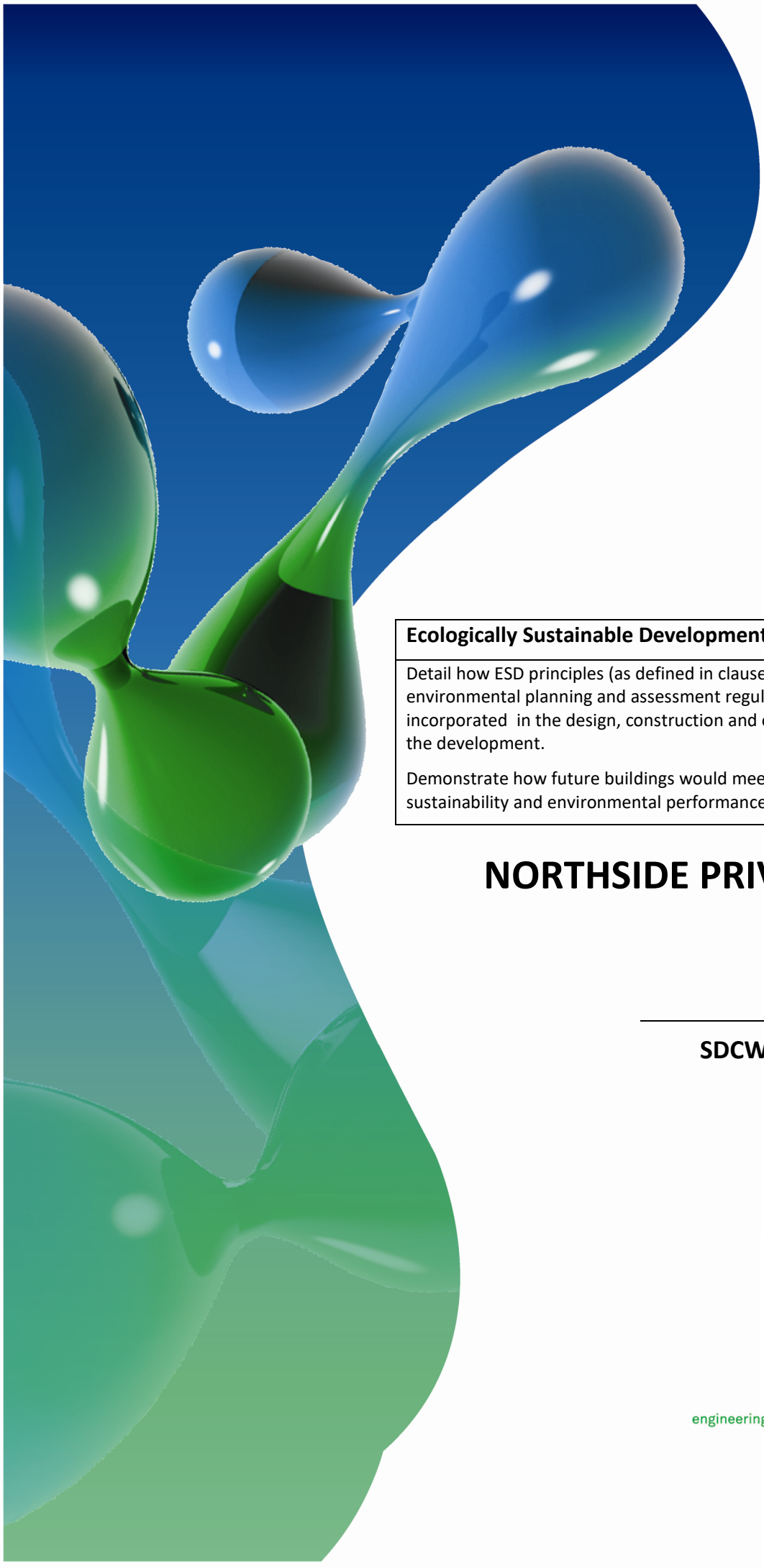

ESD REPORT

Ecologically Sustainable Development (ESD)
Detail how ESD principles (as defined in clause 7(4) of schedule 2 of the environmental planning and assessment regulation 2000) will be incorporated in the design, construction and ongoing operation phases of the development. Demonstrate how future buildings would meet or exceed minimum building sustainability and environmental performance standards.

NORTHSIDE PRIVATE HOSPITAL

Gosford, NSW

SDCW0101-Northside Private-Hospital ESD-RP001

Report Date: 30/08/2019

Umow Lai

engineering sustainable environments

REPORT AUTHORISATION

PROJECT: Northside Private Hospital

Gosford, NSW

Date	Rev	Comment	Prepared by	Checked by	Authorised by
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1.0 INTRODUCTION

1.1 GENERAL

This ESD Report has been prepared by Umow Lai on behalf of Northside Private Hospital (the 'Applicant'). It accompanies an Environmental Impact Statement (EIS) prepared in support of State Significant Development Application SSD-10159 for the development of Northside Private Hospital medical precinct at Racecourse Road, Gosford, NSE (the 'Site').

The purpose of this ESD Report is to outline the measures that are proposed to be implemented to minimise consumption of resources, energy and water, and to demonstrate that the project would meet or exceed minimum building sustainability and environmental perfroamce standards.

The sustainability initiatives proposed for the development including water and energy efficiency initiatives are in addition to the minimum compliance requirements of the BCA (i.e. Section J).

As a result of the sustainability initiatives discussed within this report, the Northside Private Hospital development is expected to achieve a high level of environmental sustainability.

1.2 PROJECT DESCRIPTION

The following aims and objectives have been identified as forming the basis of the proposed development of the subject land to accommodate the proposed private hospital:

- Deliver a new private hospital to meet the significant demand that exists in the Central Coast;
- Design the site to create a high-quality hospital for both staff and patients;
- Respond to the current and projected growth of Gosford and the Central Coast with the delivery of a private hospital;
- Ensure minimal environmental impact; and
- Ensure development is compatible with surrounding development.

The proposal seeks approval for the redevelopment of the site to construct Northside Private Hospital. Specifically, the proposed private hospital would include; medical suites, in-patient units, general practitioner clinics, radiology rooms, intensive care unit and operating theatres. Further to this, the proposed private hospital will incorporate ground floor retail units and associated mezzanine level, ground floor and basement car parking. The proposed private hospital would comprise of 24,844m² of gross floor area (GFA).

1.3 REFERENCED STANDARDS

This report has been undertaken with reference to the following:

- Clause 7(4) Schedule 2 of the Environmental Planning and Assessment Regulation 2000 (EP&A Regulations)
- NCC 2019 Building Code of Australia – Volume 1
- Gosford City Centre Development Control Plan 2018 (GCC DCP)
- SEARS & CSIRO Requirements

1.4 SOURCE DOCUMENTATION

The project's architectural documentation has been used in preparation of this report. Inputs have also been coordinated with all relevant Consultants.

1.5 LIMITATIONS OF THIS REPORT

Due care and skill has been exercised in the preparation of this report.

The purpose of this ESD Report is to outline the measures that are proposed to be implemented to minimise consumption of resources, energy and water, and to demonstrate that the project has been assessed against a suitable accredited rating scheme, as detailed within the EIS. It should be read in conjunction with the current project documentation and specific applications may vary during the design development of the project.

No responsibility or liability to any third party is accepted for any loss or damage arising out of the use of this report by any third party. Any third party wishing to act upon any material contained in this report should first contact Umow Lai for detailed advice which will take into account that party's particular requirements.

2.0 SCHEDULE 2 OF EP&A REGULATION 2000

The followings section details how the proposed Northside Private Hospital incorporates the principles of ecologically sustainable development (ESD) in accordance with Schedule 2 Clause 7(4) of the *Environmental Planning and Assessment Regulation 2000* (EP&A Regulation).

2.1 THE PRECAUTIONARY PRINCIPLE

Per Schedule 2 Clause 7(4) of the EP & A Regulation:

*(a) the **"precautionary principle",** namely, that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation. In the application of the precautionary principle, public and private decisions should be guided by:*

(i) careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment, and

(ii) an assessment of the risk-weighted consequences of various options.

2.1.1 PROJECT RESPONSE

The precautionary principle has been adopted and all potential impacts have been considered and mitigated where a risk is present, as outlined in this report and any accompanying documentation.

The built form embraces sustainable design principles as it has been planned to maximise the passive (i.e. energy free) performance of the building. This is achieved by orientating the building along the East-West axis and providing a relatively shallow plan to allow daylight to penetrate across the floor plate. External shading on the North façade aids reducing the load and energy consumption of the cooling system.

Stormwater design will ensure post-development peak event discharge rates do not exceed pre-development rates and design development will explore the feasibility for all rainwater from new roofs is to be captured and re-used on site for irrigation and building services. Roof materials and colours will also be carefully selected in order to contribute to a cooler microclimate and mitigate any potential for the 'Heat Island Effect'.

Building services, lighting and equipment will be specified to be highly energy efficient using current best practice approaches and products.

Whilst a comprehensive climate risk assessment has not been carried out on this site, any potential future climate-driven risks relating to this site have been considered, with the highest risk being an increase in maximum temperatures and the length and frequency of heat events.

In relation to any predicted increases in temperatures, the current concept design pays particular attention to addressing high external heat loads by proposing measured glass to façade ratios and other passive measures to support energy efficient mechanical solutions. Design development will further explore options for enhancements to the building thermal envelope through increased insulation, high-performance glazing, detailing of the building fabric to minimise unwanted infiltration and careful consideration of thermal mass.

Therefore the design directly addresses Greenhouse Gas Emissions (GHG Emissions) and their impact on climate change.

2.2 INTER-GENERATIONAL EQUITY

Per Schedule 2 Clause 7(4) of the EP & A Regulation:

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

2.2.1 PROJECT RESPONSE

Good architecture often outlasts the architect, great architecture may endure ten times as long. The impact of architecture on its environment is enduring and significant. What architects do today will shape the environment for future generations. Northside hospital has embodied this approach by proposing a keystone building for the Northside Medical precinct. The building acts as a gateway, welcoming visitors to the precinct and into Gosford.

The concept design has embraced Wellbeing of Occupants as a fundamental requirement by focusing on delivering fresh air, quality acoustics, and low toxicity materials and finishes.

The proposed design places an emphasis on daylight access that will result in the project actively engaging its occupants with their surroundings, considered a key factor in the link between building design and occupant wellbeing – commonly referred to as our 'biophilic response'.

The building targets high levels of energy efficiency and low operational energy consumption. A low energy building minimises the GHG gas emissions during use. GHG Emissions are a known key contributor to human-caused climate change, considered one of the most critical inter-generational issues of our time. By addressing this at an early stage the building aims to "meet the needs of the present without compromising the ability of future generations to meet their own needs" the a key takeaway from the infamous Brundtland Report. [1]

2.3 CONSERVATION OF BIOLOGICAL DIVERSITY AND ECOLOGICAL INTEGRITY

Per Schedule 2 Clause 7(4) of the EP & A Regulation:

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

2.3.1 PROJECT RESPONSE

By selecting a brownfield site to be redeveloped the project enables sites of a biodiverse nature protection from development. The proposed works have minimal impact on existing vegetation and biological communities on the site, moreover the intended works include re-instating additional site vegetation. The landscape design will consider a range of initiatives to enhance the biodiversity on the site. Refer to the landscape architectural package for more information on proposed landscape.

[1] Our Common Future ('Brundtland Report'). 1987. Brundtland. G et al.

2.4 IMPROVED VALUATION, PRICING AND INCENTIVE MECHANISMS

Per Schedule 2 Clause 7(4) of the EP & A Regulation:

*(d) **"improved valuation, pricing and incentive mechanisms"**, namely, that environmental factors should be included in the valuation of assets and services, such as:*

(i) polluter pays, that is, those who generate pollution and waste should bear the cost of containment, avoidance or abatement,

(ii) the users of goods and services should pay prices based on the full life cycle of costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any waste,

(iii) environmental goals, having been established, should be pursued in the most cost effective way, by establishing incentive structures, including market mechanisms, that enable those best placed to maximise benefits or minimise costs to develop their own solutions and responses to environmental problems.

2.4.1 PROJECT RESPONSE

The environmental targets for the project have largely been embedded in the nature of the development rather than as additional 'add-on' items. For example, the proposed areas will have a high degree of thermal efficiency and careful considerations has been given to incorporate excellent distribution of daylight and optimisation of mechanical ventilation systems throughout the medical areas - reducing ongoing operating costs for the hospital. A utility monitoring strategy is also proposed for on-going management of energy and water consumption.

A reduction in waste directed to landfill will be realised through planned waste management strategies and as such a cost saving may be realised. Further cost savings will be achieved by a reduction in potable water consumption via rainwater harvesting and re-use. Finally, by ensuring the total volume of stormwater discharge is not increased this development will place no greater strain on existing infrastructure, thus negating the need to upgrade said infrastructure. The cost of which ultimately gets passed onto the rate payer in the medium to long term.

3.0 GOSFORD DEVELOPMENT CONTROL PLAN 2018

The followings section details how the proposed Northside Private Hospital responds to Chapter 5 (Built form) and 8 (Environmental Management) of the Gosford Development Control Plan 2018 concerning the sections ESD requirements.

3.1 CHAPTER 5 - BUILDING FORM

3.1.1 5.2.8 BUILDING SUSTAINABILY AND ENVIROMENTAL PERFORMANCE TARGETS FOR KEY SITES

1. *Measures to improve energy efficiency, water efficiency and waste minimisation should be investigated as part of the enhanced design excellence and design review process.*

Energy efficiency is maximised through the provision of active systems which generate more energy than they consume. High performance chillers using water cooled systems can achieve COPs of up to 8. For every 1Kw of electricity consumed 8 kW of coolth can be provided. Extensive water retention will be installed on site. There is currently provision for meeting landscaping and toilet flushing demand, while re-using rainwater in cooling towers will be investigated in subsequent stages. Waste minimisation has been targeted for the construction and in-use stages of the project; the project is aiming for 90% of waste generated on to be divert from landfill.

2. *Buildings are to comply with or where possible exceed the Building Sustainability Index (BASIX) by 10% for residential development.*

N/A

3. *Buildings are to achieve a 4.5 star as built NABERS rating for commercial office buildings.*

N/A

4. *To minimise energy use, buildings are to be designed to: a. include high levels of insulation to reduce energy consumption and include energy efficient appliances; and b. incorporate green roof and green facade/green wall elements to reduce heat loads on internal spaces.*

A high performance façade will insulate the internal environment, thus requiring less energy to mitigate the effect of diurnal temperature swings while providing a stable environment for occupants. Green roofs have been incorporated throughout the podium levels of the building reducing cooling loads and providing green spaces for occupants.

5. *Development is to reduce the need for active heating and cooling by incorporating passive design measures including design, location and thermal properties of glazing, natural ventilation, appropriate use of thermal mass and external shading, including vegetation.*

The built form embraces sustainable design principles as it has been planned to maximise the passive (i.e. energy free) performance of the building. This is achieved by orientating the building along the East-West axis and providing a relatively shallow plan to allow daylight to penetrate across the floor plate. External shading on the North façade aids reducing the load and energy consumption of the cooling system. Areas such as green roofs and landscapes surrounding entrances have been incorporated to provided localised cooling.

6. *All new water fittings and fixtures in all non-residential development, the public domain, and public and private parks are to be the highest Water Efficiency Labelling Scheme (WELS) star rating available at the time of development.*

WELS rated fittings will be incorporated into a wider strategy to reduce water use on site.

7. *Rainwater tanks are encouraged to be installed for all non-residential development.*

At concept stage, retention tanks are being sized to service the landscaped irrigation and toilets for the building. Using retention water for cooling towers is also being considered by the design team.

8. *Where possible, use building materials, fittings and finishes that: a. have been recycled; b. are made from or incorporate recycled materials; and c. have been certified as sustainable or 'environmentally friendly' by a recognised third-party certification scheme.*

The Project will include the following initiatives:

a. A minimum 90% of all construction waste generated will be diverted from landfill by either re-use or recycling.

b. A high percentage of PVC products used in the project including those in all formwork, pipes, flooring, blinds and cables shall meet the *Best Practice Guidelines for PVC in the Built Environment*, published by the Green Building Council of Australia.

c. A high percentage of timber used in building and construction will be from a reused source or certified by a forest certification scheme.

3.1.2 INTERNAL AMENITY

4. *fixed shading devices are not to substantially restrict access to natural daylight and outlook.*

Any shading provided on the north façade will aim reduce cooling loads without impinging on occupants views or daylight.

3.1.3 SITE COVER AND DEEP SOIL ZONES

3. Landscaped areas are to be irrigated with recycled water

Allowances have been made in the retention tank sizing for an irrigation area of 2500m^2.

3.2 CHAPTER 8 – ENVIROMENTAL MANAGEMENT

3.2.1 8.2 ENERGY EFFICIENCY AND CONSERVATION

1. *N/A*

2. *Improve the control of mechanical space heating and cooling by designing heating/ cooling systems to target only those spaces which require heating or cooling, not the whole building.*

   As the building contains a large number of private medical suites, the heating/cooling system has been designed on a zonal basis to allow for maximum control for occupants. Therefore, systems can respond to demand ensuring spaces are not overserved. This also serves to reduce the risk of cross contamination as zones are isolated from one another.

3. *Improve the efficiency of hot water systems by: a. insulating hot water systems, and b. installing water saving devices, such as flow regulators, 3 stars rated shower heads, dual flush toilets and tap aerators.*

   The hospital has high ambitions for water reduction. As outlined in the following Sustainable Framework, rainwater will be harvested and re-used on site in a number of ways; fittings will be water conserving and insulating pipes will deliver hot water, reducing heat gains and improving system efficiency.

4. *Reduce reliance on artificial lighting and designing lighting systems to target only those spaces which require lighting at any particular 'off-peak' time, not the whole building.*

   The buildings lighting control strategy will be based around "daytime" and "night time" settings to reduce lighting consumption. Where feasible, daylight dimming and PIR sensors will be installed so the lighting system responds to occupancy. Additionally, the shallow form of the building allows daylight to penetrate the floor plate illuminating the majority of spaces during the day.

5. *Provide an Energy Efficiency Report from a suitably qualified consultant to accompany any development application for new commercial office development with a construction cost of $5 million or more that demonstrates a commitment to achieve no less than 4 stars under the Australian Building Greenhouse Rating Scheme.*

   An Energy Efficiency pathway to meet "Best practice" equivalence has been provided in the subsequent sections detailing the energy strategy for the building.

6. *All non-residential development Classes 5 to 9 need to comply with the Building Code of Australia energy efficiency provisions.*

   The building will meet the BCA energy efficiency provisions as outlined in the Sustainable Framework.

3.2.2 8.3 WATER CONSERVATION

1. *New dwellings, or developments which contain a residential component within a mixed use building or serviced apartments intended or capable of being strata titled, are to demonstrate compliance with State Environmental Planning Policy (Building Sustainability Index: BASIX) 2004.*

   N/A

2. *All new development shall demonstrate implementation of best practice water saving infrastructure including provision of rainwater / storm water retention tanks.*

   Water retention has been sized for flushing 380 toilets and irrigating 2500m^2 of landscape. Further allowances made by made for harvested rainwater to serve the cooling towers on site. This will be invested by the design team in the subsequent stages and is dependent on space availability for the retention tank.

3.2.3 8.6 WASTE AND RECYCLING

1. Development applications for all non-residential development must be accompanied by a waste management plan that addresses:

a. best practice recycling and reuse of construction and demolition materials,

b. use of sustainable building materials that can be reused or recycled at the end of their life,

c. handling methods and location of waste storage areas that have no negative impact on the streetscape, building presentation or amenity of occupants and pedestrians, and

d. procedures for the on-going sustainable management of green waste; garbage and recyclables including, glass, metals and paper; including access estimated volumes; required bin capacity and on-site storage requirements.

A waste management plan is to be provided with the future EIS. Other measures include a Environmental Management Plan formalised for implementation during the construction phase. In addition to this the contractor will implement on-site staff wellbeing practices. The contractor will aim for a minimum of 90% of all construction waste generated to be diverted from landfill by either re-use or recycling.

4.0 CLIMATE CHANGE ADAPTATION

This section responds to the CSIRO projected impacts of climate change.

The design is developed to be future proof and climate change proactive. Various features and systems will be implemented at the project in order to withstand the extreme weather events such as heatwaves, droughts, extreme rainfall and gustier wind conditions. Additionally, the design maximizes landscape consideration, material selection and social equity aspects.

Climatic events such as heat waves cause additional stress on a building's systems. The effects of which can be mitigated by a high performance building envelope, serving to shield the internal environment from extreme weather events. Measures to achieve this include:

- Attention to solar gain through shading devices and high performance windows.
- Airtight construction and controlled ventilation (taking advantage of heat exchangers to temper incoming air reducing stress on the cooling system).
- High levels of insultation minimises the heat gains through the building fabric.

Large retention systems protect the site from drought events as there will be a personal reservoir on site for water. This reduces the loading on the maniple water system during times of drought.

Storm water detention rates will be sized to account for increase, prolonged rainfall events. By slowly releasing water from the site there is less pressure on the local storm water system, reducing the chance of flash floods. However, given the large demand for rainwater the retention tank may take the majority of all rainwater falling on the site.

Changes to wind patterns in future climates is unclear, with little agreement between statistical data. However, with increasingly frequent extreme weather events leading to short, intense wind periods the frame and foundation design will accommodate this additional loading. Furthermore, given the coastal location, increases in driving rain frequency from storms will be mitigated by a tightly detailed façade stopping water ingress and preserving the building fabric.

Landscape design will maximise permeable surfaces to slow the run-off of rainfall from the site. Furthermore, green spaces in the surrounding area and green roofs will incorporate shading and rain refuge to cover occupants and visitors during climatic events.

5.0 SUSTAINABLE FRAMEWORK

This framework identifies the project pathway to sustainable performance. Specifically, the key principles underpinning the sustainability initiatives in the design and operation of Northside Private Hospital.

Several environmental initiatives have been considered in shaping a best practice design:

- Project Sustainable Navigation
- Wellbeing of Occupants
- Resource Efficiency: Energy
- Resource Efficiency: Water
- Infrastructure & Accessibility
- Materials
- Urban Ecology
- Emissions
- Innovations

5.1 ENVIRONMENTAL INITIATIVES

5.1.1 PROJECT SUSTAINABLE NAVIGATION

This aspect encourages the adoption of practices and processes that enable and support best practice sustainability outcomes throughout the different phases of a project's design, construction and its ongoing operation. It also promotes practices that ensure a project will be used to its optimum operational potential.

The Project will include the following initiatives:

1. The Project team will establish ongoing environmental performance targets relating to its consumption of energy and water, production and recycling of waste, and to the ongoing maintenance and improvement of good indoor environmental quality. Furthermore the hospital will monitor and report on nominated targets to ensure consequential outcomes.
2. During design and documentation, the Project team will review the design for its ease of maintenance for all building services and building fabric.
3. Comprehensive pre-commissioning and commissioning activities will be performed for all nominated building systems.
4. Post completion the project will undergo a 12 month period of building tuning, with minimum quarterly meetings, to optimise the buildings systems.
5. An independent commissioning agent will be engaged to lead and coordinate on commissioning and building tuning activities.

6. Building user guides will be produced by the Contractor to help users interact effectively with the buildings, optimising building performance and user comfort. The Guides will include guidance on all sustainability attributes of the site, and also information on maintenance requirements.
7. Building services will include metering on all major energy and water-consuming equipment, providing the facility manager with information on system performance and allowing them to closely manage efficient use of resources on site.
8. A systematic and methodical Environmental Management plan will be formalised for implementation during the construction phase by the Contractor. In addition to this the contractor will implement on-site staff wellbeing practices.
9. The design will include infrastructure for operational waste management, the separation of waste streams and considerations for end of life disposal. A waste management consultant has been appointed to manage these aims.

5.1.2 WELLBEING OF OCCUPANTS

This aspect aims to encourage initiatives that enhance the comfort and well-being of occupants. Issues such as air quality, thermal comfort and acoustic comfort are addressed within these initiatives. The 'Wellbeing of Occupants' aspect recognises that buildings are designed for people and that a holistic approach should be taken where reductions in energy use and occupants' health and wellbeing are not pursued to the detriment of each other.

The Project will include the following initiatives:

1. Closely controlled mechanical ventilation will be provided throughout the hospital. The systems performance will be optimised through the provision of demand controlled ventilation linked to occupancy. In-takes and exhausts will follow best practice guidelines to avoid unwanted recirculation.
2. The project will address noise in enclosed spaces by reducing noise levels to no more than 5dB(A) above the satisfactory levels provided in Table 1 AS/NZS 2107:2000 and mitigation reverberation. Noise transmission will be through detailed acoustic separation.
3. Light fittings shall be selected, where possible, such that glare is controlled or reduced and where required glare from sunlight will be reduced through a combination of blinds, screen, fixed devices, or other means. Occupants will also have the ability to control lighting in the spaces through manual lighting controls.
4. All habitable areas will be extensively daylit, delivered by a façade providing high levels of daylight and views for patients.
5. All paints, sealants, adhesives, floor coverings and composite timbers used internally will meet low VOC (Volatile Organic Compound) emissions limits, as specified in Greenstar credit 13.1.
6. Any engineered wood products will meet low formaldehyde limits, as specified in Greenstar credit 13.2.

5.1.3 RESOURCE EFFICIENCY: ENERGY

The Energy aspect aims to promote a project's reduction of operational energy consumption below a comparable standard-practice building. Such reductions are directly related to reduced greenhouse gas emissions, lower overall energy demand as well as reductions in operating costs for building owners and occupants.

The Project will include the following initiatives:

1. Energy modelling demonstrating a reduction in energy consumption and GHG emissions of the proposed building as compared to a reference building. The reference building is defined as Section J Deemed-to-Satisfy compliant.
2. Good passive design features will be incorporated into the proposal to achieve measurable impacts on both building services strategies and the thermal comfort of occupants. These features will include:
    a. High-performance double glazing
    b. Insulation levels which exceed minimum Section J requirements
    c. Attention to detailing reducing the impact of thermal bridging
    d. Appropriate solar control via shading devices
3. LED lighting, which offers life cycle cost advantages and reduced annual energy consumption, shall be utilised wherever possible A high percentage of lighting will be controlled either through occupant detection, daylight controls or time clock controlled to meet BCA Section J6 requirements.
4. A mechanical ventilation strategy will provide closed control of the internal environment. Demand controlled ventilation will respond to the needs of occupants, conserving energy when zones are not in use by running at a lower capacity. Heat recovery will allow incoming air to be pre-tempered so less energy is required to bring it to delivery temperature. The system is further controlled by constructing an airtight building fabric. This prevents unwanted infiltration and humidity entering the building zones and the building fabric which can be degraded over time via interstitial condensation.
5. Indirect evaporative cooling shall be considered as part of the HVAC strategy employed in the proposal. Indirect evaporative cooling provides an excellent solution for pre-cooling of outside air for traditional HVAC systems and can be easily combined with heat recovery technology. By providing pre-cooling to traditional HVAC systems, significant reductions in chiller energy consumption can be achieved.
6. Active systems such as chillers will be optimised in a number of ways Firstly, by re-using the heat rejected as part of the cooling process to satisfy a requirement for heat elsewhere in the building. This increases the combined systems seasonal energy efficiency ratio (SEER) through seasons where areas of the hospital require heating and cooling simultaneously. Secondly, systems will be sufficiently sized to run at an efficient operating margin, with sufficient capacity to account for the increasingly likelihood of climatic events such as heatwaves. However, care will be given not to oversize systems as this can lead to an decrease in the operating performance.
7. The domestic hot water system (DHW) will be low–emission, utilising one or any combination of the following technologies (to be selected during detailed design):

a. Natural gas with solar pre-heat

b. Natural gas with high-efficiency condensing boilers

c. Heat-pump technology. Heat-pumps utilising refrigerants with a lower global warming potential (GWP) (e.g. CO_2) will be preferred over those using conventional refrigerants.

8. The project will make provisions for the inclusion of solar photovoltaic (PV) arrays to supplement energy consumption and reduce ongoing operating costs. It is proposed the available roof space is reviewed and a suitable PV system be assessed for feasibility in detailed design stage.

5.1.4 INFRASTRUCTURE & ACCESSIBILITY

This aspect facilitates a reduction in the dependency on private car use and promote the use of alternative means of transport to reduce overall greenhouse gas emissions.

If reliance on individual motor vehicle transportation is to be reduced, it is necessary to maximise alternative transportation options, such as the use of mass transport options, cycling or walking, and the selection of sites that are close to a large number of amenities.

The Project will include the following initiatives:

1. The site is highly accessible by various bus routes with the closest being less than 5 minutes' walk. In addition the site is in close proximity to a number of community services such as Gosford railway station.
2. Infrastructure allowances will be made for low emission vehicles and electric vehicle charging.
3. Active transport facilities such as bicycle parking, showers and lockers will be available on site for occupants and visitors.

5.1.5 RESOURCE EFFICIENCY: WATER

Water efficiency facilitates the reduction of potable water consumption through measures such as the incorporation of water efficient fixtures and building systems and water re-use.

Reductions in operational water consumption may be achieved through the maximisation of water efficiency within the project.

The Project will include the following initiatives:

1. The proposal includes rainwater harvest and re-use. During concept design, the re-use of harvested rainwater within the cooling towers has been discussed and will be investigated further in subsequent stages. Due to the retention / detention requirements for the site, large volumes of water are available. Water will also be reused for the flushing of toilets throughout the building.
2. All bathroom fixtures (toilet pans, urinals, hand basin taps and showers) will meet or exceed the following minimum WELS ratings:

    a. Basin taps and urinals to be equal to or more than 5 Star WELS

    b. Showers to be equal to or more than 3 Star (>6.0 but <=7.5L/min) WELS

    c. Toilets to be equal to or more than 4 Star WELS

3. Landscape areas will be irrigated using sub-soil drip irrigation with wherever practical automated control to limit unnecessary irrigation

5.1.6 MATERIALS

Materials aims to address the consumption of resources within a building construction context, by encouraging the selection of lower-impact materials. Additionally, it involves absolute reductions in the amount of waste generated or the recycling of as much of the waste generated as possible.

The Project will include the following initiative:

1. A minimum 90% of all construction waste generated will be diverted from landfill by either re-use or recycling.

In addition the following options are being explored and may also be incorporated:

2. A high percentage of PVC products used in the project including those in all formwork, pipes, flooring, blinds and cables shall meet the *Best Practice Guidelines for PVC in the Built Environment*, published by the Green Building Council of Australia.

3. A high percentage of timber used in building and construction will be from a reused source or certified by a forest certification scheme.

5.1.7 URBAN ECOLOGY

Urban Ecology facilitates the reduction of negative impacts on the sites' ecological value as a result of urban development; rewarding projects that minimise harm and enhance the quality of local ecology.

The Project will include the following initiatives:

1. The total proposed works are contained within the existing site and the site's current ecology will be improved through well-considered landscape design.
2. Re-using previously developed land to minimise development on greenfield sites.
3. Rooftops that will contribute to a cooler microclimate through the use of light coloured roof materials to reduce the 'Heat Island Effect'. Green terraces are also proposed throughout the building which further reduce the heat island effect and provide a green refuge for occupants.

5.1.8 EMISSIONS

Emissions help to assess the environmental impacts of 'point source' pollution generated by projects. Negative impacts commonly associated with buildings might include increased stormwater discharge and pollutants entering the public sewer or disturbances to native animals and their migratory patterns as a result of light pollution.

The Project will include the following initiatives:

1. The lighting design shall be compliant with AS1158: Lighting for Roads and Public Spaces and AS4282: Control of the Obtrusive Effects of Outdoor Lighting. This would be achieved through control of upward light output ration (LOR) or control of direct illuminance.

2. Stormwater design will ensure post-development peak event discharge rates do not exceed pre-development rates.
3. Landscape solutions will be applied to achieve a high level of stormwater performance across the site, improving water quality prior to discharge from the site.
4. Best practice legionella control will be present for the water based heat rejection systems. avert impacts associated with harmful microbes in building cooling systems.

5.1.9 INNOVATIONS

Facilitating innovation helps spread innovative practices, processes and strategies that promote sustainable communities and cities.

Two issues have been highlighted for the hospital:

Air tightness – During the concept stage the design team engaged in an air tightness workshop to identify issues facing the project in achieving an airtight envelope. The team acknowledged that unwanted infiltration and water ingress should be mitigated to improve energy efficiency and protect the building. The team agreed that the façade system going forward should be one easily rendered airtight and that airtightness workshops should be considered at every stage to monitor progress. In subsequent stages, a focus on the detailing of junctions, how to manage the air tightness throughout construction and assessing verification will be a priority for the team.

Wellbeing – Elements of the WELL standard are to be included within the propose design to enhance well-being and aid patient recovery. Roof terraces will be design in-line with the requirement of WELL V2 “Restorative Spaces”. Furthermore, the use of natural materials and plants to incorporate biophilia into the internal spaces. The benefits of biophilia have been demonstrated through various studies to improve patient recovery (e.g. “Totaforti. 2018. Applying the benefits of biophilic theory to hospital design”)