If a building becomes architecture, then it is art. Clearly, if a building is not functionally and technically in order, then it isn't architecture either – it's just a building.
Arne Jacobsen

Mechanical Engineering
Lighting Design
Sustainable Design
Electrical Engineering

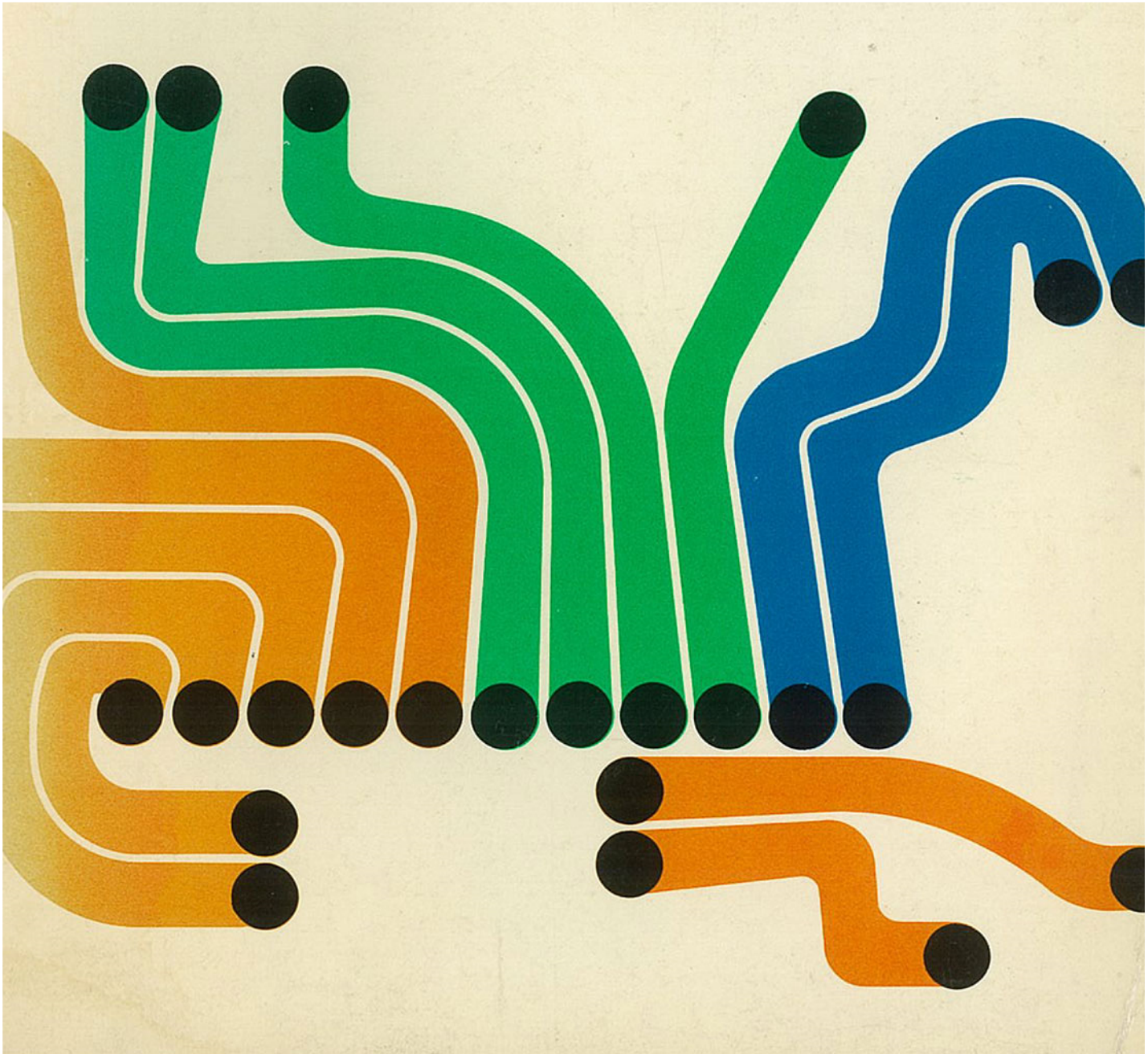
Copenhagen
London
Sydney
Hong Kong
New York

Level 8, 9 Castlereagh Street
Sydney, NSW, 2000, Australia
ABN 50 001 189 037
t : +61 / 02 9967 2200
e : info@steensenvarming.com

SUSTAINABLE DESIGN

STEENSEN VARMING

Meadowbank Education and Employment Precinct Schools Project: ESD SEARS Report



Level 8, 9 Castlereagh Street
Sydney, NSW, 2000, Australia
ABN 50 001 189 037
t : +61 / 02 9967 2200
e : info@steensenvarming.com

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Garry Luu
Sustainability Consultant

garry.luu@steensenvarming.com
+61 2 99672200

Level 8, 9 Castlereagh Street
Sydney, NSW, 2000, Australia
ABN 50 001 189 037
t : +61 / 02 9967 2200
e : info@steensenvarming.com

Table of contents

Level 8, 9 Castlereagh Street
Sydney, NSW, 2000, Australia
ABN 50 001 189 037
t : +61 / 02 9967 2200
e : info@steensenvarming.com

1.0 Introduction

1.1 Overview

This ESD SEARs has been prepared by Steensen Varming on behalf of the NSW Department of Education (the Applicant). It accompanies an Environmental Impact Statement (EIS) in support of State Significant Development Application (SSD 18_9343) for the Meadowbank Education and Employment Precinct Schools Project (hereafter referred to as MEEPSP) at 2 Rhodes Street, Meadowbank (the site).

The K-12 MEEPSP will cater for 1,000 primary school students and 1,620 high school students. The proposal seeks consent for:

- A multi-level, multi-purpose, integrated school building with a primary school wing and high school wing. The school building is connected by a centralised library that is embedded into the landscape. The school building contains:
    - Collaborative general and specialist learning hubs, with a combination of enclosed and open spaces;
    - Adaptable classroom home bases;
    - Four level central library, with primary school library located on ground floor and high school library on levels 1 to 3.
    - Laboratories and workshops;
    - Staff workplaces;
    - Canteens;
    - Indoor gymnasium;
    - Multipurpose communal hall;
    - Outdoor learning, play and recreational areas (both covered and uncovered).
- Associated site landscaping and public domain improvements;
- An on-site car park for 60 parking spaces; and
- Construction of ancillary infrastructure and utilities as required.

The purpose of this ESD SEARs report is to summarise the Environmentally Sustainable Design (ESD) initiatives adopted for the MEEPSP, and how the project has addressed the SEARs requirements.

Level 8, 9 Castlereagh Street
Sydney, NSW, 2000, Australia
ABN 50 001 189 037
t : +61 / 02 9967 2200
e : info@steensenvarming.com

1.2 Response to SEARs

The ESD SEAR's report is required by the Secretary's Environmental Assessment Requirements (SEARs) for SSD 18_9343. This table identifies the SEARs and relevant reference within this report.

Table 1 – SEARs and Relevant Reference

SEARs Items	**Project Response to DGR**
Detail how ESD principles (as defined in clause 7(4) of Schedule 2 of the Regulation) will be incorporated in the design and ongoing operation phases of the development.	The ESD initiatives proposed for the MEEPSP aims to reduce the environmental impacts typically associated with buildings during the construction and ongoing operation of the building. The project utilises a resource hierarchy approach, with emphasis on avoiding then reduction of energy, water, materials etc. The outcome of the resource hierarchy approach is to ensure the schools aligns with the ecological sustainable development principles of Clause 7(4) of Schedule 2 of the Environmental Planning and Assessment Regulation 2000. Refer to section 4.1 Resource Conservation for the proposed ESD initiatives.
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.	The MEEPSP is targeting a certified 4 Star Green Star rating utilising the Green Building Council of Australia's (GBCA) Design and As-built rating tool (DAB) version 1.2. A 4 Star Green Star rating is considered 'Australian excellence' level. The Green Star rating tool is a framework developed by the GBCA, and is categorised in 9 sustainability categories which cover issues such as environmental management, indoor environment quality, energy, water, waste, transport, emissions, ecology and innovation. Refer to section 4.1 Resource Conservation and section 4.1.2 Water conservation and 4.1.4 Emissions for WSUD.
Include preliminary consideration of building performance and mitigation of climate change, including consideration of Green Star Performance.	Building performance will be considered in the design of the MEEPSP. Refer to Section 4.0 for the building performance measures considered to reduce resource consumption and carbon emissions, and impact on climate change. Green Star Performance has been considered in line with the project briefing requirements to achieve a certified Green Star Design and As-built Rating. The rating tools are similar; however Green Star Performance focuses on the building operation and maintaining a valid certification against the Australian Government's National Carbon Offset Standard for buildings. This requires ongoing measuring, reduction, offsetting and reporting of emissions. The project will consider strategies and building systems that facilitates measuring, reduction and reporting for the schools to claim carbon neutral certification, such as Green Star credit 6.1 Monitoring. The Carbon offsetting will need to be considered by SINSW. Ongoing reporting would also be by SINSW.

Level 8, 9 Castlereagh Street
Sydney, NSW, 2000, Australia
ABN 50 001 189 037
t : +61 / 02 9967 2200
e : info@steensenvarming.com

SEARs Items	Project Response to DGR
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 selection and social equity aspects (respite/shelter areas).	A climate adaptation study will be undertaken to identify the climate risks in response to the projected impacts. Actions and design strategies will be identified to lower the impacts and the associated risk levels. At the current stage, the MEEPSP proposes the following strategies in response to the CSIRO projected impacts of climate change. **Hotter days and more frequent heatwave events:** ■ Passive building design features to reduce/dampen the effects of increasing temperature, such as solar shading and solar control glazing. ■ The MEEPSP proposes the use of mixed mode ventilation, however acknowledges the impacts of climate change and has proposed the use of air conditioning during peak conditions. This is to ensure that appropriate internal conditions can be achieved and maintained as temperatures continue to rise. ■ Landscaping has also been proposed to reduce urban heat island effect. **Extended drought periods:** ■ Consideration of native low water landscaping to reduce potable water consumption; and ■ Rainwater harvesting and low flow fixtures and fittings. **More extreme rainfall events:** ■ Consideration of increased drainage capacities to reduce flooding of roofs and hard surfaces; and ■ Assessment of design of the building to address post development probable maximum flood (PMF) level. **Gustier wind conditions:** ■ Design of windows and openings with controls to limit the impact of gustier wind conditions for internal spaces; ■ Landscaping to buffer strong winds to outdoor areas. **Material selection:** ■ Use of durable façade materials and materials to improve building thermal performance such as insulation and thermal mass; and ■ Covered/shaded outdoor respite areas.

This report presents a concise summary of the design decisions made during the Schematic design stage, and outlines the key ESD opportunities and initiatives that are likely to be implemented into the MEEPSP. The strategies presented in this report are based on the current architectural schematic design developed by Woods Bagot Architects.

To ensure a sustainable outcome, the following are key strategies being addressed within the proposed design:

- Incorporate a high-performance building envelope, to ensure energy efficiency as well as occupant comfort (including thermal, visual and acoustic comfort);

Level 8, 9 Castlereagh Street
Sydney, NSW, 2000, Australia
ABN 50 001 189 037
t : +61 / 02 9967 2200
e : info@steensenvarming.com

- Incorporate appropriate passive and active design strategies to ensure a low-energy as well as low-maintenance design outcome;
- Adopt water sensitive urban design principles; and
- Adopt practices to minimise demolition, construction and operational waste including recycling of demolition and construction waste.

To benchmark the environmental performance of the building, the project will target a certified 4 Star Green Rating under the GBCA's Design and As-built version 1.2 rating tool.

Systems will also be included to facilitate ongoing operations energy reduction, and reporting mechanisms to demonstrate achievement of carbon neutral certification.

Level 8, 9 Castlereagh Street
Sydney, NSW, 2000, Australia
ABN 50 001 189 037
t : +61 / 02 9967 2200
e : info@steensenvarming.com

2.0 Targets / Benchmarks

In addition to the Secretary's Environmental Assessment Requirements (SEARs), the following environmental targets are aspired by School Infrastructure NSW (SINSW):

- Exceed the requirements of Section-J of the National Construction Code (NCC) for energy-efficiency in building fabric and building services / systems by 10%.
- Achieve a certified 4 Star Green Rating under the GBCA's Design and As-built version 1.2 rating tool.

2.1 NCC Section-J

Section-J of the National Construction Code (Previously known as the Building Code of Australia) 2019 relates to "energy efficiency" of buildings". Section J is a minimum performance target for standard buildings, and specifies minimum performance targets known as deemed-to-satisfy (DTS) requirements, for building fabric and services.

The proposed MEEPSP aims to exceed the DTS requirements of Section-J. A JV3 methodology is being applied for the project to demonstrate the improvement beyond DTS by 10%.

Any improvement in energy-efficiency beyond the minimum requirements of Section-J, will also contribute towards the project's Green Star energy score.

2.2 Green Star Design and As-built Rating tool v1.2

The Green Star rating tool is a framework developed by the Green Building Council of Australia (GBCA), and is categorised in 9 sustainability categories which cover issues such as management, indoor environment quality, energy, water, waste, transport, emissions, ecology and innovation.

The MEEPSP is targeting a certified 4 Star Green Star rating utilising the Green Building Council of Australia's (BCA's) Design and As-built rating tool (DAB) version 1.2. A 4 Star Green Star rating is considered 'Australian excellence' level.

Refer to Section 4.0 for further details in relation to the sustainability measures incorporated in the project.

2.3 Green Star Performance v1.2

The Green Star performance rating tool is an initiative by the Green Building Council of Australia (GBCA), and focuses on the sustainable building operations. Green Star

Level 8, 9 Castlereagh Street
Sydney, NSW, 2000, Australia
ABN 50 001 189 037
t : +61 / 02 9967 2200
e : info@steensenvarming.com

performance is an extension of the Australian Government's National Carbon Offset Standard for buildings, and is a certified rating system for projects seeking the Carbon Neutral Certification Trade Mark.

Green Star Performance utilises the same framework as the Design-and-As built rating tool, such as the sustainability categories and similar credits.

Green Star performance offers projects and existing building portfolios a clear framework for measuring, reducing, offsetting and reporting for claiming against the Carbon Neutral Certification Trade Mark.

The key difference between Green Star DAB and Performance is achieving and maintaining a valid carbon neutral claim against the National Carbon Offset Standard for buildings.

Level 8, 9 Castlereagh Street
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3.0 Sustainability Approach

Sustainable building design involves a holistic and integrated design approach, which builds on an increased awareness of site opportunities, form and function, to encompass and target a broad range of sustainable design initiatives.

For the MEEPSP, the key priorities to support the functional demand i.e. a learning / teaching environment, are as follows:

- The promotion of natural daylight;
- High levels of IAQ (Indoor Air Quality);
- Thermal, Visual and Acoustic comfort;
- Resource conservation (energy, water and waste); and
- The creation of an integrated community resource.

The promotion of natural daylight – There is a direct correlation between access to daylight and student performance, attention, productivity and general wellbeing;

Excellent Indoor Air Quality (IAQ) – In a similar manner to daylight, there is proven correlation between student performance, occupant wellbeing, student attendance and staff retention. Principle strategies include:

- Increased levels of outside air through the promotion of mixed mode or natural ventilation strategies, and increased outdoor air allowances;
- Mould prevention through the avoidance of thermal bridges, condensation and effective strategies in ventilation, odour and pollution control;
- Low pollutant emitting materials selections such as low VOC paints, adhesives, sealants, composite woods etc.

Excellent Thermal, Visual and Acoustic comfort:

- Thermal comfort: To ensure teachers, students and administrators are not subject to unacceptable extremes in temperature as they teach, learn and work;
- Visual comfort: To ensure the quality of light is supportive of visual tasks such as reading and presenting. In design for natural daylight, consideration must be given to daylight uniformity, penetration depth, solar heat ingress and glare control;
- Acoustic comfort: To ensure effective communication can be achieved at all times. Noise from ventilation systems is eliminated, external and internal disruptive noise affecting classrooms is also minimised. The design should aspire to reduce sound reverberation levels to 1.5 seconds or less, HVAC noise to 45dBA or less (40dBA ideal);

Resource conservation (energy, water and waste) – In delivering on the functional demands of an educational building (high levels of daylight, thermal comfort, visual comfort, and IAQ), incurs resource use through the optimisation of these attributes. These are to be supported with minimal consumption of energy and water resources, or the generation of waste and pollution in demolition, construction and operation of the building. Our approach to resource conservation is based on applying a "hierarchy" methodology as outlined in the following sections (See section 4.1).

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The creation of an integrated community resource – The Schools can play a role within the local community through the use of shared facilities (library's, auditoriums, sport facilities and open spaces), facilitating events such as farmers markets, community gatherings, and integration of community gardens;

The development of the building and surrounds as a teaching tool – Students develop greater knowledge retention, understanding and awareness, when they have the opportunity to interact directly with their environment through the mediums of touch, sight and feel, compared to the traditional textbook learning.

The above approach has been taken to ensure the ESD strategies proposed meet the SEARs and targets/benchmarks discussed in the previous section (section 4.1).

The following sections provide a high-level overview of the strategies considered.

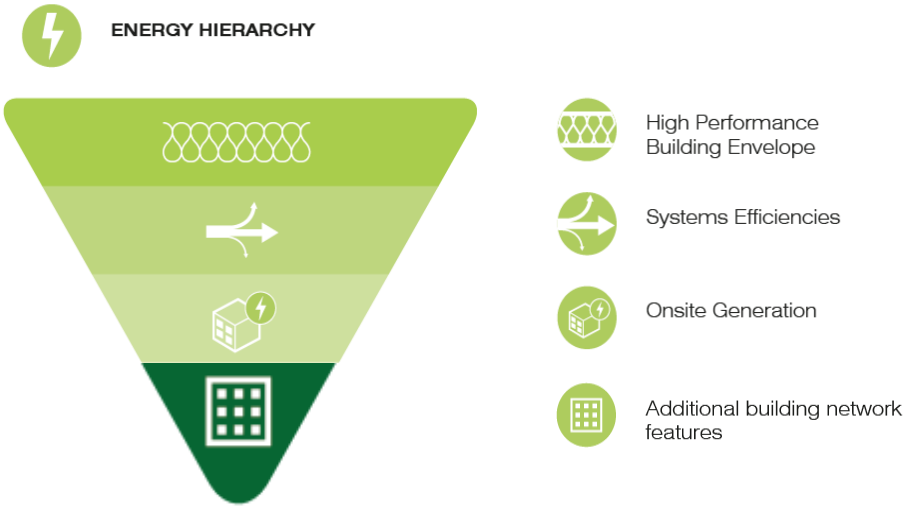
3.1 Resource Conservation

This section provides an overview of the resource conservation measures.

3.1.1 Energy Conservation

The proposed approach to sustainability and energy related systems is based on applying an "energy hierarchy" methodology.

This methodology has the reduction of energy use as its first priority, and then seeks to meet the remaining energy demand by the most efficient means available, before the inclusion of on-site generation and importation of green power.



The following energy initiatives have been proposed for the MEEPSP:

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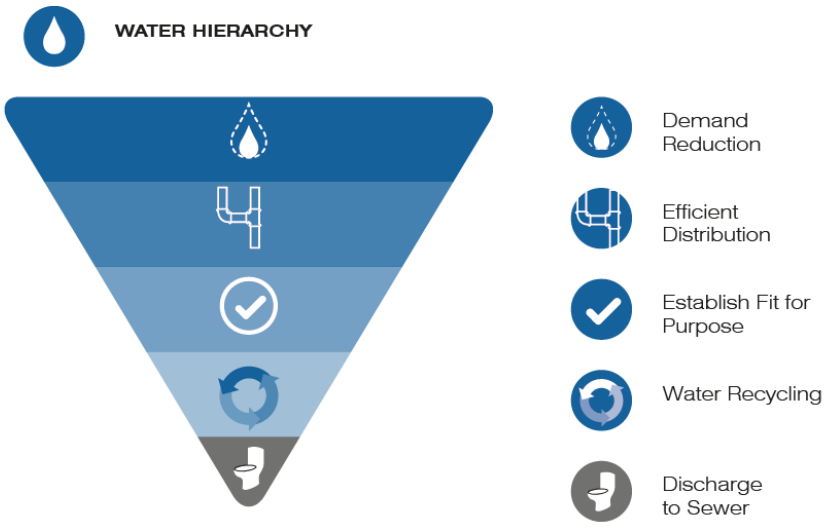
Sydney, NSW, 2000, Australia
ABN 50 001 189 037
t : +61 / 02 9967 2200
e : info@steensenvarming.com

- **Building Form** has been designed to with consideration of façade access for greater access to natural daylight and opportunity for natural ventilation.
- **Passive design principles** will be employed to respond to environmental conditions of the building including orientation, solar access, prevailing winds, seasonal and diurnal temperatures changes.
- **A Mixed Mode Ventilation strategy** has been incorporated for improved indoor air quality, whilst also reducing energy consumption associated with air-conditioning. When external and internal conditions are favourable, external windows to each cluster can open to facilitate natural ventilation.
- **Building energy performance improvement -** Energy modelling will be undertaken using the BCA Section J, JV3 energy modelling guidelines. The energy modelling will demonstrate the project achieves a minimum 10% energy reduction against the benchmark standard.
- **Energy efficient LED lighting, zoning, controls and site co-ordination** for both internal and external lighting systems are to be designed.
- **Occupancy controls** will be provided to spaces so that AV, lighting and mechanical systems can be shut down both manually and automatically when unoccupied.
- **A 99 kWp Solar photovoltaic (PV) array** has been proposed and will be located on the roof terrace. Energy generated onsite can be reused onsite.
- **High efficiency HVAC**
- **CO2 monitoring**

3.1.2 Water Conservation

The following hierarchy will be applied, along with the following proposed strategies:



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- **Water efficient fixtures / fittings** will be specified. These include fittings such as taps, showerheads, toilets, zip taps, dishwashers etc certified under the WEL rating scheme;
- **Rainwater Reuse** - Rainwater collection and reuse systems will be incorporated. Reuse options include landscape irrigation and toilet flushing. The rainwater system will at a minimum achieve the following requirements as per the development control plan Part 8.2:
  - A rainwater tank to meet greater than 50% of non-potable water demand; and
  - 80% of the water supply for use within open spaces (including irrigation, ponds, water features etc.) must be provided from sources other than potable water such as rainwater tanks or treated grey-water.

- **Fire Systems test water** will be captured and stored for re-use using in a separate fire services water tank.

3.1.3 Materials

Selection of environmentally preferable materials is a key priority for the project, because building materials consume energy and natural resources during its manufacture and for their transportation to the construction site.

Preference will be given to materials that contain high-recycled content and/or are highly recyclable. The following strategies have been proposed:

- **Use sustainable timber-** timber products used for concrete formwork, structure, wall linings, flooring and joinery will be sourced where possible from reused, post-consumer recycled or FSC-certified, or PEFC certified timber.
- **Steel** – will be specified to meet specific strength grades, energy-reducing manufacturing technologies, and off-site fabrication. Steel will also be sourced with a proportion of the fabricated structural steelwork via a steel contractor accredited by the Environmental Sustainability Charter of the Australian Steel Institute.
- **Recycled concrete** – The project aims to reduce the use of Portland cement through substitutions. Fine and coarse aggregate inputs are to be sourced from manufactured sand or other alternative materials, and the amount of Portland cement will be reduced within the concrete mix.
- **High recycled content or recyclability** – Furniture items with high recycled or recyclability content have been considered.

3.1.4 Emissions

Proposed design aims to ensure reduction of all forms of emissions, including watercourse pollution, light pollution and ozone depletion.

- **Water Sensitive Urban Design (WSUD)** integrates water cycle management with urban planning and design. The aim of WSUD is to manage the impacts of storm

Level 8, 9 Castlereagh Street
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e : info@steensenvarming.com

water run-off from the development to protect and improve waterway health by replicating the natural water cycle.

As part of the WSUD, the development will incorporate rainwater reuse (refer to section 4.1.2) and storm water management.

The storm water drainage system will prevent storm water contamination, control sedimentation and erosion during construction and operation of the building. The storm water treatment system will target reductions for the following pollutants

- Total Suspended Solids (TSS)
- Gross Pollutants (GP)
- Total Nitrogen (TN)
- Total Phosphorous (TP)

On-site Stormwater Detention (OSD) has been considered for the project, however it is expected that the site will not require OSD for the proposed development areas due to the proximity of the open watercourse which the catchment discharges to.

3.1.5 Other Key measures

The following measures have been considered for the schools. These measures are intended to reduce the environmental impacts associated with the construction of new buildings.

- **Environmental Management Plan (EMP)** – The EMP will be developed and implemented for the construction stage, including demolition and excavation, to address environmental, worker health and safety and community risks. The EMP is a project specific plan and developed using State and Federal Guidelines and standards. The main contractor will implement an Environmental Management System certified to the ISO 14001 standard to ensure the objectives of the EMP are met.
- **Site waste management plan**. During the demolition and construction phase, a project-specific site waste management plan (WMP) will be developed and implemented, to reduce recycling of demolition and construction waste.
- **Comprehensive commissioning** – pre-commissioning, commissioning, and quality monitoring for all building services will be carried out.
- **Waste storage** will be provided dedicated to the separation and collection of recyclable waste.
- **Cycle parking and end of trip facilities** – bicycle parking racks, changing and shower facilities and lockers will be provided for staff.
    - Bicycle parking; and
    - End of Trip Facilities.