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

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SUSTAINABLE DESIGN

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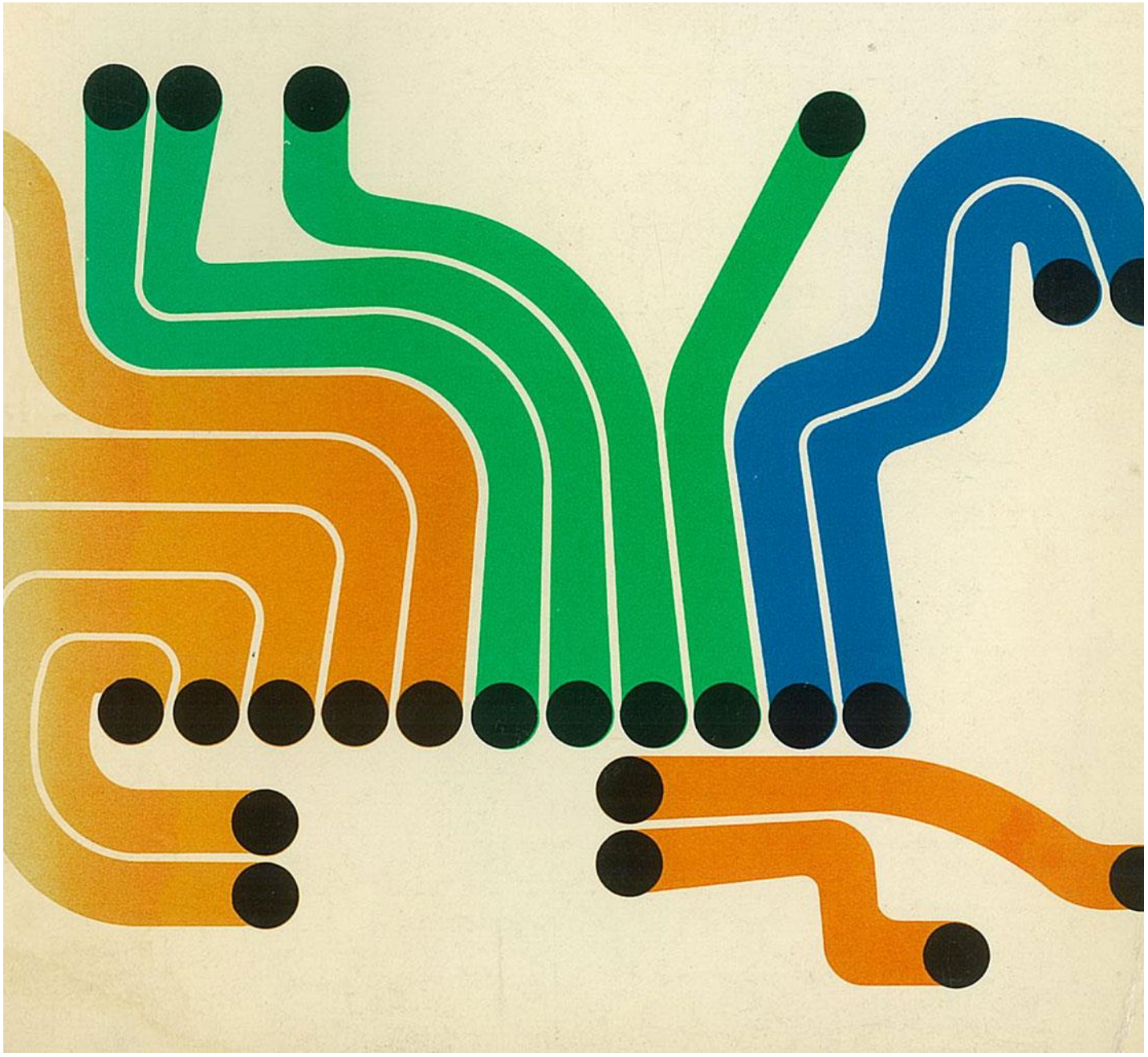
Paediatric Services Building at The Children's Hospital at Westmead
ESD SSD Report



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1.0 Introduction

1.1 Proposed Development

The proposal seeks consent for the construction of a new Paediatric Services Building (PSB) to be located adjacent to the CASB (Central Acute Services Building), and on the site of the decommissioned P17 car park, including development of the Hawkesbury Road forecourt and access links. This includes works associated with CHW forecourt on Hawkesbury Road to provide improved community amenity in the form of a new front entry, improved street frontage and enable a more cohesive main entrance connecting existing CHW, adjoining research facilities, and the PSB.

The scope of proposed works includes:

Construction of the main PSB:

- The main PSB may contain the following uses: perioperative and interventional services, neonatal and paediatric intensive care units, cancer centre, acute inpatient beds, back of house and parent facilities; and
- Alterations and additions to existing CHW KR and CASB buildings adjoining PSB site area to accommodate floor realignment and movement corridors
- Construction of a new pedestrian canopy link through KR, connecting the main PSB with the CHW forecourt and existing hospital entrance
- The canopy link is to be lifted 2 storeys above the CHW forecourt
- A new ground plane / forecourt landscaped area extending from Hawkesbury Road to the proposed PSB
- Tree removal to accommodate the construction of the PSB

1.2 Response to SEARs

The ESD SEAR's report is required by the Secretary's Environmental Assessment Requirements (SEARs) for SSD-10349252. 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 PSB at The Children's Hospital at Westmead 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 hospital aligns with the ecological sustainable development principles of Clause 7(4) of Schedule 2 of the Environmental Planning and Assessment Regulation 2000.

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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**
	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 PSB at The Children's Hospital at Westmead 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. 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 PSB at The Children's Hospital at Westmead 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 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 PSB at The Children's Hospital at Westmead 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.

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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 PSB at The Children's Hospital at Westmead 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 ■ 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. **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.

1.3 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:

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- **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.

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2.0 Targets / Benchmarks

In addition to the Secretary's Environmental Assessment Requirements (SEARs), the following environmental targets are being investigated by Health Infrastructure (HI):

- 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 project is investigating a 10% energy improvement, it is understood that the uplift in energy performance between the NCC 2016 and NCC 2019 is significant and may not be achievable.
- Achieve a certified 5 Star self-certified/equivalency rating against the GBCA's Design and As-built version 1.3 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 PSB at The Children's Hospital at Westmead 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 PSB at The Children's Hospital at Westmead is targeting a self-certified/equivalent 5 Star Green Star rating 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 self-certification pathway is based on the agreed approach between Health Infrastructure and DPIE in demonstrating an equivalency against the Green Star rating system.

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Refer to Section 3.0 for further details in relation to the sustainability measures incorporated in the project.

2.3 Green Star Performance v1.3

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 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.

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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 PSB at The Children's Hospital at Westmead, 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. 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).

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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.

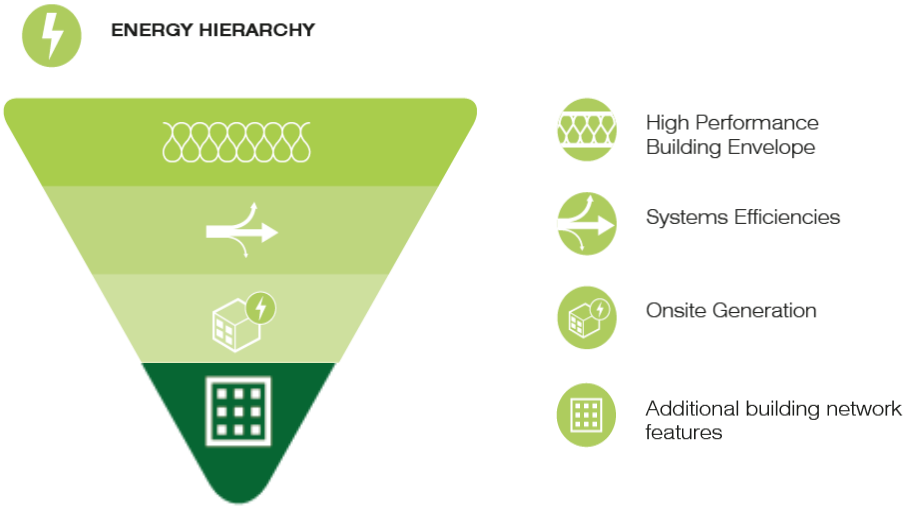
3.1 Resource Conservation

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 PSB at The Children's Hospital at Westmead:

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

  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.

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- **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** have been considered. 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.

3.1.2 Water Conservation

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

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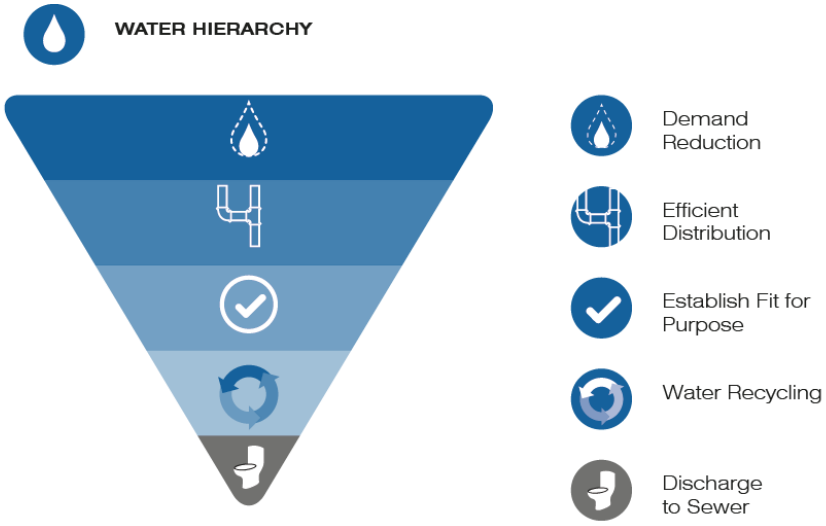

- **Water efficient fixtures / fittings** will be specified. These include fittings such as taps, showerheads, toilets, zip taps, dishwashers etc certified under the WEL rating scheme;
- **Passive irrigation of garden beds** through grading and wicking beds.
- **Plant species** selection is primarily 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 and stored for 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:

- **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.

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- **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

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 incorporate rainwater reuse (refer to section 3.1.2) 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) will not be included in the project as restricting discharge is not intended. OSD has not been included given the proximity of the hospital to the Toongabbie Creek, and its location at the downstream end of the wider catchment. Restricting runoff in this scenario will likely increase the flood risk, as delaying run-off is more likely to coincide with the peak flood level.

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

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3.1.5 Other Key measures

The following measures have been considered for the PSB at The Children's Hospital at Westmead. 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.

- **Dedicated Waste storage** is being considered to the separation and collection of recyclable waste.

- **Low emissions transport infrastructure** have been considered to create a clean air zone, including electrical vehicle charging.