WOOD & GRIEVE ENGINEERS

Kent Road Public School Development

Herring Road, Marsfield NSW

Ecologically Sustainable Development Report

Revision 3

Prepared for:

Gardner Wetherill Associates

Prepared by:

Nicholas Johnson
Project No. 40704

\\WGE.FILES\PROJECTS\40704\PROJECT DOCUMENTATION\SUSTAINABILITY\GENERAL\SU-RE_001.DOCX

Date:
22 October 2018

Level 6, Building B, 207 Pacific Highway, St Leonards NSW 2065
T: (02) 8484 7000 **E:** sydney@wge.com.au **W:** www.wge.com.au

Revision

REVISION	DATE	COMMENT	APPROVED BY
1	11.09.2018	Draft Report	NCJ
2	13.09.2018	SSD Issue	NCJ
3	22.10.2018	Revised SSD Issue	NCJ

Contents

1. Executive Summary

This Ecological Sustainable Development Report has been prepared for Gardner Wetherill Associates for the proposed alterations & additions to the Kent Road Public School located at Herring Road, Marsfield NSW.

This report provides an overview of the proposed Ecologically Sustainable Development (ESD) principles and sustainability initiatives to be included within the project and is intended to form part of the Environmental Impact Statement (EIS) for the State Significant Development Application - SSD9344. This is a direct design response to the ESD Principles of the Secretary's Environmental Assessment Requirements (SEARs), and NSW Environmental Planning and Assessment Regulation 2000, as required by the NSW Environmental Planning and Assessment Act 1979 No 203.

This report includes:

- An overview of the sustainability drivers for the project (both regulatory & identified project drivers)
- Detail regarding specific ESD initiatives which will be implemented throughout all phases of the project.
- Demonstration of how the project includes sustainable building principles which reflect national best practice to improve overall environmental performance;
- Consideration of future climate change impacts; and
- Identification of how the development responds to the future predicted impacts of CSIRO projected impacts of climate change.

Information contained within this report has been prepared in direct response to the:

- Secretary's Environmental Assessment Requirements – ESD Principles;
- NSW Environmental Planning and Assessment Act 1979;
- NSW Environmental Planning and Assessment Regulation 2000;
- State Environmental Planning Policy – Education Establishments & Chile Care Facilities – 2017;
- Ryde Development Control Plan 2014;
- Ryde Local Environment Plan 2014; and

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

- Energy – including improved energy efficiency across the buildings and its associated sources.
- Water Efficiency – including reduced potable water demand and improved storm water quality.
- Materiality – considering the whole of life impact of materials and considering their retention and selection to minimise harm to the environment, including efficiency and construction.

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

2. Introduction

The Development Application (DA) seeks approval for the redevelopment of the Kent Road Public School, including:

- Site preparation;
- Construction of three (3) new two-to-three storey buildings to allow for increased student population from 750 to 1,000 containing;
  - 34 home-base spaces;
  - Canteen;
  - Administration facilities;
  - Staff facilities;
  - Special program/counselling rooms;
- Construction of a new entry canopy;
- Reconfiguration of car drop off / pick up arrangements on Kent Road;
- Landscaping and fencing; and
- Tree removal.

All new building works are located within the existing school campus & within the City of Ryde Municipal Council zone.

This report addresses the ESD and efficiency aspects in response to Key Issue 7 – within the Secretary's Environmental Assessment Requirements (SS9344) listed under Section 78A(8) of the Environmental Planning & Assessment Act (Schedule 2 – Regulation 2000).

Further to the above, the report also addresses Schedule 4 – Principle 2 – sustainable, efficient and durable as noted within the State Environmental Planning Policy – Education Establishments & Chile Care Facilities – 2017.

The report utilised best practice sustainable design principles and borrows elements from external sustainability assessment tools deemed to be in-line with accepted industry best practice.

Figure 1: Proposed Redevelopment – Site Plan. Source: Gardner Wetherill Associates.

2.1 Sustainable Design Initiatives

In pursuit of the ESD design principles, the Kent Road Public School development will pursue design excellence benchmarked from a number of sources.

These include best practice design initiatives from:

- Secretary's Environmental Assessment Requirements – Section 78A(8);
- NSW Environmental Planning and Assessment Act 1979;
- NSW Environmental Planning and Assessment Regulation 2000;
- State Environmental Planning Policy – Education Establishments & Chile Care Facilities – 2017;
- Ryde Development Control Plan 2014; and
- Ryde Local Environment Plan 2014.

2.2 Environmental Planning and Assessment Regulation 2000

SEARs outlines requirements for this development that must be addressed as part of the Environmental Impact Statement. These are:

- Detail how **ESD principles** (as defined in clause 7(4) of Schedule 2 of the Environmental Planning and Assessment Regulation 2000) will be incorporated in the design and ongoing operation phases of the development.

  Schedule 2 7(4) of the Environmental Planning and Assessment Regulation 2000 states:

  "The principles of ecologically sustainable development are as follows:

  a) the precautionary principle, namely, that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation. In the application of the precautionary principle, public and private decisions should be guided by:
    (i) careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment, and
    (ii) an assessment of the risk-weighted consequences of various options,

  b) inter-generational equity, namely, that the present generation should ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations,

  c) conservation of biological diversity and ecological integrity, namely, that conservation of biological diversity and ecological integrity should be a fundamental consideration,

  d) improved valuation, pricing and incentive mechanisms, namely, that environmental factors should be included in the valuation of assets and services, such as:
    (i) polluter pays, that is, those who generate pollution and waste should bear the cost of containment, avoidance or abatement,
    (ii) the users of goods and services should pay prices based on the full life cycle of costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any waste,
    (iii) environmental goals, having been established, should be pursued in the most cost effective way, by establishing incentive structures, including market mechanisms, that enable those best placed to maximise benefits or minimise costs to develop their own solutions and responses to environmental problems."

- Include a framework for how the future development will be designed to consider and *reflect national best practice sustainable building principles to improve environmental performance and reduce ecological impact.* This should be based on a materiality assessment and include waste reduction design measures, future proofing, use of sustainable and low-carbon materials, energy and water efficient design (including water sensitive urban design) and technology and use of renewable energy;
- Include preliminary *consideration of building performance and mitigation of climate change, including consideration of Green Star Performance*; and

- Provide a statement regarding how the design of the future development is responsive to the CSIRO projected impacts of climate change. Specifically:
  - hotter days and more frequent heatwave events;
  - extended drought periods;
  - more extreme rainfall events;
  - gustier wind conditions; and
  - how these will inform material selections

2.3 State Environmental Planning Policy (Education Establishments & Childcare Facilities) 2017

Schedule 4 – Schools – design quality principles of the SEPP includes **Principle 2** – sustainable efficient and durable which states the following:

Good design combines positive environmental, social and economic outcomes. Schools and school buildings should be designed to minimise the consumption of energy, water and natural resources and reduce waste and encourage recycling.

Schools should be designed to be durable, resilient and adaptable, enabling them to evolve over time to meet future requirements.

2.4 Ryde Local Environment Plan (LEP) 2014

Local Environmental Plan (LEP) – 2014

The City of Ryde Local Environment Plan (2014) has a specific focus on providing ecologically sustainable development through the City. In consultation with the relevant Clause 6.6, the LEP includes specific provisions for new developments so they do not have an adverse impact on the surrounding environment.

The particular ambitions of Clause 6.6 include:

- Water demand reduction, including efficiency, water recycling and minimisation of potable water demand;
- Energy demand reduction, including energy generation, use of renewable energy and reduced reliance on mains power;
- Indoor environment quality, including daylight provision, glare control, increased outside air rates and thermal comfort;
- A reduction in new materials consumption and use of sustainable materials, including recycled content in concrete, sustainable timber and PVC minimization;
- Emissions reduction, including reduced flow to sewer and light pollution;
- Transport initiatives to reduce car dependence such as providing cycle facilities, car share and small vehicle parking spaces;
- Land use and ecology, including reduced topsoil removal and contaminated land reclamation.

2.5 Ryde Development Control Plan (DCP) 2014

City of Ryde has a specific DCP developed in 2014 with aim of addressing ESD & sustainability more broadly within the precinct. The ESD elements addressed by this report are replicated below:

DCP – Part 7.1: Energy Smart Water Wise (Part 2.6 All other developments – Schools)

Objectives:

(O1) Design to allow maximum solar access to rooms/zones that are used most

(O2) Design to manage solar access via the inclusion of either vertical or horizontal shading devices

(O3) Preserve solar access to adjacent impacted developments; and

(O4) Reduce to consumption of water, electricity & gas.

Controls

(a) Ceiling/roof and walls must be with insulation. Roof insulation must be minimum R3.0 rated or equivalent and wall insulation must have a minimum R1.5 rating (or equivalent).

(b) Hot water system design/selection must take account for lowering greenhouse emissions impact.

(c) Products installed as part of the development must have a minimum MEPS rating of 4.5 Stars.

(d) Products installed as part of the development must have a minimum WELS rating of 4.5 Stars.

(e) *Wherever practical, orient the development to reduce the need for artificial lighting & power.*

3. Project Design Response

3.1 SEARS Design Response

The following documents the project's dedicated response to the Principles of ESD as defined within Clause 7(4) – Schedule 2 of the Environmental Protection and Assessment Regulation 2000).

3.1.1 Precautionary Principle

There are no perceived threats of serious or irreversible environmental damage as a result of proposed development on the desired site. The site of proposed development contains pre-existing buildings, which suggest the site does not hold ecological significance. Provided the proposed demolition of any existing building is managed accordingly, the proposed development is not likely to result in irreversible environmental damage, as the net impacts (ecological footprint) on the environment are relatively similar to that of the existing school campus boundary.

The proposed development is to utilise the existing major site infrastructure and upgraded to accommodate improved building amenity (as required). Therefore, no serious or irreversible environmental damage is expected due to the on-going operation of the building. During project construction the project shall be subject to a dedicated and site-specific environmental management plan.

3.1.2 Inter-generational equity

The proposed school redevelopment conserves inter-generational equity through minimising the consumption of resources whilst providing an upgraded built environment that will ensure the health and well-being of occupants into the future. The design intent will reduce demand on virgin raw materials, ensuring future generations are adequately supplied with such materials.

As the proposed development site has previously been developed on, valuable biological utility is not diminished as a result on the new development elements. Given there is limited diversity of the environment currently on the site, it is not envisaged that this will be significantly impacted as a result of new development.

Waste streams will be dealt with in ecologically safe methods. Waste-water and storm water will be plumbed to the existing stormwater infrastructure. The development is expected to benefit from a lower stormwater impact compared with a standard practice development as rainwater is to be retained for use within the school grounds & toilet flushing demand.

The below methods will be implemented on this project to contribute to a greater sustainable outcome for this generation and those following:

- Where timber products are used, sustainably sourced from accredited suppliers.
- High WELS rated water fittings ensuring lower building water demand.
- LED lights, which have longer lives, consume less energy and produce a higher quality light than their counterparts.
- Low-VOC paints, which do not emit dangerous volatile components, risking the health of users.
- Best practice PVC plastics in formwork, piping, cables and conduits. These materials have a reputation for damaging the environment in their production, both upstream and downstream of the manufacturing process.
- A target of 90% of construction and demolition waste will be diverted from landfill.
- Consideration for low embodied energy products, recycled or green rated products, such as GECA or "Global Green Tag".

In summary, Inter-generational equity is realised in the use of energy and water efficiency measures, which aim to reduce the consumption of limited resources, preserving these for future generations. Further detailed examples are provided within the following sections.

3.1.3 Conservation of biological diversity and ecological integrity

There is limited biological diversity on the current site due to the site being previously developed and occupied. The proposed school redevelopment will have limited, if any, impact on the current level of biological diversity and ecological integrity. Where new landscaping is proposed, the selection of plants will be in accordance with local bio-region ensuring the plant selection & local biodiversity is complimented.

3.1.4 Improved valuation, pricing and incentive mechanisms

This project will include the integration of a number of initiatives, which aim to internalise pollution and other undesirable environmental outcomes.

- Contractors will be requested to provide and abide by an Environmental Management Plan and Environmental Management System that is in accordance with NSW Environmental Management Systems Guidelines. This places a value on environmentally responsible building practices and places a form of "polluter pays" onto the contractors to ensure they are held responsible for the environmental management of the building site as they complete their work.
- The cost to recycle the construction and demolition waste will be borne by the project team. The project team will be required to target 90% recycling of construction waste. The increased cost of recycling construction materials will also incentivise the purchase of less materials, thereby reducing over-ordering and material wastage.
- The costs of producing the following pollution: sewage, landfill waste, and CO_2 emissions are partially borne by the project team and accounted for in the project's sustainability initiatives. The project has voluntarily elected to:
    - improve their water consumption efficiency, thereby paying to reduce production of sewage;
    - reduce their energy consumption, which means the project has paid for the design and implementation of solutions which will reduce CO_2 emissions; and
    - recycle waste streams in the construction and operation of the project, which will cost more than standard practice where all material waste is directed to landfill.

3.2 Australian Best Practice ESD Framework

The following section details a provisional list of ESD initiatives for inclusion within the design & development of the project. They have been selected on the basis they align with the *national best practice sustainable building principles to improve environmental performance and reduce ecological impact*. In this instance, the 'national best practice building principles' have been identified as those current within the Green Building Council of Australia's – Green Star framework. Green Star is currently accepted within the building and construction industry as representative of Australian Best Practice in design & construction with reference to environmental conservation and performance. While it is not envisaged the project shall target formal Green Star certification, the project is seeking to respond directly to the SEARS requirements by utilising the recognised best practice framework.

Green Star is Australia's foremost holistic environmental assessment tool. Design & As-built V1.2 is the current tool applicable to all building types within the industry and outlines a series of environmental performance criteria design to improve environmental sustainability & building performance.

There are nine performance categories within Green Star, as follows:

- Management (Building/Performance)
- Indoor Environmental Quality (IEQ)
- Energy (GHG emissions)
- Transport
- Water (Potable)
- Materials
- Land Use & Ecology
- Emissions; and
- Innovation.

The following sections provide a dedicated description of the project's response to ESD and alignment with best practice principles of sustainable design.

3.2.1 Building / Environmental Management

The proposed project will aim to incorporate a number of building management initiatives designed to ensure optimal design & operations of the building are achieved. The design team will take into consideration the future maintainability of systems in their designs. This includes ease of access to equipment, replicability of equipment, safety of accessing the equipment, and ease of operating the equipment by operations personnel and users. Examples include:

- Comprehensive commissioning & building systems tuning;
- A Building Management and Control System (BMCS) may be installed which can digitally control the HVAC system to ensure optimal effectiveness and energy efficiency;
- A formalised environmental management plan will be prepared prior to Construction (by main Contractor) to ensure that during construction, best practice environmental performance standards are maintained; and
- A dedicated waste management plan for operational waste will also be developed in accordance with the project design.

3.2.2 Indoor Environment Quality

Indoor environment quality directly impacts on the wellbeing, health, and productivity of building occupants. It can be quantified under 3 broad headings; indoor air quality, daylight, and acoustics.

Initiatives aimed at improving the indoor environment quality include:

- Indoor Air Quality
  - Low VOC paints and carpets
  - Low-formaldehyde wood products
  - Increased outdoor air rates, particularly for occupants at elevated levels of air
  - Quality cleaning processes for the mechanical systems and ductwork to reduce any mould potential
  - Externally ducted range-hood exhaust to external façade louvres; and
  - Design to ensure ventilation systems are free of pollutants & harmful contamination points.

- Daylight
  - High levels of natural daylight to be achieved
  - Glare control through the use of fixed and operable louvres/blinds
  - Minimum uniform lighting design to allow for comfortable lighting conditions avoiding high levels of change in lighting conditions
  - Location of windows to allow excellent views out which encourages connection to the outdoors.

- Acoustics
  - Low levels of reverberation, to reduce the reflection of noise around spaces. Use of acoustic panelling and material finishes will assist this.

3.2.3 Energy efficiency – Greenhouse Gas Emissions reduction

A variety of energy efficiency measures are applicable to the proposed Kent Road Public School redevelopment. These energy efficiency measures may form part of the final design and operation of the space. The final strategy will always be a combination of sustainability, operational feasibility, architectural intent and site-specific appropriateness.

The energy efficiency strategy follows the hierarchy pyramid below. Best practice energy conservation dictates that in the first instance demand is reduced. This has a much greater benefit to the overall long-term sustainability of the site compared to efficiency measures or renewables/offsets. As such, the focus will be on the elements that provide the greatest return on investment.

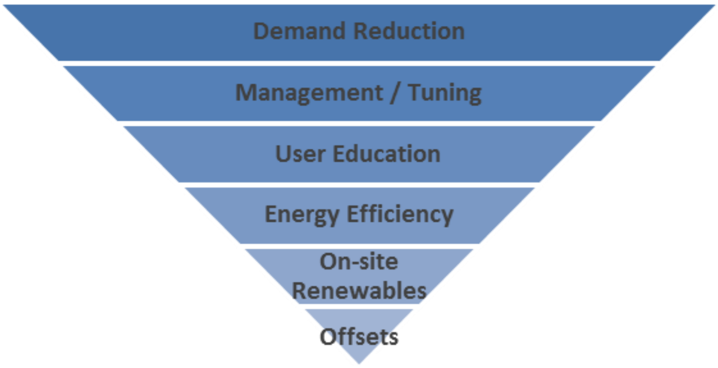

Figure 2 Energy efficiency strategy hierarchy.

In order to ensure optimised energy demand reduction is identified, final building design will be subject to detailed energy modelling which has the ability to optimise glazing performance and ensure the building fabric performance is maximised. This will allow the design to team to ensure fundamental building design responds appropriate to the site-specific climate conditions as well as the identified user groups.

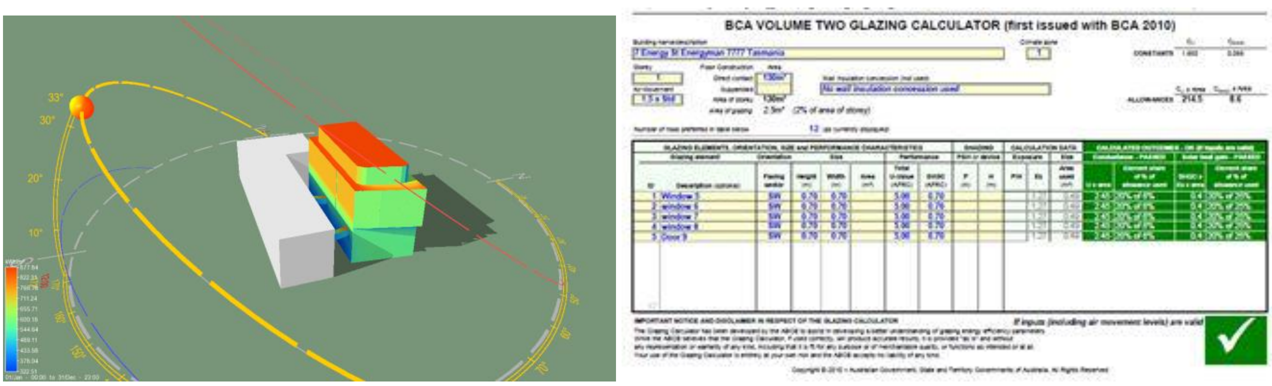

Figure 3: Sample image from IES thermal modelling software & NCC Section J glazing calculator. Source: IES Virtual Environment.

In addition to the above, the project design has been influence by typical ratios of energy end uses in schools identified within a national Government report published in 2012. Since the greatest energy consumption within the design control is HVAC &, lighting, these present the greatest opportunity for energy reduction. Proposed energy efficiency measures which are to be integrated into the project focus primarily on these energy end uses and reducing energy demand and the subsequent greenhouse emissions profile of the project.

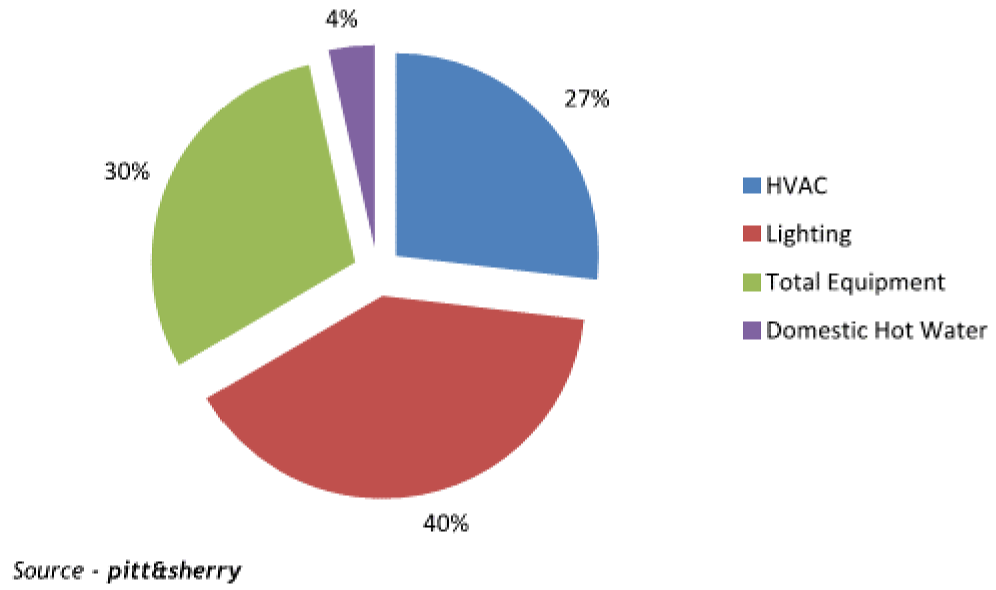

Figure 4: Typical electricity end-use shares 1999-2012. Source: Pitt & Sherry. Council of Australian Governments – Baseline Energy Consumption in Commercial Buildings in Australia, November 2012.

Energy efficiency measures which will reduce energy usage & greenhouse gas emissions nominate for inclusion within the project include:

Passive Thermal Design

- External façade & walls with incorporation of thermal mass will create a thermally efficient external building fabric providing full year suitability within the Sydney climate zone.
- Façade design for maximum passive thermal performance.
- Current proposed design allows for passive natural daylight.
- Glass selection to be considerate of passive thermal performance – solar control for summer, passive thermal heating optimisation in winter. Southern exposed facades to consider double-glazing design.
- High rated building fabric performance – high total R-values for thermal efficiency on exposed floors, external walls and exposed roof zones (minimum standards as reference within Ryde DCP to be adopted).
- Operable windows for mixed-mode space conditioning. This also allows for future design adaptability and greater building life-cycle.

Lighting

- Efficient lighting e.g. LEDs. This will reduce the electrical load on the grid for the same electrical output. Further, LED globes have a longer life, reducing replacement periods which demands less maintenance, as well as reducing landfill of precious materials
- Lighting controls including timing and occupancy sensors to reduce the demand on the lighting system.
- Optimised lighting zoning control in order to reduce energy demand & improve efficiency via localised lighting control.
- Sub-metering will allow for effective energy management & optimisation of building performance. Typical meter allocation is end-uses in excess of 10,000kWa/annually; however this can be further optimised at the schools request.

- BMS building control will monitor & provide automated building operation & maximise energy efficiency.
- External lighting to time-clock controlled for optimised energy efficiency.

Heating / Air-Conditioning Systems

- Energy and water efficient appliances – lowering energy demand
- BMS building control will monitor & provide automated building operation & maximise energy efficiency.
- Economy cycle integration for suitable times of the year when outdoor ambient conditions don't require mechanical pre-treatment.
- Centralised gas hot water system for lower GHG emissions impact.
- Mixed-mode system with natural ventilation integration – refer Figure 5 below.

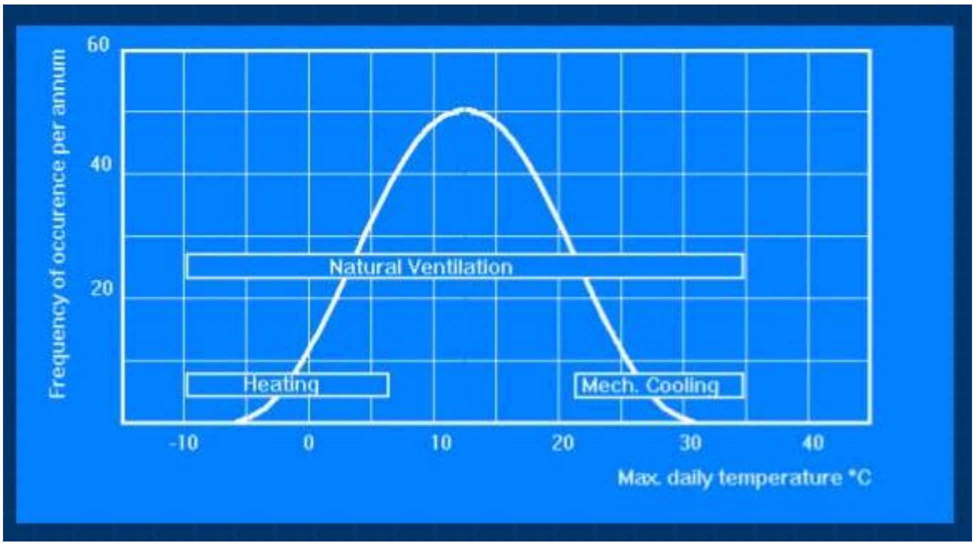

Figure 5: HVAC system diagram. Source: Troup Bywaters + Anders, London.

On-site Renewable Supply

- The proposed development includes provision for a minimum 99kW on-site renewable (solar) energy supply design to offset campus energy demands.

3.2.4 Water Efficiency

A variety of water efficiency measures are applicable to the proposed school re-development. The following water efficiency initiatives are intended to influence the final design and operation of the spaces contributing to the project's overall commitment to reduce potable water demand.

The following chart describes the typical water consumption of non-residential buildings in NSW.

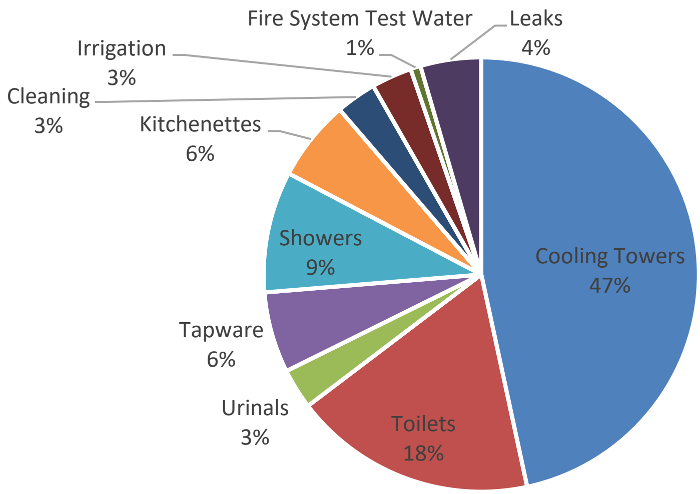

Figure 8: Typical water consumption for non-residential in NSW. Source: *NABERS Preliminary Assessment of an office in NSW, 2017*

Water efficiency measures, which reduce water consumption & included within the project are:

- Water efficient fixtures and fittings – includes taps, wash basins, WCs, Urinals, showers and supplementary water uses for student education.

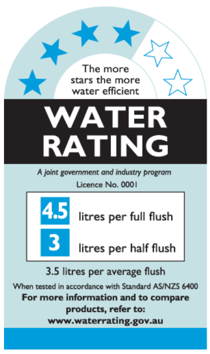

Figure 9. Example of a WELS water efficiency-rating label.

In accordance with industry best practice standards, the following performance schedule identified within Green Building Council of Australia's – Green Star scheme will ensure potable water demand is effectively reduced:

Nominated WELS Fixtures – Green Star Design & As-built V1.2	
Fixture / Equipment Type	**WELS Rating (minimum)**
Taps	6 Star
Toilet	5 Star
Showers	3 Star (>4.5 but <= 6.0 L/min)

- Water meters linked to the BMS will ensure inefficiencies such leaks are detected prior to the significant loss of water.
- On-site rainwater harvest – offset for irrigation demand & toilet flushing.
- Landscape irrigation supply (not including sports field supply) shall be also connected to existing on-site rainwater storage infrastructure reducing the demand from potable water supplies.
- Minimalistic impact of the project does not increase potable water demand as existing vegetation is largely un-impacted by the proposed development.

3.2.5 Sustainable Materials and Building Components

Additional resources aside from energy & water are consumed by new developments. These include the building materials in the initial build, through to the materials consumed by on-going building maintenance. The following resource efficiency measures are intended to influence the project's overall ecological footprint & reduce the environmental impact of the project as a whole.

Construction Materials

Construction materials are a highly carbon intensive component of any development. They often involve very energy intensive production processes, large amounts of raw materials including water and energy, and long transport distances to reach the location of the development.

The following will be adopted by the project to reduce waste from construction materials.

- Sustainably sourced timber.
- A high recycling target of 90% diversion from landfill for the construction and demolition waste.

Design Materials

Improved indoor environment quality is a significant benefit of sustainable design. The design will include a significant commitment to improve indoor environment quality via the following initiatives:

- Thermal comfort provided by the bespoke air conditioning system, high thermal mass & availability to natural daylight & passive thermal performance.
- Material selections, which focus on reducing volatile organic compounds (VOC) levels and minimise formaldehyde impacts. Paints, sealants, adhesives, carpets, floor and material finishes will all comply with best practice VOC criteria as identified within Green Star – industry best practice standard.
- Engineered wood products will limit formaldehyde levels via architectural specification in accordance with industry best practice standards.
- Steel material to be sourced from suppliers who are signatories to the Australian Steel Institute Sustainability Charter ensuring the manufacture of steel products is sustainable and reduces energy demand.
- PVC materials will be procured from suppliers which comply with industry best practice guidelines for PVC manufacture which aims to reduce the environmental impact of PVC material production.
- Consideration of additional material specifications which select & prefer materials and products which include reused content, environmental product declarations, third party sustainability certifications or product stewardship programs.
- Design intent also includes selection of durable, long-life cycle materials such as sandstone, slate and copper – materials that have demonstrated over time to improve the building longevity and life cycle.

Operational Materials

The major waste streams from school buildings are comprised of paper and cardboard from writing and study materials, mixed glass, plastics recyclables, and organics from food items. The proposed redevelopment will be responsible for providing operational waste facilities in accordance with industry best practice waste removal and separation guidelines.

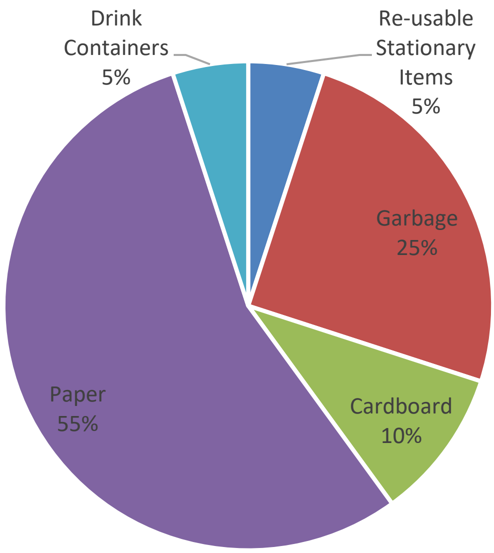

Figure 10: Typical composition of School waste streams *(Source: Recycling Near You)*

It is envisaged that a dedicated Site Waste and Recycling Minimisation & Management Plan (SWMMP) will be prepared for the proposed development. The plan will identify, quantify and classify the likely waste streams to be generated during both construction & operation and in addition, identify the appropriate servicing requirements.

Key objectives & design responses include:

- 90% recycling target for general construction waste consistent with industry best practice;
- Identification of likely waste streams & how each waste stream shall be treated for both construction & operation;
- Identification of storage locations & allocated waste resources;
- Signage requirements for optimised waste recovery / recycling; and
- Identification of monitoring & reporting schedules for optimised future waste management.

3.3 Mitigation of Climate Change Impacts

Further to the above commitments to best practice sustainable building principals, the following section responds further to the SEARS requirements by addressing the CSIRO projected impacts of climate change. The proposed development seeks to respond to these projected impacts via the following commitments:

3.3.1 Extreme rainfall events

The increased occurrence of extreme rainfall events poses additional flash flooding risk & temporary stormwater quality issues within the proposed development. In response to such risks, the project design includes the following mitigation measures:

- Construction of low height masonry wall behind existing security fence along Herring Road to deflect overland flow and flood waters to the south-west of the site as the objective is to minimise water ingress to main construction site.
- On-site stormwater detention will also be designed for significant rainfall events including 1-in-100 year rainfall event; and
- On-site provision for rainwater reuse will also assist in the projects response to flash rainfall events.

3.3.2 Heatwave events

The increased occurrence of extreme heatwave events will add stress onto building services systems and pose increased threat levels to building occupant health. In response to such risks, the project design includes the following mitigation measures:

- Architectural design response includes passive thermal principles which improve building passive thermal performance & occupant comfort.
- Mixed-mode HVAC design allows for reduced reliance on building services reducing stress on equipment and lowering the emissions profile of the project.
- Additional shading including covered pedestrian walkways will improve human exposure to direct sun while transferring between buildings.

3.3.3 Extended drought periods

The project responds positively to risk of drought exposure via the inclusion of on-site rainwater reuse provisions. This will reduce overall potable water demand but also provide future provision for landscape irrigation and toilet flushing.

3.3.4 Gustier wind conditions

The project structural design including overall building structure & façade design will respond to the elevated risk of gustier wind exposure via the inclusion of appropriate design measures such as thermal mass, limitation of exposed cantilevers and improved overall structural strength in design.

Additional initiatives include new vegetation to the school playground, architectural fins to building stairs & associated walkways to provide wind breaks as well as additional glass screens (with an ability to future retrofit additional screens).

4. Summary

Ecologically Sustainable Design is a driving consideration in the redevelopment of the Kent Road Public School project. As described within the report above, the proposed buildings will incorporate a number of ESD initiatives chosen as reflective of industry best practice in sustainable design & construction. The initiatives are designed to reduce the projects overall greenhouse gas emissions profile, potable water consumption and material resources impact.

The development's commitment to reducing the overall environmental impact is evident of the holistic approach taken to long-term sustainability and dedicated response to the elevated risks of climate change.

Documented initiatives cover a range of categories including:

- Building & environmental management
- Energy & greenhouse gas emissions
- Potable water reduction
- Minimising waste to landfill
- The indoor environment
- Occupant amenity and comfort; and
- Response to CSIRO projected climate change risks.

We trust this report provides sufficient overview of the project commitment to environmentally sustainable design and the sustainability vision for the proposed Kent Road Public School redevelopment project.

APPENDIX A Best Practice Matrix

The following list provides benchmark comparison of the projects commitment to best practice sustainability initiatives

Benchmark Initiative – Green Star Design & As-built V1.2	**Credit Category**
Commissioning & Building Tuning for all HVAC / services systems	Man-2
Adaptation & resilience to climate change	Man-3
Energy & water metering & monitoring	Man-6
Environmental & Construction management	Man-7
Dedicated operational waste management	Man-8
Improved indoor air quality	IEQ-9
Optimised acoustic performance	IEQ-10
Improved visual comfort	IEQ-12
Reduced VOC/formaldehyde levels	IEQ-13
Reduced GHG emission profile	ENE-15
Reduced potable water demand	Wat-18
Reduced building life cycle impacts	Mat-19
Responsible material selections	Mat-20
Construction & demolition waste management	Mat-22
Retained ecological value	Eco-23
Sustainable site reuse	Eco-24
Stormwater management	Emi-26
Decreased light pollution	Emi-27
Improved HVAC emissions & legionella risk management	Emi-28