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

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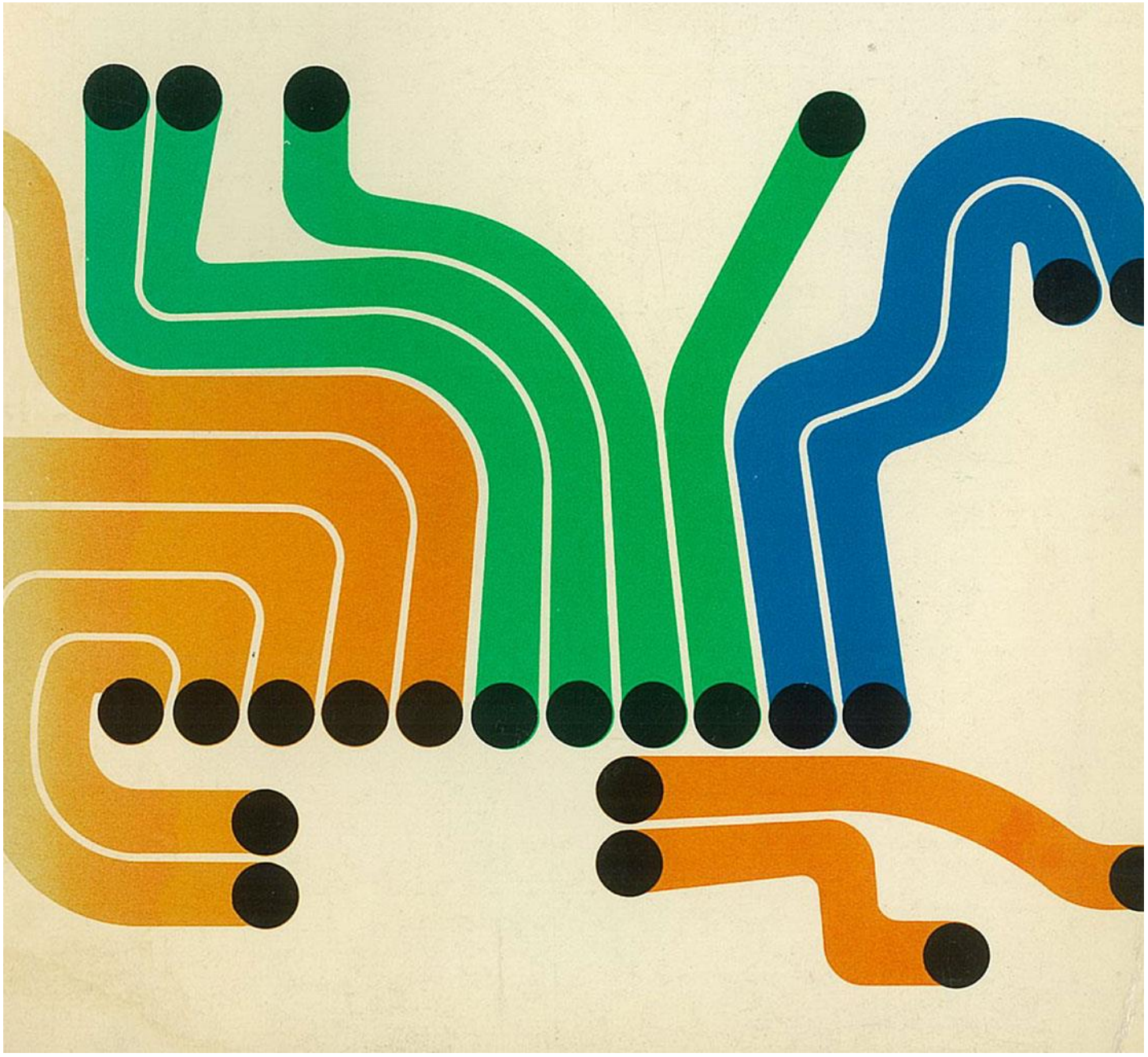
Sydney Children's Hospital Stage 1 and Children's Comprehensive Cancer Centre ESD SSD Report



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
Senior 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

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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 Proposed Development

The purpose of this Report is to support the State Significant Development Application (SSDA) for The Sydney Children's Hospital Stage 1 (SCH-1) and Children's Comprehensive Cancer Centre (CCCC) at Randwick Hospitals Campus (the project). This report responds to item 11 Ecological Sustainable Development (ESD) of the Secretary's Environmental Assessment Requirements (SEARs) issued 2 December 2020 for State Significant Development Application (SSDA) 10831778.

The Randwick Health and Education Precinct (RHEP) is one of the most comprehensive health innovation districts in Australia. While health care at RHEP has been evolving for over 160 years, the last five years has seen a strengthening of collaboration amongst a wide range of organisations in the precinct, including with government, universities and community.

The project seeks to strengthen the precinct as a world-class centre for health, research and education, driving cutting edge, compassionate and holistic healthcare and wellness programs for the local community and other residents of NSW. The project will deliver brand new, state-of-the-art paediatric health, medical research and education facilities and will assist to transform paediatric services and a key step in realising the vision for the RHEP.

1.2 Background

The project scope includes construction and operation of a new 9 storey building plus 2 basement levels and a plant room to provide:

- A new Emergency Department
- A new Intensive Care Unit
- Short Stay Unit
- Day and Inpatient CCCC oncology units
- Children's Comprehensive Cancer Centre
- Ambulance access, parking, back of house and loading dock services accessed via the lowered Hospital Road
- Integration with the Prince of Wales Acute Services Building and Integrated Acute Services Building, both currently under construction
- Integration with the proposed Health Translation Hub (HTH) which is a facility being developed by UNSW for education, training and research
- Public domain and associated landscaping
- Tree removal
- Utilities services and amplification works;
- Site preparation and Civil works

The project is located on the corner of High Street and Hospital Road, Randwick. The figure below shows the project site plan.

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

1.3 Response to SEARs

The ESD SEAR's report is required by the Secretary's Environmental Assessment Requirements (SEARs) for SSD-10831778. This table identifies the SEARs and relevant reference within this report.

Table 1 – SEARs and Relevant Reference

Ecologically Sustainable Development (ESD) 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.	
SEARs Items	**Project Response to DGR**
Detail proposed measures to minimise consumption of resources, water (including water sensitive urban design) and energy.	The ESD initiatives proposed for The Sydney Children's Hospital Stage 1 and Children's Comprehensive Cancer Centre 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 hospital 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 3.1 Resource Conservation for the proposed ESD initiatives.
Detail how the future development would be designed to consider and reflect national best practice sustainable building principles to improve environmental performance and reduce ecological impact. This should be based on a materiality assessment and include waste reduction design measures, future proofing, use of sustainable and low-carbon materials, energy and water efficient design (including water sensitive urban design) and technology and use of renewable energy."	The Sydney Children's Hospital Stage 1 and Children's Comprehensive Cancer Centre is targeting an equivalent/self-certified 5 Star Green Star rating utilising the Green Building Council of Australia's (GBCA) Design and As-built rating tool (DAB) version 1.3. A 5 Star Green Star rating is considered 'Australian excellence' level. The SCH1/CCCC project will be designed to 5 Star Green Star equivalent benchmark utilising the Green Building Council of Australia's (BCA's) Design and As-built rating tool (DAB) version 1.3. A 5 Star Green Star rating is considered 'Australian excellence' level. The SCH1/CCCC aspires to a 5 Star Green Star Rating or agreed alternative methodology for ESD outcomes. ESD strategies have been proposed in improving the environmental performance of the building, such as improved indoor environment quality, energy and water conservation, renewable energy, waste reduction, management processes, ecology and landscaping and water sensitive urban design. The measures proposed are included in Section 3.1 onwards. The measures will be benchmarked against the performance requirements of the equivalent/self-certified rating.
Include an assessment against an accredited ESD rating system or an equivalent program of ESD performance. This should include a minimum rating scheme target level.	The Sydney Children's Hospital Stage 1 and Children's Comprehensive Cancer Centre is targeting an equivalent/self-certified 5 Star Green Star rating utilising the Green Building Council of Australia's (GBCA) Design and As-built rating tool (DAB) version 1.3. A 5 Star Green Star rating is considered 'Australian excellence' level.

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

Ecologically Sustainable Development (ESD)
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.

SEARs Items	Project Response to DGR
	The self-certification pathway is based on the agreed approach between Health Infrastructure and DPIE in demonstrating an equivalency against the Green Star rating system. 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 3.1 Resource Conservation and section 3.1.2 Water conservation and 3.1.4 Emissions for WSUD.
Include a statement regarding how the design of the future development is responsive to the CSIRO projected impacts of climate change. – Relevant Policies and Guidelines: • NSW and ACT Government Regional Climate Modelling (NARCliM) climate change projections.	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. The Climate Adaptation study will be undertaken during end of Schematic or early Design Development phase of the project. At the current stage, The Sydney Children's Hospital Stage 1 and Children's Comprehensive Cancer Centre 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 Sydney Children's Hospital Stage 1 and Children's Comprehensive Cancer Centre proposes the use of air conditioning. 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 ■ Consideration of recycled water and rainwater reuse 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.

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

Ecologically Sustainable Development (ESD) 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.	
SEARs Items	**Project Response to DGR**
	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.
Include an Integrated Water Management Plan detailing any proposed alternative water supplies, proposed end uses of potable and non-potable water, and water sensitive urban design."	An Integrated Water Management Plan will be developed by the design team. Refer to the Civil design report for measures related to stormwater drainage (run-off and pollution) and flooding. Refer to Section 3.1.4 Emissions for details regarding water sensitive urban design.

1.4 ESD Strategy Development

The higher than usual quantity of stakeholders, in combination with the high sustainable design aspirations, necessitates the need for a greater level of collaboration between stakeholders and the project team. This is ensured by adopting an integrated design process that focuses on the design, construction, operation and occupancy of the building over its complete life cycle.

The ESD initiatives considered are therefore a result of numerous workshops and meetings between all parties, with focussed discussions in three phases:

- **Phase 1:** Identifying the project ESD opportunities, objectives, and priorities.
- **Phase 2:** Defining the project Targets and KPIs.
- **Phase 3:** Further reviews by the design team regarding feasibility, design impact and preliminary costing

Key to the development of the ESD Strategy has been through employing the United Nations Sustainable Development Goals (UN SDGs) as the foundation for the overarching sustainability themes. The UN SDGs identify a holistic set sustainability issues, that address wider issues that can be influenced by the decisions made by the project team.

The outcomes from this process have been considered for the project.

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 being investigated by the design team:

- Exceed the requirements of Section-J of the National Construction Code (NCC) for energy-efficiency in building fabric and building services / systems by 10%.
- The SCH1/CCCC project will be designed to 5 Star Green Star equivalent benchmark utilising the Green Building Council of Australia's (BCA's) Design and As-built rating tool (DAB) version 1.3. A 5 Star Green Star rating is considered 'Australian excellence' level. The SCH1/CCCC aspires to a 5 Star Green Star Rating or agreed alternative methodology for ESD outcomes.

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 Sydney Children's Hospital Stage 1 and Children's Comprehensive Cancer Centre 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 v1.3

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 SCH1/CCCC project will be designed to 5 Star Green Star equivalent benchmark utilising the Green Building Council of Australia's (BCA's) Design and As-built rating tool (DAB) version 1.3. A 5 Star Green Star rating is considered 'Australian excellence' level The SCH1/CCCC aspires to a 5 Star Green Star Rating or agreed alternative methodology for ESD outcomes.

The self-certification pathway is based on the agreed approach between Health Infrastructure and DPIE in demonstrating an equivalency against the Green Star rating system.
Refer to Section 3.0 for further details in relation to the sustainability measures incorporated in the project.

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

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 Sydney Children's Hospital Stage 1 and Children's Comprehensive Cancer Centre, the key priorities to support the functional demand i.e. a Patient recovery, resource efficiency, are as follows:

- The promotion of natural daylight and views;
- High levels of IAQ (Indoor Air Quality);
- Creation of healing environments;
- Thermal, Visual and Acoustic comfort; and
- Resource conservation (energy and water) and waste reduction.

The promotion of natural daylight – There is a direct correlation between access to daylight and patient recovery times, staff attention, productivity and general wellbeing;

Indoor Air Quality (IAQ) – In a similar manner to daylight, there is a correlation between occupant wellbeing, patient recovery time and staff retention. Principle strategies include:

- 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.

Creation of Healing Environments – Healing environments are a critical component for healthcare and hospital facilities. Healing environments with good natural daylight and thermal comfort have shown to increase patient recovery times, which is key attribute of a sustainable hospital.

Excellent Thermal, Visual and Acoustic comfort:

- Thermal comfort: Patients, staff and occupants are not subject to unacceptable extremes in temperatures as they recover, work and visit patients;
- Visual comfort: Achieve a quality of natural light that supports patient recovery and staff and visitor wellbeing. In design for natural daylight, consideration must be given to daylight uniformity, penetration depth, solar heat ingress and glare control;
- Acoustic comfort: To ensure Noise from ventilation systems is eliminated, external and internal disruptive noise affecting spaces and to maintain privacy.

Resource conservation (energy, water) and waste reduction – In delivering on the functional demands of a hospital (high levels of daylight, thermal comfort, visual comfort, and IAQ), incurs resource use through the optimisation of these attributes. Furthermore, the laboratory nature of the building will mean an energy and water intensive building.

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

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 3.1).

The above approach has been taken to ensure the ESD strategies proposed meet the SEARs and targets/benchmarks discussed in the previous section (section 2.0).

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

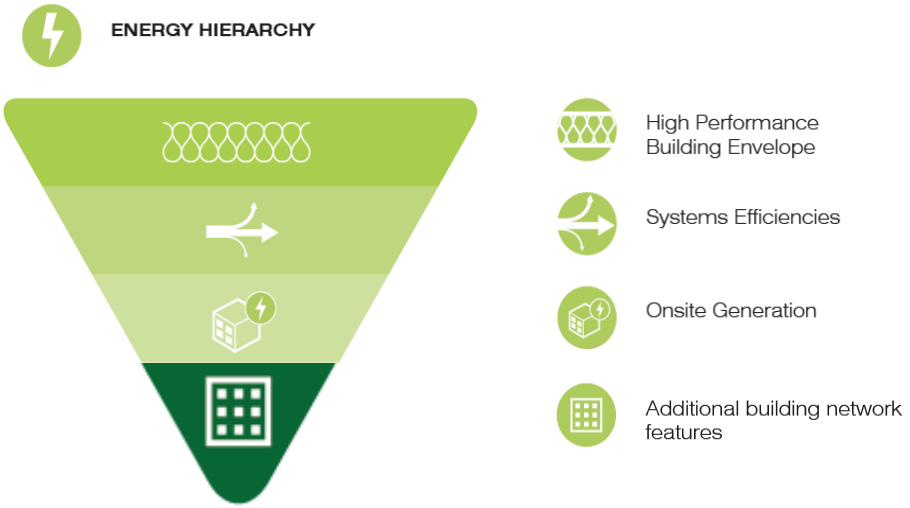
3.1 Resource Conservation

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 are being considered for The Sydney Children's Hospital Stage 1 and Children's Comprehensive Cancer Centre:

- **Building Form** has been designed with consideration of façade access for greater access to natural daylight.

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

Daylight and views are critical for a patient recovery, and hence a large percentage of patient wards have been oriented facing north and south, which offer greater access to daylight and views without significant solar control devices required to restrict unwanted solar heat gains.

- **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.

- **Building energy performance improvement -** Energy modelling will be undertaken using the BCA Section J, JV3 energy modelling guidelines. The energy modelling will aim to achieve 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 investigated for spaces so that AV, lighting and mechanical systems can be shut down both manually and automatically when unoccupied.

- **Possibility of roof and building mounted solar photovoltaic (PV) cells** are under consideration with further detailed assessments to be undertaken. Energy generated can be used onsite.

- **High efficiency HVAC** which includes chillers, boilers, fans, pumps and heat rejection.

- **CO2 monitoring / Demand Controlled Ventilation** will be considered**.**

- **Metering and Monitoring** will be included in the design to monitor energy consumption for ongoing building reporting and tuning.

- **Fume Cupboard Management** (recirculating air in fume cupboards) will be proposed for to assist with reducing HVAC energy use in laboratories.

Level 8, 9 Castlereagh Street
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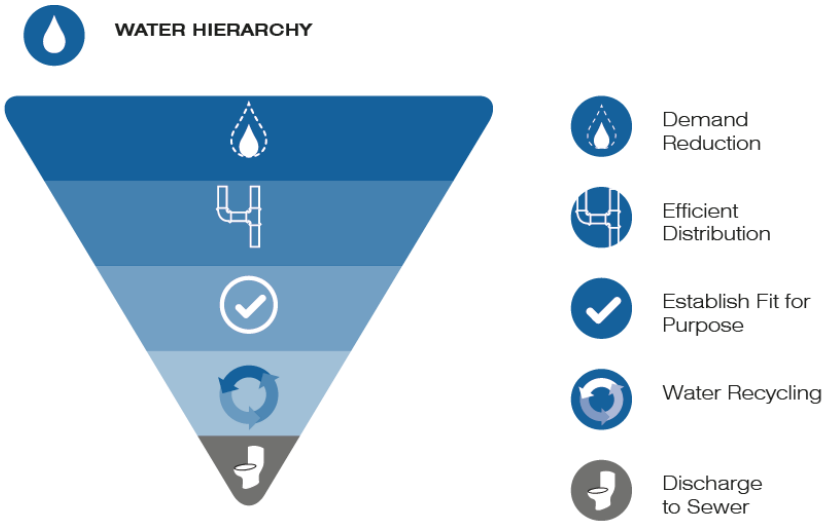
3.1.2 Water Conservation

The following water hierarchy has been applied, along with the following strategies being considered:



- **Water efficient fixtures / fittings** will be specified. These include fittings such as taps, showerheads, toilets, zip taps, dishwashers etc certified under the Water Efficiency Labelling and Standards (WELS) rating scheme;
- **Passive irrigation of garden beds** through grading and wicking beds.
- **Plant species** selection is primarily endemic and native, selected for low maintenance and low watering requirements;
- **Recycled Water / Rainwater Harvesting and Reuse** – Recycled water and rainwater harvesting and reuse systems will be considered. Reuse options include landscape irrigation. Potential reuse options will be considered however are reliant on water quality.
- **A separate fire services water tank** will be considered to capture fire system test water for storage and re-use.

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. A whole life cycle approach to materials will be taken.

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

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

- **Use sustainable timber-** timber products used for concrete formwork, structure, wall linings, flooring and joinery will be considered and 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 will consider the use of Portland cement reduction through fine and coarse aggregate substitutions. Fine and coarse aggregate substitutes include manufactured sand or other alternative materials.

- **High recycled content or recyclability** – Furniture items with high recycled or recyclability content have been considered.

3.1.4 Emissions

The 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 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 consider rainwater reuse (refer to section 3.1.2) and storm water management.

  Surface stormwater will be directed into garden beds where practical, to provide passive irrigation, reduced stormwater outflow and moisture retention in the soil.

  The project will also incorporate an Onsite Stormwater Detention (OSD) system, as this is required by Randwick City council.

3.1.5 Other Key measures

The following measures have been considered for The Sydney Children's Hospital Stage 1 and Children's Comprehensive Cancer Centre. 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

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

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.
- **Dedicated Waste storage** is being considered to the separation and collection of recyclable waste.
- **Low emissions transport infrastructure** has been considered to create a clean air zone, including electrical vehicle charging.
- **Cycle parking and proposed shared access Campus wide EoT facilities** – bicycle parking racks, changing and shower facilities and lockers will be considered for staff.