JOHN HUNTER HEALTH AND INNOVATION PRECINCT

769 MILITARY ROAD,

NEW LAMBTON HEIGHTS, NSW

ESD REPORT

FOR

STATE SIGNIFICANT DEVELOPMENT APPLICATION (SSDA)

BVN

Client

EMF GRIFFITHS

Sustainability Consultants

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EXECUTIVE SUMMARY

EMF Griffiths have been engaged as ESD Consultants by BVN Architecture to prepare this ESD report in support of the State Significant Development Application (SSDA) for the John Hunter Health and Innovation Precinct (JHHIP) project (the project).

This report provides an outline of the Ecologically Sustainable Development (ESD) initiatives included in the project as well as future commitments to ensure best practice design and construction in regard to ecologically Sustainable Development (ESD).

The project is led by health Infrastructure (HI) and comprises of the works described in the introductory section of this report.

The developing schematic design proposal for these works is the subject of this SSDA report.

The project is subject to the following sustainability policies and regulations: -

- National Construction Code (NCC 2019) Section J for Energy Efficiency.
- Government Resource Efficiency Policy 2019 (GREP).
- Health Infrastructure Design Guidance Note No. 058.
- Health Infrastructure Engineering Services Guidelines (ESG).
- Hunter New England Health Sustainability Plan 2020 – 2030 (Jun 2020).
- Brief - John Hunter Health and Innovation Precinct Approach to Sustainability (March 18 2020).
- The objectives of the Department of Planning, Industry and Environment (DPIE).

The above documents contain provisions that translate into best practice sustainable design targets and objectives for the project, for which an ESD strategy has been developed from early design phase. This SSDA report captures the ESD strategies in place and outlines the ESD strategies that will guide project design as it evolves, demonstrating how the project addresses the SEARs issued by the Department of Planning, Industry and Environment (DPIE).

The project has been benchmarked with a 5-star Green Star – Design & As Built v1.3 rating to ensure that best practice in sustainable design is achieved and demonstrated. The Green Star pathway is provided in Appendix A.

Key ESD initiatives included in the project are: -

- A building design that is responsive to the local climate and includes passive design measures to provide high quality indoor environments that to support the function of the building as a place to heal people. This translated into spaces that are thermally comfortable, have adequate access to fresh air and natural light, maximise the visual connection to the outdoor landscape, are acoustically adequate and where the presence of indoor air pollutants is minimised.
- Façade optimisation to ensure the project meets the energy efficiency requirements of NCC 2019 Section J while allowing high levels of daylight penetration, visual connection to nature and adequate glare management.
- Measures to reduce potable water consumption including water efficient fixtures and fittings and favouring drought tolerant vegetation in landscaped areas.
- Measures to reduce energy consumption including energy efficient building systems and controls adequately commissioned and tuned. Key energy saving measures include an automated building management system LED lighting and energy efficient mechanical systems.
- Installation of a solar photovoltaic (PV) system to reduce Greenhouse Gas (GHG) emissions associated with the building's operational energy consumption.
- Adequate provisions to enable waste stream separation and reduction of waste sent to landfill.

SECTION 1

INTRODUCTION

SECTION 1.0 INTRODUCTION

1.1 PURPOSE OF THIS REPORT

This report identifies and responds to relevant government policy, targets, and requirements pertinent to the John Hunter Health and Innovation Precinct (JHHIP) project (the project). Its primary purpose is to detail how the project addresses Item 8 'Ecologically Sustainable Development' (ESD) of the Secretary's Environmental Assessment Requirements (SEARs) issued by the Department of Planning, Industry and Environment (DPIE).

This report forms part of the Environmental Impact Statement documentation required to meet the SEARs.

1.2 CONTENTS OF THIS REPORT

This report describes the ESD initiatives that have been investigated and included in the project as well as the ESD initiatives to be considered in future development phases to achieve and demonstrate Australian best practice in sustainable development. This includes uncertified benchmarking of the project against a 5-star Green Star – Design & As Built v1.3 rating and the project response to SEARs requirements.

1.3 PROJECT OVERVIEW

In June 2019, the NSW Government announced a significant expansion of the John Hunter and John Hunter Children's Hospitals with the $780 million John Hunter Health and Innovation Precinct (JHHIP) project.

The JHHIP will transform healthcare services for Newcastle, the greater Hunter region and northern NSW communities. The infrastructure will provide additional inpatient capacity to the John Hunter and John Hunter Children's Hospitals and create further opportunities for partnerships with industry and higher education providers.

The JHHIP will deliver an innovative and integrated precinct with industry-leading facilities working in collaboration with health, education, and research partners to meet the current and future needs of the Greater Newcastle, Hunter New England and Northern NSW regions.

The John Hunter Health and Innovation Precinct Project is being planned and designed with ongoing communication and engagement with clinical staff, operational staff, the community, and other key stakeholders with a strong focus on the following: -

- Patient-centred care.
- Contemporary models of care.
- Future economic, health and innovation development opportunities.
- Environmental sustainability.

1.4 SUBJECT SITE

The John Hunter Health Campus (JHHC) is located on Lookout Road, Lambton Heights, within the City of Newcastle Local Government Area (LGA), approximately 8km west of the Newcastle CBD. The hospital campus is located approximately 3.5km north of Kotara railway station.

The JHHC comprises the John Hunter Hospital (JHH), John Hunter Children's Hospital (JHCH), Royal Newcastle Centre (RNC), the Rankin Park Rehabilitation Unit and the Nexus Unit (Children and Adolescent Mental Health). JHHC is a Level 6 Principal Referral and Tertiary Hospital, providing the clinical hub for medical, surgical, child and maternity services within the Hunter New England Local Health District (HNELHD) and across northern NSW through established referral networks. Other services at the campus include the Hunter Medical Research Institute (HMRI), Newcastle Private Hospital and the HNELHD Headquarters.

1.5 SSDA PROPOSAL

Approval is being sought for a new Acute Services Building and refurbishment of existing hospital facilities at John Hunter Hospital comprising: -

- Construction and operation of a new seven (7) storey Acute Services Building [plus four (4) semi-Basement Levels] to provide: -
  - An expanded and enhanced Emergency Department.
  - Expanded and enhanced medical imaging services.
  - Expanded and enhanced intensive care services - Adult, Paediatric and Neonatal.
  - Expanded and enhanced operating theatres including interventional suites.
  - An expanded Clinical Sterilising Department.
  - Women's Services including Birthing Unit, Day Assessment Unit, and Inpatient Units.
  - Integrated flexible education and teaching spaces.
  - Expanded support services.
  - Associated retail spaces.
  - New rooftop helipads.
  - New semi-Basement car parking.
- Refurbishment of existing buildings to provide: -
  - Additional Inpatient Units.
  - Expanded support services.
- A new hospital entry canopy and works to the existing drop off.
- Link bridge to the Hunter Medical Research Institute (HMRI).
- Campus wayfinding and signage.
- Landscape works.
- Site preparation including bulk earthworks, tree removal, environmental clearing, cut and fill.
- Mines grouting remediation works.
- Construction of internal roads network and construction access roads and works to existing at-grade carparking.
- Connection to the future Newcastle Inner City Bypass.
- Inground building services works and utility adjustments.

1.6 SEARS REQUIREMENTS

The Department of Planning, Industry and Environment (DPIE) have issued Secretary's Environmental Assessment Requirements (SEARs) to the Applicant for the preparation of an Environmental Impact Statements (EIS) for the proposed development. This report has been prepared having regard to Item 8 Ecologically Sustainable Development of the SEARs, as detailed below: -

Item	SEARs Requirement	Relevant Section of Report
8.1	*Identify how ESD principles (as defined in clause 7(4) of Schedule 2 of the Regulation) would be incorporated in the design and ongoing operation phases of the development.*	2.3
8.2	*Identify proposed measures to minimise consumption of resources, water (including water sensitive urban design) and energy.*	2.4, Appendix A

Item	SEARs Requirement	Relevant Section of Report
8.3	*Identify how the 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.*	2.5
8.4	*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.*	2.6, Appendix A
8.5	*Include a statement regarding how the design of the development is responsive to the NARCliM projected impacts of climate change.*	2.7
8.6	*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.*	2.8

1.7 SITE CLIMATE

The site is a coastal climate with mean minimum annual temperature ranging from 7.4˚C in winter to 19.5˚C in summer; and mean maximum annual temperature ranging from 18.1˚C in winter to 29.4˚C in summer. Figure 3 below shows average temperature data based on 1998-2021 data from the closest weather station from the Bureau of Meteorology (Newcastle University station).

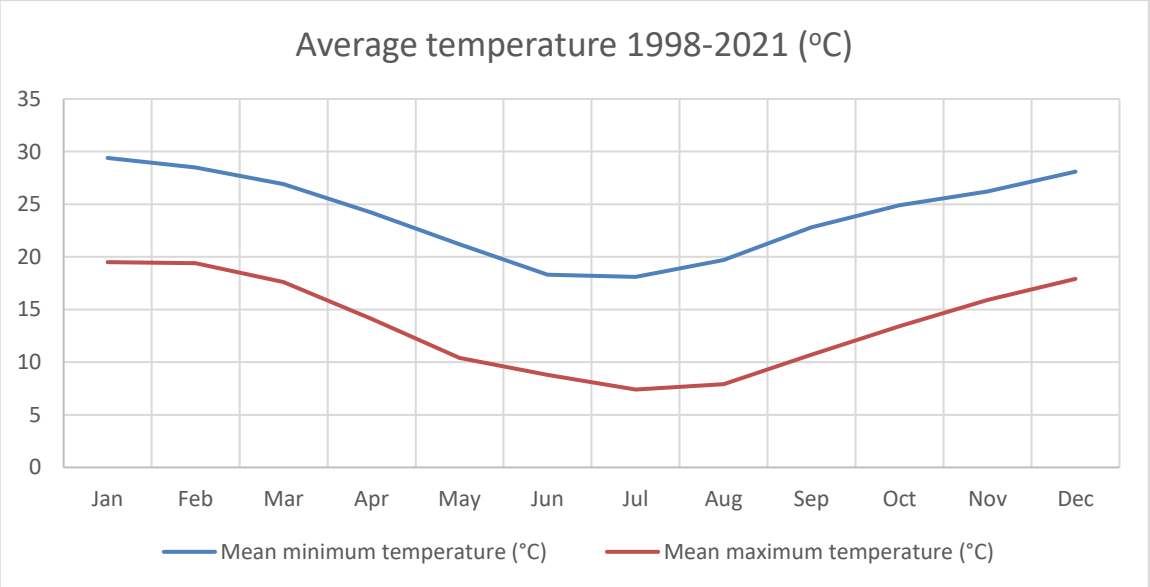

Figure 3: Temperature Data for Years 1998 – 2021 (Newcastle University Weather Station).

Rainwater data for the period 1998 – 2021 indicates a median total annual rainfall of 1,068.3mm. The monthly averages and daily maximums for this period are shown in Figure 4.

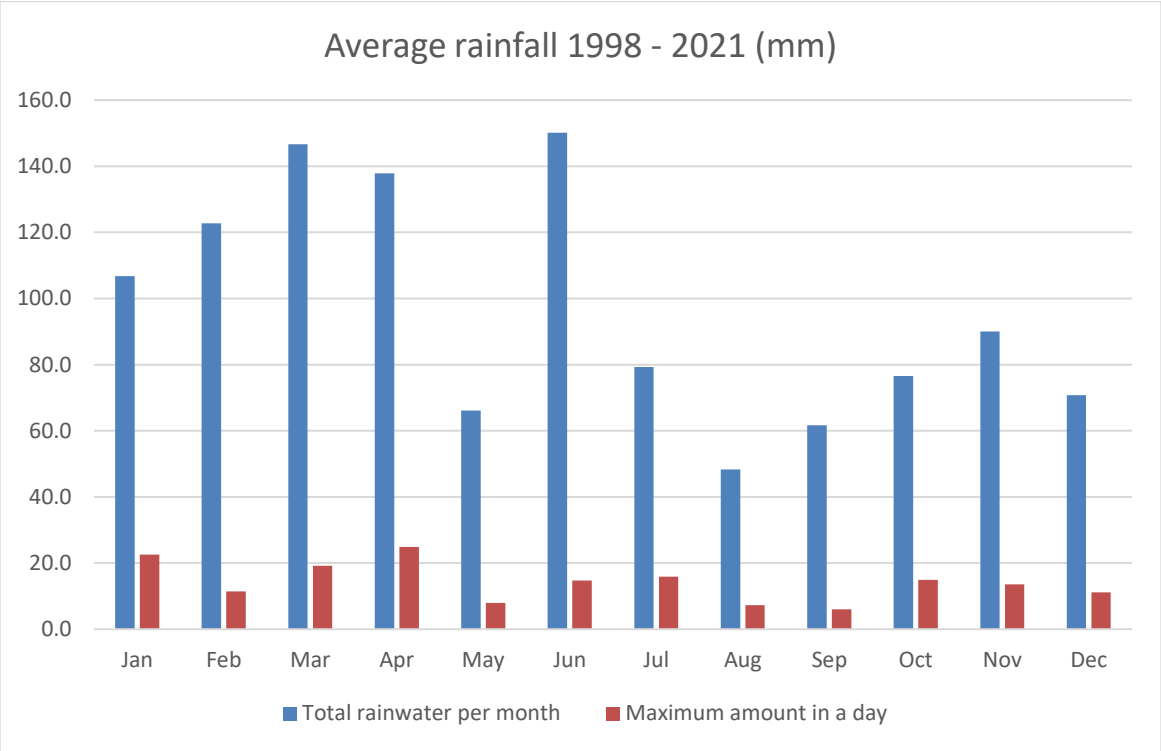

Figure 4: Rainfall Average Data for 1998-2020 (Newcastle University Weather Station).

SECTION 2

DESIGN RESPONSE TO ASSESSMENT REQUIREMENTS

SECTION 2.0 DESIGN RESPONSE TO ASSESSMENT REQUIREMENTS

2.1 GENERAL BUILDING DESIGN

The energy consumption of a building can amount to its largest environmental impact. Sustainable design techniques focus on reduction of energy consumption by energy efficient practices, passive design, and cleaner energy production/renewable energy to reduce CO_2 emissions to the atmosphere.

The benefits of an energy efficient building are reduced operating costs, a healthier indoor environment, reduced liability, and recognition of being environmentally responsible. Therefore, in a first instance, the project will incorporate multiple design and operational initiatives to address energy targets.

The aim of passive building performance is to reduce reliance on energy of any source, this means preventing excessive heat entering the building during summer or being lost during winter and/or the need for artificial lighting. To this end, the project has considered general building form, orientation, and shading, as well as roof space for renewable energy as required: -

- The orientation and shading have been considered to ensure solar gain is managed appropriately for heating and cooling.
- Orientation and façade design will consider daylighting requirements and views for improved health and wellbeing of patients and staff. Deep plan forms have been avoided so natural lighting is most effective.
- The building is being designed to meet the stringent energy efficiency requirements of NCC 2019 Section J. This applies to both building fabric and services, including insulation, glazing, and shading which will be designed to ensure spaces require minimal additional heating and cooling.
- The proposed design provides spatial allowance for the future installation of a rooftop photovoltaic electricity system to reduce greenhouse gas emissions and reliance on mains power.

2.2 SITE IMPACT

The project will be constructed on previously developed land, on the site of the existing facility. In increasing the built form on the site, the Project Team has considered how this will affect the following: -

- Heat island effect.
- Ecological impact, in particular landscaping for increased ecological value and supporting biodiversity.
- Site emissions (light pollution).

The Project Team has reviewed how landscaping is incorporated into the ESD strategy to ensure the site's contribution to heat island effect is mitigated.

Additionally, the new building will provide stormwater infrastructure to help reduce the pressure on the stormwater utility.

2.3 ESD PRINCIPLES

The proposed development has sought to incorporate the principles of ecologically sustainable development (ESD), as defined in Clause 7(4) of Schedule 2 of the Environmental Planning & Assessment Regulation (2000).

The table below quotes the ESD principles from the regulation and outlines the project's response to each principle: -

Item	ESD Principle	Project Response
(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.*	Adequate due diligence has been conducted to understand the local environment and investigate any risks the project may pose. The proposed development will be constructed on previously developed land, as it a redevelopment of the existing hospital campus. During the design and construction phases, the main contractor will implement an Environmental Management Plan (EMP) demonstrating formalised systematic and methodical approach to environmentally friendly construction that answers to site specific environmental risks and hazards. Project ESD responses align with the targeted initiatives under Green Star scorecard within Appendix A. A Biodiversity Development Assessment Report (BDAR) has been prepared as part of the EIS to assess the impacts of the proposed development in accordance with the requirements of the *Biodiversity Conservation Act 2016*, *Biodiversity Conservation Regulation 2017* and Biodiversity Assessment Method. Any threats of serious or irreversible environmental damage will be identified and managed through adequate implementation of measures to prevent environmental degradation.
(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.*	The proposed development ensures the health, diversity and productivity of the environment are maintained through the implementation of passive and active design measures that reduce operational energy and water use from the project. Energy consumption will be designed to achieve compliance to the National Construction Code NCC 2019 Section J requirements. The reduction in water use will be established through high WELS rated water fixtures and fittings, which significantly reduce potable water consumption. Waste generated during the construction phase will be separated in multiple streams to enable recycling and reuse with a consequent reduction in the amount of waste sent to landfill. Reducing energy, water and waste ensures that the health, diversity, and productivity of the environment is maintained for the benefit of future generations. The project will ensure that the health, diversity and productivity of the environment are maintained or enhanced by using HI's ESD Evaluation Tool to demonstrate an equivalent 5-star Green Star outcome is achieved. HI's ESD Evaluation Tool has been previously applied across HI projects as an accepted alternate framework by DPIE to demonstrate ESD outcomes.

Item	ESD Principle	Project Response
(c)	**Conservation of Biological Diversity and Ecological Integrity** *Namely, that conservation of biological diversity and ecological integrity should be a fundamental consideration.*	The proposed development being in previously developed land alleviates much of the biological diversity concern for the development. Prior to commencement of construction, the Main Contractor will develop an Environmental Management Plan (EMP) to ensure that construction works do not adversely affect the biological diversity and ecological integrity of the site, including for example, measures to protect existing trees to be retained. The Main Contractor will monitor adherence to the EMP via an Environmental Management System (EMS) to ensure that all Sub-Contractors carry out their works in line with the EMP and mitigate any risks to the environment. A climate change adaptation plan will be prepared to help future proof the development to withstand the effects of climate change.
(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.*	The valuation of the project's assets and services consider environmental factors through the implementation of various ESD initiatives. Environmental aspects are key criteria in the design and selection of building systems and materials. For example, the building façade is being designed for good daylighting, thermal comfort, glare mitigation and energy performance rather than the lowest cost façade system. Mechanical, lighting and vertical transportation systems are being designed for low energy consumption and their components will be selected considering whole-of-life costs, i.e., including operational energy use in the equation. Materials will be selected based on a life cycle assessment which considers the cradle-to-grave environmental impact of materials. Environmental goals of the project and specific initiatives are identified in the ESD Scorecard provided in Appendix A, reflecting an equivalent 5-star Green Star Design & As-Built pathway. This approach is in line with the NSW Government Resource Efficiency Policy (2019).

2.4 MINIMISING CONSUMPTION OF RESOURCES

Key ESD measures to reduce energy and water consumption are summarised below. These are to be read in conjunction with the Green Star Scorecard in Appendix A – Green Star Scorecard.

2.4.1 Façade Design

The façade design has been designed to adopt best practice design principles to provide high quality indoor environments (thermal comfort, acoustics, glare and daylighting) while reducing the need for mechanical heating, ventilation and air conditioning (HVAC) and artificial lighting. This may include: -

- Rationalising the extent of the glazing (i.e., window to wall ratio).
- Implementation of external shading as necessary to limit solar gain in summer and reduce the heat load from the façade.
- Implementing high performance glass that allows higher levels of daylight while blocking thermal load from the sun and reducing heat transfer by conduction.

- Thermal bridging through all studs and construction junctions will be reduced by ensuring insulation is continual around sensitive areas.
- Air tightness will be tested and maximised to reduce infiltration.
- Shading of windows to manage solar gain.

To ensure an optimum façade design, the project is targeting the following Green Star credits: -

- Acoustic Comfort.
- Glare Reduction.
- Daylight.
- GHG Emissions Reduction – Building Fabric.

2.4.2 **Mechanical Services**

All building services will be designed to achieve compliance to NCC 2019 Section J. The following mechanical strategies will be considered for implementation: -

- All mechanical equipment to be efficient, subject to life cycle costing analysis outcomes.
- Mechanical system to consist of a centralised plant configuration which allows for diversity and improves energy efficiency.
- Ductwork/pipework systems to be designed to reduce system pressure losses and reduce fan and pump motor power.
- Variable speed motors and pumps to be provided for ventilation fans, where suited.
- A Building Management Control System (BMCS) to be installed with automatic intelligent controls to optimise plant efficiency and monitor and record energy consumptions to reduce energy wastage.
- Where applicable, refrigerants with low ozone depletion potential and low global warming potential to be specified.

2.4.3 **Electrical Services**

The Project Team will work to implement electrical services that assist energy efficient design, as detailed below, subject to detailed design of the project: -

- Robust, long-life LED lighting with automatic lighting control system to reduce energy wastage – lighting control strategies may include implementation of area dimming, time clock, daylight sensors or PIDs as appropriate.
- Electrical equipment to be specified to be energy efficient in line with the NSW Government Resource Efficiency Policy (GREP) requirements to reduce building electricity consumption.
- Major energy uses to be sub-metered by end use, and function area. Monitoring will be enabled through the BMCS system.
- Appropriate zoning of departments so that areas of the hospital not in use after daytime business hours may be shut down.
- A photovoltaic (PV) system and associated infrastructure.

2.4.4 **Hydraulics Services**

The Project Team will implement the hydraulics services that assist water efficient design as detailed below, subject to detailed design of the project: -

- Potable water using fixtures to be high efficiency rated by WELS. Specification of fittings to be confirmed in the detailed design, but as a minimum they will be based on GREP requirements.
- Potable water sub-metering to be connected to the BMCS to reduce wastage through identifying leaks or poor operational performance. Sub-meters to be installed.

- High efficiency, gas-fired domestic hot water plant to be specified.

2.4.5 Sustainable Materials and Reducing Waste

The Project Team will take into consideration the sustainable strategies outlined below regarding materiality, waste reduction design measures, future proofing, and use of sustainable and low-carbon materials. Specification of materials or means to reduce waste will form part of the Tender for the Main Contractor: -

- Specifying low VOC emitting materials to improve indoor air quality.
- Specifying engineered wood products with low or no formaldehyde limits.
- Forest Stewardship Council (FSC) or Australian Forestry Standard (AFS) certified timber products will be favoured during construction.
- Certified products (e.g., GreenTag or GECA) will be favoured during construction.
- Undertaking a cradle-to-grave life cycle assessment (LCA) to inform selection of materials and systems of low embodied energy and low environmental impact, minimise mass or volume of materials used and implement sound procurement strategies that support the sustainability aspirations for building materials.
- Pipe material selection based on current best practice such that: -
  - PVC-u to be specified based on the GBCA guidelines.
  - Polyethylene material to be specified for pressure water and gas services, as Polyethylene is recyclable and has significantly lower environmental impact than the alternative ductile iron material.
  - Pipe bedding materials to be specified to be locally sourced, where practical.
- Selecting permanent formworks, flooring, blinds and cables with no PVC or PVC products that comply to GBCA's best practice guidelines for PVC.
- Prioritising locally sourced materials and procuring salvaged and/or recycled materials.
- Efficient selection of materials to limit off-cut wastage during construction.
- Resilient equipment and materials will be incorporated when possible into the design to reduce the need for maintenance or replacement.

2.5 SUSTAINABILITY BENCHMARKING

Preliminary consideration of building performance for the proposed development is reflected by applying passive sustainable design principles and achieving the minimum performance requirements stipulated under NCC 2019 Section J.

The building's sustainable design and management practices are further supplemented by consideration of the design practices stipulated in the Green Star Design & As Built v 1.3 rating tool.

2.5.1 NCC 2019 – Section J Requirements

Section J of the NCC requires that the building fabric and services of the proposed development reduce the generation of greenhouse gas emissions associated with the operation of the building.

The NCC requires buildings to use energy efficiently. This requirement is defined in Volume 1 of the NCC under Section J "Energy Efficiency". There are six (6) subsections, J1 to J8, which focus on separate aspects of energy efficiency. J1 and J3 relate to the building's fabric and envelope and J5 to J8 relate to the building services.

Compliance can be demonstrated by meeting the Deemed-To-Satisfy (DTS) provisions or by applying one of the Verification Methods outlined in the NCC. The Verification Methods are generally applied to buildings to which the DTS provisions are not immediately applicable.

The JV3 Verification Method demonstrates compliance with Clause JP1 and is the approach that will be adopted for the JHHIP project. In order to establish compliance with Section J JP1 using the JV3 Verification Method, the energy consumption of the proposed development must be less than the energy consumption of a 'reference building'. Section J compliance then ensures that the proposed building has good energy performance.

While Section J compliance is a policy requirement, meeting the stringent requirements of NCC 2019 – Section J will also contribute to the project aspirations to reduce operational energy consumption.

2.5.2 Green Star Design & As-Built v1.3

Green Star is an environmental rating tool that evaluates ESD performance of buildings measured across a number of criteria including energy and water efficiency, Indoor Environment Quality (IEQ) and resource conservation. Green Star was created to: -

- Establish a common language and standard of measurement for green buildings.
- Promote integrated, whole-building design.
- Identify building life-cycle impacts.
- Raise awareness of green building benefits.
- Recognise environmental leadership.
- Transform the built environment to reduce the environmental impact of development.

Health Infrastructure (HI) is committed to improving the environmental performance and sustainability of its projects. In accordance with NSW Government policy, HI has established an alternative ESD Framework to ensure effective ESD outcomes on all of HI's projects while delivering results that facilitate good clinical solutions.

In alignment with the NSW Government Resource Efficiency Policy (2019), HI has defined minimum targets under its approved alternative ESD Framework, demonstrating equivalency with an accredited rating scheme. It is a set of scores that reflect the merit of various ESD initiatives applicable to health facilities, developed by ESD specialists to meet the needs of HI. HI's Evaluation Tool has been used across numerous HI projects as an accepted alternative framework by Department of Planning, Industry & Environment (DPIE). It draws upon the Green Building Council of Australia's (GBCA) Green Star rating tool to establish an equivalent benchmark to sustainable building performance. Emphasis is placed on meeting the intent of each initiative, with sufficient evidence provided to support the claim that the initiatives have been achieved. This approach provides flexibility to tailor the methodology in a manner that best suits this project, without being constrained by some of the Green Star limitations.

A 5-star Green Star outcome requires a minimum of sixty (60) points achieved through HI's ESD Evaluation Tool at completion. To allow for contingency and unforeseen circumstances, the JHHIP ESD strategy targets a minimum of sixty-six (66) points, providing a six (6) point buffer to demonstrate the project is commensurate to a 5-star Green Star rated building.

The Project Team has developed an ESD Scorecard to reflect an equivalent 5-star Green Star Design & As-Built v1.3 pathway. This scorecard is provided in Appendix A and outlines the initiatives that will be implemented in the project to demonstrate it is commensurate to Australian Excellence in sustainable development.

To meet the targeted points under the greenhouse gas (GHG) emissions credit, the proposed building design (including project building fabric and services) must perform better than those of an equivalent benchmark building (which is 10% improvement on the reference building). Therefore, the proposed building services shall be more energy efficient and perform better than a conventional building.

2.6 IMPROVING ENVIRONMENTAL PERFORMANCE AND REDUCING ECOLOGICAL IMPACT

The project has been designed in line with national best practice sustainable building principles to improve environmental performance and to reduce ecological impact.

An integrated approach to ESD, whereby all Design Team members are aware of the incremental effect of their actions on the overall project, is by far the most effective path to achieving a strong ESD outcome. Passive design and active systems can be implemented to enhance a building's performance, but unless the fundamentals have been addressed, the optimum outcome cannot be assured. In addition, occupant wellbeing is of utmost consideration especially considering the project as designed to heal its occupants.

The Project Team is committed to achieving and/or subject to the following sustainability policies and regulations which provide the project's framework for improving environmental performance and reducing ecological impact: -

- The EP&A ESD principles.
- A 5-star "equivalent" Green Star outcome without formal certification by the Green Building Council of Australia (GBCA).
- National Construction Code (NCC 2019) Section J for Energy Efficiency.
- NSW Government Resource Efficiency Policy (GREP).
- Health Infrastructure Design Guidance Note (DGN) No. 058.
- Health Infrastructure (HI) Engineering Services Guidelines (ESG).
- The objectives of the Department of Planning, Industry and Environment (DPIE) as captured in the SEARs requirements.

At the SSDA stage, the following key ESD measures have been implemented to ensure the above policies and targets are achieved: -

- Benchmarking to 5-star Green Star – Design & As Built v1.3 equivalent to 'Australian Excellence' which represents above best practice in the Green Star scale. The Green Star strategy includes waste reduction design measures through the development of an Operational Waste Management Plan (OWMP) and establishment of targets for the reduction of construction waste sent to landfill.

  The Green Star strategy also includes the development of a climate adaptation plan to future proof the development to the impacts of climate change and increase resilience to natural hazards.

  The implementation of sustainable and low carbon materials will be guided by the Green Star requirements for the 'Responsible Building Materials' credit.

  Energy efficient design will be achieved through a combination of passive design measures, energy efficient building systems and provisions for the future implementation of on-site renewable energy generation.

  Water efficient design will be achieved through water efficient fixtures and fittings, and water sensitive design measures. Drip irrigation and low water vegetation will be preferred to support potable water use reduction targets.

  The Green Star strategy includes targeting the credits below. Refer to Appendix A for a credit outline: -

  - Commissioning and tuning.
  - Environmental building performance.
  - End of life waste performance.
  - Metering and monitoring.
  - Operational waste – Performance pathway.
  - GHG emissions reduction.
  - Low emission vehicle infrastructure.
  - Potable water reduction.
  - Responsible building materials.
  - Reuse of land.
  - Contamination and hazardous materials remediation.
  - Reduced stormwater and stormwater pollution.
  - Light pollution reduction.
- The development will integrate energy efficient building services and fabric such that it achieves compliance to NCC 2019 Section J, which embodies more onerous requirement than the previous version of the code (NCC 2016 Section J) regarding demonstrating improvements in fabric and building services to reduce energy consumption.

The design has adopted passive cooling and heating design strategies to reduce the energy demand and GHG emissions, reducing the building demand on mechanical HVAC systems. The visual comfort of the primary spaces has also been considered to reduce the amount of artificial lighting and increasing comfort within the space.

2.7 CLIMATE CHANGE RESILIENCE

2.7.1 NARCLiM Climate Change Projections

The NSW Office of Heritage and Environment, now part of the NSW Department of Planning, Industry and Environment, has developed the NSW and ACT Regional Climate Modelling (NARCLiM) climate change projections to provide detailed datasets to support climate modelling in the near future (2020-2039) and longer term (2060-2079).

The regional models generate data for more than one hundred (100) meteorological variables. The most commonly used variables are being provided in multiple formats to ensure the information is easily accessible and easy to use. Common variables include: -

- 2 metre temperature (hourly).
- Daily maximum 2 metre temperature.
- Daily minimum 2 metre temperature.
- Precipitation [total one (1) hour].
- Surface pressure.
- 2 metre specific humidity (hourly).
- 10 metre wind speed (hourly).
- Surface evaporation.
- Soil moisture.
- Snow amount.
- Sea surface temperature.

Generally, it determines that there will be: -

- More hot days and fewer cold nights.
- An increase in the number of heatwave events.
- More hot days above 35°C; particularly in spring and summer.
- An increase in rainfall in summer and autumn and a decrease in winter and spring.
- Change in the rainfall patterns that will affect drought and flooding events.

The JHHIP project has considered the above and incorporated measures to future proof the development and increase its resilience to projected effects of climate change.

Projected Climate Change Effect	Project Response
Hotter days and more frequent heatwave events	The Project Team acknowledges projected hotter days and more frequent heatwave events for the site and have incorporated a range of measures to ensure adequate thermal conditions can still be achieved even during extreme heat conditions. Key measures include: - • Façade design will include adequate sun shading, insulation and glazing to ensure thermal load from the sun is reduced in summer while allowed in winter. This will reduce the pressure on mechanical systems to achieve comfort conditions. • Landscaping strategy includes adequate shading throughout and seeks to maximise tree retention and tree canopy cover to provide shelter and respite spaces. • Selection of cool roofing and paving materials will be a key consideration to assist with thermal management.

Projected Climate Change Effect	Project Response
Extended drought periods	Water conservation measures have been implemented to reduce potable water consumption and assist in combating extended drought periods: - • Low water landscape vegetation will be preferred. • Potable water fixtures and fittings to be of high efficiency and WELS rated. • Potable water submetering to be connected to the BMCS to be considered to reduce wastage through identifying leaks, or poor operational performances.
More extreme rainfall events and gustier wind conditions	The project incorporates the following measures in response to increased rainfall and gustier conditions: - • The project has considered flooding risk to ensure building design is responsive and adequate measures are implemented as part of the drainage strategy. • Adequately reinforced façade components will be required to withstand increased rainfall and gustier conditions. • Tree maintenance will be critical to ensure that trees do not represent a hazard in extreme weather conditions.

2.7.2 Climate Change Adaptation Plan

A climate change adaptation plan will be developed containing at a minimum the following information: -

- Summary of project's characteristics (site, location, climatic characteristics).
- Assessment of climate change scenarios and impacts on the project using at least two (2) time scales, relevant to the project's anticipated lifespan. This will include a summary of potential direct and indirect (environmental, social and economic) climate change impacts on the project.
- Identification of the potential risks (likelihood and consequence) for the project and the potential risks to people. This risk assessment is to be based on a recognised standard.
- A list of actions and responsibilities for all high and extreme risks identified.
- Stakeholder consultation undertaken during plan preparation and how these issues have been incorporated.

Prior to undertaking the initial assessment, climate change scenarios will be developed and reviewed as per the Australian Greenhouse Office (AGO) Guide (Section 4.2). The scenarios used will be sourced from the Intergovernmental Panel on Climate Change (IPCC) endorsed Global Circulation Models (GCMs) and may include: -

- CSIRO projections;
- NARCLiM climate projections; or
- Projections determined by a more detailed climate model.

The selection of the climate scenario and emissions scenario used will be clearly justified.

The JHHIP project will undertake the 'Initial Assessment' outlined in Section B (Subsections 4-6) of the AGO Guide. The ISO 31000 Standard will be used for further guidance in undertaking the risk analysis process prescribed in Section B (Subsections 5.1-5.6) of the AGO Guide.

The assessment of climate change impacts will address a minimum of two-time scales relevant to anticipated building lifespan for the primary effects of temperature, precipitation and sea-level rise. The plan will then consider the secondary effects of relative humidity, drought/flood, wind, cyclones and bushfire as a minimum.

The recognised standards to be used in this project are listed below: -

- AS 5334:2013 Climate Change Adaptation for Settlements and Infrastructure; OR
- The following two (2) standards when combined: -
  - ISO 31000-2009 Risk Management - Principles and Guidance; and
  - AGO Climate Change Risks and Impacts: A Guide for Government and Business.

Implementation of the climate adaptation plan will include: -

- At least two (2) risk items identified in the risk assessment component of the climate adaptation plan will be addressed by specific design responses.
- All risk items identified as 'high' or 'extreme' shall be addressed by specific design responses.

2.8 INTEGRATED WATER MANAGEMENT PLAN

2.8.1 Potable Water Use Reduction and Alternative Supplies

The JHHIP project will incorporate the following design initiatives to minimise potable water usage through both water efficiency measures and alternative water supplies. Many of these initiatives are in line or aligned with GREP requirements. The project will: -

- Submeter water consumption of major uses and report on their consumption.
- Set targets to reduce or stabilise water consumption
- Ensure all new water-using appliances will be at least 0.5 above the average Water Efficiency Labelling and Standards (WELS) star rating by product, except for toilets and urinals, which must be purchased at the average WELS star rating. The WELS ratings will be at least: -
  - Showerheads – 3.5-stars.
  - Toilets and urinals – 4-stars.
  - Washing machines – 4.5-stars.
  - Dishwashers – 5-stars.
  - Taps and flow controllers – 5-stars.
- Investigate design elements to enable alternative supply.
- Select mostly native and/or drought tolerant landscaping species to reduce irrigation requirements.
- Install a water efficient irrigation system that is sub-soil drip irrigated with moisture sensor overrides.
- Conservation of fire test water through water recirculation during fire pump testing and diving inspection of fire tanks to avoid draining.
- Install sensors and controls on HVAC systems to control their energy and water consumption.

2.8.2 **Water Sensitive Design**

The landscaping features will be optimised to reduce runoff water impacting the stormwater system. The project's civil design will demonstrate that the post-development peak event stormwater discharge from the site does not exceed the pre-development peak event stormwater discharge, using a one (1) year Average Recurrence Interval (ARI).

The following considerations for rainfall simulation will be adopted: -

- Continuous simulation of a minimum of ten (10) years.
- A six (6) minute time step (intervals).
- Localised climatic sequences.
- Water balances.
- Treatment train operation.

Management of stormwater peak flows will include stormwater reuse (roof collection and use) and may include one (1) or more of the following techniques: -

- Infiltration to native soils, or otherwise, filtered through an appropriately designed soil and plant stormwater treatment system, such as bio-retention; -
- Stormwater evapotranspiration; and
- Water detention.

The civil design will demonstrate that all stormwater discharged from the site meets best practice pollution reduction targets from Option B of the table below: -

Pollutants	Reduction Target (% of the typical urban annual load)	
	OPTION A	OPTION B
Total Suspended Solids (TSS)[1]	80%	80%
Gross Pollutants	85%	90%
Total Nitrogen (TN)[2]	30%	45%
Total Phosphorus (TP)[2]	30%	60%
Total Petroleum Hydrocarbons[3]	60%	90%
Free Oils[3]	90%	90%

Notes: -

1) Load based on the following particulate size distribution (by mass): 20% < 20 µm; 20% 20-60 µm; 20% 60-150 µm; 20% 150-400 µm; 20% 400-2000 µm.

2) Load includes particulate and dissolved fraction.

Stormwater treatment performance will be demonstrated for compliance by numerical modelling of pollutant export. The Model for Urban Stormwater Improvement Conceptualisation (MUSIC) model (CRCCH, 2005) is widely adopted for this purpose and will be encouraged. In any case, modelling will be undertaken based on a continuous simulation of catchment hydrology using models, parameters, and methodologies in accordance with the relevant local government requirements.

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APPENDIX A

GREEN STAR PATHWAY

APPENDIX A GREEN STAR PATHWAY

The following table summarises the points that are included as part of the Green Star Design & As-Built v1.3 5-star equivalency strategy for JHHIP project.

The final make-up of targeted points may change as the design and construction progresses, but the commitment is to achieve all points labelled as 'required' and at least sixty (60) points at completion, which is in line with a 5-star Green Star outcome. Required credits must be achieve and hence cannot be value engineered in further development phases without the written agreement of Health Infrastructure (HI).

CATEGORY / CREDIT	CODE	CREDIT CRITERIA	POINTS AVAILABLE	POINTS TARGETED	TYPE
Management					
Green Star Accredited Professional	1.0	Green Star Accredited Professional	1	1	
Commissioning and Tuning	2.0	Environmental Performance Targets	-	Complies	Required
	2.1	Services and Maintainability Review	1	1	Required
	2.2	Building Commissioning	1	1	Required
	2.3	Building Systems Tuning	1	1	Required
	2.4	Independent Commissioning Agent	1	1	Required
Adaptation and Resilience	3.1	Implementation of a Climate Adaptation Plan	2	2	
Building Information	4.0	Building Information	1	1	Required
Commitment to Performance	5.1	Environmental Building Performance	1	1	
	5.2	End of Life Waste Performance	1	1	
Metering and Monitoring	6.0	Metering	-	Complies	
	6.1	Monitoring Systems	1	1	
Construction Environmental Management	7.0	Environmental Management Plan	-	Complies	Required
	7.1	Formalised Management System	1	1	Required
	7.2	High Quality Staff Support	1	1	
Operational Waste	8A	Performance Pathway – Specialist Plan	1	1	Required
Total			14	14	

Indoor Environment Quality					
Indoor Air Quality	9.1	Ventilation System Attributes	1	1	Required
	9.2	Provision of Outdoor Air	2	1	Required
	9.3	Exhaust or Elimination of Pollutants	1	1	Required
Acoustic Comfort	10.1	Internal Noise Levels	1	1	Required
	10.2	Reverberation	1	1	
	10.3	Acoustic Separation	1	1	
Lighting Comfort	11.0	Minimum Lighting Comfort	-	Complies	Required

CATEGORY / CREDIT	CODE	CREDIT CRITERIA	POINTS AVAILABLE	POINTS TARGETED	TYPE
	11.1	General Illuminance and Glare Reduction	1	1	Required
	11.2	Surface Illuminance	1		
	11.3	Localised Lighting Control	1	1	Required
Visual Comfort	12.0	Glare Reduction	-	Complies	Required
	12.1	Daylight	2	1	Required
	12.2	Views	1		
Indoor Pollutants	13.1	Paints, Adhesives, Sealants and Carpets	1	1	Required
	13.2	Engineered Wood Products	1	1	Required
Thermal Comfort	14.1	Thermal Comfort	1	1	Required
	14.2	Advanced Thermal Comfort	1	1	
Total			17	13	

Energy					
Greenhouse Gas Emissions	15E.0	Conditional Requirement: Reference Building Pathway	-	Complies	Required
	15E.1	Modelled Performance Pathway	20	3	Required
Peak Electricity Demand Reduction	16B	Modelled Performance: Reference Building	2	1	
Total			22	4	

Transport					
Sustainable Transport	17B.1	Access by Public Transport	3	1	
	17B.2	Reduced Car Parking Provision	1		
	17B.3	Low Emission Vehicle Infrastructure	1	1	Required
	17B.4	Active Transport Facilities	1		
	17B.5	Walkable Neighbourhoods	1		
Total			7	2	

Water					
Potable Water	18B.1	Sanitary Fixture Efficiency	1	1	Required
	18B.2	Rainwater Reuse	1		
	18B.3	Heat Rejection	1		
	18B.4	Landscape Irrigation	1	1	Required
	18B.5	Fire Protection System Test Water	1	1	Required
Total			6	3	

CATEGORY / CREDIT	CODE	CREDIT CRITERIA	POINTS AVAILABLE	POINTS TARGETED	TYPE
Materials					
Life Cycle Impacts	19A.1	Life Cycle Assessment	7	4	
	19A.2	Additional Life Cycle Impact Reporting		3	
Responsible Building Materials	20.1	Structural and Reinforcing Steel	1	1	Required
	20.2	Timber Products	1	1	Required
	20.3	Permanent Formwork, Pipes, Flooring, Blinds and Cables	1	1	Required
Sustainable Products	21	Product Transparency and Sustainability	3	2	
Construction and Demolition Waste	22B	Percentage Benchmark	1	1	Required
Total			14	13	

Land Use and Ecology			6		
Ecological Value	23.0	Minimum Requirement: Endangered and Vulnerable Species and Communities	-	Does not Comply	
	23.1	Ecological Value	3		
Sustainable Sites	24.0	Conditional Requirement	-	Complies	
	24.1	Reuse of Land	1	1	
	24.2	Contamination and Hazardous Materials	1	1	
Heat Island Effect	25	Heat Island Effect Reduction	1	1	
Total			6	3	

Emissions			5		
Stormwater	26.1	Reduced Peak Discharge	1	1	Required
	26.2	Reduced Pollution Targets	1	1	Required
Light Pollution	27.0	Minimum Requirement: Light Pollution to Neighbouring Bodies	-	Complies	Required
	27.1	Light Pollution to Night Sky	1	1	Required
Microbial Control	28	Microbial Control	1		
Refrigerant Impacts	29	Refrigerant Impacts	1	1	Required
Total			5	4	

CATEGORY / CREDIT	CODE	CREDIT CRITERIA	POINTS AVAILABLE	POINTS TARGETED	TYPE
Innovation*			10		
Innovation	30	1) Soft Landings 2-7) Improving on Green Star benchmarks for Stormwater, Low VOC paints, Maintainability Review for Fitouts, Permeability rates, Commissioning and tuning (supplementary or tenancy fitout systems review), and Daylight. 8) Financial Transparency 9) High performance site office 10) Occupant Engagement 11) RAP (Reconciliation Action Plan) 12) Culture, Heritage and identity 13) Design Review 14) Social ROI 15) Green Cleaning 16) Stakeholder Engagement Strategy 18) Corporate Responsibility	10	10	
Total			10	10	

TOTAL	POINTS TARGETED 66

Table 1: Points Targeted for the Green Star Design & As-Built v1.3 Uncertified Outcomes

This Green Star strategy will continue to be refined as the project moves into detailed design, as well as documenting alignment with the LHD's aspirations.

Refurbishment and carpark works are also included in the scope of the above Green Star strategy.

Ten (10) innovation claims will be selected as the project progresses on the basis that some initiatives cannot be confirmed at schematic design (e.g., occupant engagement, design review, green cleaning, high performance site offices, etc.).