REPORT

Sustainable Development Plan

Dalmeny Public School Upgrade
NSW Department of Education

CONFIDENTIAL

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VERIFICATION

REVISION	DATE ISSUED	PREPARED BY	VERIFIED BY	AUTHORISED BY	COMMENT
1.0	31/10/2024	Richard Burton	Justin Peberdy	Jarrad Underwood	Concept Design – Issued for comment
2.0	18/12/2024	Richard Burton	Justin Peberdy	Jarrad Underwood	Schematic Design – Issued for comment
2.1	24/01/2024	Richard Burton	Justin Peberdy	Sapre Shrinivas	Schematic Design
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CHANGE LOG

REVISION	VERSION	COMMENT
2.0	Schematic Design	General updates to reflect design development
2.1	Schematic Design	Updates in response to stat planning comments
2.2	Schematic Design	Addition of Preamble as required by REF planning pathway
2.3	REF Submission	Updated to address comments
2.4	REF Submission	Updated to address stat planning comments

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1 PREAMBLE

1.1 INTRODUCTION

This Sustainable Development Plan has been prepared to accompany a Review of Environmental Factors (REF) prepared for the Department of Education (DoE) relating to the Dalmeny Public School Upgrade (the activity) under Part 5 of the Environmental Planning and Assessment Act 1979 (EP&A Act) and State Environmental Planning Policy (Transport and Infrastructure) 2021 (SEPP TI).

This document has been prepared in accordance with the Guidelines for Division 5.1 assessments – Consideration of environmental health facilities and schools, Addendum October 2024 (the Guidelines) by the Department of Planning, Housing and Infrastructure.

This report examines and takes into account the relevant environmental factors in the Guidelines and Environmental Planning and Assessment Regulations 2021 under Section 170, Section 171 and Section 171A of the EP&A Regulation.

1.2 PROPOSED ACTIVITY DESCRIPTION

The proposed activity for the Dalmeny Public School Upgrade includes the construction and occupation of a two-storey classroom building and associated covered walkways and landscaping.

Demolition

- Demolish part of existing fence on Dalmeny Drive;
- Remove two (2) trees; and
- Earthworks;

Construction and occupation

- Two-storey classroom building (Block H);
- Covered walkways (excluding between Block G and H),
- Footpath between block G and block H
- Landscaping (surrounding Block H),
- Fence and gate south of Block H;
- OSD tank;
- New Main Switch Board;
- Substation; and
- Fire Hydrant.

The classroom building will consist of the following floor layout:

- **Ground Floor Level**: Comprises eight (8) general learning spaces (GLS) and two (2) learning commons spaces (LCS). Also located on the ground floor level are amenities, services, storage spaces and a lift and two stair cases to provide access to the first-floor level; and
- **First Floor Level**: The first-floor level will also comprise eight (8) GLS and two (2) LCS. Also located on the first-floor level are amenities, a mechanical plant room and other rooms for services.

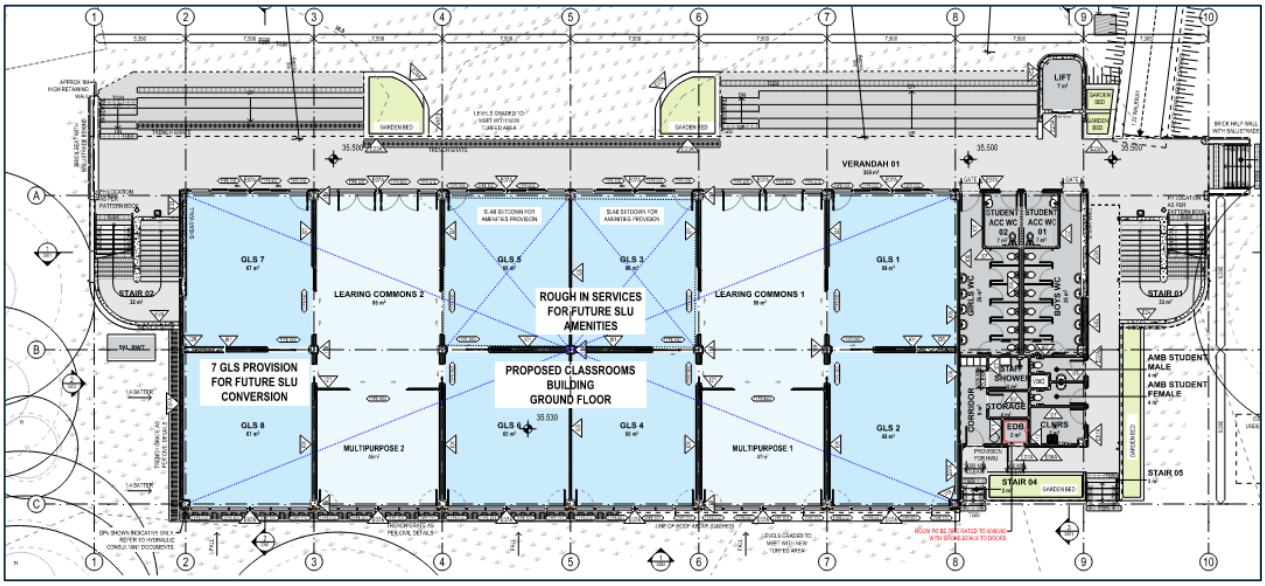


FIGURE 1 GROUND FLOOR PLAN REV 10

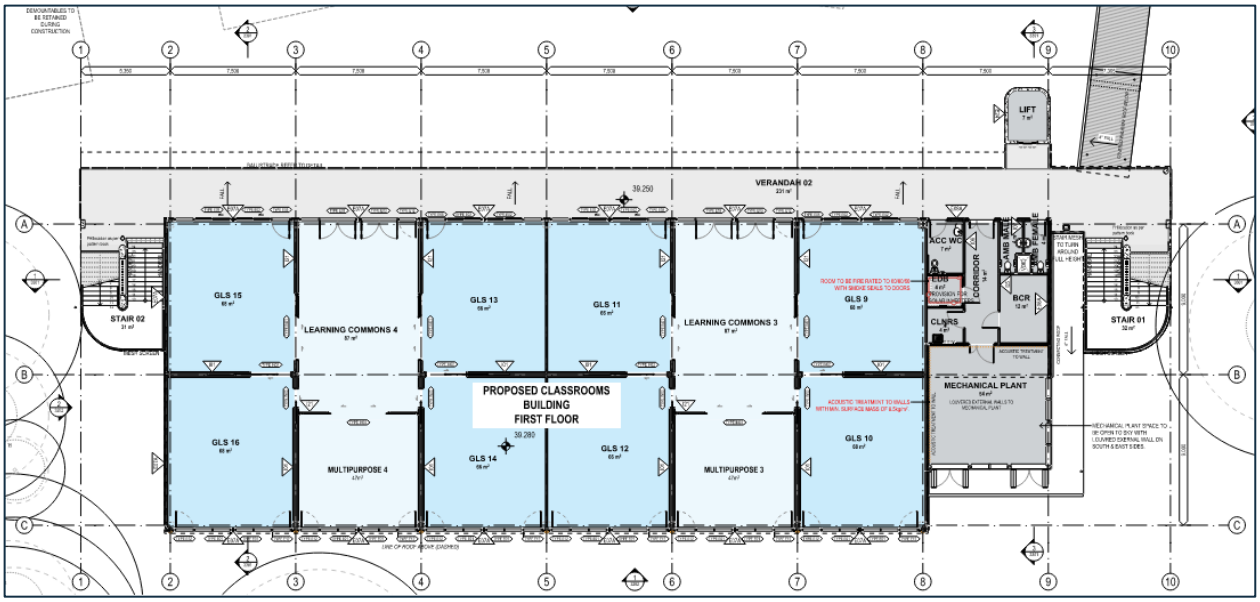


FIGURE 2 LEVEL 1 PLAN

Works to be undertaken under separate Planning Pathway (not part of this REF)

Works to be undertaken under a separate planning pathway cannot be undertaken until the Activity is completed and operational.

- Decommission and remove existing single storey portable classrooms;
- Decommission and remove existing portable amenities;
- Associated covered walkways to be demolished;
- Associated site infrastructure works;
- Shade structure over pathway between block G and H;
- Remainder of landscaping
- Fencing and gate north-west of Block H.

1.3 ACTIVITY SITE

The project site is located at 129 Dalmeny Drive, Prestons and is legally described as Lot 312 DP 882619.

Dalmeny Public School is located on the southern side of Dalmeny Drive and on the northern side of Umbria Street. The surrounding context of the site is predominantly low density residential.

Figure 3 is an aerial photograph of the site.

FIGURE 3 AERIAL PHOTOGRAPH

1.4 S171(2) ENVIRONMENTAL FACTORS

REGULATION / GUIDELINE SECTION	REQUIREMENT	RESPONSE	REPORT SECTION
Table A1 (h) – long-term effects on the environment	**(h1)** – long term effects on: i) Flood and bushfire behaviour, flooding and the flood plain, bushfire prone land ii) Natural environment, flora and fauna species and their habitats iii) Agricultural productivity iv) Industrial land supply v) Housing supply vi) Climate change vii) Cumulative impacts	The ESD initiatives have explicitly considered the relevant long effects on the following: (h1)i), (h1)ii), (h1)vi) and (h1)vii). This is identified in the Climate Adaptation assessment, where risks and adaptation measures were identified and implemented.	10.3 Climate Adaptation Report
	(h2) – meet industry recognised building sustainability and environmental performance standards, integrate environmental design, minimise greenhouse gas emissions, minimise energy and water consumption (recycled water) and material resources, renewable energy generation and storage, fossil fuel-free, sustainable travel choices, manage, reuse, recycle and safely dispose of waste	The building is designed to achieve the following industry standards: - 5-Star Green Star Buildings v1 rating (Australia's most widely accepted and recognised green building standard) - NCC 2022 Section J Specific initiatives proposed address the following; environmental performance standards, minimisation of greenhouse gas emissions, minimise energy and water consumption and material resources, renewable energy generation, fossil fuel-free, sustainable travel choices, manage, reuse, recycle and safely dispose of waste.	5.4 Green Star Buildings v1 5.1 NCC Section J 6 Sustainable Design

2 EXECUTIVE SUMMARY

NDY has been engaged by NSW Department of Education (DoE) to develop a Sustainable Development Plan (SDP) for the proposed Dalmeny Public School activity.

The principal objective of this report is to address the minimum requirements set out in the following:

- Clause 171 & 193 of Division 5 of the Environmental Planning and Assessment Regulation 2021
- SINSW *Sustainable Development Practice Note*
- SINSW Education Facilities Standard and Guideline (EFSG)
- Government Architect NSW (GANSW) Design Guide for Schools and Environmental Design in Schools Manual
- NSW Government Resource Efficiency Policy (GREP 2019)

The activity will be designed and delivered in line with the standard SINSW sustainability brief, detailed in the SINSW Sustainable Development Practice Note, with key scope including:

- 5-Star Green Star Buildings v1 certification
- SINSW EFSG compliance
- NCC Section J compliance

Through early design input from sustainability professionals, key initiatives incorporated in the proposed activity include:

- Passive design elements, such as high-performance façade, effective shading and natural ventilation to reduce the energy demand of the buildings and improve indoor environment quality for students and staff.
- Energy efficient building systems and on-site renewable energy to reduce greenhouse gas emissions.
- Consideration of the building design's resilience and adaptation to climate change impacts.
- High indoor air quality, acoustic design principles, visual amenity and thermal comfort to support the site functions as training and teaching spaces and private staff areas.
- Best practice waste management principles in operation, and construction and demolition waste diversion from landfill.
- Water efficient fixtures and fittings (high WELS ratings)
- Incorporation of stormwater management systems and water sensitive urban design (WSUD) to minimise peak stormwater flows and pollutants.
- Social sustainability initiatives such as incorporation of indigenous design elements, implementation of universal design principles and community benefits via community use of the school facilities.

The ESD initiatives of the proposed activity will be verified through a Green Star Buildings v1 certification. The activity is targeting a 5-Star rating, which is deemed to represent Australian Excellence by the Green Building Council of Australia (GBCA).

Green Star is one of the most widely adopted sustainability framework in Australia, covering a broad range of sustainability initiatives. Green Star Buildings incorporates a mixture of initiatives in line with the intent of WELL (healthy environment for occupants), NABERS (efficient building in operation), Passive House (high performing façade & mechanical systems), as well as other sustainability frameworks.

3 PROJECT SUMMARY

3.1 PROJECT SITE

The school is located within climate zone 5 – warm temperate conditions, which is associated with:

- High diurnal ranges inland and four distinct seasons
- Summer and Winter that can exceed human comfort range, while spring and autumn are ideal for human comfort
- Mild to cool winters with low humidity
- Hot to very hot summers, with moderate humidity

Refer to Figure 1 for a render of the proposed activity.

FIGURE 1: PERSPECTIVE OF DALMENY PUBLIC SCHOOL UPGRADE REV 05

3.2 INFORMATION SOURCES

The following information sources have been used in the preparation of this report:

- Clause 171 & 193 of Division 5 of the Environmental Planning and Assessment Regulation 2021
- NSW Department of Education – School Infrastructure documents:
  - Sustainable Development Practice Note
  - Education Facilities Standard and Guidelines (EFSG) – Design Guide
  - GANSW Design Guide for Schools
  - GANSW Environmental Design in Schools Manual
  - DFMA Guidelines
- NSW Government Resource Efficiency Policy (GREP) 2019
- National Construction Code (NCC) 2022 Section J
- Green Star Buildings v1 Rev C Submission Guidelines
- Architectural drawings prepared by Fulton Trotter Architects
- Discussions and feedback with the design team.

4 SUSTAINABILITY PRINCIPLES

The following section of the report details how the proposed activity responds to the relevant sustainability principles as defined in Clause 171 & 193 of Division 5 of the Environmental Planning and Assessment Regulation 2021.

4.1 THE PRECAUTIONARY PRINCIPLE

The design has been reviewed against holistic sustainability principles to ensure a robust sustainability outcome is delivered. The sustainability initiatives proposed aim to reduce the environmental impacts typically associated with buildings during the construction and ongoing operation of the building.

Sustainability measures have been incorporated, spanning across the activity's design, construction and operations, based around the core principles of:

- Efficient use of resources (energy, water and materials)
- Enhancing indoor environment quality and occupant comfort
- Minimising ecological impacts.

In line with the Green Star pathway, the head contractor will implement an Environmental Management Plan (EMP) ensuring there will also be a systematic approach to environmental considerations throughout construction.

A climate change risk assessment is scheduled to assess the anticipated impacts of climate change and implement design strategies to mitigate these impacts. Refer to Section 7 for details.

4.2 INTER-GENERATIONAL EQUITY

Student and staff health has been considered through the incorporation of indoor environmental quality design features such as daylight and glare analysis for natural lighting, best-practice lighting design, indoor air quality, thermal comfort assessment, acoustic design, and responsible material selection to reduce internal pollutants and resource depletion for future generations.

In relation to cultural diversity, the project will aim to incorporate the NSW Department of Education organisational Reconciliation Action Plan and use it as an opportunity to further embrace the objectives, including:

- [1]Procurement of all materials and labour will be in accordance with the NSW DoE Aboriginal Procurement Policy and NSW DoE Main Works 21 Preliminaries - Section 4.4 'Aboriginal Participation'
- A project-specific Aboriginal Participation Plan will be developed to monitor and report on the minimum Aboriginal participation requirements.

1. Note that the Green Star 'Procurement and Workforce Inclusion' requirements are more onerous than the mandatory DoE ones (requires at least 2% of total contract value to generate employment to disadvantaged groups, as opposed to the DoE's 1.5% requirement.

Universal design principles will be implemented to provide safe, equitable and dignified access for persons with disabilities. Conservation of Biodiversity and Ecological integrity

The proposed design will consider design strategies to minimise the urban heat island effect, such as the use of light-coloured external finishes. High quality access to external views will be considered to increase student engagement with the natural environment.

Construction and operational environmental management systems and plans will be detailed and implemented by the head contractor.

4.3 IMPROVED VALUATION, PRICING, AND INCENTIVE MECHANISMS

Total cost of operation will be reduced through sustainable considerations to reduce energy, water and waste requirements, taking into consideration whole-of-life costing. The project will ensure sustainable principles are extended to include value for money, fit for purpose, long term reliability/resilience and flexibility. Designing with the long-term operation of the building in mind will create further buy-in and cooperation from the operating stakeholders. Strategies to reduce operational waste have been considered such as the development of an operational waste management plan and separation of waste streams.

5 SUSTAINABILITY FRAMEWORKS & LEGISLATION

Relevant sustainability frameworks and legislation applicable to the proposed activity are detailed in the following sub-sections.

5.1 NCC SECTION J

The National Construction Code (NCC) is produced and maintained by the Australian Building Codes Board (ABCB) on behalf of the Australian Government with the aim of achieving nationally consistent, minimum necessary standards of relevant health and safety, amenity and sustainability objectives efficiently. Section J of the NCC Volume 1 sets out the minimum energy efficiency requirements for all commercial buildings in Australia.

The activity will achieve compliance with NCC 2022 (as required) Section J either through Deemed-to-Satisfy (DTS) Provisions, or a Performance Solution J1V2, J1V3 or similar.

5.2 EDUCATIONAL FACILITY STANDARDS AND GUIDELINES (EFSG)

The Educational Facilities Standards and Guidelines (EFSG) are intended to assist those responsible for the management, planning, design, construction and maintenance of new and refurbished school facilities. The EFSG is a suite of information compiled into Design Guides to aid in the planning, design and use of NSW Department of Education school facilities.

The guides aim to provide functional and durable facilities within a systematic whole of life, value for money framework that takes into account enhancement of learning and teaching, planning and development, sustainability and facilities management.

5.3 NSW GOVERNMENT RESOURCE EFFICIENCY POLICY (GREP)

The aim of the NSW Government Resource Efficiency Policy (GREP) is to reduce the NSW Government's operating costs and lead by example in increasing the efficiency of its resource use.

The policy intends to drive resource efficiency by NSW Government agencies in four main areas – energy, water, waste and air emissions from government operations. The policy describes measures to achieve set targets and minimum standards.

5.4 GREEN STAR BUILDINGS V1

The activity is formally registered with the GBCA for a Green Star Buildings v1 rating as: **GS-13016B**

Green Star is a voluntary sustainability rating tool for buildings, tenancies and communities in Australia. It was launched in 2003 by the Green Building Council of Australia (GBCA), a not-for-profit organisation with the key objective of driving the transition of the Australian property industry towards the design and construction of a more sustainable built environment.

Although initially developed specifically for the design and construction of office buildings, the Green Star suite of rating tools has now expanded to cover all habitable buildings and communities across a design, as built and operational performance life cycle.

Green Star is a holistic rating system, covering a wide range of sustainability themes and initiatives. The key categories included under the Green Star Buildings framework are as follows.

- **RESPONSIBLE**: Recognizes activities that ensure the building is designed, procured, built, and handed over in a responsible manner.
- **PLACES**: Supports the creation of safe, enjoyable, integrated, and comfortable places.
- **HEALTHY**: Promotes actions and solutions that improve the physical and mental health of occupants.
- **PEOPLE**: Encourages solutions that address the social health of the community.
- **RESILIENT**: Encourages solutions that address the capacity of the building to bounce back from short-term shocks and long-term stresses
- **NATURE**: Encourages active connections between people and nature and rewards creating biodiverse green spaces in cities.

- **POSITIVE**: Encourages a positive contribution to key environmental issues of carbon, water, and the impact of materials.
- **LEADERSHIP**: Recognizes projects that set a strategic direction, build a vision for industry, or enhance the industry's capacity to innovate.

The targeting of Green Star is based on NSW Education's Commitment to Sustainability and action to certify projects over $10 million with new building gross floor area over 1000m² to *Green Star Design & As built*. Since 2023 the GBCA has not been accepting registrations under the *Design and As Built* tool, and all registrations have been made using the *Buildings v1 tool*.

It is also noted that the GBCA is developing a revised version of the tool (version 1.1), the tool is currently being refined by the GBCA and in the consultation phase. It is expected that it will be ready prior to the completion of this project. As appropriate, the school may elect to upgrade their rating from 1.0 to 1.1, or to elect several credits from the revised tool.

5.5 GOVERNMENT ARCHITECT NSW ENVIRONMENTAL DESIGN GUIDE FOR SCHOOLS

The Government Architect NSW (GANSW) released an Environmental Design in Schools Manual which illustrates a set of design principles as guidelines to follow for new development and expansion of schools. The design principles from the GANSW Design Guide for Schools include:

- Context, Built Form and Landscape
- Sustainable, Efficient and Durable
- Accessible and Inclusive
- Health & Safety
- Amenity
- Whole of Life, Flexible and Adaptive
- Aesthetics

5.6 ENVIRONMENTAL PLANNING AND ASSESSMENT REGULATION 2021

Environmental Planning and Assessment Regulation 2021 is a planning tool that captures NSW legislation relating to planning.

5.7 SUSTAINABLE DEVELOPMENT PRACTICE NOTE

The SINSW Sustainable Development Practice Note outlines the framework for the integration of sustainable development principles in the planning, design, tender and construction phases for all School Infrastructure projects. This framework is closely aligned to NSW Government policy positions and the United Nations Sustainable Development Goals.

6 SUSTAINABLE DESIGN

The proposed activity aims to go beyond minimum building requirements and provide a progressive sustainability outcome for the community. The sustainability principles adopted for the project will contribute to the conservation of resources and future resilience, across the whole life cycle of the project; from construction, through to the operational phase.

The sustainability initiatives will be verified through a Green Star Buildings v1 Rev C certification, with the activity targeting a 5-Star rating. This Green Star Buildings rating applies to the new classroom building only.

This section of the report outlines the initiatives incorporated into the proposed activity in line with the EFSG and Green Star categories and credits. Under each sub-category, the initiatives already incorporated into the design, and additional opportunities identified for further investigation have been outlined. These will be refined through further investigation in design development.

Refer to Appendix 10.1 for the Green Star Buildings scorecard outlining specific credits proposed for the project.

The Green Star pathway and associated relevant design details will be incorporated into project contract documentation, noting that final pathway is still under development and will be further developed during later design stages. The head contractor will ultimately be responsible for ensuring the Green Star 5-star outcome is achieved.

6.1 RESPONSIBLE

6.1.1 GENERAL PRINCIPLES

Responsible project development principles outline design and construction practices which support the activity and integration of building performances and responsible construction practices. These practices and processes include;

- Guidance from sustainability professionals
- Responsible construction practices
- Commitments to performance (e.g. reducing building and operational waste).
- Pre-commissioning, commissioning and tuning
- Air tightness testing for building performance verification
- Building information to facilitate operator and user understanding
- Metering and monitoring
- Training of construction personnel for sustainable construction practices

6.1.2 PROPOSED INITIATIVES

The following initiatives are currently included in the preliminary sustainability strategy, in order to ensure that the activity minimises its environmental impact through construction and operational management:

- SINSW Commissioning and Temporary Schools Program reviews process to assist in advising, monitoring, and verifying the commissioning and tuning of the nominated building systems throughout the design, tender, construction, commissioning and tuning phases.
- Provision of building information to facilitate operator and user understanding of all building systems, and their specific operation and maintenance requirements and/or environmental targets
- Environmental targets for the activity and a system in place to measure results, for reduction of energy and water consumption.
- Responsible construction practices will be in place, including development of project-specific best-practice environmental management plan (EMP) and high-quality staff support services. Implementation of a formalized approach to planning, implementing and auditing during construction to ensure conformance with the EMP.
- Specialist waste consultant will be engaged to develop of an operational waste management plan (OWMP). OWMP principles to be incorporated into the design the design, including separation of waste streams (e.g. paper, cardboard, glass, plastics, toner cartridges, batteries, organics etc.) to facilitate reuse, recycling, composting, and overall waste reduction.
- Public communication and marketing of the project's sustainability targets and outcomes, to accelerate sustainability in the built environment.

- Waste management plans for demolition, construction and operation of the site. Minimum of 90% of construction and demolition waste will be diverted from landfill.
- Implementation of responsibly manufactured products for internal finishes

6.2 HEALTHY

6.2.1 GENERAL PRINCIPLES

Healthy, comfortable learning environments are vital for students and staff, particularly when they may require spaces that facilitate focus and engagement for a considerable amount of time. General principles include:

- High indoor air quality
- Acoustic comfort with noise levels suitable to the activities within each space
- Good lighting design and control that is suitable to the space and free from glare
- High levels of daylight amenity and views for visual interest
- Reduce harmful exposure to toxins from building materials and finishes
- Thermal comfort

6.2.2 PROPOSED INITIATIVES

The following initiatives are currently included in the preliminary sustainability strategy:

- Passive design principles have been incorporated in the design, including high-performance building envelope, effective shading and building orientation, and natural ventilation openings to support comfortable and low-energy indoor environment quality.
- Acoustic consultant engaged to advise design to support the building's function as training, teaching and multi-purpose spaces for students, staff and community use.
- Best-practice lighting will be provided to improve lighting comfort via flicker-free, high-quality lighting that accuracy addresses the perception of colour within the space.
- High levels of daylight and external views are provided to regularly occupied learning and administration areas, to support high levels of visual comfort for building occupants. Refer to Preliminary Daylight Assessment undertaken for the project.
- Internal air pollutants have been reduced via selection of materials with low or no volatile organic compound (VOC) levels and low formaldehyde concentrations, verified via on-site testing.
- Effective heating and cooling to improve thermal comfort, in accordance with EFSG guidelines.

6.3 POSITIVE

6.3.1 GENERAL PRINCIPLES

Through a range of performance measures buildings can; improve their energy efficiency which will reduce Greenhouse Gas emissions from grid-based energy; reduce their potable water demand making them more drought tolerant; and, reduce their embodied carbon through sustainable materials selection. General principles include:

- Selection of materials with low embodied carbon
- Energy efficient buildings
- No fossil fuel use
- Offsetting of residual carbon emissions
- Reducing potable water consumption, such as through the use of high efficiency water fixtures.
- Installation of a solar PV system capable of generating the new energy consumed by the proposed building.

6.3.2 PROPOSED INITIATIVES

The following initiatives are currently included in the preliminary sustainability strategy, in order to enhance the energy efficiency of the building. Refer to preliminary energy modelling reporting.

- Highly energy efficient building, exceeding the minimum requirements of the NCC Section J. Energy to be undertaken to demonstrate a reduction in energy consumption in comparison to a NCC DtS compliant reference building, in line with the following targets:

- Minimum 10% reduction, excluding any contribution from renewable energy (e.g. rooftop solar PV) in line with EFSG Section DG02.03 and the Green Star Building Credit 22 *Minimum Expectation*
- Minimum 20% reduction, including onsite renewable energy contribution.

Final improvement will be demonstrated via energy modelling in schematic design. Specific energy efficiency provisions will include:

- Exceeding the minimum building envelope R-values of NCC Section J
- Improving on the glazing performance requirements of NCC Section J
- Effective shading devices which reduce solar heat gains to conditioned spaces
- Energy-efficient lighting (typically LED) will be provided throughout, exceeding lighting power densities of the NCC Section J
- High efficiency electric domestic hot water systems
- High efficiency heating, ventilation and air conditioning systems with mixed-mode 'traffic light' controls system to reduce operational energy.
- All-electric building services
- New roof mounted solar photovoltaic (PV) system. It is noted that the Dalmeny Primary School works includes provision for a solar PV array. Currently 75kW is proposed, exact sizing may be refined in future project phases.

- High-efficiency water fixtures.
- Reduction in embodied carbon of materials, achieved through sustainable concrete and steel selection. The building's upfront carbon emissions to be at least 20% less than a business-as-usual reference building, in line with Green Star Credit 21 *Credit Achievement*.
- Inclusion of a 5kL rainwater tank to reduce potable water consumption, targeting a minimum 45% reduction in potable water consumption.

6.4 PLACES

6.4.1 GENERAL PRINCIPLES

Under this category people are placed at the forefront of the design to ensure the building supports health movement, provides enjoyable places and contributes the local community and cultural heritage of the site. General principles include:

- Active transport (walking and cycling) is encouraged, and private vehicle use is reduced
- Communal spaces which support occupant and community engagement are developed
- The local community's cultural heritage embedded in the design

6.4.2 PROPOSED INITIATIVES

The following initiatives are currently included in the preliminary sustainability strategy to improve sustainable transport options:

- To encourage active and public transport, bicycle parking for staff and students, as well as changing facilities for staff to be provided to the activity.

6.5 PEOPLE

6.5.1 GENERAL PRINCIPLES

This category recognizes the contributions made by the local workforce which develops the building and aims to ensure sustainable practices support workers during the construction process, for areas including mental health and social inclusion. Additionally, the building design is reviewed for universal design principles for improved accessibility. General principles include:

- The builder supports mental health initiatives and promotes diversity
- The building has Indigenous design aspects, or a Reconciliation Action Plan is developed
- Disadvantaged groups are supported for workforce inclusion
- Universal design principles for people with disabilities are embedded in the design.

6.5.2 PROPOSED INITIATIVES

The following initiatives are currently included in the preliminary sustainability strategy:

- The builder has policies and programs to support construction workers and provides staff support.
- The Head Contractor has procurement practices in place to support disadvantaged groups gain employment opportunities, including:
  - Procurement of all materials and labour will be in accordance with the NSW DoE Aboriginal Procurement Policy and NSW DoE Main Works 21 Preliminaries - Section 4.4 'Aboriginal Participation'
  - A project-specific Aboriginal Participation Plan will be developed to monitor and report on the minimum Aboriginal participation requirements.
  - At least 2% of the building's total contract value has been directed to generate employment opportunities for disadvantaged and under-represented groups.
- Inclusive design principles are followed to ensure building users with diverse needs have ease of access and way finding throughout the building.

6.6 NATURE

6.6.1 GENERAL PRINCIPLES

Impacts to nature are minimised and the biodiversity of the site is fostered through selection of native plant species, this also supports the wellbeing of building and local groups who can maintain a connection with nature through urban green spaces. Waterways are protected through a volume controlled stormwater management strategy. General principles include:

- Protect and enhance ecological and biodiversity value
- Minimise negative impacts, such as lighting pollution and stormwater pollution.

6.6.2 PROPOSED INITIATIVES

The following initiatives are currently included in the preliminary sustainability strategy:

- Specified stormwater pollution reduction targets are met.
- Appropriate lighting design to reduce light pollution, including ensuring an upward Light output Ratio (ULOR) <5% or use of awnings to block light pollution to neighbours and the night sky
- All heat-rejection systems to be waterless to eliminate risk of Legionella (no cooling towers)

7 CLIMATE CHANGE RESILIENCE

The projected impacts of climate change on the proposed activity has been assessed, based on predicted climate change models. A Climate Adaptation Workshop was be held with all project stakeholders on 02 Dec 2024. The workshop goals were to:

- Identify and describe risks posed by climate change to the activity and rate the consequences and likelihood of each
- Identify and evaluate the potential adaptation actions and/or design strategies to mitigate those risks which are deemed unacceptable.

To facilitate this process, pre-workshop notes were be provided to all stakeholders attending the workshop which consisted of the following parts:

- Climate change projections
- Consequence scale for the risk assessment
- Likelihood scale for the risk assessment

A climate change risk assessment undertaken as per AS 5334-2013 and Green Star Buildings v1 requirements. Expected impacts from climate change were identified with reference made to both CSIRO projects for the East Coast (South) sub-cluster and NSW Government's NSW and ACT Regional Climate Modelling (NARCLiM) projections. The results showed the following:

- Extreme temperatures are projected to increase with very high confidence, and substantial increases in temperatures reached on hot days, as well as the frequency of hot days.
- Average temperatures will continue to increase in all seasons (very high confidence)
- Generally, less rainfall is expected in winter (medium confidence), but the intensity of extreme rainfall events is expected to increase (high confidence)
- Time spent in drought is expected to increase (low confidence) over the course of the century.

The design's responsivity to the above impacts has been assessed in accordance with Green Star requirements, at least two of the risks identified will be addressed by specific design responses, suggested risks to be addressed are detailed within the Climate Adaptation Report.

8 NET ZERO AND RESOURCE EFFICIENCY

The proposed activity aims to minimise greenhouse gas emissions, to reflect the NSW government's goal of net zero emission by 2050, and consumption of energy, water and material resources. The key initiatives which have been selected to contribute to these goals are summarised below.

8.1 ENERGY CONSUMPTION AND NET ZERO 2050

The building incorporates the following initiatives into its design:

- Greater than 20% reduction in energy efficiency over minimum NCC compliance
- Passive design including consideration of orientation, thermal mass, shading, and fabric and glazing insulation performance, and colour
- Energy efficient lighting design and control
- Energy efficient heating, ventilation, and air conditioning design and control
- Energy efficient appliances and equipment
- Energy monitoring and passive and active design principles to limit grid reliance during peak demand periods
- Renewable energy sources, including solar photovoltaic panels
- 100% electric design to minimise gas use and greenhouse gas emissions
- Commissioning and tuning strategies

8.2 WATER CONSUMPTION

The building incorporates the following initiatives into its design:

- Water efficient fixtures, equipment, and appliances
- Water use monitoring
- Provision of bubblers and taps to encourage water drinking and reduced waste
- Water sensitive urban design
- Stormwater management, and groundwater and drinking water catchment protection
- Commissioning and tuning strategies

8.3 OTHER MATERIALS CONSUMPTION

The building incorporates the following initiatives into its design:

- At minimum 20% reduction in upfront carbon through sustainable material selection, including low embodied carbon materials and high recycled content materials. Including major construction materials – concrete, steel, timber and aluminium
- Building flexibility and built for disassembly

9 CONCLUSION

This report identifies the sustainability measures being pursued or investigated by the project team, demonstrating how the relevant sustainability requirements have been addressed.

The proposed design for the activity incorporates sustainability measures that have far reaching benefits from the perspective of energy, water and waste reduction; as well as providing good indoor environment quality, thermal comfort and visual comfort. By this means, the proposed activity will have a positive impact on the health and wellbeing of the students and staff occupying the building.

Mitigation Measures

Table 1 summarises the mandatory sustainability initiatives required to achieve the 5-star Green Star Buildings v1 certification in line with the proposed sustainability strategy.

TABLE 1 MITIGATION MEASURES

MITIGATION NAME	MITIGATION MEASURE	REASON FOR MITIGATION MEASURE
Green Star Mandatory Requirements	All mandatory items required by the Green Star Buildings v1 guidelines. Refer to 10.2 Green Star Buildings v1 Pathway	Achievement of mandatory items is non-negotiable when targeting a formal Green Star rating.
Educational Facilities Standards and Guidelines ESD Schedules	Achievement of all ESD initiatives required by the EFSG. Refer to 10.1 SINSW ESD Schedule	EFSG ESD requirements

10 APPENDICES

10.1 SINSW ESD SCHEDULE

Refer to the following page(s).

PROJECT:	Oatmeny Public School Upgrad
REVISION	A
AUTHOR	Richard Porter

											SINSW SUSTAINABILITY REVIEW				INDEPENDENT SUSTAINABILITY VERIFICATION							
Sustainability Strategy Priority	**Sustainability initiatives / requirements** Where application, this is an extract only from the relevant EFSG. For full requirements refer to https://efsg.det.nsw.edu.au/	**Project stage**	**Basis for Initiative**	**Crossover with Green Star**	**Recommended evidence to demonstrate compliance**	**Has this been implemented in the project?** Y or N or NA	**Contractor's ESD consultant comments**	**Actual evidence** This evidence needs to show that the requirement from column C has been met	**Responsibility**(identify party responsible to provide evidence)	**Planning check** **Is the evidence proposed accepted?** Y or N	**Design Check** **Is the project compliant?** Y or N	**As Built Check** **Is the project compliant?** Y or N	**SINSW Sustainability comment**	**Independent ESD Review Comments (insert date)**	**D&C Contractors Response (insert date)**	**Independent ESD Review Comments (insert date)**	**D&C Contractors Response (insert date)**	**Independent ESD Review Comments (insert date)**	**Independent ESD Compliance Review**	**Potential impact of departure on Green Star Points: Y, N, N/A.**	**Documentary Evidence provided?**	**Evidence Index (optional)**
Act on climate change	**Improvement over NCC** All new facilities must be designed and built so that energy consumption is predicted to be at least 10% lower than if build to minimum compliance with National Construction Code requirements. Each building's system and façade must comply with the corresponding Section J requirements in the National Construction Code. That is, the building cannot show that their façade, or any system, performs worse than the reference building. The energy consumption reduction must be achieved without including renewable energy generation in the calculation.	Ph 2-5: Architectural Design	DG02.03 GREP	DAB c15E.0 GHG Emissions Reduction - Conditional Requirement	**1.** Energy modelling report / Predictive energy modelling and thermal comfort assessment. Report needs to show at least 10% improvement of building over minimum NCC requirements; and **2.** As-built evidence that model is an accurate representation of the building, e.g. drawings; and **3.** Specifications / calculations supporting modelling inputs, e.g. window energy rating scheme certificates, calculated R-values of walls, roofs, etc. 4. As an alternative to 2 and 3 above, a Statement by energy modeller confirming that the model accurately represents the building.	Y	Energy modelling has confirmed that the school significantly exceeds the requirement to reduce energy consumption by at least 10% vs. a reference building.	Refer to Energy Modelling Assessment	Sustainability												1
Act on climate change	**Passive design** The need for active cooling and heating shall be minimised by employing passive / sustainable design principles listed in DG 55, DG 06.02 and DG 27.12 as well as the GA NSW Environmental Design in Schools Guidelines. This includes: - Window size and shading to prioritise passive cooling in summer and heating in winter - Orientation - Thermal mass - building fabric colour and performance - shading	Ph 2-5: Architectural Design	DG55 DG06.02 DG27.12 GA NSW Environmental Design in Schools	DAB c15 GHG Emissions Reduction	**1.** Thermal modelling report **2.** As built evidence demonstrating measures implemented to reduce need for active cooling / heating **3.** Passive design report by Architect listing all passive design initiatives implemented	Y	Large reductions in energy consumption, as a result of passive design principles, have been incorporated in the design.	Refer to Energy Modelling Assessment	Sustainability												2
Act on climate change	**Energy efficient lighting design and modelling** - LED lighting must be installed - The design of the lighting systems and the selection of fittings is to be undertaken based on a Whole of Life approach, such as diodes and control gear with a long life - Section J part 6 maximum illumination power density provisions must be adhered to, along with all other elements of part 6 - System must support sustainable design principles including reducing energy consumption, such as timed or sensor feedback functionality - Lighting designs should be carried out utilising industry standard lighting design software such as AGi32, Dialux or Relux.	Ph 2-5: Services Design	DG2.3.1 DG63.01 DG63.04 DC63.05 DG63.03.02	DAB c15 GHG Emissions Reduction	**1.** Lighting drawings **2.** Lighting specifications / schedules **3.** Lighting modelling report showing compliant power densities	Y	Assumed to be included in patternbook documentation for standard hubs		Electrical												3
Act on climate change	**Lighting control and switching** - The use of lighting controls will assist in substantially improving energy efficiency on sites, and should be considered for all new lighting systems, in new build or site refurbishments. - Lighting control should be simple to operate and adhere to all requirements of DG 63.06 - Constant Light Output and Daylight Harvesting systems are recommended given their ability to reduce lighting energy whilst maintaining comfortably lit spaces. Consideration should be given to these strategies as stipulated in DG 63.06 - Including daylight sensors in rooms to reduce light output or turn off light when sufficient daylight is provided within the space - When the space is large and perimeter lighting is adjacent to windows, perimeter lighting is on a separate zone to make maximum use of daylight - Local switching should be provided where it is identified that the users can benefit from manual operation of the lighting and other lighting automation technology is considered cost prohibitive. The switching should be clearly marked and robust. Provisions for energy efficient switching in Schools are outlined within DG63 and DG65.	Ph 2-5: Services Design	DG63.06 DG63.07 DG65.03.01	DAB c15 GHG Emissions Reduction DAB c4 Building Information	**1.** Electrical & lighting drawings showing switching groups and automatic controls **2.** Lighting modelling report showing compliant power densities **3.** Lighting operations and maintenance manual	Y	Assumed to be included in patternbook documentation for standard hubs		Electrical												4
Act on climate change	**Energy efficient appliances & equipment** Electrical equipment must be at least 0.5 stars above the market average star rating or comply with high efficiency standards specified in the GREP HVAC system must have timed or sensor feedback functionality for energy conservation Systems shall be designed to minimise energy consumption. System design / equipment selection is to be based on whole of life cost analysis. Specific requirement are outlined in the EFSG	Ph 2-5: Services Design	DG2.3.3 DG55	DAB c15 GHG Emissions Reduction	**1.** Schedule of appliances and equipment with their star ratings or performance standards, signed by head contractor or architect. All appliances and equipment required in the GREP must be listed, incl air conditioning equipment, electric motors, transformers, etc. **2.** As built mechanical drawings / statement from head contractor; **3.** Whole of life cost analysis demonstrating systems were selected based on WCL performance	Y	HVAC controls are based on EFSG requirements, which comply with the noted tier		Mechanical												5
Act on climate change	**Heat loss/gain** The design must take steps to control heat loss from the building during cooler winter months and heat gain during the warmer months. Refer to HVAC Design considerations in DGD4.01	Ph 2-5: Services Design	DGD4.01	DAB c15 GHG Emissions Reduction	**1.** Thermal modelling report **2.** As built evidence demonstrating that model is an accurate representation of the building **3.** Specifications/ calculations supporting modelling inputs	Y	The building utilises shading design and improved thermal fabric performance to reduce heat gains and losses, and reduce overall energy consumption.	Refer to Energy Modelling Assessment	Sustainability												6
Act on climate change	**Indoor environment control** - Both the thermal comfort and indoor air quality shall be controlled automatically within specified parameters. - Controls shall be simple and intuitive to use. - A "traffic light" light system (described in DG 55.01 Thermal Comfort and Indoor Air Quality Policy) should be used to inform users of the suitability of outdoor conditions to utilise natural ventilation.	Ph 2-5: Services Design	DG55 DG 55.01 Thermal Comfort and Indoor Air Quality Policy	DAB c15 GHG Emissions Reduction	**1.** As built evidence demonstrating controls have been installed as required. **2.** Commissioning report / statement by head contractor confirming controls have been set as required	Y	Traffic light system is included to all learning spaces as per the EFSG		Mechanical												7
Act on climate change	**Renewable energy** A grid connected solar PV system must be installed in line with DG66 requirements Where feasible, PV systems shall be installed to offset as much of the electricity consumed by the school as is practicable	Ph 2-5: Services Design	DG2.3.4 DG55	DAB c15 GHG Emissions Reduction; DAB c16 Peak Electricity Demand	**1.** As installed drawings of PV system **2.** Energy modelling report showing renewable energy generation	Y	PV system to be installed and sized to offset building consumption	Preliminary Calculations and proposed system size included in concept documentation (Concept Report and Drawings)	Electrical												8
Act on climate change	**Battery Energy Storage System** A battery energy storage system shall only be designed in consultation with SINSW Sustainability sustainability.enquiries@det.nsw.edu.au	Ph 2-5: Services Design	DG66.8.3	DAB c15 GHG Emissions Reduction; DAB c16 Peak Electricity Demand Reduction	As installed drawings of battery storage system	NA		No battery system proposed	Electrical												9
Act on climate change	**Heaters** Electric heating must be preferred over gas heating. Where gas heating is considered, it must be approved by SINSW Sustainability Heating equipment must be designed from a whole-of life perspective and: - Support sustainable design principles including reducing energy consumption and carbon emissions - Be accessible and serviceable - easy to maintain with minimal impact on school use when maintenance is being performed	Ph 2-5: Services Design	DG56	DAB c15 GHG Emissions Reduction	**1.** If reverse cycle air conditioning is installed, confirmation that gas heaters are not installed, OR **2.** Evidence that the gas heaters installed are energy efficient	Y	No gas heating is included in the mechanical design		Mechanical												10
Act on climate change	**Water heaters** - Hot water and tempered water generation for schools must be carefully considered to ensure that a Whole of Life assessment is undertaken to minimise life cycle costs and carbon emissions - Environmentally friendly options such as solar heating (if vandal resistant) and heat pumps are preferred energy sources to	Ph 2-5: Services Design	DG53.09	DAB c15 GHG Emissions Reduction	1. WOL cost assessment for hot water systems 2. Hydraulic drawings/schematics showing installed DHW systems	Y			Hydraulics												11
Build resilience	**Site investigations for resilienc** The following detailed reports/ surveys/ information should be considered in developing the business case: - Slope, drainage and erosion issues including flood risks (if any) - Geotechnical and soil conditions - Airborne pollutants - Bushfire risks - Appraisal of available services infrastructure - Climate change risk assessment must be undertaken considering at least two different climate change scenarios An environmental risk report will be required for developments proposed within sensitive natural environments or sites subject to natural risks (e.g. flood prone sites, bush fire areas)	Ph 1: Site Selection and Masterplan	DG03.02	DAB c3 Adaptation and Resilience	**1.** Detailed reports or surveys developed **2.** Environmental risk report **3.** Evidence demonstrating recommendations have been implemented and risks addressed through design responses.	Y		Contamination and Geotech report	BPI+Infrastructure												12
Build resilience	**Bushfire protection** Development applications on bush fire prone land must be accompanied by a Bush Fire Assessment Report demonstrating compliance with the aim and objectives of Planning for Bush Fire Protection and the specific objectives and performance criteria for the land use proposed. Local Authorities and the Rural Fire Service can provide advice on the design of buildings in bush fire prone areas. The Building Code of Australia and AS3959 "Construction of buildings in bushfire-prone areas" set out the requirements for buildings which are within close proximity to a defined bush fire zone. Mandatory landscape management strategies: - Keep the amount of fuel (leaves, twigs, logs, dead grass) in the vicinity of buildings to a minimum. - Ensure trees are located at away from buildings to avoid branches overhanging and leaves collecting on roofs. - Do not plant shrubs against buildings. - The crowns of trees planted on the hazard side of the development should not be contiguous. - Plant fire resistant trees and shrubs on the hazard side of the development to reduce the potential impact of wind, fire intensity, radiant heat, and rate of spread as well as intercepting burning embers. - Avoid combustible fencing materials. - Provide irrigation and garden sprinklers to water areas near the buildings (subject to water authority approval)	Ph 1: Site Selection and Masterplan	DG13.01	DAB c3 Adaptation and Resilience	**1.** Bush fire assessment report **2.** Statement by Architect / fire consultant outlining building strategies implemented in line with BCA and AS3959. **3.** Bush fire management plan outlining management strategies implemented **4.** Landscape plans detailing bush fire management measures implemented	N/A			BPI+Infrastructure												13
Build resilience	**Climate change adaptation** Sites and school communities must be able to withstand natural and urban hazards and adaptively respond to climate change over time, especially for projects involving vulnerable communities e.g. climate generating exacerbated flood, storm surge, inundation, heatwaves, bush fires, extreme storm and other weather events. School facilities must be able to withstand natural hazards and adapt to shocks and stresses to avoid social and economic costs of interrupted operation and repairing or replacing damaged assets. To achieve this, increasing resilience to natural hazards must be considered in the business case development so that associated costs are budgeted. An initial assessment of natural hazards and project vulnerability must be carried out, in consultation with resilience experts, to inform the business case and identify hazards where further analysis is required. The assessment must report on at least two different timescales (2050 and 2070) and consider high emissions scenarios consistent with 2C and 4C for each timescale. The Intergovernmental Panel on Climate Change (IPCC) endorsed emissions scenarios should be used to dictate the assessed scenarios Where significant risks are identified in the initial assessment, a comprehensive climate change risk assessment must be undertaken.	Ph 1: Site Selection and Masterplan	DG02.08	DAB c3 Adaptation and Resilience	**1.** Climate risk assessment, and **2.** Climate adaptation plan **3.** Emergency management plan	Y	Climate change risk workshop and report have been completed by NDY with inputs from all design disciplines. All risks and their ratings are identified within the report.	Refer to Climate Change Adaptation Repo	Sustainability												14
Build resilience	**Weather protection** Circulation areas provided between administrative, staff and all student spaces (except Agriculture), should be protected from sun, rain and unfavourable winds.	Ph 2-5: Architectural Design	DG08.05	Not covered in Green Star	As built drawings showing circulation areas are protected as required	Y	All circulation areas have a roof to protect against weather	Refer to Schematic Design drawing	Architect												15

Build resilience	**Urban heat island mitigation - roof colour** The roof colour will also have an impact on the thermal performance of the roof, therefore the product's Solar Reflectance Index (SRI) should be considered to mitigate the heat island effect. The product selected must meet the following three-year Solar Reflectance Index (SRI) requirements: For roof pitch < 15, minimum SRI of 64 For roof pitch > 15, minimum SRI of 34 Where a three-year SRI is not available, the following requirements must be met: For roof pitch <15, minimum SRI of 82 For roof pitch >15, minimum SRI of 34	Ph 3-4: Product and Material Selection	DG20 Fabric	DAB c25 Heat Island Effect	**1.** Site Plan highlighting all relevant areas as referenced within the area schedule; **2.** 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; and **3.** Supplier Documentation material data sheet for compliant roofing and hardscape materials.	Y	Roof Colour will be SURFMIST SRI 82		Architect										TBC			16
Consume responsibly	**Building User's Guide** Produce a Building User's Guide to enable the client to understand the building systems and operate systems to maximise efficiency. This must: - Clearly and concisely describe the operation of building and its services - Detail a reasonable maintenance program - Advise the user of the most suitable replacements for consumables	Ph 7-9: Construction, Commissioning Post Occupancy and Operation		DAS c4 Building Information	**1.** Building user's guide			D&C contractor responsible													TBC			17
Consume responsibly	**Stormwater management** Must aim to minimise the transportation of toxicants to waterways and other offsite environments, and maintain the existing hydrological regimes. Due diligence for flooding must be done early to inform building and landscaping design	Ph 1: Site Selection and Masterplan	DG2.4.3	DAB c26 Stormwater	**1.** Stormwater modelling report showing stormwater pollution and flows. **2.** Civil / Hydraulic drawings showing management measures. **3.** Water sensitive urban design report (if WSUD was used)	Y		Pollutant reductions are targetted through the use of filtration devices. Due diligence completed for		Civil										TBC			18
Consume responsibly	**Drinking water catchment protection** For developments within drinking water catchment areas, a water cycle management study is to be included with the Development Application for Education Facility developments involving: - Agriculture facilities - Biosolids and effluent re-use schemes - Sewerage systems or works (including package sewerage treatment plants) - Stormwater or works involving the disposal of untreated runoff	Ph 1: Site Selection and Masterplan	DG1.07	GSC c24 Integrated Water Cycle	**1.** Water cycle management study **2.** Evidence that recommendations in the study have been followed / implemented	NA				RPInfrastructure										TBC			19
Consume responsibly	Where a new school is to be developed a Hazardous materials study is to be conducted, including: - Asbestos Containing Materials (ACM) - Synthetic Mineral Fibres (SMF) - Polychlorinated Biphenyl's (PCB) - Lead Paint - Ozone Depleting Substances Any existing structures and all parts of the site should be examined in order to determine the presence of hazardous materials before the commencement of any renovation or demolition. Inspection should be conducted in accordance with DG48. Where hazardous materials are found a Hazardous Materials Management Plan should be prepared	Ph 1: Site Selection and Masterplan	DG48.01	DAB 24.2 Contamination and Hazardous Materials	**1.** Hazardous materials study / site inspection report / survey **2.** Management plans for hazardous materials identified **3.** Remediation strategies implemented **4.** Environmental auditor certificates / clearance certificates	Y		PSI	RPInfrastructure											TBC			20
Consume responsibly	**Operational waste** A waste storage area must be included in all new school sites. The provision of space must include source separation including bin stations and appropriate signage of waste and receptacles for multiple waste streams, including: - Organics - Comingled containers - Paper & cardboard - Container deposit scheme - Soft plastic - General waste Designers must refer to AS 4123.7 Mobile waste containers - Colours, markings, and designation requirements for further guidance on bin colour, waste stream and waste type. Safe methods for vehicle access and the transfer of waste must also be considered. For new and refurbished schools, an operational waste management plan (OWMP) must be developed to establish operational waste targets, identify opportunities for reuse and recycling in the operation of the facilities and make adequate provision for the facilities to accommodate for the OWMP. The OWMP must address all requirements from DG 2.7.2	Ph 2: Concept Design - Space planning	DG02.7.1	DAB c8 Operational Waste	Operational waste management plan Operational waste reports showing diversion rates	NA		Existing school, item not relevant												TBC			21
Consume responsibly	**Building flexibility** Position structural members considering the future flexibility of the structure. Avoid ad hoc placing of columns internally, giving preference to uniformity in layout. Design all internal walls as non-load bearing to enable future flexibility.	Ph 2: Concept Design - Space planning	DG21.1.16	Not covered in Green Star	As built drawings or statement by relevant professional	N		Window and ventilation required at edge wall thus no room for shear walls. Shear walls has been fit within cavity to suit layout, has been reviewed and agreed by pattern book team.		Structure										TBC			22
Consume responsibly	**Hydraulic services** Hydraulic services should: - Support sustainable design principles including reducing water consumption and waste production. - Appropriately treat any trade waste to ensure minimal environmental impact - Be accessible and serviceable - easy to maintain with minimal impact on school use when maintenance is being performed - Use products with a long life span – many hydraulic services are concealed so durability is essential	Ph 2-5: Services Design	DG51.01	DAB c18 Potable Water	**1.** Hydraulic report showing sustainability initiatives implemented to reduce potable water consumption **2.** As built drawings showing trade waste arrestors					Hydraulics										TBC			23
Consume responsibly	**Water sub-metering** In addition to the main water meter for the site provide sub meters for the following: - Mixed irrigation systems - Laboratory buildings - Amenities blocks - Canteens - Any other major water use on the site	Ph 2-5: Services Design	DG53.04	DAB c6.0 Metering	**1.** As built hydraulic drawings					Hydraulics										TBC			24
Consume responsibly	**Rainwater collection** Include roof water harvesting and tank storage in new schools and where practical in existing schools to reduce the demand on drinking water supplies. Tank water can connect to drip irrigation systems for adjacent landscape/gardens with the major preference being for gravity fed supply to minimise ongoing maintenance. The rainwater tanks must be connected to toilets for toilet flushing. If this is not feasible, approval must be granted by SIN	Ph 2-5: Services Design	DG53.14 DG2.4.2 DG53.01	DAB c18B.2 Rainwater Reuse	**1.** As built hydraulic drawings showing tank connection to end uses and capacity	Y		5kL Rainwater Harvesting tank is being considered as part of targeting Water Use credit in Green Star Buildings v3.		Hydraulics										TBC			25
Consume responsibly	**Fire system water reuse** Where schools are required to install a sprinkler system for fire safety, it is recommended to install a closed loop system must be installed to capture and reuse fire systems testing and maintenance water, or by using an alternative non-potable water source.	Ph 2-5: Services Design	DG2.4.2	DAB c18B.5 Fire System Test Water	Fire engineering report					Fire										TBC			26
Consume responsibly	**Ground water** Where ground water is available for use for irrigation purposes in drought affected locations, enquiries must be undertaken with the Department of Planning, Industry and Environment to determine the suitability of a ground water system.	Ph 2-5: Services Design	DG53.03	DAB c18 Potable Water	1. Relevant due diligence report / investigation	NA		Ground water not available for irrigation												TBC			27
Consume responsibly	**Trade waste** Arrestors for acid, grease, plaster and clay of adequate capacity must be installed to treat wastewater from science laboratories, kitchens, art rooms and canteens as required in DG52.	Ph 2-5: Services Design	DG52	Not covered in Green Star	**1.** As built drawings showing trade waste arrestors or **2.** Letter by Hydraulic Engineer confirming arrestor have been installed as required	NA		No science labs, kitchens, art rooms, or canteens within scope												TBC			28
Consume responsibly	**Water Fixture efficiency** All products must be rated to AS 6400 to the following minimum WELS ratings: - Tapware to 5 star flow rating requirements - Showers to have 3 star flow rating requirements - Water Closet Pans to 4 star flow rating requirements - Urinals to 5 star flow rating requirements - Flow restrictors can be used to minimise water usage and wastage for staff amenities - Taps with timed flow can be used to minimise water usage and wastage in student amenities. - New and replacement urinals must use manual in lieu of automatic flushing mechanisms. A microwave-activated urinal flushing system may be used as an alternative. In any case, all new water-using appliances must be at least 0.5 stars above the average WELS star rating by product type, except toilets and urinals, which must be purchased at the average WELS star rating. Where WELS rating is not available, use the alternat	Ph 3-4: Product and Material Selection	DG53.02 DG2.4.1	DAB c18B.1 Potable Water - Sanitary Fixture Efficiency	1. Schedules of materials, fixtures, fittings and equipment with WELS/WaterMark ratings, demonstrating compliance and identifying those with flow restrictors and timed flow.	Y		Will comply as per EFSG requirements. Detailed selections have not yet taken place.												TBC			29
Consume responsibly	**Life cycle assessment (environmental)** Environmental impacts of products and materials has been assessed and inform material selection	Ph 3-4: Product and Material Selection	DG01.03	DAB c.19A - Life cycle assessment	Life cycle assessment report	Y		Upfront Carbon assessment has been performed by NDY which identifies the required material substitutions to achieve compliance with Green Star Buildings Upfront Carbon requirements, and identifies the environmental impacts of products and materials.	Refer to Upfront Carbon Assessmer	Sustainability										TBC			30
Consume responsibly	**Whole of life costing (WOL)** Total cost of ownership (TCO) assessment / Analysis of direct and indirect costs and benefits / Life cycle costing analysis When calculating the whole of life cost for the different materials / building elements or systems, the following must be considered: - the total initial capital cost of the system/s – including design, project management, builder and building services works in connections etc. - resources (energy and where applicable water) consumption. - Maintenance. - the replacement of component parts. - disposal costs - ecological sustainable options - durability - vandalism - safety The whole of life cost shall be calculated over the estimated life of the asset/s.	Ph 3-4: Product and Material Selection	DG01 All design guides for selection of materials and building systems	GSC c20 - Return on Investment	Life cycle costing report for relevant system					Cost Planner										TBC			31

Consume responsibly	**Sustainable materials** Construction materials must be selected based on the following: - Adequately and economically perform their intended functions, and also have lower adverse environmental impacts throughout their life cycle (refer to DG 3) - Contain reduced or no hazardous substances (e.g. low VOC) to ensure effective indoor environmental quality. Reduce the demand for rare or non-renewable resources. - Have low embodied energy and water. - Are made from or contain recycled materials or can be reused or recycled at the end of their useful	Ph 3-4: Product and Material Selection	DG02.05	DAB c21 Sustainable Products	**1.** Environmental Product Declarations of products / materials used; Product certificates (like GECA, FSC, et3) **2.** Suppliers' declarations confirming recycled contents in products **3.** Bill of quantities	Y	Will be considered in Specification. Current specification based on similar 5 star project. Futher development throughout process.		Architect										TBC			32
Consume responsibly	**Sustainable timbe** - No rainforest timbers, or timbers from high conservation forests, are to be used unless plantation grown. Use only recycled timber, engineered and glued timber composite products, or timber from plantations or from sustainably managed regrowth forests that are FSC, AFS or PEFC certified - All timber used is to be termite (white ant) resistant or treated to be termite resistant to the appropriate hazard	Ph 3-4: Product and Material Selection	DG2.5.1 DG71.05.01	DAB c20.2 Responsible Building Materials - Timber	**1.** Evidence of chain of custody **2.** Bill of quantities	Y			Architect										TBC			33
Consume responsibly	**Built for disassembly** Consider the use of building materials which are able to be disassembled for re-use, in conjunction with considerations for the ease and removal of accommodation over time.	Ph 3-4: Product and Material Selection	DG02.07			NA													TBC			34
Consume responsibly	**Concrete** - Use materials complying with AS based on the Whole of Life approach to materials selection. - Do not use breccia or dolerite in concrete mixes. - Fly ash is a manufacturing bi-product that can be used as a cement replacement but should limited to a maximum of 20% by weight of cement content.	Ph 3-4: Product and Material Selection	DG71.02	DAB c19B.1	**1.** Structural specifications and drawings **2.** Structural Engineer's report showing % cement replacement	Y	Upfront Carbon assessment has been completed identifying project materials selections as well as impact of appropriate material	NDY Embodied Carbon Assessment	Sustainability										TBC			35
Consume responsibly	**Construction waste** Targets must be established to increase diversion of waste sent to landfill, with a minimum diversion rate target of 90%. Consider opportunities for re-use and recycling of materials in the construction phase	Ph 7-9: Construction, Commissioning Post Occupancy and Operation	DG02.07	DAB c22 Construction and Demolition Waste	Construction waste reports showing percentage (minimum 90%) of waste re-used and recycled (diverted from landfill)		To be confirmed in future phases												TBC			36
Consume responsibly	**Maintainability** All systems and equipment that is installed within a school is to be provided with suitable access to ensure that this equipment is safely and efficiently maintainable. In order to ensure that maintenance is available, on the completion of all buildings, drawings are to be provided showing the completed (As Built) building including all equipment and equipment access arrangements. Any mechanical ventilation system within the building 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, fan coil units, humidifiers and filters in the air handling system. The project team should demonstrate that there is a project level review process in place to ensure that the building has been designed as per the EFSG, that any issues identified have been closed out and that the outcomes can be communicated to the relevant facilities/ operations teams Maintenance required and cost of this maintenance are to be considered in assessment of the project's life cycle cost. Operation and Maintenance manuals (O&M Manuals) are to be provided, written in clear, concise English covering the various building elements, assemblies, equipment, service installations and systems incorporated into the Works.	Ph 2-5: Services Design	DG16.10 DG 01.04	DAB c2.1 Services and Maintainability Review DAB c9.1.2 Ventilation System Attributes DAB c4 Building Information	**1.** As built drawings including all equipment access arrangements for maintenance		To be completed during future phases		RPInfrastructure										TBC			37
Foster connections	**Site investigations for place making / community connections** The following detailed reports/ surveys/ information should be considered in developing the business case: - Local environment/ character - Climate and microclimate - Heritage significance / impact - Appraisal of physical and visual factors affecting site development - Available transport/ road infrastructure servicing the site - Geo-technical and Soil reports will be required for each site to investigate the suitability of the topsoil and anticipated sub-grade materials for horticultural purposes. - Testing for toxic residues must be undertaken in all areas identified as being a possible risk - i.e. filled or dumped gro	Ph 1: Site Selection and Masterplan	DG03.02	GSC c12 Culture, Heritage and Identity DAB 24.2 Contamination and Hazardous Materials	**1.** Relevant reports/surveys developed (these ideally include recommendations for further development stages) **2.** Evidence demonstrating recommendations / best practice solutions have been implemented/addressed.	Y		Heritage Report	RPInfrastructure										TBC			38
Foster connections	**Ecological conservation** Schools sites must conserve for future generations, the biological diversity of genetic materials, species and ecosystems on that site and consider the surrounding natural environment. An Ecological Assessment Report must be prepared for the site in order to understand the existing conditions and future conservation strategies. The design of the facilities must provide unique and valuable environmental conservation learning opportunities and effective environmental modelling to the wider community. Schools must connect with nature and incorporate biophilic design principles. Open space must allow for exploration, and biodiversity and earth education to enhance the site's outdoor learning potential.	Ph 1: Site Selection and Masterplan	DG02.06	DAB c23 Ecological Value GSC c29 Ecological Value (incl Biodiversity Enhancement)	**1.** Biodiversity or ecological assessment / local flora and fauna survey **2.** Ecological Assessment Report which documents the following: - ecological values (current, future, and past) identified for the site and their protection measures - ecological impacts from light and noise pollution and water quality and their mitigation requirements - existing vegetated areas and biodiversity values being retained how biodiversity has been considered within the project's material supply chain - list of management strategies to protect the integrity of ecological values throughout project planning, construction, and occupancy community and local stakeholder expectations including Aboriginal or Torres Strait Islander groups and environmental groups - Adequate due diligence must be conducted where an area of biodiversity or high ecological value is identified on the site, where at least 50% of this area must be retained. **3.** Biodiversity management plan describing measures for the conservation and protection of threatened species or communities, biodiversity enhancement, tree protection, etc. **4.** Evidence demonstrating measures have been implemented to protect and enhance endangered species / ecological communities identified; to preserve or re-establish native flora; etc.	Y		Biodiversity report. No risks or futher actio	RPInfrastructure										TBC			39
Foster connections	**Productive landscape** Consider including opportunities for development of community garden within the site and relationships with community groups near this to occur.	Ph 1: Site Selection and Masterplan	DG2.06	GSC c14.2 Local Food Production	Site plan demonstrating location and size of community garden	NA			Landscape										TBC			40
Foster connections	**Bicycle storage** Provide 1 space for every 20 students to AS2890.3 standard	Ph 2: Concept Design - Space planning	SG552 4.36	DAB c17 Sustainable Transport		Y	Needs to be reviewed as to what is existing. Residual to be added to project scope		Architect										TBC			41
Foster connections	**Community use of facilities** Some school facilities are used out of hours for activities such as weekend church groups, sport events and public meetings. Liaise with the Project Director to gain an understanding of any shared use, or community use arrangements that are being considered for the site. New schools should be designed so that direct access to the open play space, fields , hall and gym can be achieved without the public gaining access to the buildings.	Ph 2: Concept Design - Space planning	DG16.08 Department of Education's Community Use of School Facilities Implementation Procedures	DAB c30B Community Benefits	**1.** Confirmation by the Architect that direct access has been provided to open space and any other facilities that could be shared with the community. **2.** A list of community engagement activities undertaken to develop a community benefits strategy. **3.** Plans clearly outlining how the outcomes from the community benefits strategy have been implemented in the project **4.** Joint-use or lease agreements where already in place	NA			SINSW										TBC			42
Foster connections	**Open pay space** Open play space must be provided for students to access during recess, lunch breaks and for outdoor learning. Open play space can be comprised of - Paved and grassed areas - Rooftops and terraces - Covered outdoor areas The designated open play space must be easily monitored and managed by school staff. Where a joint use agreement can be negotiated with a local council or land owner, the required play space can be located off-site providing the facilities are - In close proximity to the school - Easily accessible - Safe and secure Designs must aim to achieve a minimum of 10m2 per student. Where this figure is not achievable the proposed m2 per student of the	Ph 2: Concept Design - Space planning	DG10.03	Not covered in Green Star	Plan view drawings showing provision of open space				Architect										TBC			43
Foster connections	**Staff room** Staff rooms should adequately accommodate staff work and recreation, and focus on indoor environment quality, enjoyment and interaction through provision of the following: •Daylight • Ventilation • Views • Landscaping/Indoor Plants • Acoustic Comfort	Ph 2: Concept Design - Space planning	EFSG Staff Unit	GSI c Amenity Space	**1.** Extracts from the EFSG requirements for staff rooms **2.** Evidence of staff room delivered accordingly	NA	Staff rooms not included in scope of works												TBC			44
Foster connections	**Reconciliation action plan (RAP)** The project should adopt formalised steps to provide opportunities for Aboriginal and Torres Strait Islander peoples Projects must implement strategies during design, construction and operation that contribute positively towards reconciliation with Australia's first people and address social inequalities within Australia is between Indigenous and non-Indigenous Australians. The project demonstrate a relationship to, and a role in delivering the action items within the Department of Education's RAP. This could include incorporation of indigenous design strategies and indigenous designers, celebration of indigenous culture on the site through art or landscape, and procurement from indigenous suppliers and workers. Refer to the GA NSW 'Designing with Country' Discussion paper for guidance and examples. The project must adopt all relevant requirements within the NSW Government's Aboriginal Procurement Policy (January 2021)	Ph 2-5: Architectural Design	Department of Education's Reconciliation Action Plan NSW Government Aboriginal Procurement Policy GANSW 'Designing with Country' discussion paper	DAB c30D Reconciliation Action Plan	**1.** Evidence of the project's relationship with the RAP, e.g. actions implemented in line with RAP, etc.				SINSW										TBC			45
Foster connections	**Security** Safety in Design and Crime Prevention Through Environmental Design (CPTED) principles are to be implemented in project planning stage. Advice on the electronic surveillance systems can be sought early in the design phase. CCTV systems are required in several locations where indicated in the Rooms and Spaces Technical Data table, including: - Secondary clinic - Primary sick bay - Library	Ph 2-5: Services Design	DG14.10 DG65.08 DG65.10	GSC c15 Safe Places	**1.** Crime risk assessment or equivalent **2.** Evidence of designing out crime principles implemented **3.** Security services plans, schedules and forms by School Security Unit (SSU) **4.** SSU specification and evidence of input on project specification	N		Pending SSU review and inpu	RPInfrastructure										TBC			46
Foster connections	**Digital infrastructure** New buildings and refurbishments are required to provide a common wireless solution compatible across the school, providing a consistent user experience and support mechanism. This involves the replacement of existing legacy wireless equipment, such as wireless access points and site switches	Ph 2-5: Services Design	DG64.12.02	GSC c22.2 Digital Infrastructure	**1.** Contracts describing the network infrastructure specification and operational requirements	Y	Assumed for now, ICT Audit Pending	Evidence to be detailed during Detailed Desig	Electrical										TBC			47

Foster connections	**Sustainable Transport Planning / Transport Assessment** Transport planning must prioritise the delivery of feasible, connected networks and rectify transport deficiencies. The **School Transport Assessment** process must prioritise critical transport infrastructure to satisfy community expectations and statutory planning obligations. The assessment seeks to address school travel demand efficiently, safely and sustainably by maximising the most active and sustainable transport modes and reducing car parking capital expenditure and car travel demand. The School Travel Plan must be developed to inform the design response, construction traffic management, travel plan and post-occupancy operations to meet daily travel demand to school	Ph 1: Site Selection and Masterplan	Schools Transport Practice Note	DAB c17 Sustainable Transport	• A review of the school's travel demand; • The establishment of transport modes to promote during construction and post-occupancy; • Identification of transport improvements required to meet school travel demand; • Actions to inform the site design, master plan, Construction Traffic and Pedestrian Management Plan and Travel Plan; • Actions to address road safety concerns; and	Y		Active Transport Plan	RPInfrastructure												TBC			48
Unlock human potential	**Green cleaning** Designs should support the implementation of a Green Cleaning policy for the school, this may include: - Appropriate cleaning areas are to be provided to safely store chemicals and equipment. - Hand washing stations - Use of HEPA filtration in vacuum equipment - Use of materials and surfaces that are easily cleaned	Ph 7-9: Construction, Commissioning Post Occupancy and Operation	WoG Facilities w	GSP c6 Green Cleaning	**1.** WEB Clean School User Guide **2.** Green Cleaning specifications		To be confirmed during future design phases															TBC			49
Unlock human potential	**Healthy canteen policy** The NSW Healthy School Canteens Strategy applies to all NSW Government schools (primary, secondary and central schools) with a canteen. The school should play a role in encouraging healthy dietary options in an effort to help reduce childhood obesity through food provided in the school canteens. As such, School canteens should be designed to encourage onsite preparation, storage, display and promotion of healthy 'everyday' foods.	Ph 2: Concept Design - Space planning	Department of Education's Healthy Canteen Policy	DAB c30D Integrating Healthy Environments	**1.** Research report behind Healthy Canteen Policy **2.** Evidence that policy initiative has been incorporated into the school under assessment.	NA	Canteen not within scope of works															TBC			50
Unlock human potential	**Daylight glare control** Discomforting glare and brightness contrasts must be avoided. Designers must seek to: - Exclude direct sunlight from all learning spaces, libraries, administrative offices and staff studies for the period of 9.00am to 3.30pm including Eastern Daylight Saving Time between 21st September to 21st March (equinoxes). - Exclude direct sunlight from desk level in all learning spaces between 9am and 3:30pm. 'Sun exclusion and glare control can be achieved by the use of elements such as sun shades, eave extensions, tinted glazing, screens, vertical blades and the like'. Glare must only be controlled by blinds as a last resort. Designers must prepare sun diagrams in the design phase as a minimum requirement.	Ph 2-5: Architectural Design	DG12 DG07.01	DAB c12.0 Glare Reduction	**1.** Daylight glare modelling report / sun diagrams showing direct sunlight has been excluded as required. **2.** Drawings supporting inputs of model, showing location of blinds and any other glare control device	Y	provided to all north facing windows. South facing windows should be shaded by the verandah. We note that the statement 'glare must only be controlled by blinds as a last resort' conflicts with th		Architect												TBC			51
Unlock human potential	**Acoustic Performance** Design of internal spaces must address the following Acoustic outcomes: - **Internal Noise Levels**: An internal noise level assessment must be carried out for all new buildings to ensure comfortable acoustic conditions for the spaces occupied. The internal noise levels within the space must meet the limits stipulated in Table 11.05.1 of Section 11.06 Acoustic Performance Guidelines or be within the range stipulated in Table 1 of the AS/NZS 2107:2016 standard. The more stringent of the two should be met	Ph 2-5: Architectural Design	DG 11.06 DG 11.03 DG 11.02	DAB c10 Acoustic comfort	**1.** Report by qualified acoustics consultant demonstrating noise measurements are compliant. **2.** Detailed Drawings indicating sound insulation details and other relevant acoustic design features.	Y			Acoustic												TBC			52
Unlock human potential	**Noise emission to the environmen** Generally noise emission to the environment from mechanical services noise sources (such as air conditioners) are the subject of a development consent conditions. In NSW the development consent conditions will refer to the Industrial Noise Policy (INP) or Local Council requirement. Where no condition regarding noise sources exists for a school development, noise emission from such sources should be designed to satisfy the requirements of the Industrial Noise Polic	Ph 2-5: Architectural Design	DG11.04	Not covered in Green Star	1. Report by qualified acoustics consultant	Y			Acoustic												TBC			53
Unlock human potential	**Fly free indoors** Fly screening must be provided in all schools to the doors, windows and other openings in food preparation, biology, and non-washdown closet toilet spaces or where specifically nominated in the EFSG. Schools in localities where fly incidence constitutes a health hazard (especially trachoma or other nuisance) will require fly screens to all opening sashes.	Ph 2-5: Architectural Design	DG31.01	Not covered in Green Star	As-built drawings showing fly screening has been provided as required	NA	There are no external windows to the Oosh Kitchenette. Hence no flyscreens allowed for.		Architect												TBC			54
Unlock human potential	**Accessibility** -All new facilities must meet current DTS provisions of the NCC and the associated standards. Generally AS 1428.1 is the minimum design standard for access and mobility. However, it is DoE's policy that any enhanced requirements noted in AS 1428.2 be incorporated in any new design. -Additionally, DoE have enhanced circulation requirements as noted in DG / CIRCULATION - Provide hearing augmentation system for areas that have amplification, generally within Gymnasium, libraries, movement studios and Communal Halls, provide a system to assist the aurally challenged to hear music and speech within the main auditorium and on the stage - Provide the International Symbol for Deafness to indicate that an assistive hearing device is installed	Ph 2-5: Architectural Design	DG19.01 DG05.14	DAB 30D Universal design	**1.** Accessibility plan **2.** As-built drawings or other evidence demonstrating that minimum and enhanced accessibility requirements have been provided for walkways, corridors, ramps, etc. **3.** Photographic or other evidence of signage installed	Y	Needs to comply with this anyway		Architect												TBC			55
Unlock human potential	**Access to Views** Building design must ensure that at least 60% of primary occupied spaces have a clear line of sight to high quality internal or external views. The space must be within 8m from the view. High quality views include: External views - vegetation, body of water, sky, or frequent outdoor movement (people, vehicles, animals) Internal views - landscaped area, water features, atrium' Note: Primary Spaces are defined as spaces that where students or staff are expected to work, or remain for an extended period of time, typically longer that 2 hours. This includes classrooms, laboratories, computer labs and office/administration are	Ph 2-5: Architectural Design	DG2.10	DAB c12.2 Views	**1.** Views Calculations and Mark-up this must be done in accordance with the GBCA'*Daylight and Views Hand Calculation Guide*: https://www.gbca.org.au/uploads/79/35919/Green%20Star_Daylight%20and%20Views%20Hand%20Calculation%20Guide%20May%202015%20RELEASE.pdf)	Y	Calculation of views compliance has been completed and shows tha Dalmeny demonstrates **83.1%** of nominated area complying with views requirement	Refer to G-007 - EFSG Access to Views Assessmen	Sustainability												TBC			56
Unlock human potential	**Access to Daylight** Designers must seek to maximise natural daylight in all learning and administration spaces to improve indoor amenity and create a pleasant environment and reduce energy usage through windows and skylights - Access to high levels of daylight must be ensured for at least 40% of primary occupied spaces per floor. A space is considered to have high levels of daylight if: the space has minimum 160 lux due to daylight during 80% of the nominated hours OR the following requirements are met: No overshadowing – external shading should not impinge on the direct 25 degree line from centre of the window Minimum 40% Visual Light Transmittance (VLT) for building glazing' Note: Primary Spaces are defined as spaces that where students or staff are expected to work, or remain for an extended period of time, typically longer that 2 hours. This includes classrooms, laboratories, computer labs and office/administration areas.	Ph 2-5: Architectural Design	DG2.3.1 DG12	DAB c12 Visual Comfort	**1.** Daylight modelling report demonstrating how natural daylight has been maximised in all habitable spaces; and **2.** As built drawings demonstrating that the model accurately represents the building (i.e. window size and location; skylights installed, etc.); and **3.** Specifications supporting inputs used in modelling (e.g. skylights and glass specs)	Y	Natural daylight access exceeds the required 40% area threshold. Confirmed through cDA modelling	Refer to Dalmeny Daylight Modelling Assessmen	Sustainability												TBC			57
Unlock human potential	**Ventilation and Indoor Air Quality** The maximum Co2 concentration must not exceed **1,500ppm** for more than 20 consecutive minutes in each day A ventilation strategy must be developed to ensure that sufficient ventilation is provided to all spaces to meet the requirements of the BCA/NCC and associated standards. Specifically ventilation equipment must be designed from a whole-of-life perspective and support healthy indoor environments, energy efficiency and ease of maintenance. This must also meet requirements for: - Natural ventilation mode and cross ventilation: in line with DG5.01 - Mechanically Assisted cross ventilation: In two storey blocks where cross flow ventilation is not possible to the lower floor, mechanically assisted cross ventilation is to be provided to the lower floor learning spaces nominated in the EFSG, the design must adhere to DG57.18. - Roof ventilator control: in line with DG65.16 - Wind powered roof ventilators: Designed to suit local ambient climatic conditions to ensure correct sizes, locations and numbers as detailed in DG57.14 - Sanitary Spaces sufficient natural ventilation or mechanical ventilation, to disperse odours and /or humidity in line with - Cross ventilation is to be used where possible. - Provide mechanical ventilation to all Disabled Toilets. - Ventilation in storage spaces in line with DG5.05 - Ventilation in permanent learning spaces and libraries in line with DG55 - Outdoor air requirements and control of Indoor CO2 levels - designs must adhere to DG55.02 - Ventilation in printing rooms: The ventilation system is to be designed to serve the whole room and is not intended to provide localised exhaust at equipment. Adhere to ventilation requirements set out in DG57.1	Ph 2-5: Services Design	DG57.01 DG05.04 DG05.05 DG57.16 DG05.01 DG57.18 DG05.02 DG37 DG65.16 Thermal Comfort and Indoor Air Quality – Performance Brief	DAB c15 GHG Emissions Reduction	**1.** Cooling system strategy including WOL analysis **2.** Concept plans **3.** Construction drawings **4.** Trade-based specification **5.** As built drawings, including indication of windows and cross ventilation	N	All items comply with the noted requirements, with the exception of the roof ventilator, which will be raised as a departure, noting that there is no printing room or chemical store rooms within the scope of this project.	To be provided in future versions of this docume	Mechanical												TBC			58
Unlock human potential	**Lighting comfort** - Consider the furniture layouts to determine the orientation of luminaires. Especially when positioning luminaires in Materials Technology spaces to ensure adequate illumination on machines and work surfaces; - avoid potential stroboscopic effects and avoid shadows from ductwork - Mount luminaires as high as possible, but generally no higher than 4000mm AFFL (excluding Gymnasiums and Halls), to improve luminance uniformity and reduce direct glare in the direction of normal view - The standard lamp colour temperature is 4,000°K, except in certain toilet areas where the Design Guide requires the use of blue colours. - The Colour Rendering Index (CRI) for light sources must be minimum 80 or higher - Compliance with the uniformity requirements stipulated in Table 3.2 of the AS/NZS 1680 standard should be demonstrated by the presentation of the output from lighting design software. - The Unified Glare Rating (UGR) must be calculated in accordance with the procedure outlined in Clause 8.3.3 of AS/NZS 1680.1:2006 standard, and the calculated value must not exceed the maximum values specified in Table 8.2 of the standard - The maintained illuminance levels must meet the recommended levels as specified in the AS/NZS 1680 standard., and the maintained illuminance values achieve a uniformity of no less than the values given in Table 3.2 of AS 1680.1:2006, with an assumed standard maintenance factor of 0.8. - To ensure flicker-free lighting, the following luminaire requirements should be considered: LED lighting – electronic drivers with 12-bit or greater resolution - Modelling must provide output that clearly demonstrates that the proposed design is compliant with the standards including but not	Ph 2-5: Services Design	DG63.03	DAB c11 Lighting Comfort DAB c11.1 General Illuminance and Glare Reduction	**1.** Lighting drawings **2.** Architectural drawings **3.** Lighting specifications / schedules **4.** Product data sheets **5.** Isolux plot drawings **6.** Lighting modelling report showing compliant uniformity and UGRs	Y	Assumed to be included in patternbook documentation for standard hubs	To be detailed in future revision	Electrical												TBC			59
Unlock human potential	**Thermal comfort** The inclusion of active cooling within school facilities is directed by the Department's Air Cooling policy: 2.1 Schools with a long term average mean maximum January temperature of 33 oC and above: Generally, air conditioning is to be provided to all school buildings. 2.2 Schools with a long term average mean maximum January temperature of below 33oC: Air conditioning is to be installed in all permanent learning spaces and libraries forming part of each projects scope. - Thermal modelling is undertaken to demonstrate that learning spaces and libraries have been designed to achieve a predicted mean vote (PMV) of +/- 1 for 95% of occupied hours	Ph 2-5: Services Design	DG06.03 DG55.01 DG55.02	DAB c14 Thermal Comfort	**1.** Mechanical drawings showing HVAC systems installed, or **2.** Confirmation from sub-contractors that services have been installed and commissioned as required; and **3.** Modelling report showing required PMV is achieved. Modelling report to be done in line with methodology described in Draft thermal comfort and indoor air quality interim performance brief for DG55	Y	Air conditioning is provided to all nominated spaces within the projects scope, and will meet the thermal comfort requirements, subject to future modelling	Refer to Mechanical Concept Repo	Mechanical												TBC			60
Unlock human potential	**Microbial control** As a measure to prevent legionella, heated water to hand basins, showers etc. shall be stored at temperature above 65 C. Thermostatic mixing valves are to be used for tempered water generation at each point of use. Valves need to comply with microbe disinfection requirements - "Code of Practice for Thermostatic Mixing Valves NSW" as approved by the NSW Health Department.	Ph 2-5: Services Design	DG51.09 DG53.11	DAB c28 Microbial Control	1. Letter by hydraulic engineer confirming hot water is stored above 65 deg and that valves comply with code of practice.	Y			Hydraulics												TBC			61

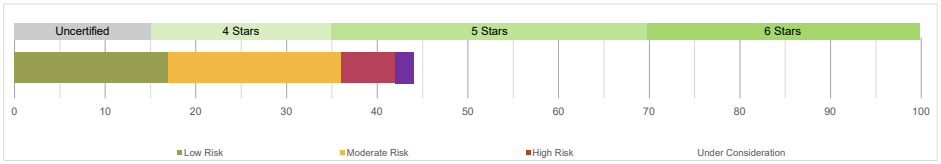
Unlock human potential	**External access lighting** External Access Lighting shall be provided to illuminate building entrances, footpaths, sheltered walkways, roadways and car park External Access Lighting must: - Be minimal and designed to prevent glare to pedestrians, nearby residents and to motorists. Evidence of compliance with AS4282, AS/NZS 1158 and other applicable Australian Standards must be provided by the designer. - Be located so as to link various sources of illumination such as street lighting (for carpark and roadways) and internal security lighting (for footpaths, walkways and entrances). - Illuminate building entry doors. - Highlight 'accident-prone' areas such as changes in level, stairs and ramps. - Provide vertical illumination	Ph 2-5: Services Design	DG63.08.01	DAB c27.0 Light Pollution to Neighbouring Bodies	**1.** As built drawings indicating the location of all external luminaires **2.** Letter by lighting designer describing glare prevention measures	Y	External lighting product selections out of NDY scope. Specifications will prescribe for contractor's selections to reduce glare and comply with AS4282 & AS/NZS 1158.	To be detailed in future revision	Electrical										TBC			62
Unlock human potential	**Low VOC emitting materials** All surface coatings, and other volatile organic compound (VOC) emitting products including adhesives, sealants, carpets, carpet tiles, and carpet underlays, must be made from low-VOC emission materials. - Paints must meet the limits stipulated in the Australian Paint Approval Scheme's (APAS) VOC limits for low VOC paints. - Paints, adhesives and sealants must not exceed the maximum VOC limits stipulated in the Green Star Buildings rating tool. - Carpets must not exceed the total VOC limits stipulated in the Green Star Buildings tool.	Ph 3-4: Product and Material Selection	DG2.5.2	DAB c13 Indoor Pollutants	**1.** Product specifications, certificates, safety datasheets that demonstrate low-VOC contents **2.** Bill of quantities	Y	Will be detailed further in specifications		Architect										TBC			63
Unlock human potential	**Low formaldehyde-emitting materials** Only low formaldehyde-emitting engineered wood products should be used, such as those that meet the Australian Standards for formaldehyde emission limit E1 (MCDAS classification) or lower. The engineered wood products must not exceed the emissions limits stipulated in the Green Star Buildings rating tool. 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. This requirement excludes formwork.	Ph 3-4: Product and Material Selection	DG2.5.2	DAB c13 Indoor Pollutants	**1.** Product specifications, certificates, safety datasheets that demonstrate low-formaldehyde contents Bill of quantities	Y	Will be detailed further in specifications		Architect										TBC			64
Unlock human potential	**Acoustic post-occupancy evaluatio** Post Occupancy evaluations are often undertaken to assess the performance of recently completed or existing facilities. Where a Post Occupancy Evaluation is to be undertaken it should be conducted by the project team or acoustic engineer and should be undertaken of selected acoustic parameters only. Evaluation must include (as per the above criteria) - Internal noise levels, - Room acoustics, - Noise emission, - Room-to-room acoustics performance The noise measurement and documentation must be provided by a qualified acoustic consultant and in accordance with AS/NZS 2107:2016 Measurements shall be conducted in at least 10% of regularly occupied space	Ph 7-9: Construction, Commissioning, Post Occupancy and Operation	DG11.07	ISSP c13 Internal Noise Levels	**1.** Commitment by SI to conduct acoustic post-occupancy evaluation														TBC			65
Unlock human potential	**Pesticide free environments** Schools must be designed, constructed and maintained, without using chemicals for termite and other pest control. No chemical pesticides and termicide to be used. Preventive treatments to be by physical means and careful design to minimise risk	Ph 7-9: Construction, Commissioning, Post Occupancy and Operation	DG2.5.3	Not covered in Green Star	Statement by head contractor that no pesticides or termites have been used.														TBC			66

10.2 GREEN STAR BUILDINGS V1 PATHWAY

Refer to the following page(s).

greenstar Buildings

NDY
A TETRA TECH COMPANY



SINSW 5-Star - Dalmeny

20/01/2025 - Schematic Design

	Credit	Minimum Expectation	Credit Achievement	Exceptional Performance	Total Points Available	Targeted Performance Level: Low Risk	Targeted Performance Level: Moderate Risk	Targeted Performance Level: High Risk	Targeted Performance Level: Under Consideration	Points Associated: Low Risk	Points Associated: Moderate Risk	Points Associated: High Risk	Points Associated: For Consideration	Requirements	Comments
Responsible					**17**										
1	Industry Development	-	1	-	**1**	Credit Achievement				**1**				**EFSG Reference: DG2.01 - Scope** **EFSG Reference: DG2.09 - Sustainability Benchmarking** **Credit Achievement:** The building owner or developer appoints a Green Star Accredited Professional. The building owner or developer discloses the cost of sustainable building practices to the GBCA. The building owner or developer markets the building's sustainability achievements.	Exact details of compliance Financial Transparency disclosure to be confirmed by SINSW in future phases.
2	Responsible Construction	•	1	-	**1**	Credit Achievement				**1**				**EFSG Reference: DG02.07.1 - Construction and Demolition Waste** **Minimum Expectation:** Environmental management system; environmental management plan; 80% of C&D waste diverted from landfill; training to construction personnel. **Credit Achievement:** 90% of C&D waste diverted from landfill; waste contractors and facilities comply with the Green Star criteria.	
3	Verification and Handover	•	1	-	**1**	Credit Achievement				**1**				**EFSG Reference: DG20.03 - Air Tightness** **GBCA Technical Question Reference: Request R-14422** **Minimum Expectation:** Metering and monitoring systems; environmental performance targets; designed and tested for airtightness; commissioning; tuning; operations and maintenance information; building users guide. **Credit Achievement:** Independent Commissioning Agent is engaged. As per Request R-14422, the SINSW 'Commissioning and Temporary Schools Program Team' can be used in lieu of engaging a dedicated independent commissioning agent.	Noted that tuning is not done by SINSW's commissioning team. Will need to be provided by a 3rd party. Air tightness consultant required to be engaged to set targets and review design.
4	Responsible Resource Management	•	-	-	**0**	Minimum Expectation				•				**EFSG Reference: DG02.07.1 - Operational Waste** **Minimum Expectation:** Separate collection of landfill, comingled recyclables, and one other (soft plastic or compostable organics). Size of waste storage area and access to waste storage area (by both occupants and waste contractors) signed off by a specialist waste consultant or contractor.	Noted by RPI that qualified waste management professional will be engaged to confirm requirements met
5	Responsible Procurement	-	1	-	**1**										
6	Responsible Structure	-	3	2	**5**	Credit Achievement				**3**				**Credit Achievement:** At least 50% of all structural components (by cost) meet a Responsible Products Value of at least 10. The structure is defined as load bearing and stability components of a building, including steel, timber, concrete load bearing elements.	
7	Responsible Envelope	-	2	2	**4**										
8	Responsible Systems	-	1	1	**2**										
9	Responsible Finishes	-	1	1	**2**	Credit Achievement				**1**				**Credit Achievement:** The project must have 40% of all internal building finishes (by cost) meet a Responsible Products Value of at least 7. Internal finishes include flooring, plasterboard, paints, ceilings, partitions, doors, internal windows or similar. Joinery used as part of a wall finish may also be counted. Sealants and Adhesives used for finishes are also included. Loose furniture is excluded.	
									Total	**7**					
Healthy					**14**										
10	Clean Air	•	2	-	**2**	Minimum Expectation				•				**Minimum Expectation:** Air intake and exhaust separation to meet ASHRAE 62.1; outside air 50% higher than AS1668.2 or 700ppm CO_2 DCV; ductwork cleaning before operation.	
11	Light Quality	•	2	2	**4**	Credit Achievement				**2**				**EFSG Reference: DG12 - Natural Light & DG63 - Lighting** **Minimum Expectation:** High quality artificial lighting and glare reduction. Note the CRI requirements for Green Star buildings exceed the requirements of the EFSG. **Credit Achievement:** Project to satisfy the daylight requirements for high levels of natural daylight in 40% occupied areas. External glare to be controlled. **Exceptional Performance:** Project to satisfy increased artificial lighting requirements. Including "avoiding excessive lighting or overly uniform solutions."	Daylight modelling demonstrates compliance is easily achieved for the proposed design.
12	Acoustic Comfort	•	2	-	**2**	Minimum Expectation	Credit Achievement			•	**2**			**GBCA Technical Question Reference: Request R-14412** **Minimum Expectation:** Engage acoustic consultant to develop acoustic comfort strategy. **Credit Achievement:** Engage acoustic consultant to achieve three out of the following five acoustic considerations: internal noise levels, external noise levels, acoustic separation, impact noise transfer and reverberation control.	
13	Exposure to Toxins	•	2	-	**2**	Minimum Expectation	Credit Achievement			•	**2**			**EFSG Reference: DG02.05 - Sustainable Materials** **Minimum Expectation:** Low VOC and low formaldehyde materials. **Credit Achievement:** On-site tests verify the building has low Volatile Organic Compounds (VOC) and formaldehyde levels.	Requires on-site testing
14	Amenity and Comfort	-	2	-	**2**										
15	Connection to Nature	-	1	1	**2**									**Credit Achievement:** The building provides high quality views, and interaction with nature (5% of the building's regularly occupied areas must be planted, that regular occupants can interact with).	
									Total	**2**	**4**				
Resilient					**8**										
16	Climate Change Resilience	•	1	-	**1**	Credit Achievement				**1**				**EFSG Reference: DG02.08 - Climate Change Adaptation** **Minimum Expectation:** Climate change pre-screening checklist. This is undertaken by NDY in Phase 2. **Credit Achievement:** Project-specific climate change risk and adaptation assessment undertaken by a specialist consultant. Workshop will be provided by NDY in Phase 2, with final report issued in Phase 3.	Climate Change workshop completed. Outcomes of CCR report must be addressed through future design phases
17	Operations Resilience	-	2	-	**2**										
18	Community Resilience	-	1	-	**1**										
19	Heat Resilience	-	1	-	**1**		Credit Achievement				**1**			**EFSG Reference: DG20.03 - Design / Detailing** **Credit Achievement:** Minimum 75% of the site comprises elements that reduce the heat impact island effect. Landscaping, new roofing materials to be kept light in colour, or shaded by trees or solar panels.	High-SRI roofing to be installed (e.g. Colorbond Surfmist)
20	Grid Resilience	-	3	-	**3**									**Credit Achievement:** The building overall peak demand is reduced by 10%. This can be achieved with on or a combination of; Active Generation and Storage Systems, Demand Response, Passive Design Solutions.	
									Total	**1**	**1**				
Positive					**30**										
21	Upfront Carbon Emissions	•	3	3	**6**	Minimum Expectation	Credit Achievement			•	**3**			**EFSG Reference: DG01.03 - Whole of Life** **EFSG Reference: DG02.05 - Sustainable Products** **EFSG Reference: DG2.5.1 - Chain of Custody** **EFSG Reference: DG21.02 - Concrete** **EFSG Reference: DG21.05 - Sustainable Timber** **Minimum Expectation:** Building upfront carbon emissions reduced by 10%, necessitating comprehensive push for lower carbon civil, architectural and structural materials. **Credit Achievement:** Building upfront carbon emissions reduced by 20%	NDY Embodied Carbon Assesment identifies the required design/material substitutionss needed to achieve the required 20% embodied carbon reductions. This will need to be captured in detailed design.
22	Energy Use	•	3	3	**6**	Credit Achievement	Exceptional Performance			**3**	**3**			**EFSG Reference: DG02.03 - Energy Conservation** **Minimum Expectation:** Building operational energy reduced by 10%, via high performance building fabric and systems. **Credit Achievement:** Building operational energy reduced by 20%. Will require comprehensive push for high performance building fabric (i.e. insulation, glazing performance, air-tightness & reduced thermal bridging) and energy-efficiency systems (HVAC, LED lighting, controls systems) and on-site renewable energy generation (solar PV).	Significant energy use reductions are achievable, confirmed via energy modelling. Modelling to be updated in future design phases to ensure continued compliance.
23	Energy Source	•	3	3	**6**	Minimum Expectation		Exceptional Performance		•		**6**		**GBCA Technical Question Reference: Request R-16910** **Minimum Expectation:** Zero Carbon Action Plan to be developed. **Credit Achievement:** All electricity under the control of the building owner must be sourced from renewables. The renewable energy contract length must be at least 5 years **Exceptional Performance:** As per Credit Achievement since Education buildings do not have a delineation between base building and tenants	ZCAP is not required since the building is all electric. The NSW Government is responsible for electricity across its entire portfolio. Their procurement approach is due to be updated. Credit feasibility to be updated once details are revealed.
24	Other Carbon Emissions	-	2	2	**4**	Credit Achievement				**2**				**Credit Achievement:** All refrigerants in the new buildings must be either eliminated OR offset as below. Eliminating Refrigerants: Use of refrigerants with a GWP of 10 or less Offsetting Refrigerants: 100% of carbon emissions from refrigerants must be offset	
25	Water Use	•	3	3	**6**	Minimum Expectation	Credit Achievement			•	**3**			**EFSG Reference: DG02.04 - Water Conservation** **Minimum Expectation:** High efficiency fitting and fixtures **Credit Achievement:** The building uses 45% less potable water compared to a reference building. **Exceptional Performance:** The building uses 75% less potable water compared to a reference building.	5kL RW tank allows for targeting of Credit Achievement. Water to serve landscape irrigation and toilet flushing.
26	Life Cycle Impacts	-	2	-	**2**									**EFSG Reference: DG01.03 - Life Cycle Assessment** The project demonstrates a 30% reduction in life cycle impacts when compared to standard practice.	The latest GS Buildings tool has applied weightings to the LCA impacts which we note as being very challenging to achieve. (focus has shifted from just carbon)
									Total	**5**	**9**	**6**			
Places					**8**										

	Credit	Minimum Expectation	Credit Achievement	Exceptional Performance	Total Points Available	Targeted Performance Level: Low Risk	Targeted Performance Level: Moderate Risk	Targeted Performance Level: High Risk	Points Associated: Under Consideration	Points Associated: Low Risk	Points Associated: Moderate Risk	Points Associated: High Risk	Points Associated: For Consideration	Requirements	Comments
27	Movement and Place	•	3	-	3	Minimum Expectation	Credit Achievement			•	3			**EFSG Reference: SG552 4.36 - Bicycle Storage** **GBCA Technical Question Reference: Request R-14416 & R-14426** **Minimum Expectation:** Showers and changing facilities provided for all staff. **Credit Achievement:** As per Request R-14426, Credit Achievement can be awarded using the SINSW Schools Transport Assessment Template. Liaison required with GBCA, traffic engineer and/or SINSW Transport representative to confirm if this is feasible for existing school. To be confimed in Phase 2-3.	End of Trip showers are captured in Schematic Design plans. Bicycle parking to be detailed in future design phases
28	Enjoyable Places	-	2	-	2									**Credit Achievement:** The project provides publically accesible spaces that support community activity, and an activation strategy is provided to ensure placemaking continues after completion.	
29	Contribution to Place	-	2	-	2									**Credit Achievement:** The project team provides an urban context report and public realm interface design that outlines the urban context of the development. The design must address any local challenges and contribute positively to the proposed urban context.	
30	Culture, Heritage and Identity	-	1	-	1									**Credit Achievement:** The project team must comply with; Community Led Design Responses, OR Independent Design Review. Community Led Design Responses - The project team must show that they have undertaken local analysis to identify culture, heritage, identity unique to the project site. Independant Design Review - Independant design reviews are held at key points during the development of the design (e.g. review by the GANSW)	
									Total		3				
	People				**9**										
31	Inclusive Construction Practices	•	1	-	1	Credit Achievement				1				**Minimum Expectation:** Head contractor provides gender inclusive facilities and protective equipment; policies on-site to increase awareness and reduce instances of discrimination, racism, and bullying. **Credit Achievement:** Policies and programs implemented are relevant to construction workers on site; high quality staff support on-site to reduce at least five key physical and mental health impacts; the effectiveness of the interventions are evaluated.	
32	Indigenous Inclusion	-	2	-	2									**Credit Achievement:** The project team must demonstrate that; A key member of the Project Team is part of the organisational RAP Working Group, at least 90% of the RAP targets have been met on the project, All implemented actions related to the RAP are publicly reported on the project's website	
33	Procurement and Workforce Inclusion	-	2	1	3		Credit Achievement				2			**Credit Achievement:** Social procurement plan is implemented. At least 2% of the total contract value is directed to generate employment opportunities for disadvantaged and under-represented groups. It is noted that the NSW Government 'Aboriginal Procurement Policy' specifies a minimum of 1.5% Aboriginal representation in all contracts over $7.5m. Therefore an additional 0.5% representation will be required to comply with this credit (via Aboriginal participation or other disadvantaged group).	
34	Design for Inclusion	-	2	1	3				Credit Achievement				2		SINSW Umbrella TQ was previously approved (R-14538) for the previous tool. An updated TQ may allow this credit to be targeted under the current Green Star Buildings tool
									Total	1	2		2		
	Nature				**14**										
35	Impacts to Nature	•	2	-	2	Minimum Expectation				•				**EFSG Reference: DG90 - Landscape Design** **GBCA Technical Questions Reference: Request R-14474** **Minimum Expectation:** Existing site is not deemed to include areas of high ecological value; light pollution minimised.	Landscape noted: Cumberland Plain Woodland to be retained and protected
36	Biodiversity Enhancement	-	2	2	4									**EFSG Reference: DG90 - Landscape Design** **GBCA Technical Question Reference: Request R-14545** **Credit Achievement:** External landscaping (horizontal or vertical) provided to at least 15% of the site. Landscape include diverse species and prioritise the use of climate-resilient and indigenous plants. Ecologist engaged to develop a site-specific Biodiversity Management Plan. At least 60% of plants must be indigenous, and include at leaste one significant (nesting) tree or equivalent habitat per 500m2 of landscaped area. **Exceptional Performance:** External landscaping (horizontal or vertical) provided to at least 30% of the site. The landscaping includes critically endangered and/or endangered plant species native to the bioregion	
37	Nature Connectivity	-	2	-	2									**Credit Achievement:** The site must be built to encourage species connectivity through the site, and to adjacent sites. If the project sits within a blue or green grid strategy it must contribute to the goals of the strategy	
38	Nature Stewardship	-	2	-	2									**Credit Achievement:** Area of restoration or protection equivalent to the GFA of the project are provided.	
39	Waterway Protection	-	2	2	4									**EFSG Reference: DG95 - Stormwater** **Credit Achievement:** Average annual stormwater discharge (ML/yr) is reduced by 40% across the site. Specified pollution reduction targets are met. **Exceptional Performance:** Average annual stormwater discharge (ML/yr) is reduced by 80% across the site. Specified pollution targets are met.	Pollutant targets noted as being easily achieved in current design. OSD tank requirements noted as challenging to achieve. Point has been removed accordingly.
									Total						
	Leadership				**2**										
40	Market Transformation	-	1	-	1									**Credit Achievement:** Projects must show an initiative is innovative by demonstrating that the technology or process in not commonly used within Australia's building industry or globally, depending on the context of the innovation claimed. Projects must demonstrate initiatives align with with the following scoring metrics; Control of Outcome, Length of Impact, Scale of Impact, Transformation Potential, Value Generation.	
41	Leadership Challenges	-	1	-	1	Credit Achievement				1				Climate Positive Pathway is achieved	
									Total	1					

10.3 CLIMATE ADAPTATION REPORT

Refer to the following page(s).

REPORT

Climate Adaptation Plan

Dalmeny Public School Upgrade
School Infrastructure NSW

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Revision: 1.0 – Draft Issue for Comment | **Issued:** 19 December 2024

Document name: DAPS-NDY-XX-XX-RP-V-0006

NDY
A TETRA TECH COMPANY

VERIFICATION

REVISION	DATE ISSUED	PREPARED BY	VERIFIED BY	AUTHORISED BY	COMMENT
1.0	19/12/2024	Richard Burton	Dana Jump	Shri Srinivas	Draft Issue for Comment

STAKEHOLDERS

ROLE	TEAM MEMBER	ORGANISATION
Project Manager	Nicholas Lau	RPInfrastructure
Architect	Jarrod Phillips	Fulton Trotter
Structural Engineer	Brian Kim	Meinhardt
Electrical Services	Shri Srinivas	NDY
Hydraulics Services	Rhys Edwards	Acor
Mechanical Services	Chia Halim	NDY
Civil	Yolandi Cooper	Meinhardt
Landscape	Alex Gordan	Groundlink
Sustainability	Richard Burton	NDY

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Table of contents

EXECUTIVE SUMMARY

NDY were commissioned to develop a Climate Change Adaptation Plan for Dalmeny Public School with the intent of achieving 1 point for Credit 16 Climate Change Resilience (Credit Achievement).

This assessment was undertaken during the developed design stage of the project to assess the effectiveness of adaptation measures that had already been incorporated, as well as identifying any additional risks that need consideration. Consequently, the assessment has allowed the identification of additional adaptation measures required for implementation, specifically focusing on hazards defined as "High" or "Extreme" risk.

The analysis has assessed the site's climatic conditions using one climate change scenario (RCP8.5) for two-time scales relevant to the project's lifespan, which in this case included 2050 (~25 years post-practical completion) and 2090 (65 years from occupation, noting the expected building life before major refurbishments is ~50-years).

Climate Projections and Assessed Risks

Projections in this report were based on outputs from global climate models (GCMs) with data provided by CSIRO's Climate Change in Australia's database relevant to Sydney. The results showed the following (CSIRO Climate Change Projections, East Coast Cluster Report 2015):

- Extreme temperatures are projected to increase with very high confidence, along with substantial increases in temperatures reached on hot days, the frequency of hot days, and the duration of warm spells.
- Projected mean, maximum and minimum temperatures will continue to increase in all seasons (very high confidence).
- Decreases in winter and spring rainfall is projected (high confidence), however summer and autumn rainfall is expected to increase with less confidence due to natural climate variability (main driver of rainfall changes).
- The intensity of extreme rainfall events is projected to increase (high confidence).
- There is high confidence that climate change will result in a harsher fire-weather climate in the future.
- Time spent in drought is projected to increase (low confidence) over the course of the century.

Table 1 below shows the number of risks identified before and after adaptation measures (both in terms of alternative design solutions and operational) were considered for the project.

TABLE 1: SUMMARY OF INITIAL AND REASSESSED RISKS

RISK RATING	YEAR	LOW	MEDIUM	HIGH	EXTREME	TOTAL
Business as Usual: Number of risks when considering business as usual design measures	2040	5	9	3	0	17
	2075	4	10	3	0	17
Residual Risks: Number of risks following adaptation measures	2040	7	10	0	0	17
	2075	7	10	0	0	17

1 INTRODUCTION

1.1 CLIMATE CHANGE RISK ASSESSMENT OVERVIEW

NDY, A Tetratech Company, were commissioned to undertake a climate change risk assessment for Dalmeny Public School in line with current predictions to determine the hazards and risks associated with future climatic conditions, and how these are likely to affect this precinct into the future.

This report details the methodologies and outcomes of the climate change risk assessment, which was performed during the design phase and used to inform the sustainability strategy for the project.

The climate change risk assessment used scientific projections to inform the identification of hazards and respective risks specific to the site. The assessment was developed in accordance with AS 5334-2013 Climate Change Adaptation for Settlements and Infrastructure, with reference made to the Australian Government guideline document Climate Change Impacts & Risk Management: A Guide for Business and Government (2006).

The risk assessment is detailed in Section 4 of this report and is broken into a description of the predicted climate scenarios and effects (temperature, increases in rainfall, evaporation, and flooding likelihoods), understanding how these climate change conditions are likely to impact the building, its users and surrounding community into the future, and identifying the project responses to adapt to these risks. These responses are the basis of the Climate Adaptation and Resilience Plan, with the aim to assign responsible parties and actionable design items to be incorporated throughout the design, tender, construction and operational processes, as applicable.

1.2 DEVELOPMENT DESCRIPTION

1.2.1 SITE

The two storey 2,364 m^2 extension to Dalmeny Public School is located at 1612 Dalmeny Dr, Prestons, NSW, 2170. The two storeys will be comprised of:

- Teaching spaces
- Internal walkways
- Bathrooms
- External staircases
- Concrete structure.

The project's sustainability commitments include achieving a 5-star Green Star Buildings rating.

1.2.2 LOCATION

The CSIRO and Australian Bureau of Meteorology's "Climate Change in Australia" climate projections are categorised within natural resource management (NRM) regions that are defined by catchments and bioregions. Dalmeny Public School falls within the East Coast cluster (refer to Figure 1 below).

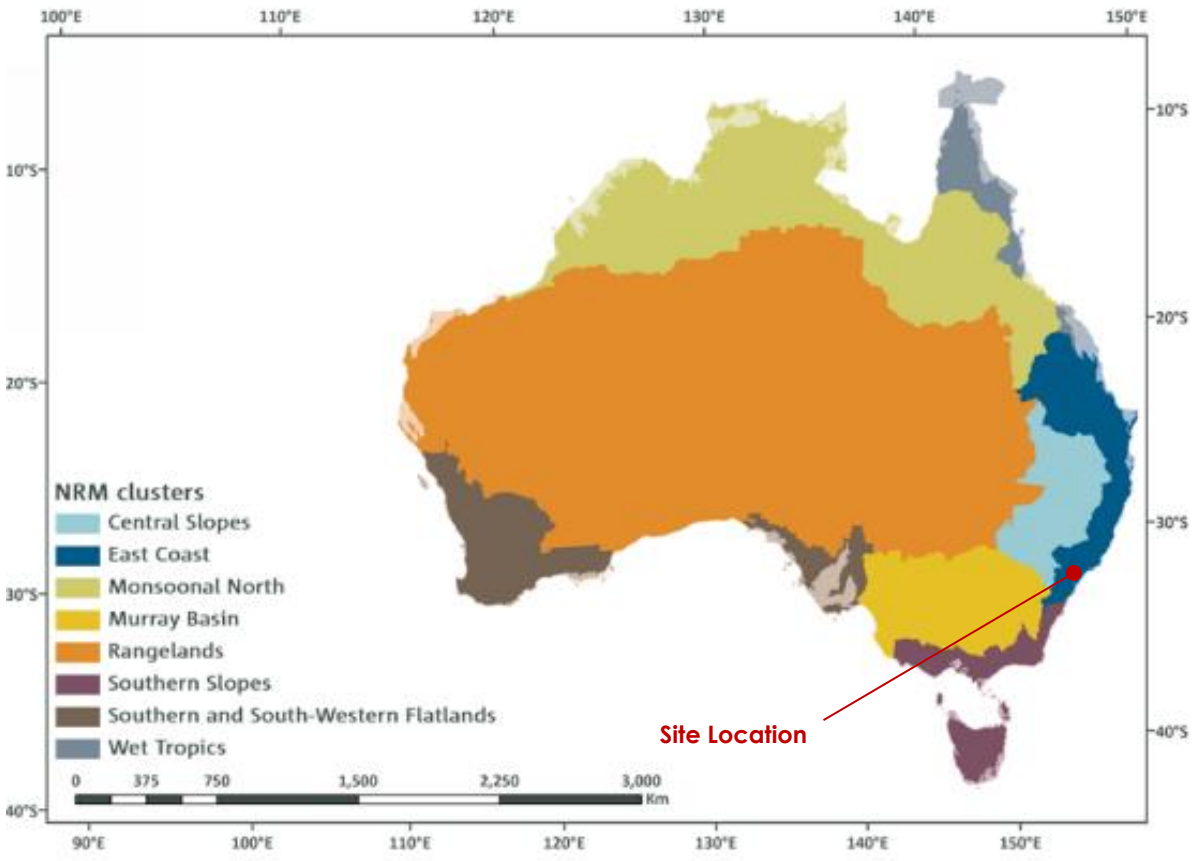


FIGURE 1: SITE LOCATION WITHIN THE NRM CLUSTERS (EAST COAST)

1.2.3 CLIMATIC CHARACTERISTICS

The East Coast cluster is defined as sub-tropical, with tropical and temperate influences. In terms of climate types, the cluster includes tropical regions in the north and temperate regions in the south, both with warm summers. Furthermore, at higher elevations summers are mild. Generally, summers are warm and winters are mild, with a small temperature gradient between the warm inland of NSW and further to the south and east (CSIRO Climate Change Projections, East Coast Cluster Report 2015).

2 CONTEXT ESTABLISHMENT

2.1 SCOPE & PURPOSE

This Climate Change Adaptation Plan has been developed in accordance with AS 5334-2013 Climate Change Adaptation for Settlements and Infrastructure with the intent of achieving 1 point for *Credit 16 Climate Change Resilience* within the Green Star Buildings v1 rating tool. This assessment was undertaken during the developed design stage of the project to assess the effectiveness of adaptation measures that had already been incorporated, as well as identifying any additional risks that need consideration. Consequently, the assessment has allowed the identification of additional adaptation measures required for implementation, specifically focusing on hazards defined as "High" or "Extreme" risk.

The process for the assessment had the following key steps:

1. Workshop facilitated by NDY for key project stakeholders to identify key issues and discuss climate change projections identified for the site and relevant to the development-
    a. Define the relevant climate variables with the design and construction team;
    b. Map out the direct and indirect effects of a changing climate on the proposed building design;
2. Evaluate the level of risk of each climate hazard based on likelihood of occurrence and consequence of effect;
3. Identify potential adaptation and mitigation measures to reduce the level of risk, focussing on those risks deemed unacceptable to building owners and end users;
4. Allocate responsibilities of implementing the adaptation measures, either by integrating the strategy in to the design of the building itself, or by engaging with the building owner and/or operator.

2.2 SUITABLY QUALIFIED PROFESSIONAL UNDERTAKING ASSESSMENT

This Climate Change Adaptation Plan has been developed by a team of experienced sustainability consultants, including Sanjeev Ganda (Senior Sustainability Consultant) and reviewed by Dana Jump (Senior Sustainability Consultant). Detailed CVs are provided in Appendix A.

Sanjeev has a formal tertiary qualification in Sustainability from Victoria University of Wellington (Master of Building Science) and is also a qualified Green Star Accredited Professional (GSAP). Sanjeev has experience in Climate Adaptation Plans, including for residential, healthcare, offices, retail, and education facilities.

Dana Jump has a formal tertiary qualification in Sustainability from Edith Cowan University (Bachelor of Science in Environmental Management) and is a qualified Green Star Accredited Professional (GSAP) and Infrastructure Sustainability Accredited Professional (ISAP) Dana has over three years of experience delivering Climate Risk assessments and implementing Climate Adaptation Plans for different project types, including infrastructure, retail and commercial.

2.3 KEY OBJECTIVES

Success criteria for future-proofing the office building against climate change impacts included the following, as per the Department of the Environment and Heritage Australian Greenhouse Office (AGO) Climate Change Impacts and Risk Management: A Guide for Business and Government (2006):

- Public Safety - Maintaining public safety;
- Local Economy and Growth - Protecting and enhancing local business;
- Community and Lifestyle - Protecting the existing lifestyle enjoyed by the local community and visitors;
- Environment and Sustainability – Protecting environmental amenity;
- Administration - Ensuring sound public administration and governance.

2.4 DESIGN LIFE OF ASSET

It is important to select a timeline relevant to the design life of the infrastructure components and one that is appropriate to cover the asset investment horizon, such as leasing tenure. This will affect the climate projections

used, the level of climate risk the asset may potentially be exposed to and the resulting climate adaptation response. The office building has been designed to last for 50-60 years before major refurbishment.

TABLE 2: DESIGN LIFE OF ASSET ELEMENTS

ASSET TYPE	DESIGN LIFESPAN (YEARS)
Structure	50
Drainage (Civil and Hydraulic)	50
Building Pavement (Civil and Hydraulic)	50
Critical infrastructure systems – security & communications	25
HVAC	15
Façade	30
Materials and Finishes (Architectural elements)	30

2.5 CLIMATE CHANGE CONTEXT/SCENARIOS

2.5.1 GREENHOUSE GAS EMISSIONS SCENARIOS

Although future emissions growth is complex and uncertain, the Intergovernmental Panel on Climate Change (IPCC) has developed a range of potential future greenhouse gas emissions scenarios to address this uncertainty and represent a plausible set of future economic and social conditions on which emission levels were generated (Australian Government Department of Climate Change, 2009).

As per guidance in the AGO's Guide, specifically Section B4.1, a limited number of scenarios covering the most plausible future climate change impacts were used in this analysis to gain a holistic picture of predicted climate change impacts for this site.

The Representative Concentration Pathway (RCP) 8.5 IPCC climate change scenario was used in this impact assessment. This scenario reflects the global climate model (GCM) simulations and was selected as it represents a high-emission scenario and therefore allows the potential worst-case impacts to be assessed. The 6th Report by IPCC (AR6) was released in March 2023 and states: 'some future changes are unavoidable and/or irreversible but can be limited by deep, rapid and sustained global greenhouse gas emissions reduction'. The findings of this latest science confirm that the global trends align with this worst-case scenario.

Representative Concentration Pathway 8.5 (RCP8.5)

This scenario is representative of a high-emission scenario, for which the carbon dioxide concentration reaches about 940 ppm by the end of the 21st century and assumes that global annual GHG emissions (CO2-e) continue to rise through to 2100 **Invalid source specified.**. This scenario represents 'business as usual' and combines assumptions regarding the absence of climate change policies with higher world populations and modest rates of technological change or energy intensity improvements which culminate in higher energy demands and therefore greenhouse gas emissions increasing year on year.

2.5.2 FUTURE TIME SCALES

In accordance with best practice and Green Star guidelines, NDY have assessed the site's climatic conditions for the following two relevant timescales:

- 2050, approximately 25 years post-practical completion;
- 2090, approximately 65 years following occupation, noting the expected building life before a major refurbishment is 50-60 years.

2.5.3 CLIMATE VARIABLES

Based on the site's location, vulnerabilities, and the explicit requirements of Green Star Buildings v1.0, the following climate variables have been considered:

Primary Effects

Temperature
Average Annual Temperature
Extreme Temperature Events

Rainfall
Average Annual Rainfall
Extreme Rainfall Events

Relative Humidity
Average Humidity

Solar Radiation
Average Solar Radiation

Sea
Sea Level Rise

Drought
Periods of Drought

Secondary Effects

Wind
Extreme Wind

Hail
Hail size

Lightning
Frequency and location

Bushfire
Dust Storm

2.5.4 STANDARDS

In addition to AS 5334-2013, ISO 31000 – Risk Management (Standards Australia, 2009) and the AGO Guide, "Climate Change Risks and Impacts: A Guide for Government and Business", were used to establish the context for this assessment. Prior to the stakeholder workshop, these documents were referenced to ensure that all relevant risks were identified, analysed and evaluated, allowing the design team and project stakeholders to focus on proposing initiatives and strategies during the workshop itself.

2.6 RISK CRITERIA

The following tables define the risk likelihood, consequence and overall priority rating for each of the hazards assessed. All have been taken from or adapted from AS 5334-2013.

TABLE 3: RISK ASSESSMENT LIKELIHOOD SCALE

RATING	DESCRIPTOR	RECURRENT OR SINGLE EVENT RISKS	LONG TERM RISKS
Almost Certain	Could occur several times per year	Has happened several times in the past year and in each of the previous 5 years or Could occur several times per year	Has a greater than 90% chance of occurring in the identified time period if the risk is not mitigated
Likely	May arise about once per year	Has happened at least once in the past year and in each of the previous 5 years or May arise about once per year	Has a 60-90% chance of occurring in the identified time period if the risk is not mitigated
Possible	May arise a couple of times in a generation	Has happened during the past 5 years but not in every year or May arise once in 25 years	Has a 40-60% chance of occurring in the identified time period if the risk is not mitigated
Unlikely	May arise once in a generation	May have occurred once in the last 5 years or May arise once in 25 to 50 years	Has a 10-30% chance of occurring in the future if the risk is not mitigated
Rare	May arise once in a lifetime	Has not occurred in the past 5 years or Unlikely during the next 50 years	May occur in exceptional circumstances, i.e. less than 10% chance of occurring in the identified time period if the risk is not mitigated

TABLE 4: RISK ASSESSMENT CONSEQUENCE SCALE

DESCRIPTOR	ENVIRONMENTAL	SOCIAL/CULTURAL	FINANCIAL
Insignificant	No adverse effects on natural.	No adverse human health effects.	Little financial loss or increase in operating expenses.
Minor	Minimal effects on the natural environment.	Short-term disruption to employees, customers or neighbours. Slight adverse human health effects or general amenity issues.	Additional operational costs. Financial loss is small <10%.
Moderate	Some damage to the environment, including local ecosystems. Some remedial action may be required.	Frequent disruptions to employees, customers or neighbours. Adverse human health effects.	Moderate financial loss 10-50%.
Major	Significant effect on the environment and local ecosystems. Remedial action likely to be required.	Permanent physical injuries and fatalities may occur. Severe disruptions to employees, customers or neighbours.	Major financial loss 50-90%.
Catastrophic	Very significant loss to the environment. May include localized loss of species, habitats or ecosystems. Extensive remedial action essential to prevent further degradation. Restoration likely to be required.	Severe adverse human health effects, leading to multiple events of total disability or fatalities. Total disruptions to employees, customers or neighbours. Emergency response at a major level.	Extreme financial loss >90%.

TABLE 5: PRIORITY MATRIX

		LIKELIHOOD				
		Rare	Unlikely	Possible	Likely	Almost Certain
CONSEQUENCE	Catastrophic	Low	Medium	High	Extreme	Extreme
	Major	Low	Medium	Medium	High	Extreme
	Moderate	Low	Low	Medium	High	Extreme
	Minor	Low	Low	Medium	Medium	High
	Insignificant	Low	Low	Low	Medium	Medium

3 CLIMATE CHANGE PROJECTIONS FOR EAST COAST

The following climate change projections have been assigned a confidence rating which follows IPCC likelihood terminology. The IPCC uses the following terminology for certainty/likelihood of outcomes.

The confidence rating does not equate to a probabilistic confidence, rather it covers the type, amount, quality, and consistency of evidence, and the extent of agreement (CSIRO Climate Change Projections, East Coast Cluster Report 2015). The following terminology for certainty/likelihood of outcomes are used in this report:

- Low confidence
- Medium confidence
- High confidence
- Very high confidence

It is important to understand that climate change is not expected to be linear or smooth. It is anticipated that climate change will be characterised by extreme events that are hard to predict and even harder to manage and as a result many ecosystems, both natural and man-made, will find it difficult to adapt (IPCC, IPCC WGI AR5 Climate Change 2013: The Physical Science Basis, 2013).

3.1 TEMPERATURE

3.1.1 HIGHER TEMPERATURES

Continued increases in mean, daily maximum and daily minimum temperatures are projected for the East Coast cluster with very high confidence with the near future (2030) projected increase of mean annual temperature around 0.6 to 1.3 °C above the climate of 1986–2005, with only minor differences between RCPs (CSIRO Climate Change Projections, East Coast Cluster Report 2015). Late in the century (2090), there is a large difference between scenarios, with projected warming of 2.7 to 4.5 °C for RCP8.5 (CSIRO Climate Change Projections, East Coast Cluster Report 2015).

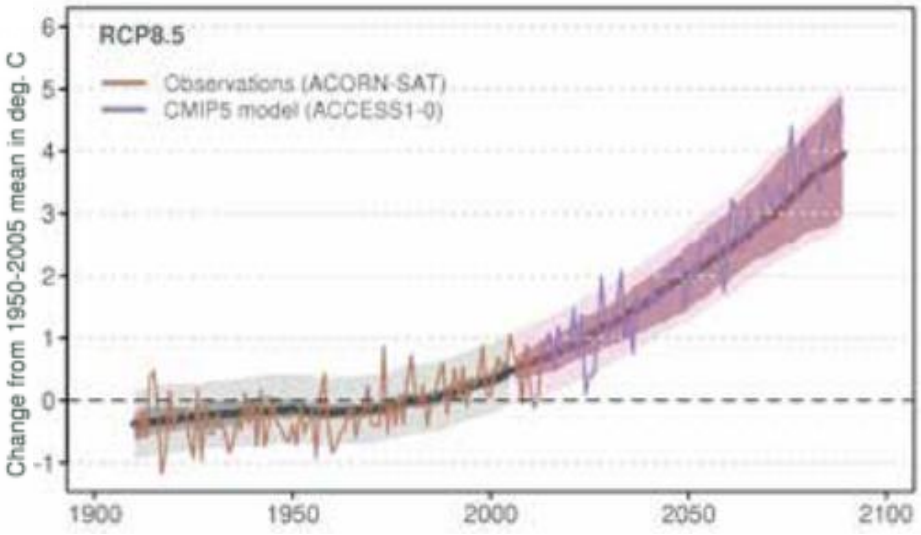


FIGURE 2: EAST COAST ANNUAL AVERAGE SURFACE AIR TEMPERATURE (°C) FOR 1910–2090 (CSIRO CLIMATE CHANGE PROJECTIONS, EAST COAST CLUSTER REPORT 2015)

TABLE 6: AVERAGE MAXIMUM SEASONAL TEMPERATURE (BUREAU OF METEOROLOGY, HOLSWORTHY AERODROME STATION NO. 066161) AND FUTURE PROJECTIONS (CSIRO CLIMATE CHANGE PROJECTIONS, EAST COAST CLUSTER REPORT 2015)

Season	Baseline	2050 @ RCP8.5	2090 @ RCP8.5
Summer	28.5° C	29.8° C (+1.3° C)	33.0° C (+4.5° C)
Autumn	23.8° C	25.1° C (+1.3° C)	28.4° C (+4.6° C)
Winter	18.2° C	19.4° C (+1.2° C)	23.1° C (+4.9° C)
Spring	24.3° C	25.8° C (+1.5° C)	29.6° C (+5.3° C)

3.1.2 HOTTER AND MORE FREQUENT HOT DAYS, FEWER FROSTS

A substantial increase in the temperature reached on the hottest days, the frequency of hot days and the duration of warm spells are projected with very high confidence and as a result, an expected decrease in the frequency of frost-risk days is projected with high confidence (CSIRO Climate Change Projections, East Coast Cluster Report 2015).

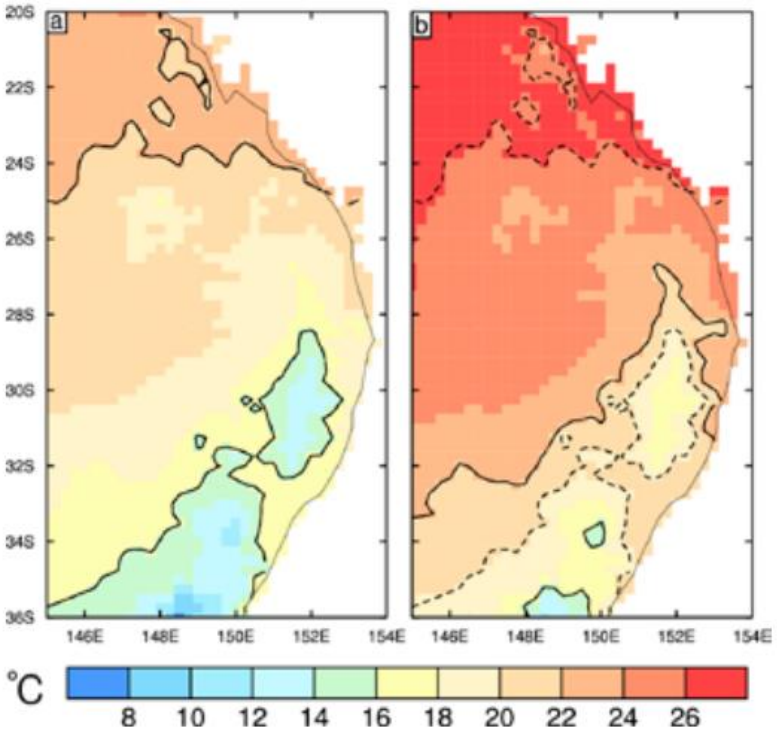


FIGURE 3: ANNUAL MEAN SURFACE AIR TEMPERATURE (°C), FOR THE PRESENT CLIMATE (A), AND MEDIAN WARMING UNDER RCP8.5 FOR 2090 (B) (CSIRO CLIMATE CHANGE PROJECTIONS, EAST COAST CLUSTER REPORT 2015)

TABLE 7: AVERAGE ANNUAL NUMBER OF DAYS ABOVE 35°C AND 40°C (CSIRO CLIMATE CHANGE PROJECTIONS, EAST COAST CLUSTER REPORT 2015)

THRESHOLD	CURRENT	2050 @ RCP8.5	2090 @ RCP8.5
Over 35 °C	12.8 days	5 days (-7.8 days)	15 days (+2.2 days)
Over 40 °C	2.4 days	0.8 days (-1.6 days)	3.3 days (+0.9 days)

The risk of line outages, blackouts, and asset failures is likely to increase**Invalid source specified.**. This is due to increases in peak demand from increased air-conditioning use exceeding baseload increases. Although the main drivers for energy consumption are demographic and socio-economic factors, climatic conditions are also linked to average and peak energy demands. **Invalid source specified.**.

Higher rates of infectious and water-borne disease, as well as increased rates of heat-related stress and mortality, particularly among the aged and vulnerable populations, are likely outcomes (Grose et. al, 2015).

The frequency of hot days and the frequency of high fire risk weather is likely to increase. Dalmeny, within the East Coast cluster, currently experiences temperatures above 35°C, on average, 12.8 days per year. Studies have highlighted that by 2090 this is predicted to increase under RCP8.5, and the number of days over 40°C increases to 3.3 days (CSIRO Climate Change Projections, East Coast Cluster Report 2015). This has important ramifications for air pollution and health, with ozone pollution events linked to the frequency of hot, sunny days and with the highest particle pollution concentrations linked to the presence of bushfire smoke (Grose et. al, 2015).

3.1.3 HEATWAVES

The frequency of heatwave events is predicted to increase over time, which will cause further challenges to the school operations. As such multiple risks relating to extreme temperature have been identified. Refer to Appendix D. Risk Register, and has necessitated many mitigations in the schools design and operations.

3.2 PRECIPITATION

3.2.1 EXTENDED DROUGHT PERIODS

There is medium confidence that the time spent in drought and extreme drought frequency will increase over the course of the 21st century in line with projected declines in annual and cool season rainfall, but low confidence in projecting the duration of extreme droughts (CSIRO Climate Change Projections, East Coast Cluster Report 2015).

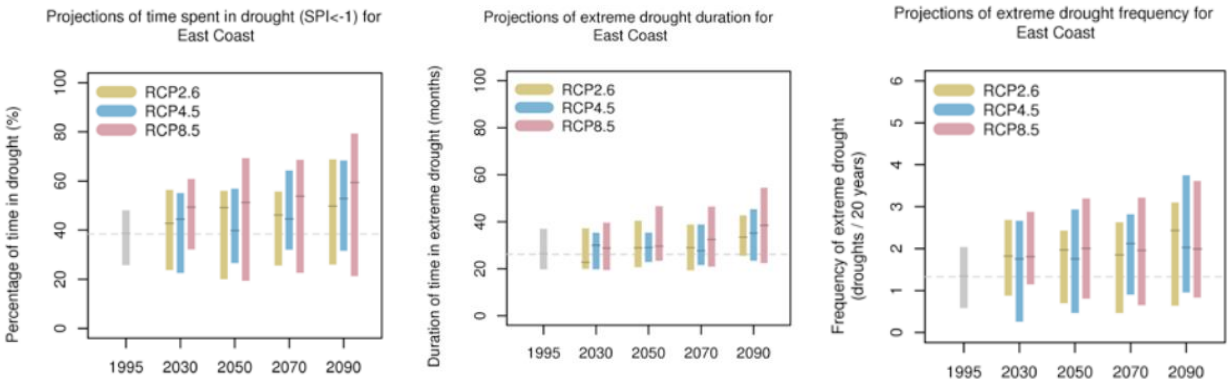


FIGURE 4: TIME IN DROUGHT (LEFT), DURATION OF EXTREME DROUGHT (MIDDLE), AND FREQUENCY OF EXTREME DROUGHT (RIGHT) (CSIRO CLIMATE CHANGE PROJECTIONS, EAST COAST CLUSTER REPORT 2015)

3.2.2 EXTREME RAINFALL EVENTS

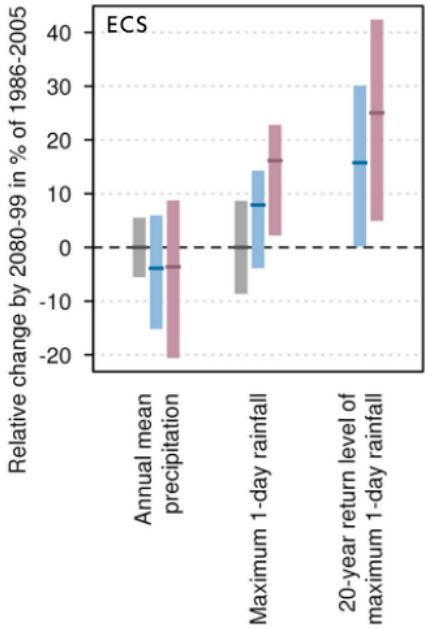


FIGURE 5: PROJECTED CHANGES IN MEAN RAINFALL, MAGNITUDE OF ANNUAL MAXIMUM 1-DAY RAINFALL, AND MAGNITUDE OF 1 IN 20-YEAR RAINFALL EVENTS FOR 2090 (CSIRO CLIMATE CHANGE PROJECTIONS, EAST COAST CLUSTER REPORT 2015)

There is high confidence that whilst the intensity of heavy rainfall extremes will increase, the magnitude of change cannot be reliably projected (CSIRO Climate Change Projections, East Coast Cluster Report 2015). The trend of annual mean rainfall is unclear and tending toward decrease whilst increased magnitudes of extreme rainfall events are projected. Separated into cool and warm seasons, the latter being the season where the largest annual daily totals are currently being observed, the increase in 1-day rainfall is larger in the warm season. The magnitude of the anticipated extremes of rainfall are highly dependent on the emission scenario and the future time period.

3.2.3 AVERAGE RAINFALL

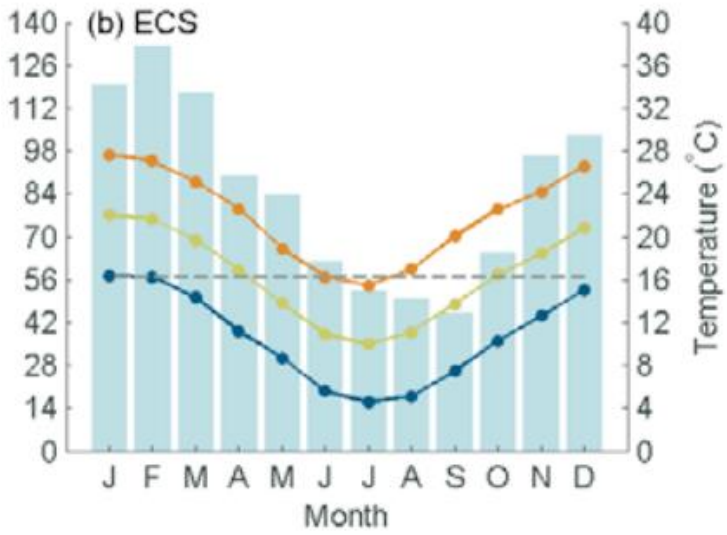


FIGURE 6: MONTHLY RAINFALL AND TEMPERATURE CHARACTERISTICS FOR THE EAST COAST CLUSTER (CSIRO CLIMATE CHANGE PROJECTIONS, EAST COAST CLUSTER REPORT 2015)

The East Coast cluster experienced prolonged periods of extensive drying in the early 20th century and again by the end of the century. In the latter, drying occurred primarily during the cool season. Overall, there is no long-term trend in annual rainfall throughout the 20th century and this will extend with high confidence into the near term (2030). Long-term trends indicate there is high confidence that cool season rainfall will continue to decline and there is medium confidence that rainfall will remain unchanged in the warm season (CSIRO Climate Change Projections, East Coast Cluster Report 2015).

TABLE 8: AVERAGE RAINFALL (BUREAU OF METEOROLOGY, HOLSWORTHY AERODROME STATION NO. 066161) AND FUTURE PROJECTIONS (CSIRO CLIMATE CHANGE PROJECTIONS, EAST COAST CLUSTER REPORT 2015)

SEASON	BASELINE	2050 @ RCP8.5	2090 @ RCP8.5
Summer	85.1 mm	86.8 mm (+2%)	94.4 mm (+11%)
Autumn	86.7 mm	84.1 mm (-3%)	84.9 mm (-2%)
Winter	69.5 mm	63.9 mm (-8%)	57.7 mm (-17%)
Spring	52.2 mm	50.7 mm (-3%)	48.1 mm (-8%)

3.3 SEA LEVEL RISE AND FLOODING

Relative sea level has risen around Australia at an average rate of 1.4 mm per year between 1966 and 2009, and 1.6 mm per year after the influence of the El Niño Southern Oscillation (ENSO) on sea level is removed (CSIRO Climate Change Projections, East Coast Cluster Report 2015). Increasing global temperatures have a direct impact on sea level as the water expands with temperature and increases can also be expected from melting glaciers and ice caps. As temperatures are virtually certain to rise, sea levels are similarly virtually certain

to rise, in line with IPCC predictions **Invalid source specified.**. There is very high confidence that sea level will continue to rise during the 21st century. In the near future (2030), the projected range of sea-level rise for the cluster coastline is 0.07 to 0.18 m above the 1986–2005 level, with only minor differences between RCPs (CSIRO Climate Change Projections, East Coast Cluster Report 2015). As the century progresses, projections are sensitive to emissions pathways. By 2050, RCP8.5 gives a rise of 36cm, and by 2090, RCP8.5 gives a rise of 88cm (CSIRO Climate Change Projections, East Coast Cluster Report 2015).

TABLE 9: EAST COAST SEA LEVEL PREDICTIONS FOR 2090

CLIMATE VARIABLE	2050 @ RCP8.5	2090 @ RCP8.5
Sea Level Rise	24 cm above baseline	64 cm above baseline

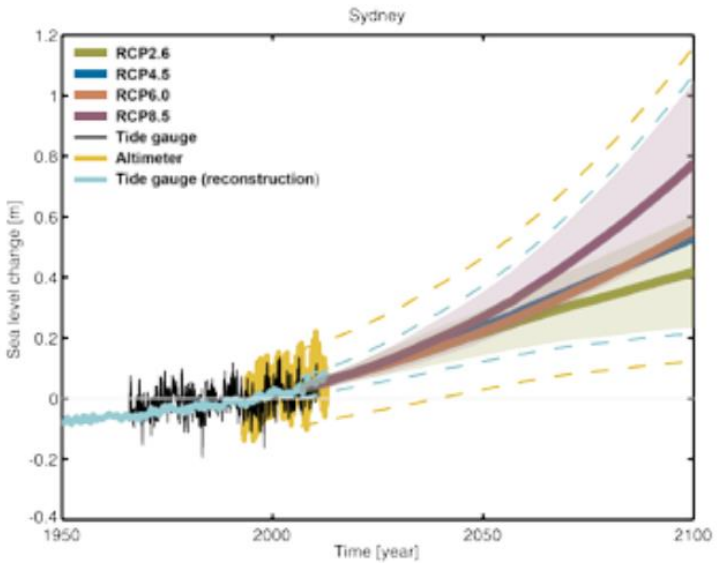


FIGURE 7: OBSERVED AND PROJECTED RELATIVE SEA LEVEL CHANGE (M) FOR SYDNEY HARBOUR (WHICH HAS CONTINUOUS RECORDS AVAILABLE (1966–2010) (CSIRO CLIMATE CHANGE PROJECTIONS, EAST COAST CLUSTER REPORT 2015)

The project is located inland away from the sea. The local topography means that school flooding due to sea level rise is not a risk.

3.4 GUSTIER WIND CONDITIONS

There is high confidence in small changes to mean wind speed under RCP 8.5 scenarios by 2050. For 2090 changes are projected to remain small with winter wind speed projected to reduce with medium confidence under RCP8.5. These reduced winter wind speeds are assumed to be due to a projected southward movement of storm tracks and the subtropical ridge, thus weakening westerly winds (CSIRO Climate Change Projections, East Coast Cluster Report 2015).

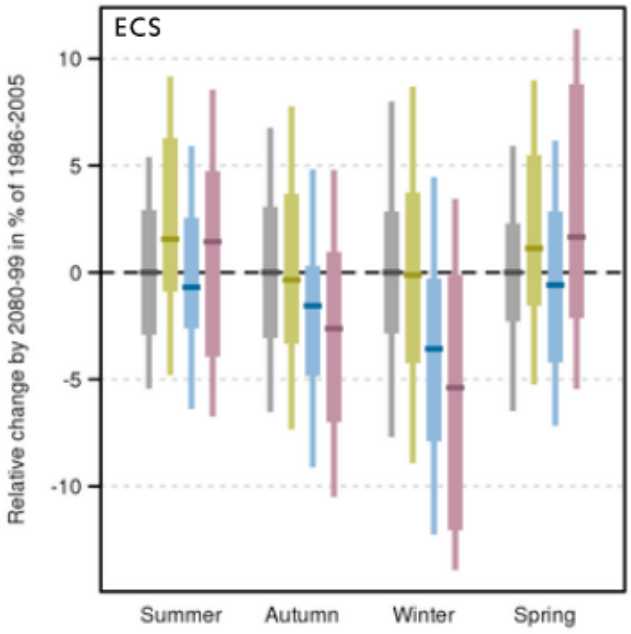


FIGURE 8: PROJECTED NEAR-SURFACE WIND SPEED CHANGES FOR 2090. ANOMALIES ARE GIVEN AS A PERCENTAGE WITH RESPECT TO THE 1986-2005 MEAN (CSIRO CLIMATE CHANGE PROJECTIONS, EAST COAST CLUSTER REPORT 2015)

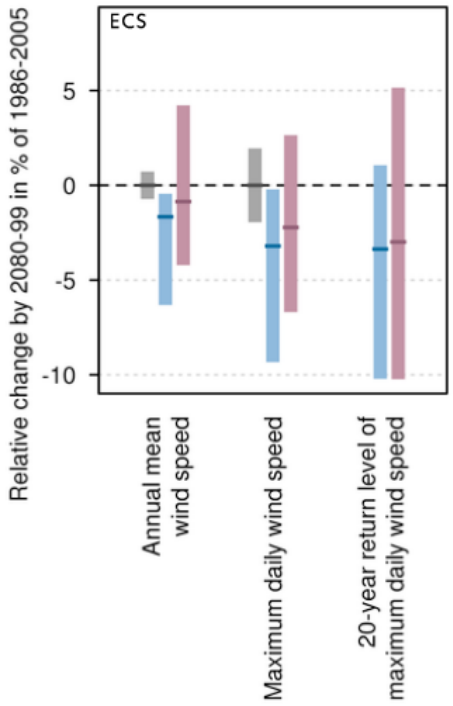


FIGURE 9: PROJECTED NEAR-SURFACE ANNUAL MEAN WIND SPEED, ANNUAL MAXIMUM DAILY WIND SPEED AND THE 20-YEAR RETURN VALUE FOR THE ANNUAL MAXIMUM DAILY WIND SPEED FOR 2090. ANOMALIES ARE GIVEN AS A PERCENTAGE WITH RESPECT TO THE 1986-2005 MEAN (CSIRO CLIMATE CHANGE PROJECTIONS, EAST COAST CLUSTER REPORT 2015)

3.5 SOLAR RADIATION & RELATIVE HUMIDITY

Solar radiation and relative humidity are projected to have small changes for 2030 with high confidence. By 2090 there is low confidence in increased winter and spring radiation (related to decreases in cloudiness associated with reduced rainfall), medium confidence in decreases in relative humidity in summer and autumn, and high confidence in decreases in winter and spring (CSIRO Climate Change Projections, East Coast Cluster Report 2015).

TABLE 10: SOLAR RADIATION AND HUMIDITY (BUREAU OF METEOROLOGY, HOLSWORTHY AERODROME STATION NO. 066161) AND RELATIVE HUMIDITY (CSIRO CLIMATE CHANGE PROJECTIONS, EAST COAST CLUSTER REPORT 2015)

CLIMATE VARIABLE	BASELINE	2050 @ RCP8.5	2090 @ RCP8.5
Yearly Average Daily Solar Radiation	16.2 MJ/m2	16.6 MJ/m2 (+2.7%)	16.7 MJ/m2 (+3.4%)
Yearly Average 3 pm Humidity	52%	52.5 % (+0.9%)	52.7 % (+1.3%)

3.6 INCREASED EVAPORATION RATES, REDUCED SOIL MOISTURE, AND RUNOFF

There is high confidence that potential evapotranspiration will increase in the East Coast cluster in all seasons however, there is medium confidence about the magnitude of the increase. Changes to rainfall and evapotranspiration are projected to lead to a decrease in soil moisture, particularly in winter and spring, with medium confidence (CSIRO Climate Change Projections, East Coast Cluster Report 2015). There is medium confidence that runoff will decrease by 2050 and 2090 with RCP8.5 (CSIRO Climate Change Projections, East Coast Cluster Report 2015).

3.7 BUSH FIRE

Bushfire occurrence depends on four 'switches':

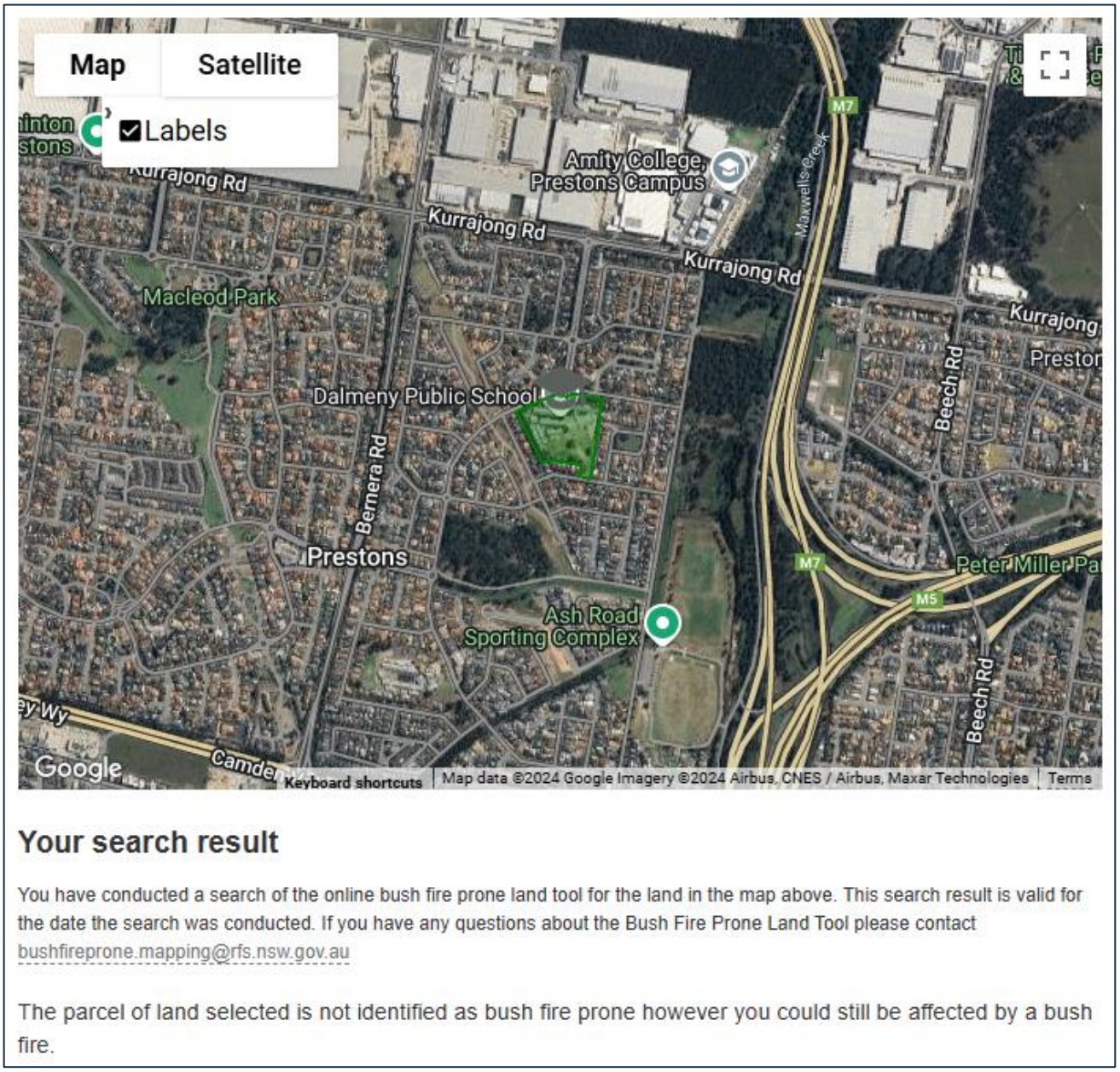
1) ignition, either human-caused or from natural sources such as lightning;
2) fuel abundance or load;
3) fuel dryness, where lower moisture contents are required for fire, and
4) suitable weather conditions for fire spread, generally hot, dry and windy **Invalid source specified.**.

There is high confidence that climate change will result in a harsher fire-weather climate in the future. However, there is low confidence in the magnitude of the change, as this depends on the rainfall projection (CSIRO Climate Change Projections, East Coast Cluster Report 2015).

TABLE 11: MAXIMUM RECORDED TEMPERATURE, TIME IN DROUGHT AND FIRE WEATHER (BUREAU OF METEOROLOGY, SYDNEY AIRPORT STATION NO. 066037) AND FUTURE PROJECTIONS (CSIRO CLIMATE CHANGE PROJECTIONS, EAST COAST CLUSTER REPORT 2015)

CLIMATE VARIABLE	BASELINE	2050 @ RCP8.5	2090 @ RCP8.5
Maximum Recorded Temperature (°C)	45.9° C	47.3° C (+1.4° C)	50.8° C (+4.9° C)
Time in Drought	38%	50%	60%
Fire Weather (Severe Fire Danger Days)	0.9 days	1.305 days (+45%)	2.07 days (+130%)

The site is situated in Georges River Council, the bushfire map is provided in Figure which shows the site is not identified as a bush fire prone area, however, could still be indirectly affected by a bush fire. So, risks associated with bushfires need to be considered in the design.



Your search result

You have conducted a search of the online bush fire prone land tool for the land in the map above. This search result is valid for the date the search was conducted. If you have any questions about the Bush Fire Prone Land Tool please contact bushfireprone.mapping@rfs.nsw.gov.au

The parcel of land selected is not identified as bush fire prone however you could still be affected by a bush fire.

FIGURE 10: NSW RURAL FIRE SERVICE BUSH FIRE PRONE LAND MAP

4 RISK ASSESSMENT & ADAPTATION PLAN

4.1 RISK MANAGEMENT

Climate change adaptation is a risk management process just like any other risk considered by a successful modern business. The prioritisation of risk management actions comes from an informed understanding of the potential risks and the adaptation opportunities within the challenges ahead of us.

Modern business is ideally placed to tackle climate change, because businesses are inherently pragmatic and are used to change. However, the reason and time to act will be varied across the business community and must extend beyond legislated reporting of emissions and desire to curb energy use, to management of business risk for:

- Direct or physical risks
  - To physical assets, staff and visitors.
- Fiduciary liability
  - Fiduciary liability on Company Directors to consider and mitigate for climate change risk.
  - There is a real risk of 'litigation against a director who has failed to perceive, disclose or take steps in relation to a foreseeable climate-related risk that can be demonstrated to have caused harm to a company' (Hutley SC, 2016).
- Risk disclosure
  - Publicly listed companies are increasingly being pressured to normalise their climate risk disclosure practices. Particularly as the world moves towards a carbon-constrained future.
- Financial risk
  - Long term financial planning. 'Climate change is a financial risk if you've got a long-term asset portfolio'. Paul Fisher who retired as deputy head of the Bank of England's Prudential Regulation Authority (climatealliance.org.au, 2016).
- Social license
  - Social license to operate. Failure to maintain your business social license with customers and the broader community at large has often resulted in real consequences for business operations because the marketplace is savage to businesses that ignore reality.

4.2 THE PROCESS

This Climate Adaptation Plan for Dalmeny Public School is the result of a collaborative and iterative risk management process engaging all relevant areas of the business as presented below:

- Step One: Climate projections with justification of modelling scenario.
- Step Two: Risk management workshop records potential climate change impact and risk level.
- Step Three: Risk management workshop records design and operational adaptation action and re-assessed risk level.

4.2.1 STEP ONE: BEFORE THE WORKSHOP – ESTABLISHING THE CONTEXT

Prior to the stakeholder workshop, NDY established the frameworks for identifying and analysing the risks identified for the project in relation to the climate projection data to ensure a common understanding amongst project stakeholders.

A Pre-Workshop Notice G-001[1.0] (dated 1st Nov 2024 and provided in Appendix B for context) was issued prior to the workshop with the intent of informing the stakeholders about the following:

- The site-specific climate change scenarios used to assume future changes.
- The scope of the assessment including the boundaries, timescales and emissions scenarios utilised.
- A 'Consequence Scale for Risk Assessment' and a 'Likelihood Scale for Risk Assessment' that would be used to define how the project risks would be classified and evaluated to measure the consequences, likelihoods and risk priorities for the project.

- Setting the priorities of the workshop to identify and describe the risks posed by climate change for the development, rating these using the above scales, as well as identifying and evaluating potential adaptation actions to mitigate any risks identified as unacceptable.

4.2.2 STEP TWO: DURING THE WORKSHOP

The following stakeholders attended the workshop and/or included their views to contribute to the climate change assessment and analysis of risks for the project:

Attendees:

- Danielle Fogarty – Sustainability Manager (SINSW)
- Frank Princi – Project Manager (SINSW)
- Murgaja Karandikar – Architect (Fulton Trotter)
- Syed Zaman – Architect (Fulton Trotter)
- Jarrod Phillips – Architect (Fulton Trotter)
- Nicholas Lau – Project Manager (RPInfrastructure)
- Sarah Hamilton – Project Manager (RPInfrastructure)
- Hock Ter – Sustainability (NDY)
- Nicola Ring (NDY)
- Yolandi Cooper – Civil (Meinhardt)

Facilitators:

- Richard Burton – Sustainability (NDY)
- Sanjeev Ganda - Sustainability (NDY)

All participants were provided with quantitative and descriptive information on the climate change scenarios and data produced by NDY's analysis (refer to Appendix C – Workshop Presentation).

The workshop generated a list of risks directly related to the site-specific data and project risks associated with climate change. These risks were then evaluated using knowledge of existing controls that are already designed to mitigate these risks, the consequences of the risks identified as well as the likelihood of their occurrence for this site. This, in turn, informed the priority rating for each risk identified in Appendix D – Risk Register.

The workshops included brainstorming exercises to identify additional risk controls or future measures to reduce the risk of hazards at the site.

4.2.3 STEP THREE: AFTER THE WORKSHOP

The risk register established for the project was circulated to all attendees and project stakeholders for comment. All outstanding items have been collated by NDY in a project-specific Climate Change Risk Register, where 'High' or 'Extreme' risks were identified. All risk items identified will require the implementation of design elements and/or policies in place to be mitigated.

4.3 IDENTIFYING ADAPTATION ACTIONS AND REASSESSING RISK

Once climate risk ratings have been applied to potential climate change risks, adaptation actions are identified to reduce the risk rating of extreme, high, medium, and low risk rated climate risks.

Generally, there are four possible approaches in responding to climate change:

- Avoid: Avoid locating assets in vulnerable areas or ignore and replace when required;
- Adapt: Design systems and adaption measures to operate in predicted future climate conditions. There are two approaches:
  - Respond Now (future proof through current measures), OR
  - Anticipate and Respond Later (enable future adaptive measures);
- Defend: Install defences at or around critical infrastructure;
- Retreat: Develop and implement plans to relocate from the vulnerable area.

The project looks to incorporate the above 'Adapt' measures where risks to the project have been identified. These can either be through design considerations or through future-proofing the asset to allow for flexible responses that will allow for adaptive measures to be implemented in the future. To address potential climate

change impacts and inform further design development and operational considerations, the mitigation measures are detailed in Appendix D. Risk Register

At a minimum, the Climate Adaptation Plan should be reviewed whenever the base information utilised to develop site-specific climate change scenarios has been updated or every five years, as good practice.

4.4 IDENTIFIED RISKS

4.4.1 TOP 2 RISKS

TABLE 12: TOP 2 IDENTIFIED RISKS

RISK #	HAZARD	DESCRIPTION OF IMPACT	CONTROLS IDENTIFIED IN WORKSHOP	CONSEQUENCE	BAU RISK	RESIDUAL RISK
01	Extreme Temperature	HVAC systems not maintaining internal conditions. Increase in electricity consumption due to higher temperatures combined with humidity. Mechanical equipment not performing.	The new learning block is to be served by an air cooled VRF air conditioning system. The system is designed for current climate conditions in Camel load calculation software, weather data obtained for closest weather station. Thus, the calculations for East Coast has already accounted above ASHRAE requirement by 1.8 °C DB in summer. Noting that the school has school holidays during peak summer and at other times finishes mid afternoon meaning the mechanical system wont be subjected to operating for the entire summer period and afternoon to evening. The system is 100% electric, so it is unlikely to be replaced in the near future if the client aims to significantly reduce carbon emissions, compared to, say, a project going from a gas system to an electric one. Therefore, it is likely the replacement would only occur if the system does not meet performance requirements. Expected life span of the mechanical AC systems is approximately 15 years. Individual condensers may be isolated, decommissioned and replaced as required. We expect some technology advances to be made near the end of life cycles, which may allow higher capacity plant to be integrated into the same plant spaces. Condenser plant is situated on an open plant with louvre enclosure, adequate space has been provisioned to allow for individual plant replacement."	Moderate	High	Medium
02	Extreme Temperature	Uncomfortable internal conditions created during higher temperature weather events.	Building to NCC 2022 requirements only.	Moderate	High	Medium

For full details and risk and likelihood ratings at each timescale, refer to Appendix D Risk Register

4.4.2 FOLLOW-UP ACTIONS

It is required that all 'High' and 'Extreme' risks be mitigated. Following the workshop no 'High' or 'Extreme' risks remain, however some items still require follow-up in future design phases.

TABLE 13: FOLLOW-UP ACTIONS

RISK NO	HAZARD	RISK	DESCRIPTION	FOLLOW-UP ACTION
01	Extreme Temperature	HVAC systems not maintaining internal conditions. Increase in electricity consumption due to higher temperatures combined with humidity. Mechanical equipment not performing.	A 5% safety factor to the sizing of the outdoor units is also applied to account for increase in temperature. Outdoor condenser units are to be selected for a higher ambient temperature of 40 C°DB. There are manually operable louvres which will provide natural ventilation in classrooms. However the system is designed to cope mechanically. Thermal fabric performance exceeding NCC 2022 outlined in Risk 2.	Provide details of building fabric performance. Provide datasheets of mechanical equipment selection.
02	Extreme Temperature	Uncomfortable internal conditions created during higher temperature weather events.	- Building envelope consists thermally insulated walls with CFC, metal wall cladding or blockwork. - Building insulation is specified above NCC Section J Minimium requirements - Building is designed with passive design principles, and HVAC systems are further provided to meet thermal comfort requirements up to 40 C°DB. In the event of even higher temperatures HVAC systems will still operate, but won't hit the internal design temperatures.	Provide details of building fabric performance.
06	Heatwave	Risk of Dehydration	Noted that multiple mitigations have been identified. It has been further noted that bubblers are intended to be provided as a further mitigation strategy. Must be detailed in future phases by the architect	Provide drawings detailing the location of bubblers and number of bubblers
15	Extreme Rainfall	Water entering critical infrastructure (lift pit)	Lift pits noted as the most critical ground floor located infrastructure	Risk level, and mitigations if required, of ingress by wind driven rain and overland flows to be addressed in future design phases by architect and civil engineer.
18	Extreme Weather Events	Extreme winds could cause some trees to fall onto facility or people.	SI has a maintenance regime which involves an annual survey of all existing trees by a appropriately qualified arborist to assess any potential risks and mitigate them through appropriate maintenance measures e.g. pruning etc. These actions make damage to persons and property extremely unlikely.	Provide evidence from maintenance team that noted tree maintenance occurs as described (e.g. signed confirmation letter)

4.4.3 RISK REGISTER

Refer to Appendix D. Risk Register

5 GREEN STAR REQUIREMENTS

Within its Green Star Buildings v1.0 certification submission, the project is targeting 1 point for *Credit 16 Climate Change Resilience* (Credit Achievement).

The credit requirements are as follows:

- Completing the climate change pre-screening checklist and communicating risks to the applicant.
- Developing a project-specific climate change risk and adaptation assessment for the building.
  - Using data for the representative concentration pathway RPC8.5.
  - Assess scenarios for one medium term timescale between 2040-2050 and one long term timescale between 2070-2090.
  - Identify the primary and secondary climate change variables from Table 2 in AS5334:2013.
  - Define consequences and likelihoods for risks.
  - Assess risks in consultation with the project team and relevant stakeholders.
  - Develop a Risk Register and provide treatment options for 'high' and 'extreme' risks.
  - Communicate the results of the assessment to all design discipline leads.
- Addressing extreme and high risks:
  - All 'Extreme' risks must be addressed through specific design responses.
  - All 'High' risks must be addressed through design or future operational responses.
  - Regardless of risk rating, at least two risks identified in the assessment must be addressed by specific design responses.
- Methodology must align with:
  - AS 5334-2013, and
  - *AS/NZ ISO 31000:2009 Risk Management requirements.*
- Suitably Qualified Professional: the consultant completing these works must hold a formal tertiary qualification in a relevant field with a minimum of five years' experience in climate risk and adaptation assessments.

This report has documented all of these requirements.

5.1 DOCUMENTATION FOR GREEN STAR SUBMISSION

To meet Green Star methodology, a pre-screening checklist was completed early in the design process and a climate change risk assessment was undertaken.

A stakeholder workshop sought input from the design team to identify the likely risks associated with a changing climate and how these changes would impact on the project. Design and operational mitigation strategies were developed to reduce the risks highlighted as high and extreme risks, embedding resilience to future climate change into the design.

No 'High' or 'Extreme' risks due to climate change impacts remained following design elements and operational strategies (refer to Section 6.2).

NDY and the project team have addressed all requirements for *Credit 16. Climate Change Resilience* through this process, as described in the following table, and deem the project eligible for **Credit Achievement - 1 point**.

TABLE 14: ADRESSING GREEN STAR BUILDINGS V1.0 REQUIREMENTS

CREDIT REQUIREMENTS		ADDRESSED
Completing the climate change pre-screening checklist and communicating risks to the applicant		Appendix B
Developing a project-specific climate change risk and adaptation	• Using data for the representative concentration pathway RPC8.5	Section 2.5.2
	• Assess scenarios for one medium term timescale between 2040-2050 and one long term timescale between 2070- 2090	Section 2.5.3
	• Identify the primary and secondary climate change variables from Table 2 in AS5334:2013	Section 2.5.4

CREDIT REQUIREMENTS		ADDRESSED
assessment for the building	• Define consequences and likelihoods for risks	Section 4.1 & Appendix D
	• Assess risks in consultation with the project team and relevant stakeholders	Section 4.2
	• Develop a Risk Register and provide treatment options for 'high' and 'extreme' risks	Section 2.5.2
	• Communicate the results of the assessment to all design discipline leads	Section 4.3, 4.4 & Appendix B
Meet relevant Standards / Methodology	• AS 5334-2013	Section 2.6
	• *AS/NZ ISO 31000:2009 Risk Management requirements*	Section 4.1
Addressing extreme and high risks	All risks rated as 'Extreme' must be addressed through specific design responses	Section 4.6, 5 & Appendix D
	All risks rated as 'High' must be addressed through design or future operational responses	Section 4.6, 5 & Appendix D
	Regardless of risk rating, at least two risks identified in the assessment must be addressed by specific design responses	Section 4.6, 5 & Appendix D
The consultant completing these works must hold a formal tertiary qualification in a relevant field with a minimum of five years' experience in climate risk and adaptation assessments		Section 2.2 & Appendix A

5.2 SUMMARY OF INITIAL AND REASSESSED RISKS

The initial climate change risk analysis pre-workshop identified twelve 'high' and two 'extreme' risks due to climate change impacts for 2090. With the introduction of adaptation measures, as part of the workshop these risks have been mostly reduced to 'medium' risk, with no remaining 'high' or 'extreme' risks for 2090.

TABLE 15: NUMBER OF RISKS IDENTIFIED

RISK RATING	YEAR	LOW	MEDIUM	HIGH	EXTREME	TOTAL
Business as Usual: Number of risks when considering business as usual design measures	2040	5	9	3	0	17
	2075	4	10	3	0	17
Residual Risks: Number of risks following adaptation measures	2040	7	10	0	0	17
	2075	7	10	0	0	17

6 ASSUMPTIONS AND LIMITATIONS

The key assumptions underpinning this risk assessment are as follows:

- The purpose of the risk assessment is to highlight the potential for climate change induced risks and inform the decision-making process, which enables the design and operation of climate-resilient infrastructure.
- Risk assessment and mitigation is a dynamic and iterative process for the duration of the asset's life cycle. This report is the first step in the process.
- The assessment of risks and possible adaptation measures is qualitative and not quantitative.
- The climate change projections adopted are those that have been reasonably predicted for future climatic conditions. It should be noted that some projections currently involve a considerable degree of uncertainty.
- The climate projections are regional, not localised, so their accuracy is limited and subject to the uncertainties of scientific and technical research. They are however sufficient for the purposes of this assessment with recommendations representing professional judgement.
- Climate change projections are currently conservative given global data projections are still in the process of incorporating findings from the latest science published in the 6th IPCC Report (AR6).
- This plan does not ensure the implementation of any identified adaptation and resilience measures. It remains the responsibility of the project team and operational entities to incorporate the sustainability advise hereby provided.

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APPENDIX A. CVS

Refer over.

DANA JUMP | SENIOR SUSTAINABILITY CONSULTANT

Dana is a sustainability management and advisory professional with expertise in infrastructure, built environment, and ESG clients. With 18 years of professional experience in the Australia & New Zealand Region, Dana has successfully developed and implemented sustainability strategies for ESG, Climate Change Resilience, Green Star, Infrastructure Sustainability and WELL Buildings accreditations.

Dana is passionate about challenging social norms and inspiring planners, designers, and constructors to create practical and meaningful sustainability outcomes. Currently, Dana holds an industry seat in the ISC Design and As Built Technical Working Group and Property Council of Australia Western Australian Planning and Infrastructure Committee.

DISCIPLINE

Sustainability

EXPERTISE

ESG, Climate Change Resilience, Sustainability strategy and accreditation (GSAP, ISAP, WELL), Management system reviews and auditing

EXPERIENCE

18+ years

QUALIFICATIONS

BSc. Env Management and Occupational Health and Safety

Grad.Cert. Environmental Management

Green Star Sustainability Accredited Professional (GSAP)

Infrastructure Sustainability Accredited Professional (ISAP)

PROFESSIONAL AFFILIATIONS

ISC Design and As Built Technical Working Group Industry Member

Property Council of Australia Committee Member

OFFICE LOCATION

Perth, Western Australia, Australia

RELEVANT PROJECT EXPERIENCE

MIXED USE

Lots 1&2 The Oval, Subiaco East, Perth, Western Australia (2023 - Current | $ Commercial in Confidence)

Lots 1 & 2 Subiaco Oval will deliver a market leading mixed-use development with Lot 1 incorporating a 30-storey residential tower and Lot 2 an 11-storey residential tower, including a shared underground carpark. NDY have been engaged for all core services including ICT / communications, vertical transportation and sustainability.

As a sustainability consultant, Dana provided timely and expert sustainability advice to integrate sustainable design principles and Green Star Buildings v1.0 requirements into project Lots 1&2 The Oval, ensuring high performance and sustainably responsible outcomes. Dana has conducted the climate change risk assessment for the project to include resilience adaptation options into the project design.

RAIL

METRONET Byford Rail Extension Project, Perth, Western Australia, Australia (2022 | $885 m)

The Armadale Line will be extended approximately 8km south to a new ground-level station in Byford, supporting one of the fastest growing areas in Australia. Armadale Station will be rebuilt as an elevated station with three nearby busy level crossings removed and replaced with elevated rail. The project will kick-start development opportunities in the Armadale and Byford town centres, providing new and safe connections around the stations.

In this position, Dana conducted climate change and resilience studies for IS and Green Star ratings, while also providing senior technical ISAP support for NDY and the broader alliance team as needed. This involved assisting with resource efficiency and life cycle assessment studies, as well as engaging with the design team to identify early sustainability rating alignment technical challenges and potential project opportunities.

Papakura to Pukekohe Electrification Project, Auckland, New Zealand (2021 | NZ$371 m)

The Papakura to Pukekohe rail electrification project will extend the electric train network approximately 20 kilometres south from Papakura to Pukekohe.

SANJEEV GANDA | SUSTAINABILITY CONSULTANT

Sanjeev joined NDY in 2019 after graduating from the University of Wellington with a Master of Building Science.

Sanjeev's technical sustainability experience includes climate change adaptation, daylight, thermal comfort, energy modelling, and structured sustainability frameworks such as Green Star.

Sanjeev has contributed to various projects with this diverse skill set, including offices, aged care, new builds, schools, and hotels in New Zealand and Australia.

Sanjeev's area of expertise is climate change adaptation and Life Cycle Assessment, where he strives to find solutions to adapt to and mitigate climate change impacts through an analytical approach.

DISCIPLINE

Sustainability

EXPERTISE

Life Cycle Assessment, climate change adaptation, energy modelling, daylight modelling, third-party sustainability certifications.

EXPERIENCE

4+ years

QUALIFICATIONS

Bachelor of Building Science – Sustainable Engineering Systems

Master of Building Science – Sustainable Engineering Systems.

PROFESSIONAL AFFILIATIONS

Green Star Accredited Professional (Design & As Built

NABERSNZ Trainee Assessor.

OFFICE LOCATION

Auckland, New Zealand

RELEVANT PROJECT EXPERIENCE

OFFICES NEW

Sylvia Park 3 Te Kehu Way, Auckland, New Zealand (2021 - ongoing | NZ$ 63M)

Construction of a second office building at Sylvia Park marking the next stage in the asset's continued mixed-use evolution. Located at 3 Te Kehu Way, the six-storey development will target a 6 Star Green Star rating and has been designed in response to tenant feedback.

Sanjeev worked in a technical advisory role, delivering the climate change adaptation workshop, risk assessment, climate adaptation plan and life cycle assessment for the project. Sanjeev also modelled the operational energy of the project and delivered the Green Star submission.

Building 11 Central Park Greenlane, Auckland – Green Star & NABERSNZ (2022 - ongoing)

The KiwiRail Auckland Integrated Rail Management Centre, known as Building 11, is an integrated delivery between developers, Oyster Property, and KiwiRail to house the rail network teams in Auckland.

Sanjeev worked in a technical advisory role, delivering the climate change adaptation workshop, risk assessment, climate adaptation plan and life cycle assessment for the project.

RESIDENTIAL

Sylvia Park Build to Rent, Auckland, New Zealand (2021)

Sylvia Park Built to Rent development comprises 295 apartments across one 12-storey and two 9-storey residential buildings.

Sanjeev worked in a technical advisory role, delivering the climate change adaptation workshop, risk assessment, climate adaptation plan and life cycle assessment for the project.

Working together with the design team, Sanjeev input into the design of the project, advising strategies to mitigate impacts resulting from climate change events like extreme rainfall and temperature.

RETAIL

IKEA Sylvia Park, Auckland, New Zealand (2022)

The first New Zealand IKEA store has made a commitment to sustainability with targeting a 5-star Green Star Design and As Built v1.0 rating.

Sanjeev worked in a technical advisory role, delivering the climate change adaptation workshop, risk assessment, climate adaptation plan and life cycle assessment for the project.

Countdown Waimakariri, Kaiapoi, New Zealand (2022)
A new 3,600m^2 supermarket located in Kaiapoi, New Zealand targeting 5 Star Green Star Design & As Built NZ v1.0

Working together with the design team, Sanjeev input into the design of the project, advising strategies to mitigate impacts resulting from climate change events like extreme rainfall and temperature.

AGED CARE

Fairway Gardens Care, Auckland New Zealand (2022)

A three-storey building situated within Fairway Gardens Village at the edge of Pakuranga golf course containing admin and back-of-house area, common areas, kitchen facilities, 62 care suites, and internal and external courtyards.

Working together with the design team, Sanjeev input into the design of the project, advising strategies to mitigate impacts resulting from climate change events like extreme rainfall and temperature.

Pōhutakawa Landing, Auckland New Zealand (2022)

A two-storey building containing admin and back-of-house areas, 24 Care Suites, 17 Care Type A Suites, 8 Care Type B Suites, 15 Dementia Care Suites, common areas, kitchen facilities, internal and external courtyards, and a memory loop track.

Working together with the design team, Sanjeev input into the design of the project, advising strategies to mitigate impacts resulting from climate change events like extreme rainfall and temperature.

Oakridge Villas, Kerikeri, New Zealand (2022)

A two-storey 65-bed residential care facility including 27 small care suites, 23 large care suites, a 15 memory care suite wing, common areas, and internal courtyards/memory gardens targeting 6 Star Green Star Design & As Built NZ v1.0

Working together with the design team, Sanjeev input into the design of the project, advising strategies to mitigate impacts resulting from climate change events like extreme rainfall and temperature.

INDUSTRIAL

Fisher & Paykel Healthcare Building 5, Auckland, New Zealand (2022)

16,000m2 research and development facility located in Auckland, New Zealand targeting 5 Star Green Star Design & As Built NZ v1.0.

Working together with the design team, Sanjeev input into the design of the project, advising strategies to mitigate impacts resulting from climate change events like extreme rainfall and temperature.

30 Bowden Road, Auckland, New Zealand (2022)

Two 20,000m^2 two-storey warehouses located in Auckland targeting 5 Star Green Star Design & As Built NZ v1.0.

Working together with the design team, Sanjeev input into the design of the project, advising strategies to mitigate impacts resulting from climate change events like extreme rainfall and temperature.

APPENDIX B. PRE-WORKSHOP CONSULTANT ADVICE NOTE

Refer over.

PROJECT:	SINSW - DALMENY PUBLIC SCHOOL (DAPS) UPGRADE	CAN NO:	G-001[1.0]
Date:	**1 November 2024**	**Project No:**	**41151 - 001**
Pages:	**8**		

NAME	COMPANY	EMAIL
Via email		

SUSTAINABILITY – CLIMATE CHANGE ASSESSMENT: PRE-WORKSHOP NOTES

This consultant advice note aims to provide information to all stakeholders attending NDY's climate change adaptation workshop, where we will facilitate the consultation process to establish a Climate Adaptation Plan for the SINSW Dalmeny Public School Upgrade.

Workshop agenda

- Introduction
    - Climate change background
    - Purpose and process
    - Green Star Buildings methodology
- Climate Change Impacts on the SINSW Dalmeny Public School Upgrade
    - Assumptions and projections
    - Risk assessment
- Adaptation measures
    - Discussion
- Wrap-up/Next steps

The priorities for the workshop will be two-fold:

1. Identify and describe risks posed by climate change to the development and rate the consequence and likelihood of each,
2. Identify and evaluate potential adaptation actions and/or design strategies to mitigate unacceptable risks.

Pre-reading

Climate Adaptation Vs. Mitigation

Climate change adaptation is quite distinct from climate change mitigation:

- Mitigation is about making climate change less severe.
- Adaptation accepts that there will be some degree of climate change no matter how successful our combined mitigation efforts are - and looks to design communities and buildings that are resilient to it. This will be the focus of our workshop.

Please, familiarise yourself with the information listed below before the workshop scheduled for April 2024.

- Annex 1: Climate Projections
- Annex 2: Climate Hazard pre-screening checklist
- Annex 3: Climate Risk Assessment and Adaptation Register
- Annex 4: Consequence Scale for Risk Assessment
- Annex 5: Likelihood Scale for Risk Assessment

Assumptions

The climate assessment conducted for this project follows basic assumptions in line with Green Star Buildings v1.1 guidelines, as follows:

1. The two 'time scales' referenced throughout the risk assessment and adaptation planning process are 2050 (~25 years post-practical completion) and 2090 (65 years from occupation, noting the expected building life before major refurbishments is ~50-years).
2. The United Nations Intergovernmental Panel on Climate Change (IPCC) Representative Concentration Pathways (RCP) correspond to different greenhouse gas (GHG) concentration trajectories with each level based on different assumptions. The chosen pathway for this climate assessment is **RCP8.5**, which is representative of a high-emissions scenario if emissions continue to rise throughout the 21st century.

Data

Climate change projection and baseline data have been sourced from:

- Climate Change in Australia (CCIA) (a joint Bureau of Meteorology and CSIRO initiative)
- NSW / ACT Regional Climate Modelling (NARCliM) projections
- Intergovernmental Panel on Climate Change (IPCC) Sixth Assessment Report Chapter 11: Australasia
- Bureau of Meteorology Holsworthy Aerodrome weather station, which is closest to the site. Full references will be included in the final report.

We look forward to discussing this during the Climate Adaptation Workshop. If you have any questions or would like further information before the session, please do not hesitate to contact us.

NDY, A Tetra Tech Company

Richard Burton | Engineer | Sustainability
r.burton@ndy.com

ANNEX 1: CLIMATE PROJECTIONS – HOLSWORTHY AERODROME AWS (STATION NO. 066161), METRO SOUTH CLUSTER, IPCC

Climate Variable		Baseline	2050 @ RCP8.5	2090 @ RCP8.5	Commentary
Average Maximum Temperature (°C)	Summer	28.5° C	29.8° C (+1.3° C)	33.0° C (+4.5° C)	There is very high confidence in continued **substantial increases** in projected **mean, maximum and minimum temperatures**. By late in the century (2090), for a high emission scenario (RCP8.5) the projected range of warming is 5.0 °C above the climate of 2008 - 2023.
	Autumn	23.8° C	25.1° C (+1.3° C)	28.4° C (+4.6° C)	
	Winter	18.2° C	19.4° C (+1.2° C)	23.1° C (+4.9° C)	
	Spring	24.3° C	25.8° C (+1.5° C)	29.6° C (+5.3° C)	
Maximum Recorded Temperature (°C)		45.9° C	47.3° C (+1.4° C)	50.8° C (+4.9° C)	More hot days and warm spells are projected with very high confidence. Extreme temperatures are projected to increase at a similar rate to mean temperature, with a **substantial increase in the temperature reached on hot days, the frequency of hot days, and the duration of warm spells** (very high confidence).
Number of Hot Days	over 35ºC	12.8 days	5 days (-7.8 Days)	15 days (+2.2 Days)	
	over 40ºC	2.4 days	0.8 days (-1.6 Days)	3.3 days (+0.9 Days)	
Average Monthly Rainfall (mm)	Summer	85.1 mm	86.8 mm (+2%)	94.4 mm (+11%)	A continuation of the trend of prolonged periods of extensive drying since the early 20th Century. **Decreases in winter and spring rainfall** is projected with high confidence. Summer and autumn rainfall is expected to increase to varying degrees, projected with less confidence due to natural climate variability, and this will remain the major driver of rainfall changes.
	Autumn	86.7 mm	84.1 mm (-3%)	84.9 mm (-2%)	
	Winter	69.5 mm	63.9 mm (-8%)	57.7 mm (-17%)	
	Spring	52.2 mm	50.7 mm (-3%)	48.1 mm (-8%)	
Highest Daily Rainfall (mm)		172.0 mm	185.8 mm (+8%)	215.0 mm (+25%)	There is a high confidence that the intensity of heavy rainfall events will **increase** over the course of the century, this is because in a warming climate, rainfall extremes are expected to increase in magnitude mainly due to a warmer atmosphere being able to hold more moisture (Sherwood et al., 2010).
Time in Drought		38%	50%	60%	**Time spent in drought is projected to increase** (medium confidence) over the course of the century.
Fire Weather (Severe Fire Danger Days)		0.9 days	1.305 days (+45%)	2.07 days (+130%)	There is high confidence that climate change will result in a **harsher fire-weather climate** in the future. However, there is low confidence in the magnitude of the change, as this is strongly dependent on rainfall projections and other fire 'switches.
Sea Level Rise		-	13 cm above baseline	64 cm above baseline	Global mean sea level will continue to rise, and height of extreme sea-level events will also increase across Australia (very high confidence). However, it is not considered an issue in Canberra due to its proximity to the ocean.
Yearly Average Daily Solar Radiation (MJ/m^2)		16.2 MJ/m2	16.6 MJ/m2 (+2.7%)	16.7 MJ/m2 (+3.4%)	Solar radiation is projected to **increase** (high confidence) over the course of the century.
Yearly Average 3 pm Relative Humidity (%)		52.0 % RH	52.5 % RH (+0.9%)	52.7 % RH (+1.3%)	A tendency for a **decline** in relative humidity is projected for winter and spring, although changes in the near term will be small (high confidence).
Yearly Average 3 pm Wind Speed (km/h)		18.0 km/h	18.4 km/h (+2.4%)	18.8 km/h (+4.2%)	There is medium confidence in **little change** to wind speeds.

ANNEX 2: CLIMATE HAZARD PRE-SCREENING CHECKLIST

CHECK LIST	CRITERIA RESPONSE [YES/NO]	HAS DATA REGARDING FUTURE CLIMATE EXPOSURE BEEN REVIEWED? [YES/NO]	HAS A RISK TO THE PROJECT BEEN IDENTIFIED? [YES/NO]	HAS A RISK TREATMENT BEEN IDENTIFIED? [YES/NO] IF YES, DESIGN OR OPERATIONAL MEASURE?
Has the project area been previously impacted by extreme climate events? (e.g., storms/tropical cyclones, extreme rainfall, and flooding, damaging winds, damaging hail, bushfires, heatwaves, drought, coastal inundation) Please indicate which events.	No	Yes	Yes Further risks will potentially be identified during consultation	This will be discussed in the Climate Adaptation Workshop. A combination of design and operational design measures will likely be identified – refer to the climate risk and adaptation assessment for preliminary/suggested measures.
Is the project located in a cyclone zone?	No	Yes	No	
Is the project located in or adjacent to a bushfire-prone area?	No	Yes	No	
Is the project located in or adjacent to a flood-prone area?	Yes	Yes	No	
Is the project located at or adjacent to the coastline or tidally influenced waterway?	No	Yes	No	
Will the project accommodate occupants vulnerable to the impacts of climate extremes? (e.g., children, elderly, low mobility, seeking medical treatment) Please indicate potential groups of vulnerable occupants and which events they are likely to be exposed to.	Yes	Yes	No	

ANNEX 3: CLIMATE RISK ASSESSMENT AND ADAPTATION REGISTER

ITEM	ASPECT	DESCRIPTION OF HAZARD	CONSEQUENCE	2050 LIKELIHOOD	2050 RISK	2090 LIKELIHOOD	2090 RISK
01	Average Temperature	Accelerated material deterioration (colour fading or failure) due to higher temperatures.	Insignificant	Possible (Once in 25 years)	Low	Possible (Once in 25 years)	Low
02	Average Temperature	Cracking/failure of seals due to higher temperatures	Minor	Possible (Once in 25 years)	Medium	Likely (Once per year)	Medium
03	Average Temperature	Increase in electricity consumption due to higher temperatures	Minor	Likely (Once per year)	Medium	Likely (Once per year)	Medium
04	Extreme Temperature	HVAC not maintaining internal conditions during heat waves.	Moderate	Possible (Once in 25 years)	Medium	Likely (Once per year)	High
05	Extreme Temperature	Changes in occupant travel behaviour during heat waves (increased demand for carparking).	Insignificant	Unlikely (Once in 50 years)	Low	Unlikely (Once in 50 years)	Low
06	Droughts	Sediment/debris may build up in surrounding drainage infrastructure due to less frequent washout in drought. Build up of internal pressure.	Moderate	Possible (Once in 25 years)	Medium	Possible (Once in 25 years)	Medium
07	Droughts	Structural cracking due to soil moisture changes	Major	Unlikely (Once in 50 years)	Medium	Unlikely (Once in 50 years)	Medium
08	Droughts	Risk of dehydration (and heat stroke in very extreme conditions) to occupants during increasingly hot days, particularly to vulnerable populations.	Major	Possible (Once in 25 years)	Medium	Possible (Once in 25 years)	Medium
09	Droughts	Soft landscape damage due to high temperatures or drought, planting dieback creating an unattractive external environment.	Minor	Possible (Once in 25 years)	Medium	Likely (Once per year)	Medium
10	Extreme Rainfall	Stormwater system blockages as a result of higher flows	Major	Possible (Once in 25 years)	Medium	Possible (Once in 25 years)	Medium
11	Extreme Rainfall	Water entering ground floor due to overland flow / localised flooding - may affect access to the building for occupants and emergency services.	Major	Possible (Once in 25 years)	Medium	Possible (Once in 25 years)	Medium
12	Extreme Rainfall	Prolonged periods of no rainfall	Insignificant	Possible (Once in 25 years)	Low	Possible (Once in 25 years)	Low
13	Sea Level Rise	Surrounding sewer / stormwater infrastructure impacted by storm surge.	Moderate	Rare (Once per lifetime)	Low	Rare (Once per lifetime)	Low
14	Extreme Rainfall Extreme Wind Extreme Temperature	Extended blackouts due to transmission infrastructure failure or capacity being exceeded.	Major	Possible (Once in 25 years)	Medium	Possible (Once in 25 years)	Medium
15	Hail / Snow / Lightning	Blocked downpipes/guttering as a result of hail	Moderate	Possible (Once in 25 years)	Medium	Possible (Once in 25 years)	Medium
16	Hail / Snow / Lightning	Façade / solar PV / mechanical kit damage by hail / lightning / wind	Moderate	Possible (Once in 25 years)	Medium	Possible (Once in 25 years)	Medium
	Extreme Wind		Moderate	Possible (Once in 25 years)	Medium	Possible (Once in 25 years)	Medium
			Moderate	Unlikely (Once in 50 years)	Low	Unlikely (Once in 50 years)	Low
17	Hail / Snow / Lightning	Soft landscaping damage due to scouring or hail.	Insignificant	Possible (Once in 25 years)	Low	Possible (Once in 25 years)	Low

18	Bushfire	Increase in PM (particulate matter), CO2, bushfire smoke in the air and HVAC system.	Moderate	Unlikely (Once in 50 years)	Low	Unlikely (Once in 50 years)	Low
19	Dust Storms	Airborne dust soiling ventilation filters more quickly, dirtying solar panels more quickly, dirtying facade more quickly.	Minor	Rare (Once per lifetime)	Low	Rare (Once per lifetime)	Low
20	Extreme Wind	Extreme winds could cause some trees to fall onto the facility or people.	Major	Possible (Once in 25 years)	Medium	Likely (Once per year)	High

ANNEX 4: CONSEQUENCE SCALE FOR RISK ASSESSMENT

SCALE OF RISK	SERVICE QUALITY	COMPLIANCE	INFRASTRUCTURE	FINANCIAL	SOCIAL
Insignificant	Minor deficiencies in principle that would pass without comment	Concerns about compliance would be resolved without special attention	No infrastructure damage, little change to infrastructure service	Little financial loss or increase in operating expenses	No adverse human health effects.
Minor	Services would be regarded as satisfactory, but personnel would be aware of deficiencies	Minor perceived or actual breaches of compliance would be resolved	Localised infrastructure service disruption, no permanent damage. Some minor restoration work required. Early renewal of infrastructure by 10-20%. Need for new/modified equipment	Additional operational costs. Financial loss is small <10%.	Short-term disruption to employees, customers or neighbours.
Moderate	Services would be regarded as barely satisfactory by the general public and the organisation's personnel	Formal action would be required to answer perceived breaches or charges of compliance failure	Limited infrastructure damage and loss of service. Damage recoverable by maintenance and minor repair. Early renewal of infrastructure by 20-50%	Moderate financial loss 10-50%	Frequent disruptions to employees, customers or neighbours.
Major	The general public would regard the organisation's services as unsatisfactory	Significant amounts of management and advisers' effort would be required to answer charges of compliance failures	Extensive infrastructure damage requiring major repair. Major loss of infrastructure service. Early renewal of infrastructure by 50-90%	Major financial loss 50-90%	Severe disruptions to employees, customers or neighbours.
Catastrophic	Services would fall well below acceptable standards and this would be clear to all	Obvious and proven breaches of legal and regulatory requirements with the prospect of corporate or individual penalties	Significant permanent damage and/or complete loss of the infrastructure and infrastructure service. Loss of infrastructure support and translocation of service to other sites. Early renewal of infrastructure by >90%	Extreme financial loss >90%	Total disruption to employees, customers, or neighbours.

ANNEX 5: LIKELIHOOD SCALE FOR RISK ASSESSMENT

RATING	DESCRIPTOR	RECURRENT OR EVENT RISKS	LONG TERM RISKS
Almost Certain	Could occur several times per year	Has happened several times in the past year and in each of the previous 5 years *or* Could occur several times per year	Has a greater than 90% chance of occurring in the identified time period if the risk is not mitigated
Likely	May arise about once per year	Has happened at least once in the past year and in each of the previous 5 years *or* May arise about once per year	Has a 60-90% chance of occurring in the identified time period if the risk is not mitigated
Possible	Maybe a couple of times in a generation	Has happened during the past 5 years but not in every year *or* May arise once in 25 years	Has a 40-60% chance of occurring in the identified time period if the risk is not mitigated
Unlikely	Maybe once in a generation	May have occurred once in the last 5 years *or* May arise once in 25 to 50 years	Has a 10-30% chance of occurring in the future if the risk is not mitigated
Rare	Maybe once in a lifetime	Has not occurred in the past 5 years *or* Unlikely during the next 50 years	May occur in exceptional circumstances, i.e. less than 10% chance of occurring in the identified time period if the risk is not mitigated

APPENDIX C. WORKSHOP PRESENTATION SLIDES

Refer over.

Norman Disney & Young
A TETRA TECH COMPANY

08 November 2024

SYDNEY METRO SOUTH CLUSTER (KOGARAH, DALMENY, GREENWAY PARK AND KINGSWOOD)

AGENDA

Introduction (5-10 min)

- Purpose and Importance
- Climate change projections

Climate Change Impacts on the project (10-15 min)

- Assumptions and projections
- Green Star methodology

Adaptation measures (30-40 min)

- Discussion

Wrap-up/Next steps (5 min)

DEFINITIONS

Weather - Atmospheric conditions at a specific place and time.

Climate - Weather conditions at a specific place over a long period.

Mitigation - Reducing our contribution towards climate change.

Adaptation - Accepts that there will be some degree of climate change no matter how successful our combined mitigation efforts are - and looks to design buildings that are resilient to it. **This will be the focus of our workshop.**

NDY
A TETRA TECH COMPANY

PURPOSE

PURPOSE

Understand the future impacts on the project.

Identify solutions to mitigate these impacts for a more resilient project.

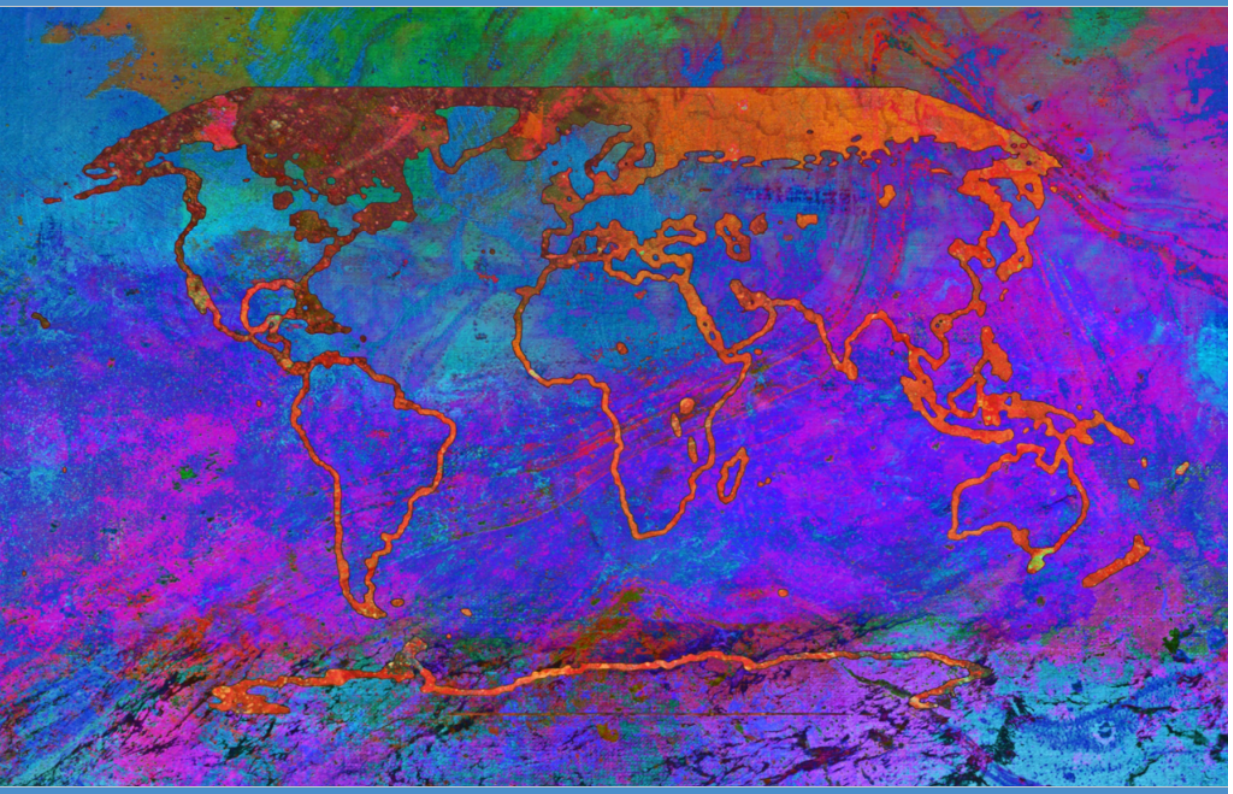
NDY
A TETRA TECH COMPANY

IMPORTANCE

ipcc
INTERGOVERNMENTAL PANEL ON climate change

Climate Change 2021

The Physical Science Basis



WGI

Working Group I contribution to the
Sixth Assessment Report of the
Intergovernmental Panel on Climate Change

WMO UNEP

NDY
A TETRA TECH COMPANY

CLIMATE CHANGE WIDESPREAD, RAPID AND INTENSIFYING

- IPCC

REPORT FINDINGS

Target is to limit change in global temperature to **1.5 °C above preindustrial levels.**

Beyond this and there will be irreversible damage.

Global temperature **already risen by 1.1 °C** with only 0.1 °C caused by natural forces.

1.5 °C will probably be reached and exceeded within the next two decades.

Immediate, rapid and large-scale action required to reduce greenhouse gas emissions to limit rise to 1.5 °C

ASSUMPTIONS

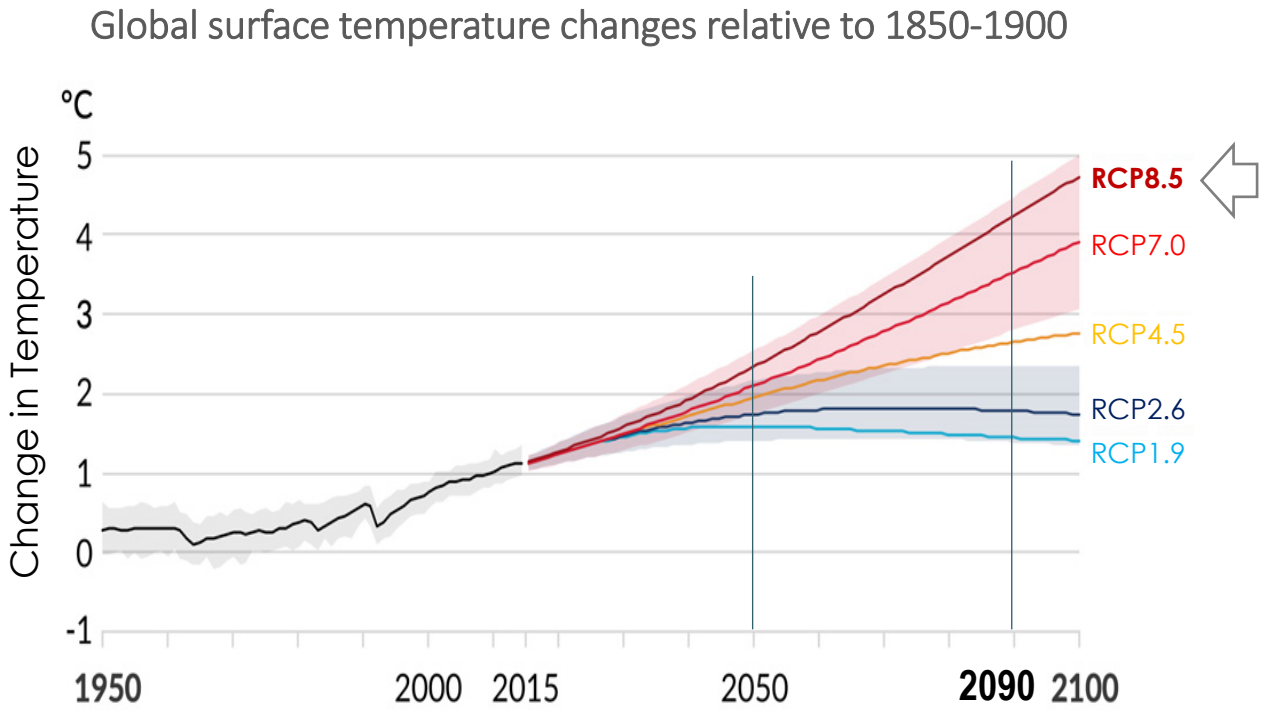
Time scales:

2050 +25 years from Practical Completion

2090 +65 years

RCP8.5

High-emissions scenario, and the most likely scenario as agreed throughout the industry.

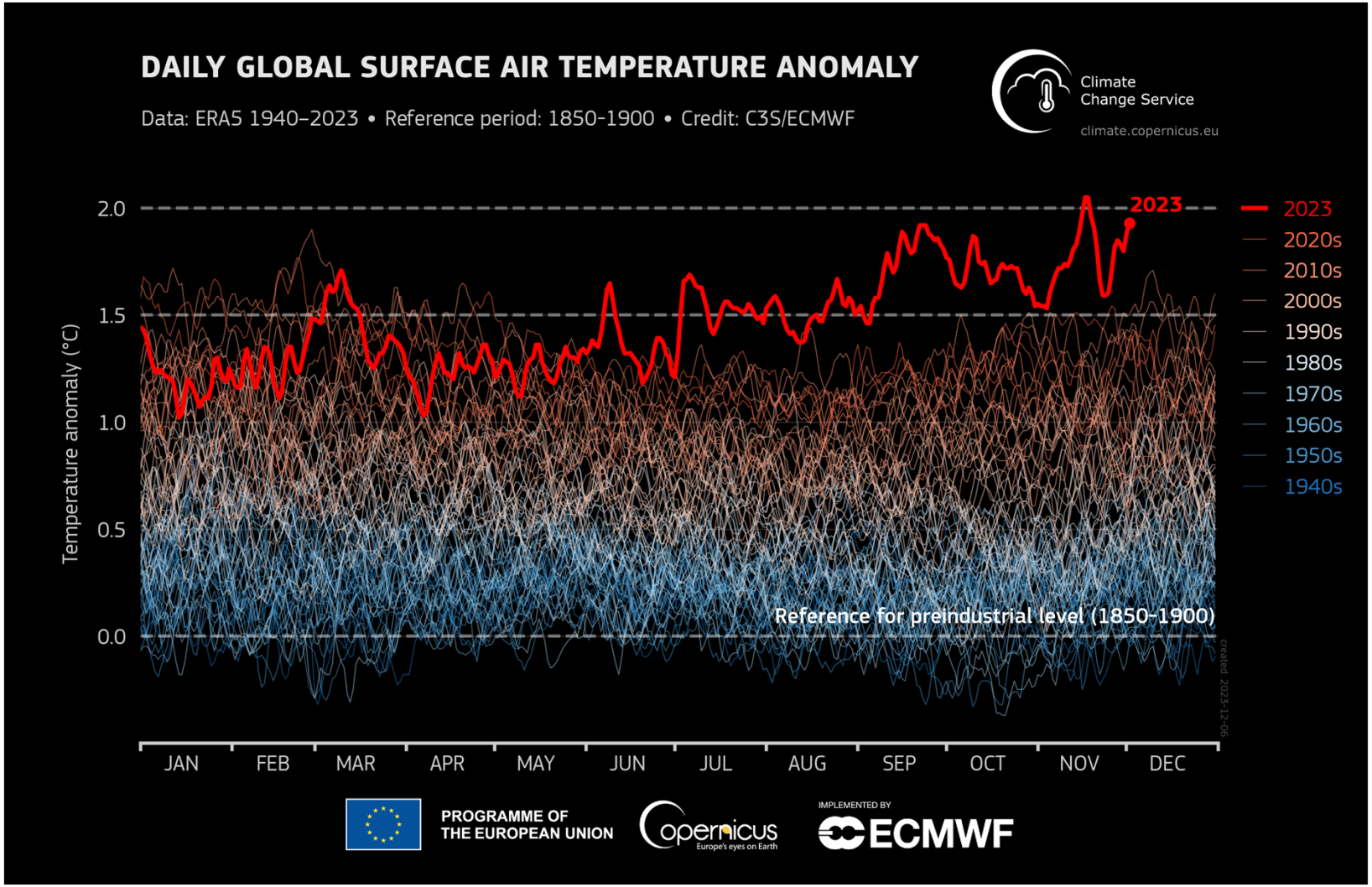


Representative Concentration Pathways (RCP)

by the United Nations Intergovernmental Panel on Climate Change (IPCC) are scenarios for different greenhouse gas (GHG) concentration.

GLOBAL - 2023 IN REVIEW

HOTTEST YEAR ON RECORD



AUSTRALIA- 2023 IN REVIEW

2023 WAS AUSTRALIA'S **EIGHTH-HOTTEST** YEAR ON RECORD (BOM, 2024)

Western Australia hitting highs of 49.5°

Central WA, southern QLD and northern NSW temperatures on average between +1.5°C to +2.5°C warmer than normal

Rainfall was slightly above average

2011 – 2020 Warmest decade on record

DUST STORM

September 2009
Eastern Australia

HEATWAVE

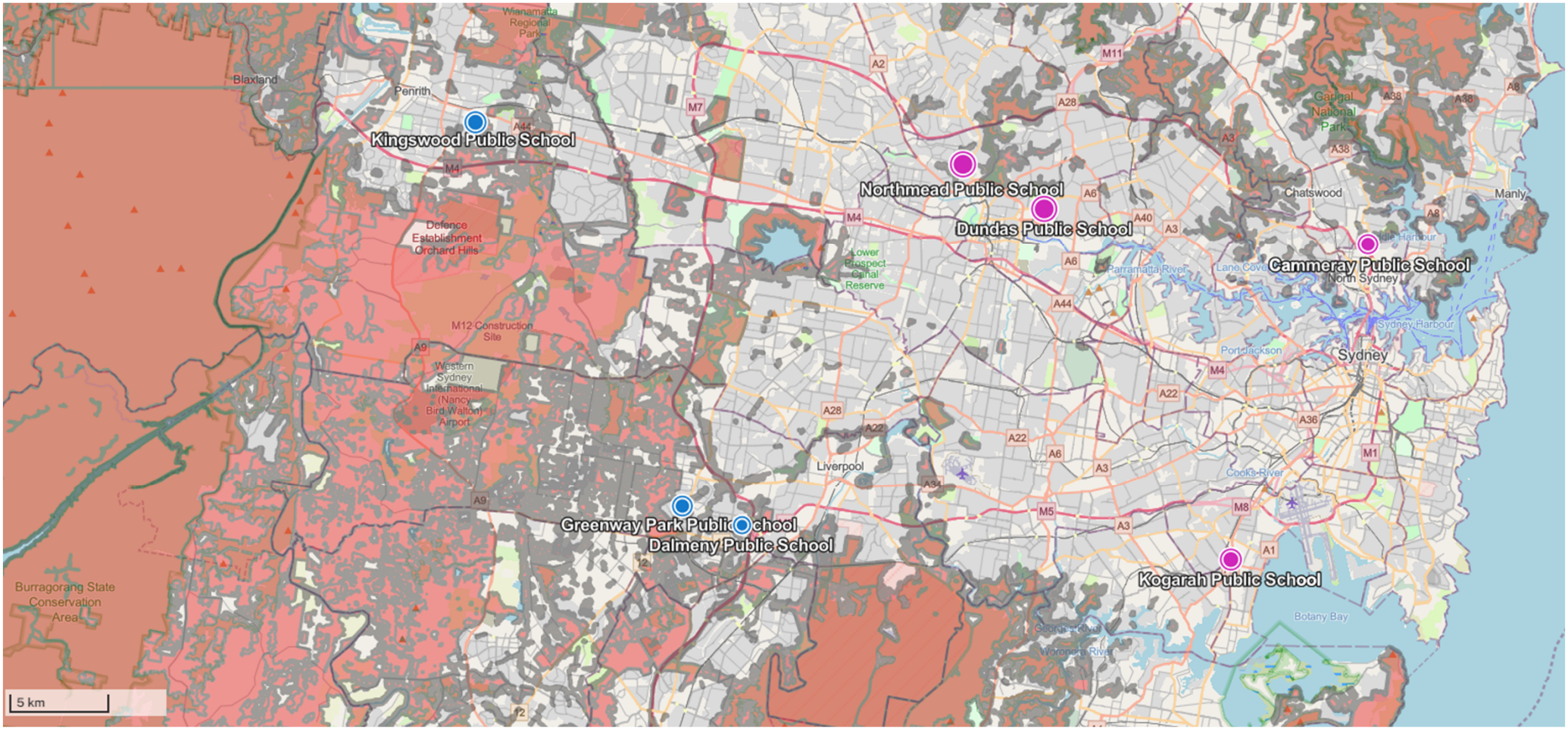
2012-2013

Australia

BUSHFIRE

2019-2020

Australia



BUSH FIRE PRONE AREA

Sydney

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Bushfire in Northmead Reported in November 2020, (Nine News, 2020)

BUSH FIRE

January 2020
South Coast

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(Georges River Council, 2024)

Rainfall	110 mm (20/03/2021)
Damage Claims	11,000
Damage	Estimated at $1 billion

Multiple Recent Flood Events (2020 & 2021)

SEVERE WEATHER AND FLOODING

February 2020
Sydney

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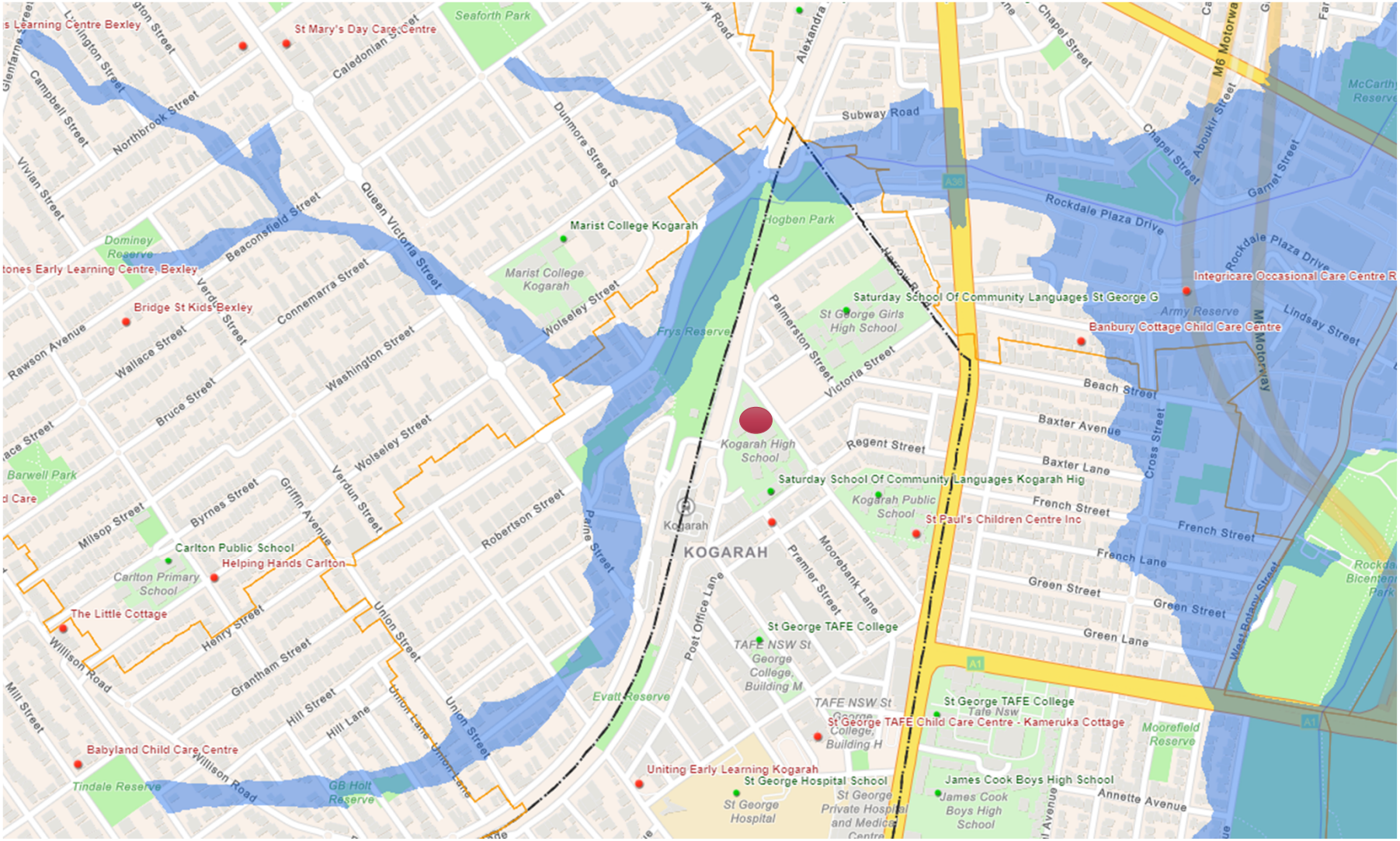
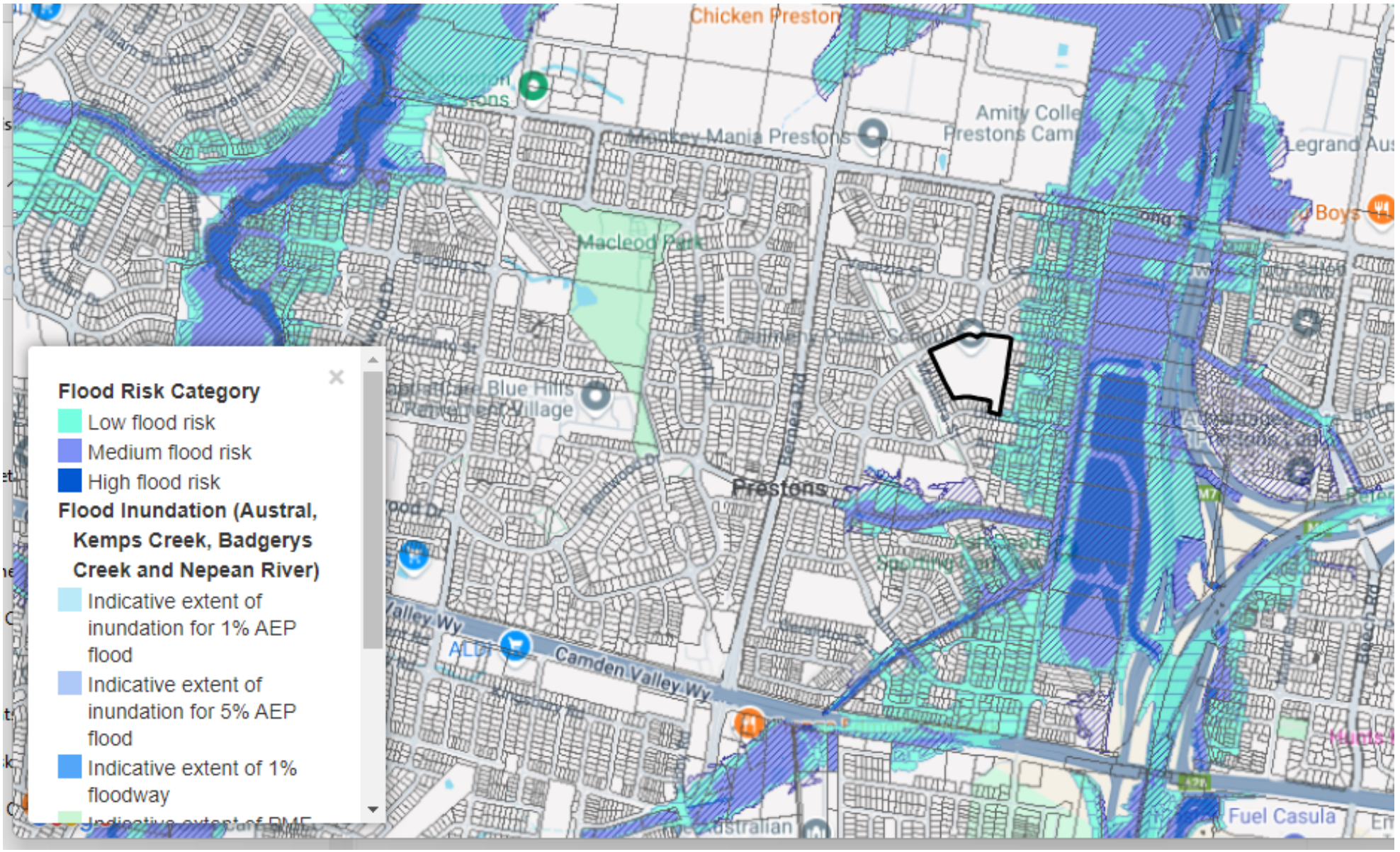


FLOODING

Kogarah Public School



FLOODING

Dalmeny Public School

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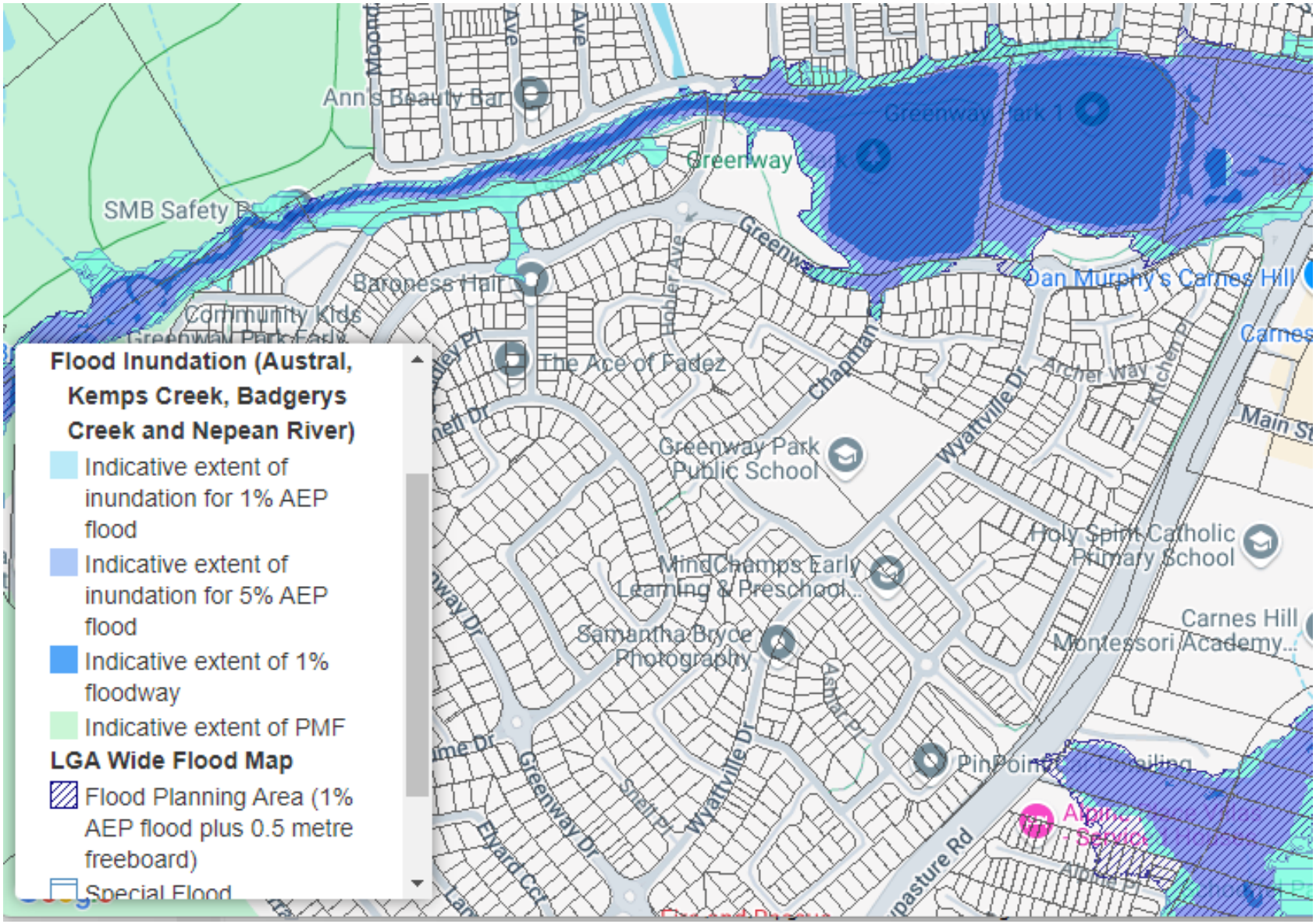

FLOODING

Greenway Park Public School

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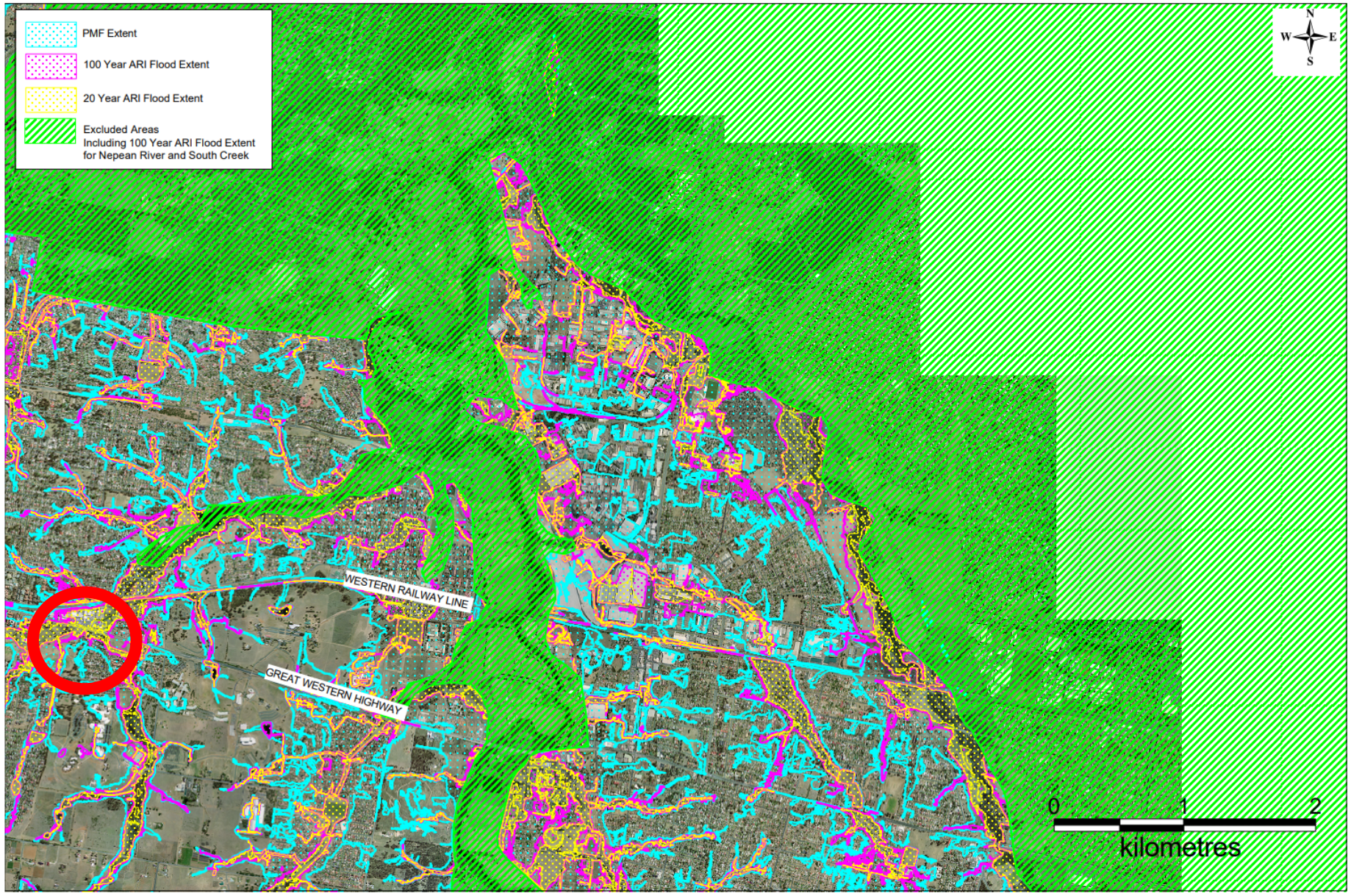

FLOODING

Kingswood Public School

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CLIMATE PROJECTIONS – SYDNEY METRO SOUTH
(2050 AND 2090)

Temperature - A continued increase in seasonal mean temperature
+2.5 °C by 2050 and +5.0 °C by 2090

Temperature - Increase in hot days >40 °C

	Today	2050	2090
Over 35 °C	5.5	5	15
Over 40 °C	0.9	0.8	3.3
Time in Drought	38%	50%	60%

Solar Radiation, Wind, humidity – Similar to today

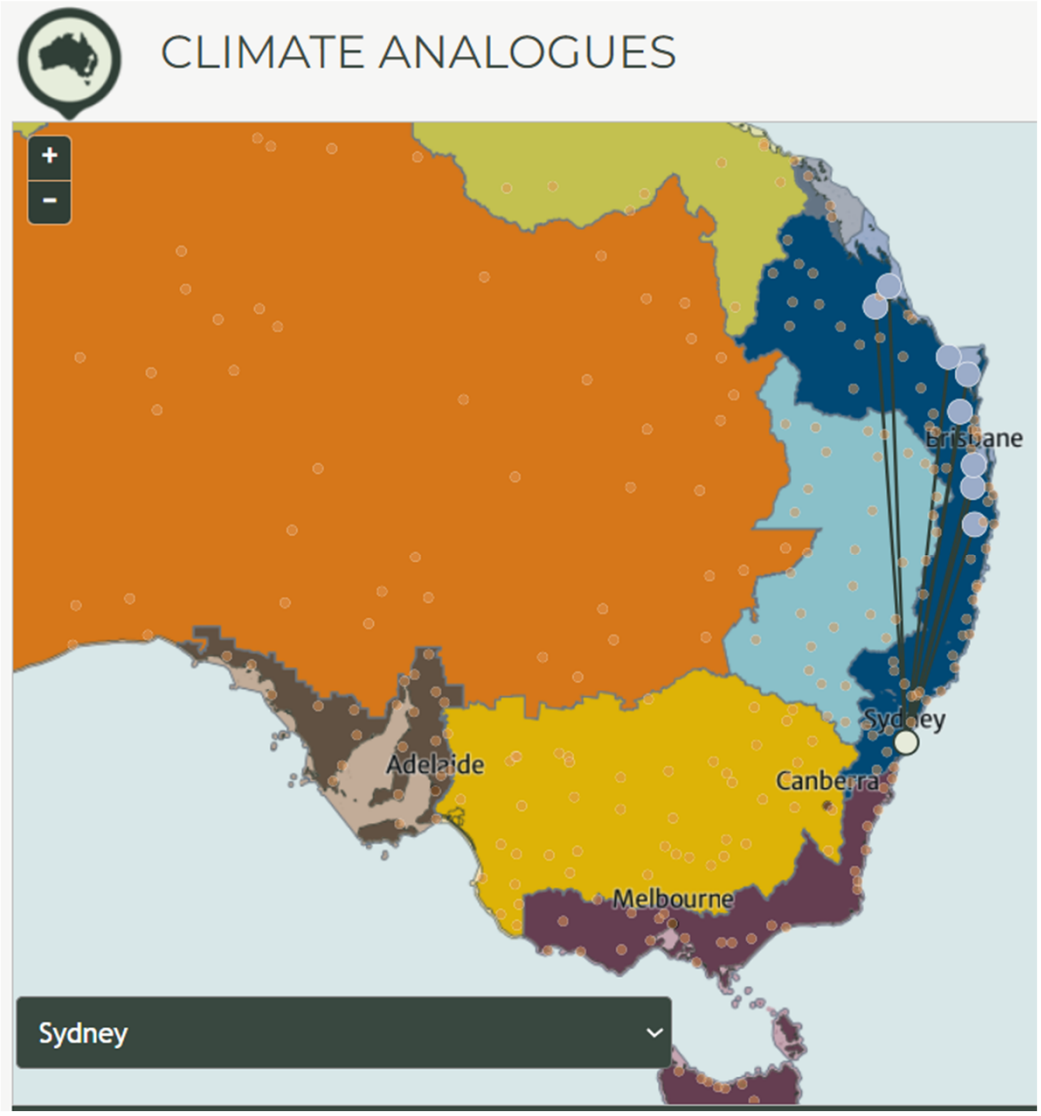
CLIMATE PROJECTIONS – SYDNEY METRO SOUTH
(2050 AND 2090)

Rain – Wetter summers and drier winters expected

Extreme Rainfall - Increase in intensity of extreme rainfall events

Severe Fire Days – Increase from 1.1 to 2.31 by 2090

WHAT DOES THIS ALL MEAN?



The climate in Sydney 2090 will resemble the current day climate in:

Bundaberg

Beaudesert

Brisbane

Yeppoon

Mount Morgan

Casino

Hervey Bay

Gympie

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https://www.climatechangeinaustralia.gov.au/en/projections-tools/climate-analogues/analogues-explorer/

WHAT DOES THIS ALL MEAN?

Heavy rain - Capacity of stormwater systems may be exceeded, causing flooding

Coastal - Coastal erosion and inundation

Drought - More frequent droughts are likely to lead to water shortages, increased demand for irrigation and increased risk of wild fires.

Agriculture - Warmer temperatures and a longer growing season could provide opportunities to grow new crops. Prolonged drought and greater frequency and intensity of storms may counteract these benefits.

Biosecurity - Warmer, wetter conditions could increase the risk of invasive pests and weeds.

Disease - There may be an increase in the occurrence of summer water-borne and food-borne diseases, such as Salmonella.

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Ministry for Environment, 2016

NDY
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GREEN STAR AND EFSG

GREEN STAR BUILDINGS CREDIT 16

Climate Change Resilience

Resilient

Credit: 16

Points: 1

Outcome

The building has been built to respond to the direct and indirect impacts of climate change.

Criteria

Minimum Expectation	**Nil**	• The project team completes the climate change pre-screening checklist. The project team communicates the building's exposure to climate change risks to the applicant.
Credit Achievement	**1 Point**	In addition to the *Minimum Expectation*: • The project team develops a project-specific climate change risk and adaptation assessment for the building. • Extreme and high risks are addressed.

EFSG CLIMATE CHANGE ADAPTATION

Sites and school communities must be able to withstand natural and urban hazards and adaptively respond to climate change over time, especially for projects involving vulnerable communities.

Climate events for consideration include: exacerbated flood, storm surge, inundation, heatwaves, bushfires, extreme storms and other weather events.

Where significant risks are identified in the initial assessment, a comprehensive climate change risk assessment must be undertaken. Any high or extreme risks must be addressed through design measures.

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IMPACTS

EXTREME TEMPERATURE

Impact Item

- HVAC systems not maintaining internal conditions. Increase in electricity consumption due to higher temperatures.
- Heat island effect affecting mech equipment
- Mechanical equipment not performing.
- Uncomfortable internal conditions are created during higher-temperature weather events.

2040	2075
RISK	RISK
Medium	Medium

EXTREME TEMPERATURE

Impact Item

- Accelerated material deterioration (colour fading or failure) due to greater solar radiation and higher temperatures.
- Cracking or failure of seals due to greater solar radiation and higher temperatures.
- High touch point materials subject to high temperatures.
- Less occupant movement outside due to more extreme temperature and humidity, and associated reduction of occupant health and wellbeing.

2040 RISK	2075 RISK
Low	Medium

2040 RISK	2075 RISK
Medium	Medium

2040 RISK	2075 RISK
Low	Low

2040 RISK	2075 RISK
Medium	Medium

EXTREME TEMPERATURE

Impact Item

- Soft landscape damage due to high temperatures or drought, planting dieback creating an unattractive external environment.

2040	2075
RISK	RISK
Medium	Medium

DROUGHT

Impact Item

- Sediment / debris may build up in surrounding drainage infrastructure due to less frequent washouts in drought.

- Water needs of the site (both quantity and quality) not met due to reduced rainfall and prolonged periods of drought.

2040	2075
RISK	RISK
Medium	Medium

EXTREME TEMPERATURE/RAIN

Impact Item

- Risk of structural stability of building and foundation systems affected by water table height increases, causing changes to ground structure.

- Changes to soil conditions: Softening soils, shrinking, swelling of soils from changes in moisture condition.

2040	2075
RISK	RISK
Medium	Medium

EXTREME RAIN

Impact Item

- Water entering the building due to overland flow/localised flooding. Stormwater system sizing.

- Water entering ground floor critical infrastructure rooms (e.g. transformer room, comms, pump room etc.).

2040 RISK	2075 RISK
Medium	Medium

EXTREME EVENTS

Impact Item

- Extended blackouts due to transmission infrastructure failure or capacity being exceeded. Resulting in impacts to students and visitors, such as disruption of regular operations and services.

2040	2075
RISK	RISK
Medium	Medium

EXTREME RAIN

Impact Item

- Roofing/roof-mounted equipment damaged by lightning.
- Facade damage by lightning.
- Risk of injury to occupants during extreme rainfall events, cyclones and atmospheric river events particularly to vulnerable populations.

2040 RISK	2075 RISK
Low	Low

2040 RISK	2075 RISK
Medium	Medium

HAIL

Impact Item

- Roofing/roof-mounted equipment damaged by hail.

2040	2075
RISK	RISK
Low	Low

WIND

Impact Item

- Wind driven rain on wall claddings particularly at junctions. Consideration to different types of cladding profiles, orientation of laps away from the prevailing wind direction, taping of joints etc

- Damage to the facade and roofing materials during storm weather events and the potential for materials to become detached due to strong winds. Pressure impacts on the building.

2040	2075
RISK	RISK
Low	Low

WIND

Impact Item

- Extreme winds could cause some trees to fall onto facility or people.

2040	2075
RISK	RISK
High	High

BUSHFIRE

Impact Item

- Increase in PM (particulate matter), CO2, bushfire smoke in the air entering the building.
- Smoke / dust impacting air quality indoors.
- Disruptions to services (e.g. power and transport) due to nearby fires.

2040	2075
RISK	RISK
Medium	Medium

EXTREME RAIN

Impact Item

- Gutters and downpipes are unable to handle rainfall during extreme rainfall events, cyclones and atmospheric river events
- Debris blocking gutters and downpipes.

Consequence	2040 @ RCP8.5		2075 @ RCP8.5	
	Likelihood	Risk	Likelihood	Risk
Moderate	Possible (Once in 25 years)	Medium	Possible (Once in 25 years)	Medium

Descriptor
Insignificant
Minor
Moderate
Major
Catastrophic

WRAP UP / NEXT STEPS

NDY will circulate the Risk/Response matrix by early Tuesday

- Incorporating today's feedback
- For stakeholders to populate with any further input/comments
- Return to NDY within 1 week

NDY will turn this into the SINSW Climate Adaptation and Resilience Plan

- We will circulate the full report for review and comments prior to end-of-year

The project must implement key responses

- Track the incorporation of design and operational responses agreed within the plan, to ensure they are delivered

APPENDIX D. RISK REGISTER

Refer over.

Climate Change Adaptation Risk Register

Project: Dalmeny Public School Upgrade
Project No: 0120.0041151.0001

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Item	Hazard	Description of Impact	Environment	Social/Cultural	Financial	Discipline	Existing Controls Identified During Workshop	Consequence	BAU 2040 @ RCP8.5		BAU 2075 @ RCP8.5		Potential New Controls (Adaptation Measures)	Consequence	Residual 2040		Residual 2075	
									Likelihood	Risk	Likelihood	Risk			Likelihood	Risk	Likelihood	Risk
01	Extreme Temperature	HVAC systems not maintaining internal conditions. Increase in electricity consumption due to higher temperatures combined with humidity. Mechanical equipment not performing.	More electricity use resulting in increased greenhouse gas emissions. Moderate	Uncomfortable occupants. Moderate	Increase cost to the school (more electricity purchased). Moderate	Mechanical	The new learning block is to be served by an air cooled VRF air conditioning system. The system is designed for current climate conditions in Camel load calculation software, weather data obtained for Sydney Airport, NSW (closest weather station). Thus, the calculations for East Coast has already accounted above ASHRAE requirement by 1.8 °C DB in summer. Noting that the school has school holidays during peak summer and at other times finishes mid afternoon meaning the mechanical system wont be subjected to operating for the entire summer period and afternoon to evening. The system is 100% electric, so it is unlikely to be replaced in the near future if the client aims to significantly reduce carbon emissions, compared to, say, a project going from a gas system to an electric one. Therefore, it is likely the replacement would only occur if the system does not meet performance requirements. Expected life span of the mechanical AC systems is approximately 15 years. Individual condensers may be isolated, decommissioned and replaced as required. We expect some technology advances to be made near the end of life cycles, which may allow higher capacity plant to be integrated into the same plant spaces. Condenser plant is situated on an open roof plant with louvre enclosure, adequate space has been provisioned to allow for individual plant replacement.	Moderate	Likely (Once per year)	High	Likely (Once per year)	High	A 5% safety factor to the sizing of the outdoor units is also applied to account for increase in temperature. Outdoor condenser units are to be selected for a higher ambient temperature of 40 C°DB. There are manually operable louvres which will provide natural ventilation in classrooms. However the system is designed to cope mechanically. Thermal fabric performance exceeding NCC 2022 outlined in Risk 2.	Moderate	Possible (Once in 25 years)	Medium	Possible (Once in 25 years)	Medium
02	Extreme Temperature	Uncomfortable internal conditions created during higher temperature weather events.	More electricity use resulting in increased greenhouse gas emissions. Moderate	Uncomfortable occupants. Moderate	Increase cost to the school (more electricity purchased). Moderate	Architecture, Mechanical	Building to NCC 2022 requirements only.	Moderate	Likely (Once per year)	High	Likely (Once per year)	High	Fulton Trotter Architects - Building envelope consists thermally insulated walls with CFC, metal wall cladding or blockwork. - Building insulation is specified above NCC Section J Minimium requirements - External window sizes are minimised to meet natural lighting requirements. The large roof overhangs, verandah and sun hoods to the windows will provide significant shading to windows. - Building is designed with passive design principles, and HVAC systems are further provided to meet thermal comfort requirements up to 40 C°DB. In the event of even higher temperatures HVAC systems will still operate, but won't hit the internal design temperatures.	Moderate	Possible (Once in 25 years)	Medium	Possible (Once in 25 years)	Medium
05	Extreme Temperature	High touch point materials subject to high temperatures.	N/A	Occupants may experience discomfort when touching materials Minor	N/A	Landscape, Architectural, Operations	*Minor impact - No further action required.*	Minor	Possible (Once in 25 years)	Medium	Possible (Once in 25 years)	Medium		Minor	Possible (Once in 25 years)	Medium	Possible (Once in 25 years)	Medium
06	Heatwave	Risk of dehydration (and heat stroke in very extreme conditions) to occupants during increasingly hot days, particularly to vulnerable populations.	N/A	Occupants health affected. Risk of dehydration to occupants Moderate	N/A	Operations	All external walkways are covered, extensive shading provided to facades and trafficable areas. HVAC systems will cool interior spaces. Noted that bubblers are intended to be provided. Details to be provided during future design phases. School operational response during heatwaves involves keeping children indoors, and during extreme heatwaves shutting the school School holiday period runs from December/Jan, limiting the exposure risk	Moderate	Likely (Once per year)	High	Likely (Once per year)	High	Bubblers to be provided. Numbers to be confirmed. Bubblers location to be confirmed.	Moderate	Possible (Once in 25 years)	Medium	Possible (Once in 25 years)	Medium
07	Heatwave	Less occupant movement outside due to more extreme temperature and humidity, and associated reduction of occupant health and wellbeing. Students likely to stay inside during lunch breaks.	N/A	Occupants are forced to use alternate entrances. Occupants attracted to site for longer periods as a refuge from the heat. Minor	N/A	Architecture	Shade structure connects existing building M and existing covered walkway network to the proposed building. Roof overhang to verandah of proposed building. School holiday period runs from December/Jan, limiting the exposure risk School operational response during heatwaves involves keeping children indoors, and during extreme heatwaves shutting the school Proposed trees will provide some shading to northern facade when mature.	Minor	Likely (Once per year)	Medium	Likely (Once per year)	Medium		Minor	Possible (Once in 25 years)	Medium	Possible (Once in 25 years)	Medium
08	Droughts	Soft landscape damage due to high temperatures or drought, planting dieback creating an unattractive external environment.	Wastage of planting. Minor	Negatively aesthetically pleasing landscaping. Drop in occupant satisfaction. Minor	Cost to replace landscaping planting more frequently. Minor	Landscape, Hydraulics	Predominantly native and drought tolerant species have been selected, appropriate for the local climatic conditions. Planting plans avoid extensive planting of single species in a contained area, to avoid failure of a particular plant resulting in areas of sparse planting. Operationally SINSW expects that grassed areas will brown during drought periods and accepts this is standard.	Minor	Possible (Once in 25 years)	Medium	Possible (Once in 25 years)	Medium		Minor	Possible (Once in 25 years)	Medium	Possible (Once in 25 years)	Medium
09	Droughts	Sediment / debris may build up in surrounding drainage infrastructure due to less frequent washouts in drought.	Overflow of water onto site. Minor	Occupants forced to use alternate entrances. Occupants unable to occupy the building. Minor	Cost to refurbish civil system. Moderate	Civil, operations	Meinhardt (civil) noted that this is not expected to be an issue at school site. No further actions required.	Minor	Unlikely (Once in 25-50 years)	Low	Unlikely (Once in 25-50 years)	Low		Minor	Unlikely (Once in 25-50 years)	Low	Unlikely (Once in 25-50 years)	Low
10	Droughts	Water needs of the site (both quantity and quality) not met due to reduced rainfall and prolonged periods of drought.	Water consumption during times of limited water availability. Minor	Restrictions in water use causing compromised operations. Minor	N/A	Hydraulics	No new rainwater storage proposed. All planter box landscape species are ultra-low water use species. Grassed areas are expected to brown during extended drought periods. SINSW notes that this is an acceptable outcome, and is standard practice across all schools. Scope of water end uses for school is minor; Bubblers, Toilets, Cleaners cupboard and refill tap. In the event of drought Shoalhaven Water does not restrict any of the water uses in this project. (restrictions apply to car washing, swimming pools and lawn/garden watering) High efficiency fittings and fixtures are selected as per the patternbook.	Minor	Possible (Once in 25 years)	Medium	Possible (Once in 25 years)	Medium		Minor	Possible (Once in 25 years)	Medium	Possible (Once in 25 years)	Medium
11	Bushfire	Increase in PM (particulate matter), CO2, bushfire smoke in the air entering the building.	N/A	Damage to property and systems due to smoke ingress. Results may included downtime of systems. Moderate	Servicing of damaged equipment related ingress of bushfire smoke. Minor	Mechanical	NDY Mech, 27.11.24 Outside air intakes are to be fitted with bushfire rated ember mesh in order to comply with the bushfire report.Units are expected to turn off during fire mode (smoke is detected by the smoke sensor) and thus bushfire smoke in the air entering the building is unlikely. Note that NCC 2022 SPEC 43 compliance (i.e., units to remain operational up to 4 hrs during bushfire) is not pursued for East Coast. Schools will not be open during bushfire and extreme smoke events. AC units are to be fitted with high efficiency F5 filters to reduce particulate matter and dust circulation.	Moderate	Possible (Once in 25 years)	Medium	Possible (Once in 25 years)	Medium		Moderate	Possible (Once in 25 years)	Medium	Possible (Once in 25 years)	Medium
13	Extreme Rainfall	Risk of injury to occupants during extreme rainfall events particularly to vulnerable populations.	N/A	Occupants injure themselves. Occupants are forced to use alternate entrances. Minor	N/A	Architectural	Fulton Trotter Architect - All floor surfaces to be slip resistant, compliant with AS1428.1 with minimum slip ratings to BCA Table D3D15, AS4586 and Australian Standards Handbooks HB 197 & HB 198 (wet pendulum method) to suit context/location.	Minor	Possible (Once in 25 years)	Medium	Possible (Once in 25 years)	Medium		Minor	Possible (Once in 25 years)	Medium	Possible (Once in 25 years)	Medium
14	Extreme Rainfall	Gutters and downpipes are unable to handle rainfall during extreme rainfall events Debris blocking gutters and downpipes.	Overflow of water onto the site. Moderate	Occupants are forced to use alternate entrances. Moderate.	Cost to fix any damages. Moderate	Hydraulic, Architecture, Civil, Operations	Gutters are designed to relevant Australian Standards i.e. 1 in 20 year 5 minute event. with some inherent safety buffer as part of the standard. The gutter and downpipe sizing does not account for future climate. However impacts are mitigated through the following: - All gutters as per patternbook designed to be eaves gutter which allow water to simply overtop and spill. (as opposed to box gutters where water may enter the structure). - Significant eaves on all sides of the building ensure that significant clearance is provided away from the facade for any spilling water. - SINSW standard maintenance involves clearing gutters and downpipes of debris.	Moderate	Unlikely (Once in 25-50 years)	Low	Possible (Once in 25 years)	Medium	The roof design ensures that roof slopes away from the trafficable side of the building, so any overflowing water falls toward non-trafficed side of the building, and onto permeable ground.	Moderate	Unlikely (Once in 25-50 years)	Low	Unlikely (Once in 25-50 years)	Low
15	Extreme Rainfall	Water entering the building due to overland flow/localised flooding. Stormwater system sizing. Water entering ground floor critical infrastructure rooms (e.g. lift pits).	Refurbishment works to fix systems would result in demolition materials sent to landfill. Increase in greenhouse gas emissions due to construction work. Minor	Occupant access to spaces may be restricted during event and during replacement of building elements. Major	Cost to fix any damages. Moderate	Civil, Electrical, Mechanical	- All gutters as per patternbook designed to be eaves gutter - Risk of egress expected to be minimised due to overhang of gutters – collected by civil - Eaves allow for 1 in 20 yr. storm event, in line with current Australian standards and drain away from trafficable areas / critical infrastructure. - nominal floor level to ensure overland flood is are not an issue. - Lift pits noted as the most critical ground floor infrastructure.	Major	Possible (Once in 25 years)	Medium	Possible (Once in 25 years)	Medium	Water ingress into lift pits due to wind-driven rain and overland flows to be addressed in future design phases by architect and civil engineer.	Major	Rare (Once in 50 years)	Low	Rare (Once in 50 years)	Low
18	Extreme Weather Events	Extreme winds could cause some trees to fall onto facility or people.	Wastage of planting. Minor	Occupants injured. Major	Cost to replace landscaping planting more frequently. Moderate	Landscape, Operations	School has a limited number of trees only, inherently lowering the risk of tree damage.	Major	Unlikely (Once in 25-50 years)	Medium	Unlikely (Once in 25-50 years)	Medium	Locations of new trees have been carefully considered to reduce future risks associated with adverse weather events. It is expected that the proposed trees receive a reasonable amount of water to ensure they successfully establish. SI has a maintenance regime which involves an annual survey of all existing trees by a appropriately qualified arborist to assess any potential risks and mitigate them through appropriate maintenance measures e.g. pruning etc. These actions make damage to persons and property extremely unlikely.	Major	Rare (Once in 50 years)	Low	Rare (Once in 50 years)	Low
19	Extreme Weather Events	Extended blackouts due to transmission infrastructure failure or capacity being exceeded. Resulting in impacts to students and teachers, such as disruption of regular operations and services.	N/A	Uncomfortable Occupant. Occupant will feel dissatisfied in the space. Minor	N/A	Electrical, Comms, Operations	Addressed primarily in operational response. If blackouts occur there are no immediate risks to occupants. All regularly occupied spaces have good access to daylight (and are only occupied during daylight hours), spaces are also able to be naturally ventilated as per the mixed mode requirements of the mechanical system. During extended blackouts the schools would send students home / not-open. Generators not intended to power the school during blackout school will close during extended blackout events.	Minor	Possible (Once in 25 years)	Medium	Possible (Once in 25 years)	Medium		Minor	Possible (Once in 25 years)	Medium	Possible (Once in 25 years)	Medium

Climate Change Adaptation Risk Register

Project: Dalmeny Public School Upgrade
Project No: 0120.0041151.0001

Item	Hazard	Description of Impact	Environment	Social/Cultural	Financial	Discipline	Existing Controls Identified During Workshop	Consequence	BAU 2040 @ RCP8.5		BAU 2075 @ RCP8.5		Potential New Controls (Adaptation Measures)	Consequence	Residual 2040		Residual 2075	
									Likelihood	Risk	Likelihood	Risk			Likelihood	Risk	Likelihood	Risk
23	Lightning	Lightning strike to building during storm events.	Increase in greenhouse gas emissions due to construction work. Minor	Building services may not run as designed without replacement. Occupant access to spaces may be restricted during the replacement of building elements. Moderate	Cost to fix any damages such as façade discolouration. Moderate	Electrical	NDY Elec, 25.11.24: Surge protections devices are proposed at the Main switchboard and all new distribution boards to protect against lightning strikes. Based on lightning risk assessment as per AS1768 Lightning Protection, no further lightning protections are required. This will prevent permanent damage to building services in the event of lightningt strike.	Moderate	Rare (Once in 50 years)	Low	Unlikely (Once in 25-50 years)	Low	0	Moderate	Rare (Once in 50 years)	Low	Unlikely (Once in 25-50 years)	Low
24	Hail	Roofing/roof-mounted equipment damaged byhail. Facade damage by hail.	Refurbishment works to fix systems would result in demolition materials sent to landfill. Increase in greenhouse gas emissions due to construction work. Moderate	Building services may not run as designed without replacement. Occupant access to spaces may be restricted during the replacement of building elements. Temporary teaching spaces required during refurbishment. Moderate	Cost to fix any damages. Moderate	Architecture, Services	NDY Mech, 27.11.24 Hail damage is unlikely as hail occurrence in East Coast climate is minimal however hail guard will be specified for condensers.	Moderate	Unlikely (Once in 25-50 years)	Low	Unlikely (Once in 25-50 years)	Low		Moderate	Rare (Once in 50 years)	Low	Rare (Once in 50 years)	Low
25	Extreme Wind	Saltwater spray due to the site's proximity to the ocean and corrosion on services systems and materials.	N/A	N/A	Premature damage to building façade elements. Insignificant	Services, Architecture, Operations	Sites are located close to the coast, though not immediately adjacent to them (400m from sea). As such limited amounts of sea spray may hit the site during extreme winds. This amount is not enough to constitute a signficant risk	Insignificant	Possible (Once in 25 years)	Low	Possible (Once in 25 years)	Low		Insignificant	Possible (Once in 25 years)	Low	Possible (Once in 25 years)	Low
26	Sea Level Rise	Sea level rise flowing onto the site.	N/A	N/A	N/A	Civil	GIS data from Climate Change In Australia has been reviewed to determine that even in the most extreme climate change scenario, sea level rise will not directly impact the site. As such this risk is Not Applicable.	N/A					Not Applicable	0	0		0	

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