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

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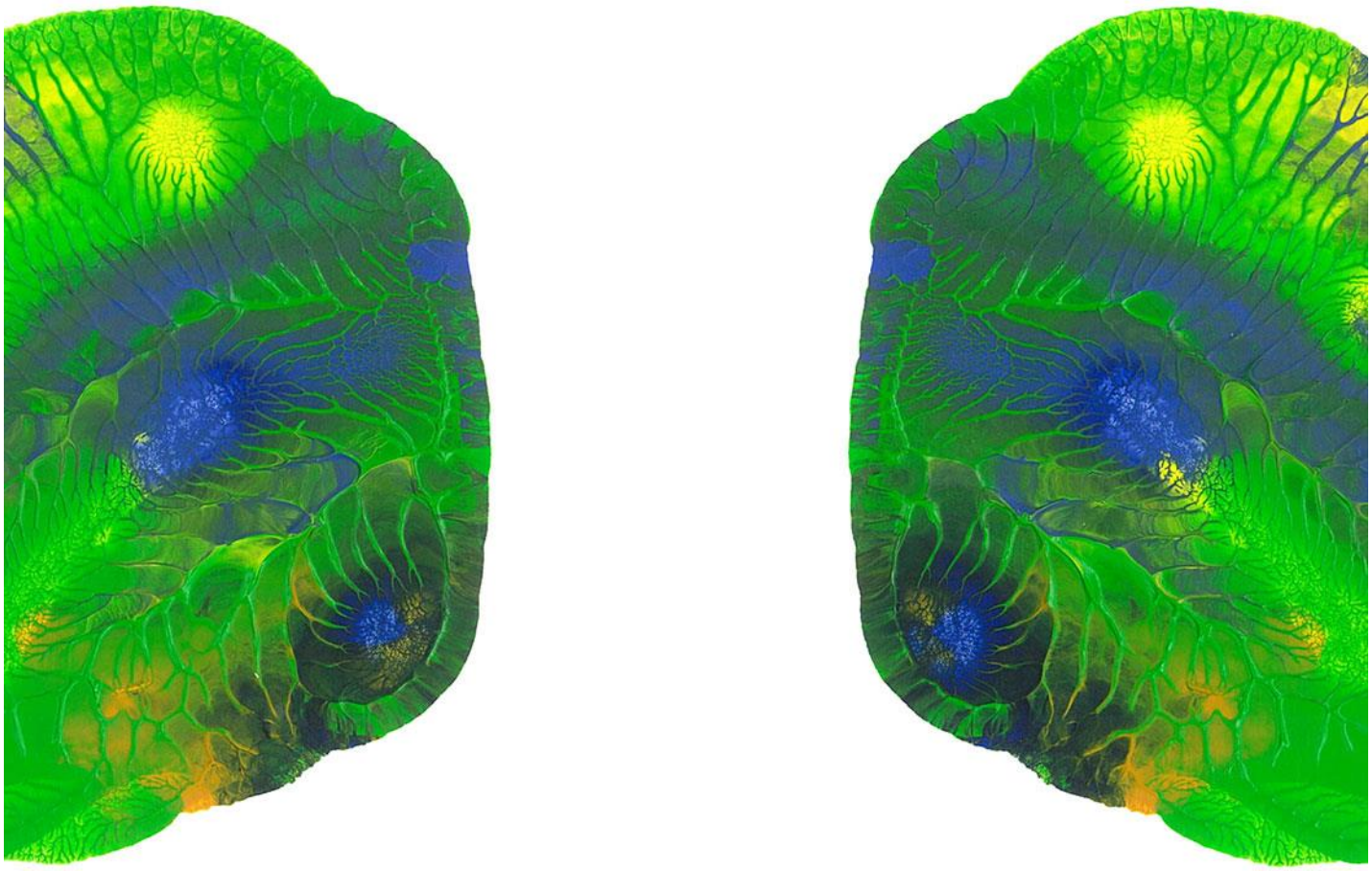
SUSTAINABLE DESIGN

STEENSEN VARMING

Narrabeen Education Precinct ESD Report (DA)



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1.0 Executive Summary

This report has been prepared for the Narrabeen Education Precinct, located at 6 and 10 Namona Street, North Narrabeen, within the local government area of Northern Beaches Council, to form part of the Development Application (DA) submission. The proposed Narrabeen Education Precinct development includes redevelopment of Narrabeen North Public School (NNPS) and Narrabeen Sports High School (NSHS). Both NNPS and NSHS have been identified by the NSW Department of Education (DoE) as requiring upgrade works.

The purpose of this report is to outline the Sustainability objectives of the project and provide an overview of how the proposed design for NNPS and NSHS would address sustainability principles, through all stages of design, construction, and operation of the facility. The design is driven by a holistic approach to Environmentally Sustainable Design (ESD), as outlined in Section-2 of this report.

Following are some of the key strategies being addressed by the proposed design:

- Incorporate a high-performance building envelope, to ensure energy efficiency as well as occupant comfort (including optimised indoor air quality, thermal, acoustic and visual comfort) for both student and staff areas
- Incorporate appropriate passive and active design strategies to ensure a low-energy as well as low-maintenance outcome
- Adopt water sensitive urban design principles
- Adopt practices to minimise demolition, construction and operational waste including diverting at least 80% of demolition and construction waste away from landfill; and
- Incorporate materials that have a reduced-environmental impact. Preference will also be given to internal surface finishes with low-emitting materials in terms of volatile organic compounds and formaldehyde emissions.

In terms of overall sustainability performance, the current design scheme is aspiring to achieve a high environmental performance outcome, to exceed standard industry-practice. Strategies include the following:

- An improvement of at least 10% above the Deemed-to-Satisfy provisions of the National Construction Code (NCC 2019) energy efficiency provisions (Section-J), is being targeted for the building-envelope performance as well as the whole-building energy consumption.
- Designing towards meeting the Environmentally Sustainable Design (ESD) requirements listed in the Educational Facilities Standards and Guidelines (EFSG), developed by the School Infrastructure New South Wales (SINSW).
- Obtaining guidance from the Green Star Design and As-Built (DAB) V1.3 tool developed by the Green Building Council of Australia (GBCA).

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2.0 Proposed development

2.1 Proposal

The proposed Narrabeen Education Precinct development includes redevelopment of Narrabeen North Public School (NNPS) and Narrabeen Sports High School (NSHS). The Public School and High School have been identified by the NSW Department of Education (DoE) as requiring upgrade works.

The works at NNPS upgrade the school including demolition of existing buildings (Blocks H and J), construction of three (3) new buildings with refurbishment of three (3) existing buildings (Blocks B, K and V).

The works at NSHS upgrade the school including addition of new two (2) storey extension to Building A, construction of new single storey amenities building and refurbishment of four (4) existing buildings (Buildings A, B, C and K).

This Development Application (DA) will seek consent for the following works at NNPS & NSHS:

The works the subject of the Development Application (DA) at NNPS comprise:

- Construction of a new two (2) storey building containing administration facilities, multi-purpose hall and out-of-school-hours care (OSHC) facility on the ground floor with staff facilities and amenities on the first floor; and
- New Covered Outdoor Learning Area (COLA).

The works the subject of the DA at NSHS comprise:

- Alterations and additions to Building A (Gymnasium) to create new stage for gymnasium and new two (2) storey addition comprising canteen, boys and girls changing rooms and staff room on the ground floor; and movement studio and two (2) new General Learning Spaces (GLS) on the first floor.

Other development works are occurring on the site under separate planning pathways including:

- Development without consent (REF); and
- Exempt development

The proposed development does not seek to increase staff or student numbers.

2.2 Site Description

The subject sites are located at 6 and 10 Namona Street, North Narrabeen (referred to as the Narrabeen Education Precinct) and falls within the local government area of Northern Beaches Council. The Narrabeen Education Precinct has a total area of 9.84 hectares.

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Narrabeen North Primary School (NNPS) is located on the northern side of Namona Street, North Narrabeen and is legally described as Lot 3 Deposited Plan (DP) 1018621. NNPS is surrounded by residential dwellings to the east, grassed sporting fields (Warriewood Valley Sportsground) to the north and Northern Beaches Indoor Sports Centre to the west. NNPS contains two (2) Binishell domes (Block A and Block B) which are identified as a local heritage item under the *Pittwater Local Environmental Plan 2014*. The two (2) Binishell Domes are listed as State significant on DoE's Section 170 Heritage and Conservation Register. The Double Binishell Dome (Block B) is listed on the State Heritage Register (SHR).

Narrabeen Sports High School (NSHS) is located on the southern side of Namona Street and is legally described as Lot 12 DP 1119562. NSHS is surrounded by Pittwater Road to the east, Pittwater Sports Centre to the south and Mullet Creek to the west.

Figure 1 Site Aerial Map, Source: Nearmap

2.3 NEP site plan

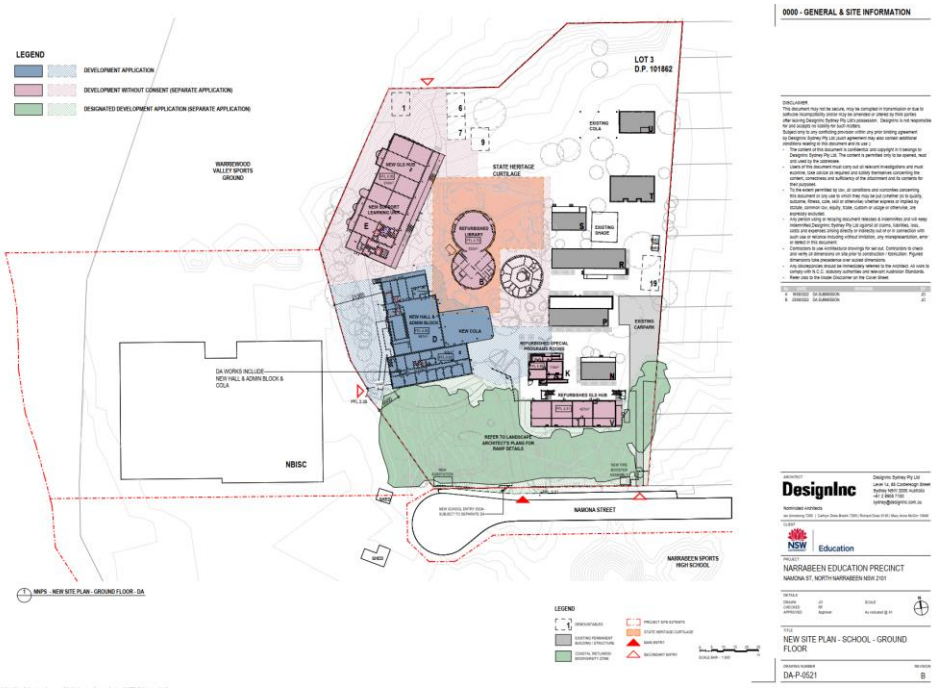

Figure 2 Site Plan of Narrabeen North Public School

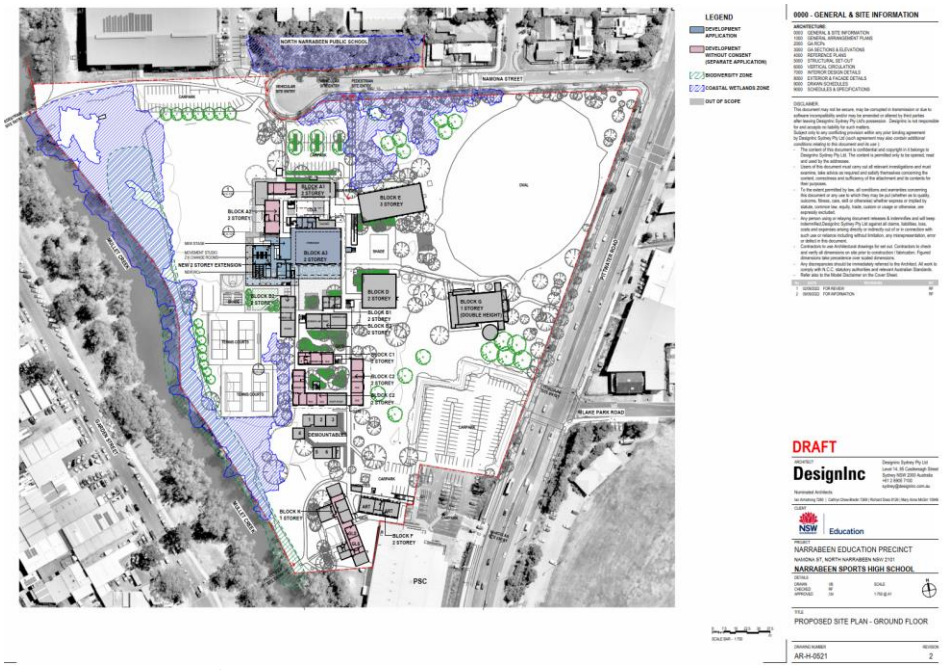

Figure 3 Site plan of Narrabeen High School

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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 Narrabeen Education Precinct, School Infrastructure NSW (SINSW) has a strong focus on sustainability, and this has been a key project priority for the design team. This report outlines the key ESD opportunities and initiatives to be implemented on the NNPS and NSHS project. The strategies presented in this report are based on the current architectural design developed by DesignInc Architects.

The key ESD priorities for NNPS and NSHS are as follows:
- The promotion of daylighting
- Provision of excellent indoor air quality (IAQ)
- Ensure a high level of occupant comfort (thermal, visual, and acoustic comfort)
- Resource conservation (energy, water, and waste); and
- Utilise environmentally preferable building materials
- Development of the building as a sustainability teaching tool
- Address the requirements for climate change adaptation and resilience

- **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 considered 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 always be achieved, noise from ventilation systems, external and internal disruptive noise affecting classrooms is minimised.

- **Resource conservation (energy, water and waste)** – In delivering on the functional demands of an educational building (high levels of daylight, thermal

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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 section 3 of this report.

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

- **Climate change adaptation and resilience** - The project will seek to identify and develop strategies to increase the resilience of the Narrabeen Education Precinct in response to potential risks arising from climate change. The latest available global climate models show that in the coming decades, Australia is projected to experience the following:

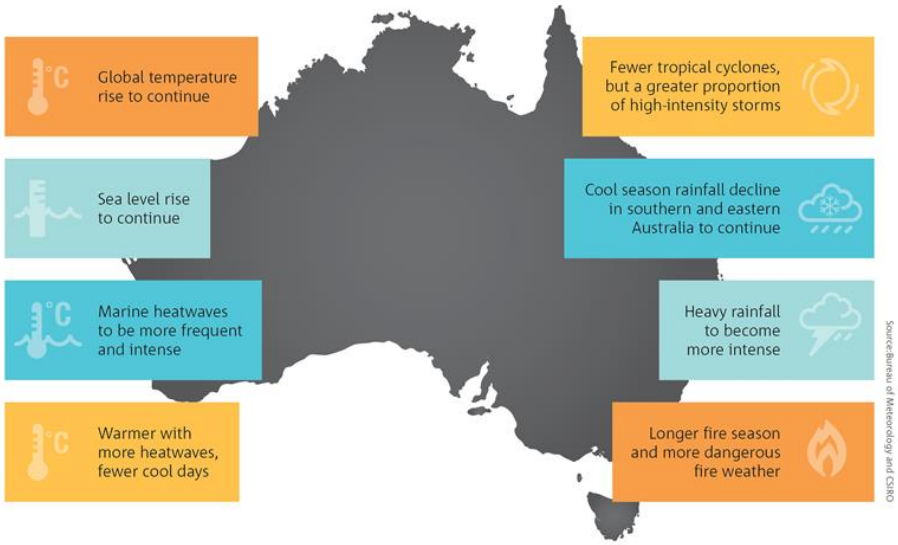

Figure 4 Summary of climate change projections for Australia (Source: CSIRO)

The below climatic variables will be considered to develop a resilience strategy for the Narrabeen Education precinct.

- Temperature
- Relative Humidity
- Precipitation
- Fire weather/Bushfires
- Drought
- Flood
- Solar Radiation
- Evapotranspiration
- Soil Moisture
- Wind
- Sea-level rise
- Cyclones

Considering the above, the project will analyse key risks arising from climate change projections for the parts of the project affected, as well as mitigation strategies to eliminate or reduce such risks as much as possible.

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4.0 Key Strategies

The following sections provide an overview of the resource conservation hierarchy approach that is considered by the proposed design.

4.1 Energy

Proposed approach to energy related systems is based on applying an energy hierarchy methodology. The energy hierarchy methodology has the reduction of energy use as its 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.

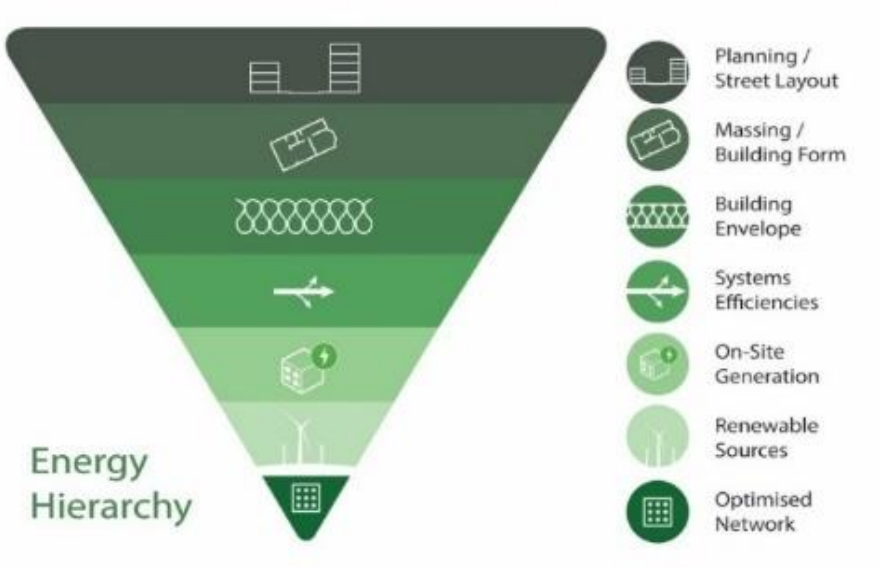

Figure 5 Energy hierarchy

The following initiatives are being considered for the proposed design:

- **Passive design** strategies are employed to achieve a climate-responsive building envelope. Consideration is given to optimisation of orientation, solar access, prevailing winds, for enabling greater access to natural daylight and opportunity for natural ventilation.
- **High performance building envelope** is being achieved via the following considerations:
  - **Glazing ratios** are optimised to achieve an equilibrium between allowing daylight to enter buildings while reducing solar and conductive heat gains
  - **Window positions are optimised** to block unwanted solar radiation, while allowing visible light and possibility for natural ventilation
  - **External Shading** – is incorporated to restrict unwanted heat gains within spaces, while allowing daylight access. Deciduous trees are also utilised to help shade direct solar ingress.

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  - **Building air tightness** – Doors leading to conditioned spaces are designed to close automatically to maintain airtightness, and thereby reduce unwanted heat transfer during peak summer and winter conditions.
  - **Thermal Mass** – Incorporate exposed thermal mass, where feasible, to reduce the rate of change of temperatures within buildings and reduce the peak heating and cooling demands
  - **Daylighting** – Fenestration design is aimed at optimising daylight availability
  - **Mixed Mode Ventilation** strategy is considered for enabling provision of optimum indoor air quality, whilst also reducing energy consumption associated with air-conditioning. When external and internal conditions are favourable, external windows to each building / space can open to facilitate natural ventilation.
- **Zoning of HVAC and lighting services** – Zoning of HVAC and lighting services will be incorporated to avoid energy wastage. Occupancy sensors (motion detectors) will be provided in all primary spaces, to detect when the space is unoccupied, and thereby turn off the electrical lighting and mechanical systems.
- **High efficiency HVAC** (Heating, Ventilation & Air-conditioning) and lighting systems to be incorporated.
- **Occupancy controls** will be provided to spaces so that AV, lighting, and mechanical systems can be shut down both manually and automatically when unoccupied where appropriate.
- **Metering and Monitoring** of energy, water, and air quality to promote awareness of resource usage and resource efficiency
- **On-site renewables** –Roof-mounted photovoltaics are being considered as part of the current design, as it has the potential to reduce the peak energy demand of the building. The project aims to promote the switch to renewable energy and building electrification.

4.2 Water

Water efficiency is another key aspect of sustainable design. For the project, major uses of water would include landscape irrigation; and general water demand (domestic hot and cold water, toilet flushing and cleaning/maintenance). The following strategies are being considered to reduce water consumption, in accordance with the water hierarchy illustrated in Figure 4.

- **Efficient fixtures / fittings**: Installation of high-efficiency fixtures and fittings, within one star of the best available WELS rating
- **Low-water landscaping** - Landscaping to consist of low-water demand species and xeriscaping
- **Rainwater Reuse** - Rainwater collection and reuse systems is being considered

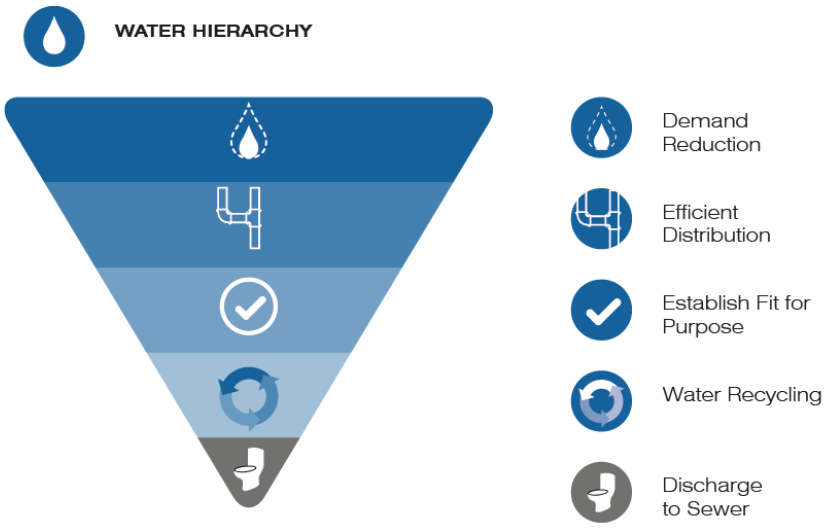

Figure 6 Water hierarchy

4.3 Materials

Selection of environmentally preferable materials is a key priority for the project. Preference will be given to materials that are non-toxic, contain high-recycled content and/or highly recyclable. The following strategies are being considered:

- **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 to be considered.
- **Site waste management plan** – During the demolition and construction phase, a project-specific site waste management plan (WMP) will be developed and implemented, for recycling of demolition and construction waste.
- **Low-impact construction methods** such as prefabrication and designed for manufacture and assembly (DfMA) shall be applied where possible. Prefabricated structures built in purpose-built factories are less labour intensive, more time efficient, and produce less waste compared to

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traditional onsite construction methods. Raw materials and construction elements are not exposed to the elements, which ensures high quality in the final building, and the construction process is less weather dependant.

4.4 Emissions

Proposed design aims to minimise all forms of emissions, including watercourse pollution, light pollution and ozone depletion. The following initiatives are being considered to preserve site quality and reduced stormwater pollution:

- **Storm water pollution prevention -** This would include implementation of measures to prevent storm water contamination, to control sedimentation and erosion during construction and operation of the building.

- **Pollution of night sky** will be minimised by ensuring that the electric lighting within the site will not cause any direct beam of light into the night sky. Light pollution can disturb the habitat of migratory birds and impacts the behaviour of nocturnal animals in the site vicinity.

- **Emissions from HVAC refrigerants** and insulation products have the capacity to damage the ozone layer. For the proposed design, refrigerants with low ODP will be specified and installed within all the proposed HVAC systems.

4.5 Waste reduction

The following initiatives are being considered to minimise waste during construction and operation phases:

- **Construction waste management** - During the construction phase, a project-specific construction waste management plan (WMP) will be developed and implemented by the Head contractor. This is to divert construction and demolition waste disposal away from landfills. The sub-contractors will be instructed to send the recyclable resources recovered from the debris, back to manufacturing processes for recycling / reuse.

- **Operational waste management** - To ensure recycling of operational waste, a dedicated storage space will be provided for locating recycling bins.