AECOM Imagine it. Delivered.

UON Honeysuckle Campus
University of Newcastle
6th June 2018
Doc No. AEC-UON-ESD-RPT-001-C

Concept Plan Development Application - Sustainability Statement

Concept Plan Development Application - Sustainability Statement

Client: University of Newcastle

ABN: 15 736 576 735

Prepared by

AECOM Australia Pty Ltd
17 Warabrook Boulevard, Warabrook NSW 2304, PO Box 73, Hunter Region MC NSW 2310, Australia
T +61 2 4911 4900 F +61 2 4911 4999 www.aecom.com
ABN 20 093 846 925

6th June 2018

Job No.: 60565223

Quality Information

Document Concept Plan Development Application - Sustainability Statement

Ref 60565223

Date 6th June 2018

Prepared by Ian Dixon

Reviewed by Tim Dunn

Revision History

Rev	Revision Date	Details	Authorised	
			Name/Position	Signature
A	16-May-2018	Draft for Client Review	Ian Richardson Project Director	
B	04-Jun-2018	Final Issue	Ian Richardson Project Director	
C	06-Jun-2018	Minor update to address comment	Ian Richardson Project Director	

Table of Contents

1.0 Introduction 1
2.0 Site and Development Description 1
2.1 The Development 1
2.2 Site Context 2
2.3 Local Climate Context and Solar Considerations 3
3.0 Regulatory and Policy Context 6
3.1 Building Code of Australia – Section J 6
3.2 Secretary's Environmental Assessment Requirements 6
3.3 EPA Regulation 2000 - ESD Principles 6
3.4 Newcastle City Council 7
3.4.1 Newcastle Local Environmental Plan 2012 (LEP) 7
3.4.2 Newcastle Development Control Plans 2012 (DCP) 7
3.5 Green Star Design & As Built 7
3.6 University of Newcastle Design Guidelines / Policies 8
3.6.1 UON Environmental Sustainability Plan 2018-25 8
3.7 Market Drivers and Emerging Influences 8
3.7.1 Changes to Building Codes and Standards 8
3.7.2 Decarbonisation of the built environment 8
3.7.3 Electric Vehicle Uptake 8
3.7.4 Health & Wellbeing 9
3.7.5 Community & Social Sustainability 9
3.8 Timeline 9
4.0 University Buildings Best Practice - Case Studies 2
5.0 Response to the SEARS 4
5.1 EP&A Regulation 2000 4
6.0 The Sustainability Framework 5
7.0 Conclusion 7

1.0 Introduction

This report supports a Concept Plan Development Application (Concept Plan DA) submitted to the Department of Planning and Environment (DP&E) pursuant to Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

University of Newcastle (UON) is seeking to secure concept approval for a new campus located at Honeysuckle Drive in the Newcastle CBD. The Concept Plan DA seeks consent for education uses, a maximum building envelope, maximum building height, maximum gross floor area, pedestrian and vehicular access, circulation arrangements and approval of the strategies and design parameters for the future detailed design of development.

This report has been prepared to outline key Ecologically Sustainable Design (ESD) requirements and drivers and the proposed project specific Sustainability Framework which defines the principles that will be incorporated into the future design, construction and operation of the site and to specifically respond to the Secretary's Environmental Assessment Requirements (SEARs) issued for the Concept Plan DA on 8th May 2018 which states in section 5 that the Environmental Impact Statement (EIS) shall:

- *Detail how ESD principles (as defined in clause 7(4) Schedule 2 of the EP&A Regulation 2000) will be incorporated in the design of the development.*
- *Demonstrate how the proposed development will reflect best practice sustainable building principles to improve environmental performance, including energy and water efficient design and technology and use of renewable energy.*
- *The EIS must include an ESD Statement.*

This report forms the ESD statement and summarises:

- The key Ecologically Sustainable Design (ESD) requirements, drivers and context review;
- Proposes a project specific Sustainability Framework which defines the principles that will guide the sustainable design of the project in future stages of the development;
- Provide summary of best practice design considerations to improve environmental performance, including energy and water efficient design and technology and use of renewable energy.

The report is based on the University of Newcastle Honeysuckle City Campus Development Concept Master Plan Report October 2017.

2.0 Site and Development Description

2.1 The Development

The University of Newcastle (UON) is in the process of further expanding its presence in the Newcastle CBD through the development of the Honeysuckle City Campus. The development will provide next generation teaching and learning facilities, campus support services, student accommodation and publicly accessible zones for community engagement. This is known as the Honeysuckle City Campus Development (HCCD) and comprises of three sites:

- Site 1 (8,546 m^2)
- Site 2 (5,880 m^2)
- Site 3 (6,478 m^2)

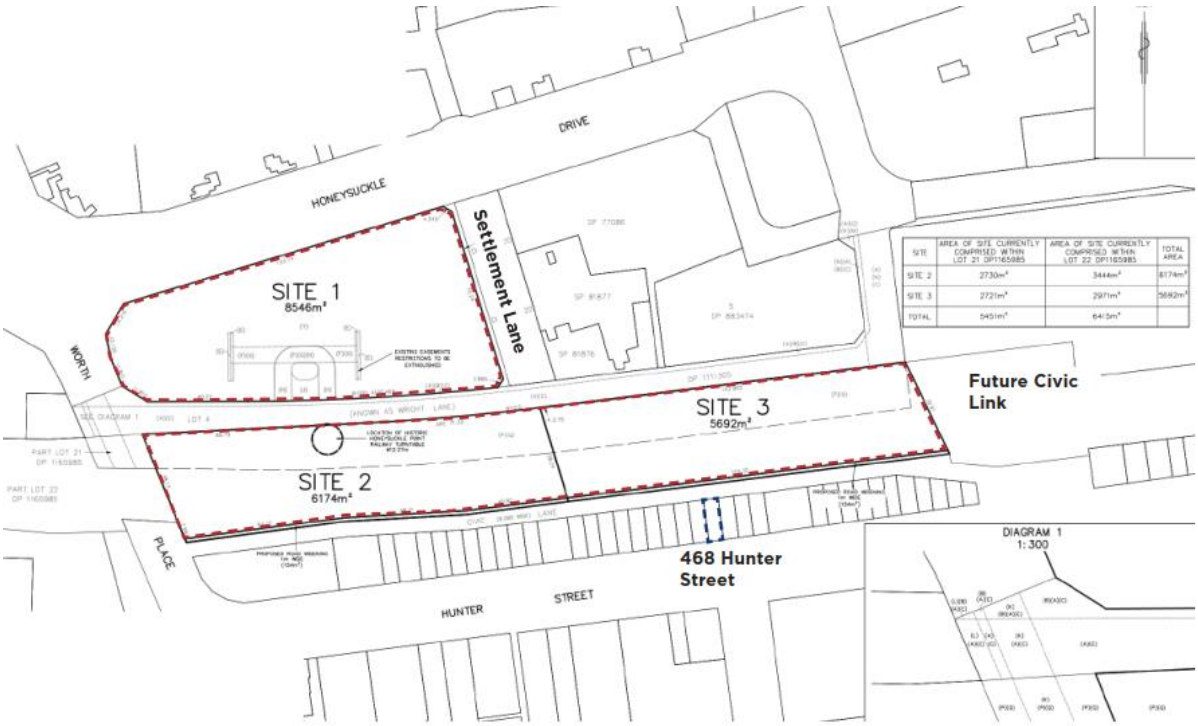

Figure 1 Honeysuckle City Campus Development Site Plan

2.2 Site Context

The site is bounded by Honeysuckle Drive to the north, a private lot with Right of Public Access known as Settlement Lane to the east, Civic lane to the south, Worth Place to the west and future Civic Link to the east. The site's location is close to the waterfront within the Newcastle CBD, offering an ideal location for the University's new campus as well as opportunity to contribute to the broader plans in place for Newcastle's urban renewal.

Overlapping part of the Honeysuckle City Campus is the Honeysuckle State Significant Development (SSD). Site 1 is located completely within the SSD boundary.

Figure 2 Honeysuckle State Significant Development boundary

2.3 Local Climate Context and Solar Considerations

The site is located within climate zone 5, experiencing a warm temperate climate with reduced temperature extremes due to its proximity to the ocean. Figure 3 shows the site orientation and sun path during summer.

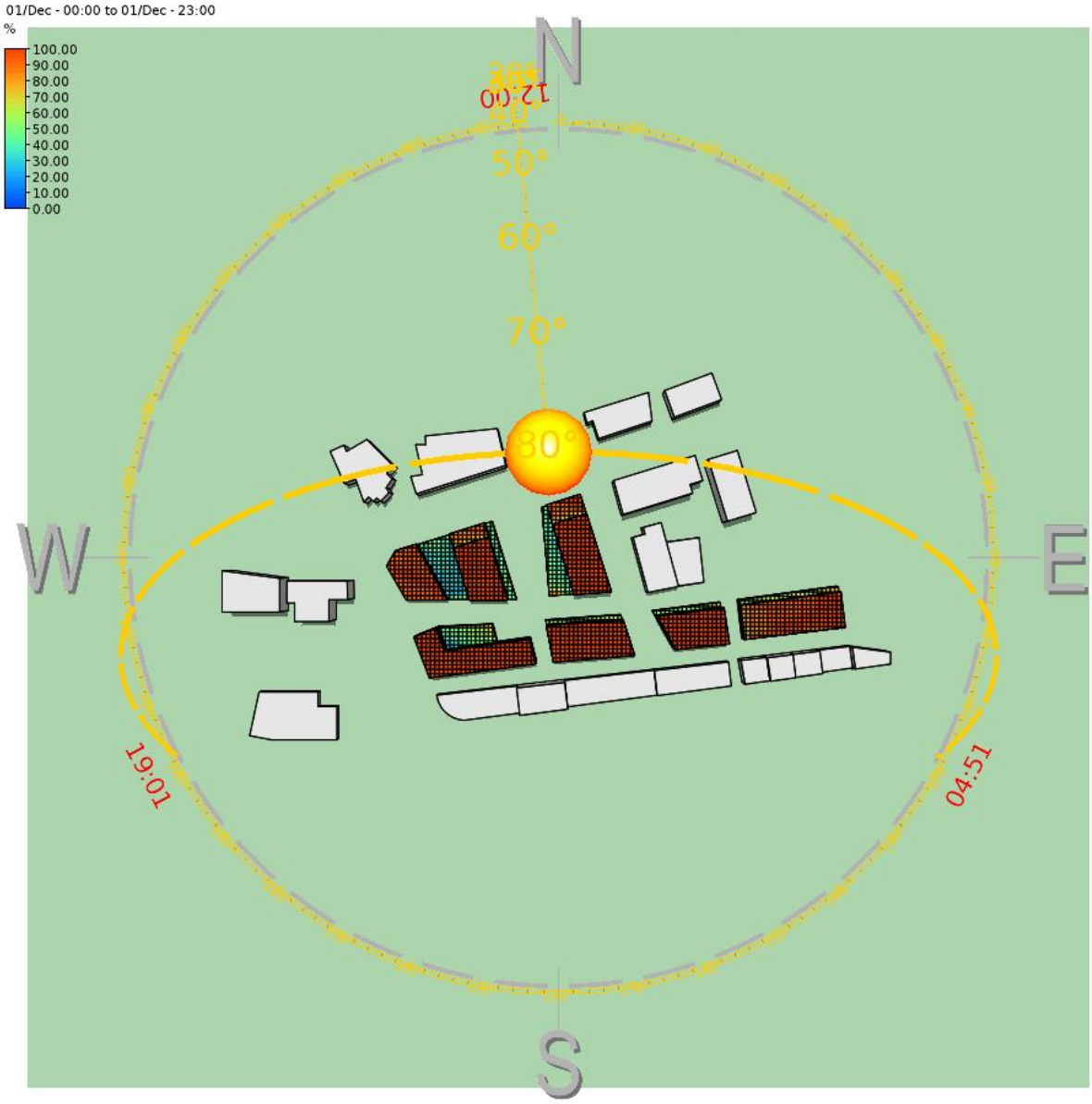

Figure 3 Honeysuckle City Campus Site Context

Figure 4 is an isometric view from the East / North East and Figure 5 from West / North West on summer solstice indicating the solar insolation (w/m2)

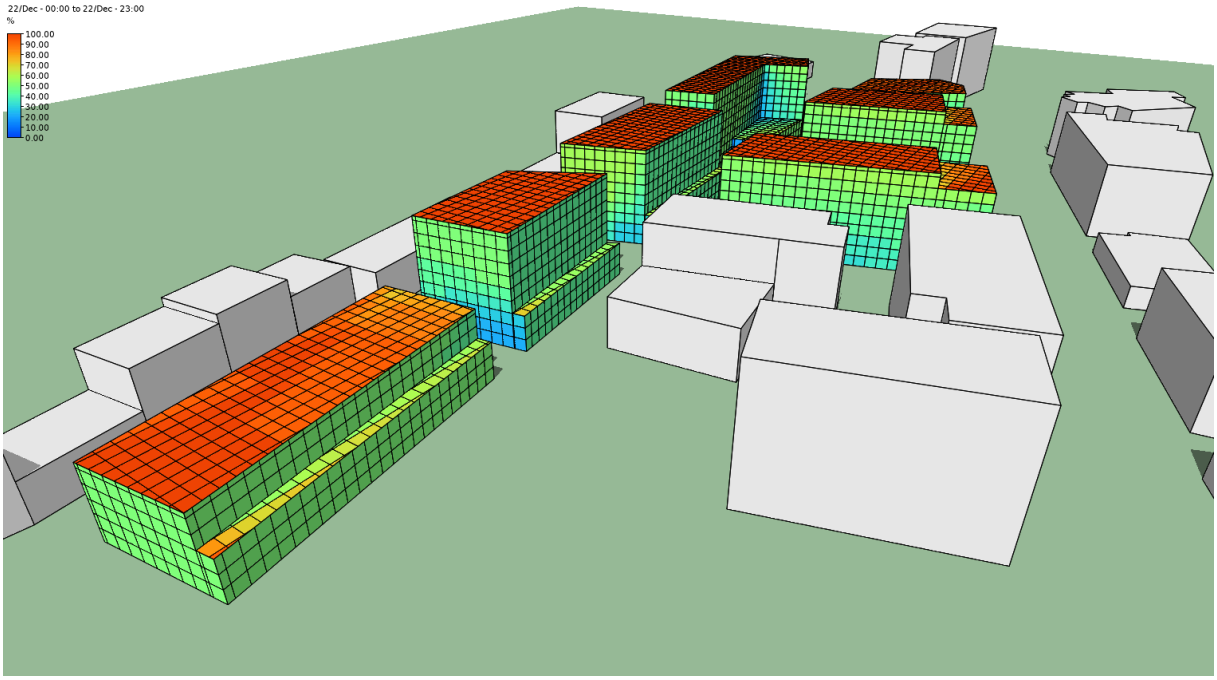

Figure 4 Summer Solstice – ENE Solar Exposure

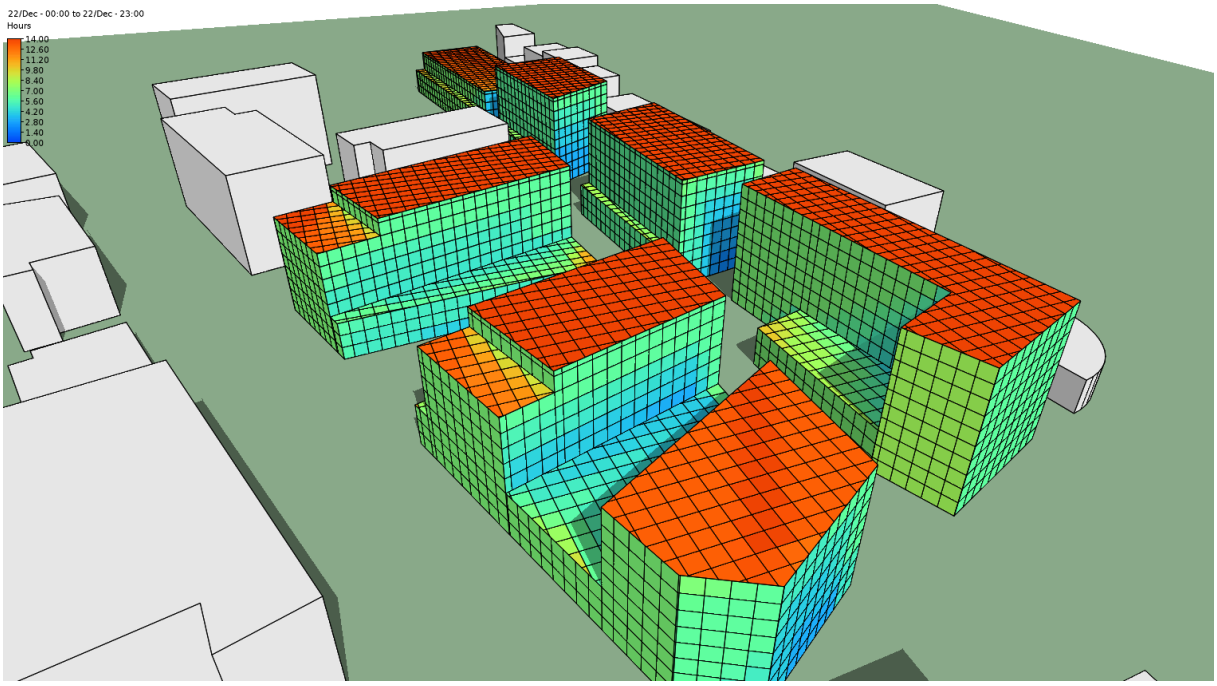

Figure 5 Summer Solstice – WNW Solar Exposure

The site generally has a favourable layout and orientation. There is no overshadowing from surrounding buildings providing excellent solar access to roofs which would support the use of solar energy system for both electricity and hot water.

The east and west elevations are also afforded some protection from the low angle sun due to surrounding buildings of similar height and also each other. However, solar grains particularly from the west will need to be addressed through design measures such as extent of glazed elements and or use of shading / blinds in conjunction with high performance glazing. Solar gains through glazed elements to the north will also need to be managed through appropriate use of shading devices or blinds and glazing performance with low Solar Heat Gain Coefficients (SHGC) to minimise heat gains and glare. Whilst solar control will be desirable year round for academic spaces, solar access during

winter and shoulder season periods should be actively encouraged for the student accommodation building to reduce the need for active heating.

Figure 6 below displays the average temperatures for Newcastle based on data recorded between 1990 and 2012. Conditions fall within typically acceptable thermal comfort bands of 20-24°C for over 4 months of the year, meaning that there is strong potential for using mixed mode ventilation strategies subject to addressing external noise constraints. Mixed mode strategies can be coupled with night purges to cool the building structure and delay the need for active cooling the following day.

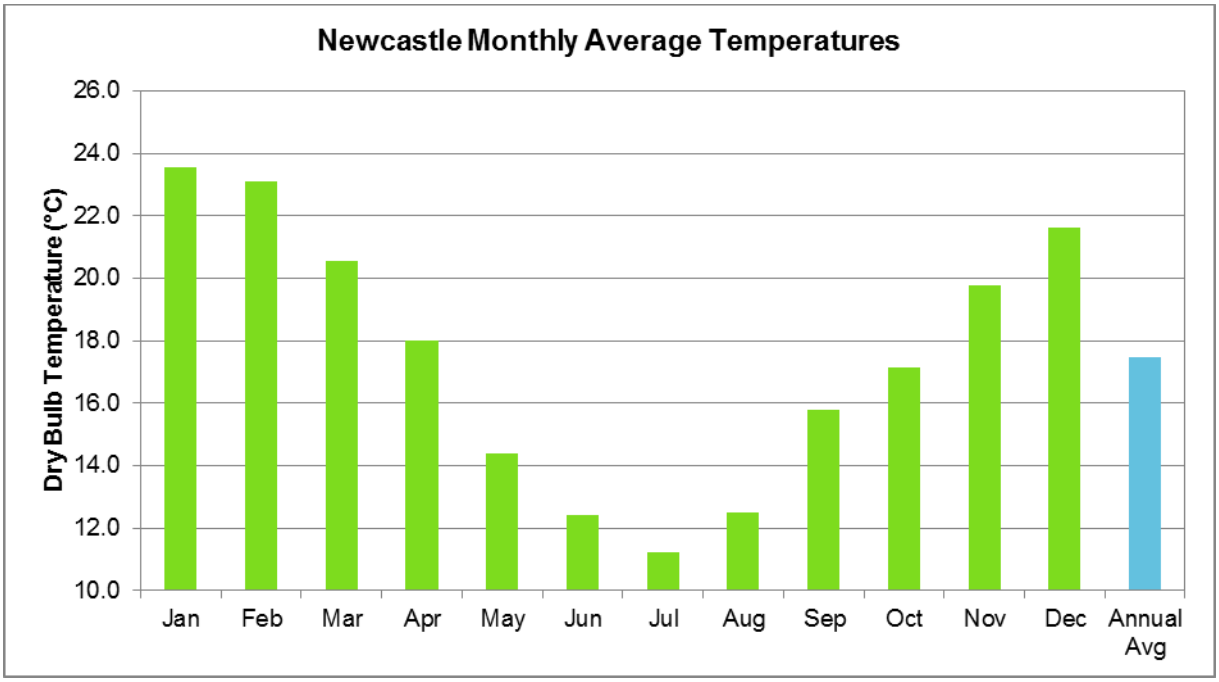

Figure 6 Outdoor temperature profile

3.0 Regulatory and Policy Context

The relevant regulations (incl. state planning requirements) and other drivers which will collectively influence the sustainability response for the development are summarised as follows:

3.1 Building Code of Australia – Section J

The National Construction Code (NCC) Building Code of Australia (BCA) sets the mandatory minimum energy performance requirements for buildings in Section J. The objective is to reduce building greenhouse gas emissions by efficiently using operational energy. Section J is focused on establishing minimum acceptable practice in the building industry.

The building must meet the Deemed-to–Satisfy (DTS) requirements as set out in NCC BCA Section J. This will set the minimum requirements for building fabric, glazing, building sealing, HVAC and light and power provisions. If the DTS requirements cannot be met, a Performance Solution of the building design must be shown as compliant using an Assessment Method such as simulation modelling in accordance with the JV3 Verification Method. Due to the broader sustainability objectives being targeted by the project (incl. Green Star) the building and services will in many cases set performance that is superior to the minimum level needed to meet Section J.

The energy efficiency provisions are undergoing major revisions for the 2019 NCC version which will see an increase in overall energy performance requirements for new buildings constructed under the new Section J provisions.

3.2 Secretary's Environmental Assessment Requirements

The SEARs require that the EIS shall:

- *Detail how ESD principles (as defined in clause 7(4) of Schedule 2 of the Environmental Planning and Assessment Regulation 2000 (EP&A Regulation 2000) will be incorporated in the design of the development; and*

- *Demonstrate how the proposed development will reflect best practice sustainable building principles to improve environmental performance, including energy and water efficient design and technology and use of renewable energy.*

3.3 EPA Regulation 2000 - ESD Principles

In Schedule 2 of the EP&A Regulation, clause (1) subclause (f) requires that an EIS:

- *must include the reasons justifying the carrying out of the development in the manner proposed, having regard to biophysical, economic and social considerations, including the principles of ecologically sustainable development set out in subclause (4).*

The principles of ecologically sustainable development in sub clause (4) are as follows:

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.*

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,*

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

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

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

iv. 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, 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.

3.4 Newcastle City Council

3.4.1 Newcastle Local Environmental Plan 2012 (LEP)

The LEP requires that design excellence in management of environmental impacts such as sustainable design, overshadowing, wind and reflectivity all of which are to be addressed in the development approval process.

3.4.2 Newcastle Development Control Plans 2012 (DCP)

A number of DCP controls apply to the site including glazing reflectivity and minimum performances for water fixtures. Access to sunlight and optimisation of orientation to maximise benefits of solar access are other DCP controls that apply. Further, the DCP also requires commercial and educational buildings are to meet a minimum 4 Star Green Star Rating.

3.5 Green Star Design & As Built

Green Star, developed and administered by the Green Building Council of Australia (GBCA), is a set of rating tools that deliver independent verification of sustainable outcomes throughout the life cycle of the built environment. The GBCA's mission is to "lead the sustainable transformation of the built environment" and it aims to achieve this by encouraging practices that:

- Reduce the impact of climate change
- Enhance the health and quality of life of inhabitants and the sustainability of the built environment
- Restore and protect the planet's biodiversity and ecosystems
- Ensure the ongoing optimum operational performance of buildings
- Contribute to market transformation and a sustainable economy

Green Star rating tools rate built environment performance on a scale from 0 to 6 stars, in a similar fashion to NABERS tools, with certified ratings available for 4 stars and upward.

The Green Star – Design & As Built tool assesses the sustainability attributes of a building primarily through nine different categories:

- Management
- Indoor Environment Quality
- Energy
- Transport
- Water
- Materials
- Land Use and Ecology
- Emissions
- Innovation

The current Design & As Built tool version is 1.2 and tool updates are scheduled for release annually.

3.6 University of Newcastle Design Guidelines / Policies

3.6.1 UON Environmental Sustainability Plan 2018-25

This policy outlines UON's high-level strategic objectives to guide the future development of the University. The strategy was developed as the University enters an important decision-making stage with ageing infrastructure, growing student population, funding uncertainty, increasing utility bills and competition for enrolments.

The strategy includes a number of objective targets for energy, carbon, water and waste that the University will pursue and aim to achieve through this development. The University policy also targets by 2025 attainment of formal Green Star ratings for all new buildings at a 6 Star level and an aspirational target of carbon neutral (subject to further detailed analysis). Note a 5 Star Green Star rating requirement was set for Building 1A of the development by UON prior to the release of the Environmental Sustainability Plan 2018-25.

3.7 Market Drivers and Emerging Influences

There are a number of market and industry drivers that will influence the project design and operational decisions. While these external forces can be considered risks, they can also provide opportunities to maximise sustainable outcomes for the development when considered early in the project development. Key drivers are summarised below, and along with statutory and the University's own internal objectives have helped shape the sustainability framework summarised in section 6.0 of this report:

3.7.1 Changes to Building Codes and Standards

Driven by the Government's commitment to reduce its emissions by 26-28% on 2005 levels by 2030 and the National Energy Productivity Plan, the National Construction Code is expected to increase design stringency under Section J of the Building Code of Australia. The proposed changes are projected to reduce energy consumption of new buildings in the order of 40%[1] and will involve a number of changes including new constraints on the allowable window-to-wall ratios, glazing, thermal insulation and thermal bridging properties.

3.7.2 Decarbonisation of the built environment

Like many other countries who are signatories to the Paris Climate Agreement, Australia has committed to becoming net zero by 2050. Buildings are a major contributor to resource depletion and carbon emissions and have a significant role to play in reducing the transition to net zero economies. There are growing policy platforms to encourage buildings to become net zero. Achieving net zero requires an efficient building running on green power with remaining carbon emissions (from waste, gas, water and transport) being reduced and then offset using carbon credits. Furthermore, the future evolution of rating tools such as Green Star will likely increase the emphasis on achieving net zero outcomes for buildings. It is anticipated that changes to Green Star will include restrictions on fossil fuel use in buildings. As part of the transition to net zero carbon, the project in the longer term needs to include systems capable of using alternatives to the use of fossil fuel.

3.7.3 Electric Vehicle Uptake

Electric vehicles (EV) have rapidly developed from concept to market emergence, with prices declining every year. While currently only forming 0.2% of Australia's annual vehicle sales in 2015 in Australia, this is anticipated to increase sharply in coming years as cost of production declines, along with the improvements in availability and range capacity of EVs, and developments in public charging infrastructure. Considerations should be made for the future provision of electric vehicle charging infrastructure in the future development.

[1] Australian Building Codes Board, NCC 2019 Review of Section J, https://www.abcb.gov.au/Resources/Videos/NCC-2019-Review-of-Section-J

3.7.4 Health & Wellbeing

Research is increasingly demonstrating links between the built environment and the health of the population, increasing the demand for certain new precincts and buildings to include features that support health and wellbeing of users. Sustainable design is moving beyond environmental considerations and the focus is shifting to health and wellbeing. Rating tools dedicated to health and wellness have now emerged (WELL Standard) and future planning policies are be expected to increasingly encourage built environment design features that can improve people's health, and reduce incidence of chronic disease occurrences.

3.7.5 Community & Social Sustainability

With global urbanisation taking place at a rapid rate, governments and cities are starting to pay more attention to the sustainability attributes of the planning, design and construction of new projects. This involves the delivery of projects that offer diverse, affordable, inclusive, well connected and healthy places to live, work and play - as well as encourage opportunities for business diversity, efficiency, innovation and economic development.

3.8 Timeline

Due to the potential timeline for the developments associated with this master plan the targets and market drivers have been mapped to further contextualise the associated influence over the course of the development. Refer Figure 7.

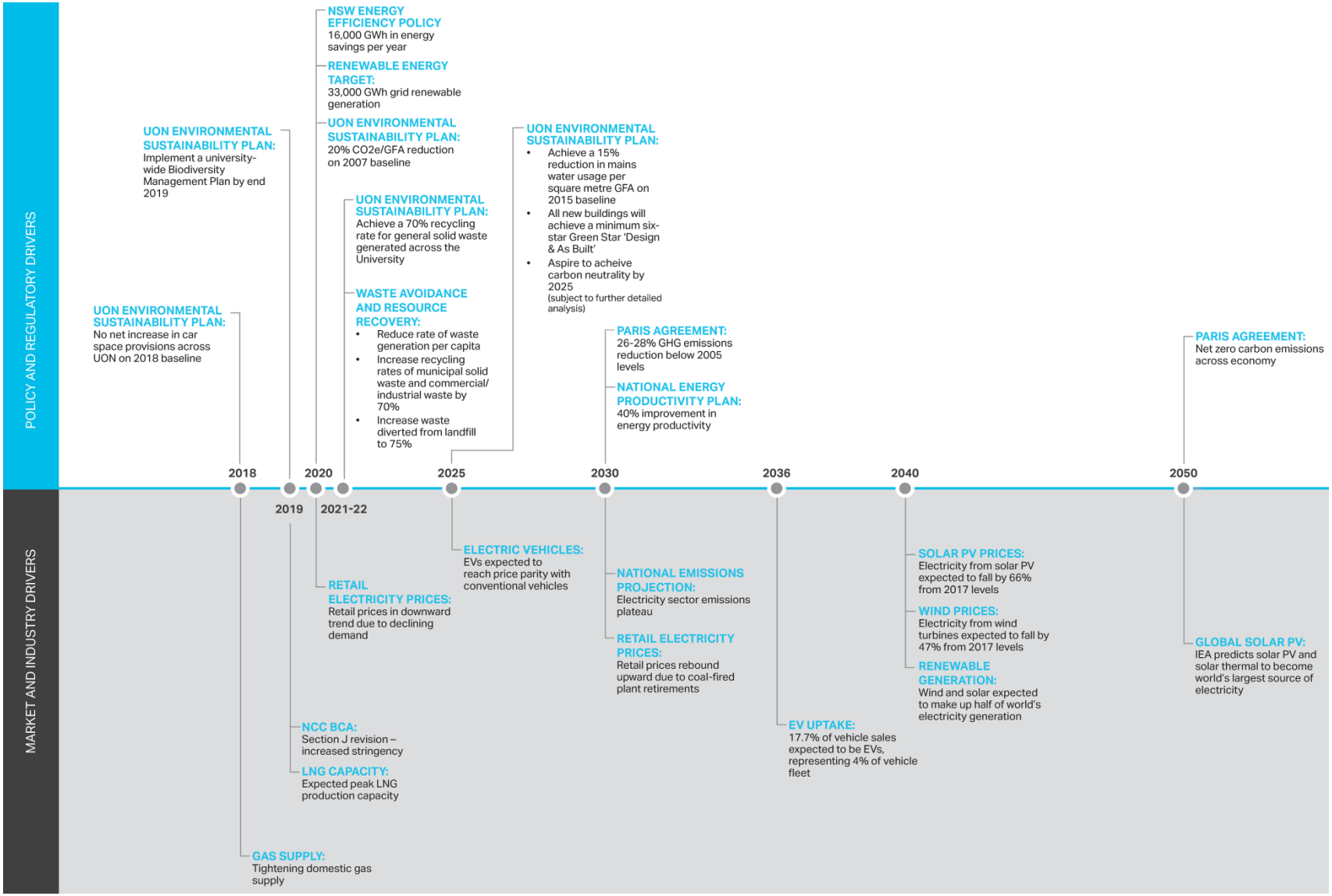

Figure 7 Timeline

4.0 University Buildings Best Practice - Case Studies

Universities demonstrate their drive for innovation and environmental credentials through the design of their campus buildings. Campus buildings provide a very visible and tangible medium for Universities to showcase sustainable design and architecture, acting as a form of passive marketing to existing and prospective students as well as the community. The case studies below provide a snapshot of recently constructed university buildings, and can serve to guide best practice for the design of the HCCD.

NeW Space – University of Newcastle

Description: NeW Space is focused on a sustainable design and has been awarded a 5 Star Green Star – Education Design V1 Certified Rating by the GBCA. The dramatic design not only looks striking and at one with the environment in which it sits, but also features a myriad of environmentally sustainable features.

Cost: $95 million

ESD Features:

- High performance double glazing and engineered aluminium frames
- Passively designed to maximise natural ventilation
- Rainwater harvesting for reuse in toilet flushing and landscape irrigation.

Dr. Chau Chak Wing Building – University of Technology, Sydney

Description: The landmark building in the UTS City Campus Master Plan, its unique design is a physical manifestation of the innovative thinking that underpins the UTS Business School. It has been awarded a 5 Star Green Star – Education v1 Rating by the GBCA.

Cost: $180 million

ESD Features:

- Maximised natural daylighting through high performance double glazed, low-emissivity glass-panelled curtain wall
- Use of low environmental impact, sustainability sourced cross-laminated timber
- Recyclable waste storage and polystyrene compactor.

Lowy Cancer Research Centre – University of New South Wales

Location: Sydney, NSW

Description: The Lowy Cancer Research Centre was designed to create a 'flexible and evolving research facility', able to adapt to a dynamic research program. The building is heavily serviced, but utilises all possible available technology to reduce its ecological footprint.

Cost: $100 million

ESD Features:

- Uses campus-wide bore water aquifer, recharged by rain and stormwater
- All research write-up stations within 6m of natural light, reducing need for artificial lighting
- Tri-generation system installed to provide building electricity, heating and cooling.

5.0 Response to the SEARS

The SEARS are detailed in section 3.2 and include the following:

1. Detail how ESD principles (as defined in clause 7(4) of Schedule 2 of the Environmental Planning and Assessment Regulation 2000 (EP&A Regulation 2000) will be incorporated in the design, construction and ongoing operation of the development.
2. Demonstrate how the proposed development will reflect best practice sustainable building principles to improve environmental performance, including energy and water efficient design and technology and use of renewable energy.

5.1 EP&A Regulation 2000

The EP&A Regulation ESD Principles will be met as follows:

Table 1 EP&A Regulation 2000

EP&A Regulation Requirement	Methodology/Approach
Precautionary Principle	The development will be designed to avoid where practicable damage to the environment. The development will actively seek to rehabilitate and restore environmental conditions on the site through remediation of site contamination and stabilisation of the mine shafts. Further, an ESD framework (section 6.0) will guide the design, of the development through adoption of strategies that will reduce energy and water consumption, limit carbon emissions, encourage use of responsible materials, reduce waste and limit other forms of emissions from the site including light pollution. The project will also target a formal sustainability rating using the Green Star Design and As Built tool which will evidence a measurable demonstration of reduced impact and harm to the environment.
Intergenerational equity	The development will seek to benefit present and future generations through increased health and environmental benefits associated with reductions in pollution, enhanced health through improved active transport facilities and creating a space that can be utilised and accessed by all ages, cultures and abilities. The development will provide a substantial educational capacity into the heart of the Newcastle CBD providing facilities that will be a resource for ongoing learning. The development will also seek to integrate the best practice indoor environmental quality features to reduce internal air pollutant levels and enhance the internal building environment to the benefit of occupant health.
Conservation of biological diversity and ecological integrity	The development will actively seek to rehabilitate environmental conditions on the site remediation of site contamination and stabilisation of the mine shafts Further, restorative sustainability strategies seek to enhance the ecological and biological value of the site through introduction of landscaping.
Improved valuation, pricing and incentive mechanisms	The development is targeting high levels of sustainability performance which will impose additional upfront costs to the development but will ultimately result in increased asset value with improved financial and environmental life cycle performance. As part of the sustainability framework (section 6.0) life cycle costing will be used during the design to form part of the overall integrated project decision making and assessment of major building components and systems to maximise sustainability benefits and create long term value both monetary and non-monetary to building owners, occupants and other stakeholders.

6.0 The Sustainability Framework

The sustainability framework for the development is intended to provide guiding principles and design considerations focused around key sustainability themes. Implementation of this framework will enable the development to incorporate best practice sustainability principles which respond to the University's own targets as well as regulatory requirements, policies and emerging market trends and drivers.

The framework has been developed with regard to the following:

1. The key policy drivers including Australia's national carbon reduction target under the Paris Agreement, numerous State-level policies and guidance on energy and waste, and the local level LEPs and DCPs that govern design decisions.
2. The key market and industry drivers including trends in the domestic electricity and gas markets, advances in the renewable energy industry and the market broadening definition of sustainability.
3. The University's sustainability policies and objectives including the separate carbon, water and waste targets and also the broader aim to achieve 6 Star Green Star ratings for all new buildings. Note a 5 Star Green Star rating requirement was set for Building 1A of the development by UON prior to the release of the Environmental Sustainability Plan 2018-25.
4. The University's priority areas related to sustainability as indicated through their policies. These being Energy, Carbon, Water and Waste.
5. The development staging - due to the prolonged staging over many years, centralised solutions may not be feasible or practical and therefore, localised responses in relation to each building development are required. However, where possible augmentation of systems should be consider to enable future localised systems to each other.

The key objectives of the framework are to:

- Inform and guide sustainability considerations for the duration of the project from the initial enabling works through to the building design, construction and handover stages of the asset.
- Ensure sustainability considerations are integral to the overall integrated design and delivery of the project.
- Provide guiding principles alongside the University's sustainability targets which aims to drive best practice and innovation.
- Provide flexibility for market-determined solutions that are the most cost-effective using the technologies available at the time of the development to achieve sustainable outcomes.

This framework should be updated at key project milestones to ensure that any changes in staging, building types and function along with external policy and market drivers are adequately captured.

The project specific framework and associated design considerations for the key phases of the project is shown below in Table 2.

Table 2 Project Sustainability Framework

Theme	Aim	Relevant Drivers	Targets	Key Design Considerations for Project Stages	
				Building Works	Precinct Works
Leadership & Governance	Demonstrate leadership by embedding sustainability objectives into decision making processes, and committing to setting targets and having a measuring and monitoring system to track the environmental performance of the building.	• Green Star Rating Tools (Design & As Built) • Environmental Planning & Assessment Regulation 2000 • University Policies, Vision and Ambitions	• Commitment to achieving a 6 Star Green Star Design & As Built rating for new buildings. Building 1A within the development to achieve 5 Star rating as requirement for this building set by UON prior to release of the 2018-25 Environmental Sustainability Policy targets.	• Design and construct buildings under the Green Star D&AB rating framework • Have dedicated commitment to set environmental targets and measure results for the environmental performance of the building • Report on key metrics such as energy use, water use and waste generation during construction and operation.	• Consider adopting the Green Star Communities rating for multiple developments within HCCD • Coordination of design and development of HCCD using a holistic approach and decision making methods that take into account the interaction of buildings with the precinct.

Energy & Carbon Minimisation	Minimisation of carbon emissions and energy consumption through energy efficient design strategies and applications.	• UON Environmental Sustainability Plan 2018-25
		• Paris Agreement
		• National Energy Productivity Plan
		• Renewable Energy Target
		• Domestic Gas Supply
		• Grid Electricity Carbon Emissions
		• Retail Electricity Prices
		• Building Code Australia Section J
			• 20% $CO_{2\text{-}e}/m^2$ GFA (target 83.04kg$CO_{2\text{-}e}$ per m^2 GFA) reduction by 2020 on a 2007 baseline
			• Aspirational target of carbon neutral by 2025 (subject to further detailed analysis)
			• Relevant Green Star Design and As Built Credits:
			  ○ Credit 15 - GHG
			  ○ Credit 16 - Peak Demand
			  ○ Credit 6 - Metering and Monitoring
			  ○ Credit 2 - Commissioning and Tuning
			  ○ Innovation – On site renewables
				• Follow the energy reduction hierarchy in design of the buildings; energy conservation, energy efficiency, renewable energy, low emission energy, carbon offsetting
				• Optimise building orientation and layout of buildings to minimise energy use
				• Use of highly efficient thermal envelopes and glazing systems in combination with considered shading devices to effectively manage heating and cooling loads & energy consumption
				• Building Services design to target improvement over minimum NCC Section J requirements and be maximised as far as practicable to optimise energy efficiency
				• Consider the use of exposed thermal mass and storage systems to smooth thermal loads and improve overall energy efficiency
				• Project teams to consider application of alternative low carbon energy sources such as solar PV, battery storage and ground source heat exchange
					• Where feasible, the potential for reticulation infrastructure to allow for connection of localised systems to each other in future stages is to be explored so that site infrastructure can potentially be shared (e.g. thermal cooling/heating systems, stormwater/rainwater, solar PV, battery storage and microgrids)
					• Consider green vegetation and green infrastructure to enable cooler microclimates.

Theme	Aim	Relevant Drivers	Targets	Key Design Considerations for Project Stages	
				Building Works	Precinct Works
				• Where feasible, connection of localised systems to each other in future stages is to be explored so that site infrastructure can potentially be shared (e.g. shared stormwater/ rainwater systems and thermal cooling/heating systems) • Building to include comprehensive metering and monitoring systems to enable ongoing monitoring and management • Buildings to be commissioned to high standard with ongoing tuning for a minimum of 12 months.	

Water	Reduce potable water usage and maximise opportunities for rainwater / stormwater capture and reuse for non-potable purposes.	• UON Environmental Sustainability Plan 2018-25	• 15% annual potable water use per m^2 GFA (target 0.59kL/m^2 GFA) reduction on 2015 baseline by 2025
			• Relevant Green Star Design and As Built Credits:
			  ○ Credit 19 - Potable Water
			  ○ Credit 6 - Metering and Monitoring
				• Install water efficient fixtures and appliances
				• Harvest rainwater from building rooftops for non-potable water uses
				• Select zero-irrigation, drought-tolerant native vegetation for landscaping purposes and use water efficient irrigation systems
				• Where feasible, connection of localised systems to each other in future stages is to be explored so that site infrastructure can potentially be shared (e.g. shared stormwater/rainwater systems)
				• Water meters and monitoring system.
					• Integration of water sensitive urban design features
					• Consider opportunity for reticulation for future shared systems such as rainwater harvesting
					• Limit irrigation to sporting fields and some lawn areas
					• Select zero-irrigation, drought-tolerant native vegetation for landscaping purposes and use water efficient irrigation systems
					• Seek to maximise use of non-potable water for landscaping and irrigation purposes.

Waste & Materials	Minimise construction and material waste generated throughout the project lifecycle by considering embodied lifecycle impacts of material selections for the project. Contractors,	• UON Environmental Sustainability Plan 2018-25
		• Waste Avoidance and Resource Recovery Strategy (WARR)
			• Increase recycling rates for general solid waste to 70% across UON
			• Green Star Design & As Built Credits:
			  ○ 8 – Operational Waste
			  ○ 19 – Life Cycle
				• Adequate waste separation facilities and transfer stations for general waste, paper/cardboard, co-mingled and organics recycling
				• Consider alternatives to the use of concrete and steel structures such as structural timber which has a reduced embodied carbon impact, faster construction time, and can
					• Have site-wide waste handling and collection programs, facilities and processes in-place for separation and recycling of waste generated on site
					• Consider potential for waste storage and handling systems such as pneumatic/vacuum waste systems.

Theme	Aim	Relevant Drivers	Targets	Key Design Considerations for Project Stages	
				Building Works	Precinct Works
	subcontractors and suppliers are to adopt sustainability as a key initiative in their work and procurement processes.		Assessment ○ 20 – Responsible Building Materials ○ 21 – Sustainable Products ○ 22 Construction and Demolition Waste	reduce requirement for building foundations • Reduce Portland cement content through maximising use of supplementary cementitious materials where feasible • Maximise use of steel and timber sourced from certified environmentally responsible suppliers • Permanent formwork, pipes, flooring, blinds and cables to be free of PVC or PVC that meets the GBCA's Best Practice Guidelines for PVC • Sustainable timber procurement through GBCA approved Forest Certification Schemes or reused sources • Have waste handling and collection programs, facilities and processes in place for separation and recycling of waste generated on-site • All procurement decisions to adhere to UON's 'Socially Responsible Procurement Policy' and 'Buy Local Strategy' • Select products with verified third party certification such as Environmental Product Declarations.	
Land Use, Ecology & Biodiversity	Natural ecosystems and local landscape habitat to be preserved and site ecological value enhanced	• UON Environmental Sustainability Plan 2018-25 • Environmental Planning & Assessment Regulation 2000	• Develop and implement university wide Biodiversity Management Plan by end 2019 • Seek to promote selection of vegetation native to the region • Green Star Design & As Built Credits: ○ 23 – Ecological Value	• Consider green infrastructure that can provide a visual connection with the surrounding green space • Improve the ecological value of the site through use of native landscaped areas • Consider integration of Green Roof / Green Walls for buildings for additional ecological value and to reduce heat island effect • Use of native landscaping in planet boxes or landscaped areas delivered as part of the	• Select zero-irrigation, drought-tolerant native vegetation for landscaping purposes in open areas • Improve the ecological value of the site through use of native landscaped areas • Consider green infrastructure that can provide a visual connection with the surrounding green space • Where feasible, improve habitat connectivity by providing green corridors

Theme	Aim	Relevant Drivers	Targets	Key Design Considerations for Project Stages	
				Building Works	Precinct Works
			○ 24 Sustainable Sites ○ 25 Heat Island Effect	building.	through the site.
Emissions and Discharges	Reduce sources of pollution and emissions to limit degree of environmental harm caused.	Nil	• Green Star Design & As Built Credits: ○ 26 – Stormwater ○ 27 – Light Pollution ○ 29 – Refrigerant Impacts	• Where feasible, implement construction measures to minimise adverse impact of: ○ light spill ○ noise ○ vibration ○ local air quality ○ stormwater discharge • Water sensitive urban design principles to be adopted to reduce stormwater flow and water quality targets to be set • Where feasible, connection of localised systems to each other in future stages is to be explored so that site infrastructure can potentially be shared (e.g. shared stormwater/rainwater systems) • Minimise the use of insulants and refrigerants with high global warming potential and use only zero ozone depleting potential products • Light spill to neighbouring properties to be controlled • Light pollution to night sky to be prevented.	• Where feasible, implement construction measures to minimise adverse impact of: ○ light spill ○ noise ○ vibration ○ local air quality ○ stormwater discharge • Water sensitive urban design principles to be adopted and water quality targets to be set • Light spill to neighbouring properties to be controlled • Light pollution to night sky to be prevented.
Climate Change Resilience	The site will be designed for resilience to the effects of climate change and natural disasters. This may include issues such as extreme temperatures, hail and flooding. Different climate change risks and impacts to be assessed, with design strategies and	• Paris Agreement • NSW Climate Change Policy Framework • Climate Change Fund Draft Strategic Plan 2017-22 • National Carbon Offset Standard	• Mitigate all identified extreme and high climate risks • Relevant Green Star Design and As Built Credits: ○ 3 Adaptation and Resilience	• Climate change risk assessment to be conducted for buildings • Building design to include features to address identified climate risks such as locating critical infrastructure above the flood level.	• Consider design and provision of green spaces and green infrastructure to create cooler microclimates.

Theme	Aim	Relevant Drivers	Targets	Key Design Considerations for Project Stages	
				Building Works	Precinct Works
	plans in place to address them.	• Green Star Design & As Built Credit 3 – Climate Adaptation			
Health and Wellbeing	The site and buildings to include features that enhance physical and mental wellbeing.	• Increasing market focus on health and wellbeing	• Relevant Green Star Design and As Built Credits: ○ Indoor Environmental Quality Category ○ 17 Sustainable Transport ○ Inn – Active Design	• Preference for low formaldehyde and low volatile organic compounds (VOCs) materials to improve internal air quality, where feasible • Design buildings with consideration to the impact on human health and wellbeing, such as natural daylight, ventilation, visual, thermal and acoustic comfort • Design of building to include provision for end of trip facilities, where feasible • Preference availability of fresh food outlets over of fast food, where feasible.	• Consider design and installation of green spaces and green infrastructure to create cooler microclimates • Precinct design to enable better accessibility for cyclists and pedestrians • Precinct design to improve pedestrian permeability and connection to public transport corridors.
Social / Community Benefit	Project to initiate community and local stakeholder engagement and involvement in the project development, and contribute to the delivery of legacy projects that benefit local communities. Opportunities to increase employment positions for locals, indigenous workers and businesses may also be pursued as a benefit to the local community.	• UON Environmental Sustainability Plan 2018-25 • Community engagement for development benefit	• Increase student and staff awareness of university environmental sustainability issues • Relevant Green Star Innovation credits: ○ Reconciliation Action Plan (RAP) ○ Local Procurement	• Rooftop gardens or food gardens may be considered • Streets to have footpaths for pedestrian use • Design of public domain with regard to crime prevention principles • Local procurement of contractor team and materials • Learning resources for students/staff in high public traffic areas and through online mediums	• Provision of sufficient open spaces and parks for recreational uses by the community, where feasible • Streets to have footpaths for pedestrian use during construction stages • Design of public domain with regard to crime prevention principles • Local procurement of contractor team and materials.
Economic	Project design to consider the business case for sustainability components	• High value asset for University	Green Star Innovation – Social Return on Investment Credit	• Major building components and systems such as fabric, structure, plant equipment to be assessed using integrated design and	• Project team to evaluate precinct options and initiatives by considering environmental, social and economic

Theme	Aim	Relevant Drivers	Targets	Key Design Considerations for Project Stages	
				Building Works	Precinct Works
	and ecological design. WOL costing should be integrated into the project decision making process, where different components, systems and equipment are assessed on a life cycle costing basis to maximise sustainability benefits and create long-term value for the asset owner, occupants and other key stakeholders. Scenarios to be compared to an agreed BAU scenario.			life-cycle costing assessment • For building energy and water services design, develop options under the scenarios: Business-as-Usual, Lean (efficiency), Green (renewables), and Clean (low emissions) for options assessment to ensure that sustainability has been embedded into the design • Project team to evaluate project initiatives by considering environmental, social and economic aspects through use of multi-criteria analysis or other scored means • Project team to consider alternative servicing strategies for energy, water and waste for comparison against business-as-usual.	aspects through use of multi-criteria analysis or other scored means • For precinct energy and water services design, develop options under the scenarios: Business-as-Usual, Lean (efficiency), Green (renewables), and Clean (low emissions) for options assessment to ensure that sustainability has been embedded into the design • Life cycle costing to be used in infrastructure investment decisions, where feasible

7.0 Conclusion

AECOM has reviewed the applicable sustainability requirements including statutory obligations defined by the Building Code of Australia Section J, EP&A Regulation, SEARS and Newcastle City Council Development Control Policies. The University's own Sustainability Policies also assist in defining a number of sustainability considerations. Current sustainability rating tools applicable to the site and emerging market drivers and trends have also been reviewed and considered.

The proposed framework will inform the detailed development application for future enabling works as well as the buildings.

Initial sustainable design considerations for the future development have also been nominated alongside the framework and include:

- Rehabilitation and restoration of environmental conditions on the site through remediation of site contamination and stabilisation of the mine shafts;
- Use of landscaping to manage stormwater and increase local biodiversity and site ecological value and improve local amenity;
- Passively designed buildings with high-performing building envelope elements and façade materials to minimise need for artificial lighting and to manage heating and cooling loads;
- Use of energy-efficient building services including HVAC, lighting devices and smart control systems;
- Application of on-site energy generation and storage through use of solar technology. This could include both generation of electrical energy potentially combined with battery storage and solar thermal energy for generation of hot water;
- Stormwater management and potable water reduction measures through efficient fixtures and use of rainwater harvesting and reuse;
- Utilisation of low-emissions materials and mixed mode ventilation to improve indoor air quality;
- Utilisation of recycled materials and alternatives to concrete and steel where possible to reduce project life cycle impacts;
- Implementation of responsible construction practices that manage environmental impacts and reduce construction and demolition waste;
- Comprehensive building operations and facilities management practices including extensive energy and water metering and monitoring systems; and
- Operational waste management through recycling and waste handling facilities and procedures.

On the basis of this review, the proposal is capable of complying with the applicable sustainability requirements and statutory obligations.