WOOD & GRIEVE ENGINEERS

Macquarie University Building W6A & B Refurbishment

Ecological Sustainable Development Report

Prepared for:

Macquaire University
C/- Capital Insight
Project Management

Date:
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Revision

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2	10/08/2017	Revised DA Issue	NCJ
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Contents

Executive summary

This Ecological Sustainable Development (ESD) report has been prepared for Macquarie University and is intended to provide an overview of the proposed ESD framework to be implemented for the proposed development at the Macquarie University Arts Precinct, Building's W6A & W6B refurbishment.

The framework presented within this report has been developed via consultation with the project design team and attempts to provide a suitable overview for the Department of Planning & Environment and provide surety of the project's commitment to ESD.

This report includes:

- An overview of the sustainability drivers for the project (both regulatory & identified project drivers)
- Detail regarding the overall sustainability framework adopted for the site; and
- Detail regarding specific ecological design responses (where possible).

Information contained within this report has been prepared in direct response to:

- Local and international sustainability drivers;
- City of Ryde Local Environment Plan (LEP) – 2014;
- City of Ryde Development Control Plan (DCP) – 2014;
- Secretary's Environmental Assessment Requirements (Section 78A (8A) EPA Act.
- Industry best practice drivers for ecological sustainable design.

The report is intended to provide an overview of the proposed project's Ecological Sustainable Development Framework for further refinement within the Detailed Design phase of the project.

Macquarie University is currently committed to a range of initiatives which are designed to reduce the overall environmental footprint of the campus and the universities operations. The project redevelopment shall be included within the current benchmark implementation of the One Planet Ecological Footprint tool developed by the Footprint Company. This is a current campus-wide programme and intended to reduce the overall ecological footprint of the university. The program includes both existing and future buildings & significant structures.

The methodology behind this tool measures the impact of existing building operations and calculates a 'planet rating' meaning – how many planets (of resources) would it take to continue existing if everyone continued as business as usual.

Source: http://www.mq.edu.footprintcompany.com.au/

The current benchmark index across the campus is 1.4 planets. Scores are achieved by assessing key impact areas of each building including: biological capacity, energy, water, structure & roof, façade, internal elements, services, transport and fitout operations. While no official benchmark has been set, a nominal project target of 1.0 planets has been identified as the project target; however, the outcome is not viewed as mandatory.

1. Introduction

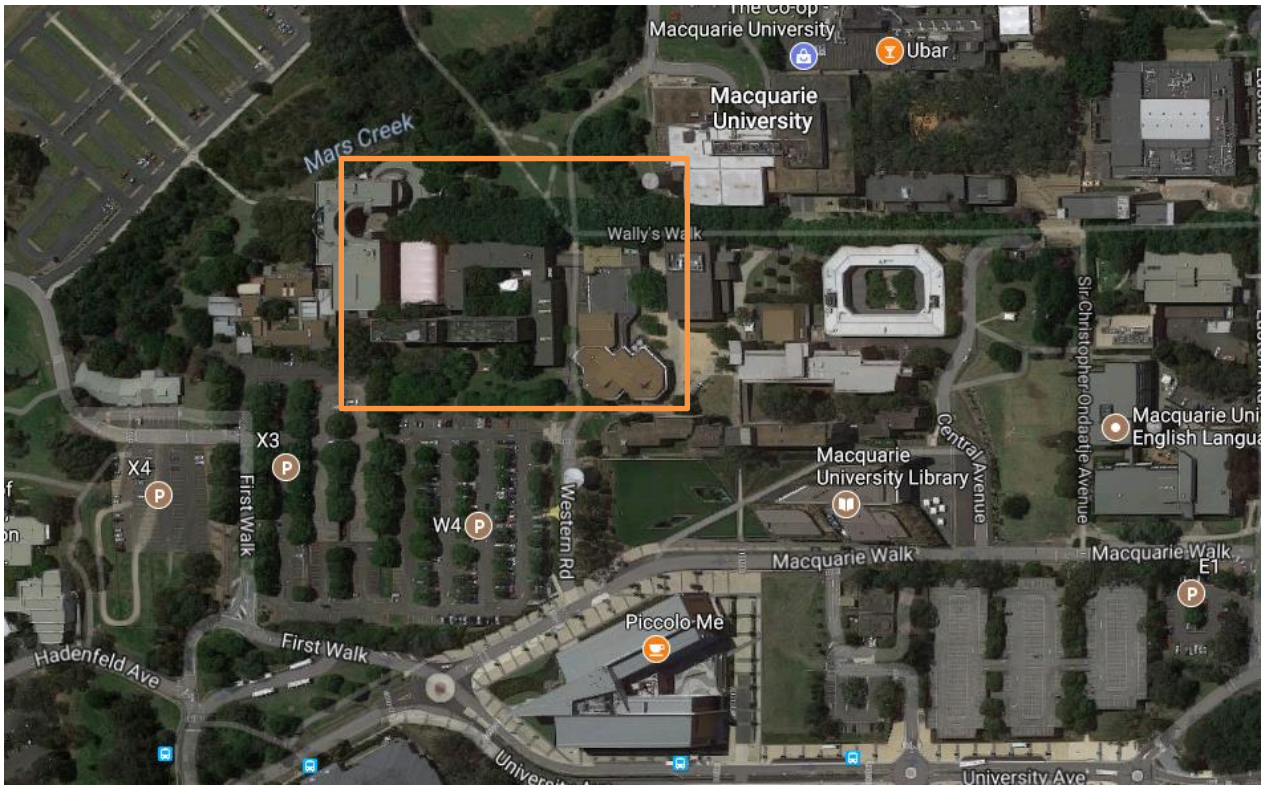
The proposed project consists of the refurbishment and extension to the existing W6A & B building, the proposed development is summarised below:

- W6A and W6B to be internally refurbished to provide superior amenity and spaces consistent with requirements of contemporary best practice for academic teaching/ learning;
- New entrance to W6B from Wally's Walk to provide legible entrance and visual connection;
- W6A's aged core to be replaced with a new core that will also serve as the vertical circulation and collaborative hub facilitating interdepartmental and student /academic meetings & joint work to reverse the current academic silo character of the existing tower;
- W6A's northern facade to be fitted with new transparent twin wall glazed and integrally solar shaded facades which also accommodate the necessary services runs installed;
- New purpose-built faculty showcase building to be erected in the location of the berm to the south of W6A to accommodate MQU's ancient cultures and modern history collections, wet and dry teaching and fieldwork spaces, function/ exhibition space, and academic uses;
- Covered atrium space to be erected between W6A and the new showcase building to connect the new and existing refurbished built structures and to thereby create a unified 'Arts Precinct';
- North-south visual connection between Wally's Walk and new east-west pedestrian connection to the south of the precinct to assist orientation for visitors and users of the buildings; and
- Augmentation of the precinct services capacity to serve the new development, adjacent existing facilities and future developments in line with the University Master Plan.

Macquarie University – W6A & W6B Refurbishment

The following image identifies the project site:

Source: Macquarie University.



Source: Google Maps.

2. Project Sustainability Drivers

The proposed ecological sustainable design framework for the project includes various associated drivers including:

- Ecological Sustainable Design principles and visions identified within the City of Ryde DCP - 2014
- SEARs Document
- Architectural design standards which represent 'design excellence'
- One Planet Living Philosophy;
- Industry recognised best practice environmental standards (such as Green Star);
- Macquarie Universities – Environmental Performance Drivers

Further details regarding the above are documented below.

2.1 Applicable Regulatory Frameworks

The following regulatory frameworks apply to the development:

2.1.1 City of Ryde (Local Environmental Plan / Development Control Plan)

Local Environmental Plan (LEP) – 2014

The City of Ryde Local Environment Plan has a specific focus on providing ecologically sustainable development through the City of Ryde. In consultation with this community need, the LEP includes specific provisions for commercial & mixed use developments so they do not have an adverse impact on the surrounding environment. The particular aims of the plan include:

- Reduce water demand, including water efficiency, recycling and minimisation of potable water demand
- Energy demand reduction, including energy generation, use of renewable energy and reduced reliance on mains power.
- Indoor environmental quality, including daylight provision, glare control and thermal comfort.
- A reduction in new materials consumption, and the use of sustainable materials, including recycled content in concrete, sustainable timber and PVC minimisation.
- Emissions reduction, including reduced flow to sewer and light pollution,
- Transport initiatives to reduce car dependence such as cyclist facilities, car share and small vehicle parking spaces; and
- Land use & ecology including reduced topsoil removal, and contaminated land reduction.

Development Control Plan (DCP) – 2014

Part 7.1 – Energy Smart Water Wise: 2.6 – All Other Developments supports the LEP in the identification of more detailed sustainability planning controls, these include:

- 2.6.1 – Energy Efficiency – maximising solar access to rooms inclusive of areas of most use:
- 2.6.2 – Managing solar access to windows through the use of either vertical or horizontal shading devices such as external shading structures, pergolas, blinds, or shutters to control the penetration of sunlight.
- 2.6.3 – Preserving solar access to north facing windows and solar panels; and
- 2.6.4 – reducing consumption of water, electricity and gas

2.2 Secretary's Environmental Assessment Requirements

The Secretary's Environmental Assessment Requirements (SEARs) document identifies a number of key Ecological Sustainable Development (ESD), as outlined within Section 6 of the document.

The project must include:

- Detail of how ESD principles will be incorporated into the design and on-going operation phases of the proposal;
- Demonstrate that the proposal has been assessed against a suitable accredited rating scheme to meet industry best practice; and
- Include a description of the measures that would be implemented to minimise the consumption of resources, water (including WSUD) and energy; and
- Demonstrate compliance with Statement of Commitments for Environmentally Sustainable Development.

2.3 Industry Best Practice Design Tools – Green Star

Green Star is a sustainability rating tool developed by the Green Building Council of Australia (GBCA) with the specific purpose of assisting industry in enabling a consistent and measured approach to the sustainability rating of buildings. Buildings and tenancies are ranked between 1 and 6 Stars with only those rating 4 or above receiving formal certification by the GBCA.

The project design to date has utilised the GBCA's Green Star – Design & As-built tool to inform the project design response to the above provisions and has currently allowed for compliance with the intent of Green Star to a minimum 5 Star Green Star standard.

2.4 One Planet Footprint

If everyone in the world lived like the average Australian, we would require approximately 4 planets to support our current population. Taking the world average, the human population currently requires approximately 1.3 planets to support us indefinitely. Given that we only have one planet; it is necessary to bring our average ecological footprint to below 1 planet to ensure that we are not depleting existing long term assets to sustain our lifestyle.

Given that developing nations are seeking to improve their standard of living and given population growth, we are currently increasing our Ecological Footprint which will require even greater effort to reduce in the future. The One Planet Footprint tool for the University is provided by The Footprint Company.

3. Summary of Ecological Design Response

The project design response to date has been identified via the following design drivers:

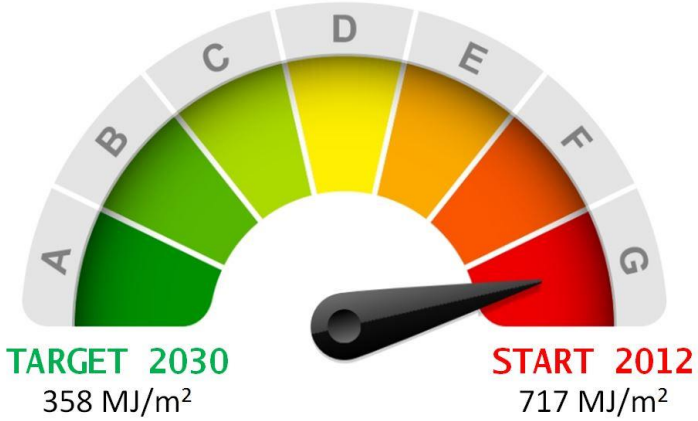
Macquarie University has identified targets as key improvement areas across the campus. Currently published on the university website are the below energy efficiency targets to be achieved by the year 2030.

As such, the development seeks to align itself with the following campus-wide objectives to reduce overall greenhouse gas emissions and energy usage.

North Ryde Campus: Greenhouse Gases: 50% total reduction on 2012 levels (fossil fuel powered energy)

North Ryde Campus: MegaJoules (MJ): 50% reduction on 2012 levels (fossil fuel powered energy)

Buildings: 50% improvement on benchmark average for buildings of that type (about a 4.5-5 star NABERS equivalent)



Source:https://www.mq.edu.au/business_and_community/property_and_facilities/esd_ecologically_sustainable_development/energy_efficiency/

Macquarie University – W6A & W6B Refurbishment

In response to the above 'campus-wide' reduction targets, the W6A & W6B project has identified a series of ESD initiatives identified within both Green Star & OnePlanet Living as described within Section 2 above.

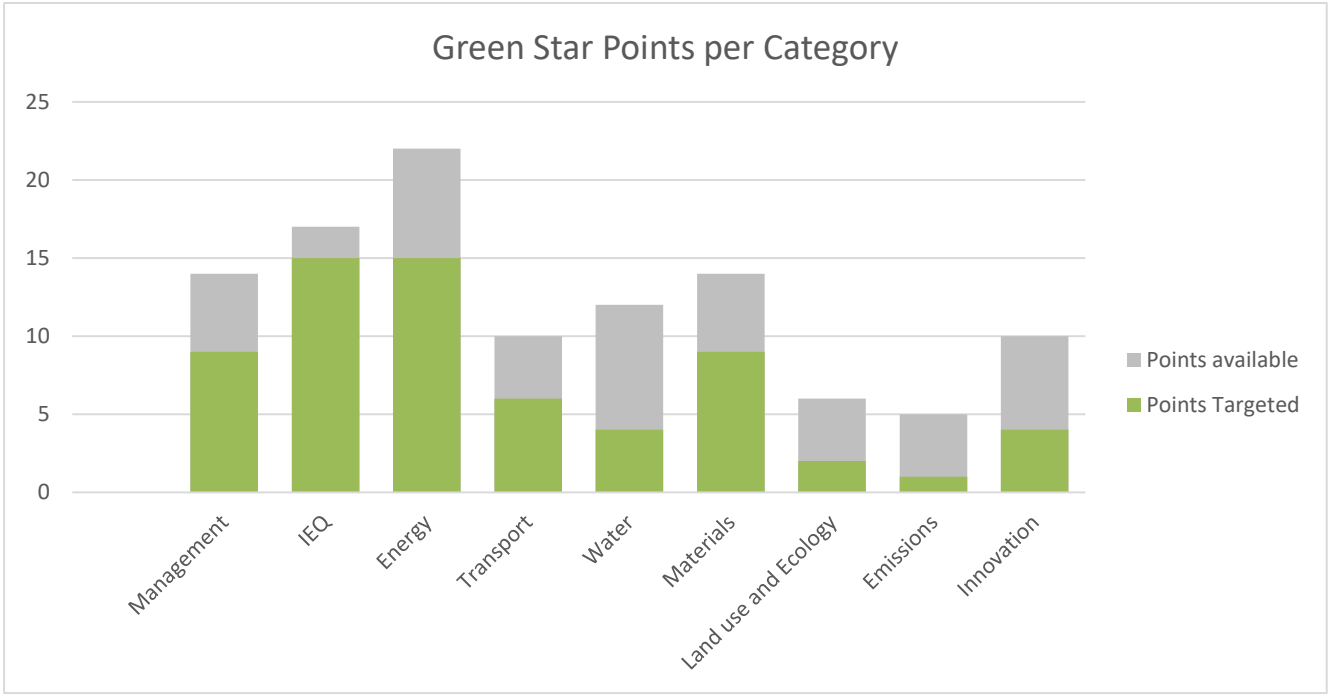
The project design to date, has identified the following Green Star Pathway with the intent to make real-world contributions to the Macquarie University's One Planet Footprint target.

The following includes:

- An assessment against Green Star Design and As-Built v1.1; and
- One Planet Footprint.

The intent of project is to identify an equivalent 5 Star Green Star (Australian Excellence Standard) which identifies initiatives that would minimise the consumption of resources, water and energy as identified within the OnePlanet tool. Both tools are being used to influence the project within Detailed Design phase & ensure the project delivers successful initiatives that create real-world impacts & reduce the universities ecological footprint.

The current Green Star pathway has identified the following potential credit pathway:



Macquarie University – W6A & W6B Refurbishment

Category	Points available	Points Targeted	Points with no or minimal cost		Points potential at cost	Points not targeted
			Low Risk	Medium Risk		
Management	14	8	8	0	1	5
IEQ	17	14	8	1	4	3
Energy	22	12	4	8	0	10
Transport	10	6	6	0	0	4
Water	12	4	0	0	4	8
Materials	14	9	3	0	6	5
Land use and Ecology	6	3	1	2	0	3
Emissions	5	2	2	0	0	3
Innovation	10	4	4	0	0	6
SUBTOTAL	110	62	36	11	15	**48**
TOTAL			**62**			

The above target schedule exceeds the current SEARs requirement of Australian Best practice allowing for optimisation during the detailed design project phase & ensuring the most effective initiatives are included within the project construction and operation.

The following One Planet Analysis outlines the Green Star credits which may contribute to the Macquarie campus One Planet Footprint ambitions. The analysis targets a 25% improvement on the current campus benchmark of 1.4 planets. Thus the effective target for the W6A and W6B project is 1.05 planets.

The proposed development has included many features in the current design to assist in this goal.

The following Ecological Sustainable Development (ESD) opportunities and initiatives below are for potential inclusion within the project. As the design progresses, a number of documented elements may prove more feasible than others and as such, priority will be given to those which have the greatest impact assessed against both Green Star intent & OnePlanet living outcome.

3.1 Energy Efficiency / GHG Emissions Reduction

A variety of energy efficiency measures are applicable to the proposed buildings. These energy efficiency measures may form the part of the final design and operation of the spaces. The final strategy will always be a combination of sustainability, operational feasibility, architectural intent and site-specific appropriateness.

It is expected the project shall include initiatives such as the following:

Energy efficiency measures which could be applied to the buildings to reduce their energy consumption include:

- Brise soleil – A dual-skin building facade incorporating sun control louvres will reduce heat loads and improve insulation of the building.
- Shading - due to the dual-skin façade, reduces direct solar gains and increases comfort without compromising the connection to the outside. Shading allows improved thermal comfort, or reduced energy consumption, or larger glazed areas.

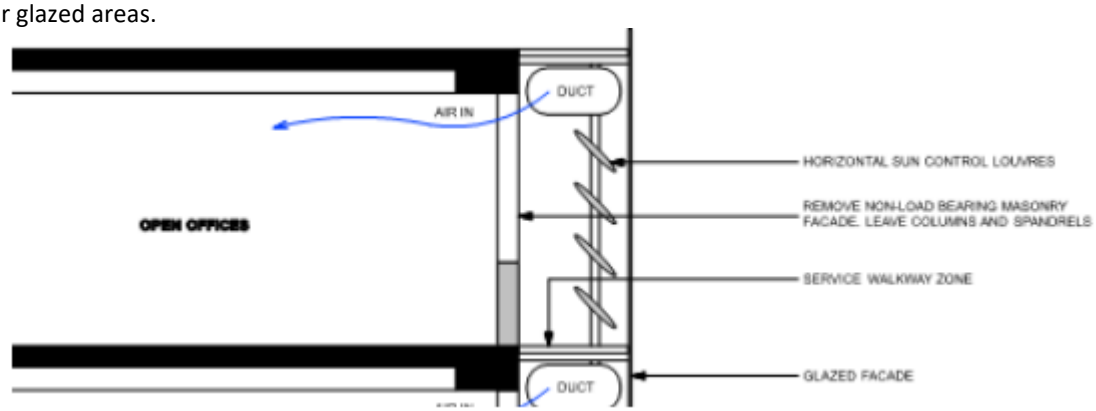


Figure 1 Duel-skin façade providing **brise soleil** from the sun control louvres and **shading** of windows by the service walkway.

- Solar passive design which maximizes north and south facing windows, and minimizes east-west glazing.
- High performance glazing, to exceed the requirements of the Building Code of Australia.
- Thermally efficient construction, including consideration of thermal mass, insulation where required and the lack of insulation where beneficial.
- Efficient HVAC systems with high COPs, appropriately designed to meet the needs of the system.
- Bespoke mechanical design systems sized appropriately for the development. These systems will have adequate efficiency, possible measures include economy cycles, CO2 monitoring or temperature band fluctuation control to promote energy efficiency in the design.
- Energy and water efficient appliances
- Lighting controls including timing, occupancy and daylight sensors to reduce the demand on the lighting system.
- Efficient lighting systems with LED lighting
- On-site Solar Photovoltaic energy power system with minimum 48kW design capacity.
- Effective commissioning, building tuning and optimisation period to ensure operational energy efficiency is achieved and matches the efficiency identified within design.

3.2 Potable Water Reduction

A variety of water efficiency measures are applicable to the proposed office and its individual buildings.

The following chart describes the typical water consumption of an office space. There may be a larger proportion attributed to irrigation for the Macquarie Arts Precinct Project as there is more vegetation for this project than the standard office.

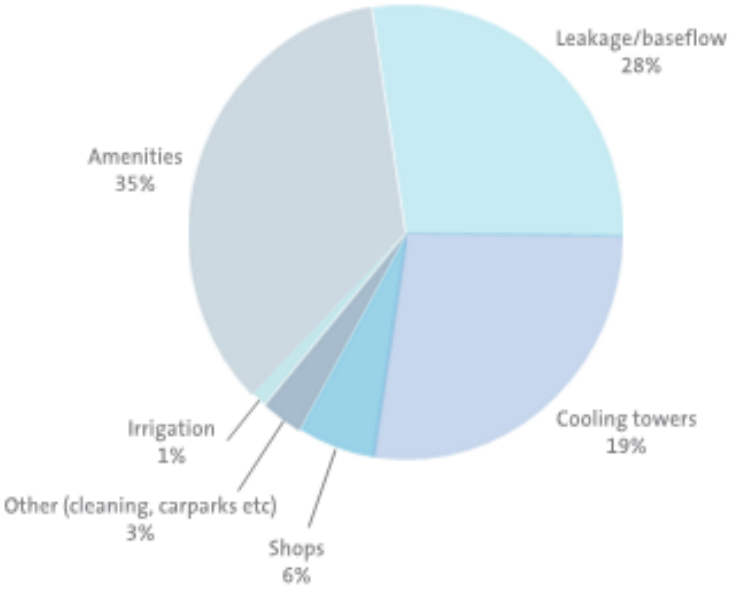


Figure 2 Typical water consumption of an office in Sydney.

There are a number of strategies that can be implemented to reduce the overall potable water consumption of the development:

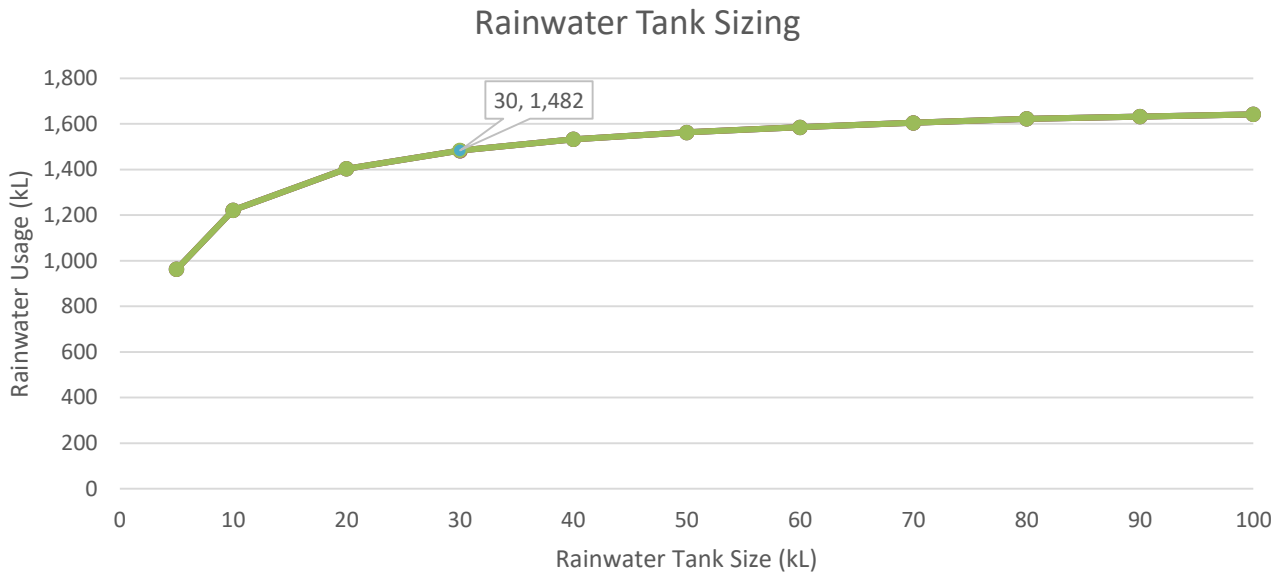
- High WELS rated fixtures and fittings, including the following standards:
  - Taps – 6 Star WELS
  - Urinals – Waterless
  - Toilets – 4 Star WELS
  - Showers – 3 Star WELS (max. 7.5L/min)
  - Dishwashers – 5 Star WELS
  - Washing Machines (where applicable) – 5 Star WELS
- Water sub-metering for effective monitoring and maintenance programs – includes HVAC water, back of house, landscape, potable water supply etc.
- Re-use of fire services test water back into storage provisions (where possible).
- Collection, storage and reuse of rainwater runoff for toilet flushing, landscape irrigation and minor cleaning and wash-down purposes.
- Rainwater collection and reuse, which can offset irrigation and cooling tower water consumption
- Methods to reduce water consumption in landscaped areas. These could include drip-system irrigation for trees and larger plants. Consideration for the use of moisture sensors and the use of native plants in the landscaping plan. Natives are designed to thrive in the Australian environment and are typically more resilient than their exotic counterparts.
- Water education plan to provide information to users regarding their water consumption.

Figure 3 Left to Right: WELS rating for efficient fittings and drip irrigation.

3.3 Water Sensitive Urban Design

The following water sensitive urban design (WSUD) principles may be considered for implementation by the project. These include:

- Rainwater Reuse - A rainwater tank has been investigated for implementation. A 30kL tank is suggested based on the use of the rainwater for irrigation, WCs, urinals and cooling towers.
- Stormwater detention systems to retain a signification of stormwater on-site.
- Stormwater treatments to improve the water quality of stormwater destined for the Sydney Water stormwater system.



3.4 Structural & Material Improvement Options

Construction materials are a highly carbon intensive component of any development. They often involve very energy intensive production processes, large amounts of raw materials including water and energy, and long transport distances to reach the location of the development. However, there are a number of environmentally friendly practices starting to become accepted by the construction industry. Depending on the materials selected for the constructions, and the options available in the area, the following may be adopted for material selections.

- Recycled content in steel, concrete, or pavement.
- Minimisation of excess wasted material.
- Quantification of materials in the planning stages to reduce the risk of over ordering materials.
- Use of materials with longer lifespans
- Use of materials with lower environmental impacts in their production processes.

One of the most significant design efficiency factors within the current design of W6A is the re-use of the existing building structure. This is expected to make a significant impact on the OnePlanet Living tool & reduce the overall ecological footprint of the development.

The Universities OnePlanet Living tool shall be utilized to make final design decision on material selection in pursuit of the design intent target of 1.05 planets.

3.5 Waste Reduction

The following resource efficiency measures are intended to influence the architecture in finalising the design and operation of the spaces.

- Reduced consumption in operation – adoption of the Universities sustainable procurement policy which outlines products with limited packaging.
- Reduced Construction Waste – target 90% construction & demolition waste during construction.
- Dedicated operational waste management plan – to limit operational waste to landfill and improve recycling rates.
- Target minimum 10 year fit-out life-cycle for all internal finishes baring general wear & tear
- On-going waste monitoring for reporting & future management of waste rates.

Refer operational waste management plan for further detail.

3.6 Improved Indoor Environmental Quality

Improved indoor environment quality is a significant aspect of sustainable design. The value in productivity of occupants within an office generally will always overshadow the costs of energy or water consumed in the operation of the building. Therefore, it is important to ensure that the occupants have a healthy environment which encourages productivity and positive mental and physical wellbeing.

The following design features are considered with the intent to improve indoor environmental quality.

- Views have been considered for each of the buildings to optimise the access of the building occupants to green or environment enhancing vistas.
- Thermal comfort is provided through maintaining the internal temperature between 21 and 24 degrees C for the occupied periods. This is applicable to all indoor conditioned areas. Comfort will be achieved through providing adequate insulation in line with the NCC to all envelope elements and reducing draft by designing the indoor air velocity to a maximum of 0.25m/s, except where natural ventilation or fans are used for adaptive cooling. This will be achieved through the mechanical design criteria.

- Glare and radiant temperature control through the use of operable blinds on each window.
- Artificial Lighting Design – will be zoned & designed appropriately to ensure the optimum lighting comfort is achieved. This includes general illuminance and glare reduction in accordance with best practice standards, optimised surface illuminance for building users and localised occupant lighting controls.
- Acoustic comfort – will be optimised to ensure building internal noise levels, reverberation levels and appropriate acoustic separation levels are achieved in accordance with best practice standards. Examples include optimised internal materials and finishes to reduce reverberation improved building facades in order to ensure appropriate acoustic separation is achieved.
- Material Selections – will focus on reducing volatile organic compounds (VOC) levels and minimise formaldehyde impacts. Paints, sealants, adhesives, carpets, floor and material finishes will all comply with best practice VOC criteria via the architectural specification and design intent.

4. Summary Overview

This Ecological Sustainable Development (ESD) report has been prepared for Macquarie University and has provided an overview of the proposed ESD framework to be implemented for the proposed development at the Macquarie University Arts Precinct, Building's W6A & W6B refurbishment.

In response to the Universities campus-wide targets, City of Ryde LEP/DCP and the SEARs document, the project has included a significant number of best practice environmental initiatives throughout the development designed to reduce the ecological footprint commonly associated with construction and design. The combination of Australian Best Practice Green Star initiatives & the OnePlanet Living tool will ensure a comprehensive ESD outcome is achived.

We trust that the information contained within this report provides a suitable overview of the project's commitment to ecological sustainable development and a reduced environmental impact.

Appendix 1

Provisional Green Star Self-Assessment

Green Star - Design & As Built Scorecard

Project:	Macquarie University Building W6A & B Refurbishment
Targeted Rating:	5 Star - Australian Excellence

Core Points Available	Total Score Targeted
99	62.6

Total Points Awarded	Total Points TBC
0.0	10.1

CATEGORY / CREDIT	AIM OF THE CREDIT / SELECTION	CODE	CREDIT CRITERIA	POINTS AVAILABLE	POINTS TARGETED	POINTS AWARDED	POINTS TBC
Management				14			
Green Star Accredited Professional	To recognise the appointment and active involvement of a Green Star Accredited Professional in order to ensure that the rating tool is applied effectively and as intended.	1.0	Accredited Professional	1	1		
Commissioning and Tuning	To encourage and recognise commissioning, handover and tuning initiatives that ensure all building services operate to their full potential.	2.0	Environmental Performance Targets	-	Complies		
		2.1	Services and Maintainability Review	1	1		
		2.2	Building Commissioning	1	1		
		2.3	Building Systems Tuning	1	1		
		2.4	Independent Commissioning Agent	1	0		
Adaptation and Resilience	To encourage and recognise projects that are resilient to the impacts of a changing climate and natural disasters.	3.1	Implementation of a Climate Adaptation Plan	2	0		
Building Information	To recognise the development and provision of building information that facilitates understanding of a building's systems, operation and maintenance requirements, and environmental targets to enable the optimised performance.	4.1	Building Operations and Maintenance Information	1	1		
		4.2	Building User Information	1	0		
Commitment to Performance	To recognise practices that encourage building owners, building occupants and facilities management teams to set targets and monitor environmental performance in a collaborative way.	5.1	Environmental Building Performance	1	1		
		5.2	End of Life Waste Performance	1			1
Metering and Monitoring	To recognise the implementation of effective energy and water metering and monitoring systems.	6.0	Metering	-	Complies		
		6.1	Monitoring Systems	1	1		
Construction Environmental Management	To reward projects that use best practice formal environmental management procedures during construction.	7.0	Environmental Management Plan	-	Complies		
		7.1	Formalised Environmental Management System	1	1		
Operational Waste	Performance Pathway	8A	Performance Pathway - Specialist Plan	1	0		
		8B	Prescriptive Pathway - Facilities	-	0		
Total				14	8	0	1

Indoor Environment Quality				16			
Indoor Air Quality	To recognise projects that provide high air quality to occupants.	9.1	Ventilation System Attributes	1	1		
		9.2	Provision of Outdoor Air	2	0		
		9.3	Exhaust or Elimination of Pollutants	1	1		
Acoustic Comfort	To reward projects that provide appropriate and comfortable acoustic conditions for occupants.	10.1	Internal Noise Levels	1	1		
		10.2	Reverberation	1	1		
		10.3	Acoustic Separation	1	1		1
Lighting Comfort	To encourage and recognise well-lit spaces that provide a high degree of comfort to users.	11.0	Minimum Lighting Comfort	-	Complies		
		11.1	General Illuminance and Glare Reduction	1	1		
		11.2	Surface Illuminance	1	1		
		11.3	Localised Lighting Control	1	0		
Visual Comfort	To recognise the delivery of well-lit spaces that provide high levels of visual comfort to building occupants.	12.0	Glare Reduction	-	Complies		
		12.1	Daylight	2	2		
		12.2	Views	1	1		

Indoor Pollutants	To recognise projects that safeguard occupant health through the reduction in internal air pollutant levels.	13.1	Paints, Adhesives, Sealants and Carpets	1	1	
		13.2	Engineered Wood Products	1	1	
Thermal Comfort	To encourage and recognise projects that achieve high levels of thermal comfort.	14.1	Thermal Comfort	1	1	1
		14.2	Advanced Thermal Comfort	0	1	
Total				**16**	**14**	**0** **2**

Energy				**22**		
Greenhouse Gas Emissions	E. Modelled Performance Pathway	15A.0	Conditional Requirement: Prescriptive Pathway	-	Not Targeted	
		15A.1	Building Envelope	-	0	
		15A.2	Glazing	-	0	
		15A.3	Lighting	-	0	
		15A.4	Ventilation and Air-conditioning	-	0	
		15A.5	Domestic Hot Water Systems	-	0	
		15A.6	Building Sealing	-	0	
		15A.7	Accredited GreenPower	-	0	
		15B.0	Conditional Requirement: NatHERS Pathway	-	Not Targeted	
		15B.1	NatHERS Pathway	-	0	
		15C.0	Conditional Requirement: BASIX Pathway	-	Not Targeted	
		15C.1	BASIX Pathway	-	0	
		15D.0	Conditional Requirement: NABERS Pathway	-	Not Targeted	
		15D.1	NABERS Energy Commitment Agreement Pathway	-	0	
		15E.0	Conditional Requirement: Reference Building Pathway	-	Complies	
		15E.1	Comparison to a Reference Building Pathway	20	10	
Peak Electricity Demand Reduction	Performance Pathway	16A	Prescriptive Pathway - On-site Energy Generation	-	0	
		16B	Performance Pathway - Reference Building	2	2	2
Total				**22**	**12**	**0** **2**

Transport				**10**		
Sustainable Transport	Prescriptive Pathway	17A.1	Performance Pathway	0	6	
		17B.1	Access by Public Transport	3	0	
		17B.2	Reduced Car Parking Provision	1	0	
		17B.3	Low Emission Vehicle Infrastructure	1	0	
		17B.4	Active Transport Facilities	1	0	
		17B.5	Walkable Neighbourhoods	1	0	
Total				**7**	**6**	**0** **0**

Water				**12**		
		18A.1	Potable Water - Performance Pathway	12	4	

Potable Water	Performance Pathway	18B.1	Sanitary Fixture Efficiency	0	0		
		18B.2	Rainwater Reuse	0	0		
		18B.3	Heat Rejection	0	0		
		18B.4	Landscape Irrigation	0	0		
		18B.5	Fire System Test Water	0	0		
Total				**12**	**4**	**0**	**0**

Materials				**14**			
Life Cycle Impacts	Performance Pathway - Life Cycle Assessment	19A.1	Comparative Life Cycle Assessment	6	5		
		19A.2	Additional Life Cycle Impact Reporting	1	1		
		19B.1	Concrete	0	0		
		19B.2	Steel	0	0		
		19B.3	Building Reuse	0	0		
Responsible Building Materials	To reward projects that include materials that are responsibly sourced or have a sustainable supply chain.	20.1	Structural and Reinforcing Steel	1	1		
		20.2	Timber Products	1	0		
		20.3	Permanent Formwork, Pipes, Flooring, Blinds and Cables	1	1		
Sustainable Products	To encourage sustainability and transparency in product specification.	21.1	Product Transparency and Sustainability	3	0		
Construction and Demolition Waste	Percentage Benchmark	22A	Fixed Benchmark	-	0		
		22B	Percentage Benchmark	1	1		
Total				**14**	**9**	**0**	**0**

Land Use & Ecology				**6**			
Ecological Value	To reward projects that improve the ecological value of their site.	23.0	Endangered, Threatened or Vulnerable Species	-	Not Targeted		
		23.1	Ecological Value	3	0		
Sustainable Sites	To reward projects that choose to develop sites that have limited ecological value, re-use previously developed land and remediate contaminate land.	24.0	Conditional Requirement	-	Complies		
		24.1	Reuse of Land	1	1		
		24.2	Contamination and Hazardous Materials	1	1		1
Heat Island Effect	To encourage and recognise projects that reduce the contribution of the project site to the heat island effect.	25.0	Heat Island Effect Reduction	1	1		
Total				**6**	**3**	**0**	**1**

Emissions				**5**			
Stormwater	To reward projects that minimise peak stormwater flows and reduce pollutants entering public sewer infrastructure.	26.1	Reduced Peak Discharge	1	1		
		26.2	Reduced Pollution Targets	1	0		
Light Pollution	To reward projects that minimise light pollution.	27.0	Light Pollution to Neighbouring Bodies	-	Complies		
		27.1	Light Pollution to Night Sky	1	1		
Microbial Control	To recognise projects that implement systems to minimise the impacts associated with harmful microbes in building systems.	28.0	Legionella Impacts from Cooling Systems	1	0		
Refrigerant Impacts	To encourage operational practices that minimise the environmental impacts of refrigeration equipment.	29.0	Refrigerants Impacts	1	0		
Total				**5**	**2**	**0**	**0**

Innovation				10			
Innovative Technology or Process	The project meets the aims of an existing credit using a technology or process that is considered innovative in Australia or the world.	30A	Innovative Technology or Process		2		2
Market Transformation	The project has undertaken a sustainability initiative that substantially contributes to the broader market transformation towards sustainable development in Australia or in the world.	30B	Market Transformation		0		
Improving on Green Star Benchmarks	The project has achieved full points in a Green Star credit and demonstrates a substantial improvement on the benchmark required to achieve full points.	30C	Improving on Green Star Benchmarks	10	1		1
Innovation Challenge	Where the project addresses an sustainability issue not included within any of the Credits in the existing Green Star rating tools.	30D	Innovation Challenge		1		1
Global Sustainability	Project teams may adopt an approved credit from a Global Green Building Rating tool that addresses a sustainability issue that is currently outside the scope of this Green Star rating tools.	30E	Global Sustainability		0		
Total				**10**	**4**	**0**	**4**

TOTALS	AVAILABLE	TARGETED
CORE POINTS	99	58.0
CATEGORY PERCENTAGE SCORE		58.6
INNOVATION POINTS	10	4.0
TOTAL SCORE TARGETED		62.6

AWARDED	TBC
0.0	10.1