility identifying its characteristics and associated GHG coefficient calculations. •Power Purchase Agreement (PPA) and Thermal Power Purchase Agreements (TPPA)* for identifying the duration of the power supply contract, supply availability (including proportion of GreenPower®) and an operational plan which corresponds with the DIR. •Designer's statement indicating the total capacity of conventional chilled water, heating hot water heating, and domestic hot water heating plant installed in the building, the design heating or cooling load of each system, and hence the percentage of design load met by conventional plant. Refer to the Shared Services and Low-Carbon Energy Supply Assessment Guidelines for more details regarding the above documents. Design and construction documentation for the energy utility are not required for the purposes of the Green Star submission for the buildings.		x	x		x	x	x					x																							
		15E.1	Comparison to a Reference Building Pathway	20	9	Up to 20 points are available for this credit. Points are awarded independently for improving on the building's fabric against a Reference Building (4 points), and for reducing emissions against the Benchmark Building (16 points). Points are awarded on a continuous scale in accordance with Table 15E.1 (refer the technical manual) Accredited GreenPower® products Projects which have committed to procure GreenPower® products can be rewarded for supporting grid-connected renewable energy supply infrastructure. Shared Services This credit allows projects with shared energy supplies to be rewarded for a reduction in GHG emissions. The intent of this approach is to also reward buildings which connect to low-carbon energy sources at a utility-scale, rather than only rewarding those projects which produce low-carbon energy on-site. This approach is intended to cover the procurement opportunities for energy and utility systems, including the following: •District thermal networks. •Shared combined heat and power systems. •Private wire networks with embedded renewable energy. •Grid connected low-carbon energy (e.g. biomass or biogas systems). Other options may be available to projects through a technical question (formerly known as a Credit Interpretation Request). Please contact the GBCA for more information. Where shared systems are intended to meet the full building load for a particular energy stream, the energy contracts must clearly demonstrate that sufficient capacity is available. These contracts may take the form of Power Purchase Agreements (PPA) and Thermal Power Purchase Agreements (TPPA). The agreements must be for at least ten years after Practical Completion and identify supply availability and other matters related to reliance of supply. Where a project enters into a PPA for a period of less than ten years, the emissions reduction benefit will be prorated. Where a project enters into a TPPA for a period of less than ten years, the emissions reduction benefit will be prorated as follows: •If the building is provided with conventional plant able to satisfy 100% of the building's design heating or cooling load requirements (as applicable), in addition to connections to the local infrastructure, the emissions reduction benefit will be prorated. In this case, a reference case GHG emission factor will need to be defined to set the upper limit for interpolation. By default this would assume the same fuel source as for the reference building, and reference system efficiencies. •If the building is provided with conventional plant only able to satisfy less than 100% of the building's design heating or cooling load requirements (as applicable), in addition to connections to the local infrastructure, then the building is dependent on the ongoing delivery of thermal energy to satisfy its design loads. In this case, it is acceptable to take full emissions reduction credit, and no adjustment is applied to the GHG emission factor. At this time, no benefit is given for contract periods greater than ten years. The maximum benefit that can be derived from Shared Services (and accredited GreenPower® products) is limited to the number of points awarded for GHG emission reduction due to the building design improvements alone. Hence full points for the credit will only be able to be achieved by buildings which have already achieved at least 50% emission reduction below the Benchmark Building. This calculation is performed by the Greenhouse Gas Emissions Calculator. ||Project teams are encouraged to contact GBCA to ensure points awarded under this credit element can be counted towards meeting the Minimum Requirement for 5 and 6 star ratings. ||R2.15.01 Refer to Shared Services and Low-Carbon Energy Supply Assessment Guidelines for additional details.																			•Extract(s) from the Commissioning Report demonstrating (through supporting evidence) that the building has been commissioned and operates as intended by the design (i.e. as described in the energy modelling report). •For naturally ventilated spaces, demonstrating that the building operates as a naturally ventilated space in accordance with AS 1668.4-2012 and requires no mechanical air- conditioning for occupancy. •As built drawings demonstrating that the facade details and materials are the same as described in the energy modelling report. •For naturally ventilated spaces, drawings for each space clearly showing openings and dimensions of ventilation inlets and outlets. ||GreenPower® •Power Purchase Agreement (PPA) identifying the duration of the power supply contract, supply availability (including proportion of GreenPower®) and guaranteed GHG emission factor. Mixed Use Projects Project teams are required to provide, for each separate part of the building, all documentation (as defined above) needed to demonstrate compliance with the relevant pathway used. Shared Services Procurement Contract Approach •Power Purchase Agreement (PPA) and Thermal Power Purchase Agreements identifying the duration of the power supply contract, supply availability (including proportion of GreenPower®) and guaranteed GHG emission factor. •Designer's statement indicating the total capacity of conventional chilled water, heating hot water heating, and domestic hot water heating plant installed in the building, the design heating or cooling load of each system, and hence the percentage of design load met by conventional plant.		x	x					x	x	x	x						

GREEN STAR SCORECARD & REQUIREMENTS | **PROJECT: UPGRADES TO CHATSWOOD PUBLIC SCHOOL & CHATSWOOD HIGH SCHOOL** | **GREEN STAR TARGET: 4 STAR (MINIMUM SCORES REQUIRED: 45)**

Document revision: 1.3 | **Date: 17.Apr.2019** | **ADDRESS: CHATSWOOD NSW 2067** | **SCORES TARGETED: 49 (4 STAR WITH 4 BUFFER POINTS)**

Note: details below are provided as a guide only, where required the project team shall refer to the Green Star Design and As-built submission guidelines v1.2 for further details.

CATEGORY / CREDIT	AIM OF THE CREDIT / SELECTION	CODE	CREDIT CRITERIA	POINTS AVAILABLE	POINTS TARGETED	Compliance Requirements Note:	Design Submission Documentation	As Built Submission Documentation
Peak Electricity Demand Reduction	Prescriptive Pathway	16A	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%	1	1	One (1) point is awarded where it is demonstrated that the use of on-site renewable energy or on-site generation sources reduces the peak electricity demand by at least 15%. Peak electricity demand is the predicted annual peak calculated as the sum of all distribution boards (to include all miscellaneous loads) relevant to the building as shown in the as-installed electrical schematics. Peak electricity demand must be calculated in line with the below requirements: •In accordance with AS/NZS 3000:2007 (or as subsequently amended); •As the absolute design capacity of the system, after the application of diversity factors, but prior to the application of contingency factors as required for utility agreements (the value is likely to be about 30% less than that for the utility agreement); and •To include all building end-use loads, except process loads, in the peak demand assessment. For mixed-mode ventilated buildings, peak demand must be calculated in the mechanically ventilated mode. Refer to the Building Energy Consumption and Greenhouse Gas Emissions Calculation Guidelines for the applicable assessment scope.	Project teams must submit the following documentation: •Submission Template for 16A OR16B •Evidence to support claims made in the Submission Template •Completed Green Star – Design & As Built Energy Calculator 16A Prescriptive Pathway •Extract(s) from the specification(s)* where the proposed solution(s) are described. •Calculation of the peak electricity demand referencing as-installed drawings and AS/NZS 3000, detailing (with supporting calculations) the design, operation and justifying the capacity of the intended system. •Schematic electrical drawings clearly indicating the type, location and details of the proposed solution(s).	Project teams must submit the following documentation: •Submission Template for 16A OR16B •Evidence to support claims made in the Submission Template •Completed Green Star – Design & As Built Energy Calculator •Calculation of the peak electricity demand referencing as-installed drawings and AS/NZS 3000, detailing (with supporting calculations) the design, operation and justifying the capacity of the intended system. •Schematic electrical drawings clearly indicating the type, location and details of the proposed solution(s).
		16B	Performance Pathway - Reference Building: Up to 2 points are available where it is demonstrated that the project's predicted peak electricity demand has been reduced below that of a Reference Building: •20% : 1 point •30%: 2 points	-		Up to two (2) points are awarded where it is demonstrated that the building's peak electricity demand is reduced when compared to that of the Reference Building. Points are awarded as follows: •One (1) point is awarded for a 20% reduction in peak electricity demand; and •Two (2) points are awarded for a 30% reduction in peak electricity demand. Partial points are awarded based on a sliding scale of percentage improvement after a minimum achievement of 10% reduction in peak electricity demand. Refer to the Building Energy Consumption and Greenhouse Gas Emissions Calculation Guidelines for details on how to complete the calculation, including the definition of the Reference Building.	16B Reference Building Pathway •Energy modelling report containing a section specifically on peak electricity demand reduction, with information provided as per the requirements of the Building Energy Consumption and Greenhouse Gas Emissions Calculation Guidelines.	•Extract(s) from the Commissioning Report that specifically highlight the systems which contribute towards the peak electricity demand reduction, and demonstrate that they have been commissioned and operate as intended by the design (i.e. as described in the energy modelling report).
Total				**22**	**10**			
Transport				**10**				
	Performance Pathway: Up to 10 points are available where projects provide access to sustainable transport infrastructure which decreases greenhouse gas emissions from transport, decreases mental and social impacts of commuting, and encourages the uptake of healthier active transport options.	17A.1	Performance Pathway	10	TBC	The Performance Pathway only applies to regular occupants of the building. Up to 10 points are awarded under this pathway. Points are awarded based on a holistic approach to reducing the impacts from transport, where the proposed building performance is improved when compared to a reference building across four indicators: •Emissions reduction; •Active mode encouragement; •Vehicle kilometres travelled reduction; and •Walkable location. Points are awarded by completing the Sustainable Transport Calculator with the predicted transport mode split as defined in a Travel Plan or Transport Plan specifically developed for the project. More information is available in the Sustainable Transport Calculator Guide. The Travel Plan or Transport Plan must be developed by a suitably qualified transport professional (see Definitions), as the plan will inform the inputs into the Sustainable Transport Calculator. This pathway may be most appropriate for those projects that are not located in Central Business Districts, which are typically well connected to public transport networks. Projects located in suburban or regional settings may find this pathway the most appropriate to their sustainability goals. Project teams should consult with their transport specialists for advice about which pathway to use.	All project teams must submit the following documentation: •Submission Template •Evidence to support claims made in the Submission Template •Sustainable Transport Calculator (17A Performance Pathway only) •Travel Plan including a site-specific transport assessment and transport improvements as outlined in the Compliance Requirements. •Transport Drawings showing the provision and location of transport facilities as recommended by the Travel Plan, and justifying inputs into the Sustainable Transport Calculator.	All project teams must submit the following documentation: •Submission Template •Evidence to support claims made in the Submission Template •Transport Drawings showing the provision and location of transport facilities as recommended by the Travel Plan, and justifying inputs into the Sustainable Transport Calculator.
		17B.1	Access by Public Transport	3	0	The Prescriptive Pathway applies to regular building occupants and visitors. Up to seven (7) points are available based on the following credit elements: Up to 3 points are available based on the accessibility of the site by public transport. The points score is determined by completing the Access by Public Transport Calculator. Points are awarded based on the percentage of people within the Greater Capital City Statistical Area (GCCSA) that can access the site by public transport within 45 minutes during peak hour. Projects located outside of a GCCSA use the 'rest of state' statistical area for assessment.	All project teams must submit the following documentation: •Submission Template •Evidence to support claims made in the Submission Template •Access by Public Transport Calculator (17B Prescriptive Pathway only)	N/A
		17B.2	Reduced Car Parking Provision	1	0	1 point is available where there is a reduction in the number of car parking spaces in the proposed building when compared to a standard-practice building. The points awarded are based on the level of the reduction and the site's access to public transport, as per Table 17B.2. This credit is applicable regardless of the location of the project, or the nature of local planning requirements, as neither of these factors lessens the environmental impact of the use of private motor vehicles. Notes on calculating the project's maximum car parking rates: •The project's Accessibility Rating is determined by its location using the Access by Public Transport Calculator. •Total peak building occupancy is determined by the BCA Review Report, prepared by a qualified Building Surveyor. •Where a building has multiple uses, a hybrid rate shall be determined based on the proportion attributable to each use. Where no carparks are provided, 1 point is awarded unless this has been enforced by planning requirements, where it becomes Not Applicable.		
Sustainable Transpor	Prescriptive Pathway: Up to 7 out of 10 points are available where projects provide access to sustainable transport infrastructure as demonstrated using specified prescriptive	17B.3	Low Emission Vehicle Infrastructure	1	0	1 point is available where parking spaces and/or dedicated infrastructure is provided to support the uptake of low-emission vehicles. To qualify for this point, the low-emission vehicle infrastructure must meet one of the following benchmarks: •15% of parking is dedicated to fuel-efficient vehicles (see Definitions), with a maximum of 5% for motorcycle parking; •5% of parking is dedicated to electric vehicles and charging infrastructure is provided for each space; or •For residential projects (at least 80% GFA Class 1a or 2), dedicated car share spaces and vehicles are provided at the rate of 1 per 70 project occupants. Parking for fuel-efficient and electric vehicles Parking spaces for fuel-efficient and electric vehicles must be clearly designated, for example through use of different coloured line markings and highly visible signage. Spaces designated for small cars are not considered to be equivalent to spaces for fuel efficient vehicles. Appropriate electric vehicle charging infrastructure must be easily accessed by the users of dedicated electric vehicle charging spaces. It must comply with all relevant Standards and health and safety legislation. Parking for car share vehicles (residential projects only) Parking spaces for car share vehicles must be clearly designated, for example through use of different coloured line markings and highly visible signage. The car share parking spaces must be accessible to all car share scheme members. No parking spaces provided Where no parking spaces are to be provided, there is no opportunity to apply any of the above initiatives. In this instance, the 'Low Emission Vehicle Infrastructure' point is made 'Not Applicable'. Please see the Introduction section of the Submission Guidelines for additional information.	Project Drawings showing the proposed car parking spaces, bicycle parking spaces, and end-of trip facilities.	Project Drawings showing the proposed car parking spaces, bicycle parking spaces, and end-of trip facilities.

Responsible Party (Design Submission)

CODE	Building owner (NSW Dep. of Edu)	Builder	Architect (Architectus)	Structural Consultant (Wood & Grieve	Mechanical Consultant (BSE)	Electrical Consultant (BSE)	Hydraulics/Fire Consultant (Wood&Gri	Mechanical Contractor	BMS / Control Contractor	Electrical Contractor	Hydraulics / Fire Contractor	ESD Consultant (BSE)	Landscape Architect (Oculus)	Ecologist	Acoustic Consultant (BSE)	Civil (Wood & Grieves)	Quantity Surveyor (WT Partnership)
16A					x	x						x					
16B																	
Total																	
Transport																	
17A.1			x														
17B.1	x																
17B.2																	
17B.3			x														

Responsible Party (As Built Submission)

CODE	Building owner (NSW Dep. of Edu)	Builder	Architect (Architectus)	Structural Consultant (Wood & Grieve	Mechanical Consultant (BSE)	Electrical Consultant (BSE)	Hydraulics/Fire Consultant (Wood&Gri	Mechanical Contractor	BMS / Control Contractor	Electrical Contractor	Hydraulics / Fire Contractor	ESD Consultant (BSE)	Landscape Architect (Oculus)	Ecologist	Acoustic Consultant (BSE)	Civil (Wood & Grieves)	Quantity Surveyor (WT Partnership)
16A								x		x		x					
16B																	
Total																	
Transport																	
17A.1			x									x					
17B.1																	
17B.2																	
17B.3		x	x									x					

GREEN STAR SCORECARD & REQUIREMENTS	PROJECT: UPGRADES TO CHATSWOOD PUBLIC SCHOOL & CHATSWOOD HIGH SCHOOL	GREEN STAR TARGET: 4 STAR (MINIMUM SCORES REQUIRED: 45)
Document revision: 1.3 Date: 17.Apr.2019	ADDRESS: CHATSWOOD NSW 2067	SCORES TARGETED: 49 (4 STAR WITH 4 BUFFER POINTS)

Note: details below are provided as a guide only, where required the project team shall refer to the Green Star Design and As-built submission guidelines v1.2 for further details.

CATEGORY / CREDIT	AIM OF THE CREDIT / SELECTION	CODE	CREDIT CRITERIA	POINTS AVAILABLE	POINTS TARGETED	Compliance Requirements Note:	Design Submission Documentation	As Built Submission Documentation
	criteria.	17B.4	Active Transport Facilities	1	0	1 point is available where bicycle parking and associated facilities are provided to regular building occupants and visitors. The number of regular occupants and visitors is to be based on the project's design occupancy. The project team must justify how the number of regular occupants and visitors has been determined within the Submission Template. Please see the Definitions section for detail on regular occupants and visitors. Default values for regular occupants and visitors may be determined as described in the Guidance section, however in all instances where project design occupancy values are available prior to issuing of Tender documentation, these take precedent. Facilities can be provided within the building's boundary, or outside. If the facilities are outside the site boundary, they must be under the control of the building owner and be accessible to all building occupants and visitors (depending on the users being served by those facilities). Secure bicycle parking is defined as that which is in accordance with AS 2890.3. End-of-trip Facilities for Regular Occupants Where the building type includes regular occupants working in the building (i.e. all non-residential buildings), end-of-trip facilities are also required. End-of-trip facilities are defined as showers, changing amenities with appropriate drying space, and lockers. The number of end-of-trip facilities that must be provided is specified in Table 17B.4.3. End-of trip-facilities do not need to be provided for non-staff occupants such as students of schools, apartment residents or patients of healthcare buildings etc. The design of the end-of trip facilities must be appropriate to encourage their use over that of private vehicle use. Therefore, the project team is expected to justify how their location, locker sizes, privacy requirements, and size are conducive to this aim		
		17B.5	Walkable Neighbourhoods	1	0	1 point is available where the project is located conveniently to amenities or the project achieves a specified Walk Score; One (1) point is awarded where the project complies with one of the following options: •The project is located so that at least four (4) amenities for industrial buildings, or at least eight (8) amenities for all other types of buildings, are within 400m of the project. The distance is to be measured from the centre of the project's site; or •The project achieves a Walk Score of at least 70 for industrial buildings, or at least 80 for all other types of buildings, as determined by the website www.walkscore.com, using the 'street smart' method of calculation. Guidance for manual method of calculation Amenities can be off or on-site and are defined as: convenience stores; pharmacies; post offices, restaurants, food and beverage outlets; gyms, pools and sports facilities; hospitals, clinics and healthcare centres; childcare centres; newsagencies; retail centres; cinemas and theatres; supermarkets and grocery stores; libraries; banks or ATMs; public parks; community centres; churches; and educational facilities (i.e. schools or universities). Amenities that are similar in nature to that of the development cannot be considered for purposes of this credit. For example, a project with residential unit cannot consider other residences as amenities. Where there are two or more of any one amenity this will count as only 2 amenities. Therefore, 3 restaurants will only count as 2 amenities, 4 convenience stores will only count as 2, etc.	•Walk Score Report •Site Plan* showing the amenities nearby	•Site Plan* showing the amenities nearby
Total				10	0			
Water				12				
	Performance Pathway: Up to 12 points are available based on the magnitude of the predicted reduction in potable water consumption, when the project is compared against a Reference Building.	18A.1	Potable Water - Performance Pathway	12	0	This credit addresses the potable water consumption from the use of sanitary fixtures, appliances, HVAC, irrigation systems, and swimming pools (where present). Compliance Requirements and guidance for the Performance Pathway are detailed in the Green Star Potable Water Calculator Guide. Points achieved by the Performance Pathway are determined in accordance with the Green Star Potable Water Calculator. Shared Services This credit rewards projects for reduction in potable water usage due to the use of reclaimed water from on-site rainwater, greywater, blackwater, stormwater or supplied reclaimed water. The Green Star Potable Water Calculator allows for the inclusion of the amount of non-potable water that is available from a central or shared service for use within the building.	Project teams must submit the following documentation: •Submission Template (for the selected compliance pathway) •Evidence to support claims made in the Submission Template for 18A •Completed Green Star – Design & As Built Potable Water Calculator •Drawing(s) clearly showing the location of all heat rejection equipment installed on the project. •Drawings showing the landscape design and the irrigation system, listing the name, location, and plant species zone as it appears in the Calculator. •Manufacturer's information showing that the application efficiency for the landscape irrigation system. •Manufacturer's information including backwash volume and frequency of filter cleaning. •Drawing(s) of process cooling water usage loops. •Contract from off-site water supplier stating the volume to be supplied and date of commencement of delivery where off-site reclaimed water supply is included in the design.	Project teams must submit the following documentation: •Submission Template (for the selected compliance pathway) •Evidence to support claims made in the Submission Template for 18A •Completed Green Star – Design & As Built Potable Water Calculator •Drawing(s) clearly showing the location of all heat rejection equipment installed on the project. •Drawings showing the landscape design and the irrigation system, listing the name, location, and plant species zone as it appears in the Calculator. •Drawing(s) of process cooling water usage loops. •Contract from off-site water supplier stating the volume to be supplied and date of commencement of delivery where off-site reclaimed water supply is included in the design.
		18B.1	Sanitary Fixture Efficiency	1	1	One (1) point is awarded where all fixtures are within one star of the WELS rating stated in the technical manual; Where the project does not contain one or more of these fixtures or equipment items then the WELS rating for that item does not need to be achieved. One (1) point is available where the WELS rating of the remaining fixtures and equipment met the relevant WELS rating criteria.	Project teams must submit the following documentation: •Submission Template (for the selected compliance pathway) •Evidence to support claims made in the Submission Template for 18B •WELS certificates for all toilets, urinals, taps, showers, dishwashers, and residential-scale laundry equipment. •Manufacturer's data for commercial-scale laundry equipment, should be submitted in lieu of WELS certificates. •Drawing(s) for each typical floor showing isolation valves for floor-by-floor testing of the fire sprinkler system, and drawings of the water storage and re-use system(s).	Project teams must submit the following documentation: •Submission Template (for the selected compliance pathway) •Evidence to support claims made in the Submission Template for 18B. •Drawing(s) for each typical floor showing isolation valves for floor-by-floor testing of the fire sprinkler system, and drawings of the water storage and re-use system(s).

Responsible Party (Design Submission)

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17B.4																	
17B.5			x														
18A.1			x				x	x					x				
18B.1			x				x				x	x					

Responsible Party (As Built Submission)

CODE	Building owner (NSW Dep. of Edu)	Builder	Architect (Architectus)	Structural Consultant (Wood & Grieves	Mechanical Consultant (BSE)	Electrical Consultant (BSE)	Hydraulics/Fire Consultant (Wood&Gri	Mechanical Contractor	BMS / Control Contractor	Electrical Contractor	Hydraulics / Fire Contractor	ESD Consultant (BSE)	Landscape Architect (Oculus)	Ecologist	Acoustic Consultant (BSE)	Civil (Wood & Grieves)	Quantity Surveyor (WT Partnership)
17B.4																	
17B.5		x															
18A.1		x	x					x			x	x	x				
18B.1		x	x								x	x					

GREEN STAR SCORECARD & REQUIREMENTS	PROJECT: UPGRADES TO CHATSWOOD PUBLIC SCHOOL & CHATSWOOD HIGH SCHOOL	GREEN STAR TARGET: 4 STAR (MINIMUM SCORES REQUIRED: 45)
Document revision: 1.3 Date: 17.Apr.2019	ADDRESS: CHATSWOOD NSW 2067	SCORES TARGETED: 49 (4 STAR WITH 4 BUFFER POINTS)

Note: details below are provided as a guide only, where required the project team shall refer to the Green Star Design and As-built submission guidelines v1.2 for further details.

CATEGORY / CREDIT	AIM OF THE CREDIT / SELECTION	CODE	CREDIT CRITERIA	POINTS AVAILABLE	POINTS TARGETED	Compliance Requirements Note:	Design Submission Documentation	As Built Submission Documentation
Potable Water	Prescriptive Pathway: Up to 6 points out of 12 are available where it is demonstrated that the building's potable water consumption has been reduced through best practice water saving design features.	18B.2	Rainwater Reuse	1	1	One (1) point is awarded when a rainwater tank is installed to collect and reuse rainwater, within the project's site boundary as deemed appropriate by the project team. The rainwater tank size must meet the criteria contained in the technical manual; Where the GFA of the building falls between the figures outlined in the above Table, or for projects above or below the areas listed in the Table, a ratio of 10 L/m2 shall be used to determine the minimum tank size required to meet the Compliance Requirements. The requirements provide a minimum tank size. To achieve the best outcome for the project the sizing of the rainwater tank should be based on the collection area, the rainfall in a particular location, and the demands for rainwater use on the project. It is recognised that the sizing of the rainwater tank is highly dependant on the collection area, the rainfall in a particular location, and the demands for rainwater on the project. The sizing of the rainwater tank has been over-simplified for this DTS methodology. Project teams should not rely on this sizing information to achieve the best outcome for their project. Project teams wishing to use the Performance Pathway to accurately size the rainwater tank, may submit a Technical Question (formerly known as Credit Interpretation Request).	Tank specification indicating size and location of the rainwater system and the connections to the water end uses.	Tank specification indicating size and location of the rainwater system and the connections to the water end uses.
		18B.3	Heat Rejection	2	2	Two (2) points are awarded where no water is used for heat rejection. To comply, the project must be either naturally ventilated (allowing for the use of ceiling fans or similar) or the HVAC system must not use water for heat rejection. To claim that the project is naturally ventilated, it must be demonstrated that the building is naturally ventilated in accordance with AS1668.4-2012 The use of ventilation and air-conditioning in buildings – Part 4: Natural Ventilation of buildings. To claim that no water based heat rejection system is used it must be demonstrated that the air conditioning needs of the project are met by means other than water based heat rejection.	•Drawing(s) of process cooling water usage loops.	•Drawing(s) of process cooling water usage loops.
		18B.4	Landscape Irrigation	1	1	One (1) point is awarded where either drip irrigation with moisture sensor override is installed, or where no potable water is used for irrigation. The landscaping and associated systems must be designed to reduce the consumption of potable water required for irrigation through the installation of subsoil drip irrigation and moisture sensor controls. In the case of a xeriscape garden, the provision of irrigation systems must be able to be removed within three months of landscaping installation and the landscaping must not require watering after this time. Where the building has no landscaping (including roof, vertical and planter gardens) or landscaping represents less than 1% of the site area, this point is 'Not Applicable' and is excluded from the points available.	Landscape/Hydraulics drawings showing either the drip irrigation system, or showing the location of the xeriscape garden.	Landscape/Hydraulics drawings showing either the drip irrigation system, or showing the location of the xeriscape garden.
□		18B.5	Fire System Test Water	1	0	One (1) point is awarded when one of the following conditions is met: •The fire protection system does not expel water for testing; or •The fire protection system includes temporary storage for 80% of the routine fire protection system test water and maintenance drain-downs for reuse on-site calculated on the basis that any single zone is drained down annually. •If sprinkler systems are installed, each floor must be fitted with isolation valves or shut-off points for floor-by-floor testing. ||The Fire Protection System Test Water criterion (18B.5) is deemed 'Not applicable' for projects where: □A sprinkler system is not required under Part E of the NCC, or □A sprinkler system is not provided by the project team, and Does not include a water-based fire protection system	Extracts from the Fire Engineering Report where it states that the building's fire suppression system has no sprinklers.	Extracts from the Fire Engineering Report where it states that the building's fire suppression system has no sprinklers.
Total				**12**	**5**			
Materials				**14**				
Life Cycle Impacts	ance Pathway - Life Cycle Ass	19A.1	Comparative Life Cycle Assessment: Up to 6 points are available where a whole-of-building, whole- of-life (cradle-to-grave) life cycle assessment (LCA) is conducted for the project and a reference building. Points are awarded based on the extent of environmental impact reduction achieved for nominated environmental impact categories, when compared to a reference building. Points from operational energy reductions are capped at 3 out of the 6 points available for 19A.1. Please refer to the Compliance Requirements for further details	6	0	Projects that choose to use the 'Life Cycle Assessment' credit may not use the 'Life Cycle Impacts' credit and vice-versa. The 'Life Cycle Assessment' credit is considered the performance approach to addressing environmental impacts of materials, whilst the 'Life Cycle Impacts' credit takes the prescriptive approach. . Project teams shall demonstrate the reduction of environmental impacts when compared to the reference building. Points are awarded based on the extent of environmental impact reduction achieved against seven defined environmental impact categories. The LCA shall use a whole-of-building, whole-of-life methodology in accordance with 19A.1.1, an appropriately defined reference building in accordance with 19A.1.2, and shall be peer reviewed in accordance with 19A.1.3. Both the LCA and the peer review shall be carried out by a competent LCA practitioner in accordance with 19A.1.4. Points are awarded based on a cumulative percentage impact reduction calculation. This is defined as the sum of all impact category changes between the project and the reference building. One point may be claimed for the first 30% cumulative reduction and an additional point for every additional 20% cumulative reduction to a maximum of 6 points (i.e. a 130% cumulative reduction), in line with Table 19A.1. The final score is rounded to one decimal place. || The points calculation is performed in the Green Star – Design & As Built: LCA Calculator. The points available due to operational energy reduction (EN 15978 Module B6) are capped at 3 out of the 6 points. This is in place to decrease the double-counting of operational energy benefits, as rewarded within the 'Greenhouse Gas Emissions' credit. The remaining 3 points available must be achieved under the other Modules. The points cap may not always be applied – a total of 6 points may be achieved solely under the other Modules, however no more than 3 points can be achieved under Module B6. Project teams are required to input the results for the reference and proposed projects in the Green Star – Design & As Built: LCA Calculator which applies the above calculation methodology. || R2.19A.02 Impact category reductions are equally weighted. Increases in impact are calculated as a percentage of the cumulative sum, including Module B6. Where the whole-of-life impact in any category is increased by more than 10%, no points may be claimed for this entire credit. Refer technical manual for 19A.1.1 LCA METHODOLOGY, 19A.1.2 DEFINITION OF REFERENCE BUILDING, 19A.1.3 PEER REVIEW, and 19A.1.4 COMPETENT LCA PRACTITIONER	Project teams must submit the following documentation: •Submission Template •Evidence to support claims made in the Submission Template •Green Star – Design & As Built: LCA Calculator •LCA Report - The LCA report is to be presented in accordance with ISO 14044. The LCA report must confirm the LCA methodology of the credit has been followed and that no impact increases by more than 10% when compared to the reference building score. The peer review statement, comments of the practitioner and any response to recommendations made by the reviewer shall be included in the LCA report. If points are claimed for the use of LCA in materials and/or construction impact reduction, or within design review, the processes and findings shall be clearly stated in the LCA Report. •Peer Review Statement - A peer review statement is a summary of the peer review findings signed by the peer reviewer, it must be clear that the peer reviewer statement refers to the final LCA report for the project, the same report which is submitted for this credit, by reference to specific document versions, dates or other means. •LCA practitioner competencies statement or LCACP certificate for practitioner and peer reviewer. •Standard Practice Reference Building Documentation - Signed declarations from the principal architect and engineer for the project, confirming that the reference building was constructed in accordance with the specific requirements and guidance of this credit. Also confirming the reference building design, technologies and construction are true representation of contemporary practice for the type and function of the project. •Actual Reference Building Documentation - Signed declarations from the principal architect and engineer for the project, confirming and demonstrating how the reference building meets the specific guidance above.	Project teams must submit the following documentation: •Submission Template •Evidence to support claims made in the Submission Template •Green Star – Design & As Built: LCA Calculator •LCA Report - The LCA report is to be presented in accordance with ISO 14044. The LCA report must confirm the LCA methodology of the credit has been followed and that no impact increases by more than 10% when compared to the reference building score. The peer review statement, comments of the practitioner and any response to recommendations made by the reviewer shall be included in the LCA report. If points are claimed for the use of LCA in materials and/or construction impact reduction, or within design review, the processes and findings shall be clearly stated in the LCA Report. •Peer Review Statement - A peer review statement is a summary of the peer review findings signed by the peer reviewer, it must be clear that the peer reviewer statement refers to the final LCA report for the project, the same report which is submitted for this credit, by reference to specific document versions, dates or other means. •LCA practitioner competencies statement or LCACP certificate for practitioner and peer reviewer. •Standard Practice Reference Building Documentation - Signed declarations from the principal architect and engineer for the project, confirming that the reference building was constructed in accordance with the specific requirements and guidance of this credit. Also confirming the reference building design, technologies and construction are true representation of contemporary practice for the type and function of the project. •Actual Reference Building Documentation - Signed declarations from the principal architect and engineer for the project, confirming and demonstrating how the reference building meets the specific guidance above.
		19A.2	Additional Life Cycle Impact Reporting: Up to 4 additional points are available where the LCA is used to inform the building's design process or as built outcome. Any combination of the below four initiatives may be targeted: •Additional life cycle impact reporting; •Material selection improvement; •Construction process improvement; or •LCA Design Review.	4	0			

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18B.2			x				x									x	
18B.3								x									
18B.4							x						x				
18B.5							x										
Total																	
Materials																	
19A.1 / 19A.2		x	x	x	x	x	x									x	x

Responsible Party (As Built Submission Documentation)

CODE	Building owner (NSW Dep. of Edu)	Builder	Architect (Architectus)	Structural Consultant (Wood & Grieves)	Mechanical Consultant (BSE)	Electrical Consultant (BSE)	Hydraulics/Fire Consultant (Wood&Gri	Mechanical Contractor	BMS / Control Contractor	Electrical Contractor	Hydraulics / Fire Contractor	ESD Consultant (BSE)	Landscape Architect (Oculus)	Ecologist	Acoustic Consultant (BSE)	Civil (Wood & Grieves)	Quantity Surveyor (WT Partnership)
18B.2		x									x					x	
18B.3								x									
18B.4											x		x				
18B.5		x									x						
Total																	
Materials																	
19A.1 / 19A.2		x	x	x				x	x	x	x					x	x

GREEN STAR SCORECARD & REQUIREMENTS | **PROJECT: UPGRADES TO CHATSWOOD PUBLIC SCHOOL & CHATSWOOD HIGH SCHOOL** | **GREEN STAR TARGET: 4 STAR (MINIMUM SCORES REQUIRED: 45)**

Document revision: 1.3 | **Date: 17.Apr.2019** | **ADDRESS: CHATSWOOD NSW 2067** | **SCORES TARGETED: 49 (4 STAR WITH 4 BUFFER POINTS)**

BSE TRUE PARTNERS

Note: details below are provided as a guide only, where required the project team shall refer to the Green Star Design and As-built submission guidelines v1.2 for further details.

CATEGORY / CREDIT	AIM OF THE CREDIT / SELECTION	CODE	CREDIT CRITERIA	POINTS AVAILABLE	POINTS TARGETED	Compliance Requirements Note:
		19B.1	Concrete: Refer 19B1.1 - 19B1.3; NOTE: If the cost of all poured concrete (all costs) represents less than 1% of the project's contract value, the 'Life Cycle Impacts – Concrete' pathway (19B.1) cannot be targeted. This credit addresses all new concrete used in the project including structural and non-structural uses. Concrete masonry, including core-filled, is excluded. Recycled concrete elements may also be targeted under the 'Sustainable Products' credit (21).	2	0	19B1.1 Portland Cement Reduction: 1 point is available where the Portland cement content is reduced by 30%, measured by mass across all concrete used in the project compared to the reference case; OR 2 points are available where the Portland cement content is reduced by 40%, measured by mass across all concrete used in the project compared to the reference case. Further information available in the technical manual.
				0.5	0	19B1.2 Water Reduction: 0.5 point is available where the mix water for all concrete used in the project contains at least 50% captured or reclaimed water (measured across all concrete mixes in the project). Further information available in the technical manual.
				0.5	0	19B1.3:Aggregates Reduction 0.5 point is available where either: At least 40% of coarse aggregate in the concrete is crushed slag aggregate or another alternative materials (measured by mass across all concrete mixes in the project), provided that use of such materials does not increase the use of Portland cement by over five kilograms per cubic meter of concrete; OR At least 25% of fine aggregate (sand) inputs in the concrete are manufactured sand or other alternative materials (measured by mass across all concrete mixes in the project), provided that use of such materials does not increase the use of Portland cement by over five kilograms per cubic meter of concrete. Further information available in the technical manual.
		19B.2	Steel; Refer 19B2.A - 19B2.B; Note: If the material cost of structural and reinforcing steels represents less than 1% of the project's total contract value, or there are no new structural or reinforcing steels used in the project, the 'Life Cycle Impacts – Steel' pathway (19B.2) cannot be claimed. All benchmark calculations in this credit are based on the mass of steel in the building.	1	0	19B2.A: Reduced Mass of Steel Framing (Steel framed building): Up to 1 point is available when there is a reduction in the mass of steel framing used when compared to standard practice. The reduced mass of steel framing can be demonstrated by one of the following design initiatives: •High strength steel; or •Reduction in mass of steel framing by 5% when compared to a suitable reference building High Strength Steel For this option, project teams must demonstrate that 95% of Category A products and 25% of Category B products meet the strength grades specified in Table 19B.2A.1 and Table 19B.2A.2, as applicable. Please refer the technical manual for further information.
				1	0	19B2.B: Reduced Use of Steel Reinforcement (Concrete framed building); Up to 1 point is available when there is a reduction in the mass of steel reinforcement used when compared to standard practice. To demonstrate compliance the Submission Template must be completed by a qualified Structural Engineer that includes the following: •A description of how the amount of reinforcing steel has been reduced; •Calculations of the reduction in the total amount (by mass) of reinforcement necessary for the design structure against a reference case; •Standard reinforcement detailing shall be defined by an industry standard such as the Reinforcement Detailing Handbook – Concrete Institute of Australia; •Justification of the reference case reinforcing rates; •Confirm that the reduction has been achieved by without changing the load path to other structure elements that are not steel. Please refer the technical manual for further information.
		19B.3	Building Reuse; refer 19B3.1 - 19B3.2. Note: Where the site contained no buildings at the time of purchase, or the total GFA of the original building(s) is less than 20% of the GFA of the new building that replaces it, the 'Life Cycle Impacts – Building Reuse' pathway cannot be targeted.	2	0	19B3.1: Façade Reuse; 1point is available where at least 50% (by area) of the building façade is retained; OR 2 points are available where the proportion retained is 80%.. The proportion of the total façade being reused shall be demonstrated by vertical area. Refurbishment of Existing Elements Refurbishment of a reused façade element is inconsequential to determining whether the element is reused. However, where more than 20% of a façade element is replaced as part of the refurbishment, the element may not be counted as reused. The proportion of the façade refurbishment should be measured by length, volume or mass, whichever is more appropriate and the metric chosen must be justified by the project team.
				2	0	19B3.2: Structure Reuse; 1 point is available where at least 30% (by mass) of the existing major structure is retained; OR 2 points are available where the proportion retained is 60%.; Major structure is defined as floors, columns, beams, load bearing walls and foundations. The measure of retained building structure shall be based on gross building volume. Gross building volume is measured as the building footprint (m2) x building height (m). For a proportion of the existing major structure to be considered reused, all the major structural elements must be retained in that part of the building. The reused percentage should be calculated as a proportion of the existing structure volume. Refurbishment of Existing Elements Refurbishment of a structural element is inconsequential to determining whether the element is reused. However, where more than 20% of a structural element is replaced as part of the refurbishment, the element may not be counted as reused. The proportion of the structural element. refurbishment should be measured by length, volume or mass, whichever is more appropriate and the metric chosen must be justified by the project team

CODE	Design Submission Documentation	Building owner (NSW Dep. of Edu)	Builder	Architect (Architectus)	Structural Consultant (Wood & Grieves)	Mechanical Consultant (BSE)	Electrical Consultant (BSE)	Hydraulics/Fire Consultant (Wood&Gri	Mechanical Contractor	BMS / Control Contractor	Electrical Contractor	Hydraulics / Fire Contractor	ESD Consultant (BSE)	Landscape Architect (Oculus)	Ecologist	Acoustic Consultant (BSE)	Civil (Wood & Grieves)	Quantity Surveyor (WT Partnership)
19B.1	Project teams must submit the following documentation: •Submission Template •Evidence to support claims made in the Submission Template •Structural Specifications •Structural Drawings •Structural Engineer's report, including: Summary calculation of the Portland cement content in the project based on the reference case and the actual case as well as showing the percentage reduction of Portland cement. Identifying all water or coarse or fine aggregate uses in the project and demonstrating how the Credit Criteria is met. •Concrete suppliers submission detailing target mix designs for each product supplied to the project identifying strength grade of the concrete, any special properties associated with each product, quantities and types of Cement, supplementary cementitious materials, water, coarse aggregates and fine aggregates. •Confirmation from the Architect, Quantity Surveyor or Head Contractor that no new concrete is specified in the project; or comparing the cost of concrete specified in the project against the project's total contract value.		x	x	x													
19B.2	Project teams must submit the following documentation: •Submission Template •Evidence to support claims made in the Submission Template Recommended Supporting Evidence •Steel Quantity Summary produced by the Quantity Surveyor or other qualified professional tabulating uses of steel in the project, its source, specification and mass. •Structural Engineer's or Quantity Surveyors Report demonstrating the reduction in mass of structural steel framing or reinforcing steel in the building. •Summary of steel quantities produced by BIM model. •Drawings supporting claims of optimal fabrication techniques. •Quantities (by mass) of structural and reinforcing steel as percentages of the total steel products installed in the building (structural steel and reinforcing steel only). •Total cost of new steel specified in the project against the project's total contract value and the percentage (by mass) of structural steel framing and steel reinforcement summarised in a report by the Quantity Survey, Project Manager, Cost Planner or other qualified professional.					x						x						x
19B.3	Project teams must submit the following documentation: •Submission Template •Evidence to support claims made in the Submission Template Recommended Supporting Evidence •Demolition or Site Drawings Indicating the structures on site at time of purchase, extent of demolition and retained structure and façade.		x	x													x	

CODE	As Built Submission Documentation	Building owner (NSW Dep. of Edu)	Builder	Architect (Architectus)	Structural Consultant (Wood & Grieves)	Mechanical Consultant (BSE)	Electrical Consultant (BSE)	Hydraulics/Fire Consultant (Wood&Gri	Mechanical Contractor	BMS / Control Contractor	Electrical Contractor	Hydraulics / Fire Contractor	ESD Consultant (BSE)	Landscape Architect (Oculus)	Ecologist	Acoustic Consultant (BSE)	Civil (Wood & Grieves)	Quantity Surveyor (WT Partnership)
19B.1	Project teams must submit the following documentation: •Submission Template •Evidence to support claims made in the Submission Template Summary calculation of the Portland cement content in the project based on the reference case and the actual case as well as showing the percentage reduction of Portland cement. Identifying all water or coarse or fine aggregate uses in the project and demonstrating how the Credit Criteria is met. •Concrete suppliers submission detailing target mix designs for each product supplied to the project identifying strength grade of the concrete, any special properties associated with each product, quantities and types of Cement, supplementary cementitious materials, water, coarse aggregates and fine aggregates. •Confirmation from the Architect, Quantity Surveyor or Head Contractor that no new concrete is specified in the project; or comparing the cost of concrete specified in the project against the project's total contract value.		x	x	x													
19B.2	Project teams must submit the following documentation: •Submission Template •Evidence to support claims made in the Submission Template Recommended Supporting Evidence •Steel Quantity Summary produced by the Quantity Surveyor or other qualified professional tabulating uses of steel in the project, its source, specification and mass. •Drawings supporting claims of optimal fabrication techniques. •Quantities (by mass) of structural and reinforcing steel as percentages of the total steel products installed in the building (structural steel and reinforcing steel only). •Total cost of new steel specified in the project against the project's total contract value and the percentage (by mass) of structural steel framing and steel reinforcement summarised in a report by the Quantity Survey, Project Manager, Cost Planner or other qualified professional.		x		x													x
19B.3	N/A		x															

GREEN STAR SCORECARD & REQUIREMENTS	PROJECT: UPGRADES TO CHATSWOOD PUBLIC SCHOOL & CHATSWOOD HIGH SCHOOL	GREEN STAR TARGET: 4 STAR (MINIMUM SCORES REQUIRED: 45)
Document revision: 1.3 Date: 17.Apr.2019	ADDRESS: CHATSWOOD NSW 2067	SCORES TARGETED: 49 (4 STAR WITH 4 BUFFER POINTS)

Note: details below are provided as a guide only, where required the project team shall refer to the Green Star Design and As-built submission guidelines v1.2 for further details.

CATEGORY / CREDIT	AIM OF THE CREDIT / SELECTION	CODE	CREDIT CRITERIA	POINTS AVAILABLE	POINTS TARGETED	Compliance Requirements Note:	Design Submission Documentation	As Built Submission Documentation
Responsible Building Materials	To reward projects that include materials that are responsibly sourced or have a sustainable supply chain.	19B.4	Structural Timber: To qualify for points in this credit a minimum requirement must be met: 19B.4.0 Responsible Sourcing : The minimum requirement is met where all structural timber used in the building is responsibly sourced. 19B 4.1 Reduced Embodied Impacts: Up to 3 points are available where the building is constructed from the following proportion of structural timber: •1 point for 30% of the building's GFA; •2 points for 70% of the building's GFA; and •3 points for 90% of the building's GFA. If the structural timber used represents less than 30% of the building's GFA, then the 'Life Cycle Impacts – Structural Timber' pathway (19B.4) cannot be targeted.	4	0	19B.4.0 RESPONSIBLE SOURCING It is a minimum requirement for this criterion that all structural timber used in the building is FSC or PEFC certified. Compliance shall be demonstrated by either achieving the 'Responsible Building Materials – Timber Products' credit criteria or providing all relevant supporting documentation in this criterion submission. Please refer to the Documentation Requirements section. 19B.4.1 REDUCED EMBODIED IMPACTS Up to three (3) points are awarded based on the proportion (by gross floor area) of structural timber used in the building. Any gross floor area (GFA) that is constructed and / or supported from structural timber is deemed compliant. Any GFA where the vertical structure is not primarily structural timber shall not be included as compliant area. This may include concrete cores, lift shafts or hybrid material structure. Floor area calculations shall be taken from above the ground plane, inclusive of any on-grade or ground floor slab. Any floors located below ground should not be included in the area calculations. Additionally, calculations only apply to the new floor area constructed as part of the project's scope of works – existing floor area should be excluded. Where the minimum requirement is met, the following points will be awarded: •For 30% of the building's GFA – 1 point; •For 70% of the building's GFA – 2 points; and •For 90% of the building's GFA – 3 points. Points will be awarded on a sliding scale basis, up to one decimal place. For example, where the structural timber used in the building is 40% of the GFA, 1.3 points will be awarded.	Project teams must submit the following documentation: •Submission Template •Evidence to support claims made in the Submission Template Recommended Supporting Evidence 19B.4.0 Minimum Product Attributes •Where the minimum requirement for the structural timber has not been met by achieving the corresponding criteria, provide Documentation Requirements as per the following: o20.2 'Responsible Building Materials – Timber Products'. •Where the minimum requirement for the structural timber has been met by achieving the corresponding criteria, no further documentation is required in this criterion submission. 19B.4.1 Structural – Reduced Embodied Impacts •Floor plans and section drawings marked-up identifying which areas of the building are constructed and / or supported from structural engineered timber. •Area schedule identifying the compliant proportion of the building's GFA. •Structural Engineer's report including summary calculations of the compliant proportion of the building's GFA.	Project teams must submit the following documentation: •Submission Template •Evidence to support claims made in the Submission Template Recommended Supporting Evidence 19B.4.0 Minimum Product Attributes •Where the minimum requirement for the structural timber has not been met by achieving the corresponding criteria, provide Documentation Requirements as per the following: o20.2 'Responsible Building Materials – Timber Products'. •Where the minimum requirement for the structural timber has been met by achieving the corresponding criteria, no further documentation is required in this criterion submission. 19B.4.1 Structural – Reduced Embodied Impacts •Floor plans and section drawings marked-up identifying which areas of the building are constructed and / or supported from structural engineered timber. •Area schedule identifying the compliant proportion of the building's GFA. •Structural Engineer's report including summary calculations of the compliant proportion of the building's GFA.
		20.1	Structural and Reinforcing Steel; Note: Where the cost of structural and reinforcing steels is less than 1% of the Project Contract Value, or there are no new structural or reinforcing steels used in the project, this criterion is made 'Not Applicable'.	1	1	1 point is available where 95% of the building's steel (by mass) is sourced from a 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); or •For concrete framed buildings, at least 60% (by mass) of all reinforcing bar and mesh is produced using energy-reducing processed in its manufacture (measured by average mass by steel maker annually). 20.1.0Responsible Steel Maker For a steel manufacturer or a steel maker to be considered a responsible source of steel, they must show that they comply with both of the following initiatives: •The steel making facilities where the structural and/or reinforcing steel for the project is sourced have a currently valid and certified ISO 14001 Environmental Management System (EMS) in place. Valid ISO 14001 Environmental Management System (EMS) certificates must be provided from the steel making facilities where the structural and/or reinforcing steels in the project were produced; and •The steel maker supplying the steel is a member of the World Steel Association's (WSA) Climate Action Programme (CAP). A current CAP certificate from the WSA, confirming that the steel maker is a member of the CAP, must be provided. Certificates are valid for a period of two years and must be current at the time that the Green Star documentation is submitted to achieve points for this criterion. 20.1A Responsible Steel Fabricator For a steel fabricator to be considered a responsible source of steel, they must show that they are a current member of the ASI's Environmental Sustainability Charter Group 20.1B Energy-Reducing Processes in Steel Reinforcement Production Energy reduction arising from energy-reducing processes must equate to at least 40 MJ/tonne, measured as a percentage of annual mass of reinforcing steel produced by the steel maker. To determine compliance with this benchmark, a lifecycle assessment must be made in accordance with the Protocol for Demonstrating Equivalency in Energy Reduction provided in the Guidance section. Reinforcing steel products sourced from a steel maker using a Polymer Injection Technology (PIT, as developed by the University of NSW) in manufacturing their reinforcing products is an acceptable method of demonstrating compliance with this criterion. Where the reinforcing steel products are not made using Electric Arc Furnace (EAF) technology, it shall be shown that the alternative production method is at least environmentally equivalent to EAF steel.	Project teams must submit the following documentation: •Submission Template •Evidence to support claims made in the Submission Template •Structural drawings •Structural Specifications •Steel Producer's ISO14001 certificate •Details of Steel Fabricators membership of ASI Environmental Sustainability Charter •Energy-Reducing Processes Report from every reinforcing steel maker, explaining the energy-reducing processes used in their steel making process and confirming that it is used in the production of at least 60% of the reinforcement products they produce on an annual basis. (See Polymer Injection Technology and Equivalency Protocol explanations in Guidance). The report must contain a summary of the life cycle assessment result for this technology in accordance with the Equivalency Protocol. •Confirmation from the Supplier stating, where relevant based on the credit criteria claimed: oThat they are a responsible steel maker, and listing their compliance documentation.	Project teams must submit the following documentation: •Submission Template •Evidence to support claims made in the Submission Template •Bill of Quantities / Report from Quantity Surveyor / Cost Planner / Project Manager or other qualified professional •Structural drawings •Confirmation from the Supplier stating, where relevant based on the credit criteria claimed: oThe total quantities (by mass) of structural and/or reinforcing steel supplied to the building.
		20.2	Timber Products; Note: Where the cost of timber is less than 0.1% of the Project Contract Value, this criterion is made 'Not Applicable'.	1	1	1 point is available where at least 95% (by cost) of all timber used in the building and construction works is either: •Certified by a forest certification scheme that meets the GBCA's 'Essential' criteria for forest certification; or •Is from a reused source. 20.2A Certified Timber Timber must be sourced from forests that have been certified by forest certification schemes that are deemed to satisfy the minimum requirements of the GBCA's 'Essential Criteria' for forest certification (refer to the Guidance section for further details). Timber and timber products sourced from certified forests must be accompanied by a relevant Chain of Custody (CoC) in order to be recognised as certified timber. Currently in Australia, FSC International and PEFC-accredited forest certification schemes both meet the GBCA's 'Essential' criteria. 20.2B Reused Timber Timber that is reused includes timber that is pre-existing in a building and timber that is procured from a second-hand source (refer to the Definitions section for further details).	•Bill of Quantities / Report from Quantity Surveyor / Cost Planner / Project Manager or other qualified professional •Invoices confirming types of timber product and quoting chain of custody code.	•Bill of Quantities / Report from Quantity Surveyor / Cost Planner / Project Manager or other qualified professional •Invoices confirming types of timber product and quoting chain of custody code.
			Permanent Formwork, Pipes, Flooring, Blinds and Cables; Note: Where the cost of PVC products in the project is less than 1% of the Project Contract Value this criterion is made 'Not Applicable'.			1 point is available where 90% (by cost) of all permanent formwork, pipes, flooring, blinds and cables in a project either: •Do not contain PVC and have a recognised product declaration; or •Meet the GBCA's Best Practice Guidelines for PVC. 20.3A Products that do not contain PVC For this option, project teams shall demonstrate that PVC products used in the project do not contain PVC by providing either a: •Safety data sheet (SDS) or equivalent, that describes the composition of the products; or •Environmental Product Declaration (EPD) for the product. Compliance may be demonstrated with an industry-wide EPD	•Bill of Quantities / Report from Quantity Surveyor / Cost Planner / Project Manager or other qualified professional •Best Practice Guidelines Certificate for PVC product. •Invoices confirming types of PVC products used •Product data sheets and SDSs or EPDs.	•Bill of Quantities / Report from Quantity Surveyor / Cost Planner / Project Manager or other qualified professional •Best Practice Guidelines Certificate for PVC product. •Invoices confirming types of PVC products used •Product data sheets and SDSs or EPDs.

Responsible Party (Design Submission Documentation)

CODE	Building owner (NSW Dep. of Edu)	Builder	Architect (Architectus)	Structural Consultant (Wood & Grieves	Mechanical Consultant (BSE)	Electrical Consultant (BSE)	Hydraulics/Fire Consultant (Wood&Gri	Mechanical Contractor	BMS / Control Contractor	Electrical Contractor	Hydraulics / Fire Contractor	ESD Consultant (BSE)	Landscape Architect (Oculus)	Ecologist	Acoustic Consultant (BSE)	Civil (Wood & Grieves)	Quantity Surveyor (WT Partnership)
19B.4			x	x													
20.1		x		x													x
20.2		x	x													x	

Responsible Party (As Built Submission Documentation)

CODE	Building owner (NSW Dep. of Edu)	Builder	Architect (Architectus)	Structural Consultant (Wood & Grieves	Mechanical Consultant (BSE)	Electrical Consultant (BSE)	Hydraulics/Fire Consultant (Wood&Gri	Mechanical Contractor	BMS / Control Contractor	Electrical Contractor	Hydraulics / Fire Contractor	ESD Consultant (BSE)	Landscape Architect (Oculus)	Ecologist	Acoustic Consultant (BSE)	Civil (Wood & Grieves)	Quantity Surveyor (WT Partnership)
19B.4		x	x														
20.1		x		x													x
20.2		x	x														x

GREEN STAR SCORECARD & REQUIREMENTS | **PROJECT: UPGRADES TO CHATSWOOD PUBLIC SCHOOL & CHATSWOOD HIGH SCHOOL** | **GREEN STAR TARGET: 4 STAR (MINIMUM SCORES REQUIRED: 45)**

Document revision: 1.3 **Date: 17.Apr.2019** | **ADDRESS: CHATSWOOD NSW 2067** | **SCORES TARGETED: 49 (4 STAR WITH 4 BUFFER POINTS)**

Note: details below are provided as a guide only, where required the project team shall refer to the Green Star Design and As-built submission guidelines v1.2 for further details.

CATEGORY / CREDIT	AIM OF THE CREDIT / SELECTION	CODE	CREDIT CRITERIA	POINTS AVAILABLE	POINTS TARGETED	Compliance Requirements Note:	Design Submission Documentation	As Built Submission Documentation
		20.3		1	1	20.3B Best Practice Guidelines for PVC For this option, project teams shall demonstrate that PVC products used in the project meet the GBCA's Best Practice Guidelines for PVC. Compliance of a PVC product to the Guidelines shall be demonstrated using any of the following options: •A valid audit verification certificate for each of the PVC products specified or used in the project. The certificate must clearly state the product name, compliance against the GBCA's Best Practice Guidelines for PVC, date of validity, auditor's name, and signature. The auditor must be JAS-ANZ accredited. •A product accreditation certificate from a Green Building Council of Australia accredited scheme. The scheme must clearly reference the guidelines in their standard.||R2.20.02 Note: An Auditor Verification Guidance document is available on the GBCA website, this document provides the means by which the auditor must establish compliance		
Sustainable Products	To encourage sustainability and transparency in product specification.	21.1	Product Transparency and Sustainability; Note: Points are calculated based on specified benchmarks for the percentage of compliant products used in the project.	3	3	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 awarded based on the percentage value of the products that meet one of the specified initiatives. This is demonstrated by calculating the Project Sustainability Value (PSV) and comparing it with the Project Contract Value (PCV). Points are calculated by completion of the Green Star – Design & As Built: Sustainable Products Calculator. Points are awarded as detailed in the technical manual 21A: Reused Products are items that are have been previously used and are incorporated in the project without significant changes to the structure or function of the item. Cleaning, making good, repairs, recovering and resurfacing are allowed. 21B: Recycled Content Products; are items produced with recovered materials. The Sustainability Factor of a recycled content product represents the fraction of pre- and post-consumer recovered content included in the product by mass. For example, if a product has 75% recycled content, the Sustainability Factor is 0.75. 21C: Environmental Product Declarations. There are several independent EPD schemes operating globally, providing services associated with the release and publishing of EPDs on behalf of scheme participants. EPD schemes can differ in format and scope, including in the life cycle stages considered and whether the EPDs are independently verified. Only EPDs published by schemes that consider a minimum cradle-to-gate scope and include independent verification are recognised in this credit. Published EPDs shall confirm compliance to listed standards and include the scope considered, and by whom the EPD was verified. For compliance with this credit, two EPD formats are recognised as follows: Products with a product-specific, third-party verified EPD For this format the following minimum requirements apply: •The EPD is issued in conformance with ISO 14025 or EN15804; •The EPD must be independently-audited; and •The EPD must be based on a cradle-to-gate scope as a minimum. Products with an industry-wide, third-party verified EPD For this format the following minimum requirements apply: •The EPD is issued in conformance with ISO 14025 or EN15804; •The EPD must be independently-audited; •The EPD must be based on a cradle-to-gate scope as a minimum; and •The product manufacturer must be recognised as a participant in the EPD 21D: Third-Party Certification. Third Party Certification levels A, B & C are defined in the GBCA's Framework for Product Certification Scheme. Several certification schemes have been assessed against the GBCA Framework for Product Certification Scheme and meet the requirements for the Third Party Certification requirement in this credit. These schemes are listed on the GBCA website. Other certification schemes can apply for assessment. For more information, refer to the Product Certification information page on the GBCA's website: http://new.gbca.org.au/product-certification-schemes/ 21E: Stewardship Program: Product stewardship programs encourage projects and suppliers to share responsibility for the effective reduction, reuse, recycling or recovery of products. Product stewardship also helps manage environmental harm arising from the product when it becomes waste. Products stewardship programs must be demonstrated with a product stewardship contract. The two types of Product Stewardship Contracts, for a leased item and a purchased item, are defined below. Product Stewardship Contract – Leased Item For this arrangement the following minimum requirements apply: •The contract must be between a supplier and the building owner or tenant; •The supplier must agree to collect the item at the lease end for re-lease, re-use or recycling; and •The contract may not include exemptions which relate to timing, quality or quantity that will be accepted for collection. Product Stewardship Contract – Purchased Item For this arrangement the following minimum requirements apply: •The contract must be between a supplier and the building owner or tenant; •The supplier must agree to collect item at the end of use for re-lease, re-use or recycling; and •The contract may not include exemptions which relate to timing, quality or quantity that will be accepted for collection.	Project teams must submit the following documentation: •Submission Template •Evidence to support claims made in the Submission Template •Sustainable Products Calculator •Confirmation of Project Cost from quantity surveyor or other qualified professional •Product Certification Certificate outlining the environmental credentials of the product •Environmental Product Declarations certificates	Project teams must submit the following documentation: •Submission Template •Evidence to support claims made in the Submission Template •Sustainable Products Calculator •Confirmation of Project Cost from quantity surveyor or other qualified professional •Confirmation from supplier that products supplied are recycled, recycled content and cost •Quantity Surveyors Report or other evidence of cost of certified products •Evidence of product cost •Product Stewardship contracts
Construction and Demolition Waste	This credit includes a minimum requirement that must first be met to qualify for points, and two alternative pathways to demonstrate reductions in waste going to landfill.	22	Reporting Accuracy	_	0	The minimum requirement is met where the waste contractors and waste processing facilities servicing the project demonstrate compliance with the Green Star Construction and Demolition Waste Reporting Criteria. All waste contractors and waste processing facilities that provide waste management and reporting services to Green Star projects must either: •Hold a 'Compliance Verification Summary' issued by a 'Suitably Qualified Auditor', confirming compliance with the Green Star Construction and Demolition Waste Reporting Criteria; or • Where a 'Compliance Verification Summary' has not been obtained, complete a 'Disclosure Statement' outlining how much of the Green Star Construction and Demolition Waste Reporting Criteria has been implemented. For full details and definitions of the terms 'Compliance Verification Summary' and 'Suitably Qualified Auditor', please refer to the Green Star Construction and Demolition Waste Reporting Criteria. This verification of compliance is a prerequisite for the recognition and acceptance of the waste reports to be provided under either of the below two pathways.	N/A	Project teams must submit the following documentation: •Submission Template •Evidence to support claims made in the Submission Template •Compliance Verification Summaries from waste contractor(s) and waste processing facilities as detailed in the Green Star Construction and Demolition Waste Reporting Criteria document. •Disclosure Statement from waste contractor(s) and waste processing facilities outlining how much of the Green Star Construction and Demolition Waste Reporting Criteria has been implemented.
		22A	Fixed Benchmark	1	0	1 point is available where the construction waste going to landfill is reduced by: •Minimizing the total amount of waste sent to landfill when compared against a typical building (defined in kilograms of waste per square meter of gross floor area (GFA)). Points are awarded in accordance with the waste benchmarks for a typical building, as per Table 22A.1 (refer technical manual)	•Demolition or Site Drawings* indicating the structures on site at time of purchase, extent of demolition and retained structure and façade.	•Cumulative waste report generated from the monthly waste reports provided by the waste contractor over the entire duration of construction and demolition works. The monthly reports and supporting waste disposal dockets do not need to be included in the credit submission.

Responsible Party (Design Submission Documentation)

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20.3		x	x													x	
21.1		x	x														x
22																	
22A																	

Responsible Party (As Built Submission Documentation)

CODE	Building owner (NSW Dep. of Edu)	Builder	Architect (Architectus)	Structural Consultant (Wood & Grieves	Mechanical Consultant (BSE)	Electrical Consultant (BSE)	Hydraulics/Fire Consultant (Wood&Gri	Mechanical Contractor	BMS / Control Contractor	Electrical Contractor	Hydraulics / Fire Contractor	ESD Consultant (BSE)	Landscape Architect (Oculus)	Ecologist	Acoustic Consultant (BSE)	Civil (Wood & Grieves)	Quantity Surveyor (WT Partnership)
20.3		x	x													x	
21.1		x	x														x
22		x															
22A																	

GREEN STAR SCORECARD & REQUIREMENTS	PROJECT: UPGRADES TO CHATSWOOD PUBLIC SCHOOL & CHATSWOOD HIGH SCHOOL	GREEN STAR TARGET: 4 STAR (MINIMUM SCORES REQUIRED: 45)
Document revision: 1.3 Date: 17.Apr.2019	ADDRESS: CHATSWOOD NSW 2067	SCORES TARGETED: 49 (4 STAR WITH 4 BUFFER POINTS)

Note: details below are provided as a guide only, where required the project team shall refer to the Green Star Design and As-built submission guidelines v1.2 for further details.

CATEGORY / CREDIT	AIM OF THE CREDIT / SELECTION	CODE	CREDIT CRITERIA	POINTS AVAILABLE	POINTS TARGETED	Compliance Requirements Note:	Design Submission Documentation	As Built Submission Documentation
		22B	Percentage Benchmark	_	0	1 point is available where the construction waste going to landfill is reduced by: •Diverting a significant proportion of waste from going to landfill; where the project team can demonstrate that at least 90% of the waste generated during construction and demolition has been diverted from landfill. Waste shall be reported in kilograms. To calculate the amount of waste diverted from landfill, the project team is required to report the total amount of waste generated and the total amount of waste diverted from landfill, and report on the proportion diverted as a percentage.		
Total				14	6			
Land Use & Ecology				6				
Ecological Value	To reward projects that improve the ecological value of their site.	23.0	Endangered, Threatened or Vulnerable Species: The minimum requirement is met where the project can demonstrate that at the date of site purchase or option contract, no critically endangered, endangered or vulnerable species, or ecological communities were present on the site.	-	TO COMPLY	It is a minimum requirement of this credit that a check is carried out to ensure that the site does not contain 'critically endangered, endangered, or vulnerable species or ecological communities' as defined in the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act). 23.0A: Where a project site is not subject to approval under the EPBC Act, the project is deemed to comply with the minimum requirement. Projects can determine that they are not subject to approval under the EPBC Act by referring to their Development Approval documents. 23.0B All projects which had a site area that consisted entirely of 'hard surface' land types at the time of site purchase or contract option, automatically comply with the minimum requirement of this credit on the basis that the site did not contain any habitats that may have been home to 'critically endangered, endangered, or vulnerable species or ecological communities' 23.0C If project teams are unsure as to whether their project site contained 'critically endangered, endangered, or vulnerable species or ecological communities', a report from suitably qualified professional shall be prepared, confirming that no issues of concern were present on the site at the time of purchase or contract option.23.0B	Project teams must submit the following documentation: •Submission Template •Evidence to support claims made in the Submission Template •Ecological Value Calculator •Proof of Date of Purchase •DA Approval Report confirming that no vulnerable or endangered species or ecological communities are present on the site. •Suitably Qualified Professional's Report confirming that no vulnerable or endangered species or ecological communities are present on the site, or confirming the Land Types found on site.	N/A
		23.1	Ecological Value: Up to 3 points are awarded where the ecological value of the site is improved by the project.	3	0	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. Land Types with High Weightings If the project is claiming land types with a weighting greater than 0.5 this must be confirmed in a report by a qualified Ecologist. Vertical Gardens and Green Roofs Only the soil surface area of gardens contributes towards recognition in this credit. That is, in vertical gardens and green roofs, only the surface area of soil/substrate in which the plants are rooted is recognised, not the total area covered by the plants. Vertical gardens are to be included as follows: •Only outdoor vertical gardens can be included in the calculator. •Only the soil/substrate surface area of the vertical garden can be counted in the calculator. The area inputted in the calculator will be halved (automatically by the calculator) to account for the ecological improvement relative to horizontal gardens. •The Ecological Land Type is determined by the associated vegetation.	23.1Ecological Value •Site Plans marked up with land type regions. •Aerial Site Photographs marked up with land type regions. •Landscape Drawings and Specifications showing types of planting, hard-standing, water- bodies, etc.	N/A
						Previous Condition of Site The project team shall demonstrate the previous condition of the site by reporting: •Whether the site was greenfield or brownfield; •The area of any buildings or structures; and •The types of land present on the site and within a 100m radius of the site boundaries. Date of Assessment The Conditional Requirement shall be applied to the condition of the site that existed at the date of site purchase or option contract (previous condition of the site). In cases where the site has been under an option contract or owned by the current owner for more than five years from the project's Green Star registration date, this requirement shall be applied to the state of the site that existed at least five, but not more than ten years, prior to the project's Green Star registration date. Site Assessment Where the previous condition of the site is unclear, a qualified Ecologist shall assess the site and make a determination of its ecological value at the approximate time of purchase. This will therefore include an assessment of historical site records. The site assessment must be based on: •A site survey including assessment of the vegetation, soil and hydrological regime; •Topographic mapping (to identify catchment areas and drainage patterns); •Local, regional and state wetland mapping where available; •The Ramsar Convention on Wetlands and 'Directory of Important Wetlands in Australia' listing; and •Aerial photography. Old Growth Forest Assessment The project team shall demonstrate that there was no old growth forest on the site at the date of site purchase or date of option contract. Prime Agricultural Land Assessment The project team shall demonstrate that site was not classified as prime agricultural land at the date of site purchase or date of option contract. Wetland Assessment and Protection For the purposes of this credit, a wetland is considered of 'High National Importance' if it is: •Deemed significant under a state or national register; or •A listed wetland under: The Ramsar Convention on Wetlands; or 'A Directory of Important Wetlands in Australia'. assumed that the project complies with this aspect of the Conditional Requirement.		

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22B		x		x													
23.0		x												x			
23.1		x	x										x	x			

Responsible Party (As Built Submission Documentation)

CODE	Building owner (NSW Dep. of Edu)	Builder	Architect (Architectus)	Structural Consultant (Wood & Grieves)	Mechanical Consultant (BSE)	Electrical Consultant (BSE)	Hydraulics/Fire Consultant (Wood&Gri	Mechanical Contractor	BMS / Control Contractor	Electrical Contractor	Hydraulics / Fire Contractor	ESD Consultant (BSE)	Landscape Architect (Oculus)	Ecologist	Acoustic Consultant (BSE)	Civil (Wood & Grieves)	Quantity Surveyor (WT Partnership)
22B		x															
23.0																	
23.1																	

GREEN STAR SCORECARD & REQUIREMENTS	PROJECT: UPGRADES TO CHATSWOOD PUBLIC SCHOOL & CHATSWOOD HIGH SCHOOL	GREEN STAR TARGET: 4 STAR (MINIMUM SCORES REQUIRED: 45)
Document revision: 1.3 Date: 17.Apr.2019	ADDRESS: CHATSWOOD NSW 2067	SCORES TARGETED: 49 (4 STAR WITH 4 BUFFER POINTS)

Note: details below are provided as a guide only, where required the project team shall refer to the Green Star Design and As-built submission guidelines v1.2 for further details.

CATEGORY / CREDIT	AIM OF THE CREDIT / SELECTION	CODE	CREDIT CRITERIA	POINTS AVAILABLE	POINTS TARGETED	Compliance Requirements Note:	Design Submission Documentation	Responsible Party: Building owner (NSW Dep. of Edu)	Builder	Architect (Architectus)	Structural Consultant (Wood & Grieves	Mechanical Consultant (BSE)	Electrical Consultant (BSE)	Hydraulics/Fire Consultant (Wood&Gri	Mechanical Contractor	BMS / Control Contractor	Electrical Contractor	Hydraulics / Fire Contractor	ESD Consultant (BSE)	Landscape Architect (Oculus)	Ecologist	Acoustic Consultant (BSE)	Civil (Wood & Grieves)	Quantity Surveyor (WT Partnership)	As Built Submission Documentation	Responsible Party: Building owner (NSW Dep. of Edu)	Builder	Architect (Architectus)	Structural Consultant (Wood & Grieves	Mechanical Consultant (BSE)	Electrical Consultant (BSE)	Hydraulics/Fire Consultant (Wood&Gri	Mechanical Contractor	BMS / Control Contractor	Electrical Contractor	Hydraulics / Fire Contractor	ESD Consultant (BSE)	Landscape Architect (Oculus)	Ecologist	Acoustic Consultant (BSE)	Civil (Wood & Grieves)	Quantity Surveyor (WT Partnership)
Sustainable Sites	To reward projects that choose to develop sites that have limited ecological value, re-use previously developed land and remediate contaminate land.	24.0	Conditional Requirement	-	TO COMPLY	Where the project site does not impact on any wetlands of 'High National Importance', the project is deemed to comply with this aspect of the Conditional Requirement and no further action is required. Where the project site does impact on any wetlands of 'High National Importance', Wetland Protection Measures must be in place that address at least the following criteria: •A site-specific Wetland Management Plan that has been produced, exhibited and implemented; •A minimum of two (2) points achieved in the 'Stormwater' credit; and •All points achieved in the 'Light Pollution' credit. The site-specific Wetland Management Plan must be: •Prepared by a qualified Ecologist or other qualified professional and include requirements for ongoing quarterly monitoring, annual reporting and management of the wetland ecosystem for a minimum of five years. •Included within the Development Application; and •Exhibited to the public on the applicant's website, or the local council's offices or library, for a minimum of 24 months. Matters of National Significance Assessment The project must not either: •Impact on any Matter of National Significance; or •Have been referred to the Federal Environmental Minister for consideration and assessed as a 'controlled action'. Where a project site is not subject to approval under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act), the project is deemed to comply with this aspect of the Conditional Requirement and no further action is required. Project teams can determine whether the project site is subject to approval under the EPBC Act by referring to their Development Approval documents. If the project approval does not include reference to the EPBC, or if there are no environmental protection requirements included in the project approval conditions, then it can be Previous Condition of Site The project team shall demonstrate the previous condition of the site by reporting: •Whether the site was greenfield or brownfield; •The area of any buildings or structures; and •The types of land present on the site and within a 100m radius of the site boundaries. Date of Assessment The Conditional Requirement shall be applied to the condition of the site that existed at the date of site purchase or option contract (previous condition of the site). In cases where the site has been under an option contract or owned by the current owner for more than five years from the project's Green Star registration date, this requirement shall be applied to the state of the site that existed at least five, but not more than ten years, prior to the project's Green Star registration date. Site Assessment Where the previous condition of the site is unclear, a qualified Ecologist shall assess the site and make a determination of its ecological value at the approximate time of purchase. This will therefore include an assessment of historical site records. The site assessment must be based on: •A site survey including assessment of the vegetation, soil and hydrological regime; •Topographic mapping (to identify catchment areas and drainage patterns); •Local, regional and state wetland mapping where available; •The Ramsar Convention on Wetlands and 'Directory of Important Wetlands in Australia' listing; and •Aerial photography. Old Growth Forest Assessment The project team shall demonstrate that there was no old growth forest on the site at the date of site purchase or date of option contract. Prime Agricultural Land Assessment The project team shall demonstrate that site was not classified as prime agricultural land at the date of site purchase or date of option contract. Wetland Assessment and Protection For the purposes of this credit, a wetland is considered of 'High National Importance' if it is: •Deemed significant under a state or national register; or •A listed wetland under: The Ramsar Convention on Wetlands; or 'A Directory of Important Wetlands in Australia'. Where the project site does not impact on any wetlands of 'High National Importance', the project is deemed to comply with this aspect of the Conditional Requirement and no further action is required. Where the project site does impact on any wetlands of 'High National Importance', Wetland Protection Measures must be in place that address at least the following criteria: •A site-specific Wetland Management Plan that has been produced, exhibited and implemented; •A minimum of two (2) points achieved in the 'Stormwater' credit; and •All points achieved in the 'Light Pollution' credit. The site-specific Wetland Management Plan must be: •Prepared by a qualified Ecologist or other qualified professional and include requirements for ongoing quarterly monitoring, annual reporting and management of the wetland ecosystem for a minimum of five years. •Included within the Development Application; and •Exhibited to the public on the applicant's website, or the local council's offices or library, for a minimum of 24 months. Matters of National Significance Assessment The project must not either: •Impact on any Matter of National Significance; or •Have been referred to the Federal Environmental Minister for consideration and assessed as a 'controlled action'. Where a project site is not subject to approval under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act), the project is deemed to comply with this aspect of the Conditional Requirement and no further action is required. Project teams can determine whether the project site is subject to approval under the EPBC Act by referring to their Development Approval documents. If the project approval does not include reference to the EPBC, or if there are no environmental protection requirements included in the project approval conditions, then it can be assumed that the project complies with this aspect of the Conditional Requirement.	Project teams must submit the following documentation: •Submission Template, for all subsets of 24. •Evidence to support claims made in the Submission Template Recommended Supporting Evidence 24.0Conditional Requirement •Extracts from the Development Application •Zoning Plans •Wetland Management Plan •CV of Ecologist		x	x											x				N/A																	

GREEN STAR SCORECARD & REQUIREMENTS | **PROJECT: UPGRADES TO CHATSWOOD PUBLIC SCHOOL & CHATSWOOD HIGH SCHOOL** | **GREEN STAR TARGET: 4 STAR (MINIMUM SCORES REQUIRED: 45)**

Document revision: 1.3 | **Date: 17.Apr.2019** | **ADDRESS: CHATSWOOD NSW 2067** | **SCORES TARGETED: 49 (4 STAR WITH 4 BUFFER POINTS)**

Note: details below are provided as a guide only, where required the project team shall refer to the Green Star Design and As-built submission guidelines v1.2 for further details.

CATEGORY / CREDIT	AIM OF THE CREDIT / SELECTION	CODE	CREDIT CRITERIA	POINTS AVAILABLE	POINTS TARGETED	Compliance Requirements Note:	Design Submission Documentation	As Built Submission Documentation
□		24.1	Reuse of Land	1	1	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. One (1) point is awarded where either of the following conditions is met: A.75% of the site was 'previously developed land' at the date of site purchase; or B.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' at the project's Green Star registration date. Previously Developed Land Previously developed land includes land that is, or was, occupied by a permanent structure, associated curtilage, road, car park or other hardstand including working areas of mines, landfills, brick pits, quarries or other industrial, commercial, institutional and residential activity and associated curtilage. This definition excludes: •Previously developed land that has undergone ecological restoration or land that is scheduled to be restored through development control procedures; •Land that was previously developed but where the developed areas have been reclaimed by the surrounding landscape via natural process and the passing of time, to the extent that it can reasonably be considered as covering more than 50% of the site and an integral part of the natural surroundings; •Land that was used for agricultural purposes at the time the site was purchased; and •Land in built up areas that has not been developed previously, even though these areas may contain certain urban features such as paths pavilions and other buildings.	24.1Reuse of Land •Aerial Photographs showing the areas that were previously developed land at the time of purchase or Green Star Registration.	24.1Reuse of Land •As Built Drawings showing the areas that were previously developed land at the time of purchase or Green Star Registration.
		24.2	Contamination and Hazardous Materials	1	1	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. •24.2A Site Contamination □The site has been previously contaminated to the extent that the intended uses, as permitted under the relevant planning scheme, were initially precluded; □The developer has adopted and implemented a best practice site remediation strategy; and □The best practice site remediation strategy and implementation has been signed off by an auditor prior to issue of the occupation certificate. •24.2B Hazardous Materials □A comprehensive hazardous materials survey has been carried out on any existing buildings or structures on the project site, in accordance with the relevant Environmental and Occupational Health and Safety (OH&S) legislation; and □Where the survey identified asbestos, lead or PCBs in any existing buildings or structures the materials have been stabilised, or removed and disposed of in accordance with best practice guidelines; or the survey concluded that no hazardous materials were found in any existing buildings or structures on the project site. Refer the technical manual for further details.	24.2Contamination and Hazardous Materials For 24.2A Site Contamination: •Certificate from the environmental auditor or relevant authority confirming that the site has been correctly and appropriately decontaminated in accordance with the relevant state and federal legislation, dated prior to the commencement of the construction phase of the project. •Contamination Report OR Site Assessment □Completed in line with National Environment Protection Measure (NEPM) guidelines; □Current at the time of site purchase or otherwise reflective of the site condition at the time of purchase; and □Clearly documenting the contamination present on the site and confirming this contamination precludes the development. For 24.2B Hazardous Materials •Confirmation that a hazardous materials survey has taken place. •Hazardous Materials Survey. •Hazardous Materials Management plan. •Copy of the hazardous materials contract or commitment to stabilise and/or remove and dispose of the hazardous materials, describing the methods used. •Clearance Certificate confirming that hazardous materials have been stabilised and/or removed and disposed of.	N/A
Heat Island Effect	To encourage and recognise projects that reduce the contribution of the project site to the heat island effect.	25.0	Heat Island Effect Reduction:	1	1	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. roofs; •Roofing materials, including shading structures, having the following: □For roof pitched <15°– a three year SRI of minimum 64; or □For roof pitched >15°– a three year SRI of minimum 34. •Only where the three year Solar Reflectance Index (SRI) for products is not available, use the following: □For roof pitched <15° – an initial SRI of minimum 82; or □For roof pitched >15° – an initial SRI of minimum 39. •Unshaded hard-scaping elements with a three year SRI of minimum 34 or an initial SRI of minimum 39; •Hardscaping elements shaded by overhanging vegetation or roof structures, including solar hot water panels and photovoltaic panels; •Water bodies and/or water courses; or •Areas directly to the south of vertical building elements, including green walls and areas shaded by these elements at the summer solstice.	•Submission Template •Evidence to support claims made in the Submission Template •Site Plan highlighting all relevant areas as referenced within the area schedule*. •Area Schedule listing the areas of each of the relevant site elements and where relevant, the SRI values and referencing plan drawings for the site (highlighting relevant areas) and supplier documentation*. •Supplier Documentation, such as oMaterial data sheet for compliant roofing and hardscape materials highlighting the three year or initial SRI for the product, as applicable.	•Submission Template •Evidence to support claims made in the Submission Template •Site Plan highlighting all relevant areas as referenced within the area schedule*. •Area Schedule listing the areas of each of the relevant site elements and where relevant, the SRI values and referencing plan drawings for the site (highlighting relevant areas) and supplier documentation*. •Supplier Documentation, such as oMaterial data sheet for compliant roofing and hardscape materials highlighting the three year or initial SRI for the product, as applicable.
Total				6	3			
Emissions				5				

Responsible Party (Design Submission Documentation)

CODE	Building owner (NSW Dep. of Edu)	Builder	Architect (Architectus)	Structural Consultant (Wood & Grieves	Mechanical Consultant (BSE)	Electrical Consultant (BSE)	Hydraulics/Fire Consultant (Wood&Gri	Mechanical Contractor	BMS / Control Contractor	Electrical Contractor	Hydraulics / Fire Contractor	ESD Consultant (BSE)	Landscape Architect (Oculus)	Ecologist	Acoustic Consultant (BSE)	Civil (Wood & Grieves)	Quantity Surveyor (WT Partnership)
24.1		x	x														
24.2		x	x											x			
25.0		x	x														

Responsible Party (As Built Submission Documentation)

CODE	Building owner (NSW Dep. of Edu)	Builder	Architect (Architectus)	Structural Consultant (Wood & Grieves	Mechanical Consultant (BSE)	Electrical Consultant (BSE)	Hydraulics/Fire Consultant (Wood&Gri	Mechanical Contractor	BMS / Control Contractor	Electrical Contractor	Hydraulics / Fire Contractor	ESD Consultant (BSE)	Landscape Architect (Oculus)	Ecologist	Acoustic Consultant (BSE)	Civil (Wood & Grieves)	Quantity Surveyor (WT Partnership)
24.1		x	x														
24.2																	
25.0		x	x														

GREEN STAR SCORECARD & REQUIREMENTS | **PROJECT: UPGRADES TO CHATSWOOD PUBLIC SCHOOL & CHATSWOOD HIGH SCHOOL** | **GREEN STAR TARGET: 4 STAR (MINIMUM SCORES REQUIRED: 45)**

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Note: details below are provided as a guide only, where required the project team shall refer to the Green Star Design and As-built submission guidelines v1.2 for further details.

CATEGORY / CREDIT	AIM OF THE CREDIT / SELECTION	CODE	CREDIT CRITERIA	POINTS AVAILABLE	POINTS TARGETED	Compliance Requirements Note:	Design Submission Documentation	As Built Submission Documentation
Stormwater	To reward projects that minimise peak stormwater flows and reduce pollutants entering public sewer infrastructure.	26.1	Stormwater Peak Discharge: 1 point is available where the post-development peak Average Recurrence Interval (ARI) event discharge from the site does not exceed the pre-development peak ARI event discharge	1	1	One (1) point is awarded where project teams demonstrate that the post-development peak event stormwater discharge from the site does not exceed the pre-development peak event stormwater discharge, using the Average Recurrence Interval (ARI) specified in Table 26.1. (contained in the technical manual) 26.1.1Climate Change Scenarios If the project is targeting the 'Adaptation and Resilience' credit (3), the Risk Assessment included in this credit submission shall be used to determine the appropriate climate change scenario. If the project is not targeting the 'Adaptation and Resilience' credit (3), the project may refer to local council flood level guidance. 26.1.2Rainfall Data for Modelling Programs Using Continuous Simulation The following considerations for rainfall simulation shall be adopted: •Continuous simulation of a minimum of 10 years; •A six (6) minute time step (intervals); •Localised climatic sequences; •Water balances; and •Treatment train operation. ||26.1.3 Management of stormwater peak flows Management of stormwater peak flows may include one or more of the following techniques: •Stormwater reuse (including roof collection and use); •Infiltration to native soils, or otherwise, filtered through an appropriately designed soil and plant stormwater treatment system, such as bio-retention; •Stormwater evapotranspiration; and •Water detention. Where specific measures are in place to collect and store stormwater in lakes, rivers or groundwater aquifers, projects are advised to submit a Credit Interpretation Request to the GBCA.	•Submission Template •Evidence to support claims made in the Submission Template Recommended Supporting Evidence 26.1Stormwater Peak Discharge •Calculation/Modelling Report by a suitably qualified professional. The report should describe: □Software or calculation methods used. □Data sets and tables that were applied. □Sizing of all stormwater treatment systems installed. □Quantity of stormwater discharge to be addressed by each stormwater treatment system (annually). □Comparing the results of the pollutant export modelling/calculations with the Pollution Reduction Targets in the relevant column of Table 26.2 (where Stormwater Pollution Targets criterion is targeted). □If relevant, summarising how hydrocarbons and free oils have been addressed. •Civil/Hydraulics drawings showing the stormwater collection, storage and treatment facilities and detailing their functional elements •Hydraulics drawings showing all the capture, storage, piping and discharge route. •Site plans showing the total areas of uncovered areas where vehicles are likely to transit and/or park (e.g. roads, loading docks, refuelling bays, and car parking, etc).	•Submission Template •Evidence to support claims made in the Submission Template Recommended Supporting Evidence 26.1Stormwater Peak Discharge •Civil/Hydraulics drawings showing the stormwater collection, storage and treatment facilities and detailing their functional elements •Hydraulics drawings showing all the capture, storage, piping and discharge route. •Site plans showing the total areas of uncovered areas where vehicles are likely to transit and/or park (e.g. roads, loading docks, refuelling bays, and car parking, etc).
		26.2	Stormwater 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	Where criterion 26.1 has been achieved, one (1) additional point is awarded where it is demonstrated that all stormwater discharged from the site meets the required pollution reduction targets when compared to untreated runoff in accordance with the following requirements. It is noted that some local governments may provide pre-determined infrastructure solutions that are 'deemed to comply' with the aim of this credit criterion. If this is the case the project team shall have this approach approved by a Credit Interpretation Request (CIR). In circumstances where this credit specifies levels or targets that are less stringent than those specified in relevant local legislation/regulations, the local legislation/regulations shall take precedence. Appropriate calculations must be undertaken by suitably qualified professionals. Any calculations and assumptions must be outlined, easy to follow, and in accordance with common practice protocols (see Guidance). 26.2.1The project must meet the minimum reductions listed in Column A of Table 26.2 when compared to untreated runoff.	26.2Stormwater Pollution Targets •Independently verified performance certification for each manufactured stormwater treatment device, proving its ability to achieve the pollution reduction targets nominated in Table 26.2 Column A.	26.2Stormwater Pollution Targets •Independently verified performance certification for each manufactured stormwater treatment device, proving its ability to achieve the pollution reduction targets nominated in Table 26.2 Column A.
Light Pollution	To reward projects that minimise light pollution.	27.0	Light Pollution to Neighbouring Bodies: The minimum requirement is met where the project complies with AS 4282:1997 Control of the obtrusive effects of outdoor lighting.	-	TO COMPLY	To qualify for points under this credit, project teams must demonstrate that all outdoor lighting on the project complies with AS 4282:1997 Control of the obtrusive effects of outdoor lighting. The conditions shall be applied to all boundaries, apart from boundaries with roads. || The boundary shall be taken as the site boundary, with no setback and no consideration of the location of adjacent buildings (i.e. worst-case scenario). The following values from Table 2.1 of AS 4282:1997 must be applied: •For Class 2 buildings (residential), the values in Columns 5A and B; or •For Class 3 to 9 buildings (non-residential), the values in Column 3.C. The system must comply with both pre- and post-curfew requirements. ||R2.27.01 Exclusion(s) Signage related to emergency exits and external emergency lighting that only illuminates in the event of an emergency/power failure are excluded from the requirements of this credit. Lighting related to other safety requirements are also excluded, for example, the lighting of ATMs. External emergency lighting that is integrated into the general external lighting scheme must comply with the requirements of the credit. For example, lights that act as general lighting but have a battery pack to ensure that they also stay on in the event of a power failure must comply.	Project teams must submit the following documentation: •Submission Template •Evidence to support claims made in the Submission Template Recommended Supporting Evidence •As Built drawings indicating the location of all external luminaires and showing the aiming point and mounting orientation of all external luminaires. •Luminaire schedule* for all external lighting, nominating the type, lighting distribution and quantity of each luminaire and including the relevant photometric data such as ULOR. •Calculation Plots* for all external lighting, showing that all grid points on the calculation plane return compliant Lux values. •Excerpt from lighting control system, or similar, demonstrating automatic deactivation of lights, based on external lux levels, where deactivation is required to achieve compliance.	Project teams must submit the following documentation: •Submission Template •Evidence to support claims made in the Submission Template Recommended Supporting Evidence •As Built drawings indicating the location of all external luminaires and showing the aiming point and mounting orientation of all external luminaires. •Luminaire schedule* for all external lighting, nominating the type, lighting distribution and quantity of each luminaire and including the relevant photometric data such as ULOR. •Calculation Plots* for all external lighting, showing that all grid points on the calculation plane return compliant Lux values. •Excerpt from lighting control system, or similar, demonstrating automatic deactivation of lights, based on external lux levels, where deactivation is required to achieve compliance.
		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	One (1) point is awarded where it can be demonstrated that one of the following specified reductions in light pollution has been achieved by the project. A.Control of upward light output ratio (ULOR), in accordance with 27.1A; or B.Control of direct illuminance, in accordance with 27.1B. This credit covers all external lighting of a project. In addition to other types of external lighting, for the purposes of this credit, luminaries inside glazed atria and those on the uppermost (uncovered) deck of an outdoor car park are considered to be external. Refer technical manual for further details.		
Microbial Control	To recognise projects that implement systems to minimise the impacts associated with harmful microbes in building systems.	28.0	Legionella Impacts from Cooling Systems:To recognise projects that implement systems to minimise the impacts associated with harmful microbes in building cooling systems.	1	1	1 point is available where the building: •Is naturally ventilated; or •Has waterless heat-rejection systems; or •Has water-based heat rejection systems that include best practice measures for Legionella Control and Risk Management, in accordance with 28C; efer technical manual further for more infromation t	Project teams must submit the following documentation: •Submission Template •Evidence to support claims made in the Submission Template •Drawings indicating the type and location of all components containing refrigerants and their heat rejection methods. •Legionella Risk Management Plan demonstrating compliance with AS/NZS 3666.2:2011 or AS/NZ 3666.3:2011 and the Victorian Public Health and Wellbeing Act 2008; showing the inspection and maintenance periods; and outlining the requirements for flushing and cleaning when the system(s) are not in operation.	Project teams must submit the following documentation: •Submission Template •Evidence to support claims made in the Submission Template •Drawings indicating the type and location of all components containing refrigerants and their heat rejection methods. •Extract(s) from the Commissioning Report demonstrating that the air-conditioning system(s) has been commissioned and found to operate as intended by the design. Where the refrigeration equipment does not use a water based heat rejection system to demonstrate compliance with the Legionella criterion.

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26.1			x	x			x									x	
26.2		x												x			
27.0 / 27.1						x											
28.0					x												

Responsible Party (As Built Submission Documentation)

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26.1			x	x			x									x	
26.2		x												x			
27.0 / 27.1										x							
28.0								x									

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Refrigerant Impa	To encourage operational pra	29.0	Refrigerants Impacts: To encourage practices that minimise the environmental impacts of refrigeration and air conditioning equipment.	1	0	1 point is awarded where one of the following criteria is achieved: •The calculated Total System Direct Environmental Impact (TSDEI) of the refrigerant systems in the building is less than 15; or •The calculated TSDEI of the refrigerant systems is between 15 and 35, AND a leak detection system ||with automated refrigerant recovery is in place ||R1.29.01; or •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 within the building systems, this point is awarded.. This credit is applicable to refrigeration equipment that is installed as part of the project. Any mechanical equipment utilised to air-condition a space is considered 'refrigeration equipment' for the purposes of this credit. This includes any HVAC&R systems and cold/freezer rooms found in the premises. Refrigeration systems used to cool down data centres are also included under these requirements. The credit criteria apply to all HVAC&R systems servicing the building, including any supplementary systems that are owned or operated by the building owner, regardless of size. Refrigeration equipment required for industrial or manufacturing processes and temporary cold/freezer rooms are excluded from the requirements of this credit. Appliances are also excluded from the requirements of this credit.
		29.1				Refer technical manual for 29.1A Calculating TSDEI, 29.1B Refrigerant Leak Detection Systems, 29.1C Low Impact Refrigerants, and 29.1D No Refrigerants
Total		*		5	4	
Innovation				10		
Innovative Technology or Process	The project meets the aims of an existing credit using a technology or process that is considered innovative in Australia or the world.	30A	Innovative Technology or Process: The project meets the aims of an existing credit using a technology or process that is considered innovative in Australia or the world.			To claim this Innovation criterion, the project team must show that an initiative is innovative by demonstrating that the technology or process is not commonly used in the state where the project is located; within Australia's building industry; or globally, depending on the context of the Innovation claimed. Innovation points are more likely to be awarded for projects that: •Employ strategies that achieve Green Star Outcomes though passive systems. •Employ technologies or strategies that achieve an outcome in Green Star through significant improvement or gains when compared against best practice technologies. •Employ technologies or strategies that are new or adopted from other industries that achieve the relevant Green Star outcome. The technologies or processes considered innovative and automatically awarded one (1) point are indicated in the technical manual
Market Transformation	The project has undertaken a sustainability initiative that substantially contributes to the broader market transformation towards sustainable development in Australia or in the world.	30B	Market Transformation: The project has undertaken a sustainability initiative that substantially contributes to the broader market transformation towards sustainable development in Australia or in the world.			To claim this Innovation criterion, the project team must show that the initiative substantially contributes to the broader market transformation towards sustainable development in Australia or the world. It must be shown that the initiative is not only being used in the building as a one-off solution but that the initiative has led to market transformation or to increased adoption of the solution. Innovation points are more likely to be awarded for projects that: •Increase the knowledge and capacity of the building industry. •Increase the knowledge of sustainable building practices in regional areas. •Change the regulatory environment. •Use technologies or strategies which, if adopted widely, would lead to a significant reduction of impacts in the built environment. The initiatives considered innovative and automatically awarded one (1) point are indicated in the technical manual
Improving on Green Star Benchmarks	The project has achieved full points in a Green Star credit and demonstrates a substantial improvement on the benchmark required to achieve full points.	30C	Improving on Green Star Benchmarks: The project has achieved full points in a Green Star credit and demonstrates a substantial improvement on the benchmark required to achieve full points. For credits where this Innovation criterion is applicable, improved benchmarks are included in the 'Innovation' section of the credit.	10	TBC	To claim this innovation credit criterion the project must demonstrate a substantial improvement to a specific benchmark (environment, social, economic), addressed by an existing Green Star credit which the project is targeting. Credits eligible for improvements on benchmarks are identified in the technical manual . A maximum of two points may be claimed for each 'Improving on Green Star Benchmarks' initiative. Other Eligible Credits It is possible to claim Innovation points for 'Improving on Green Star Benchmarks' of other credits not listed in the table above. When doing so, project teams must demonstrate how the improvement is significant. For example, within the 'Greenhouse Gas Emissions' credit, reducing emissions from lighting is recognised within the Prescriptive Pathway. The benchmark for lighting reduction is set at 30%. An improvement of 35% is unlikely to be awarded an Innovation point. However, an improvement of 50% would likely be awarded an Innovation point, as that is a significant reduction in lighting power density.

CATEGORY / CREDIT	CODE	Design Submission Documentation	As Built Submission Documentation
Refrigerant Impa	29.0 / 29.1	•Submission Template •Evidence to support claims made in the Submission Template Recommended Supporting Evidence 29.1A Calculating TDSEI •Completed Refrigerant Impacts Calculator including evidence supporting all claims and calculations. •Refrigeration System Data Sheets outlining system attributes including refrigeration type, capacity, charge rate and other data required for the Refrigerant Impacts Calculator. •Mechanical drawings showing distance between evaporator and condenser (for split systems and VRF/VRV and multi-head units), along with calculations of the additional refrigerant in this pipework, and identification of 2, 3 or 4 pipe systems. 29.1B Leak Detection Systems •Completed Refrigerant Impacts Calculator including evidence supporting all claims and calculations. •Refrigeration System Data Sheets outlining system attributes including refrigeration type, capacity, charge rate and other data required for the Refrigerant Impacts Calculator. 29.1C Low-impact Refrigerants •Refrigeration System Data Sheets outlining refrigerant used 29.1D No Refrigeration Equipment •Confirmation Letter stating that no refrigeration equipment is present in the project.	•Submission Template •Evidence to support claims made in the Submission Template Recommended Supporting Evidence 29.1A Calculating TDSEI •Mechanical drawings showing distance between evaporator and condenser (for split systems and VRF/VRV and multi-head units), along with calculations of the additional refrigerant in this pipework, and identification of 2, 3 or 4 pipe systems. 29.1B Leak Detection Systems •Refrigeration System Data Sheets outlining system attributes including refrigeration type, capacity, charge rate and other data required for the Refrigerant Impacts Calculator. •Extract(s) from the Commissioning Report demonstrating that leak detection systems have been provided and perform as outlined in 29.1B. The relevant sections must be highlighted. 29.1C Low-impact Refrigerants •Refrigeration System Data Sheets outlining refrigerant used 29.1D No Refrigeration Equipment •Confirmation Letter stating that no refrigeration equipment is present in the project.
Innovation (30A, 30B, 30C)	30A–30C	Project teams must submit the following documentation: Submission Template •Nominating which innovation categories are being targeted by the project •A description of the initiatives that are to be considered under the innovation category Supporting Documentation Project teams shall provide documentation supporting their innovation claims. This may be in the form of any of the GBCA's accepted list of evidence and must demonstrate the benefits of the initiative and how it can be deemed innovative.	Project teams must submit the following documentation: Submission Template •Nominating which innovation categories are being targeted by the project •A description of the initiatives that are to be considered under the innovation category Supporting Documentation Project teams shall provide documentation supporting their innovation claims. This may be in the form of any of the GBCA's accepted list of evidence and must demonstrate the benefits of the initiative and how it can be deemed innovative.

Responsible Party (Design Submission)

CATEGORY / CREDIT	Building owner (NSW Dep. of Edu)	Builder	Architect (Architectus)	Structural Consultant (Wood & Grieves	Mechanical Consultant (BSE)	Electrical Consultant (BSE)	Hydraulics/Fire Consultant (Wood&Gri	Mechanical Contractor	BMS / Control Contractor	Electrical Contractor	Hydraulics / Fire Contractor	ESD Consultant (BSE)	Landscape Architect (Oculus)	Ecologist	Acoustic Consultant (BSE)	Civil (Wood & Grieves)	Quantity Surveyor (WT Partnership)
Refrigerant Impa		x						x									
Innovation	As required.																

Responsible Party (As Built Submission)

CATEGORY / CREDIT	Building owner (NSW Dep. of Edu)	Builder	Architect (Architectus)	Structural Consultant (Wood & Grieves	Mechanical Consultant (BSE)	Electrical Consultant (BSE)	Hydraulics/Fire Consultant (Wood&Gri	Mechanical Contractor	BMS / Control Contractor	Electrical Contractor	Hydraulics / Fire Contractor	ESD Consultant (BSE)	Landscape Architect (Oculus)	Ecologist	Acoustic Consultant (BSE)	Civil (Wood & Grieves)	Quantity Surveyor (WT Partnership)
Refrigerant Impa		x						x									
Innovation	As required.																

GREEN STAR SCORECARD & REQUIREMENTS	PROJECT: UPGRADES TO CHATSWOOD PUBLIC SCHOOL & CHATSWOOD HIGH SCHOOL	GREEN STAR TARGET: 4 STAR (MINIMUM SCORES REQUIRED: 45)
Document revision: 1.3 Date: 17.Apr.2019	ADDRESS: CHATSWOOD NSW 2067	SCORES TARGETED: 49 (4 STAR WITH 4 BUFFER POINTS)

Note: details below are provided as a guide only, where required the project team shall refer to the Green Star Design and As-built submission guidelines v1.2 for further details.

CATEGORY / CREDIT	AIM OF THE CREDIT / SELECTION	CODE	CREDIT CRITERIA	POINTS AVAILABLE	POINTS TARGETED	Compliance Requirements Note:	Design Submission Documentation	Responsible Party: Building owner (NSW Dep. of Edu)	Builder	Architect (Architectus)	Structural Consultant (Wood & Grieves	Mechanical Consultant (BSE)	Electrical Consultant (BSE)	Hydraulics/Fire Consultant (Wood&Gri	Mechanical Contractor	BMS / Control Contractor	Electrical Contractor	Hydraulics / Fire Contractor	ESD Consultant (BSE)	Landscape Architect (Oculus)	Ecologist	Acoustic Consultant (BSE)	Civil (Wood & Grieves)	Quantity Surveyor (WT Partnership)	As Built Submission Documentation	Responsible Party: Building owner (NSW Dep. of Edu)	Builder	Architect (Architectus)	Structural Consultant (Wood & Grieves	Mechanical Consultant (BSE)	Electrical Consultant (BSE)	Hydraulics/Fire Consultant (Wood&Gri	Mechanical Contractor	BMS / Control Contractor	Electrical Contractor	Hydraulics / Fire Contractor	ESD Consultant (BSE)	Landscape Architect (Oculus)	Ecologist	Acoustic Consultant (BSE)	Civil (Wood & Grieves)	Quantity Surveyor (WT Partnership)
Innovation Challenge	Where the project addresses an sustainability issue not included within any of the Credits in the existing Green Star rating tools.	30D	Innovation Challenge: 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.			To claim innovation under this criterion, projects must address an issue that is not included within the Green Star – Design & As Built rating tool. This may be done in two ways: Current Innovation Challenge The project team demonstrates compliance with any of the Innovation Challenges listed on the GBCA website. These Innovation Challenges have been designed to challenge owners, developers, tenants and project teams to create even more sustainable projects. Current Innovation Challenges applicable to Green Star – Design & As Built include: •Affordable Housing •Carbon neutral buildings •Community Benefits •Culture, Heritage and Identity •Financial Transparency •High Performance Site Offices •Integrating Healthy Environments •Marketing Excellence •Occupant Engagement •Reconciliation Action Plan •Social Enterprise for Affordable Housing •Social Return on Investment Please refer to the GBCA website for the most up-to-date listing of Innovation Challenges and supporting information, available here: http://new.gbca.org.au/innovation-challenges/ Projects are eligible to claim Innovation Challenges that were available at the time of project registration. New Innovation Challenge The project team may address an issue not included within any of the credits in the existing Green Star rating tools or an existing Innovation Challenge. Where this is the case, the project team may develop an Innovation Challenge with the GBCA and demonstrate compliance with that Innovation Challenge, in order to claim an Innovation point. Innovation Challenges will be made public and available to other project teams to comply with in the future. Please refer to the GBCA website for additional information on applying for new Innovation Challenges, available here: http://new.gbca.org.au/innovation-challenges/																																					
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 tools.	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.			To claim this Innovation criterion, the project team must demonstrate compliance with an approved credit from another World Green Building Council (WGBC) member rating tool that covers a sustainability topic that is not included in the Green Star – Design & As Built rating tool. A list of credits from other WGBC member rating tools, and other Green Star rating tools that have been approved for this criterion are listed in the technical manual. For any credit not listed that may wish to be targeted, a technical question should be submitted to the GBCA for guidance.																																					
Total				10	0																																				

TOTAL WEIGHTED POINTS REQUIRED FOR 4 STAR TARGET:	45 POINTS	
TOTAL WEIGHTED POINTS TARGETED	49 POINTS	4 STAR WITH 4 BUFFER POINTS

Cells highlighted in Grey indicate the credits which are not targeted.